AIRPLANE MAINTENANCE MANUAL

For the

CIRRUS SR20

Aircraft Serials 20-1005 thru 20-2338



CIRRUS DESIGN INCORPORATED

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INTRODUCTION

1. COVERAGE

This Cirrus Design SR20 Airplane Maintenance Manual was prepared by Cirrus Design Technical Publications. This manual contains information necessary to enable a trained mechanic to inspect, service, clean, trouble shoot, functionally test, and repair systems and equipment in the Cirrus Design SR20. It also includes information necessary for the mechanic to perform maintenance or make minor repair to units in the airplane normally requiring such action on the flight line or in the maintenance hangar. This manual covers the as delivered airplane configuration.

The Cirrus Design SR20 Airplane Maintenance Manual was prepared using GAMA Specification No. 2 (Specification for Manufacturers Maintenance data), Revised September 1982 as a content model and format guide. However, as the specification is written to cover a whole class of aircraft rather than a particular model, some deviations from the specification were made for clarity.

This Maintenance Manual does not reflect part numbers and cannot be used for ordering replacement parts. Spares and replacement parts should be ordered using the current Cirrus Design SR20 Illustrated Parts Catalog.

Wiring schematics within the description and operation sections of this manual are for general information purposes only. Troubleshooting shall be performed using the Wiring Manual, and the optional avionics and electrical wiring diagrams provided at delivery.

2. USING THE MAINTENANCE MANUAL

This Maintenance Manual is divided into four major sections, each of which is separated into chapters. Each chapter contains its own list of effective pages and table of contents.

A. Page Numbering System

Page numbers used in this Maintenance Manual consist of two-element numbers separated by dashes, under which the page number and date are printed.

Whenever the chapter/system element number is followed by zeros in the section/subsystem (for example, 32-00) the information presented on the page is applicable to the entire system.

The section/subsystem number is used to identify information applicable to section or subsystems within a chapter or system respectively. The subject/unit element number progresses from the number ‘10’ in accordance with GAMA Specification No. 2 and the number of section/subsystem units covered.

All system/subsystem data is page numbered separately.

3. WARNINGS, CAUTIONS, AND NOTES

Warnings, Cautions, and Notes are used to highlight or emphasize important points.

Warnings call attention to use of materials, processes, methods, procedures, or limits which must be followed precisely to avoid bodily injury.

Cautions call attention to methods and procedures which must be followed to avoid damage to equipment.

Notes call attention to methods which make the procedure easier.

4. AIRPLANE SERIAL NUMBER EFFECTIVITY

Airplane serial number effectivity references are used throughout the maintenance manual to distinguish between different system designs and procedures. The effectivities are italicized and are displayed in the same font weight as the adjacent text.

Effectivity references under the “General” or “Description” sections are handled in one of two ways. If effectivity applies to entire paragraph, the effectivity reference will preface the paragraph with a colon. If effectivity applies to only a section of the paragraph, the affected content shall be followed by the effectivity reference in parentheses.

Effectivity references under the “Troubleshooting” section are handled one of three ways. If effectivity applies to the probable cause and/or remedy item in the table, the effectivity reference will preface the paragraph followed by a colon and may share the table cell with one or more additional effectivity blocks. If effectivity applies to the trouble item in the table, the effectivity reference will preface the paragraph followed by a colon. All probable cause and remedy items in that table row will pertain only to the effectivity defined for the trouble item. Alternately, a standalone table may be defined for a particular effectivity if troubleshooting differs greatly due to varying model configurations.

Effectivity references under the “Maintenance Practices” section are handled in one of two ways. If effectivity applies to only a few steps in a procedure, the effectivity reference will preface the step followed by a colon. If procedures differ greatly based on effectivity, the component and related procedures will be presented in blocks with an effectivity reference for each block.

Effectivity is also indicated in the effectivity block in the bottom corner of each page. On illustration pages, the effectivity is on the face of the illustration and in the title block beneath the illustration.

Note: For content specified with serials followed by “and subsequent” or “& subs”, effectivity in this AMM ends as follows:

Model	End Effectivity
SR20	2338

A. Aircraft Equipped with G3 Wing

Airplane serial numbers 1878, 1886 and subsequent are equipped with a redesigned wing. Where necessary, this document may use the terms “G3” or “G3 Wing” to identify this installation. The list below shows the primary structural and system changes which accompany G3 Wing configuration:

- 1 degree increase in wing dihedral,
- Removal of the aileron-rudder interconnect,
- Increased fuel capacity and associated updates to sensing and indicating system,
- Main landing gear location moved slightly, strut angle increased, and strut lengthened,
- Redesigned main landing gear fairings,
- Redesigned nose landing gear fairings,
- Redesigned lightning protection plan,
- Relocation of stall warning port,
- RH lower engine cowling modified,
- Redesigned environmental control system,
- Redesigned wing root fairings,
- Modification of interior trim panels,

- Redesigned bolster switch panel,
- Leading-edge wing tip recognition lights.

B. Special Conditions

New features are sometimes introduced on a “pilot” airplane before going into regular production. As a result, certain parts or assemblies are installed on a range of airplanes with a “split” or a break in affected serial number range.

For example, a split effectivity listing of “Serials 1878, 1886 & subs” indicates that a part or assembly was installed on aircraft serial number 1878, then removed on serial numbers 1879 through 1885, and then introduced as standard configuration on aircraft serial numbers 1886 and subsequent.

In many instances these split effectivities can result in difficult-to-interpret descriptions listing multiple serial numbers. To avoid including these cumbersome descriptions throughout the length of this publication, see the following Special Conditions table for a list of affected aircraft serial numbers and instruction on how to disposition the aircraft’s as-built configuration.

Serial Number	Special Condition	Disposition
1301	Aircraft installed with updated bulkhead 306.	Unless otherwise noted, refer to serial number 1307 for part identification.
1633	Aircraft installed with Environmental Control System with factory installed fan.	Unless otherwise noted, refer to serial number 1639 for part identification.
1878	Aircraft installed with G3 Wing and associated systems. Aircraft installed with Aircraft Data Logger (ADL) and associated systems.	Unless otherwise noted, refer to serial number 1886 for part identification of systems affected by G3 Wing and ADL installations.
1907	Aircraft installed with Perspective Avionics and associated systems.	Unless otherwise noted, refer to serial number 2016 for part identification.
2058	Aircraft installed with Air Conditioning System. Aircraft installed with Oleo Strut.	Unless otherwise noted, refer to serial number 2065 for part identification.
2220	Aircraft installed with Lycoming Engine. Aircraft installed with Perspective+ Avionics.	Unless otherwise noted, refer to serial number 2339 in AMM P/N 12137-002 for part identification.

C. Service Bulletins

Note: When part effectivities are conditional to modifications, such as service bulletins, the airplane logbook should be checked to determine the proper replacement parts.

Installation of service bulletins is shown by notations in the maintenance procedure and figure. The term “Before SB 20-XX-XX" indicates that the part effectivity is as written unless the subject Service Bulletin was installed. The term “After SB 20-XX-XX” indicates that the part effectivity is as written when the airplane has been modified in accordance with the subject Service Bulletin.

D. Avionics Configuration

Airplane serial effectivities shown in a maintenance procedure or figure may be further limited by the airplane's avionics configuration. Cirrus Design offers the SR20 with the avionic options listed in the table below; therefore, the effectivity for a maintenance procedure or figure may also be limited by the installed avionics.

Standard avionics suites are available in the following configurations:

Serials 1005 through 1267:

Configuration A
Moving Map Display (ARNAV ICDS 2000 MFD)
Single-Axis Autopilot (S-Tec System 20)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
One IFR Approach-Certified GPS (Garmin GNS 430) and One VFR GPS (Garmin GNC 250XL)
Two VHF Communications (Garmin GNS 430 and Garmin GNC 250XL)
Single Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (*Serials 1005 thru 1099:* Garmin GTX 320, *Serials 1100 thru 1267:* Garmin GTX 327)
Course Deviation Indicator (*Serials 1005 thru 1047:* Garmin GI 102, *Serials 1048 thru 1267:* Garmin GI 102A)
Directional Gyro

Configuration B
Moving Map Display (ARNAV ICDS 2000 MFD)
Two-Axis Autopilot (S-Tec System 30)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
Two IFR Approach-Certified GPS (Garmin GNS 430 and Garmin GNC 420)
Two VHF Communications Transceivers (Garmin GNS 430 and Garmin GNC 420)
Single Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (*Serials 1005 thru 1099:* Garmin GTX 320, *Serials 1100 thru 1267:* Garmin GTX 327)
Horizontal Situation Indicator (Century NSD 360A)
Course Deviation Indicator (*Serials 1005 thru 1047:* Garmin GI 102, *Serials 1048 thru 1267:* Garmin GI 102A)

Configuration C
Moving Map Display (ARNAV ICDS 2000 MFD)
Two-Axis Autopilot (S-Tec System 55)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
Two IFR Approach-Certified GPS (Garmin GNS 430)
Two VHF Communications Transceivers (Garmin GNS 430)
Two Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)
Horizontal Situation Indicator (Century NSD 1000)
Course Deviation Indicator (*Serials 1005 thru 1047:* Garmin GI 106, *Serials 1048 thru 1267:* Garmin GI 106A)

Serials 1268 thru 1336:

Configuration 2.0
Moving Map Display (Avidyne EX3000C MFD)
Single-Axis Autopilot (S-Tec System 20)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
One IFR Approach-Certified GPS (Garmin GNS 430) and One VFR GPS (Garmin GNC 250XL)
Two VHF Communications (Garmin GNS 430 and Garmin GNC 250XL)
Single Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)
Horizontal Situation Indicator (Century NSD 1000)
Course Deviation Indicator (Garmin GI 106)

Configuration 2.1
Moving Map Display (Avidyne EX5000C MFD)
Two-Axis Autopilot (S-Tec System 30)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
Two IFR Approach-Certified GPS (Garmin GNS 430 and Garmin GNC 420)
Two VHF Communications Transceivers (Garmin GNS 430 and Garmin GNC 420)
Single Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)
Horizontal Situation Indicator (Century NSD 1000)
Course Deviation Indicator (Garmin GI 102A)

Configuration 2.2
Moving Map Display (Avidyne EX5000C MFD)
Two-Axis Autopilot (S-Tec System 55X)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
Two IFR Approach-Certified GPS (Garmin GNS 430)
Two VHF Communications Transceivers (Garmin GNS 430)
Two Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)
Electronic Navigation Display (Sandel SN3308)
Course Deviation Indicator (Garmin GI 106A)

Serials 1337 and subsequent:

Configuration PFD
Primary Flight Display (Avidyne FlightMax Entegra PFD)
Moving Map Display (Avidyne EX5000C MFD)
Two-Axis Autopilot (S-Tec System 55SR)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
One IFR Approach-Certified GPS (Garmin GNS 430) and One VFR GPS (Garmin GNC 250XL)
Two VHF Communications (Garmin GNS 430 and Garmin GNC 250XL)
Single Navigation (VOR/LOC/GS) Receiver (Garmin GNS 430)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)

Serials 1359 and subsequent:

Configuration SRV
Primary Flight Display (Avidyne FlightMax Entegra PFD)
Moving Map Display (Avidyne EX3000C MFD)
Integrated Audio System with Intercom (Garmin GMA 340)
Marker Beacon Receiver (Garmin GMA 340)
One IFR Certified GPS (Garmin GNC 420)
One VHF Communications (Garmin GNC 420)
Mode C Transponder with Altitude Encoder (Garmin GTX 327)

Serials 2016 and subsequent:

Configuration Perspective
Multi-Function Display (Garmin MFD)
Primary Flight Display (Garmin PFD)
Two-Axis Autopilot (Garmin GFC 700)
Serials 2016 thru 2126: Integrated Audio System with Intercom (Garmin GMA 347)
Serials 2127 & subs: Integrated Audio System with Intercom (Garmin GMA 350)
Serials 2016 thru 2126: Marker Beacon Receiver (Garmin GMA 347)
Serials 2127 & subs: Marker Beacon Receiver (Garmin GMA 350)
Two IFR Approach-Certified GPS (Garmin GIA 63W)
Two VHF Communications Transceivers (Garmin GIA 63W)
Two Navigation (VOR/LOC/GS) Receiver (Garmin GIA 63W)
Mode C Transponder with Altitude Encoder (Garmin GTX 32)
Flight Management System Keyboard (Garmin GCU 478)
Attitude and Heading Reference System (Garmin GRS 77)
Air Data Computer (Garmin GDC 74A)
Engine Airframe Unit (Garmin GEA 71)

Serials 2086, 2087, 2117, 2120, 2122 thru 2126, 2129 thru 2132, 2136 thru 2147 with Option Installed:

Configuration “S” United States Airforce Academy
Perspective Avionics Configuration with following options installed:
- 10-inch PFD Display
- 10-inch MFD Display
- Single Attitude and Heading Reference System (Garmin GRS 77)
- Single Air Data Computer (Garmin GDC 74A)
- Engine Airframe Unit (Garmin GEA 71)
- Integrated Audio System with Intercom (Garmin GMA 347)
- Marker Beacon Receiver (Garmin GMA 347)
- Two IFR Approach-Certified GPS (Garmin GIA 63W)
- Two VHF Communications Transceivers (Garmin GIA 63W)
- Two Navigation (VOR/LOC/GS) Receiver (Garmin GIA 63W)
- Flight Management System Keyboard (Garmin GCU 478)
- Mode C Transponder with Altitude Encoder (Garmin GTX 32)
- Garmin GTS 800 Traffic Advisory System
- No Automatic Flight Control System (ACFS)
- No Garmin Synthetic Vision (SynVis)

Configuration “S” United States Airforce Academy (Continued)
- No Weather System (WX)
- No Terrain Awareness & Warning (TAWS)
- No Terminal Procedure Chart System
Artex ME406 Emergency Locator Transmitter (ELT)
Vent-Only Environment Control System
Fabric Seats
2-Blade Propeller
No Wheel Pants
No Rear Seats
No Rear Seat Headset Plugs
No Ice Protection System
No Carbon Monoxide (CO) Detector
No Enhanced Vision System (EVS)
No Wing Recognition Lights

E. Optional Equipment

Airplane serial effectivities shown in a maintenance procedure or figure may be further limited by optional equipment installed in the airplane. Cirrus Design offers the SR20 with the optional equipment listed in the table below; therefore, the effectivity for a maintenance procedure or figure may also be limited by the installed optional equipment.

Optional Equipment
Serials 1005 through 1336: Century NSD 1000 Horizontal Situation Indicator
Serials 1148 & subs: L3 SkyWatch
Serials 1032 & subs: L3 Stormscope
Serials 1148 & subs: S-Tec System 55X
Serials 1148 through 1336: Sandel SN3308 Electronic Navigation Display
Serials 1179 & subs: Avidyne EX3000C and EX5000C MFD
Serials 1233 & subs: Avidyne EMax Engine Monitoring System
Serials 1425 & subs: Garmin Mode S Transponder
Serials 1441 & subs: Honeywell Terrain Awareness and Warning System
Serials 1473 & subs Avidyne XM Weather System
Serials 2127 & subs: Iridium Weather System
Serials 1494 & subs: Avidyne Flight Director
Serials 1533 & subs: XM Radio System
Serials 1633, 1639 & subs: Cabin Air Fan Assembly
Serials 2065 & subs w/ Perspective Avionics: Air Conditioning System
Serials 2065 & subs: Oleo Strut

Optional Equipment (Continued)
Serials 1639 & subs: Artex ME406 Emergency Locator Transmitter (ELT)
Serials 2016 & subs: Bendix/King Distance Measuring Equipment
Serials 2016 & subs: Bendix/King Automatic Direction Finder
Serials 2016 & subs: Garmin Synthetic Vision
Serials 2016 & subs: Enhanced Vision System
Serials 2127 & subs: 2+1 Rear Seat
Serials 2127 & subs: Three-Harness Shoulder Belt
Serials 2127 & subs: Cargo Net
Serials 2273 & subs: MD302 Standby Attitude Module

5. REVISIONS

This manual has been prepared in loose-leaf form for ease in inserting revisions. Tabbed dividers, throughout the manual, are in standard GAMA format and numbering and allow quick reference to data in each section. Logical and convenient Tables of Contents are located at the beginning of each chapter to aid in locating specific data within that chapter.

Numbered revisions will be issued periodically. These revisions are printed on white paper and contain a revision instruction sheet to assist the user in filing the change.

Upon receipt of a numbered revision, file it according to the provided instructions as soon as possible. Additionally, a record of filing must be made on the following Log of Revisions page.

6. REVISION BARS

Changes to data in an existing section will be identified by a revision bar in the outer margin of the page.

Change bars are used in figures to indicate changes.

7. TEMPORARY REVISIONS

Temporary revisions are used to provide time sensitive information and changes as they become available. Temporary revisions provide, with the least possible delay, new information which assists in maintaining safe and efficient flight/ground operations.Temporary revisions are incorporated at the next regularly scheduled revision and become a permanent part of the Maintenance Manual.

Upon receipt of a Temporary Revision, file the revision in the applicable chapter in accordance with filing instructions that appear on the Temporary Revision. Additionally, a record of filing the Temporary Revision must be made in the Log of Temporary Revisions for that AMM chapter. Typically, the Log Of Temporary Revisions for a chapter will be replaced by a blank log when a numbered revision for that chapter is issued.

Temporary Revisions should be removed from this manual only when removal instructions are noted on the regular revision summary sheet or by instructions noted on a superseding Temporary Revision.

8. PUBLICATION CHANGE REQUEST FORM

A Publication Change Request form can be found online at the following link:

http://servicecenters.cirrusdesign.com/tech_pubs/SR2X/serviceloopform.asp

Use the form to submit a Publications Change Request to our Engineering Department and/or to tell us what you think of the quality of the publication. We will use the data you provide us to improve the quality of our technical publications.

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CHAPTER

04

AIRWORTHINESS LIMITATIONS

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CHAPTER 04 - AIRWORTHINESS LIMITATIONS

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CHAPTER 04 - AIRWORTHINESS LIMITATIONS

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AIRWORTHINESS LIMITATIONS

1. GENERAL

The Airworthiness Limitations Section is FAA approved and specifies inspection and maintenance required under paragraphs 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

This chapter outlines the maximum replacement intervals and/or maintenance requirements for aircraft components, systems, and structures determined to be life limited and/or require monitoring through scheduled maintenance.

The following airworthiness limitations and requirements are separated into groups as described below.

A. Maintenance Limitations

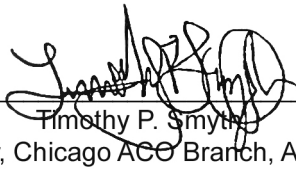
Component and system checks required to be performed during airplane scheduled maintenance.

B. Replacement Limitations

Listing of time limits for replacement of specific components.

C. Structural Limitations

Damage Tolerant Limitations required by Federal Aviation Regulations for certification.

FAA Approved  **Date** Jul 11, 2018

Timothy P. Smyth
Manager, Chicago ACO Branch, AIR-7C0
Compliance & Airworthiness Division
Federal Aviation Administration

2. DESCRIPTION

A. Maintenance Limitations

The scheduled maintenance requirements listed below are also included in AMM 5-20 (Scheduled Maintenance Checks). The following criteria must be adhered to:

- Paint Finish

  To ensure that the temperature of the composite structure is kept below 150 degrees Fahrenheit, the maximum allowable paint on the wing will have an absorptivity not greater than 0.4, with an emissivity of at least 0.9. The maximum allowable paint on the fuselage will have an absorptivity not greater than 0.6, with an emissivity of at least 0.7. (Refer to 51-20)

- Cirrus Airframe Parachute System (CAPS)

  CAPS must be serviced and maintained by Cirrus Design trained and authorized parachute system technicians only. Airframe and Powerplant license alone is not sufficient credentials for performing maintenance on CAPS. Licensed Airframe and Powerplant mechanics may visually inspect the parachute installation and activation handle installation only as specified in 5-20. (Refer to 05-20)

B. Replacement Limitations

Unless otherwise noted, the following components must be replaced with new components, overhauled components, or components which have life remaining, at the intervals specified.

The stated replacement times reflect the time interval since the manufacture of the component. Manufacture date or expiration date of the life limited component is labeled on the component.

Upon replacement of life limited component, enter component's date of installation and calculated expiration date in the Aircraft Logbook.

Item		Replacement Limits
1.	Engine	There are no life limits on the engine or its components. Refer to Chapter 5, Time Limits and Maintenance Checks, for recommended overhaul schedule.
2.	Propeller	There are no life limits on the propeller or its components. Refer to Chapter 5, Time Limits and Maintenance Checks, for recommended overhaul schedule.
3.	Cirrus Airframe Parachute System (CAPS) Rocket Motor Assembly	Replace with new or recharged unit every 10 years. Refer to Chapter 95, Special Purpose Equipment.
4.	Cirrus Airframe Parachute System (CAPS) Parachute	Replace with new or repacked (inspected/ repaired/repacked) unit every 10 years. Refer to Chapter 95, Special Purpose Equipment.
5.	Cirrus Airframe Parachute System (CAPS) Reefing Line Cutters	Airplane Serial Numbers 1005-1026: Replace with new line cutters at 3 years then every 6 years thereafter. Airplane Serial Numbers 1027 & subsequent: Replace with new line cutters every 6 years. Refer to Chapter 95, Special Purpose Equipment.

Item (Continued)		Replacement Limits
6.	Cirrus Airframe Parachute System (CAPS) Battery	Replace with new battery every 5 years or after CAPS deployment. Refer to Chapter 95, Special Purpose Equipment.
7.	Turn Coordinator/Roll Computer Batteries Serials 1005 thru 1336, 1337 & subs w/o PFD	Replace after emergency use or at Annual Inspection.
8.	Inflatable Restraint System Electronic Module Assembly	Refurbish unit every 7 years. Replace with new unit every 14 years. Refer to Chapter 25, Equipment and Furnishings.
9.	Inflatable Restraint System Pilot Seat Inflator Assembly	For P/N 20902-002: Replace with new unit every 12 years. For P/N 20902-005: Replace with new unit every 10 years. Refer to Chapter 25, Equipment and Furnishings.
10.	Inflatable Restraint System Co-Pilot Seat Inflator Assembly	For P/N 20902-002: Replace with new unit every 12 years. For P/N 20902-005: Replace with new unit every 10 years. Refer to Chapter 25, Equipment and Furnishings.

C. Structural Limitations

The certification requirements of 14 CFR 23.573 require that the composite airframe structure, cabin, wing, empennage their carry thru, and attaching structure whose failure would be catastrophic must be designed to damage tolerant criteria. Damage tolerant certification for the selected airframe life of 12,000 flight hours has been established for all of the affected parts with no special structural limitations or inspections.

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CHAPTER

05

TIME LIMITS AND MAINTENANCE CHECKS

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CHAPTER 05 - TIME LIMITS AND MAINTENANCE CHECKS

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TIME LIMITS AND MAINTENANCE CHECKS

1. GENERAL

This chapter provides the recommended intervals for the overhaul and replacement of components, and the scheduled and unscheduled maintenance for the airplane. The recommended time limits and maintenance checks given in this chapter were created to meet the requirements of the Federal Aviation Regulations. Other Regulatory Authorities can have different requirements. Follow the requirements of the Regulatory Authority of the country where the airplane is registered.

CAUTION: Recommended overhaul and replacement times are listed in Section 5-10, Time Limits. These maintenance items must be incorporated into the 100 Hour, Annual, or Progressive inspection as applicable.

A. Scheduled Maintenance Programs and Requirements

Note: It is important to note that Owners and Operators of non-commercially operated aircraft, for example private owners, require only an Annual inspection.

Because the 100 Hour Inspection items are identical to the Annual Inspection items they are listed under the same column in Section 5-20, Scheduled Maintenance Report. However, 100 Hour Inspections are not required for non-commercially operated aircraft. It is the operator's responsibility to follow the requirements of the airworthiness authority of the country where the airplane is registered.

All civil airplanes of U.S. registry must undergo a complete inspection each 12 calendar months as required by 14 CFR § 91.409. Compliance with the regulations is accomplished using one of three methods; Traditional Annual Inspection, Traditional 100 Hour Inspection, or Progressive Inspection.

(1) Traditional Annual Inspection Program

The Traditional Annual Inspection Program utilizes 14 CFR § 43, Appendix D to inspect the airplane. Annual Inspection inspection items are listed under the Traditional Program column on the Scheduled Maintenance Report in Section 5-20. (Refer to 05-20)

(2) Traditional 100 Hour Inspection Program

The Traditional 100 Hour Inspection Program is required, in addition to a complete Annual Inspection, for civil airplanes of U.S. registry which are operated commercially (for hire). The 100 Hour inspection items are identical to the Annual Inspection items and are listed under the Traditional Program column on the Scheduled Maintenance Report in Section 5-20. (Refer to 05-20)

(3) Progressive Inspection Program

The Progressive Inspection Program allows the work load to be divided into smaller operations over a time period of 400 or 800 hours. At the completion of a Progressive Inspection Program the aircraft will have undergone a full Annual Inspection. The programs were developed to maximize inspection efficiency for aircraft with annual expected usage rates in excess of 400 hours. The Progressive Inspection Programs inspection items are identical to the Annual Inspection items and are broken into 5-cyclical phases listed under the Progressive Inspection Phase column on the Scheduled Maintenance Report in Section 5-20. (Refer to 05-20)

B. Traditional Inspection Program Intervals

(1) Annual Inspection Time Intervals

The inspection interval to the next Annual Inspection may not exceed twelve calendar months. For Example: If an inspection were signed off on 15 September 2005, the next Annual Inspection would be due and must be accomplished no later than 30 September 2006. All subsequent Annual Inspections will be due in September unless the schedule is reset by performing an Annual Inspection early.

(2) 100 Hour Inspection Time Intervals

The interval between 100 Hour Inspections should never be exceeded by more than 10 hours, and then only if additional time is required to reach a place where the inspection can be satisfactorily accomplished. Additionally, the time the interval was exceeded must be included as flight hours in the next interval. For example: If a 100 Hour Inspection was due at 650 flight hours and was actually signed-off at 658 flight hours, the next 100 Hour Inspection is due at 750 flight hours, not 758 flight hours. Inspection tolerances cannot be accumulated.

C. Progressive Inspection Program Intervals

Progressive Inspection Program intervals should never be exceeded by more than 10 hours, and then only if additional time is required to reach a place where the inspection can be satisfactorily accomplished. At the completion of the 400 or 800 hour progressive inspection, the program will accomplish a full inspection of the aircraft, constituting an Annual Inspection. If all Phase Inspections are not completed within 12 calendar months, all remaining Phase Inspections must be completed to maintain airworthiness as required by 14 CFR § 91.409.

The Progressive Inspection Program uses Detailed and Routine inspections to accomplish the required maintenance. Routine Inspections are regular procedures generally consisting of a Visual or Operational Inspection of the airplane, component, or system. Detailed Inspections are comprehensive examinations or Functional Inspections of the airplane, component, or system. Disassembly is required as necessary to gain access for the inspection of assemblies and related sub-assemblies.

(1) 400 Hour Progressive Inspection Program (See Figure 05-001)

The 400 Hour Progressive Inspection Program provides for the complete inspection of the airplane utilizing a five-phase cyclic inspection program. A total of eight inspections are accomplished over the course of 400 flight hours, with an inspection occurring every 50 flight hours.

(a) 400 Hour Progressive Inspection Program Intervals

- Phase I Inspection is accomplished at the 50 hour interval and covers:
  - *Detailed* Inspection of the Wing Group
  - *Routine* Inspection of the Engine Group
  - *Routine* Inspection of the Landing Gear Group
- Phase II Inspection is accomplished at the 100, 200, 300, and 400 hour intervals and covers:
  - *Detailed* Inspection of the Engine Group
  - *Detailed* Inspection of the Propeller Group
  - *Routine* Inspection of the Landing Gear Group
- Phase III Inspection is accomplished at the 150 hour interval and covers:
  - *Detailed* Inspection of the Landing Gear Group
  - *Routine* Inspection of the Engine Group
- Phase IV Inspection is accomplished at the 250 hour interval and covers:
  - *Detailed* Inspection of the Fuselage and Empennage

- *Routine* Inspection of the Engine Group,
- *Routine* Inspection of the Landing Gear Group,
- *Routine* Inspection of the Cabin Group.

- Phase V Inspection is accomplished at the 350 hour interval and covers:
  - *Detailed* Inspection of the Cabin Group,
  - *Detailed* Inspection of the Radio Group,
  - *Routine* Inspection of the Engine Group,
  - *Routine* Inspection of the Landing Gear Group.

(2) 800 Hour Progressive Inspection Program (See Figure 05-002)

The 800 Hour Progressive Inspection Program uses the same five-phase cyclic inspection program as the 400 hour inspection with an alternating 50 hour oil service and general aircraft inspection.

Additionally, supplemental inspections are currently required for Seats and Restraints, Control Surface Rigging, Wheel and Brakes, Landing Gear, Water Traps, and Transient Voltage Suppressors. These additional inspections are annotated with a bracketed “800” under the Phase Inspection columns of the Scheduled Maintenance Report.

Service and reliability data will be collected on these systems with the intent of providing inspection relief upon future analysis. Operators enrolled in the 800 Hour Program are encouraged to provide Cirrus Design with maintenance feedback on these additional inspections using the online Publication Change Request form.
http://servicecenters.cirrusdesign.com/TechPubs/serviceloopform.asp

A total of sixteen inspections are accomplished over the course of 800 flight hours, with an inspection occurring every 50 flight hours.

(a) 800 Hour Progressive Inspection Program Intervals

- 50 Hour Inspection is accomplished at the 50, 150, 250, 350, 450, 550, 650, and 750 hour intervals and covers all inspection items as specified under the 50 Hour inspection column of the Traditional Program on the Scheduled Maintenance Report.
- Phase I Inspection is accomplished at the 100 hour interval and covers:
  - *Detailed* Inspection of the Wing Group
  - *Routine* Inspection of the Engine Group
  - *Routine* Inspection of the Landing Gear Group
- Phase II Inspection is accomplished at the 200, 400, 600, and 800 hour intervals and covers:
  - *Detailed* Inspection of the Engine Group
  - *Detailed* Inspection of the Propeller Group
  - *Routine* Inspection of the Landing Gear Group
- Phase III Inspection is accomplished at the 300 hour interval and covers:
  - *Detailed* Inspection of the Landing Gear Group
  - *Routine* Inspection of the Engine Group
  - *Supplemental* Inspection of Seats and Restraints, Control Surface Rigging, Wheel and Brakes, Water Traps, and Transient Voltage Suppressors
- Phase IV Inspection is accomplished at the 500 hour interval and covers:

- *Detailed* Inspection of the Fuselage and Empennage
- *Routine* Inspection of the Engine Group
- *Routine* Inspection of the Landing Gear Group
- *Routine* Inspection of the Cabin Group
- *Detailed* Inspection of the Ice Protection System Group

- Phase V Inspection is accomplished at the 700 hour interval and covers:
  - *Detailed* Inspection of the Cabin Group
  - *Detailed* Inspection of the Radio Group
  - *Routine* Inspection of the Engine Group
  - *Routine* Inspection of the Landing Gear Group
  - *Supplemental* Inspection of Wheel and Brakes and Landing Gear

I

Hour	Phase I	Phase II	Phase III	Phase IV	Phase V	Complete
50	X					
100		X				
150			X			
200		X				
250				X		
300		X				
350					X	
400		X				O
450	X					
500		X				
550			X			
600		X				
650				X		
700		X				
750					X	
800		X				O
850	X					
900		X				
950			X			
1000		X				
1050				X		
1100		X				
1150					X	
1200		X				O
1250	X					
1300		X				
1350			X			
1400		X				
1450				X		
1500		X				
1550					X	
1600		X				O
1650	X					
1700		X				
1750			X			
1800		X				
1850				X		
1900		X				
1950					X	
2000		X				O

Figure 05-001
400 Hour Progressive Inspection Program Phase Intervals

I

Hour	50 Hr	Phase I	Phase II	Phase III	Phase IV	Phase V	Complete
50	X						
100		X					
150	X						
200			X				
250	X						
300				X*			
350	X						
400			X				
450	X						
500					X		
550	X						
600			X				
650	X						
700						X*	
750	X						
800			X				O
850	X						
900		X					
950	X						
1000			X				
1050	X						
1100				X*			
1150	X						
1200			X				
1250	X						
1300					X		
1350	X						
1400			X				
1450	X						
1500						X*	
1550	X						
1600			X				O

* Supplemental inspections are currently required for Seats, Control Surface Rigging, Wheel and Brakes, Landing Gear, Water Traps, and Transient Voltage Suppressors. These additional inspections are annotated with a bracketed “800” under the Phase Inspection columns of the Scheduled Maintenance Report.

Figure 05-002
800 Hour Progressive Inspection Program Phase Intervals

(3) Progressive Inspection Program Eligibility

Cirrus Design SR20 airplanes with serial numbers 1005 and subsequent are eligible for the Progressive Inspection Program. Eligible airplanes must meet one of the following conditions:

(a) The airplane must have less than 50 hours total time in service, calendar time remaining within the Annual Inspection period, and comply with all applicable Airworthiness Directives, Special Inspection Requirements, and Mandatory Service Bulletins before initiating the Progressive Inspection Program.

(b) Airplanes with more than 50 hours time in service must complete an Annual Inspection and comply with all applicable Airworthiness Directives, Special Inspection Requirements, and Mandatory Service Bulletins before initiating the Progressive Inspection Program.

(4) Initiating the Progressive Inspection Program

To initiate the Progressive Inspection Program, the owner or operator must:

(a) United States: Submit a letter of request and a copy of the Progressive Inspection Program for approval to the Flight Standards District Office having jurisdiction over the area in which the applicant is located. (See Figure 05-003)
A certified mechanic holding an Inspection Authorization or an appropriately certified Repair Station will be required to supervise or conduct the Progressive Inspection. Approval must be obtained before initiating this program.

(b) International: Submit the appropriate applications and a copy of the Progressive Inspection Program for approval to the government agency having jurisdiction over the area in which the applicant is located.

(c) Make an entry in the airplane maintenance records stating that airplane has been placed on the Progressive Inspection Program in accordance with 14 CFR § 91.409 (d), noting the airplane total time in service and date.

(5) Conducting the Progressive Inspection Program

(a) Pre-Inspection:

1 Review airplane inspection records and maintenance history.

2 Determine which Phase Inspection is due.

3 Note any discrepancies indicated by owner or operator.

4 Determine and comply with any FAA Airworthiness Directives. Ensure required compliance will not become due prior to the next scheduled inspection and contrary to the instructions contained within the directive.

5 Inspect airplane records to determine hourly and calendar replacement times for components and expendable filters.

(b) Complete the applicable Phase Inspection:

Note: Inspection must be completed by a certified mechanic holding an Inspector Authorized (IA) or a Certified Repair Station.

The Progressive Inspection Program provides a checklist for each Phase Inspection and is used in conjunction with the Cirrus Design Airplane Maintenance Manual, Illustrated Parts Catalog, and all other applicable manufacturer and vendor maintenance, service manuals, and bulletins. Each Phase Inspection outlines Routine and Detailed maintenance/inspection tasks. These tasks are numbered in sequence and must be performed in sequence. Each Phase Inspection form must be completed in full.

1 Each Phase Inspection begins with the Airplane Operational and Functional Check (Refer to 05-30). This check allows for the operational check of essential airplane systems. Any defects found during the operational check should be noted and addressed before returning the airplane to service.

2 Perform the specified Inspections. Check or initial each inspection item.

3 Each Phase Inspection ends with a Airplane Operational and Functional Check and a Post Run-Up Inspection. These inspections allow for the operational check of essential airplane systems, leak checks, and status verification of Airworthiness Directives, Service Bulletins, and airplane documents.

4 In the airplane maintenance records:

- Enter date of inspection and airplane total time.
- Enter type of inspection accomplished.
- Enter the signature, certificate number, and kind of certificate held by the maintenance Facility/Inspector.
- Enter the following or similarly worded statement:
  "I certify that in accordance with a Progressive Inspection Program a Routine Inspection of (identify whether airplane or components) and a Detailed Inspection of (identify components) were performed and the (airplane or components) are (approved/disapproved) for return to service".

  If disapproved, the entry will further state "a list of discrepancies and un-airworthy items dated (date) has been provided to the owner/operator".
- Enter the hours when next inspection will be due.
  Example: "Next Phase Inspection due at 526.25 time in service".

5 At the conclusion of the Phase-II 400 Hour or 800 Hour Inspection repeat the program.

(c) Airplanes Away From Normal Base Of Operation

If airplane is away from base of operation where inspections are normally conducted, a certified technician holding an Inspection Authorization or appropriately certified Repair Station may perform inspection.

The inspection will be completed in appropriate sequence and in accordance with procedures and forms of technician who would normally perform the inspection. Electronic transmittal is acceptable means of communicating procedures and forms from normal base of operation to technician performing inspection.

(6) Canceling the Progressive Inspection Program

The owner or operator must notify the local Flight Standards District Office in writing before discontinuing the Progressive Inspection Program.

After discontinuance, if enrolling in Annual Inspection the first Annual will be due within 12 calendar months after completion of the Phase-II 400 or 800 Hour Inspection. If enrolling in the 100 Hour inspection, the first 100 hour inspection will be due within 100 hours of the Phase-II 400 or 800 Hour Inspection.

Cirrus Design Progressive Inspection Program

Letter of Request

Submitted To: Federal Aviation Administration

Flight Standards District Office Date: _____

City, State, Zip: _____

Contact Name: _____ Phone:_____ Fax: _____

In accordance with FAR 91.409 (d), the undersigned desire to use and request acceptance of the Cirrus Design Progressive Inspection Program for use as an Approved Aircraft Inspection Program. The subject facility has appropriate housing, equipment, and technical information for the necessary disassembly and proper inspection of the aircraft.

Certificated Mechanic with Inspection Authorization:

Name: _____ Certificate No.: _____

Certificated Airframe Repair Station:

Name: _____ Certificate No.: _____

The aircraft qualifies to begin the Progressive Inspection Program because:

___ it is a new aircraft with less than 50 hours time in service.

Date of Original Airworthiness Certificate _____

Total Time in Service to Date _____

___ an Annual Inspection was completed less than 50 hours ago.

Date of Annual _____

Total Time in Service at Annual _____

Total Time in Service to Date _____

Aircraft Registration Number: _____ Aircraft Model: _____

Aircraft Serial Number: _____ Engine Model: _____

Engine Serial Number: _____ Propeller Model: _____

Propeller Serial Number: _____

Registered Owners Name: _____

City, State, Zip: _____

Contact Name: _____ Phone: _____ Fax: _____

Operator Name: _____

City, State, Zip: _____

Contact Name: _____ Phone: _____ Fax: _____

Service Facility Name: _____

City, State, Zip: _____

Contact Name: _____ Phone: _____ Fax: _____

Signatures:

_____ _____ _____

Registered Owner Operator Service Facility

Figure 05-003
Sample Letter of Request

D. Airplane Operational and Functional Checks

Operational and Functional Checks must be performed before and after Scheduled Maintenance Inspections to detect any airplane abnormalities or malfunctions. These inspections are listed in Section 5-30, Airplane Operational and Functional Checks. (Refer to 05-30)

E. Unscheduled Maintenance Checks

Abnormal airplane operations require special maintenance checks. Definitions and inspection procedures for hard/overweight landings, overspeed, severe air turbulence, lightning strike, high drag/side loads due to ground handling, and ground gusts are listed in Section 5-50, Unscheduled Maintenance Checks.

CAUTION: Airplanes operated for Air Taxi operation or other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion, delamination, and/or lack of lubrication. For these conditions, periodic inspections should be performed until the operator can set his own inspection periods based on experience. For maintenance practices pertinent to operation in harsh environmental conditions, see Section 5-50, Unscheduled Maintenance Checks. (Refer to 05-50)

For airplanes enrolled in the Progressive Inspection Program, owner/operators cannot exceed the 50 hour phase intervals (±10 hours) but may perform inspections more frequently.

TIME LIMITS

1. DESCRIPTION

Cirrus recommends the following items be overhauled or replaced at the following intervals or On Condition. These maintenance items must be incorporated into a 100 Hour, Annual, or Progressive inspection as applicable. To ensure correct observation of these times, the date of removal, installation, or overhaul of such components as well as the airplanes flight hours must be entered into the Service Time Record filed in the Airplane Maintenance Log. If it is anticipated that the component time limit will occur before the next applicable required inspection, it must be incorporated in the current required inspection.

The recommended periods do not constitute a guarantee that the item will reach the period without malfunction as in-service factors cannot be controlled by the manufacturer.

“On Condition” items are to be repaired, overhauled or replaced when inspection or performance of these items reveal a potentially unserviceable or unsafe condition.

The date on the “ORIGINAL STANDARD AIRWORTHINESS CERTIFICATE,” FAA Form No. 8100-2, which is issued with a new airplane, is to be used as the basis for all inspected components listed in the following schedules.

CAUTION: Airplane control surface balance is critical to flight safety. Removal and/or addition of any paint or body filler to a control surface requires that the control surface be re-balanced. (Refer to 55-00)

Note: Refer to the applicable manufacturer's approved Instructions For Continued Airworthiness (ICA), for maintenance information related to accessories, instruments, and/or other equipment not covered in these instructions.

Item	Interval		Maintenance		Notes and Reference
	Hrs	Yrs	O'haul	Replc	
1. Gascolator Fuel Filter Serials 1878, 1886 thru 2031 w/ Purolator Gascolator	1st 25	1		X	Ref 28-20
2. Vacuum Regulator Garter Filter Element (foam) Serials 1005 thru 1267	100*	1*		X	*Whichever first.
3. Brake Assembly O-Rings Serials 1005 thru 2030 before SB 2X-05-01	100*	1*		X	*Whichever first.
4. Induction Air Filter	200*	1*		X	*Whichever first or when filter is more than 50% covered.
5. Instrument Air Filter Element (paper) Serials 1005 thru 1267	500*	1*		X	*Whichever first or when either vacuum pump is replaced.
6. Battery 2	500*	2*		X	*Whichever first.
7. Outside Air Temperature Gage/Clock Battery Serials 1005 thru 1336, 1337 thru 1422 w/o PFD		2		X	Ref 34-10
8. Battery 1 Serials 2016 & subs w/ Concorde Battery	1800*	3*		X	*Whichever first.
9. Emergency Locator Transmitter Remote Control Panel Indicator Alkaline Battery Serials w/ ACK E-01 ELT.		4		X	Ref ACK E-01 Installation and Ops Manual.
10. Propeller Governor Serials 1337 & subs w/ McCauley governor	2000*	5*	X		*Whichever first. Ref McCauley Service Bulletin 137.
11. Brake Assembly O-Rings Serials 1005 thru 2030 after SB 2X-05-01, 2031 & subs		5		X	Ref 32-42
12. Emergency Locator Transmitter Remote Control Panel Indicator Battery Serials w/ Artex ME406 ELT.		5		X	Ref Artex ME406 Installation and Ops Manual
13. Hartzell Propeller	2400*	6*	X		*Whichever first. Ref Hartzell Service Letter 61.
14. Dry Air Pump Coupling Assembly (Engine-Driven Vacuum Pump)		6		X	Ref Tempest Service Letter 001.
15. Carbon Monoxide Detector Serials w/ Perspective Avionics.		7	X		Ref 31-20

Figure 05-101
Time Limits

Item	Interval		Maintenance		Notes and Reference
	Hrs	Yrs	O'haul	Replc	
16. Emergency Locator Transmitter Remote Control Panel Indicator Lithium Battery Serials w/ ACK E-01 ELT.		8		X	Ref ACK Model E-01 Installation and Ops Manual.
17. Electric Vacuum Pump	3000*	10*		X	*Whichever first.
18. Check Valve Manifold and Check Valves Serials 1005 thru 1267		10		X	Ref Airborne Memo # 39.
19. Fuel System Boost Pump		10	X		Ref 28-20
20. Fire Extinguisher Serials w/o Gaged Fire Extinguisher		12		X	Ref 26-20
21. Alternator 1 Overhaul in accordance with manufacturer's approved Instructions For Continued Airworthiness.	2000*	12*	X		*Whichever first and at engine overhaul.
22. Alternator 2 Serials w/ B&C Specialty Products Models BC410 - Remove and return to manufacturer for factory overhaul.	1700		X		Ref B&C Specialty products ICA
23. Alternator 2 Serials w/ CMI/TCM P/N 653344 Overhaul in accordance with manufacturer's approved Instructions For Continued Airworthiness.	2000*	12*	X		*Whichever first and at engine overhaul.
24. Muffler and Heat Exchanger	1000			X	Ref 78-20
25. Engine Overhaul in accordance with manufacturer's approved Instructions For Continued Airworthiness.	2000/ 2200/ 2400*	12*	X		*Whichever first. For engine S/N 1006000 and later, TBO hours are 2200. Add 200 hours for engines that consistently accumulate 40 or more hours per month. Ref CMI M-0 Manual.
26. Oleo Strut and Rubber Elements Serials 2065 & subs	2000			X	Replacement to be performed at a Cirrus Authorized Repair Station only.
27. Propeller Governor Serials 1005 thru 1336 w/ Woodward governor.	2400		X		Ref Woodward Service Bulletin 33580M.

Figure 05-101
Time Limits (Continued)

Item	Interval		Maintenance		Notes and Reference
	Hrs	Yrs	O'haul	Replc	
28. Evaporator Blower Motor Serials 2065 & subs w/ Air Conditioning	5000			X	Refer to Enviro Operating, Servicing, and Component Maintenance Manual 21-20-05.
29. Magnetos	*	*	X		*5 years since date of manufacture or last overhaul, OR 4 years since date placed into service, whichever first. Ref CMI/TCM Service Bulletin SB643B.
30. Emergency Locator Transmitter Batteries	*	*		X	*At expiration date or after 1 hour use whichever first. Ref ACK Model E-01, Artex ME406, or Artex ELT 1000 Installation and Ops Manual.
31. Engine-Driven Vacuum Pump Serials 1005 thru 1267 w/ Parker/Airborne pump.	*	*		X	*All Parker/Airborne Engine-Driven Air Pumps are beyond their Mandatory Replacement Time and must be removed from service. Ref Airborne Service Letter #72.
32. Engine-Driven Vacuum Pump Serials 1005 and subs w/ Tempest pump.	*	*		X	*On Condition as determined by Wear Port Indicator Inspection. Ref Tempest Service Letter #004.
33. Flexible Brake System Lines	*	*		X	*On Condition.
34. Flexible Fuel Lines	*	*		X	*On Condition.
35. Flexible Oil Drain Lines	*	*		X	*On Condition.
36. Flexible Vent Lines	*	*		X	*On Condition.
37. Fuel System Drain Valve Seals	*	*		X	*On Condition.
38. Gascolator Seals	*	*		X	*On Condition.
39. Hydraulic Fluid	*	*		X	*On Condition

Figure 05-101
Time Limits (Continued)

Item	Interval		Maintenance		Notes and Reference
	Hrs	Yrs	O'haul	Replc	
40. Rudder-Aileron Interconnect Bungee Cord Serials 1005 thru 1885	*	*		X	*On Condition or 5 years since date of manufacture. Refer to MILC-5651D to determine year of manufacture by yarn color.

Figure 05-101
Time Limits (Continued)

A. Referenced Instructions For Continued Airworthiness and Other Publications

The latest revision to the following publications should be used in conjunction with this manual:

Vendor	Manual Title	Manual Number
ACK	Model E-01 ELT Installation and Operation Manual	9/94
Airborne	Product Reference Memo	39A
Airborne	Service Letter	17B
Airborne	Service Letter	Memo # 39
Amerex	Maintenance and Recharge Service Manual	05604
ARNAV	ICDS 2000 Operations Handbook	572-0555
Artex	Installation and Maintenance Manual for the ME406 ELT	570-1600
Artex	Installation and Maintenance Manual for the ELT 1000	Y1-03-0259
Avidyne	FlightMax Entegra PFD Pilot's Guide	600-00142-000
Avidyne	FlightMax EX-Series MFD Pilot’s Guide	600-00108-000
B&C Specialty Products	ICA for B&C Specialty Products Model BC410 and BC425 Alternators	BC410
Beringer	6.00-6” Wheels and Brakes Maintenance Manual	MM-ETSO-001
Beringer	5.00-5” Wheels and Brakes Maintenance Manual	MM-ETSO-002
Brackett	Inspection Intervals for Filters	I-194
Century	NSD360A / NSD1000 Horizontal Situation Indicator Manual	68S304
CMI/TCM	IO-360 Overhaul Manual	X30594
CMI/TCM	IO-360 Maintenance Manual	X30617
CMI/TCM	Standard Practice Maintenance Manual	M-0
CMI/TCM	Service Bulletin	SB 03-3
CMI/TCM	Service Information Directive	SID 97-3
CMI/TCM	Service Letter	SIL 98-9
CMI/TCM	Service Instructions for ISKRA Starter	STR-01
CMI/TCM	Service Instructions Manual for Alternators	X30531-3
CMI/TCM	Starter Service Instructions	X30592
CMI/TCM	Service Instructions for Starters	X30592
CMI/TCM	Fuel Injection Systems Overhaul and Parts Catalog	X30593
CMI/TCM	Master Service Manual for Ignition Systems	X41005-13
CMI/TCM	Service Instructions for S1200 Series Magnetos	X42001-1

Figure 05-102
Referenced Vendor Publications

Vendor	Manual Title	Manual Number
CMI/TCM	Service Instructions for S-20/S-200 Series Magnetos	X42002-2
CMI/TCM	Service Instructions for D-2000 and D-3000 Magnetos	X42003-2
CMI/TCM	Service Instructions for High Tension Ignition Harnesses	X43001
CMI/TCM	Service Instructions for Starting Vibrator Assemblies	X43003-1
CMI/TCM	Application Data for Ignition Systems	X44001-2
CO Guardian	CO Detector Model 452-201 Owners Manual	03-452-201
Concorde	ICA and Supplement for Valve Regulated Lead-Acid Main Battery	5-0142
Enviro	Operating, Servicing, and Component Maintenance Manual	GM04-101
Garmin	Cirrus Perspective Cockpit Reference Guide	190-00821-XX
Garmin	Cirrus Perspective Line Maintenance Manual	190-00920-0
Garmin	GDL 59 Data Link Installation Manual	190-00837-00
Garmin	GMA 340 Audio Panel Installation and Operation Manual	190-00149-01
Garmin	GMA 347 Pilot's Guide	190-00325-00
Garmin	GMA 350 Pilot's Guide	190-01134-12
Garmin	GNC 250XL GPS/COM Installation Manual	190-00067-62
Garmin	GNC 420 - 400 Series Installation Manual	190-00140-02
Garmin	GNS 430 - 400 Series Installation Manual	190-00140-02
Garmin	GTX 320 Transponder Installation and Operation Manual	190-00133-01
Garmin	GTX 327 Transponder Installation and Operation Manual	190-00187-02
Garmin	GTX 330 Transponder Pilot's Guide	190-00207-00
Gill	Dry-Charged Lead-Acid Aircraft Battery Service Manual	Q01-1120
Hartzell	Aluminum Blade Overhaul Manual	133C
Hartzell	Maintenance Manual for Composite Propeller Blades	135F
Hartzell	Propeller Owner's Manual and Log Book	115N
Hartzell	Propeller Owner's Manual and Log Book	145
Hartzell	Service Letter	61
Hartzell	Standard Practices Manual	202A
Heads Up	XM Radio Wireless Remote Controller Instructions	XMC050-4
Honeywell	KGP 560 and 860 EGPWS Pilot's Guide	006-18254-001
Honeywell	KN 63 Distance Measuring Equipment Installation Manual	006-00176-0004

Figure 05-102
Referenced Vendor Publications (Continued)

Vendor	Manual Title	Manual Number
Honeywell	KR 87 Automatic Direction Finder Installation Manual	006-00184-0005
Kelly/HET	Overhaul Manual - Aircraft Alternator & Starter	OE-A2
L-3	SkyWatch SKY497 Installation Manual	009-10800-001
L-3	SkyWatch SKY497 Pilot's Guide	009-10801-001
L-3	Stormscope WX-500 User's Guide	009-11501-001
McCauley	Propeller Operator's Manual	MPC-11
McCauley	Service Bulletin	137
McCauley	Service Manual	76001
McCauley	Standard Practices Manual	SPM100-1
MidContinent	Model MD302 Series SAM Standby Attitude Module Installation Manual and Operating Instructions	9017782
Parker	Cleveland Wheels & Brakes Component Maintenance Manual for External Design Wheels & Brakes	AWBCMM-0001
S-TEC	General Installation Information Bulletin	600
S-TEC	System 55 Autopilot Pilot's Operating Handbook	8747
S-TEC	System 55SR Autopilot Pilot's Operating Handbook	87127
S-TEC	System 55X Autopilot Pilot's Operating Handbook	87109
S-TEC	System Thirty Pilot's Operating Handbook	8777
Sandel	SN3308 Pilot's Guide	82001PG-C
Unison	4200/6200 Series Magneto Maintenance and Overhaul Manual	L-1037
Unison	Ignition Harness Maintenance Manual	L-1177
Unison	Master Service Manual	F-1100
Woodward	Service Bulletin	33580M

Figure 05-102
Referenced Vendor Publications (Continued)

SCHEDULED MAINTENANCE

1. DESCRIPTION

These inspections meet the intent of 14 CFR § 91.409 and Part 43, Appendix D. In addition to the inspections prescribed by this schedule, the altimeter instrument and static system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in 14 CFR § 91.411 and 91.413.

The owner and/or operator is primarily responsible for maintaining the airplane in an airworthy condition. This includes compliance with all applicable Airworthiness Directives. It is further the responsibility of the owner or operator to ensure that the airplane is inspected as specified in Parts 43 and 91 of the Federal Aviation Regulations. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgment of a certified airframe and power plant mechanic. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various chapters of the Maintenance Manual and pertinent vendor publications. It is recommended that reference be made to the applicable Maintenance Handbooks, Service Instructions, applicable FAA Regulations and Publications, Vendor's Bulletins and Vendor's Specifications for torque values, clearances, settings, tolerances, and other requirements. It is the responsibility of the owner or operator to ensure that the airframe and power plant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

2. INSPECTION GROUPS AND CRITERIA

Note: Wherever an inspection is directed to a specific part or component, it is implied that the inspection will include observation and evaluation of the surrounding area of parts and equipment.

A. Visual Inspection

When called for by an inspection task, or any time an area is visible during an inspection or maintenance action, the following visual inspection criteria shall be accomplished without requiring disassembly or removal of adjacent equipment unless otherwise specified. The criteria will normally apply to those areas, surfaces, or items which become visible by the removal or opening of access doors, panels, fairings, or cowlings. The visual inspection shall include an examination by area, component, detail, assembly, or installation, as well as any associated equipment within the immediate vicinity, using any inspection aids considered necessary. When performing an annual or 100-hour inspection, each installed miscellaneous item not covered in the following Scheduled Inspection Report shall be inspected for improper installation and improper operation.

Visual Inspection criteria will normally consist of, but are not limited to, the following criteria:

(1) Moving Parts

Proper operation, correct alignment, security, sealing, cleanliness, lubrication, adjustment, tension, travel, condition, binding, excessive wear, cracking, corrosion, deformation, and any other apparent damage.

(2) Composite Parts

Security, condition, cleanliness, separation of bond, delamination, wear, cracking, obstruction of drainage or vent holes, deformation, overheating, fluid saturation, and any other apparent damage.

(3) Metal Parts

Security, condition of finish, cleanliness, distortion, fatigue cracks, welding cracks, corrosion, and any other apparent damage.

(4) Fuel, Air, and Hydraulic Oil Lines and Hoses

Cracks, dents, kinks, loss of flexibility, deterioration, obstruction, chafing, improper bend radius, cleanliness, loss of flexibility, security, and any other apparent damage.

(5) Electrical Wiring, Bonding and Shielding

Cleanliness, loose, corroded, or broken terminals; chafed, broken, or worn, insulation; security, heat deterioration, deformation, hardening, brittleness, fluid contamination, and any other apparent damage.

(6) Bolts and Nuts

Fretting, wear, damage, stretch, proper torque, and safety wiring.

(7) Filters and Screens

Filters and screens shall be removed, cleaned, inspected for contamination, or replaced as applicable.

(8) Wet Fuel Areas

Evidence of fuel leaks, condition of sealant, cleanliness, bacterial growth, corrosion, delamination, separation of bond, and structural fatigue.

B. Operational Inspection

When called for by an inspection task, an Operational Inspection is a check to determine that a component or system is fulfilling its intended purpose. The Operational Inspection does not require quantitative tolerances. In the following schedule, the appropriate Chapter and Section from the Airplane Maintenance Manual (AMM) is defined in the “ATA Ref” Reference Column.

C. Functional Inspection

When called for by an inspection task, a Functional Inspection is a quantitative check to determine if one or more functions of a component performs within specified limits. The Functional Inspection is a comparative examination of a component or system against a specific standard. In the following schedule, the appropriate Chapter and Section from the Airplane Maintenance Manual (AMM) is defined in the “ATA Ref” Reference Column.

3. SCHEDULED INSPECTION REPORT

All references to “5-20” under the “ATA Ref” reference column are to be understood as reference to Visual Inspection criteria defined under Inspection Groups and Criteria.

A. Recommended Overhaul and Replacement Times

Recommended overhaul and replacement times are listed in Section 5-10, Time Limits. These maintenance items must be incorporated into the 100 Hour, Annual, or Progressive inspections as applicable. (Refer to 05-10)

Special Inspections are denoted with a bracketed asterisk [*].

- Special Inspections beginning with the word “And” indicate the examination is in addition to the regularly scheduled interval. For example the following inspection states that in addition to changing engine oil every 50 Hours, Annually (or every 100 Hours if aircraft flown for hire), and at each Progressive Phase Interval, the oil should be change after the first 25 hours of operation.

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
5. Engine Oil Drain and change oil. *Special Inspection: And first 25 hours	12-10	[*]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

- Special inspections beginning with “Only” require examination only at the specified time interval. For example, the following inspection states that Inspection/Check - Cabin Air Control Assembly should only be performed every 500 hours or every 5 years, whichever occurs first.

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
24. Cabin Air Control Assembly - Serials 1639 & subs w/o Perspective Avionics Perform Inspection/Check - Cabin Air Control Assembly *Special Inspection: Only every 500 hours or 5 years whichever first.	21-60		[*]				[*]	

B. 800 Hour Progressive Inspection Program

In addition to the Progressive Phase Inspections I, II, III, IV, V, the program uses an alternating 50 Hour oil service and general aircraft inspection as specified under the Traditional Program’s 50 Hr column.

Phase Inspection columns annotated with a bracketed 800, e.g. [800], are supplemental inspections that apply only to the 800 Hour Progressive Inspection Program. Operators enrolled under the 800 Hour Program are encouraged to provide Cirrus Design with maintenance feedback on these supplemental inspections using the online Publication Change Request form.
http://servicecenters.cirrusdesign.com/TechPubs/serviceloopform.asp

Scheduled Inspection Report			
Make: Cirrus Design	Model: SR20	Serial Number:	Registration Number:
Owner:		Date:	
Type of Inspection: [ ] Annual [ ] 100 Hour [ ] Progressive Inspection Program		Operating Time:	

Signature of Mechanic or Inspector _____

Certificate Number _____

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Pre-Inspection	**ATA Ref**	**50 Hr**	**Annual/ 100Hr**	**I**	**II**	**III**	**IV**	**V**
1. Operational/Functional Check Perform an airplane run-up in accordance with Operational/Functional Check in 5-30. Make a record of all malfunctions and abnormalities for reference during the inspection. After completing the Operational Check, perform a walk around to detect fluid leaks or other abnormalities.	05-30		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. Review compliance status with current Federal Aviation Regulations. This includes inspection of the following: - Airplane Flight Manual - Aircraft Log Book - Registration Certificate - Weight and Balance Record - FAA Airworthiness Directives - Cirrus Design Service Documents	-	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Engine Cowling Remove and perform visual Inspection for cracks, distortion, loose or missing fasteners and oil filler access door operation.	5-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. Engine Compartment Clean and perform Visual Inspection for leaks.	5-20	[ ]	[ ]	[ ]		[ ]	[ ]	[ ]
3. Engine Compartment Visual Inspection for loose nuts, bolts, screws, and parts.	5-20	[ ]	[ ]		[ ]			
4. Wiring Visual Inspection for damaged wiring and clamps.	5-20		[ ]		[ ]			
5. Engine Oil Drain and change oil. *Special Inspection: And first 25 hours	12-10	[*]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. Oil Filter Perform Inspection/Check - Oil Filter Particles.	12-10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7. Oil Screen Remove and perform Visual Inspection for metal particulates.	5-20		[ ]		[ ]			
8. Lubricate as required in accordance with Lubrication Schedule - Engine Group.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9. Oil Sump Plug Visual Inspection for condition.	5-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10. Oil Cooler Fins Clean and perform Visual Inspection for cracking, bending, and general condition.	5-20		[ ]		[ ]			
11. High Tension Ignition Harnesses and Leads Visual Inspection for chafing, corrosion, and deposits.	5-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12. High Tension Ignition Harnesses Functional Inspection of High Tension Ignition Harnesses in accordance with the manufacturer's approved Instructions For Continued Airworthiness.	Ref MFR ICA		[ ]		[ ]			

Select Inspection Program ----------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
13. Engine Compression Functional Inspection in accordance with the manufacturer's approved Instructions For Continued Airworthiness. Cyl # | 1 | 3 | 5 | 2 | 4 | 6 PSI | | | | | | | Master Orifice Reading:	Ref CMI/ TCM ICA		[ ]		[ ]			
14. Spark Plugs Inspect, clean, re-gap and rotate in accordance with the manufacturer's approved Instructions For Continued Airworthiness.	Ref CMI/ TCM ICA		[ ]		[ ]			
15. Magneto Functional Inspection of magneto timing in accordance with the manufacturer's approved Instructions For Continued Airworthiness.	Ref MFR ICA		[ ]		[ ]			
16. Magneto Internal Inspection in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Only every 500 hours.	Ref MFR ICA		[*]		[*]			
17. Induction System Filter Visual Inspection for security, general condition, and cleanliness.	71-60		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
18. Fuel Injection Nozzles Visual Inspection of nozzles and manifold valve for fuel stains, security, and proper venting.	5-20		[ ]		[ ]			
19. Fuel Injection Nozzles Remove and clean fuel injection nozzles in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Only every 300 hours or annually whichever first, and at first 100 hours on new, rebuilt or overhauled engines.	Ref CMI/ TCM ICA		[*]		[*]			
20. Gascolator - Serials 1005 thru 1877, 1879 thru 1885, 2032 and subs Perform Servicing - Gascolator *Special Inspection: And first 25 hours	28-20	[*]	[ ]	[*]	[ ]	[ ]	[ ]	[ ]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
21. Gascolator - Serials 1878, 1886 thru 2031 w/ Purolator Gascolator Perform Servicing - Gascolator. *Special Inspection: And first 25 hours	28-20		[*]	[*]	[ ]	[ ]	[ ]	[ ]
22. Gascolator Red Pop-Up Indicator - Serials 1878, 1886 thru 2031 w/ Purolator Gascolator Visual Inspection to verify red pop-up indicator not visible.	5-20	[ ]	[ ]	[ ]		[ ]	[ ]	[ ]
23. Fuel Pump Visual Inspection for leaks, security, and condition.	5-20		[ ]		[ ]			
24. Fuel Pump Perform Functional Test - Electric Fuel Pump	28-20		[ ]		[ ]			
25. Flexible Fuel Lines Visual Inspection for leaks, security, and condition.	5-20		[ ]		[ ]			
26. Battery 1 - Serials w/ Concorde Battery Inspection/Check - Battery 1 Capacity. *Special Inspection: Only at first 1200 hours or 2 years, whichever first, then every 200 hours or annually, whichever first.	24-30		[*]		[*]			
27. Battery 1 - Serials w/ CMI/TCM Battery Perform Electrolyte Level Check. *Special Inspection: Only at first 800 ±50 hours or 11 ±1 months, whichever first, then every 400 ±25 flight hours or 6 ±1 months, whichever first.	12-10		[*]		[*]			
28. Battery Platform, Terminals, and Cables Visual Inspection for security, corrosion, and general condition.	5-20		[ ]		[ ]			
29. Cylinder Cooling Fins Visual Inspection for cracking, bending, and general condition.	5-20		[ ]		[ ]			
30. Engine Baffling and Seals Visual Inspection for cracks, tears, and rips.	5-20		[ ]		[ ]			
31. Crankcase Visual Inspection for condition, leaks, and loose components.	5-20		[ ]		[ ]			
32. Air Intake Ducts Visual Inspection for general condition.	5-20		[ ]		[ ]			

Select Inspection Program ----------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
33. Alternate Air Door Check operation of alternate air flapper valve.	71-60		[ ]		[ ]			
34. Engine Driven Vacuum Pump - Serials 1005 thru 1267 Visual Inspection of Wear Indicator Port. *Special Inspection: Only at 600 hours from date of manufacture then every 200 hours or annually whichever first.	Ref Tempest ICA		[*]		[*]			
35. Check Valve Manifold - Serials 1005 thru 1267 Perform Inspection/Check - Check Valve Manifold *Special Inspection: Only at 5 years from date of manufacture then annually.	37-10		[*]		[*]			
36. Electric (Back-up) Vacuum Pump - Serials 1005 thru 1267 Visual Inspection for security, general condition.	5-20		[ ]		[ ]			
37. Vacuum Lines - Serials 1005 thru 1267 Visual Inspection for security, general condition.	5-20		[ ]		[ ]			
38. Throttle, Propeller, and Mixture Control Cable Visual Inspection for security and condition of cotter pins, castellated nuts, and oversized washers.	5-20		[ ]		[ ]			
39. Throttle Spring (if applicable) Visual Inspection for security, general condition.	5-20		[ ]		[ ]			
40. Exhaust System Visual Inspection for soot, distortion, and general condition.	5-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
41. Exhaust System Perform Inspection/Check - Exhaust System.	78-20		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
42. Exhaust Muffler/Heat Exchanger Perform Inspection/Check - Heat Exchanger.	78-20		[ ]		[ ]			
43. Exhaust System Perform Adjustment/Test - Forward Ball Joints.	78-20		[ ]		[ ]			
44. Cabin Heat Box and Ducts Visual Inspection for soot, distortion, and general condition.	5-20		[ ]		[ ]			
45. Oil Breather Hose and Relief Hole Visual Inspection for obstructions and security and no sagging of hose between clamp and baffle.	5-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
46. Engine Mount Weldment Visual Inspection for weld cracks, corrosion, bending, distortion, and chaffing.	5-20		[ ]		[ ]			

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
47. Engine Mount Isolators Visual Inspection for cracking, splitting, and general condition.	5-20		[ ]		[ ]			
48. Lower Engine Mount Attach Fittings - Serials 1423 thru 2064 Perform Inspection/Check - Attach Fitting Corrosion.	53-40		[ ]		[ ]			
49. Engine Mount Weldment and Lower Mount Attach Fittings Verify torque on attachment bolts. *Special Inspection: Only at first Annual then every 500 hours and after engine installation.	5-20		[*]		[*]			
50. Firewall and Seals Visual Inspection for cracks, condition, and security of attachments.	5-20		[ ]		[ ]			
51. Alternators Visual Inspection for secutity and condition	5-20		[ ]		[ ]			
52. Alternator 1 External Inspection in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Every 500 hours or 2 years, whichever occurs first, inspect brushes, insulator and gear clutch assembly per manufacturer's approved Instructions For Continued Airworthiness.	REF MFR ICA		[*]		[*]			
53. Alternator 2 Serials w/ B&C Specialty Products External Inspection in accordance with the manufacturer's approved Instructions For Continued Airworthiness.	REF B&C ICA		[ ]		[ ]			
54. Alternator 2 Serials w/ CMI External Inspection in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Every 500 hours or 2 years, whichever occurs first, inspect brushes, insulator and gear clutch assembly per manufacturer's approved Instructions For Continued Airworthiness.	REF MFR ICA		[*]		[*]			
55. Starter Visual Inspection for security and condition.	5-20		[ ]		[ ]			
56. Master Control Unit Perform Inspection/Check - Master Control Unit.	24-30		[ ]		[ ]			

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Engine Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
57. Propeller Governor Visual Inspection for security, evidence of oil leakage, and tightness of lever on governor shaft. Ensure high-RPM stop is hit before cable reaches end of travel.	5-20		[ ]		[ ]			
58. Air Conditioning Compressor - Serials w/ Air Conditioning System Perform Inspection/Check - Compressor.	21-50		[ ]		[ ]			
59. Air Conditioning Compressor - Serials w/ Air Conditioning System Perform Adjustment/Test - Compressor Drive Belt Tensioning.	21-50		[ ]		[ ]			

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Propeller Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Spinner Remove, clean and perform Visual Inspection for cracks and corrosion.	5-20		[ ]		[ ]			
2. Blades Visual Inspection for nicks, bends, cracks, gouges, erosion, and condition of tips.	5-20		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3. Blades Inspect blades for radial play or movement of blade tip.	61-10		[ ]		[ ]			
4. Blades If blade track problem is suspected, inspect blade tracking.	61-10		[ ]		[ ]			
5. Propeller Hub Visual Inspection for cracks, corrosion, leaking oil or grease.	5-20		[ ]		[ ]			
6. Lubricate as required in accordance with Lubrication Schedule - Propeller Group.	12-20		[ ]		[ ]			

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Cabin Access Panels When Cabin Access Panels are removed during the cabin group inspection, it is recommended that the panels be removed one at a time, the access area cleaned, inspected, and if no discrepancies are found, the panel reinstalled.	06-00		[ ]					[ ]
2. Cabin Windows and Windshield Clean and Visual Inspection for cracking, crazing, and general condition.	5-20		[ ]				[ ]	
3. Magnetic Compass Visual Inspection for security, clarity of glass, and signs of oil leakage. Inspect deviation card for presence and legibility of all headings.	5-20		[ ]					[ ]
4. Placards and Instrument Markings Visual Inspection for conformity, security, and condition.	11-30		[ ]					[ ]
5. Fire Extinguisher Perform Inspection/Check - Fire Extinguisher. *Special Inspection: And monthly.	26-20		[*]					[*]
6. Fire Extinguisher - Serials w/ Gaged Fire Extinguisher Perform Annual Maintenance in accordance with the manufacturer's approved Instructions For Continued Airworthiness.	REF MFR ICA		[ ]		[ ]			
7. Fire Extinguisher - Serials w/ Gaged Fire Extinguisher Perform 6-Year Maintenance in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Only every 6 years.	REF MFR ICA		[*]					[*]
8. Fire Extinguisher - Serials w/ Gaged Fire Extinguisher Perform 12-Year Hydrostatic Test in accordance with the manufacturer's approved Instructions For Continued Airworthiness. *Special Inspection: Only every 12 years.	REF MFR ICA		[*]					[*]

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
9. Cabin Access: Remove Glareshield. Remove MFD - Serials w/o Perspective Avionics Only Remove Cabin Seats. Remove Cabin Carpet. Remove Kickplates. Remove Center Bolster Trim. Remove RH Mid-Console Trim. Remove 222 Bulkhead Interior Trim	25-10 31-60 25-10 25-10 25-10 25-10 25-10 25-10		[ ]					[ ]
10. Upholstery Visual Inspection for security.	5-20		[ ]					[ ]
11. Lubricate as required in accordance with Lubrication Schedule - Cabin Group.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12. Crew Seats Perform Inspection/Check - Crew Seats.	25-10		[ ]			[800]		[ ]
13. Crew Seat Harness Perform Inspection/Check - Crew Seat Harness.	25-10		[ ]			[800]		[ ]
14. Passenger Seat Harness Perform Inspection/Check - Passenger Seat Harness.	25-10		[ ]			[800]		[ ]
15. Seat Belt Inertia Reels Visual Inspection for security of brackets and bolts.	5-20		[ ]			[800]		[ ]
16. Seat Rails and Track Visual Inspection for condition.	5-20		[ ]			[800]		[ ]
17. Instrument Panel Visual Inspection for security of lines and wiring.	5-20		[ ]					[ ]
18. Avionics Visual Inspection of components, wiring, and for security.	5-20		[ ]					[ ]
19. Control Yokes Visual Inspection for excessive play, security, and proper operation. Verify no noticeable freeplay in elevator or aileron input.	5-20		[ ]					[ ]
20. Ignition Switch and Electrical Harness Visual Inspection for damage, condition, and security.	5-20		[ ]					[ ]
21. Ignition Switch Perform Servicing - Ignition Switch. *Special Inspection: Only every 2000 hours.	74-30		[*]					[*]

Select Inspection Program ----------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
22. Rudder Pedals Visual Inspection for excessive play, security, and proper operation. Verify no noticeable freeplay in rudder or aileron input. Verify interior panels are secure to side walls and do not interfere with rudder pedal movement throughout the rudder pedal's full range of movement.	5-20		[ ]					[ ]
23. Rudder Pedal Torque Tube Bracket Perform Inspection/Check - Torque Tube Gap Tolerance.	27-20		[ ]			[800]		[ ]
24. Brake Master Cylinders Visual Inspection for leaks and security.	5-20		[ ]			[800]		[ ]
25. Flexible Brake Hoses Visual Inspection for leaks, security, and condition.	5-20		[ ]			[800]		[ ]
26. Parking Brake Valve and Control Cable Linkage Visual Inspection for leaks, security, chafing, and condition.	5-20		[ ]			[800]		[ ]
27. Cabin Air Control Assembly - Serials 1639 & subs w/o Perspective Avionics Perform Inspection/Check - Cabin Air Control Assembly *Special Inspection: Only every 500 hours or 5 years whichever first.	21-60		[*]				[*]	
28. Control Quadrant Perform Servicing - Control Quadrant.	76-10		[ ]					[ ]
29. Fuel Lines, Valves, and Gages Visual Inspection for chafing, obstruction, security, and general condition.	5-20		[ ]					[ ]
30. Cabin Doors Visual Inspection for general condition, operation, and security. Check latches, hinges, and seals for condition and security.	5-20		[ ]				[ ]	
31. Air Ducts, Electrical Leads, and Attaching Parts Visual Inspection for security, routing, chafing, deterioration, wear, and correct installation.	5-20		[ ]					[ ]
32. Pitot-Static System Floor and Center Console Water Traps Visual Inspection for contamination, obstruction or blockage.	5-20		[ ]			[800]		[ ]
33. Stall Warning Water Trap Visual Inspection for contamination, obstruction or blockage.	5-20		[ ]			[800]		[ ]
34. Circuit Breakers - Serials 1005 thru 1267 Perform Functional Check - Redundant Circuit Breakers.	24-50		[ ]					[ ]

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
35. Circuit Breakers - Serials 1268 & subs w/o SRV Perform Functional Check - Redundant Circuit Breakers.	24-50		[ ]					[ ]
36. Circuit Breakers - Serials 1337 & subs w/ SRV Perform Functional Check - Redundant Circuit Breakers.	24-50		[ ]					[ ]
37. Transient Voltage Suppressors - Serials w/o Perspective Avionics Perform Inspection/Check - Transient Voltage Suppressor.	24-50		[ ]			[800]		[ ]
38. Transient Voltage Suppressors - Serials w/ Perspective Avionics Perform Inspection/Check - Transient Voltage Suppressor.	24-50		[ ]			[800]		[ ]
39. Electrical Bonding and Shielding - Serials w/ Perspective Avionics Perform Inspection/Check - Electrical Bonding & Shielding. *Special Inspection: Only every 1000 hours or 10 years whichever first.	51-80		[*]					[*]
40. Wing Attachment Bolts Visual Inspection for condition, fit, and evidence of distress.	5-20		[ ]					[ ]
41. Cable Attachments, Cables, and Pulleys Visual Inspection for security, chafing, wear, and general condition.	5-20		[ ]					[ ]
42. Rudder-Aileron Interconnect Bungee Cord - Serials 1005 thru 1885 Visual Inspection for cord fraying, narrowing, and general condition.	5-20		[ ]			[800]		[ ]
43. GSA 81 Roll and Pitch Servos - Serials w/ Perspective Avionics Visual Inspection for condition and security.	5-20		[ ]					[ ]
44. GSA 81 Roll and Pitch Servos - Serials w/ Perspective Avionics Perform Inspection/Check - GSA 81 Servo Actuator. *Special Inspection: Only every 1000 hours or 3 years whichever first.	22-13		[*]					[*]
45. GSM 85A/86 Roll and Pitch Servo Mounts - Serials w/ Perspective Avionics Visual Inspection for condition and security.	5-20		[ ]					[ ]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
46. GSM 85A - w/ software version prior to 0764.08 Perform Adjustment/Test - GSM 85A Servo Mount Torque GSM 85A - w/ software version 0764.08 or later Perform Adjustment/Test - GSM 85A/86 Servo Clutch Test *Special Inspection: Only every 1000 hours or 2 years whichever first.	22-13		[*]					[*]
47. GSM 86 - w/ software version prior to 0764.08 Perform Adjustment/Test - GSM 85A Servo Mount Torque GSM 86 - w/ software version 0764.08 or later Perform Adjustment/Test - GSM 85A/86 Servo Clutch Test *Special Inspection: Only every 3000 hours or 2 years whichever first.	22-13		[*]					[*]
48. Flap Actuation Motor and Attach Bracket Visual inspection for condition and security.	5-20		[ ]			[800]		[ ]
49. Fuselage Drainage Holes Visual Inspection for obstructions or blockage.	12-30		[ ]				[ ]	
50. Cirrus Airplane Parachute System Perform Inspection/Check - Cirrus Airplane Parachute System	95-00		[ ]				[ ]	
51. CAPS Activation Handle Mount and Cable Visual Inspection security, chafing, and wear.	5-20		[ ]				[ ]	
52. Magnetometer - Serials w/ Perspective Avionics Perform Adjustment/Test - GMU 44 Magnetometer Calibration. *Special Inspection: Only every 2 years.	34-20		[*]					[*]
53. Magnetometer - Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics Perform Functional Test - Magnetometer Calibration. *Special Inspection: Only every 2 years.	34-20		[*]					[*]
54. Emergency Locator Transmitter - Serials w/ ACK E-01 ELT Perform Inspection/Check - ELT.	25-60		[ ]					[ ]
55. Emergency Locator Transmitter - Serials w/ Artex ME406 ELT Perform Inspection/Check - ELT.	25-60		[ ]					[ ]
56. Emergency Locator Transmitter - Serials w/ Artex ELT 1000 Perform Inspection/Check - ELT.	25-60		[ ]					[ ]

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Cabin Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
57. Air Conditioning Evaporator - Serials w/ Air Conditioning System Perform Inspection/Check - Evaporator.	21-50		[ ]					[ ]
58. Air Conditioning Condenser - Serials w/ Air Conditioning System Perform Inspection/Check - Condenser.	21-50		[ ]					[ ]
59. Air Conditioning Lines and Hoses - Serials w/ Air Conditioning System Visual Inspection for leaks, security, and condition.	5-20		[ ]					[ ]
60. Aircraft Data Logger System - Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics Perform Operational Test - Aircraft Data Logger System.	31-30		[ ]					[ ]
61. Aircraft Data Logger System - Serials 2016 & subs w/ Perspective Avionics Perform Operational Test - Aircraft Data Logger System.	31-30		[ ]					[ ]
62. Altimeter Visual and Functional Inspection for condition and calibration in accordance with 14 CFR 91.411. *Special Inspection: Only every 2 years.	14 CFR 91411		[*]					[*]
63. Altimeter Perform Adjustment/Test - Altimeter. *Special Inspection: Only every 2 years.	34-10		[*]					[*]
64. Transponder Visual and Functional Inspection for condition and calibration in accordance with 14 CFR 91.413. *Special Inspection: Only every 2 years.	14 CFR 91413		[*]					[*]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Radio Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Radio and Electronic Equipment Visual Inspection for proper installation, clearance, and security.	5-20		[ ]					[ ]
2. Wiring Visual Inspection for proper clearance, chafing, fraying, and routing.	5-20		[ ]					[ ]
3. Bonding and Shielding Visual Inspection for proper installation and condition.	5-20		[ ]					[ ]
4. Antennas Visual Inspection for condition and security.	5-20		[ ]					[ ]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Fuselage and Empennage Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Exterior Placards Visual Inspection for conformity, security, and condition.	11-20		[ ]				[ ]	
2. Empennage Access Panels Remove Empennage Access Panels LE1, LE2, RE1, RE2, RE3.	06-00		[ ]				[ ]	
3. Lubricate as required in accordance with Lubrication Schedule - Fuselage and Empennage Group.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. Skin Visual Inspection for general condition, deterioration, delamination, distortion, cracks, paint condition, and other evidence of failure.	5-20		[ ]				[ ]	
5. CAPS Exit Cover Visual Inspection of perimeter for cracking or crazing, and placard condition.	5-20		[ ]				[ ]	
6. Vertical Stabilizer and Rudder Surfaces Visual Inspection for distortion, and condition.	5-20		[ ]				[ ]	
7. Rudder System - Serials 1005 thru 1306 Perform Inspection/Check - Rudder System Rigging.	27-20		[ ]			[800]		[ ]
8. Rudder System - Serials 1307 & subs Perform Inspection/Check - Rudder System Rigging.	27-20		[ ]			[800]		[ ]
9. Rudder Bearings, Hinges, Horn, and Attachments Visual Inspection for security, condition, and freedom of movement.	5-20		[ ]				[ ]	
10. Horizontal Stabilizer and Elevator Surfaces Visual Inspection for distortion, and condition.	5-20		[ ]				[ ]	
11. Horizontal Stabilizer Access Panels and Inspection Hole Covers Visual Inspection for condition and security.	5-20		[ ]				[ ]	
12. Elevator System - Serials 1005 thru 1300, 1302 thru 1306 Perform Inspection/Check - Elevator System Rigging.	27-30		[ ]			[800]		[ ]
13. Elevator System - Serials 1301, 1307 & subs Perform Inspection/Check - Elevator System Rigging.	27-30		[ ]			[800]		[ ]
14. Elevator Pitch Trim Cartridge - Serials 1005 thru 1383 Perform Servicing - Pitch Trim Cartridge Lubrication.	27-30		[ ]				[ ]	
15. Elevator Bearings, Hinges, Horn, and Attachments Visual Inspection for wear, condition, and freedom of movement.	5-20		[ ]				[ ]	

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Wing Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Wing Access Panels The following Wing Access Panels are removed during the cabin group inspection. It is recommended that the panels be removed one at a time, the access area cleaned, inspected, and if no discrepancies are found, the panel reinstalled. • Serials 1005 thru 1885: LW3, LW6, LW7, LW8, LW9, LW10, LW11, LW12, LW13, and RW3, RW6, RW8, RW9, RW10, RW11, RW12, RW13. • Serials 1886 & subs: LW1, LW2, LW4, LW5, LW9, LW10, LW11, LW12, LW13, and RW1, RW2, RW4, RW5, RW9, RW10, RW11, RW12, RW13.	06-00		[ ]	[ ]				
2. Lubricate as required in accordance with Lubrication Schedule - Wing Group.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3. Skin Visual Inspection for general condition, deterioration, delamination, distortion, cracks, paint condition, and other evidence of failure.	5-20		[ ]	[ ]				
4. Walkway Visual Inspection for condition.	5-20		[ ]	[ ]				
5. Wing Leading Edge and Stall Strips Visual Inspection for foreign matter and debris.	5-20		[ ]	[ ]				
6. Enhanced Vision System - Serials w/ Perspective Avionics Visual Inspection for general condition, cleanliness, and security.	5-20		[ ]	[ ]				
7. Aileron Surfaces Visual Inspection for distortion, and condition.	5-20		[ ]	[ ]				
8. Aileron Actuation Arm Visual Inspection for safetying, and condition.	5-20		[ ]	[ ]				
9. Wing Tips Remove. Clean and perform Visual Inspection for cracking, rubbing, and general condition.	57-20		[ ]	[ ]				
10. Aileron Hinges, Hinge Bolts, Bearings, and Attachments Visual Inspection for security, freeplay, and binding.	5-20		[ ]			[ ]		[ ]
11. Aileron System Rigging Perform Inspection/Check - Aileron System Rigging.	27-10		[ ]			[800]		[ ]
12. Flap Hinges, Hinge Bolts, Bearings, Rub Strips, and Attachments Visual Inspection for wear, security, freeplay, binding, and corrosion.	5-20		[ ]	[ ]				

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Wing Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
13. Flap System Perform Inspection/Check - Flap System Rigging.	27-50		[ ]					[ ]
14. Pitot Mast and Static Lines Visual Inspection for security, condition, and obstruction.	5-20		[ ]	[ ]				
15. Fuel Lines Visual Inspection for chafing, obstruction, security, and general condition.	5-20		[ ]	[ ]				
16. Fuel Tank Vents Visual Inspection for condition and obstruction.	5-20		[ ]	[ ]				
17. Fuel Cap Perform Functional Test - Fuel Cap Assembly Ground Resistance.	28-10		[ ]	[ ]				
18. Air Ducts, Electrical Leads, Lines, and Attaching Parts Visual Inspection for security, routing, chafing, deterioration, wear, and correct installation.	5-20		[ ]	[ ]				
19. Aft Wing Attach Bracket Visual Inspection for corrosion, If corrosion evident, contact Cirrus Design for disposition. Reference 57-40 for access instructions.	5-20		[ ]	[ ]				
20. Aft Wing Attach Areas Visual inspection of both interior and exterior fittings for loose hardware, signs of joint wear, or relative movement between interior fitting and aft floor/fuselage skin or exterior fitting and fuselage skin. *Special Inspection: Every 300 hours or annually whichever first. If any of the above conditions are found, perform Approved Repair - Aft Wing Attachment.	57-10		[*]		[*]	[800]		

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Landing Gear Group	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Main Landing Gear Fairings Remove. Clean and perform Visual Inspection on fairings and anti-chafe spacers for cracking, rubbing, and general condition.	5-20		[ ]			[ ]		
2. Nose Landing Gear Fairing Remove. Clean and perform Visual Inspection for cracking, rubbing, and general condition.	5-20		[ ]			[ ]		
3. Tires Inspect for proper tire pressure.	12-10		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. Brake Disk/Disc Visual Inspection for corrosion, security, and general condition.	5-20		[ ]			[ ]		[800]
5. Brake Linings - Serials 1005 thru 2240 before SB2X-32-21 Using mirror, check brake lining for deterioration and maximum permissible wear. See Inspection/Check - Brake Linings for maximum permissible wear.	32-42	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. Brake Pads - Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs Using mirror, check brake pads for deterioration and maximum permissible wear. See Inspection/Check - Brake Pads for maximum permissible wear.	32-42	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7. Brake Assembly Perform Inspection/Check - Brake Assembly Serials 1005 thru 2030 before SB 2X-05-01 - Replace O-rings upon reassembly.	32-42		[ ]			[ ]		[800]
8. Brake Fluid Reservoir Replenish.	12-10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9. Brake Lines and Hoses Visual Inspection for leaks, chafing, security, and condition.	5-20		[ ]			[ ]		[800]
10. Lubricate as required in accordance with Lubrication Schedule - Landing Gear Group.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
11. Wheels Visual Inspection for cracks, corrosion, and broken bolts.	5-20		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12. Wheels Remove, Visual Inspection for condition, repack bearings.	5-20		[ ]			[ ]		[800]
13. Nose Gear Puck Stack Assembly - Serials 1005 thru 1885 Visual Inspection of pucks for cracking or splitting. Ensure attach bolts are perpendicular to puck tray and puck stack-up is in alignment.	5-20		[ ]			[ ]		[800]

EFFECTIVITY:
All

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Landing Gear Group (Continued)	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
14. Nose Gear Puck Stack Assembly - Serials 1886 thru 2064 Perform Inspection/Check - Nose Gear Puck Stack Assembly.	32-20		[ ]			[ ]		[800]
15. Nose Gear Assembly - Serials 1005 thru 1885 Perform Inspection/Check - Nose Gear Assembly.	32-20		[ ]			[ ]		[800]
16. Nose Gear Assembly - Serials 1886 & subs Perform Inspection/Check - Nose Gear Assembly.	32-20		[ ]			[ ]		[800]
17. Nose Gear Oleo Strut - Serials 2065 & subs Perform Inspection/Check - Oleo Strut.	32-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
18. Nose Gear Oleo Strut - Serials 2065 & subs Perform Adjustment/Test - Oleo Strut.	32-20		[ ]			[ ]		[800]
19. Main Gear Assembly - Serials 1005 thru 1885 Perform Inspection/Check - Main Gear Assembly.	32-10		[ ]			[ ]		[800]
20. Main Gear Assembly - Serials 1886 & subs Perform Inspection/Check - Main Gear Assembly.	32-10		[ ]			[ ]		[800]
21. Main Gear Assembly - Serials 1886 & subs Perform Inspection/Check - Main Gear Gap Measurement.	32-10		[ ]			[ ]		[800]

Select Inspection Program ---------->>>		Traditional Program		Progressive Inspection Phase				
Return to Service	**ATA Ref**	**50 Hr**	**Annual/ 100 Hr**	**I**	**II**	**III**	**IV**	**V**
1. Lubricate as required in accordance with Lubrication Schedule - Miscellaneous Items.	12-20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. Close Access: Install Main Landing Gear Fairings. Install Nose Landing Gear Fairing. Install Cabin Access Panels. Install Cabin Carpet. Install RH Mid-Console Trim. Install Center Bolster Trim. Install Kickplates. Install Cabin Seats. Install Glareshield. Serials w/o Perspective Avionics: Install MFD. Install 222 Bulkhead Interior Trim. Install Empennage Access Panels. Install Wing Access Panels. Install Aileron Cove Access Panel. Install Wing Tips.	 32-10 32-20 06-00 25-10 25-10 25-10 25-10 25-10 25-10 31-60 25-10 06-00 06-00 06-00 57-20		[ ]	 [ ] [ ] [ ]		 [ ] [ ]	 [ ]	 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
3. Verify all Airworthiness Directives complied with and airplane papers in proper order: - Airworthiness Certificate - Registration - Operating Handbook - Weight and Balance	14 CFR 91.403	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. Fuel Injection System Functional Inspection of Fuel Injection System in accordance with CMI/TCM Service Information Directive 97-3. *Special Inspection: And after engine install or fuel system component replacement.	Ref CMI/ TCM ICA		[*]		[*]			
5. Perform an airplane run-up in accordance with Operational/Functional Check in 5-30. After completing the Operational Check, perform a walk around to detect fluid leaks or other abnormalities.	05-30		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. Install Engine Cowling.	71-10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

EFFECTIVITY:
All

AIRPLANE OPERATIONAL AND FUNCTIONAL CHECK

1. DESCRIPTION

The following check must be performed before and after the Scheduled Maintenance Inspection to detect any airplane abnormalities or malfunctions. A portion of the check is accomplished with the engine running and warmed up.

The technician performing these checks must initial each box in the appropriate column to indicate completion of that step. Note any abnormalities in the notes column on the right. Spaces at the end of the checklist are provided for recording engine parameters.

WARNING: **In order to perform the following check the engine must be operating. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting this check.**

CAUTION: During all engine operations outlined in this check, exercise caution to avoid harm or damage to personnel and equipment due to propeller blast and rotating propeller blades.

CAUTION: Excessive engine temperatures must be avoided since run-up temperatures must closely parallel in-flight temperatures.

Operational Inspection Check	Initial Chk	Final Chk	Notes
1. Battery Master Switch - *Serials 1005 thru 1267* When master switch is toggled ON the following should occur: a. Autopilot system runs through self test. b. Autopilot ready light on turn coordinator illuminates when gyro reaches operational RPM. c. OIL, LOW VOLT, VACUUM, and AUX VAC lights illuminate on the annunciator panel. d. Electric (Back-up) vacuum pump operates, suction gage indicates in green arc, and the artificial horizon gyro erects.			
2. Battery 2 Master Switch When switch is toggled ON the following should occur: *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD:* a. Voltmeter indicates at least 24 volts on battery 2. b. ALT 1 and ALT 2 Caution lights illuminate. c. Flap position light off. d. Attitude gyro low voltage flag hidden. e. HSI HDG flag hidden within five minutes. f. Turn Coordinator low voltage flag hidden. g. Autopilot ready indication after gyro spool up. *Serials 1337 thru 1422 w/ PFD, 1423 thru 1581:* a. Voltmeter indicates at least 24 volts on battery 2. b. ALT 1 and ALT 2 Caution lights illuminate. c. Flap position light off. d. Autopilot ready indication after gyro spool up. e. PFD aligned within five minutes with no error messages. f. Standby attitude gyro aligned within five minutes. *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics:* a. PFD indicates at least 24 volts on Essential Bus. b. ALT 2 Caution light illuminates. c. Flap position light off. d. Autopilot ready indication on both PFD and flight guidance programmer/computer after gyro spool up. e. PFD aligned within five minutes with no error messages. f. Standby attitude gyro aligned within five minutes. *Serials 2016 & subs w/ Perspective Avionics:* a. PFD indicates at least 24 volts on Essential Bus. b. ALT 2, ALT 1, M BUS 2, and M BUS 1 caution messages are displayed on PFD. c. Flap position light off. d. AHRS aligns and COM 1 / NAV 1 are operational. e. Standby attitude gyro aligned within five minutes.			

Operational Inspection Check (Continued)	Initial Chk	Final Chk	Notes
3. Battery 1 Master Switch When switch is toggled ON the following should occur: *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD*: a. ALT1 and ALT2 fail lights should illuminate after approximately 15 seconds. b. Flap position light illuminates. c. Engine instruments operational, MAP gage should indicate approximately the altimeter setting. d. Ammeter select switch in BAT position should show slight discharge. *Serials 1337 thru 1422 w/ PFD, 1423 thru 1581:* a. ALT 1 and ALT 2 fail lights should be on. b. Flap position light illuminates. c. Engine instruments operational, MAP gage should indicate approximately the altimeter setting. d. Ammeter select switch should show slight discharge when battery selected. e. Turn battery 2 to the off position and verify PFD remains functional. f. Verify voltmeter indicates at least 24 volts on battery 1. *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics:* a. ALT 1 and ALT 2 fail lights should be on. b. Flap position light illuminates. c. Engine parameters on PFD are operational, MAP display should indicate approximately the altimeter setting. d. Turn battery 2 to the off position and verify PFD remains functional. e. Verify PFD indicates at least 24 volts on Main Bus. *Serials 2016 & subs w/ Perspective Avionics:* a. ALT 1 and ALT 2 caution messages are displayed on PFD. b. Flap position light illuminates. c. Engine parameters on MFD are operational, Man “Hg display should indicate approximately the altimeter setting. d. Turn battery 2 to the off position and verify PFD and MFD remain functional. e. Verify MFD indicates at least 24 volts on Essential Bus, Main 1 Bus, and Main 2 Bus.			

Operational Inspection Check (Continued)	Initial Chk	Final Chk	Notes
4. Lighting Verify lighting controls, avionics light sensors and lights operate properly: *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD:* a. Landing light. b. Navigation lights c. Anticollision lights d. Instrument backlighting: ASI, AH, VSI, DG, CDI, Clock, Altimeter, Turn Coordinator, engine instrumentation. e. Avionics brightness: Audio Panel, GPS/COM/NAV 1 & GPS/COM 2, Transponder, and optional avionics. f. MFD, HSI brightness. *Serials 1337 thru 1422 w/ PFD, 1423 thru 1581:* a. Landing light. b. Navigation lights c. Anticollision lights d. Instrument backlighting: ASI, AH, Altimeter, and engine instrumentation. e. Avionics brightness: Audio Panel, GPS/COM/NAV 1 & GPS/COM 2, Transponder, and optional avionics. f. PFD and MFD display and bezel key brightness. *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics:* a. Landing light. b. Navigation lights c. Anticollision lights d. Instrument backlighting: ASI, AH, and Altimeter. e. Avionics brightness: Audio Panel, GPS/COM/NAV 1 & GPS/COM 2, Transponder, and optional avionics. f. PFD and MFD display and bezel key brightness. *Serials 2016 & subs w/ Perspective Avionics:* a. Landing light. b. Navigation lights c. Anticollision lights d. Ice detection lights, if installed e. Instrument backlighting: ASI, AH, and Altimeter. f. Panel lighting: red panel and overhead flood light, red circuit breaker and alternate air flood light, CAPS handle red flood light. g. Reading and map lights. h. Avionics brightness: Audio Panel, keyboard, autopilot. i. PFD, MFD display and soft key brightness.			
5. Pitot Heater Set PITOT HEAT switch to ON position and verify pitot tube heat.			

Operational Inspection Check (Continued)	Initial Chk	Final Chk	Notes
6. Environmental System Fan operates with increasing velocity at appropriate control location. Position Control alters airflow appropriately. If equipped, AC selection starts condenser fan, illuminates light. If equipped, Verify AC recirculate position opens the evaporator doors and cool air exits cabin air panel vents. All controls operate smoothly and effectively with positive detents.			
7. Communications a. Verify all four headset jacks operate properly. b. Music is muted during transmissions and receptions. c. Verify the communications capability on both the high and low ends of the VHF COM band.			
8. Flight Controls Check for full range of travel and excessive friction. Visual Inspection for obstructions.			
9. Engine Controls Check full range of motion without any obstruction or excessive friction to travel. Power lever should provide a slight resistance at detents and have positive clearance to the console slot in both the full forward and full aft positions.			
10. Start Engine (Refer to POH Section 4) Starter spins propeller rapidly without slipping or dragging. Set engine speed at 1000 RPM.			
11. Oil Pressure Indicates pressure in the green arc within 30 seconds. If extremely cold, oil pressure may be in yellow arc for one to two minutes.			
12. Flaps Operate through full extension and retraction for steady and complete deployment. Flap position light illuminates at the retracted, 50%, and 100% positions.			
13. Trim Controls Aileron trim functions fully left and right without rudder movement caused by the rudder-aileron interconnect. Check for full range of travel and excessive friction.			
14. Altimeter Indicates within 50 feet of field elevation when set to correct barometric pressure setting.			
15. Vertical Speed Indication Indicates zero.			

Operational Inspection Check (Continued)	Initial Chk	Final Chk	Notes
16. Alternator 1 Load *Serials 1005 & subs w/o Perspective Avionics:* Increase RPM to 1000. Check that LOW VOLT light is off. Ammeter indication shows no current discharge with full avionics, landing light, pitot heat, and navigation lights operating. *Serials 2016 & subs w/ Perspective Avionics:* The ALT 1 annunciation will appear when Main Bus 1 voltage is below 27 volts and output is less than 2 amps. When ALT 1 is turned off, Main Bus 1 voltage will indicate battery 1 voltage.			
17. Alternator 2 Load *Serials 1005 & subs w/o Perspective Avionics:* Increase RPM to 2200. Check that LOW VOLT light is off. Ammeter indication shows no current discharge with full load applied to essential bus. *Serials 2016 & subs w/ Perspective Avionics:* During normal operating conditions (AC off) ALT 2 will indicate a larger load than ALT 1. There will be an ALT 2 annunciation when the ALT 2 load is less than 2 amps. When ALT 2 is not operating, ALT 1 will carry the entire electrical load.			
18. Magneto RPM Drop Set RPM to 1700. Check that a 150 or lower RPM drop occurs while operating on one magneto and no more than a 50 RPM drop difference between left and right magnetos.			
19. Fuel Selector Valve Move selector to RIGHT and LEFT positions. Verify fuel flow.			
20. Alternate Induction Air Pull alternate induction air knob. Engine RPM and MAP should show a slight drop.			
21. Engine Full Power Advance throttle to full forward. Engine RPM should indicate between 2625 and 2675 RPM in a no wind environment or with airplane nose perpendicular to wind.			
22. Fuel Flow At 2650 RPM, verify fuel flow indicates approximately 16 to 19 gal/hr.			
23. Oil Temperature Indicates in the green arc.			
24. Cylinder Head Temperature Verify temperature indicates in the green range.			
25. Brakes Rudder pedal brakes should hold airplane stationary with no slipping at full power. Parking brake should hold airplane stationary with no slipping at full power.			

Operational Inspection Check (Continued)	Initial Chk	Final Chk	Notes
26. Propeller Governor Increase RPM slightly past 2000 RPM. Propeller governor should reduce the propeller RPM by approximately 100 to 200 RPM.			
27. Magneto Grounding Set engine speed to 1000 RPM. Engine should cease to fire when magneto momentarily switched to OFF position.			
28. Engine Idle Move throttle control lever to full aft. Engine RPM should indicate between 600 and 750 RPM in a no wind environment.			
29. Engine Cut Out and Shut Down With the engine at idle, move mixture control lever slowly toward idle cutoff. Engine RPM should increase by 50+/-20 RPM before engine begins to cut out. Move mixture control lever full aft to shut down engine.			

The following tables are for recording engine parameters.

Initial Operational Check Engine Parameters								
Left Mag Drop	Right Mag Drop	Full power RPM	Full Power MAP	Full Power Fuel Flow	Oil Temp	Oil Pressure	Idle Speed	Mixture Rise

Final Operational Check Engine Parameters								
Left Mag Drop	Right Mag Drop	Full power RPM	Full Power MAP	Full Power Fuel Flow	Oil Temp	Oil Pressure	Idle Speed	Mixture Rise

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UNSCHEDULED MAINTENANCE CHECKS

1. DESCRIPTION

The following describes those maintenance checks and inspections on the aircraft which are dictated by special or unusual conditions which are not related to the time limits specified in 5-10, Time Limits. These include inspections and checks for wing strike, hard/overweight landing, overspeed, severe air turbulence, lightning strike, high drag/side loads, ground gusts, operation in harsh environmental conditions, and operation on unimproved runway surfaces.

2. MAINTENANCE PRACTICES

A. Wing Strike

Aircraft that have suffered impact to the wing must be inspected for the following:

(1) Fuselage
  (a) Aft Floor Structure - Above aft wing attach points and under seat areas, inspect for delamination, cracking, whitening, and any other evidence of structural damage.

B. Bird Strike

Aircraft that have suffered impact from bird strike must be inspected for the following:

(1) Fuselage
  (a) Aft Floor Structure - Above aft wing attach points and under seat areas, inspect for delamination, cracking, whitening, and any other evidence of structural damage.

(2) Cowling/Wings/Stabilizers/Landing Gear/Wheels/Propeller
  (a) Impact Area - At area of impact, inspect for cracks, dents, and any other evidence of damage.

C. Hard/Overweight Landing

A hard landing is any landing made at what is believed to be an excessive sink rate. An overweight landing is defined as landing the airplane at any gross weight which exceeds the maximum take-off weight as specified in the Pilot's Operating Handbook and the Airplane Flight Manual.

Note: If the hard/overweight landing is combined with high drag/side loads, additional checks are required.

(1) Fuselage
  (a) Aft Floor Structure - Above aft wing attach points and under seat areas, inspect for delamination, cracking, whitening, and any other evidence of structural damage.

(2) Landing Gear
  (a) Main gear struts - Inspect for security of attachment, permanent deformation, delamination, and cracking or splintering of strut.
  (b) Main gear attachments and supporting structure - Inspect for security loose or failed fasteners, permanent deformation, damage to fairings, tire damage, and any other evidence of structural damage.
  (c) Nose gear and attaching structure - Inspect for security, loose or failed fasteners, permanent deformation of strut or axle, strut weld cracks, puck delamination and cracks, puck pan weld cracks, engine mount weld cracks, damage to fairing, tire damage, and any other evidence of structural damage.

(3) Wings
  (a) Wings surface - Inspect for skin cracks, loose of failed fasteners, and any evidence of structural damage.
  (b) Trailing edge - Inspect for any deformation affecting normal flap operation.

D. Overspeed

An overspeed inspection must be performed anytime the airplane has exceeded one or both of the following:

- Airplane overspeed exceeding placard speed limits of flaps.

- Airplane overspeed exceeding design speeds.

(1) Landing gear
  (a) Main gear axle and fittings - Inspect for cracks, security, and evidence of structural damage.

(b) Tires - Inspect tires for flat spots, excessive wear, and tire slippage on the wheel rim.

(2) Fuselage

(a) Windshield and windows - Inspect for buckling, dents, loose or failed fasteners, and any evidence of structural damage.

(b) All hinged doors - Inspect hinges, hinge attach points, latches and attachments, and any evidence of structural damage.

(3) Cowling

(a) Inspect for buckling, cracks, loose or failed fasteners, and indications of structural damage.

(4) Stabilizers

(a) Stabilizers - Inspect skins, hinges and attachments, moveable surfaces, mass balance weights, and attaching structure for cracks, dents, buckling, loose or failed fasteners, and evidence of structural damage.

(5) Wings

(a) Flaps - Inspect for skin buckling, cracks, loose or failed fasteners, attachments, and any evidence of structural damage.

(b) Fillets and fairings - Inspect for cracks, and loose or failed fasteners.

E. Nose Landing Gear Shimmy

A Nose Landing Gear Shimmy is defined as lateral oscillation or wobble of the nose landing gear resulting in a vibration throughout the cabin that can vary in intensity. This condition normally occurs during the landing roll-out and will subside as speed is reduced. Shimmy may also occur during either takeoff roll or high speed taxi.

(1) Nose Landing Gear

(a) Strut Assembly - Perform Inspection/Check - Nose Landing Gear Strut Assembly. (Refer to 32-20)

F. Severe Turbulence and/or Maneuvers

Atmospheric conditions producing violent buffeting of airplane. Severe maneuvers can be defined as any maneuvers exceeding the Pilot's Operating Handbook and the airplane's flight limits.

(1) Stabilizers

(a) Horizontal stabilizer hinge fittings, and fittings - Inspect for security, loose or failed fasteners, and any evidence of structural damage.

(b) Vertical stabilizer - Inspect for evidence of structural damage, and damage to hinges and fittings.

(c) Elevator and rudder balance weight supporting structure - Inspect for security, loose or failed fasteners, and evidence of structural damage.

(2) Wing

(a) Wing to body fittings and supporting structure - Inspect for security, loose or failed fasteners, and evidence of structural damage.

(b) Trailing Edge - Inspect for and deformation affecting normal operation of flap and aileron.

G. Lightning Strike

If flown through a region of the atmosphere where electrical discharge is occurring, the airplane may become part of the discharge path. During a lightning strike, the current enters the airplane at one point and exits another, usually at opposite extremities. It is in these entrance and exit points where damage is most likely to occur. Burning and/or eroding of small surface areas of the skin and structure may be detected during inspection. In most cases, the damage is obvious. In some cases, however, hidden damage may result. In the case of lightning strike, this inspection must be accomplished before returning the aircraft to service.

(1) Communications

(a) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Antennas - Inspect all antennas for evidence of burning or eroding. If damage is noted, perform functional check of affected system.

(b) *Serials 2016 & subs w/ Perspective Avionics:* Antennas - Inspect all antennas for evidence of burning or eroding. If damage is noted, call Cirrus for disposition. Any component connected to the antenna may need to be returned to manufacturer for servicing.

(2) Navigation

(a) Glidescope antenna - Inspect for burning and pitting. If damage is noted, perform a functional check of glidescope system.

(b) Compass should be considered serviceable if the corrected heading is within plus or minus 10 degrees of heading indicated by the remote compass system. If remote compass is not within tolerance, remove, repair, or replace.

(3) Fuselage

(a) Skin - Inspect surface of fuselage skin for evidence of damage.

(4) Stabilizers

(a) Inspect surfaces of stabilizers for evidence of damage.

(5) Wings

(a) Skin - Inspect for evidence of burning and eroding.

(b) Wing tips - Inspect for evidence of burning and pitting.

(c) Flight surfaces and hinging mechanisms - Inspect for burning and pitting.

(6) Landing Gear/Wheels

(a) Landing gear attach fittings and axles - Inspect for evidence of pitting and damage.

(b) Wheels - Inspect for evidence of pitting and damage.

(c) Wheel pants and fairings - Inspect fasteners for pitting and damage.

(d) Perform Inspection/Check - Brake Assembly. (Refer to 32-42)

(e) Brake lines - Inspect for evidence of pitting, damage, or hydraulic fluid leaks.

(7) Propeller

(a) Propeller - Remove from service and have inspected at an authorized repair station.

(8) Powerplant

(a) Engine - Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(9) Electrical System

(a) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Power Transient Voltage Suppressor (TVS) - Perform Inspection/Check - Power TVS. (Refer to 24-50)

(b) *Serials 2016 & subs w/ Perspective Avionics:* Transient Voltage Suppressor (TVS) - Perform Inspection/Check - Transient Voltage Suppressor. (Refer to 24-50)

H. High Drag/Side Loads Due to Ground Handling

A high drag/side load condition is defined as situations when the airplane skids or overruns from a prepared surface onto an unprepared surface. This condition can also be met due to landings short of prepared surfaces, landings which cause the blowing of tires, or skidding conditions where the safety of the airplane was in question. This covers takeoffs, landings, or unusual taxi conditions.

(1) Landing Gear

(a) Main gear and fairings - Inspect for loose or failed fasteners, buckling, security, cracks, and evidence of structural damage.

(b) Nose gear and fairing - Inspect for loose or failed fasteners, cracks, security, buckling, and evidence of structural damage.

(2) Wings

(a) Wing to fuselage fittings and attaching structure - Inspect for security, loose or failed fasteners, and evidence of structural failure.

I. Ground Gusts

Ground gusts are defined as conditions where a parked or taxiing airplane is exposed to side, aft quartering, or aft wind gusts exceeding 40 knots. Such conditions can cause control system damage due to rapid oscillation and/or slamming of the control surfaces against system stops.

(1) Rudder
   (a) Hinges - Inspect for loose or failed fasteners, deformation, cracks, evidence of structural damage, and for any other evidence of damage or premature wear.
   (b) Rudder actuation arm bearing mount - Inspect for loose or failed fasteners, deformation, cracks, evidence of structural damage, and for any other evidence of damage or premature wear.
   (c) Attaching structure - Inspect for loose or failed fasteners, delaminating, cracks, evidence of structural damage, punctures, scratches, and for any other evidence of damage or premature wear.
   (d) Skin - Inspect for buckling, dents, misalignment, punctures, scratches, and for any other evidence of damage or premature wear.
   (e) Attaching hardware - Inspect for loose or failed fasteners, deformation, cracks, security of mass balance weights, balance weight supporting structure and for any other evidence of damage or premature wear.
   (f) Bellcrank - Inspect for failed fasteners, cracks and deformation.

(2) Elevator
   (a) Hinges - Inspect for loose or failed fasteners, deformation, cracks, evidence of structural damage, and for any other evidence of damage or premature wear.
   (b) Attaching structure - Inspect for loose or failed fasteners, delaminating, cracks, evidence of structural damage, punctures, scratches, and for any other evidence of damage or premature wear.
   (c) Skin - Inspect for buckling, dents, misalignment, punctures, scratches, and for any other evidence of damage or premature wear.
   (d) Bellcrank - Inspect for failed fasteners, cracks and deformation.

(3) Aileron
   (a) Hinges - Inspect for loose or failed fasteners, deformation, cracks, evidence of structural damage, and for any other evidence of damage or premature wear.
   (b) Attaching structure - Inspect for loose or failed fasteners, delaminating, cracks, evidence of structural damage, punctures, scratches, and for any other evidence of damage or premature wear.
   (c) Skin - Inspect for buckling, dents, misalignment, punctures, scratches, and for any other evidence of damage or premature wear.
   (d) Actuation arm - Inspect for bends and evidence of jamming.

(4) Flaps
   (a) Hinges - Inspect for loose or failed fasteners, deformation, cracks, evidence of structural damage, and for any other evidence of damage or premature wear.
   (b) Attaching structure - Inspect for loose or failed fasteners, delaminating, cracks, evidence of structural damage, punctures, scratches, and for any other evidence of damage or premature wear.
   (c) Skin - Inspect for buckling, dents, misalignment, punctures, scratches, and for any other evidence of damage or premature wear.

J. Operation on Unimproved Runway Surfaces

Operation on unimproved runway surfaces will cause additional wear and may require additional maintenance or inspection.

K. Operation in Harsh Environmental Conditions

In humid areas, special care should be taken to keep engine, accessories, and airframe clean to prevent oxidation. Fuel and oil should be checked frequently and drained of condensation to prevent corrosion. Visually inspect MCU, flight control surfaces, nose landing gear, cabin steps, torque tubes, and control yoke tube for corrosion in accordance with FAA AC 43.13-1B, Chapter 6, Section 5.

(1) Airframe - General
Perform Inspection/Check - Airframe General Corrosion. (Refer to 51-10)

(2) Master Control Unit
Perform Inspection/Check - Master Control Unit. (Refer to 24-30)

(3) Lower Engine Mount Attach Fittings
Perform Inspection/Check - Attach Fitting Corrosion. (Refer to 53-40)

(4) Control Yoke Assembly
Perform Inspection/Check - Control Yoke Assembly. (Refer to 27-10)

L. System Functional Tests

(1) Functional Test - Engine Monitoring System - *Serials w/ Avidyne Emax*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
USB Flash Drive	-	Any Source	Record data.
Computer with USB Port	-	Any Source	View data.

(b) Connect blank flash drive to USB port on MFD bezel.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(e) On MFD, when READY TO WRITE ENGINE DATA TO REMOVABLE MEDIA is displayed, press [Proceed].

(f) On MFD, verify the following:

1 ENGINE DATA LOG TRANSFER IN PROGRESS is displayed.

2 Status Bar displays as data is written.

3 LOG TRANSFER SUCCEEDED is displayed.

4 CONTINUE... is displayed.

(g) Remove data storage device from USB port on MFD.

(h) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(i) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(j) Verify engine data was written to flash drive.

1 Connect flash drive to USB port on computer.

2 Navigate to flash drive and open EngineLog folder.

Note: The engine log files use the following naming convention:

Engine_070207_103017_out.log

where 070207 indicates the date (February 07, 2007) and 103017 indicates the time (10:30:17).

3 Open engine log file corresponding to date of functional test and verify engine data exists for the expected times.

4 If data exists, the engine monitoring recording system is functioning properly.

5 If no data exists, the engine monitoring recording system is malfunctioning. Contact Cirrus Design for disposition.

(2) Functional Test - Flight Data Logging - *Serials w/ Perspective Avionics*

(a) For information regarding Flight Data Logging, refer to the Perspective Integrated Avionics System Pilot's Guide.

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CHAPTER 06

DIMENSIONS AND AREAS

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CHAPTER 06 - DIMENSIONS AND AREAS

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06-TOC	2	31 MAY 2011
06-00	1	31 MAY 2011
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06-00	7	15 JUN 2010
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06-00	12	19 SEP 2010
06-00	13	15 JUN 2010
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CHAPTER 06 - DIMENSIONS AND AREAS

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DIMENSIONS AND AREAS

1. GENERAL

This section describes those diagrams and text which shows the area, dimensions, stations, access doors, and physical locations of the structural members of the airplane. Also included is the cardinal rigging dimensions.

2. AIRPLANE DIMENSIONS AND AREAS

The airplane is divided into reference points in inches. These reference points provide a means of quickly identifying the locations of components. Three axes are used as reference points.

The following terms are used for the reference points:

FS - Fuselage Station is a horizontal reference designation starting in front of the nose of the airplane

WS - Wing Station is measured outboard from the centerline of the fuselage to the wing tip.

WL - Water Line is a vertical reference designation measured parallel to the ground.

BL - Buttock Line is a horizontal reference designation starting at the airplane centerline. Right or left is added to indicate direction from airplane centerline.

A. General

Length (Overall)	25.92 ft	7.90 m
Height (Maximum)	9.20 ft	2.80 m
Wing Span (Overall)	35.25 ft	10.74 m
Propeller Diameter (Maximum)	76 in.	193 cm
2 Blade Propeller Ground Clearance (Minimum)	7 in.	18 cm
3 Blade Propeller Ground Clearance (Minimum)	8 in.	20 cm

B. Cabin

Cabin Width	49.00 in.	124.00 cm
Cabin Height	50.00 in.	127.00 cm
Cabin Length	122.00 in.	309.00 cm
Cabin Volume	137.00 ft^3	3.83 m^3
Baggage Compartment Height	39.00 in.	99.00 cm
Baggage Compartment Width	40.00 in.	101.00 cm
Baggage Compartment Length	36.00 in.	91.00cm
Baggage Compartment Volume	32.00 ft^3	0.90 m^3

C. Wings

Span	35.25 ft	10.03 m
Area	135.20 ft^2	12.56 m^2
Wing Loading	22.20 lb/ft^2	108.30 kg/m^2
Aspect Ratio	9.19	9.19
Wing Dihedral - *Serials 1005 thru 1885*	4.50 °	4.50°
Wing Dihedral - *Serials 1886 & subs*	5.50°	5.50°

D. Flaps

Span	8.80 ft	2.68 m
Area	10.80 ft^2	1.00 m^2

E. Ailerons

Span	4.70 ft	1.43 m
Area	4.37 ft^2	0.41 m^2

F. Horizontal Stabilizer

Span	13.17 ft	4.01 m
Area	25.75 ft²	2.39 m²
Aspect Ratio	5.59	5.59

G. Elevator

Span	12.00 ft	3.66 m
Area	7.73 ft²	0.72 m²

H. Vertical Stabilizer

Span	5.52 ft	1.65 m
Area	15.93 ft²	1.48 m²
Aspect Ratio	1.84	1.84

I. Rudder

Span	5.42 ft	1.65 m
Area	5.26 ft²	0.49 m²

J. Landing Gear

Wheel Track (Main To Main) - *Serials 1005 thru 1885*	10.83 ft	3.30 m
Wheel Track (Main To Main) - *Serials 1886 & subs*	9.10 ft	2.77 m
Wheel Base (Main To Nose)	7.27 ft	2.21 m

3. ACCESS PANELS

A. Cabin Floor (See Figure 06-006)

Maintenance practices pertinent to the cabin floor access panels are found in Chapter 53, Fuselage. (Refer to 53-20)

B. Wing (See Figure 06-007)

Maintenance practices pertinent to the wing access panels are found in Chapter 57, Wings. (Refer to 57-30)

C. Empennage (See Figure 06-008)

Maintenance practices pertinent to the empennage access panels are found in Chapter 53, Fuselage. (Refer to 53-30)

4. CONTROL SURFACE TRAVELS AND CABLE TENSION SETTINGS

A. Aileron

Aileron Up Travel: 12.5° ±1.0°

Aileron Down Travel: 12.5° ±1.0°

Aileron Trim Deflection: 6.0° ±1.0°

Aileron Cable Tension: (See Figure 06-001)

Roll Servo Bridle Cable Tension: 25 +2.0 / -0.0 lb

B. Elevator

Elevator Up Travel: 25.0° +0° / -1.0°

Elevator Down Travel: 15.0° ±1.0°

Elevator Trim Deflection: -10.5° ±1.0°, +17° Minimum

Elevator Cable Tension: (See Figure 06-001)

Pitch Servo Bridle Cable Tension:

- *Serials 1886 & subs w/ System 55X:* 25 ±5.0 lb (11.3 ±2.3 kg)
- *Serials 2016 & subs w/ Perspective Avionics:* 25 +2.0 / -0.0 lb

C. Rudder

Maximum Right Rudder Deflection: 20.0° ±1.0°

Maximum Left Rudder Deflection: 20.0° ±1.0°

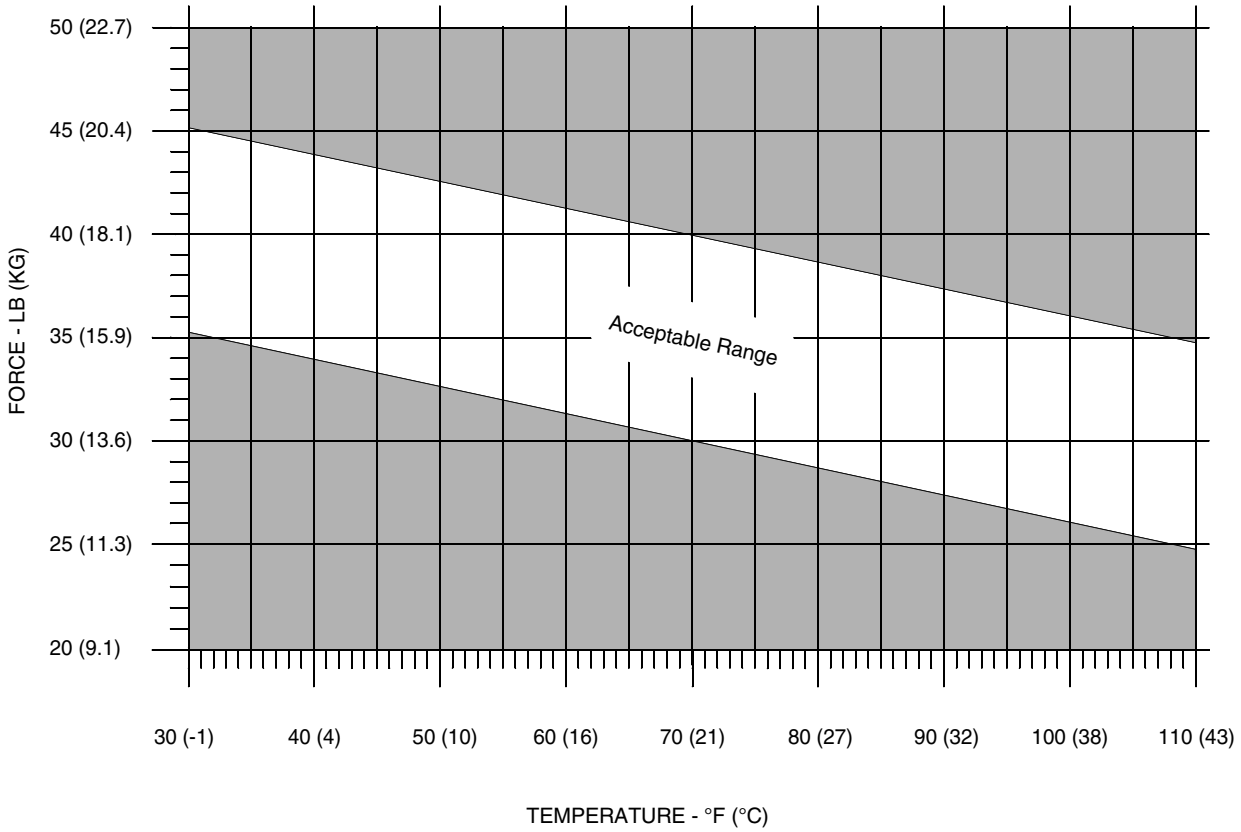
Yaw Servo Bridle Cable Tension: 25 +2.0 / -0.0 lb

D. Flaps

Flap UP: 0.0° ±0.5°

Flap 50%: 16.0° ±0.5°

Flap 100%: 32.0° ±0.5°



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Figure 06-001
Temperature Compensation Chart for Control Cable Rigging

EFFECTIVITY:
All

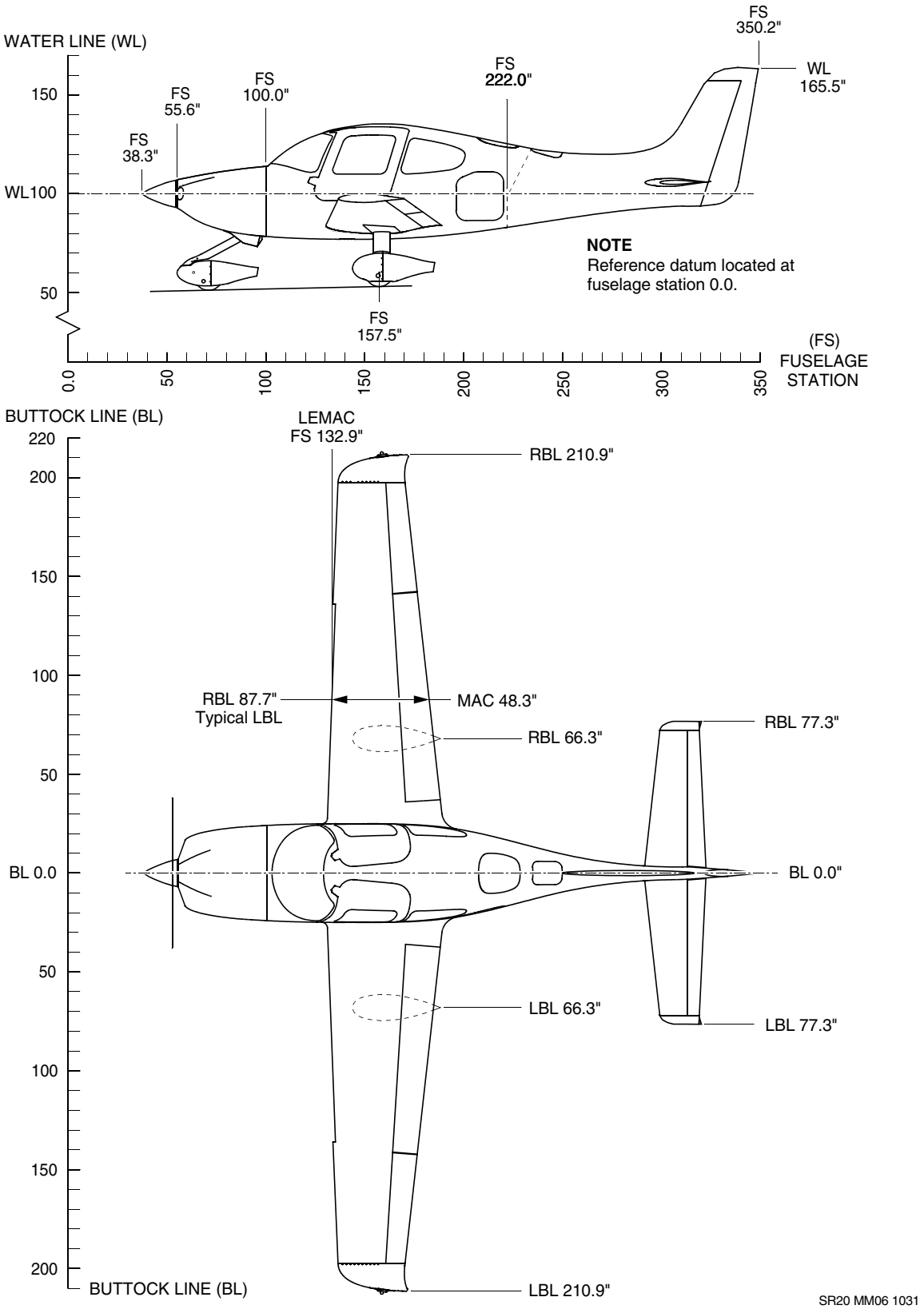


Figure 06-002
Airplane Principal Dimensions - Serials 1005 thru 1885 (Sheet 1 of 2)

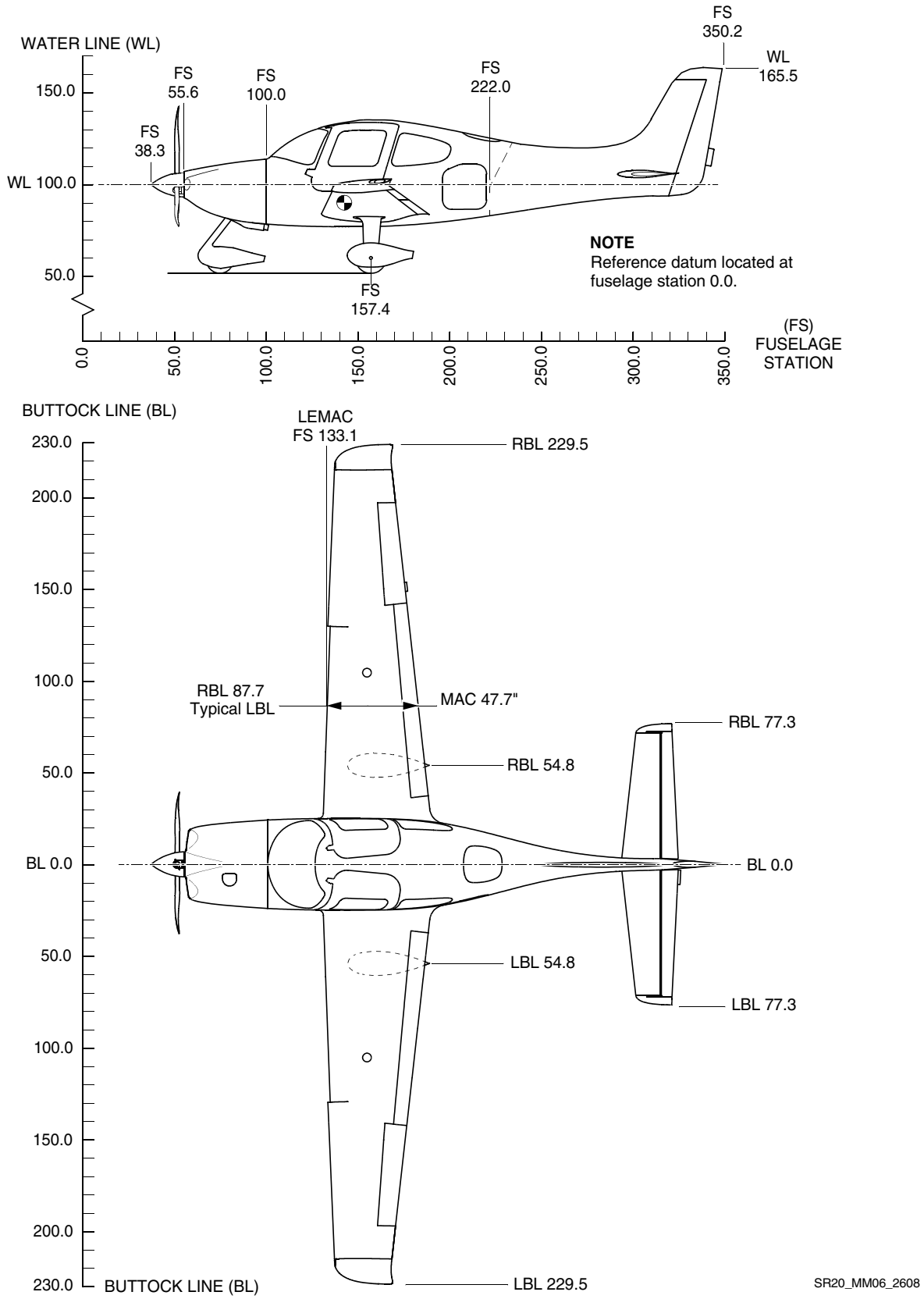
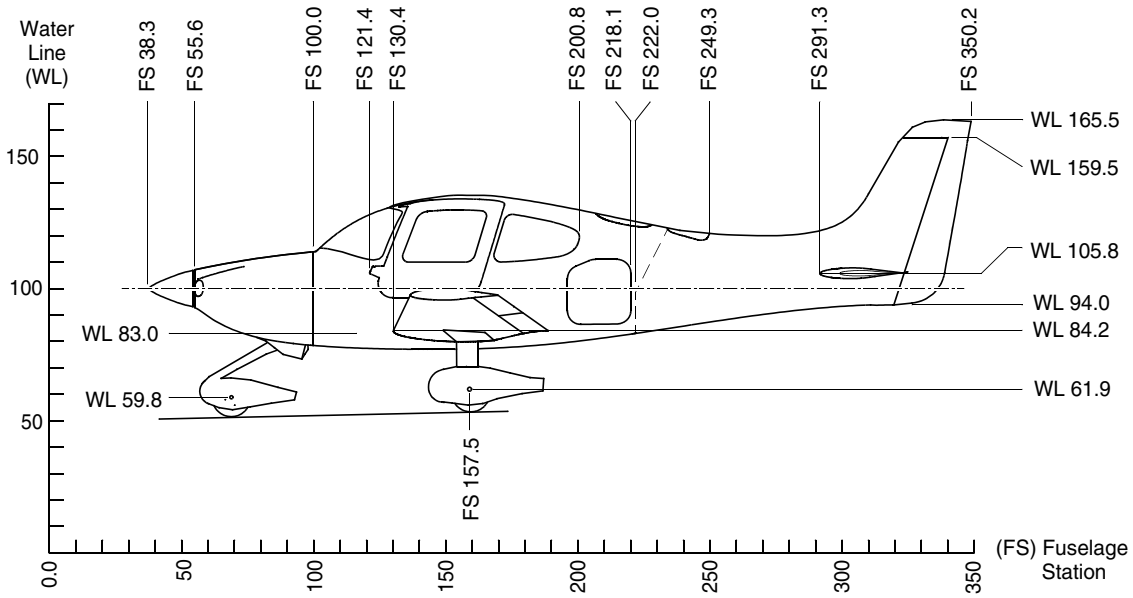


Figure 06-002
Airplane Principal Dimensions - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs



Note
Reference datum located at fuselage station 0.0.

SR20_MM06_1005

Figure 06-003
Fuselage Stations

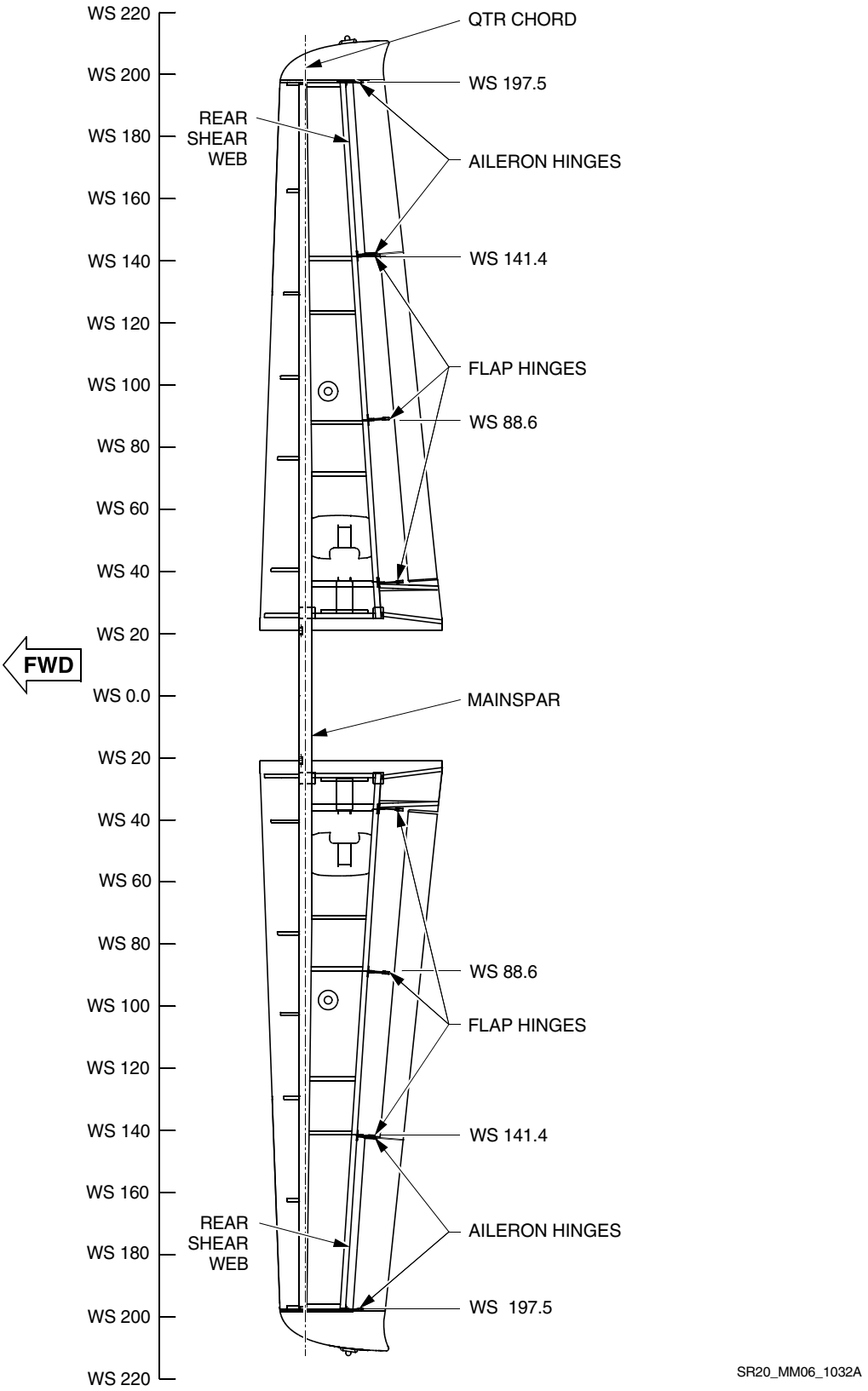


Figure 06-004
Wing Stations - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885

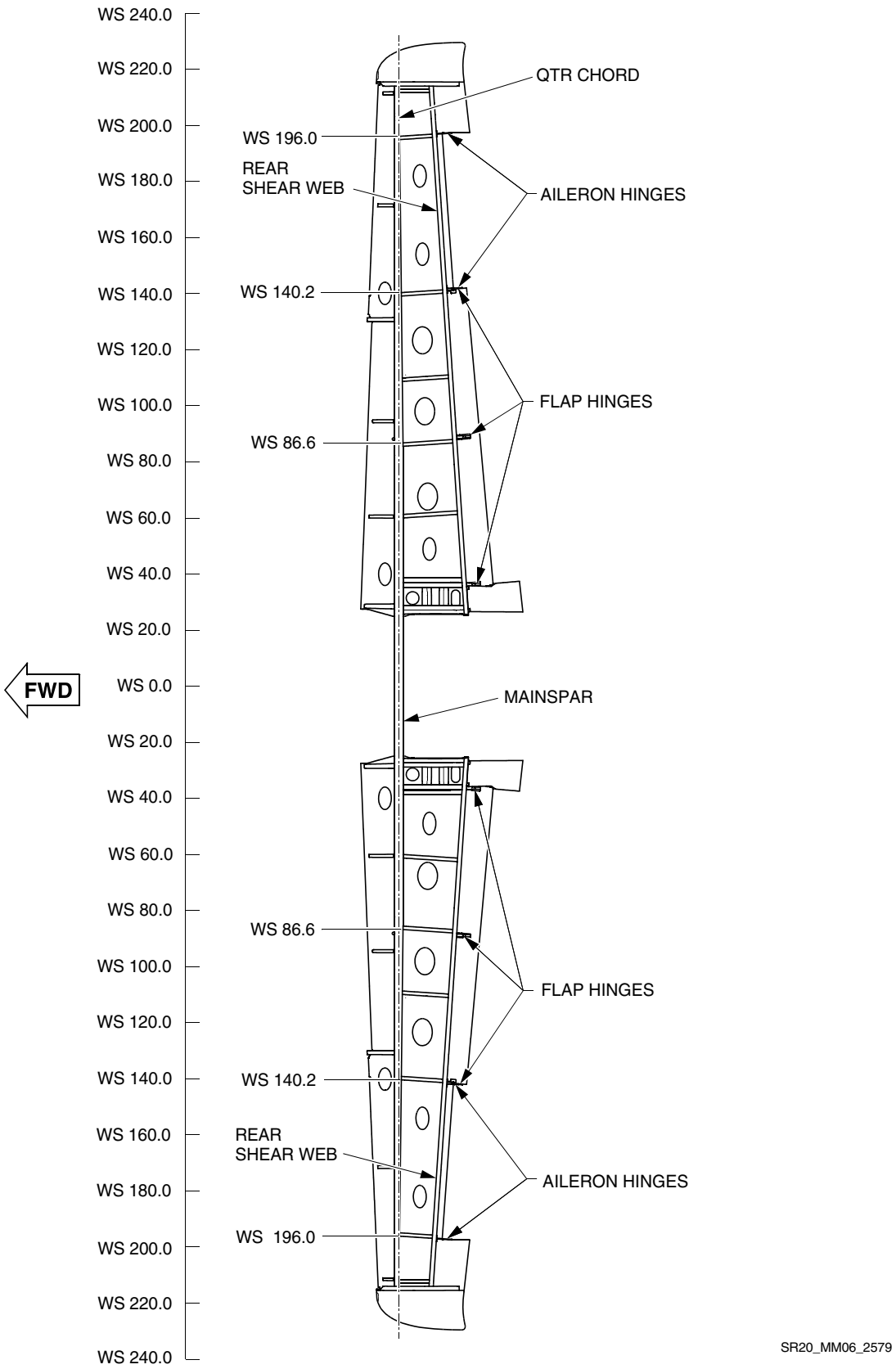
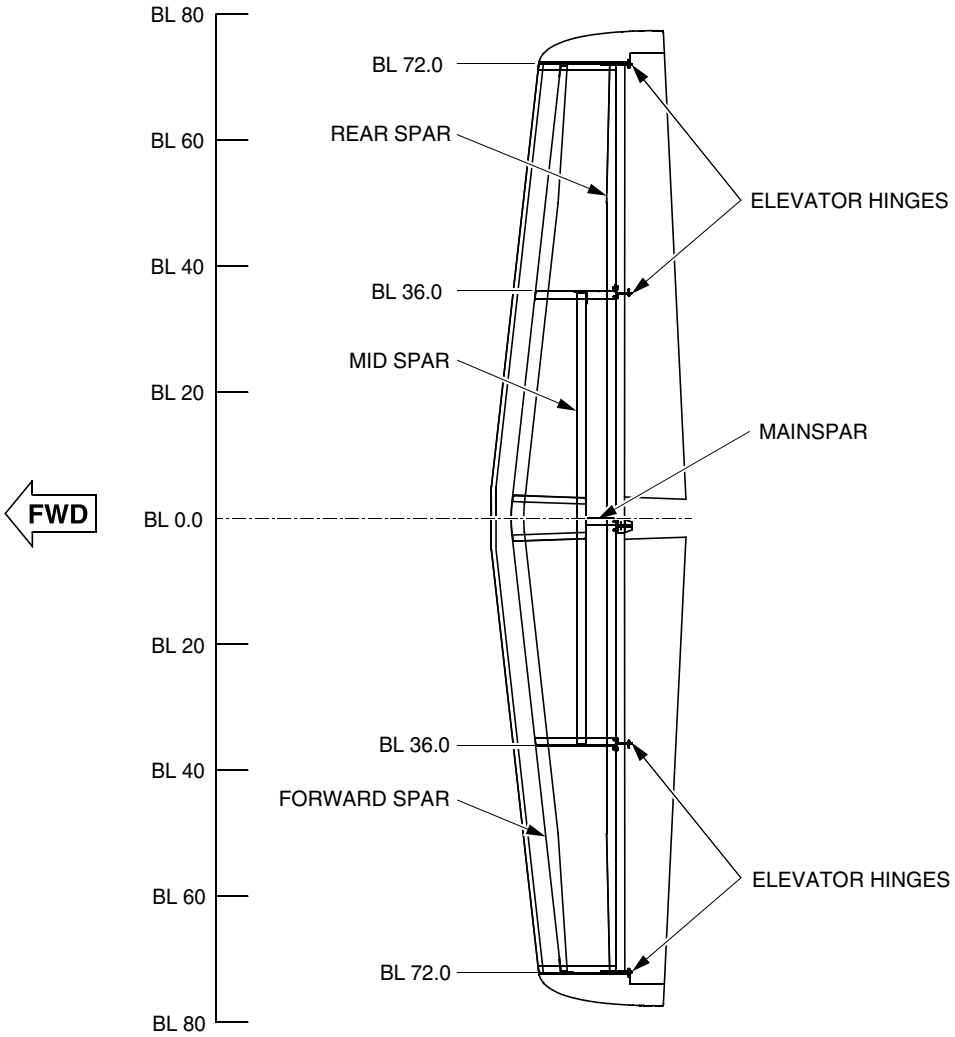


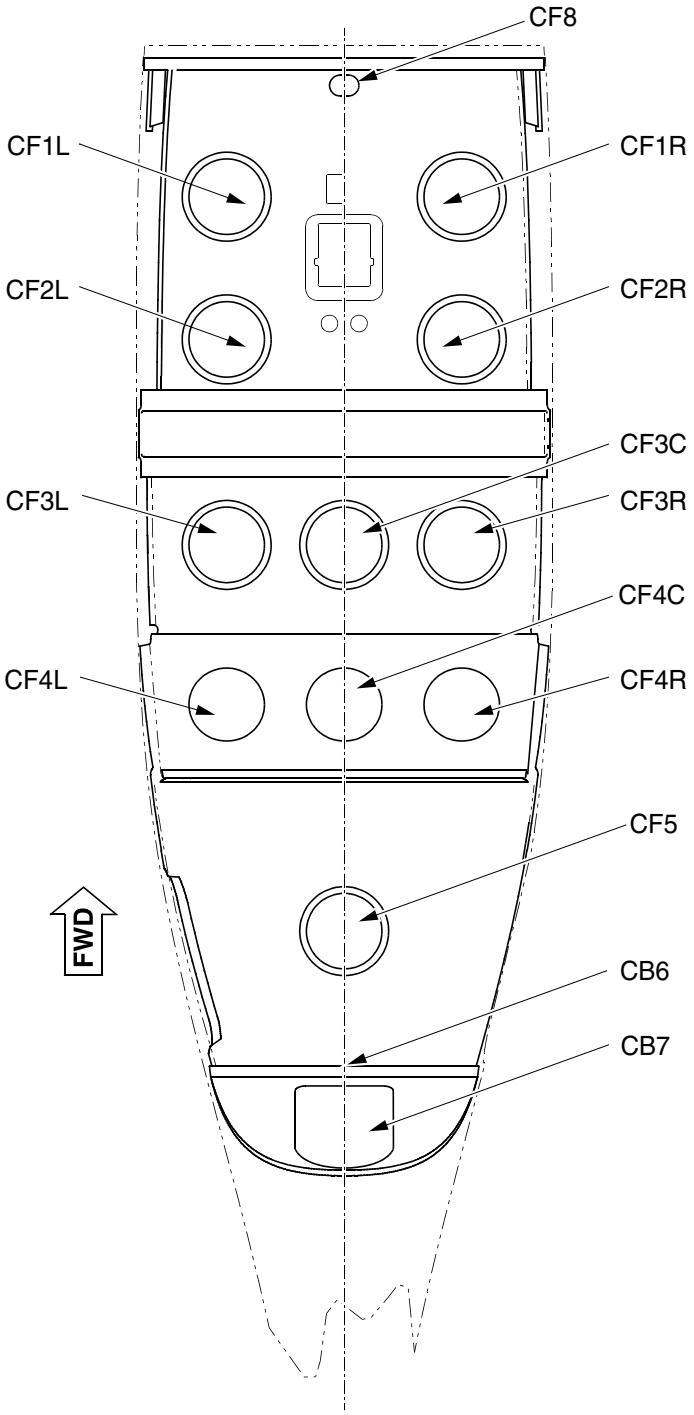
Figure 06-004
Wing Stations - Serials 1886 & subs (Sheet 2 of 2)



NOTE
Bottom view - lower skin removed for clarity.

SR20_MM06_1033A

Figure 06-005
Elevator Stations



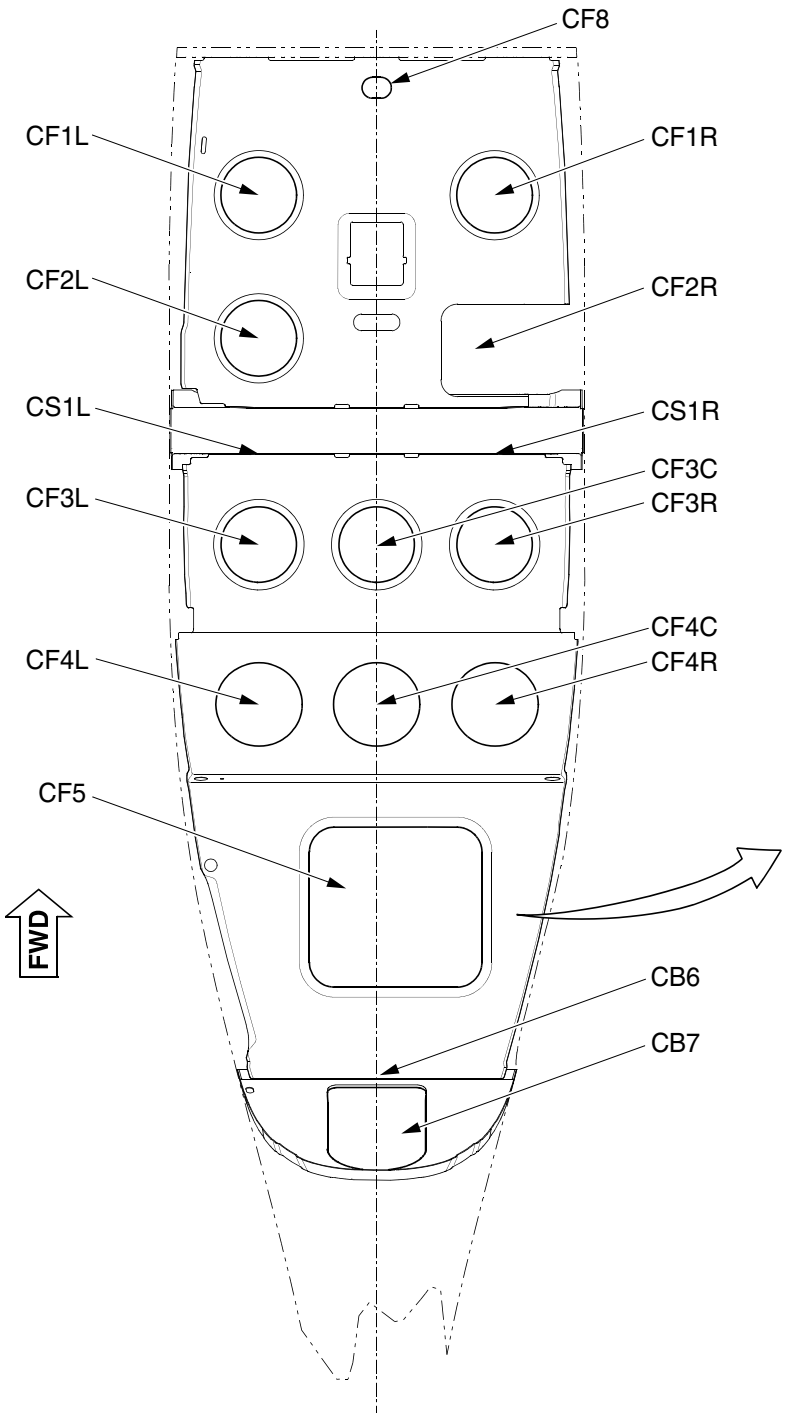
Serials 1005 thru 1632, 1634 thru 1636.

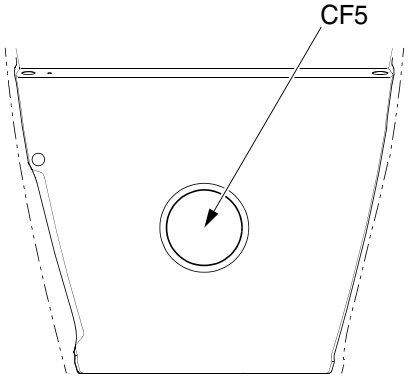
LEGEND

CF1L - Engine Mount Through-Bolt
CF1R - Engine Mount Through-Bolt
CF2L - Pilot Seat
CF2R - Co-Pilot Seat
CF3L - Passenger Seat
CF3C - Rudder-Aileron Interconnect
CF3R - Pitot-Static Water Trap
CF4L - Flight Control Cables
CF4C - Trim System Relays
CF4R - Flight Control Cables
CF5 - Marker Beacon Antenna
CB6 - ELT
CB7 - CAPS
CF8 - Transponder Antenna

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Figure 06-006
Floor Access Panels - Serials 1005 thru 1632, 1634 thru 1638 (Sheet 1 of 2)





Serials 1633, 1639 thru 2064.

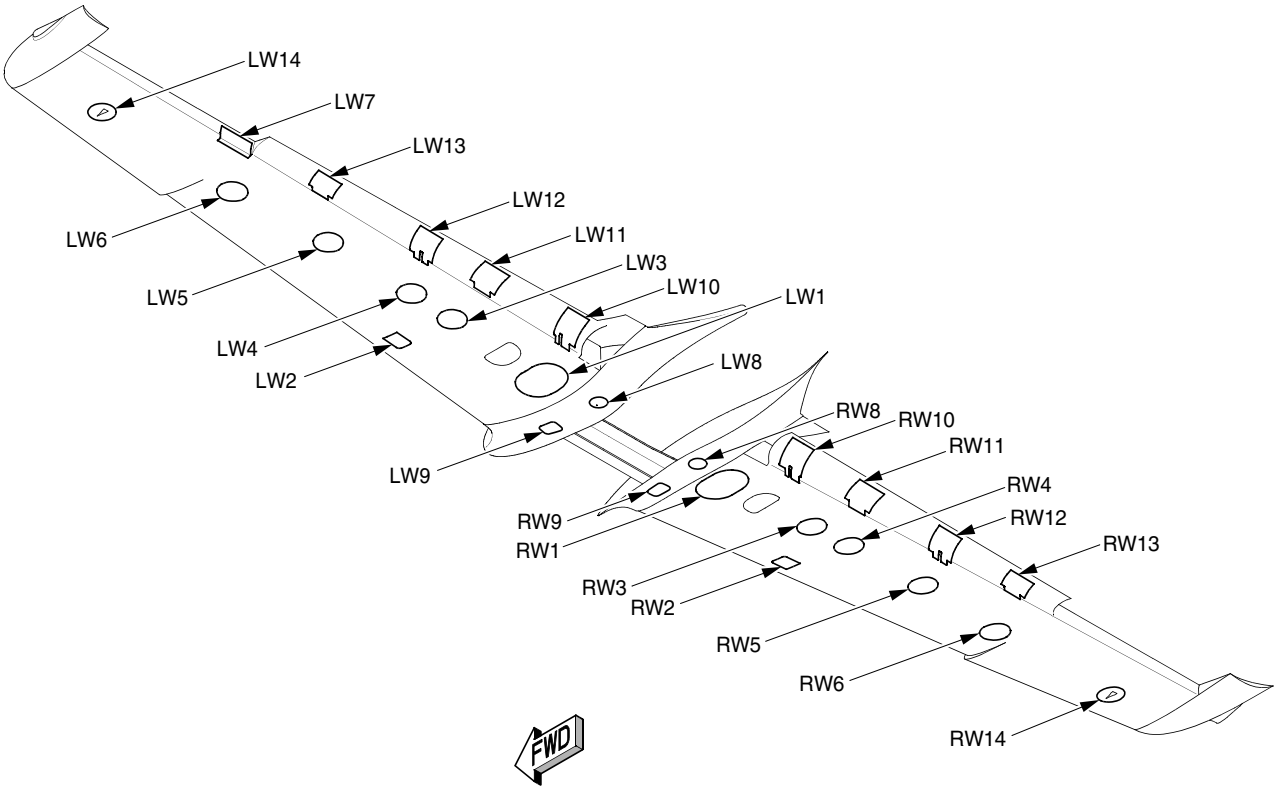
LEGEND

CF1L - Engine Mount Through-Bolt
CF1R - Engine Mount Through-Bolt
CF2L - Pilot Seat
CF2R - Co-Pilot Seat
CF3L - Passenger Seat
CF3C - Rudder-Aileron Interconnect
CF3R - Pitot-Static Water Trap
CF4L - Flight Control Cables
CF4C - Trim System Relays
CF4R - Flight Control Cables
CF5 - Marker Beacon Antenna
CB6 - ELT
CB7 - CAPS
CF8 - Transponder Antenna
CS1L - Spar Tunnel
CS1R - Spar Tunnel

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Figure 06-006
Floor Access Panels - Serials 1633, 1639 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1633, 1639 & subs



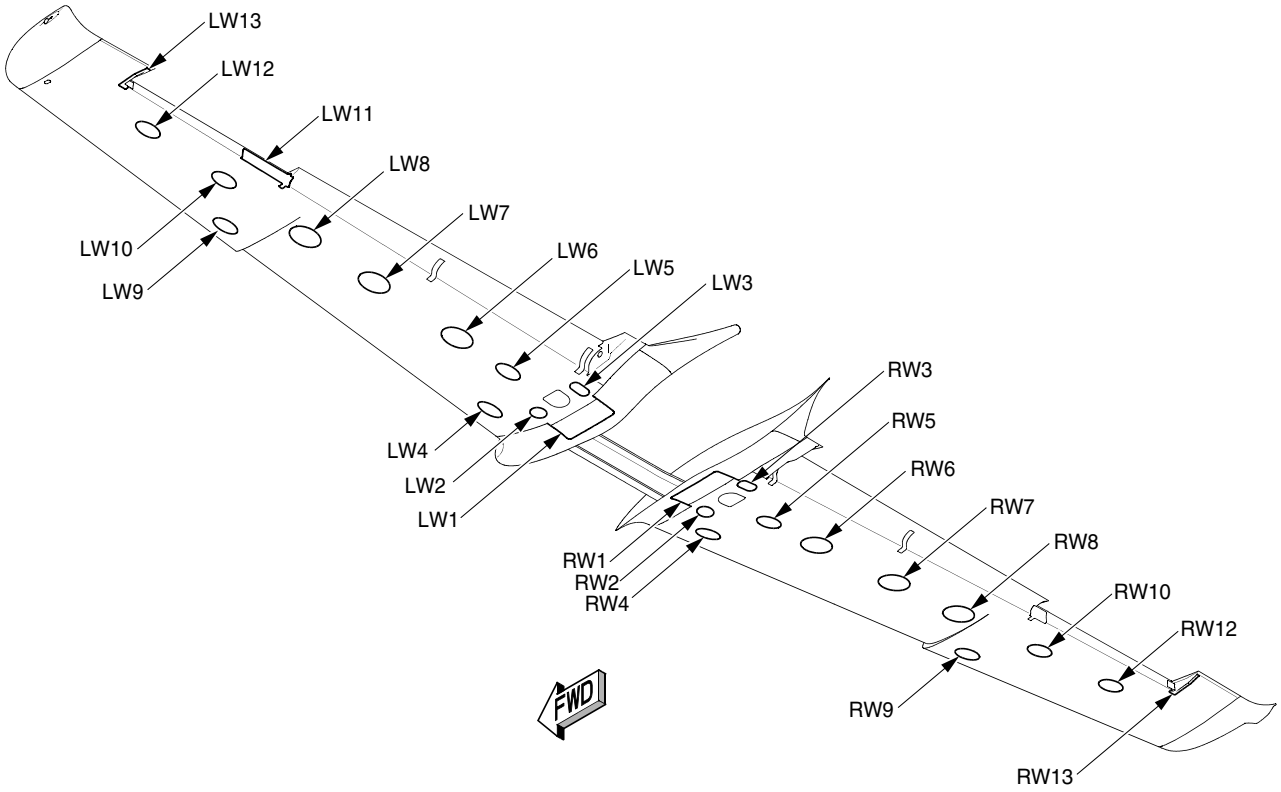
LEGEND

LW1 or RW1	-	Collector Tank
LW2 or LW2	-	Tie Down
LW3 or RW3	-	Inboard Wing
LW4 or RW4	-	Inboard Fuel Tank
LW5 or RW5	-	Outboard Fuel Tank
LW6 or RW6	-	Fuel Vent Lines
LW7	-	Aileron Cove
LW8 or RW8	-	Wing Root, Aft
LW9 or RW9	-	Wing Root, Fwd
LW10 or RW 10	-	Wing Cove, WS37
LW11 or RW11	-	Wing Cove, WS68
LW12 or RW12	-	Wing Cove, WS89
LW13 or RW13	-	Wing Cove, WS121
LW14 or RW14	-	NACA Vent

Serials 1005 thru 1877, 1879 thru 1885.

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Figure 06-007
Wing Access Panels - Serials 1005 thru 1885 (Sheet 1 of 2)



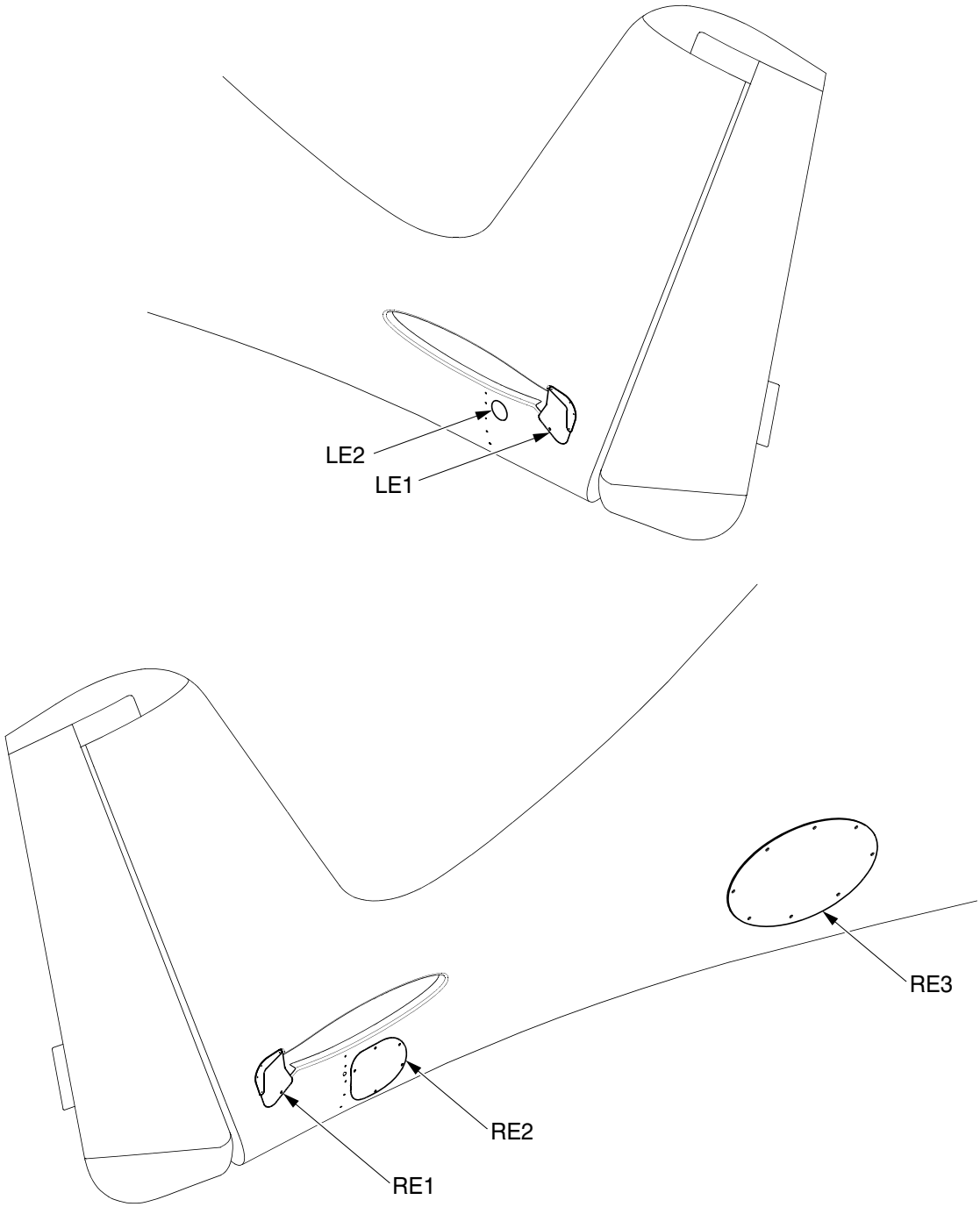
LEGEND

LW1/RW1	-	Wing Root Fairing
LW2/RW2	-	Wing Root
LW3/RW3	-	Fuel Tank, Root
LW4/RW4	-	Wing Inboard
LW5/RW5	-	NACA Vent, Inboard
LW6/RW6	-	Fuel Tank, Inboard
LW7/RW7	-	Fuel Tank, Mid
LW8/RW8	-	Fuel Tank, Outboard
LW9/RW9	-	Wing Mid
LW10/RW10	-	NACA Vent, Outboard
LW11	-	Aileron Cove
LW12/RW12	-	Wing Outboard
LW13/RW13	-	Aileron Hinge

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Figure 06-007
Wing Access Panels - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs



LEGEND

LE1 - Elevator Push Pull Rod
LE2 - Pitch Trim Cartridge
RE1 - Pitch Trim Motor Assembly
RE2 - Rudder Push Pull Rod
RE3 - Avionics Bay

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Figure 06-008
Empennage Access Panels

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CHAPTER 07

LIFTING AND SHORING

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CHAPTER 07 - LIFTING AND SHORING

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Raise Airplane		3
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Lower Airplane		3

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LIFTING AND SHORING

1. GENERAL

This chapter describes the materials necessary to lift and shore the airplane for maintenance, overhaul, repair, and abnormal conditions such as collapsed gear. The entire airplane may be lifted by using standard aircraft hydraulic jacks in conjunction with jack pads at the jack points provided on the fuselage and wings. The jacking site, when possible, should be on level ground and should be protected from wind, preferably inside a hanger. The airplane may be jacked with full fuel tanks. As the airplane's empty CG is forward of the wing jack points, add 150 to 200 lb of ballast to baggage compartment to prevent airplane from tipping forward. When possible jacks should be used in conjunction with shoring.

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JACKING

1. DESCRIPTION

Three jack points, located at each wing tiedown and tail tiedown, are provided to perform maintenance operations. Tie-down rings must be removed and replaced with jack points prior to lifting. Jack points are stowed in the baggage compartment. The airplane may be jacked using two standard aircraft hydraulic jacks at the wing jacking points and a weighted tailstand attached to the aft tail tiedown.

For leveling procedures, the airplane may be jacked using an aircraft hydraulic jack positioned at the aft tail tiedown. (Refer to 08-10)

2. MAINTENANCE PRACTICES

A. Raising the Airplane - All Ground Contacts (See Figure 07-101)

(1) Raise Airplane

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aircraft Hydraulic Jacks	-	Any Source	Support
Jack Points	-	Cirrus Design Duluth, MN 55811 218-727-2737	Support
Tailstand	300 pounds (136 kg) minimum weight	Any Source	Support
Clevis	(See Figure 7-102)	Any Source	Support
Hitch Pin		Any Source	Support

CAUTION: Do not jack the aircraft outside or in open hanger with winds in excess of 10 m.p.h.

The empty CG is forward of the wing jacking points. To prevent airplane from tipping forward during jacking, use a weighted tailstand (300-lb minimum) attached to the tail tiedown.

Jacks must be used in pairs. Do not attempt to jack only one side of aircraft. Keep the airplane as level as possible when jacking.

(b) Position airplane on a hard, flat, level surface.

(c) Remove main gear fairings. (Refer to 32-10)

(d) Remove and stow tie-down rings from wings.

Note: Figure 7-102 demonstrates one possible way of securing weighted tailstand to tail tiedown ring. (See Figure 07-102)

(e) Attach a weighted tailstand to tail tiedown ring.

(f) Position jacks and jack points for jacking. Insert jack point into wing tiedown receptacle. Holding the jack point in place, position the jack under the point and raise the jack to firmly contact the jack point. Repeat for opposite jacking point.

Note: Raise airplane no more than required for maintenance being performed.

(g) Raise the airplane keeping the airplane as level as possible.

(h) Secure jack locks.

(2) Lower Airplane

(a) Release pressure on all jacks simultaneously to keep airplane as level as possible.

(b) Remove jacks, jack points, and tailstand. Stow points in baggage compartment.

(c) Install tiedown rings.

(d) Install main gear fairings. (Refer to 32-10)

B. Raising the Airplane - Aft Tail Tiedown Only (See Figure 07-101)

(1) Raise Airplane

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aircraft Hydraulic Jack	-	Any Source	Support
Nose Wheel Block	-	Any Source	Support

CAUTION: Do not jack the aircraft outside or in open hanger with winds in excess of 10 m.p.h.

(b) Position airplane on a hard, flat, level surface.

(c) Position nose wheel block at nose landing gear to prevent airplane movement.

(d) Position jack under the aft tail tiedown and raise the jack to firmly contact the aft tail tie-down.

Note: Raise airplane no more than required for maintenance being performed.

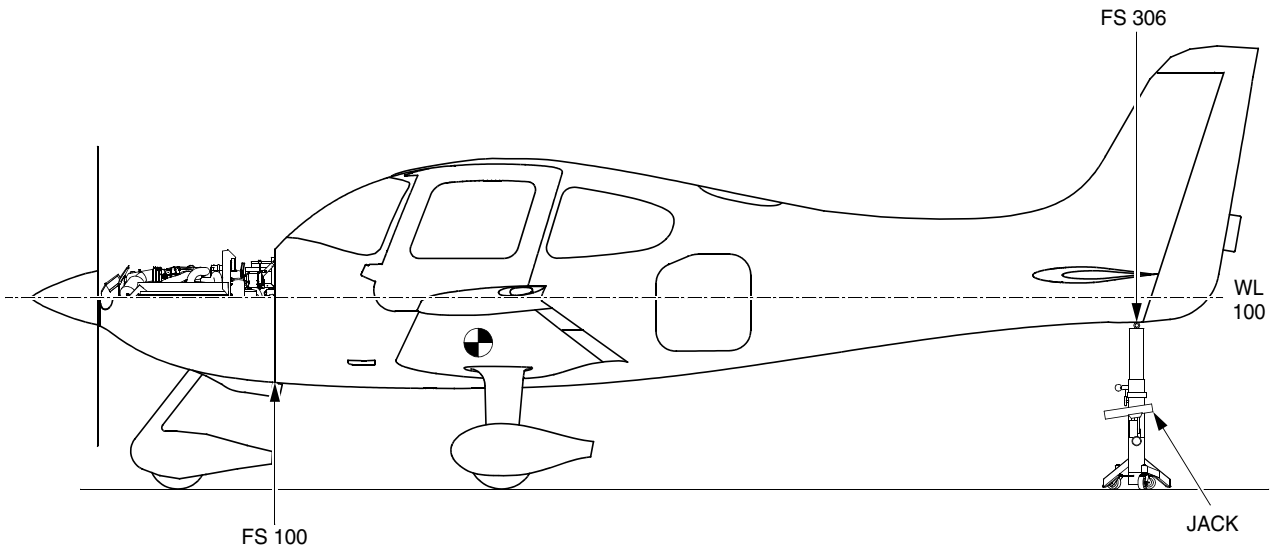
(e) Raise the airplane as required.

(f) Secure jack lock.

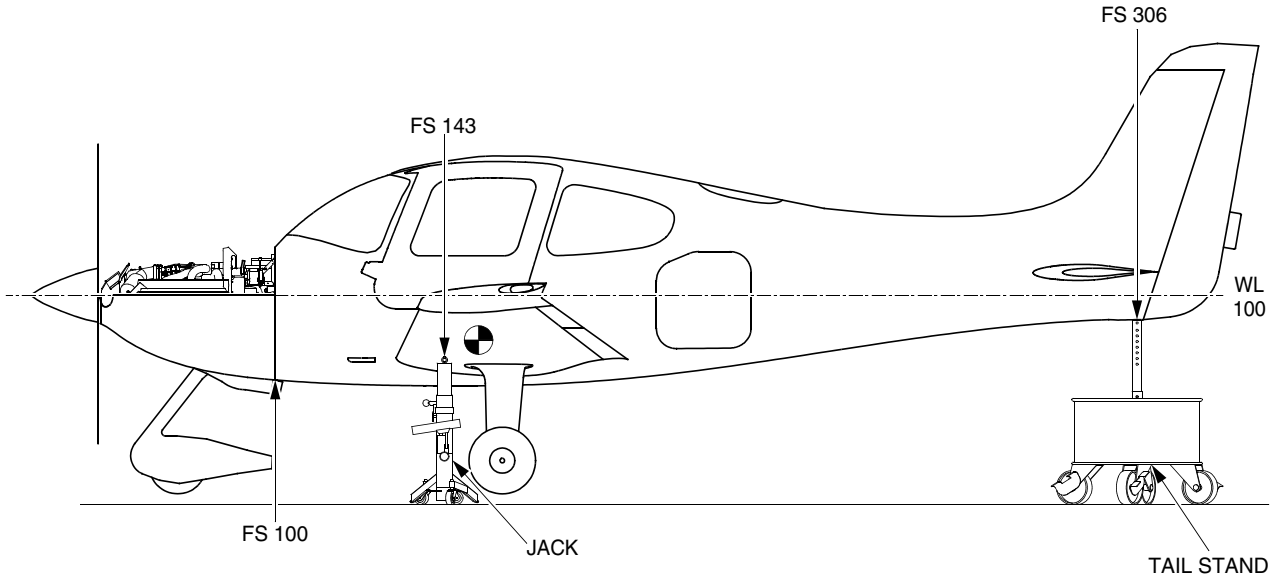
(2) Lower Airplane

(a) Release pressure on jack slowly.

(b) Remove jack.



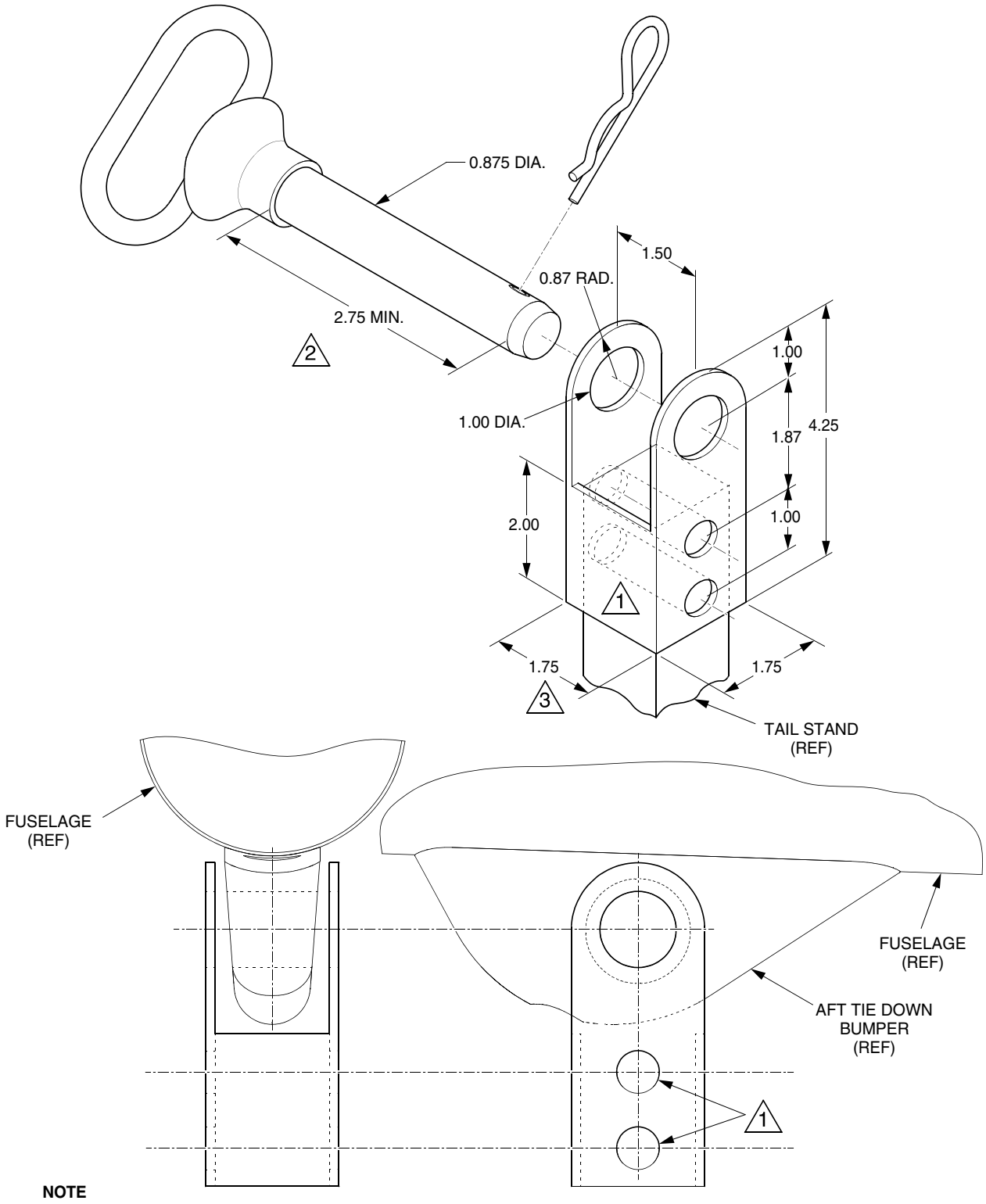
JACK FOR LEVELING PROCEDURES



JACK FOR RAISING AIRCRAFT

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Figure 07-101
Jacking Points



NOTE

1. Match drill to tail stand.
2. Hitch Pin: McMaster-Carr p/n 91594A335, 0.875 diameter X 2.750 length.
3. Clevis Material: mechanical square tubing, 1.75 X 1.75 X 11 ga. wall X 4.25 length.

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Figure 07-102
Tailstand Clevis and Hitch Pin

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HOISTING

1. DESCRIPTION

This chapter describes those instructions necessary to support the airplane during maintenance and repair. In some instances (i.e. off-runway landing, collapsed gear, etc.) it may be necessary to lift the airplane using hoisting straps.

2. MAINTENANCE PRACTICES

A. Hoisting the Airplane (See Figure 07-201), (See Figure 07-202)

CAUTION: The following procedures shall be accomplished to prepare equipment and airplane for hoisting operations.

- Defuel airplane. (Refer to 12-10)
- Remove cargo.
- Remove all antennas that will interfere with hoisting.
- Secure propeller.
- Check hoisting straps for fraying or deterioration.
- Cover windshield with padded blankets.

(1) Raise Airplane

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Hoisting Option #1: Spreader Bar	U23000A-1PA	TANDEMLOC, Inc. Havelock, NC 28532 800-258-7324	Support
Hoisting Option #1: Hoisting Straps (2)	2000 lb minimum	Any Source	Support
Hoisting Option #2: Type E Style Mobile Gantries (2)	Model F4000	Spanco, Inc. Morgantown, PA 19543 800-869-2080	Support
Hoisting Option #2: Chain, AM Hook Type Hoists (2)	2 ton capacity	Chester Hoist, Inc. Lisbon, OH 44432 330-424-7248	Support
Hoisting Option #2: Spreader Bar with Straps (for forward hoist attach)	T6854	Cirrus Design Duluth, MN 55811 218-727-2737	Support
Hoisting Option #2: Hoisting Strap (for aft hoist attach)	2000 lb minimum	Any Source	Support
Aircraft Hydraulic Jacks	-	Any Source	Support
Barrier (carpeting, bubble wrap, etc.)	-	Any Source	Protection

(b) For hoisting method #1:

1 Remove upper engine cowl. (Refer to 71-10)

CAUTION: Verify weight capacity of overhead crane meets or exceeds 2 tons (2000 kg).

CAUTION: Hoisting straps must not contact firewall flange or installed components during hoisting as damage to aircraft may result.

CAUTION: Wooden blocks may be placed against firewall as spacers to ensure hoisting straps clear firewall flange.

2 Attach a hoisting strap around upper LH engine mount where weldment attaches to firewall. Adjust strap so when weighted, strap just clears firewall flange, and there is no contact between strap and firewall components.

3 Attach a second hoisting strap around upper RH engine mount where weldment attaches to firewall. Adjust strap so when weighted, strap just clears firewall flange, and there is no contact between strap and firewall components.

CAUTION: Use a protective barrier between fuselage and straps during hoisting procedure.

4 Attach a third hoisting strap around fuselage at FS 289.

5 To assure stability and safety during hoisting operations, raise airplane slowly.

6 Raise airplane enough to place jacks under wings and tailstand under empennage. (Refer to 07-10)

7 Remove hoisting straps.

(c) For hoisting method #2:

1 Remove upper engine cowl. (Refer to 71-10)

2 Position mobile gantries equipped with hoist chains approximately at forward and aft fuselage locations.

3 Attach spreader bar to forward gantry chain. Raise with chain as required to provide engine clearance.

CAUTION: Hoisting straps must not contact firewall flange or installed components during hoisting as damage to aircraft may result.

CAUTION: Wooden blocks may be placed against firewall as spacers to ensure hoisting straps clear firewall flange.

4 Route spreader bar hoisting strap around upper LH engine mount where weldment attaches to firewall and secure strap end to spreader bar attach point. Adjust strap so when weighted, strap just clears firewall flange, and there is no contact between strap and firewall components.

5 Route opposing spreader bar hoisting strap around upper RH engine mount where weldment attaches to firewall and secure strap end to spreader bar attach point. Adjust strap so when weighted, strap just clears firewall flange, and there is no contact between strap and firewall components.

CAUTION: Use a protective barrier between fuselage and straps during hoisting procedure.

6 Attach a third hoisting strap around fuselage at FS 289 and secure to hoist chain at aft gantry.

7 Position mobile gantries as necessary directly over hoist attach points.

8 To assure stability and safety during hoisting operations, raise airplane slowly.

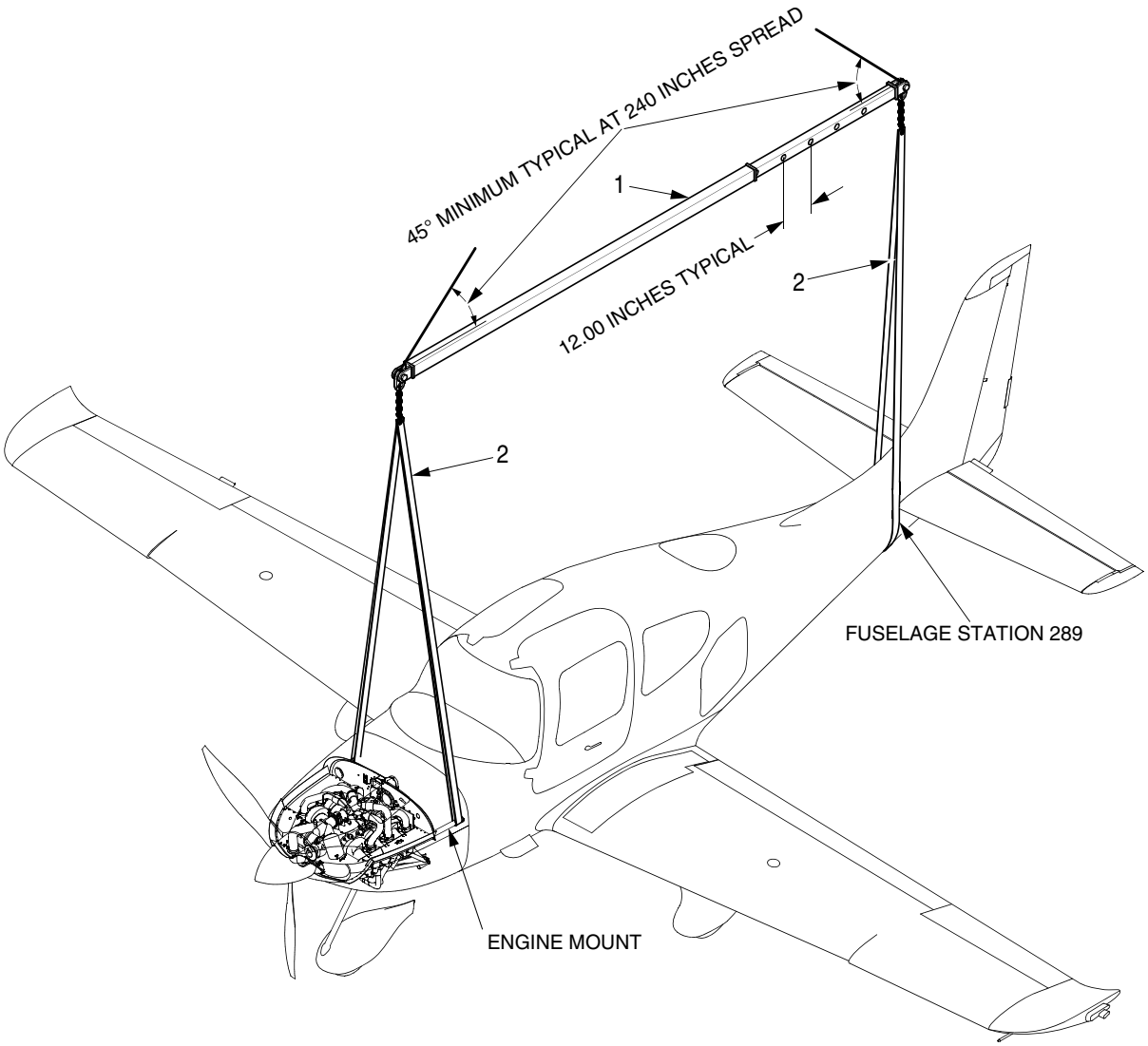
9 Raise airplane enough to place jacks under wings and tailstand under empennage. (Refer to 07-10)

10 Remove hoisting straps.

(2) Lower Airplane

(a) Release pressure on all jacks simultaneously to keep airplane as level as possible.

(b) Remove jacks, jack points, and tailstand. Stow points in baggage compartment.
(c) Install tiedown rings.
(d) Install upper engine cowl. (Refer to 71-10)



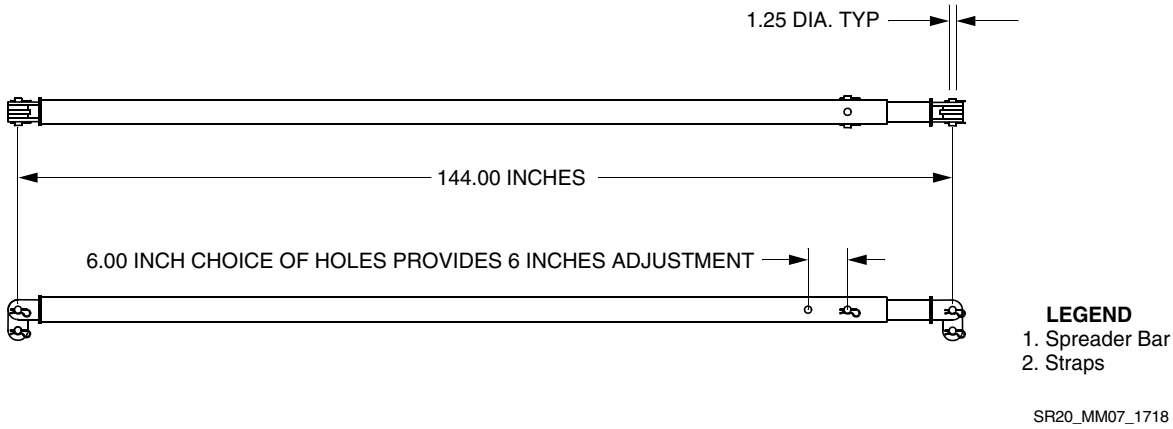


Figure 07-201
Hoisting Method #1: Hoisting with Overhead Crane

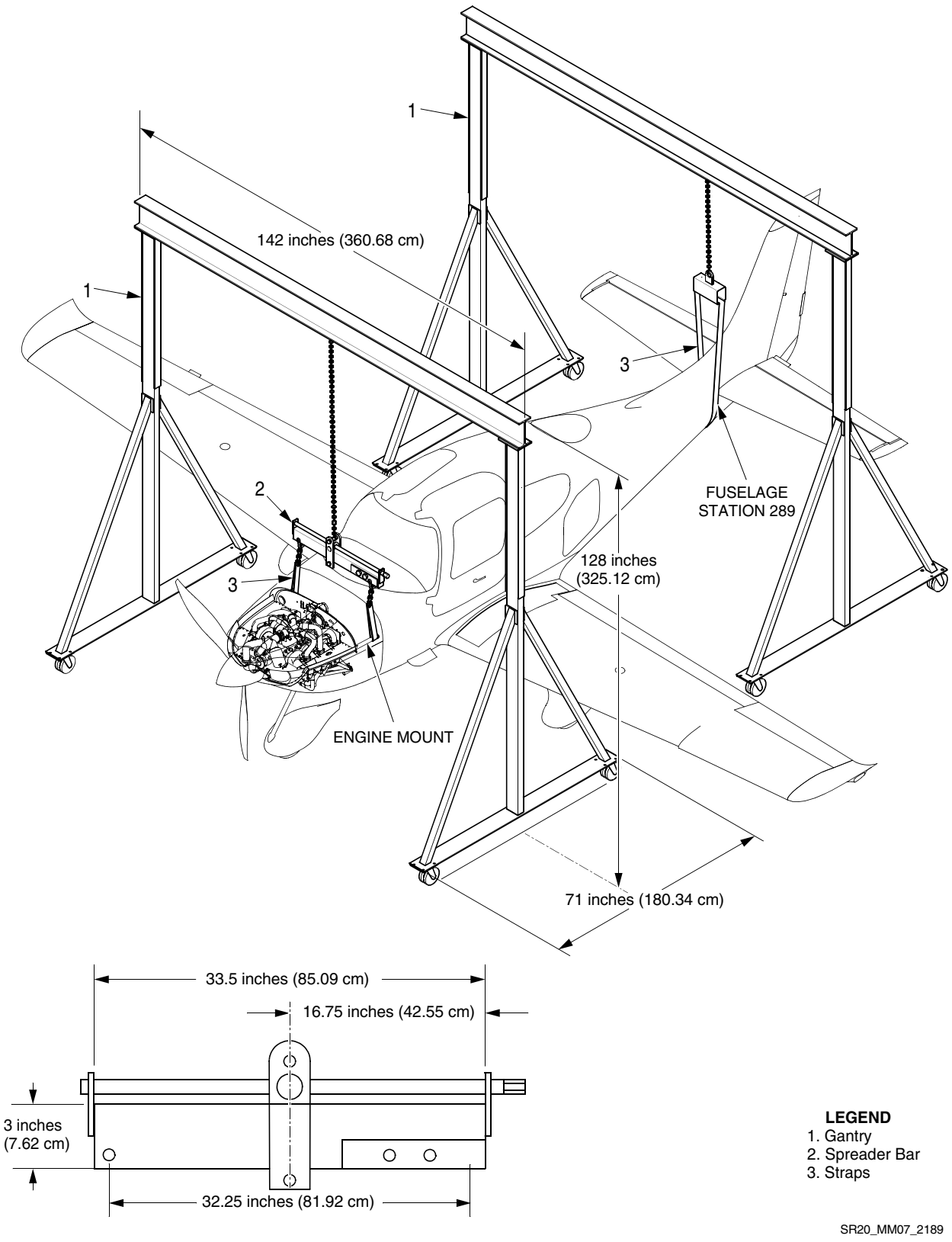


Figure 07-202
Hoisting Method #2: Hoisting with Mobile Gantries

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CHAPTER 08

LEVELING AND WEIGHING

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CHAPTER 08 - LEVELING AND WEIGHING

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LEVELING AND WEIGHING

1. GENERAL

This chapter provides information necessary to properly level and weigh the airplane for any of the various maintenance, overhaul, or major repairs which might become necessary. To obtain the expected flight performance, flight characteristics, and flight safety, the airplane must be operated within the permissible load and center of gravity envelope. If the airplane or its equipment is modified in a way that might influence its weight or center of gravity, the empty weight and corresponding center of gravity must be re-measured.

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LEVELING

1. DESCRIPTION

This chapter provides information necessary to properly level the airplane for any of the various maintenance, overhaul, or major repairs which might become necessary.

For general longitudinal leveling, the cabin door sill edge is parallel within 0.10° relative waterline 100. The door sill is used in conjunction with a spirit level to determine airplane ground attitude.

Serials 1005 thru 1422: For specific longitudinal leveling, two forward leveling points are located on either side of the cowl at fuselage station 99.00. One aft point is located on the tailcone access flange under the horizontal stabilizer on the right side, at fuselage station 299.00. The leveling points are used in conjunction with a transit to determine ground attitude.

Serials 1423 & subs: For specific longitudinal leveling, two forward leveling points are located on either side of the cowl at fuselage station 98.4. One aft point is located below the RE1 empennage access panel aft of the horizontal stabilizer, at fuselage station 316.8. Pegged ruler gauges suspended from the leveling points are used in conjunction with a transit to determine ground attitude.

For general lateral leveling, a straight edge may be placed across both cabin door sills. The door sill is used in conjunction with a spirit level to determine airplane ground pitch.

For specific lateral leveling, an alignment brace bar may be placed across the upper engine mount weldment attach points. The attach points are used in conjunction with a digital level to determine airplane ground pitch.

2. MAINTENANCE PRACTICES

A. Longitudinal Leveling

(1) Spirit Level Using Door Sill (See Figure 08-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spirit Level	-	Any Source	Level the airplane.

(b) Open LH or RH cabin door.

(c) Position and hold spirit level to composite ledge below door sill.

(d) To level airplane longitudinally, deflate nose gear tire to center bubble in level.

(2) Transit Level Using Fuselage Leveling Points (See Figure 08-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Transit Level	-	Any Source	Leveling
Ruler Gauge (Pegged), Forward and Aft	T6320	Cirrus Design Duluth, MN 55811 218-727-2737	Leveling
Aircraft Hydraulic Jack	-	Any Source	Leveling

(b) *Serials 1005 thru 1422:* At WL 95.9 on side of fuselage, remove screws at forward longitudinal leveling point located at FS 99.0, and aft longitudinal leveling point located at FS 299.0.

(c) *Serials 1423 & subs:* At WL 103.5 on side of fuselage, remove screws at forward longitudinal leveling point located at FS 98.4, and aft longitudinal leveling point located at FS 316.8.

(d) Position pegged ruler gauges at forward and aft longitudinal leveling points.

(e) Position aircraft jack at aft tail tie-down.

(f) Position and sight transit level on ruler gauges and observe transit level crosshair locations on rulers.

(g) To level airplane longitudinally, raise or lower jack as required until transit level is aligned with the same measurement on both ruler gauges. (Refer to 07-10)

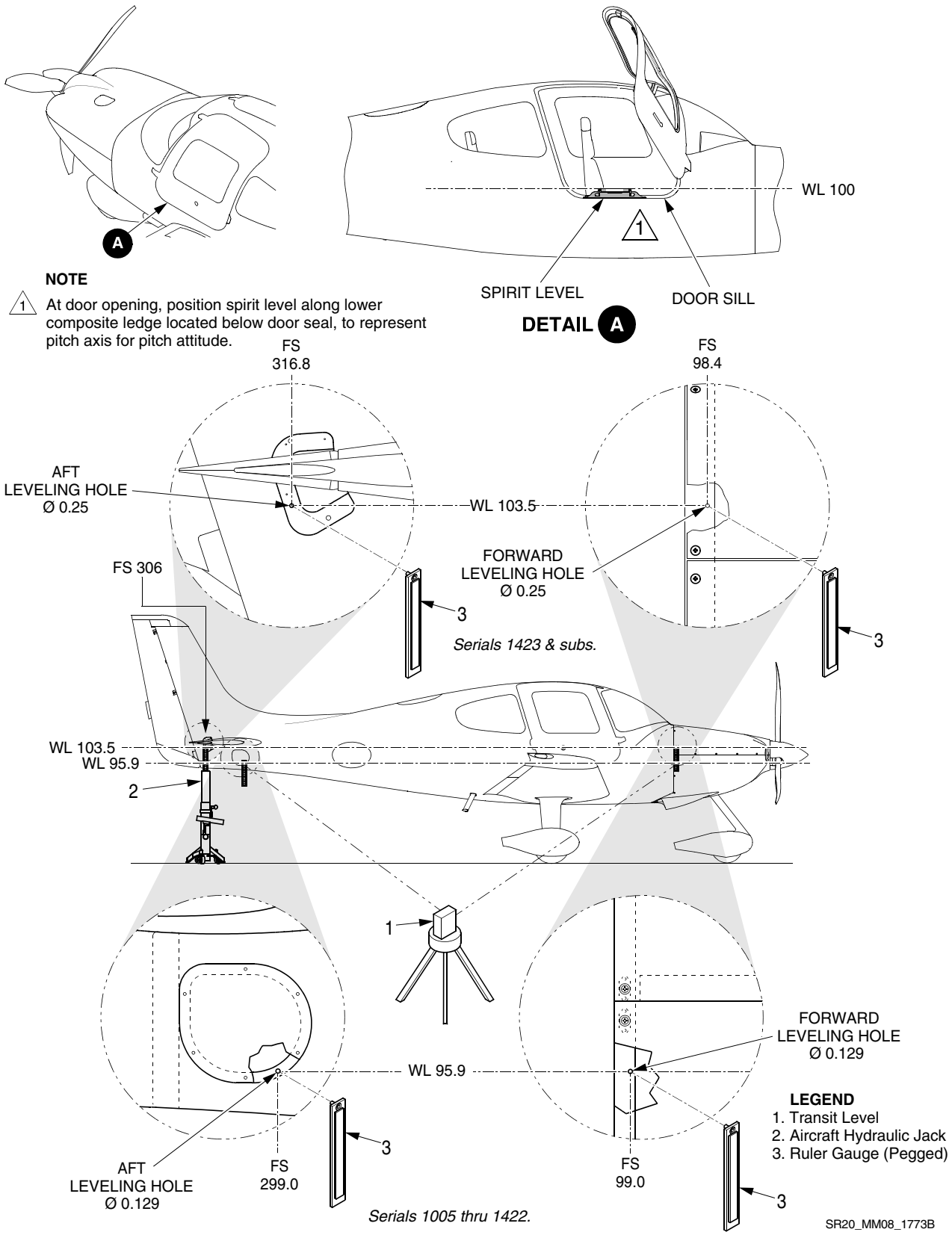


Figure 08-101
Airplane Leveling - Longitudinal

B. Lateral Leveling

(1) Spirit Level Using Door Sills (See Figure 08-102)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spirit Level	-	Any Source	Level the airplane.
Straight Edge minimum 5.0 ft (1.5 m)	-	Any Source	Level platform.
Spacer Blocks 1.0 × 2.0 inches (2.54 × 5.08 cm)	-	Any Source	Level platform.

(b) Remove main landing gear fairings. (Refer to 32-10)

(c) Open both doors on airplane.

(d) Place spacer blocks on LH and RH door sills so that height of blocks is higher than door seals.

(e) Place a straight edge on top and perpendicular to spacer blocks positioned on door sills, centered.

(f) Place spirit level on top and parallel to straight edge, centered.

(g) To level airplane laterally, deflate main gear tire to center bubble in level.

(h) Install main landing gear fairings. (Refer to 32-10)

(2) Digital Level Using Engine Mount Weldment (See Figure 08-102)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Engine Mount Leveling Bar	T2474	Cirrus Design Duluth, MN 55811 218-727-2737	Leveling
Digital Level	-	Any Source	Leveling

(b) Remove main landing gear fairings. (Refer to 32-10)

(c) Remove upper engine cowling. (Refer to 71-10)

(d) Position leveling bar on upper engine mount weldment. At flat, upper surface of leveling bar, position digital level lengthwise.

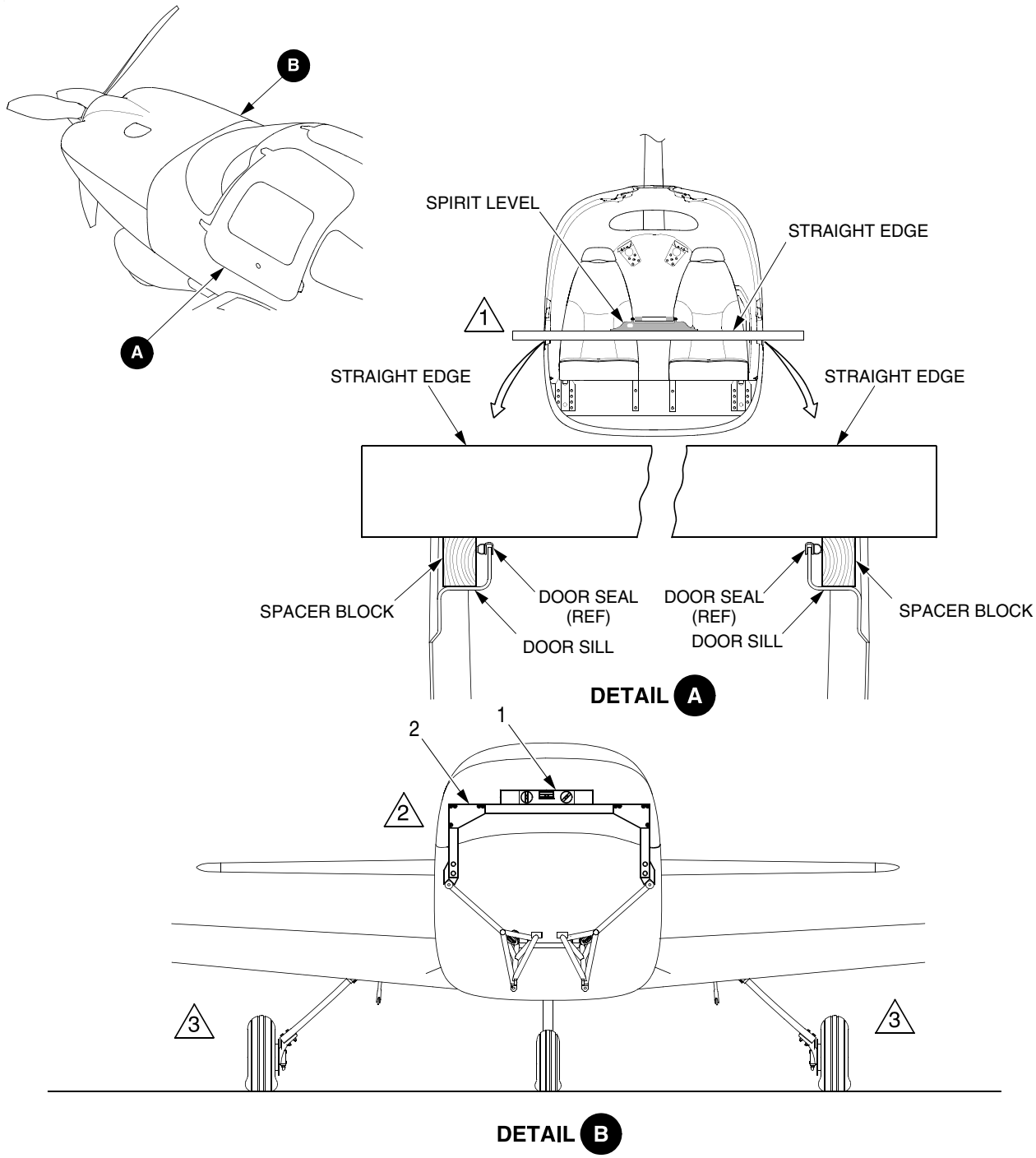
(e) To level airplane laterally, deflate LH or RH main landing gear tire as required until digital level reads 0°.

Note: Perform tasks that required leveling prior to leveling equipment removal and cowl reinstallation.

(f) Remove digital level and engine mount leveling bar from airplane.

(g) Install upper engine cowling. (Refer to 71-10)

(h) Install main landing gear fairings. (Refer to 32-10)



NOTE

1. Position spirit level on straight edge so it points outboard, to represent roll axis for roll attitude.
2. Position alignment brace bar at upper engine mount weldment attach points.
3. To level airplane laterally, deflate LH or RH main landing gear tire as required until digital level reads 0°.

LEGEND

1. Digital Level
2. Engine Mount Leveling Bar

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Figure 08-102
Airplane Leveling - Lateral

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WEIGHING

1. DESCRIPTION

This chapter provides information necessary to properly weigh the airplane for any of the various maintenance, overhaul, or major repairs which might become necessary. To obtain the expected flight performance, flight characteristics, and flight safety, the airplane must be operated within the permissible load and center of gravity envelope. If the airplane or its equipment is modified in a way that might influence its weight or center of gravity, the empty weight and corresponding center of gravity must be re-measured

2. MAINTENANCE PRACTICES

A. Weighing the Airplane

(1) Preparation

(a) Perform the following prior to weighing the airplane:

1 Inflate tires to recommended operating pressures. (Refer to 12-10)

2 Service brake reservoir. (Refer to 12-10)

3 Drain fuel system. (Refer to 12-10)

4 Service engine oil. (Refer to 12-10)

5 Move crew seats to the most forward position.

6 Raise flaps to the fully retracted position.

7 Place all control surfaces in neutral position.

8 Verify equipment installation and location by comparison to equipment list.

9 Level airplane. (Refer to 08-10)

(2) Weighing (See Figure 08-201)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scales	-	Any Source	Weigh the airplane.
Tape Measure	-	Any Source	Provide measurement for arm calculation.
Plumb Bob	-	Any Source	Aid in airplane measurement.

Note: Two scales of equal height must be used for the main gear wheels.

(b) Place scale under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).

(c) Deflate nose tire and/or shim underneath scales as required to level airplane.

(d) With the airplane level, doors closed, and brakes released, record the weight on each scale. Deduct the tare, if any, from each reading.

(3) Measuring (See Figure 08-201)

(a) Obtain measurement ‘x’ by measuring horizontally along the airplane center line (BL 0) from a line stretched between the main wheel centers to a plumb bob dropped from the forward side of the firewall (FS 100). Add 100 to this measurement to obtain left and right weighing point arm (dimension ‘A’).

(b) Obtain measurement ‘y’ by measuring horizontally and parallel to the airplane centerline (BL 0), from center of nose wheel axle, left side, to a plumb bob dropped from the line stretched between the main wheel centers. Repeat on right side and average the measurements. Subtract this measurement from dimension ‘A’ to obtain the nose wheel weighting point arm (dimension ‘B’).

(c) Determine and record the moment for each of the main and nose gear weighing points using the following formula:

Moment = Net Weight × Arm

(d) Calculate and record the as-weighed weight and moment by totaling the appropriate columns.

(e) Determine and record the as-weighed C.G. in inches aft of datum using the following formula:

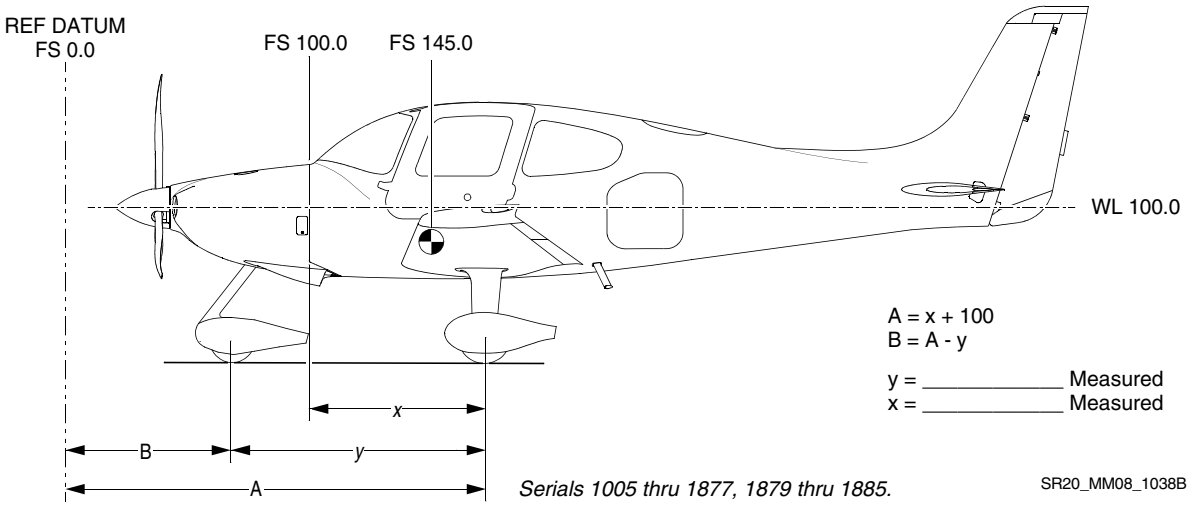
C.G. = Total Moment ÷ Total Weight

(f) Add or subtract any items not included in the as-weighted condition to determine the empty condition. Application of the above C.G. formula will determine the C.G. for this condition.

(g) *Serials 1005 thru 1885:* Add the correction for engine oil (15.0 lb at FS 78.4) if the airplane was weighed with oil drained. Add the correction for unusable fuel (26.4 lb at FS 153.95) to determine the Basic Empty Weight and Moment. Calculate and record the Basic Empty Weight C.G. by applying the above C.G. formula.

(h) *Serials 1886 & subs:* Add the correction for engine oil (15.0 lb at FS 78.4) if the airplane was weighed with oil drained. Add the correction for unusable fuel (15.0 lb at FS 154.9) to determine the Basic Empty Weight and Moment. Calculate and record the Basic Empty Weight C.G. by applying the above C.G. formula.

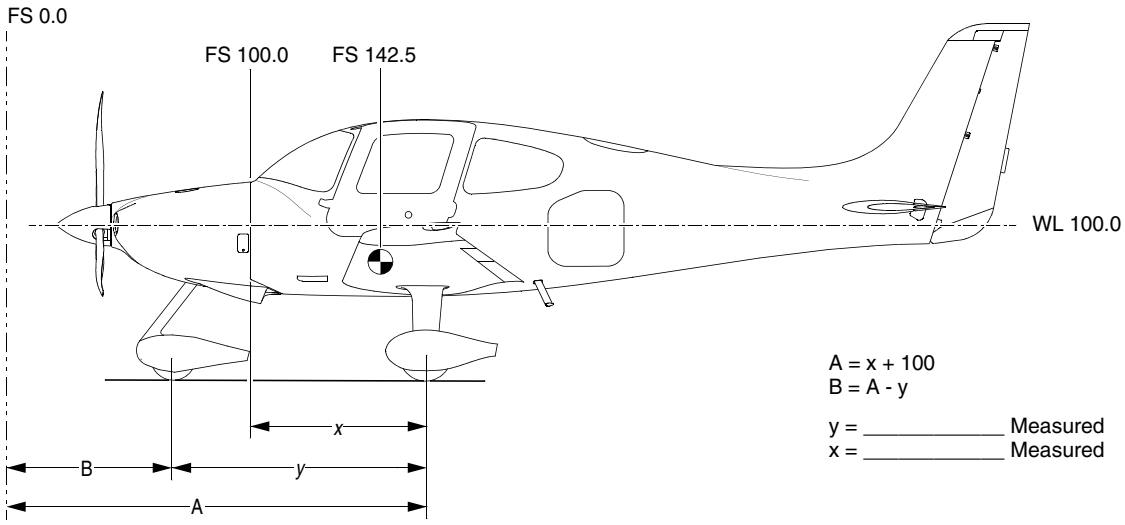
(i) Record the new weight and C.G. values on the Weight and Balance Record located in the airplane's Pilot's Operating Handbook.



Date: _____Registration No.: _____
Airplane Serial No.: _____

Figure 08-201
Airplane Weighing - Serials 1005 thru 1885 (Sheet 1 of 2)

Weighing Point	Scale Reading	- Tare	= Net Weight	X Arm	= Moment
Left Main				A =	
Right Main				A =	
Nose Gear				B =	
Total As Weighed				CG =	
CG = Total Moment + Total Weight Space below provided for additions or subtractions to as weighed condition.					
Empty Weight				CG =	
Engine Oil (if oil drained) 15 lb at FS 78.4, Moment = 1176					
Unusable Fuel			26.4	153.95	4064
Basic Empty Weight				CG =	
C.G. % MAC = 100 × (C.G. Inches - LEMAC) ÷ MAC = 100 × (C.G. Inches - 132.9) ÷ 48.4					



Date: _____Registration No.: _____
Airplane Serial No.: _____

Figure 08-201
Airplane Weighing - *Serials 1886 & subs* (Sheet 2 of 2)

Weighing Point	Scale Reading	- Tare	= Net Weight	X Arm	= Moment
Left Main				A =	
Right Main				A =	
Nose Gear				B =	
Total As Weighed				CG =	
CG = Total Moment + Total Weight Space below provided for additions or subtractions to as weighed condition.					
Empty Weight				CG =	
Engine Oil (if oil drained) 15 lb at FS 78.4, Moment = 1176					
Unusable Fuel			15.0	154.9	2324
Basic Empty Weight				CG =	
C.G. % MAC = 100 × (C.G. Inches - LEMAC) ÷ MAC = 100 × (C.G. Inches - 133.1) ÷ 47.7					

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CHAPTER

09

TOWING AND TAXIING

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CHAPTER 09 - TOWING AND TAXIING

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TOWING AND TAXIING

1. GENERAL

This chapter provides instructions necessary to tow and taxi the airplane. Movement of the airplane on the ground is accomplished using the manufacturer supplied, yoke-type tow bar, power equipment that will not damage or excessively strain the nose gear steering assembly, or by taxiing. One person is capable of moving the airplane on a smooth, level surface using the tow bar.

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TOWING

1. DESCRIPTION

This chapter provides instructions necessary to tow the airplane by hand or with tow vehicle.

2. MAINTENANCE PRACTICES

A. Airplane Towing

(1) Towing Manually

CAUTION: During the towing operation, do not turn the nose gear beyond its steering radius on either side of center. Exceeding the steering radius will result in damage to the nose gear and steering mechanism. (See Figure 09-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tow Bar	-	Any Source	Tow the airplane.
Wheel Chocks	-	Any Source	Block wheels.

(b) Insert tow bar into nose wheel towing lug.
(c) Release parking brake.
(d) Remove chocks.

Note: Do not push or pull on control surfaces or propeller when maneuvering the airplane.

(e) Move airplane to desired location.
(f) Position chocks in front of tires.
(g) Remove tow bar.
(h) Set parking brake.

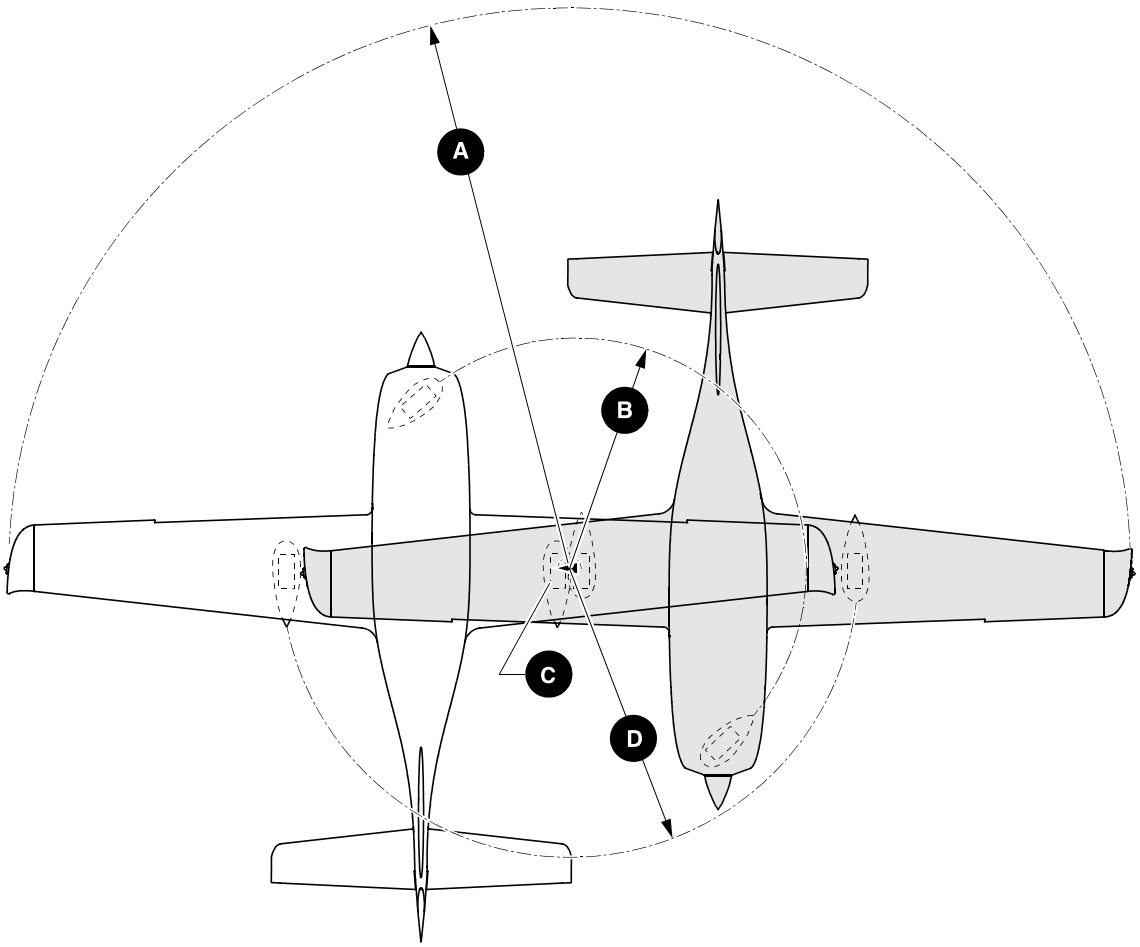
(2) Towing With Tow Vehicle

CAUTION: During the towing operation, do not turn the nose gear beyond its steering radius on either side of center. Exceeding the steering radius will result in damage to the nose gear and steering mechanism. (See Figure 09-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wheel Chocks	-	Any Source	Block wheels.

(b) Insert tow bar into nose wheel towing lug.
(c) Attach tow bar to tow vehicle.
(d) Release parking brake.
(e) Remove chocks.
(f) Move airplane to desired location.
(g) Position chocks in front of tires.
(h) Remove tow bar from tow vehicle and airplane.
(i) Set parking brake.



GROUND TURNING CLEARANCE

A	-RADIUS FOR WING TIP	23.9 ft.	(7.28 m)
B	-RADIUS FOR NOSE GEAR	7.0 ft.	(2.16 m)
C	-RADIUS FOR INSIDE GEAR	0.5 ft.	(0.15 m)
D	-RADIUS FOR OUTSIDE GEAR	12.2 ft.	(3.72 m)

Serials 1005 thru 1877, 1879 thru 1885.

A	-RADIUS FOR WING TIP	24.3 ft.	(7.41 m)
B	-RADIUS FOR NOSE GEAR	7.0 ft.	(2.16 m)
C	-RADIUS FOR INSIDE GEAR	0.5 ft.	(0.15 m)
D	-RADIUS FOR OUTSIDE GEAR	9.1 ft.	(2.77 m)

Serials 1878, 1886 & subs.

TURNING RADII ARE CALCULATED USING ONE BRAKE AND PARTIAL POWER.
ACTUAL TURNING RADIUS MAY VARY AS MUCH AS THREE FEET.

SR20_MM09_1002A

Figure 09-101
Minimum Turning Radius

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TAXIING

1. DESCRIPTION

This chapter provides instructions necessary to taxi the aircraft. The airplane is controlled with toe operated brakes during taxiing.

2. MAINTENANCE PRACTICES

A. Taxiing

CAUTION: During taxiing, do not turn the nose gear beyond its steering radius on either side of center. Exceeding the steering radius will result in damage to the nose gear and steering mechanism. (See Figure 09-101)

Note: Engine starting, taxiing, and shutdown may only be performed by authorized personnel.

(1) Airplane Taxiing

(a) Start engine. (Refer to Pilot's Operating Handbook Section 4)

(b) Advance throttle.

(c) Release parking brake.

(d) Taxi a few feet forward and apply brakes to determine brake effectiveness.

CAUTION: Observe wing clearance when taxiing near buildings or other stationary objects.

On uneven ground, taxi operations must be performed especially carefully to avoid propeller ground strike.

Do not operate engine at high RPM when taxing over ground containing loose stones, gravel, or any material that may cause damage to propeller blades.

(e) Taxi airplane to desired location.

(f) Shutdown engine.

(g) Park, chock, and moor airplane as required.

CHAPTER 10

PARKING AND MOORING

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CHAPTER 10 - PARKING, MOORING, STORAGE, AND RETURN TO SERVICE

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PARKING, MOORING, STORAGE, AND RETURN TO SERVICE

1. GENERAL

This chapter provides instructions necessary to park, moor, and store the aircraft in any of the probable conditions to which it may be subjected. Mooring procedures should be followed if anticipating high winds, or when the airplane is to remain outside for extended periods of time. Short-term storage, long-term storage, and instructions for container shipping are also included.

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PARKING AND MOORING

1. DESCRIPTION

This chapter provides instructions necessary to park or moor the airplane in any of the probable conditions to which it may be subjected. Maintenance practices necessary to prepare the aircraft for parking and mooring are included. Three fixed mooring points are provided on the airplane. Two are located on the underside of the wings and a third is located on the underside of the empennage directly below the horizontal stabilizer.

2. MAINTENANCE PRACTICES

A. Parking

(1) Temporary (See Figure 10-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tow Bar	50455-001	Cirrus Design	Tow the airplane.
Wheel Chocks	-	Any Source	Prevent airplane movement.

(b) Position airplane on level surface headed into wind.

(c) Do not set parking brake during cold weather, when accumulated moisture may freeze brakes, or when brakes are overheated.

(d) Set parking brake.

(e) Chock main gear wheels.

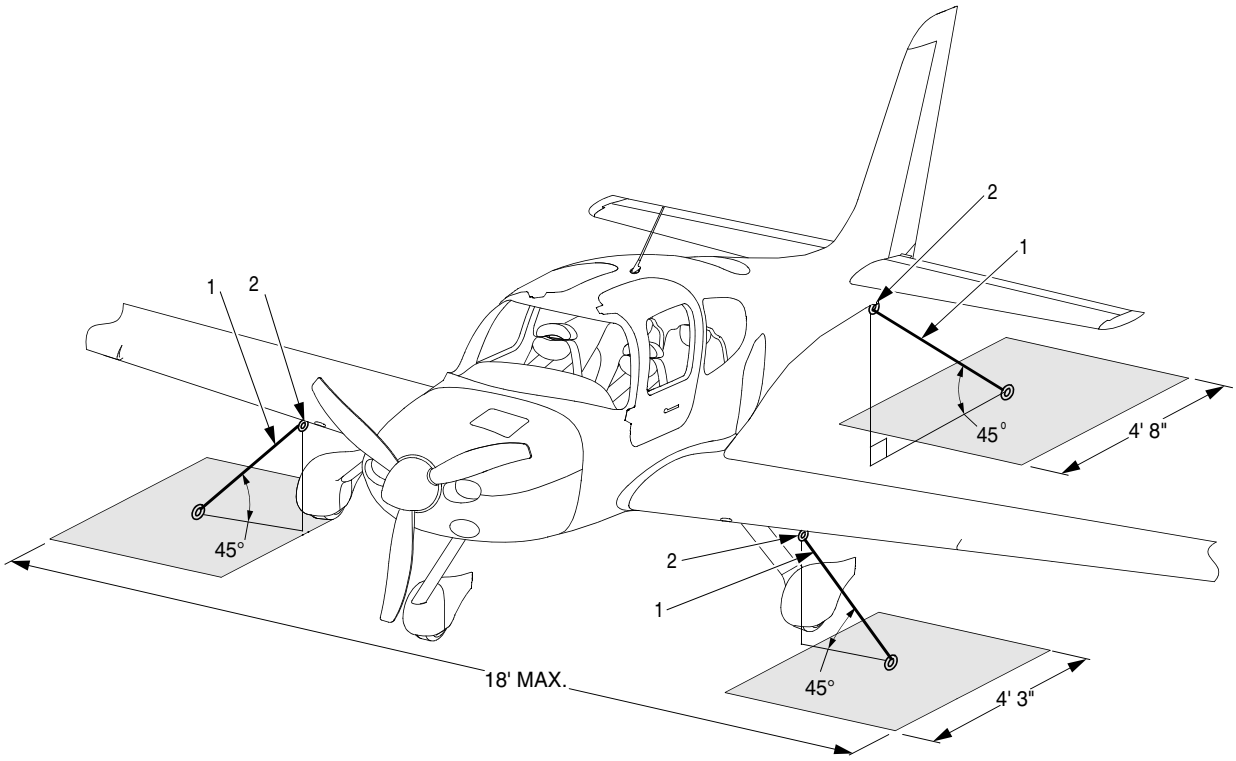
(f) In gusty or stormy weather, moor the airplane. (Refer to 10-10)

(2) Long Term (See Figure 10-102)

If the airplane is parked for long periods of time, danger of wheel bearing corrosion exists. To prevent this, the airplane should be moved by pushing or towing. To prevent flat spots and other deformations to tires, the wheels should be periodically re-positioned as described above. The frequency of the movement depends on the weather conditions. Movement should be performed daily in cold weather and weekly in warm weather.

(a) For long term and severe weather parking, follow instructions as outlined above, except use multiple tie-down lines. (Refer to 10-10)

Note: Refer to 10-30 for procedures required for longer parking durations.



LEGEND
1. Mooring Line
2. Mooring Ring

SR20_MM10_1003

Figure 10-101
Parking and Mooring - Fair Weather

B. Mooring

(1) Temporary and Mild Weather Conditions (See Figure 10-101)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wheel Chocks	-	Any Source	Prevent airplane movement.
Inlet Cover	-	Any Source	Prevent entry of moisture and/or foreign particles.
Pitot Tube Cover	-	Any Source	Prevent entry of moisture and/or foreign particles.
Static Ground Cable	-	Any Source	Ground airplane.
Rope	-	Any Source	Tie down wing and tail.

(b) Position airplane on level surface and headed into the wind.

CAUTION: Do not set parking brake during cold weather, when accumulated moisture may freeze brakes, or when brakes are overheated.

(c) Set parking brake.

(d) Chock main gear wheels.

(e) Connect mooring lines to mooring wings.

Note: During gusty or high wind conditions, mooring lines may require periodic tightening to prevent excessive movement of airplane. Use a secure anti-slip knot such as bowline to ensure security.

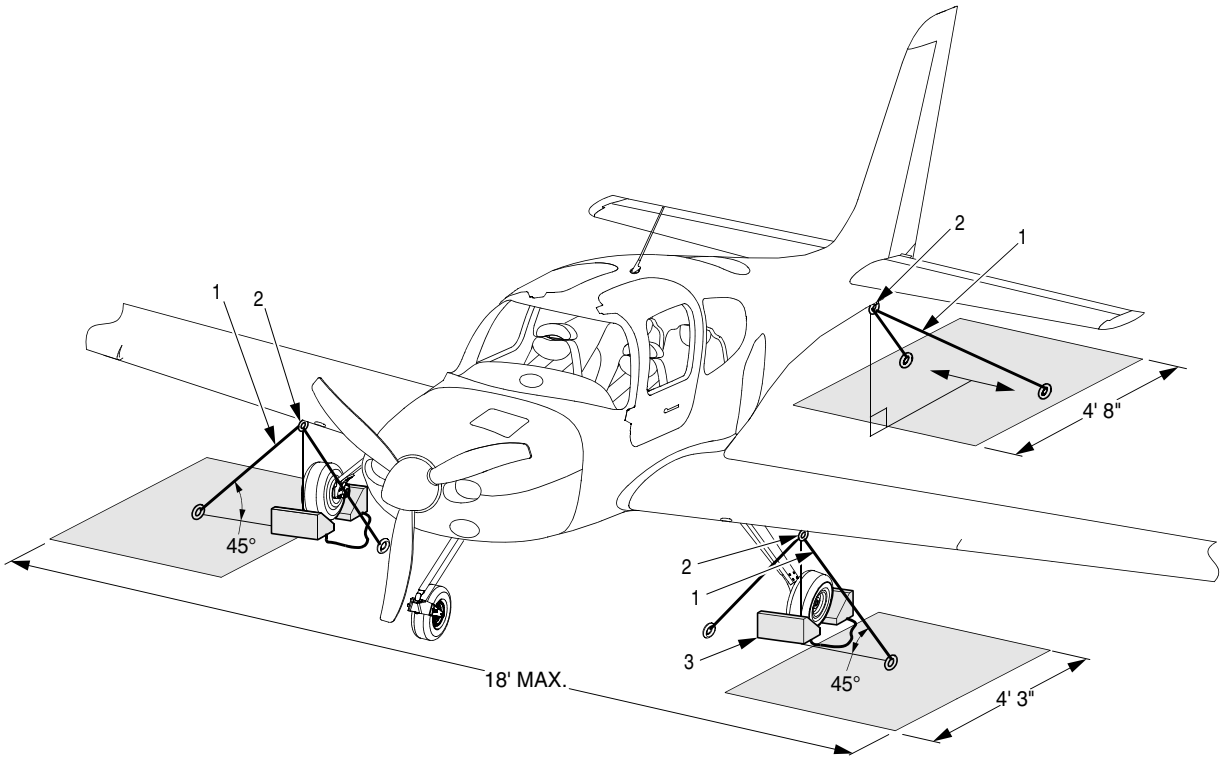
(f) Install pitot tube cover and induction air inlet cover to prevent entry of foreign materials.

(g) Attach static ground cable to tie-down ring on the wing and the ground anchor.

(2) Long Term and Severe Weather Conditions (See Figure 10-102)

CAUTION: For aircraft operated in Russia or Commonwealth of Independent States (CIS) Countries: The aircraft must be brought into a hanger if wind speed exceeds 65 knots.

(a) Follow instructions as outlined in Chapter 10-20 except use multiple tie-down lines.



LEGEND
1. Mooring Line
2. Mooring Ring
3. Wheel Chock

SR20_MM10_1030

Figure 10-102
Parking and Mooring - Long Term

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STORAGE

1. GENERAL

This chapter provided instruction necessary to store the airplane for temporary or long-term storage.

2. MAINTENANCE PRACTICES

A. Temporary Storage, 30 to 90 Days

(1) Parking and Mooring
  (a) Park and moor airplane. (Refer to 10-10)

(2) Engine Preservation
  (a) Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(3) Fuel Supply
  (a) The fuel tank must be completely filled. Check for water in tank each week. (Refer to 12-10)

(4) Landing Gear
  (a) No special procedures are required for the main and nose landing gear.

(5) Wheels
  (a) The wheels should be turned three to four revolutions per 30 days to prevent corrosion.

(6) Tires
  (a) Wipe tires with dry cloth, and treat with tire protector spray.
  (b) Turn wheels. Mark tire position and date with chalk.
  (c) Air pressure: daily visual inspection, check air pressure weekly. (Refer to 12-10)

(7) Electrical System (Refer to 24-30)
  (a) Remove battery and ELT battery and store in accordance with standard practices.
  (b) Clean battery box and battery cable terminals to neutralize any battery acid that may be present.

(8) Lubrication
  (a) Lubricate according to lubrication schedule. (Refer to 12-20)

(9) Propeller
  (a) Clean propeller to remove dirt, oil, and bug accumulation. (Refer to 12-20)

(10) Instruments
  (a) Clean and cover instruments and panel. Take any additional precautions according to the manufacture.

(11) Seats
  (a) Clean and install protective covers. (Refer to 12-20)

(12) Loose Equipment
  (a) Remove all loose equipment and store.

(13) Windshield and Windows
  (a) Clean and install covers over windshield and windows. (Refer to 12-20)

B. Long-Term Storage

(1) Parking and Mooring

CAUTION: Do not set parking brake as brake seizing can result.

(a) Park and moor airplane. (Refer to 10-10)

(2) Engine Preservation

(a) Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(3) Fuel Supply

(a) Drain fuel tanks. (Refer to 12-10)

(4) Landing Gear

(a) Clean brake assemblies.

(5) Wheels

(a) The wheels should be turned three to four revolutions per 30 days to prevent corrosion.

(b) Touch up all spots where paint has been chipped from the wheels.

(c) Turn wheels. Mark tire position and date with chalk.

(6) Tires

(a) Wipe tires with dry cloth, and treat with tire protector spray.

(b) Check air pressure periodically and inflate tires as necessary. (Refer to 12-10)

Note: It is advisable that unserviceable tires be used for prolonged storage.

(7) Electrical System (Refer to 24-30) (Refer to 05-10) (Refer to 95-00)

(a) Remove battery, ELT battery, and CAPS battery (*Serials 1005 thru 1267 after SB2X-95-20*) and store in accordance with standard practices.

(b) Clean battery box and battery cable terminals to neutralize any battery acid that may be present.

(8) Lubrication

(a) Lubricate according to lubrication schedule. (Refer to 12-20)

(9) Propeller

(a) Clean propeller to remove dirt, oil, and bug accumulation. (Refer to 12-20)

(b) Coat blades with preservative oil and wrap with moisture proof material.

(10) Instruments

(a) Clean and cover instruments and panel. Take any additional precautions according to the manufacturer.

(11) Seats

(a) Clean and install protective covers. (Refer to 12-20)

(12) Loose Equipment

(a) Remove all loose equipment and store.

(13) Windshield and Windows

(a) Clean and install covers over windshield and windows. (Refer to 12-20)

(14) Airframe

(a) Cover static port and all ventilation openings.

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CONTAINER SHIPPING

1. GENERAL

This section provides methods and procedures for the disassembly, crating, reassembly, and return to service of the aircraft for overseas container shipping. Also detailed in this section are specific personnel, facilities, quality assurance, manpower, and material requirements for this process.

The steps below allow for the aircraft to stored in a shipping container for up to 90 days. If the aircraft is to stored for more the 90 days, additional preservation is required. Call Cirrus Design to notify.

WARNING: This procedure requires a maintenance check flight performed by a Cirrus Design authorized test pilot. Contact Cirrus Design prior to performing maintenance to schedule test flight.

2. MAINTENANCE PRACTICES

Serial Number:	Registration Number
Work Order No:	Date:
Operating Time:	Hobbs Time:

	Time	Initls

A. Preparation for Shipment

(1) Document Preparation

(a) Collect Airworthiness Certificate, Registration Certificate, Radio Station License, Operating Instructions (POH), Weight and Balance Data, and Instructions for Continued Airworthiness (AMM). Insert documents in envelope and wrap in barrier material conspicuously marked to identify papers. Place envelope in aircraft cabin.

(b) Prepare shipping documents:

1 Commercial Invoice
2 Packing List
3 Original title
4 Special Instructions
5 Shipper's detail information including full name, address, telephone number, fax number, social security number / passport number or TAX ID number.
6 Consignee's detail information including, full name, address, telephone number, fax number, social security number / passport number or TAX ID number.

B. Disassembly and Preservation

WARNING: Only use non-static plastic protective wrap for packaging components.

CAUTION: The airplane must be grounded to earth prior to performing any maintenance.

Note: Unless otherwise noted, coat bolts, washers, etc., with a light film of corrosion inhibitor and reinstall as removed from component.

Unless otherwise noted, the instruction “pack and store” describes preparing the component for shipment. Perform the following:

- Coat exposed metal with light film of corrosion inhibitor.
- Bag each exposed electrical leads, connectors, and circuit boards.
- Identify each disassembled component by marking or tagging the part number (if necessary) and wrap component in barrier film and tape. Adequately cushion with polypropylene packaging material. Pack components in suitable shipping container and store in staging area.

	Time	Initls

(1) General

Note: Preserve engine in accordance with CMI/TCM documents IO-550 Maintenance and Overhaul Manual M-16, and Standard Practice Maintenance Manual M-0.

(a) If engine has not been started within 24 hours, start engine and operate until oil and cylinders reach normal operating temperatures.

(b) *Serials w/o Perspective Avionics:* Verify TAWS card has geographical data appropriate for aircraft destination. (Refer to 34-40)

(c) *Serials w/o Perspective Avionics:* Download international conversion data into MFD. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(d) For metric country destination, change PFD Baro Units to "hPa" for hectopascals or "Mb" for millibars. (Refer to 31-60)

(e) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(f) Ensure parking brake is in off position and wheels are blocked.

(g) Pull all circuit breakers.

(h) If airplane hasn't been de-fueled, defuel airplane. (Refer to 12-10)

(i) *Serials at Service Center:* Inspect airplane for corrosion and perform appropriate corrosion control procedures.

(j) Remove crew seats. Components will be reinstalled before shipping. Temporarily store in clean, dry area. (Refer to 25-10)

(k) Remove passenger seats. Components will be reinstalled before shipping. Temporarily store in clean, dry area. (Refer to 25-10)

(l) *Serials 1005 thru 1885:* Remove kick plates. Pack and store. (Refer to 25-10)

(m) Remove side duct cover trim. Component will be reinstalled before shipping. Temporarily store in clean, dry area. (Refer to 25-10)

(n) Remove floor covering. Pack and store. (Refer to 25-10)

(o) Remove floor access panels. Pack and store. (Refer to 06-00)

(p) Remove engine cowling. Component will be reinstalled before shipping. Temporarily store in clean, dry area. (Refer to 71-10)

(q) Remove nose gear fairing. Pack and store. (Refer to 32-20)

(r) Check nose landing gear tire pressure. (Refer to 12-10)

(s) Remove main gear fairings. Pack and store. (Refer to 32-10)

(t) Check main landing gear tire pressure. (Refer to 12-10)

(u) Remove wing tips. Pack and store. (Refer to 57-20)

(v) *Serials 1005 thru 1885:* Remove OAT sensor from RH NACA vent panel. Secure to inner wing. (Refer to 34-20)

(w) Using paint mixing sticks and tape, secure and wrap ailerons.

(x) Remove flaps. Pack and store. (Refer to 57-50)

	Time	Initls

Note: Record orientation of any shims at elevator bellcrank for re-installation.

(y) Remove elevator. Pack and store. (Refer to 55-20)

(2) Preserve Batteries

(a) Disconnect battery 1. (Refer to 24-30)

(b) *Serials 1268 & subs:* Disconnect battery 2. (Refer to 24-30)

(c) *Serials at Service Center:* Thoroughly clean each battery and its battery shelf, connectors, vent hoses, and cables with water and nonmetallic bristle brush. Rinse with clean water and allow to dry.

(d) Using barrier material and tape, wrap and secure battery connectors to airframe.

(3) *Serials 1005 thru 1267 after SB2X-95-20:* Remove and preserve CAPS battery.

(a) Remove CAPS battery. (Refer to 95-00)

(b) Package and ship as Class 9, UN3090 hazardous materials according to federal and international regulations.

(4) Remove and Preserve CAPS Rocket (Refer to CAPS Component Maintenance Manual, P/N 12128-001)

(a) Remove CAPS rocket assembly. (Refer to CMM 95-01-01)

CAPS Rocket Serial Number

WARNING: ***Serials 1005 thru 1267 after SB2X-95-20, 1268 thru 1422 after SB2X-95-17, 1423 & subs w/o Perspective after SB2X-95-18, 2228 & subs:*** **Ensure rocket igniter is shunted when frangible link is removed.**

(b) Serials 1005 thru 1267 after SB2X-95-20, 1268 thru 1422 after SB2X-95-17, 1423 & subs after SB2X-95-18, 2228 & subs: Shunt rocket igniter by grounding wire terminals using screw and nut. (Refer to CMM 95-01-01)

WARNING: ***Serials 1005 thru 1267 before SB2X-95-20, 1268 thru 1422 before SB2X-95-17, 1423 & subs w/o Perspective before SB2X-95-18, 2016 thru 2227:*** **Ensure firing pin actuator is secured with safety wire immediately upon removal.**

(c) Serials 1005 thru 1267 before SB2X-95-20, 1268 thru 1422 before SB2X-95-17, 1423 & subs w/o Perspective before SB2X-95-18, 2016 thru 2227: Safety the rocket motor by wiring firing pin actuator to rocket motor igniter body. (Refer to CMM 95-01-01)

(d) Store CAPS rocket assembly in secure, explosion proof container.

(e) Install CAPS access panel.

	Time	Initls

(5) Preserve Engine

WARNING: **Ensure engine magnetos are grounded prior to rotating propeller.**

(a) Clean engine. (Refer to 12-20)

(b) Preserve engine in accordance with CMI/TCM documents IO-550 Maintenance and Overhaul Manual M-16, and Standard Practice Maintenance Manual M-0.

(6) Preserve Nose Landing Gear and Engine Mount

(a) Apply corrosion inhibitor nose landing gear spindle nut.

(b) *Serials at Service Center:* Apply corrosion inhibitor to entire engine mount weldment, wrap weldment sections in barrier material, and secure with tape.

(7) Preserve Propeller

(a) Remove propeller and inspect. (Refer to 61-10)

(b) Solvent clean propeller blades. (Refer to 20-30)

(c) Apply corrosion inhibitor to blades.

(d) Using cushioning material and tape, wrap propeller blades.

(8) Remove Horizontal Stabilizer (Refer to 55-10)

(a) Remove horizontal stabilizer root fairings and discard. (Refer to 53-50)

Note: Do not attempt to reuse horizontal stabilizer root fairings.

(b) Remove pitch trim cartridge, motor assembly and elevator bellcrank. Pack and store. (Refer to 27-30)

CAUTION: If the pitch trim cartridge is damaged during removal and requires replacement, flight characteristics will be affected. Contact Cirrus Design for disposition.

(c) Record horizontal stabilizer serial number prior to removing horizontal stabilizer.

Horizontal Stabilizer Serial Number (removed)

Horizontal Stabilizer Serial Number (shipped)

(d) Remove horizontal stabilizer from airplane. (Refer to 55-10)

(e) Remove residue.

	Time	Initls

(9) Remove Wing (Refer to 57-10)

Note: All cut cable ties will be removed and wire connectors bagged during wing removal.

(a) Remove wing root fairings. Pack and store. (Refer to 53-50)

(b) Disassemble aileron cables. (Refer to 27-10)

(c) Disassemble rudder cables. (Refer to 27-20)

(d) Disassemble elevator cables. (Refer to 27-30)

(e) Disassemble flap torque tubes. (Refer to 27-50)

(f) Disconnect wiring harnesses. (Refer to 57-10)

(g) Disconnect magnetometer cable. (Refer to 57-10)

(h) Disconnect pitot-static lines.

(i) *Serials 1005 thru 1885:* Disconnect ELT remote panel indicator connection. (Refer to 25-60)

(j) *Serials 1005 thru 1885:* Disconnect COM 2, VOR/LOC, and marker beacon cables.

(k) *Serials 1268 thru 1885:* Disconnect battery 2 power/ground cables. (Refer to 57-10)

(l) *Serials 1886 & subs:* Disconnect battery 2 wiring. (Refer to 57-10)

(m) Disconnect fuel lines at center console.

(n) Disconnect stall warning lines. (Refer to 57-10)

(o) Remove LH entry step. (Refer to 53-20)

(p) *Serials 1005 thru 1885:* Disconnect environmental ducts. (Refer to 57-10)

(q) *Serials 1005 thru 1422 w/ Sandel HSI:* Disconnect HSI gyro slaving amplifier and remote gyro. (Refer to 34-50)

(r) Remove belly closeout panel. (Refer to 57-10)

Note: *Serials 1423 & subs:* Belly closeout panel will be reinstalled during Cabin preservation.

(s) Support wing and fuselage. (Refer to 57-10)

(t) Remove wing from fuselage. (Refer to 57-10)

(u) Record wing serial number.

Wing Serial Number

(10) Clean exterior and interior of airplane. (Refer to 12-20)

	Time	Initls

(11) Preserve Wing

CAUTION: Do not bend or otherwise damage aileron gap seals attached to trailing edge of wing.

Note: *Serials 1423 & subs:* Belly closeout panel will be reinstalled during Cabin preservation.

(a) *Serials 1423 & subs:* Collect screws, washers, and nuts that secure belly closeout panel.

(b) Remove main landing gear. Pack and store. (Refer to 32-10)

(c) Cap pitot tube. Secure with tape.

WARNING: Contact Cirrus Design for details on purge procedure.

(d) Purge fuel tanks with argon gas to eliminate fuel vapors.

(e) Cap all fuel and hydraulic lines. Secure with tape.

(f) Verify all cables, wiring, and ducting are properly stowed in wing.

(g) *Serials 1005 thru 1885:* Using barrier material, seal fresh air intake ducts at wing roots.

(h) *Serials at Service Center:* Apply light film of avionics grade corrosion inhibitor to roll trim electrical components.

(i) Using barrier material, seal all rib lightening holes and other openings in wing assembly.

(12) Preserve Cabin

(a) *Serials 1423 & subs:* Re-install belly closeout panel. (Refer to 57-10)

CAUTION: To avoid permanently crushing carpet nap, do not place boxes or other heavy objects on cabin floor coverings during shipping.

(b) Pack and store cabin floor coverings.

(c) Install crew and passenger seats. Do not connect inflatable seat belt harness. (Refer to 25-10)

(d) Remove emergency locator transmitter. (Refer to 25-60)

(e) Disconnect emergency locator transmitter from battery according to manufacturer's instructions. Pack and store ELT. (Refer to 05-10)

(f) Package and ship ELT battery as Class 9, UN3090 hazardous materials according to federal and international regulations.

(g) Group all keys, manuals, logbooks, certificates, AOI numbers, headsets, microphone, and fire extinguisher. Wrap in barrier material and pack in shipping box conspicuously marked to identify components. Stow on cabin floor. E-mail Weight and Balance to Reassembly Service Center.

(h) Latch seat belts. Roll loose ends of seat belts and cargo straps and secure with tape.

(i) Firmly secure all removed components stowed in cabin.

	Time	Initls
(13) Avionics		
(a) Avionics shall be left installed. No preparation or preservation for avionics is required for shipment.		
(14) Preserve Fuselage		
Note: All items removed from airplane should be individually listed for components to be packed and shipped.		
(a) Install engine cowl. (Refer to 71-10)		
(b) Using barrier material, seal all lightening holes and other openings in fuselage assembly.		
(c) Using tape, cover RH and LH static ports.		
(d) Apply light film of corrosion inhibitor to entry steps, wrap in barrier material, and secure with tape.		
(e) Immobilize rudder assembly by wrapping rudder and vertical fin with plastic wrapping.		
(f) Solvent clean exposed laminate on horizontal stabilizer empennage flange with isopropyl alcohol. (Refer to 20-30)		
(g) Using barrier material and tape, cover exposed laminate on horizontal stabilizer empennage flange.		
(h) Distribute three, 5 lb bags of silica gel desiccant in cabin.		
(i) Visually inspect beneath cabin floor for FOD, and to ensure components are properly preserved and secured.		
(j) Close all doors and verify doors are tightly shut, latched, and secured with tape.		
(k) Verify security of all access panels and covers.		
(l) Cover all windows with barrier material and secure with tape. Ensure no tape contacts windows.		
(15) Crate		
CAUTION: Do not install nose wheel chocks and aft tail support brace until airplane is loaded into shipping container. Moving airplane after securing for shipment may cause severe damage to the airplane.		
(a) Pack and load aircraft components in shipping container in reference to Cirrus Design document CDMP 106: Aircraft Disassembly For Containerized Shipping.		
(b) Tag airplane in conspicuous location with “AIRCRAFT PRESERVED FOR UP TO 90 DAYS. REPRESERVE IF NOT ACTIVATED BY...” followed by the date of the appropriate number of days after the preservation date. The same information shall be included in the shipping documents.		

Certificated Mechanic Name: _____

Certificate Number: _____

Signature: _____

	Time	Initls

C. Depreservation and Assembly

Note: Unless otherwise noted, the instruction “unpack” describes preparing the component for reassembly. Perform the following:

- Unpack components from shipping container. Remove ID tag, barrier film, tape and residue left by tape with isopropyl alcohol.
- If necessary, wipe component with dry, lint-free, cotton cloth to remove excess corrosion inhibitor.
- Inspections performed per Cirrus Design documents Completed Aircraft Inspection Standards (CAIS), and CAIS Inspection Training Manual.
- Enter recorded defects into the CAIS database.

(1) Uncrate

(a) Inspect aircraft hard points and transition areas for any damage that may have occurred during shipment. For example, inspect spar tunnel to fuselage transition, wing attach, firewall attach, and aft fuselage area. (Refer to 05-50)

CAUTION: Remove nose wheel chocks and aft tail support brace before moving airplane out of shipping container. Moving airplane while still secured for shipment may cause severe damage to the airplane.

(b) Remove aircraft components in shipping container in reference to Cirrus Design document CDMP 106: Aircraft Disassembly For Containerized Shipping. (Refer to 10-21)

(2) Inspect Aircraft Components

(a) Verify no shipping damage to aircraft components exists.

(b) If damage is found, refer to Chapter 51, Standard Practices - Structures, for damage assessment, reporting, and repair procedures. (Refer to 51-00)

(c) Inspect straps securing main components for security.

(d) Check fuselage and wing main attachment and security points.

(e) Verify no hard contact exists between propeller and fuselage, wing, container, or any other structure.

(f) Verify parts boxes and flight control pallets are free from movement and still in a secured state.

(3) Depreserve Cabin

(a) Remove desiccant from cabin.

(b) Remove components temporarily stowed in cabin.

(c) Unpack manuals, logbooks, certificates, headsets, microphone, keys, and fire extinguisher.

Note: Do not install aft console rear cover until Return to Service fuel system leak check has been performed.

		Time	Initls
(d)	Unpack cabin trim panels.		
(e)	Remove tape securing seat belts and cargo straps.		
(f)	Remove crew and passenger seats. (Refer to 25-10)		
(g)	Unpack floor coverings. (Refer to 25-10)		
(h)	*Serials 1005 thru 1885:* Unpack kick plates. (Refer to 25-10)		
(i)	Unpack cabin access panels. (Refer to 53-20)		
(4)	Depreserve Fuselage		
(a)	Check nose landing gear tire pressure. (Refer to 12-10)		
(b)	Remove barrier film and tape secured to windows. Remove residue left by tape with isopropyl alcohol.		
(c)	Remove engine cowling. (Refer to 71-10)		
(d)	Remove tape covering RH and LH static ports. Remove residue left by tape with isopropyl alcohol.		
(e)	Remove tape covering RH entry step. Remove residue left by tape with isopropyl alcohol.		
(f)	Remove all barrier material sealing lightening holes and other openings in fuselage assembly.		
(g)	Remove empennage panels LE1, LE2, RE1, RE2, and RE3.		
(h)	At emergency locator transmitter, connect battery according to manufacturer's instructions. (Refer to 05-10)		
(i)	Install emergency locator transmitter. (Refer to 25-60)		
(j)	*Serials with ACK E-01 ELT*: At emergency locator transmitter, move the main transmitter control switch to the ARMED position.		
(k)	*Serials w/ Artex ME406 ELT*: At emergency locator transmitter, ensure main transmitter control switch is in the ARM position.		
(l)	*Serials w/ Artex ELT 1000*: At emergency locator transmitter, ensure main transmitter control switch is in the ARM/OFF position.		
(m)	If required, re-register and reprogram ELT according to manufacturer's instructions. (Refer to 05-10)		
(n)	*Serials w/ Artex ME406 ELT:* Verify 15 digit transmitter identification number matches number shown on transmitter product label, and country code matches country airplane is registered in.		
(o)	*Serials w/ Artex ELT 1000:* If ELT was re-registered or reprogrammed, the ELT will be labeled with a new hexadecimal identification number according to manufacturer's instructions. Verify country code matches country airplane is registered in. (Refer to 05-10)		
(p)	Remove rudder. (Refer to 55-40)		
(q)	Remove recoverable data module. (Refer to 31-30)		

EFFECTIVITY:
All

	Time	Initls

(5) Depreserve Nose Landing Gear and Engine Mount

(a) If using permanent floor mounted fixture for horizontal stabilizer installation, remove nose landing gear. (Refer to 32-20)

(b) Remove all barrier material and tape covering engine mount weldment. Remove residue left by tape with isopropyl alcohol.

(c) *Serials 1423 & subs:* Remove belly closeout panel. (Refer to 57-10)

(6) Depreserve Horizontal Stabilizer

(a) Remove all barrier material and tape covering exposed laminate.

(7) If using permanent floor mounted fixture for horizontal stabilizer installation, install Horizontal Stabilizer. (Refer to 55-10)

(a) Record serial number of horizontal stabilizer to be installed and update log book.

Horizontal Stabilizer Serial Number

(b) Hoist and mount fuselage to bonding fixture. (Refer to 55-10)

(c) Mount horizontal stabilizer to fuselage. (Refer to 55-10)

(d) Determine horizontal stabilizer angle of incidence prior to bonding. Record obtained values: (Refer to 55-10)

LH HS 72.0	LH HS 36.0	RH HS 72.0	RH HS 36.0

(e) Record weight of part A and B prior to mixing structural adhesive.

Part A Weight	Part B Weight

(f) Bond horizontal stabilizer to fuselage in fixture. (Refer to 55-10)

(g) Initial cure horizontal stabilizer before removing fuselage from fixture. (Refer to 55-10)

CAUTION: Remove horizontal bonding fixture centering tool before removing fuselage from bonding fixture. Moving fuselage while tool is still secured may cause severe damage to the airplane.

(h) Remove fuselage from bonding fixture. (Refer to 55-10)

Note: During the post cure cycle, re-assembly of airplane may continue outside of post cure area.

(i) Post cure horizontal stabilizer after removing fuselage from fixture. (Refer to 55-10)

	Time	Initls

(j) Determine horizontal stabilizer angle of incidence following bond curing. Record obtained values: (Refer to 55-10)

LH HS 72.0	LH HS 36.0	RH HS 72.0	RH HS 36.0

(k) Unpack and install pitch trim cartridge, motor assembly and elevator bellcrank. (Refer to 27-30)

CAUTION: If the pitch trim cartridge is damaged during installation and requires replacement, flight characteristics will be affected. Contact Cirrus Design for disposition.

(l) Install nose landing gear. (Refer to 32-20)

(8) Depreserve Wing

(a) Install main landing gear. (Refer to 32-10)

(b) Check main landing gear tire pressure. (Refer to 12-10)

(c) If necessary, wipe exposed metal with dry, lint-free, cotton cloth to remove excess corrosion inhibitor.

(d) Remove all barrier material sealing lightening holes and other openings in wing assembly. Remove residue left by tape with isopropyl alcohol.

(e) Verify all cables, wiring, and ducting are properly stowed in wing.

(f) Uncap all fuel and hydraulic lines.

(g) Uncap pitot tube.

(9) Install Wing (Refer to 57-10)

Note: Do not fill fuel system as part of wing installation. If horizontal stabilizer is new or different from original factory installed horizontal stabilizer, airplane must first be weighed.

(a) Visually inspect wing spar for evidence of impact damage such as rub marks, surface wear, delamination, and general condition.

CAUTION: Before attaching wing to fuselage, carefully inspect to ensure all horizontal bonding fixture tools are removed from aircraft. This includes the spar tunnel fixture which can cause major damage if left installed.

(b) Attach wing to fuselage. (Refer to 57-10)

(c) *Serials 1005 thru 1422 w/ Sandel HSI:* Disconnect HSI gyro slaving amplifier and remote gyro. (Refer to 34-50)

(d) *Serials 1005 thru 1885:* Connect environmental ducts. (Refer to 57-10)

(e) Install LH entry step. (Refer to 53-20)

(f) Connect stall warning lines. (Refer to 57-10)

(g) Connect fuel lines at center console.

EFFECTIVITY:
All

Time | Initls

(h) *Serials 1005 thru 1885:* Connect COM 2, VOR/LOC, and marker beacon cables.

(i) *Serials 1268 thru 1885:* Connect battery 2 power/ground cables. (Refer to 57-10)

(j) *Serials 1886 & subs:* Connect battery 2 wiring. (Refer to 57-10)

(k) *Serials 1005 thru 1885:* Connect ELT remote control panel indicator connection. (Refer to 25-60)

(l) Connect pitot-static lines.

(m) Connect wiring harnesses. (Refer to 57-10)

(n) Assemble magnetometer cable.

(o) Depreseve ailerons.

(p) Unpack, depreserve, and install flaps. (Refer to 57-50)

(q) Bleed brake system. (Refer to 32-42)

(r) Install belly closeout. (Refer to 57-10)

(s) *Serials 1005 thru 2029:* Install EMM lightning protection.

(t) *Serials 1005 thru 2029:* Paint installation area. (Refer to 51-20)

(10) If using portable tool for horizontal stabilizer installation, install Horizontal Stabilizer. (Refer to 55-10)

(a) Record serial number of horizontal stabilizer to be installed and update log book.

Horizontal Stabilizer Serial Number

(b) Mount bonding tool to fuselage. (Refer to 55-10)

(c) Mount horizontal stabilizer to fuselage. (Refer to 55-10)

(d) Determine horizontal stabilizer angle of incidence prior to bonding. Record obtained values: (Refer to 55-10)

LH HS 72.0	LH HS 36.0	RH HS 72.0	RH HS 36.0

(e) Record weight of part A and B prior to mixing structural adhesive.

Part A Weight	Part B Weight

(f) Bond horizontal stabilizer to fuselage in tool. (Refer to 55-10)

Time	Initls

(g) Initial cure horizontal stabilizer before removing tool from fuselage. (Refer to 55-10)

(h) Remove bonding tool from fuselage. (Refer to 55-10)

Note: During the post cure cycle, re-assembly of airplane may continue outside of post cure area.

(i) Post cure horizontal stabilizer after removing tool from fuselage. (Refer to 55-10)

(j) Determine horizontal stabilizer angle of incidence following bond curing. Record obtained values: (Refer to 55-10)

LH HS 72.0	LH HS 36.0	RH HS 72.0	RH HS 36.0

(k) Unpack and install pitch trim cartridge, motor assembly and elevator bellcrank. (Refer to 27-30)

CAUTION: If the pitch trim cartridge is damaged during installation and requires replacement, flight characteristics will be affected. Contact Cirrus Design for disposition.

(11) *Serials 1005 thru 1885:* Perform wing angle of incidence and determine decalage. Record obtained values: (Refer to 57-10)

LH WS 197.5	LH WS 41.0	RH WS 197.5	RH WS 41.0	LH HS 72.0	LH HS 36.0	RH HS 72.0	RH HS 36.0	Decalage	
								Left	Right

(12) Depreserve and connect battery 1. (Refer to 24-30)

(13) *Serials 1268 & subs:* Depreserve and connect battery 2. (Refer to 24-30)

(14) Install flight control surfaces and perform rigging.

(a) Install recoverable data module. (Refer to 31-30)

(b) Install rudder. (Refer to 55-40)

(c) Unpack, depreserve, and install elevator. (Refer to 55-20)

(d) Assemble flap torque tubes. (Refer to 27-50)

(e) Assemble elevator cables. (Refer to 27-30)

(f) Assemble rudder cables. (Refer to 27-20)

(g) Assemble aileron cables. (Refer to 27-10)

Time | Initls

(h) Perform rigging checks following reassembly. Record obtained values:

Control Surface	Degree Deflection and Cable Tension					
Aileron Up	Nominal:	Left	Right	Trim:	Left	Right
Aileron Down	Nominal:	Left	Right	Trim:	Left	Right
Aileron Cable Tension						
Elevator Up	Nominal:			Trim:		
Elevator Down	Nominal:			Trim:		
Elevator Cable Tension						
Max Rudder	Left:			Right:		
Flap Up	Left:			Right:		
Flap 50%	Left:			Right:		
Flap 100%	Left:			Right:		

(15) Install new horizontal stabilizer root fairings. (Refer to 53-50)

(16) Unpack and install wing root fairings. (Refer to 53-50)

(17) *Serials 1005 thru 1885:* Install OAT sensor to RH NACA vent panel. (Refer to 34-20)

(18) Unpack and install wing tips. (Refer to 57-20)

(19) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(20) Depreserve and Install Rocket (Refer to CAPS Component Maintenance Manual, P/N 12128-001)

(a) Assemble CAPS rocket assembly. (Refer to CMM 95-01-01)

(b) Install CAPS rocket assembly. (Refer to CMM 95-01-01)

(c) Record serial number of new CAPS rocket assembly and update log book.

New CAPS Rocket Assembly Serial Number

(21) *Serials 1005 thru 1267 after SB2X-95-20:* Depreserve and install CAPS battery. (Refer to 95-00)

(22) Depreserve Propeller

(a) Remove all cushioning material and tape.

(b) Install propeller. (Refer to 61-10)

		Time	Initls
(23)	Depreserve engine in accordance with CMI/TCM documents IO-550 Maintenance and Overhaul Manual M-16, and Standard Practice Maintenance Manual M-0.		
(24)	General		
	(a) Visually inspect beneath cabin floor for FOD.		
	(b) Unpack and install floor access panels. (Refer to 06-00)		
	(c) *Serials 1005 thru 1885:* Unpack and install kick plates. (Refer to 25-10)		
	(d) Unpack and install floor covering. (Refer to 25-10)		
	(e) Unpack and install side duct cover trim. (Refer to 25-10)		
	(f) Install passenger seats. (Refer to 25-10)		
	(g) Install crew seats. (Refer to 25-10)		
	(h) Unpack and install main gear fairing. (Refer to 32-10)		
	(i) Unpack and install nose gear fairing. (Refer to 32-20)		
	(j) Perform Operational Test - Aircraft Data Logger System. (Refer to 31-30)		
	(k) Perform Operational Test - ELT. (Refer to 25-60)		
	(l) Install empennage panels LE1, LE2, RE1, RE2, and RE3.		
(25)	Return to Service		
	(a) Perform container shipping return to service procedures. (Refer to 10-30)		

Certificated Mechanic Name: _____

Certificate Number: _____

Signature: _____

3. PERSONNEL, FACILITIES, AND QUALITY ASSURANCE REQUIREMENTS

A. Personnel

The capability of the aircraft to satisfactorily maintain its structural integrity is dependent on the quality of the reassembly process. Therefore, it is essential that the personnel selected to perform the reassembly procedures outlined in this section be fully capable and that all maintenance be conducted with the highest possible degree of workmanship.

(1) Qualifications

(a) Mechanics

Engineering Certificate and a minimum of two years of aircraft maintenance experience.

(b) Test Pilots

Commercial Single Engine Land License, Class II Medical License, four year degree or equivalent experience in fields such as flight testing, engineering, aircraft maintenance; 1000 hours total flying time.

B. Facilities

Facility requirements should be approached with the intent of maximizing the functional uses for the reassembly process as well as providing for future reassembly changes.

(1) General

Facilities must be provided appropriate for all planned work, ensuring in particular, specialized stations for work with fiberglass/epoxy structures.

Workstations and bays must be segregated as appropriate, to ensure that environmental and work area contamination is unlikely to occur.

Lighting should be such as to ensure each inspection and maintenance task can be efficiently carried out.

Noise levels should not be permitted to rise to the point of distracting personnel from carrying out maintenance or inspection tasks. Where it is impractical to control the noise source, personnel should be provided with the necessary personal equipment to stop excessive noise causing distraction during maintenance or inspection tasks.

(2) Storage

Secure storage facilities must be provided for aircraft components, equipment, tools and material. Storage conditions must ensure segregation of serviceable aircraft components and material from unserviceable aircraft components, material, equipment and tools. The conditions of storage must be in accordance with the manufacturer's instructions to prevent deterioration and damage of stored items. Access to storage facilities must be restricted to authorized personnel.

Explosives storage to be provided for CAPS rockets, igniters, and pyrotechnic line cutters.

Storage racks should be strong enough to hold aircraft components and provide sufficient support for large aircraft components such that the component is not distorted during storage.

All aircraft components, wherever practicable, should remain packaged in protective material to minimize damage and corrosion during storage.

(3) Environmental Conditions

Since the reassembly process involve the use of resins, adhesives and solvents, it is important that the work area has adequate heating, ventilating, and air conditioning. Temperature and humidity recording equipment must be located in the reassembly area so that environmental conditions can be routinely checked and to ensure the integrity of any composite repair work being carried out.

Temperature and humidity must be controlled so that the minimum temperature is 60° F (16° C) with a corresponding relative humidity not greater than 71 percent and the maximum temperature is 75° F (24° C) with a corresponding relative humidity not greater than 46 percent.

(4) Fire Protection

Firefighter equipment must be on-site and ready to use.

(5) Electrical Power and Grounding

100 / 115 / 230 VAC, 50/60Hz, 1000 W.

28 VDC.

A good electrical ground will be used during reassembly of the aircraft.

(6) Area of Clearance (See Figure 10-211)

Area of operation will be cleared of all unneeded equipment and vehicles to allow free movement of aircraft. Cleared area must accommodate aircraft turning radius when aircraft shipping cradles are installed.

(7) Flight Test Operations

A foul weather shelter or other enclosure will be available for operation in poor weather.

A runway at least 4000 feet long and 80 feet wide.

Aircraft must be flight tested in a published, government-approved, instrument approach and controlled airfield environment.

(8) Airplane Security

The facility should be surrounded by security fencing. Lights should be used to illuminate assembled aircraft stored outside.

C. Quality Assurance

(1) Inspection

The aircraft shall be inspected and maintained in accordance with the applicable Instructions for Continued Airworthiness requirements detailed in this manual.

(2) Reassembly Workstations And Bays

The facility will comply with the recommendations in Cirrus Design document General Plant Standards.

(3) Final Inspection For Fit And Finish

Final inspection for fit and finish shall be carried out in accordance with Cirrus Design document Completed Aircraft Inspection Standards (CAIS).

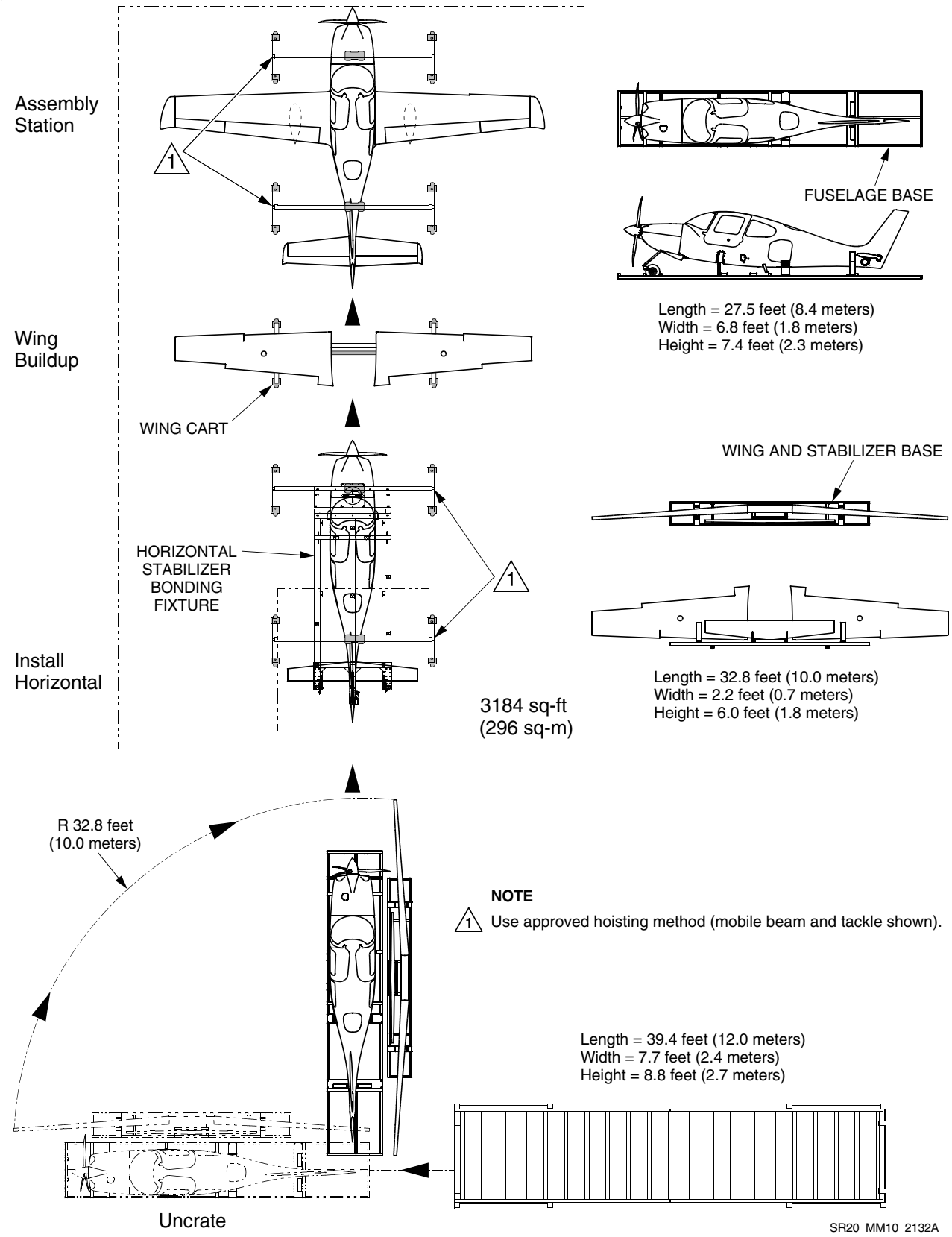


Figure 10-211
Area of Clearance

4. SPECIAL TOOLS AND EQUIPMENT

A. Crating Fixtures

Purchase or construct crating fixtures in reference to Cirrus Design document CDMP 106: Aircraft Disassembly For Containerized Shipping.

B. Consumable Materials

See the following table for a list of consumable materials required for container shipping and aircraft reassembly. Refer to the applicable chapter in Airplane Maintenance Manual and manufacturer's instructions for additional required consumable materials. (See Figure 10-212) (See Figure 10-213)

C. Tools and Equipment

See the following table for a list of tools and equipment required for container shipping and aircraft reassembly. Refer to the applicable chapter in Airplane Maintenance Manual and manufacturer's instructions for additional required tools and equipment. (See Figure 10-214)

D. Required Parts

See the following table for a list of parts required for aircraft reassembly. (See Figure 10-215)

Description	P/N or Specification	Supplier	Purpose
Argon Gas	-	Any Source	Eliminate Fuel Vapors.
Barrier Material Grease-proof, Waterproof, Flexible	-	Any Source	Aircraft Preservation
Box Shipping	-	Any Source	Shipping
Corrosion Preventive Compound Avionics Grade	MIL-C-81309 Type III	Any Source	Aircraft Preservation
Corrosion Preventive Compound General Use	MIL-C-81309 Type II	Any Source	Aircraft Preservation
Cushioning Material Grease-proof, Waterproof, Flexible	-	Any Source	Aircraft Preservation/ Shipping
Desiccant	03DD11S16	Desiccare, Inc. Pomona, CA 91768 909-444-8272	Cabin/Avionics Preservation
Envelope Packaging	-	Any Source	Aircraft Preservation/ Shipping
Isopropyl Alcohol	99% or higher purity	Any Source	Clean Installa-tion Area.
Paint Mixing Sticks	-	Any Source	Secure Ailerons.
Petroleum Jelly	V V-P-236	Any Source	Battery Preservation
Tag, Shipping	-	Any Source	Aircraft Preservation/ Shipping
Tape, Pressure Sensitive, Adhesive	-	Any Source	Aircraft Preservation/ Shipping
Tape, Shipping	-	Any Source	Aircraft Preservation/ Shipping
Tiedowns	-	Any Source	Secure Wiring Harnesses and Tubing.

Figure 10-212
Consumable Materials - Disassembly

Description	P/N or Specification	Supplier	Purpose
Corrosion Preventive Compound General Use	MIL-C-81309 Type II	Any Source	Aircraft Preservation
Cotton Cloth (clean, white, lint free)	-	Any Source	General Cleaning
Epoxy Adhesive	5 Minute Epoxy	Devcon Danvers, MA 01923 800-933-8266 http://www.devcon.com/	Composite Repair
General Purpose Adhesive Cleaner	08984	3M Company St. Paul, MN 55144 888-364-3577 http://www.3m.com/	Remove Tape Residue.
Grease Pencil	-	Any Source	Marking
High Temperature Sealant	736 RTV	Dow Corning Corporation Midlands, MI 48686 517-496-6000 http://www.dowcorning.com/	Sealing
Isopropyl Alcohol	99% or higher purity	Any Source	Clean Installation Area.
Optimax - LCD Screen Cleaning Solution	AMS 389	Photodon Traverse City, MI 49686 775-278-6741 http://www.photodon.com/	Clean Display Screens.
Paper Towels	-	Any Source	General Cleaning
Permanent Marker	0888X	Avery Dennison Pasadena, CA 91103 626-304-2000 http://www.averydennison.com/	Marking
Repair System, Structural Base Resin Curing Agent	ES6292-A ES6292-B w/ Beads	PTM&W Industries, Inc. Sante Fe, Springs, CA 90670 800-421-1518 http://www.ptm-w.com/	Composite Repair

Figure 10-213
Consumable Materials - Reassembly

Description	P/N or Specification	Supplier	Quantity
Allen Wrench and Socket Assembly (for wing attach bolt installation)	T6859-3	Cirrus Design	1
Battery Charger, 24V (for service)	TSC-01V	Teledyne Continental Motors Mobile, AL 36615 800-718-3411 http://www.tcmlink.com/	1
Bent Wrench (for wing attach bolt installation)	T6859-5	Cirrus Design	1
Borescope (for cylinder inspection)	TP905	US Industrial Tool & Supply Co. Gardena, CA 90249 800-521-7394 http://www.ustool.com/	1
Caulking Gun	-	Any Source	1
Champion Spark Plug Socket	TP329	US Industrial Tool & Supply Co. Gardena, CA 90249 800-521-7394 http://www.ustool.com/	1
Drill, 90° Die Grinder	-	Any Source	1
Drill Bits, Countersunk	-	Any Source	N/A
Drill Bits, Metal Cut-off Wheel and Arbor	-	Any Source	1
Drill Bits, Sanding Drum	80-grit	Any Source	N/A
Drill Bits, Twist	-	Any Source	N/A
Drive Ratchet Bent Wrench, 0.5-inch (for wing attach bolt installation)	T6859-2	Cirrus Design	1
Engine Mount Leveling Bar	T2474	Cirrus Design	1
Feeler Gauge (for bondline tolerance)	0.110-inch	Any Source	1
Feeler Gauge (for bondline tolerance)	0.120-inch	Any Source	1
Fuselage Base	Refer to Cirrus Design document CDMP 106: Aircraft Disassembly For Containerized Shipping	Cirrus Design	1

Figure 10-214
Tools and Equipment (Sheet 1 of 3)

Description	P/N or Specification	Supplier	Quantity
Flight Test Ballast Containers (Two Boxes)	T6858-1	Cirrus Design	1
Fuel Metering Box “Porta Test” or Liquid Fill Gages as described in TCM SID 97-3	630045-20	Approved Aircraft Accessories, Inc. Romulus, MI 48174 734-946-7777 http://www.approvedaircraft.net/	1
Hoist Chain, AM Hook Type Hoists	2 ton capacity	Chester Hoist, Inc. Lisbon, OH 44432 330-424-7248 http://www.chesterhoist.com/	2
Hoisting Option #2: Type E Style Mobile Gantries (2)	Model F4000	Spanco, Inc. Morgantown, PA 19543 800-869-2080	2
Hoisting, Aft, Strap	T6860	Cirrus Design	1
Hoisting, Forward, Spreader Bar w/ Straps	T6901	Cirrus Design	1
Hydrometer (for measuring specific gravity of batteries)	FR-1	Teledyne Continental Motors Mobile, AL 36615 800-718-3411 http://www.tcmlink.com/	1
Oil Drain Pan	-	Any Source	1
Pastry Bag	DPBR-18	Jack Guttman Inc. West Chester, Ohio 45071 800-543-1673 http://www.bakerycrafts.com/	2
Pin Extractor (for sub-D connectors)	305183	Allied Electronics, Inc. Fort Worth, Texas 76118 817-595-3500 http://www.alliedelec.com/	1
Plastic Scraper	-	Any Source	1
Plastic Wedge	6-inch	Any Source	2
Plumb Bob	-	Any Source	1
Putty Knife	-	Any Source	1
Ramp Assembly	-	Any Source	1
Rocket Storage Cabinet (for CAPS rocket storage)	-	Any Source	1

Figure 10-214
Tools and Equipment (Sheet 2 of 3)

Description	P/N or Specification	Supplier	Quantity
Saw Horses	-	Any Source	2
Scale, Digital	0-2 lb	Any Source	1
Scale, Spring, Calibrated, 0-80 lb	Model 80D	AMETEK TCI Division Largo, Florida 33773 800-527-9999 http://www.chatillon.com/	1
Scissors	-	Any Source	1
Tailstand	300 lb (136 kg) minimum weight	Any Source	1
Thermometer 0° to 250°F (-18° to 121°C)	-	Any Source	1
Torque Wrench Extension (for wing attach bolt installation)	T6859-4	Cirrus Design	1
Transit Level	-	Any Source	1
Utility Knife	-	Any Source	1
Vacuum	-	Any Source	2
Wheel Chocks	-	Any Source	2
Wing Cart	T6852	Cirrus Design	1
Wing and Stabilizer Base	Refer to Cirrus Design document CDMP 106: Aircraft Disassembly For Containerized Shipping	Cirrus Design	1
Wood Block (for trim tab adjustment)	7 3/8 × 2-inch	Any Source	2

Figure 10-214
Tools and Equipment (Sheet 3 of 3)

Description	P/N or Specification.	Supplier	Quantity
Serials 1005 thru 1422: Belly Closeout Panel	Refer to IPC, Wing Attach Installation	Cirrus Design	1
Horizontal Stabilizer	Refer to IPC, Horizontal Stabilizer Installation	Cirrus Design	1
Horizontal Stabilizer Root Fairings, LH	Refer to IPC, Horizontal Stabilizer Fairing Installation	Cirrus Design	1
Horizontal Stabilizer Root Fairings, RH	Refer to IPC, Horizontal Stabilizer Fairing Installation	Cirrus Design	1
Pitot-Static Line Fitting, Union Tee	Refer to IPC, Pitot-Static Installation for approved fitting	Cirrus Design	1
Pitot-Static Line Insert, Nylon	Refer to IPC, Pitot-Static Installation for approved insert	Cirrus Design	1
Pre-Cure Shim (for horizontal stabilizer)	Refer to IPC, Horizontal Stabilizer Installation for approved shims	Cirrus Design	1
Turnbuckle Clips (for rigging)	Refer to IPC, Flight Controls Installation for approved clips	Any Source	14
Wing Forward Attach Bolt	Refer to IPC, Wing Attach Installation for approved bolts	Any Source	2

Figure 10-215
Required Parts

RETURN TO SERVICE

1. GENERAL

This chapter provides instruction necessary to return the airplane to service after temporary storage, long-term storage, or container shipping.

2. MAINTENANCE PRACTICES

A. Return to Service

(1) Temporary and Long-Term Storage

Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(a) Remove all covers, tapes and tags from airplane.

(b) Reinstall engine battery and ELT battery. (Refer to 24-30) (Refer to 05-10)

(c) *Serials 1005 thru 1267 after SB2X-95-20, Long-Term Storage Only:* Reinstall CAPS battery. (Refer to 95-00)

(d) Fill fuel tanks (if applicable). (Refer to 12-10)

(e) Thoroughly clean and visually inspect airplane. (Refer to 12-20)

WARNING: Before rotating the propeller blades, make certain the magneto/start switch is OFF, throttle is in CLOSED position, and the mixture control is in the IDLE CUT-OFF position. Always stand clear while turning the propeller.

(f) Rotate propeller by hand through all compressions of the engine to check for liquid lock and to clear excess preservative oil from cylinders.

(g) Start engine in normal manner. (Refer to POH, Chapter 4)

(h) Perform normal warm-up and Operational Check. (Refer to 05-30)

B. Return to Service

(1) Container Shipping

(a) If installed horizontal stabilizer is new or different from original factory installed horizontal stabilizer, weigh airplane. (Refer to 08-20)

(b) Fill fuel tanks. (Refer to 12-10)

(c) Inspect fuel system for leaks.

(d) Install aft console rear cover. (Refer to 25-10)

(e) Install engine cowling. (Refer to 71-10)

(f) Perform Airplane Operational and Functional Check. (Refer to 05-30)

(g) *Serials 1005 & subs w/o Perspective Avionics:* Update NAV data on MFD and Garmin radios. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(h) *Serials 2016 & subs w/ Perspective Avionics:* Update aviation database on MFD and PFD. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

(i) *Serials 1005 & subs w/o Perspective Avionics:* Perform Operational Test - GMA 340 Audio Control Unit. (Refer to 23-50)

(j) *Serials 2016 & subs w/ Perspective Avionics:* Perform Operational Test - GMA 347 Audio Control Unit. (Refer to 23-50)

(k) Perform Operational Test - Garmin Transponder. (Refer to 34-50)

(l) Perform Inspection/Check - Crew Seats. (Refer to 25-10)

(m) Perform Operational Test - Magnetic Compass Calibration. (Refer to 34-20)

WARNING: The airplane may not be returned to service until a Cirrus Design certified test pilot has performed a flight test. Flight test may only be performed by Cirrus Design authorized personnel.

(n) Perform Functional Test - Flight Test.

(o) Clean exterior and interior of airplane. (Refer to 12-20)

(p) Perform Final Inspection - Cirrus Design documents Completed Aircraft Inspection Standards (CAIS), and CAIS Inspection Training Manual. Enter recorded defects into the CAIS database.

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CHAPTER 11

PLACARDS AND MARKINGS

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REQUIRED PLACARDS

1. GENERAL

Placards are used for identification and indication purposes. Placards give operating instructions, directional movements, servicing instructions, part or position identification, escape instructions, and safety precautions. Self adhesive cast vinyl decals or polycarbonate overlays are used for all placards located on the interior and exterior surfaces of the airplane. Missing, or placards with poor readability must be replaced.

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EXTERIOR PLACARDS

1. DESCRIPTION

This section describes the maintenance practices pertinent to those placards and markings which give operating instructions, directional movements, servicing instructions, part or position identification, escape instructions, and safety precautions. Exterior placards include: Door; Open & Close, Baggage Door Location, ELT Location, CAPS Location, Oil-Door Location, Fuel Filler Location, Gnd Power Receptacle Location, No-Step, No Push, and Rescue Instruction.

Note: Exterior placard illustrations are available in the SR20 Illustrated Parts Catalog under Chapter 11, Placards And Markings.

2. MAINTENANCE PRACTICES

CAUTION: Avoid dripping alcohol/chemical cleaner on placard as it will ruin finish.

A. Exterior Placard

(1) Removal - Exterior Placard

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Water Wash	-	Any Source	Cleaning of surface.
Hot-Air Blower	-	Any Source	Removal of placard.

CAUTION: Do not allow the structure temperature to exceed 150° Fahrenheit (65.5° C). Excessive heat may result in loss of structural integrity.

(b) Apply heat with hot-air blower until adhesive loosens from airplane surface.

(c) Peel placard away from surface, using additional heat if necessary.

(d) Solvent clean surface to remove residual adhesive. (Refer to 20-30)

(2) Installation - Exterior Placard

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Self Adhesive Vinyl Placard	-	Cirrus Design	Identification/Indication.
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Water Wash	-	Any Source	Cleaning of surface.
Rubber Roller	-	Any Source	Installation.

(b) Water wash surface where placard is to be installed.

(c) Solvent clean surface where placard is to be installed. (Refer to 20-30)

(d) Remove protective backing from placard using care not to contaminate adhesive surface.

(e) Place one edge of placard on surface and work downward to eliminate wrinkles and air pockets. Avoid stretching placard as poor adhesion will result.

(f) Press placard to surface with fingers or rubber roller. Ensure all edges are firmly adhered.

INTERIOR PLACARDS

1. DESCRIPTION

This section describes the maintenance practices pertinent to those placards and markings which give operating instructions, directional movements, servicing instructions, part or position identification, escape instructions, and safety precautions. Most airplane interior placards are integral to the individual panel's polycarbonate graphic overlay. The remaining placards are printed on cast vinyl. Interior placards include: CAPS Handle Cover, Engine Control Panel, Circuit Breaker Panel, Bolster Switch Panel, Instrument Panel, Audio Panel, Yoke Grip Switch Plate, Baggage Door, ELT Location, Alternate Induction Air, Bolster Grab Location, and Parking Brake Release.

Note: Interior placard illustrations are available in the SR20 Illustrated Parts Catalog under Chapter 11, Placards And Markings.

2. MAINTENANCE PRACTICES

CAUTION: Avoid dripping alcohol/chemical cleaner on overlay/placard as it will ruin finish.

A. Polycarbonate Graphic Overlay

CAUTION: *Serials w/ Perspective Avionics:* For backlit overlays (for example, circuit breaker panel) , follow Backlit Polycarbonate Graphic Overlay maintenance practices. (Refer to 11-30)

(1) Removal - Polycarbonate Graphic Overlay

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Clean Cloth (white, lint free)	-	Any Source	Solvent wipe.
Hot-Air Blower	-	Any Source	Removal of panel.
Putty Knife	-	Any Source	Removal of panel and residual adhesive.

(b) Remove trim panels or attaching hardware securing panel to airplane. (Refer to 25-10)

(c) Apply heat with hot-air blower until adhesive loosens from panel surface.

(d) Peel placard away from surface, using additional heat and putty knife if necessary.

(e) Solvent clean surface to remove residual adhesive. (Refer to 20-30)

(2) Installation - Polycarbonate Graphic Overlay

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Clean Cloth (white, lint free)	-	Any Source	Solvent wipe.
Rubber Roller	-	Any Source	Installation.

(b) Solvent clean surface where overlay is to be installed. (Refer to 20-30)

(c) Remove protective backing from one half of overlay using care not to contaminate adhesive surface.

(d) Align overlay half with protective backing still in place on panel and press exposed overlay half onto panel.

(e) Bend overlay back and peel remaining protective backing from overlay.

(f) Carefully work overlay toward opposite panel edge, pressing bubbles and wrinkles out with rubber roller. Ensure all edges are firmly adhered.

Note: If replacing panel and surrounding trim, allow 24 to 48 hours for adhesive to reach maximum bonding strength prior to final assembly.

(g) Install panel and surrounding trim (if applicable). (Refer to 25-10)

B. Backlit Polycarbonate Graphic Overlay - *Serials w/ Perspective Avionics*

(1) Removal - Backlit Polycarbonate Graphic Overlay

(a) While holding down backlight strip, carefully peel overlay off slowly.

CAUTION: Do not use tools (e.g. putty knife, heat gun, etc.) or solvent/cleaning products on backlight strip surfaces.

Use extreme care so that backlight strip beneath overlay is not damaged or peeled off.

(2) Installation - Backlit Polycarbonate Graphic Overlay

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tape Primer	94	3M Company	Promote adhesion.
Rubber Roller	-	Any Source	Installation.

(b) Apply tape primer to backlight strip.

(c) Remove protective backing from one half of overlay using care not to contaminate adhesive surface.

(d) Align overlay half with protective backing still in place on panel and press exposed overlay half onto panel.

(e) Bend overlay back and peel remaining protective backing from overlay.

(f) Carefully work overlay toward opposite panel edge, pressing bubbles and wrinkles out with rubber roller. Ensure all edges are firmly adhered.

(g) Perform Operational Test - Backlit Polycarbonate Graphic Overlay. (Refer to 11-30)

(3) Operational Test - Backlit Polycarbonate Graphic Overlay

(a) Set BAT 1 master switch to ON position.

(b) Turn INSTRUMENT dimmer knob fully clockwise.

(c) Shade overlay from ambient light so that backlighting is clearly visible.

(d) Ensure backlighting of new overlay is visually consistent with other backlit overlays.

(e) Ensure that backlight is not conspicuous around sides of new overlay.

(f) Turn INSTRUMENT dimmer knob counter-clockwise to OFF position.

(g) Set BAT 1 master switch to OFF position.

C. Cast Vinyl Interior Placard

(1) Removal - Cast Vinyl Interior Placard

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Clean Cloth (white, lint free)	-	Any Source	Solvent wipe.

(b) Peel placard away from surface.

(c) Solvent clean surface to remove residual adhesive. (Refer to 20-30)

(2) Installation - Cast Vinyl Interior Placard

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Clean Cloth (white, lint free)	-	Any Source	Solvent wipe.
Rubber Roller	-	Any Source	Application of surface pressure.

(b) Water wash surface where placard is to be installed.

(c) Solvent clean surface where placard is to be installed. (Refer to 20-30)

(d) Remove protective backing from placard using care not to contaminate adhesive surface.

(e) Place one edge of placard on surface and work downward to eliminate wrinkles and air pockets. Avoid stretching placard as poor adhesion will result.

(f) Press placard firmly to surface with fingers or rubber roller. Ensure all edges are firmly adhered.

CHAPTER 12

SERVICING

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SERVICING

1. GENERAL

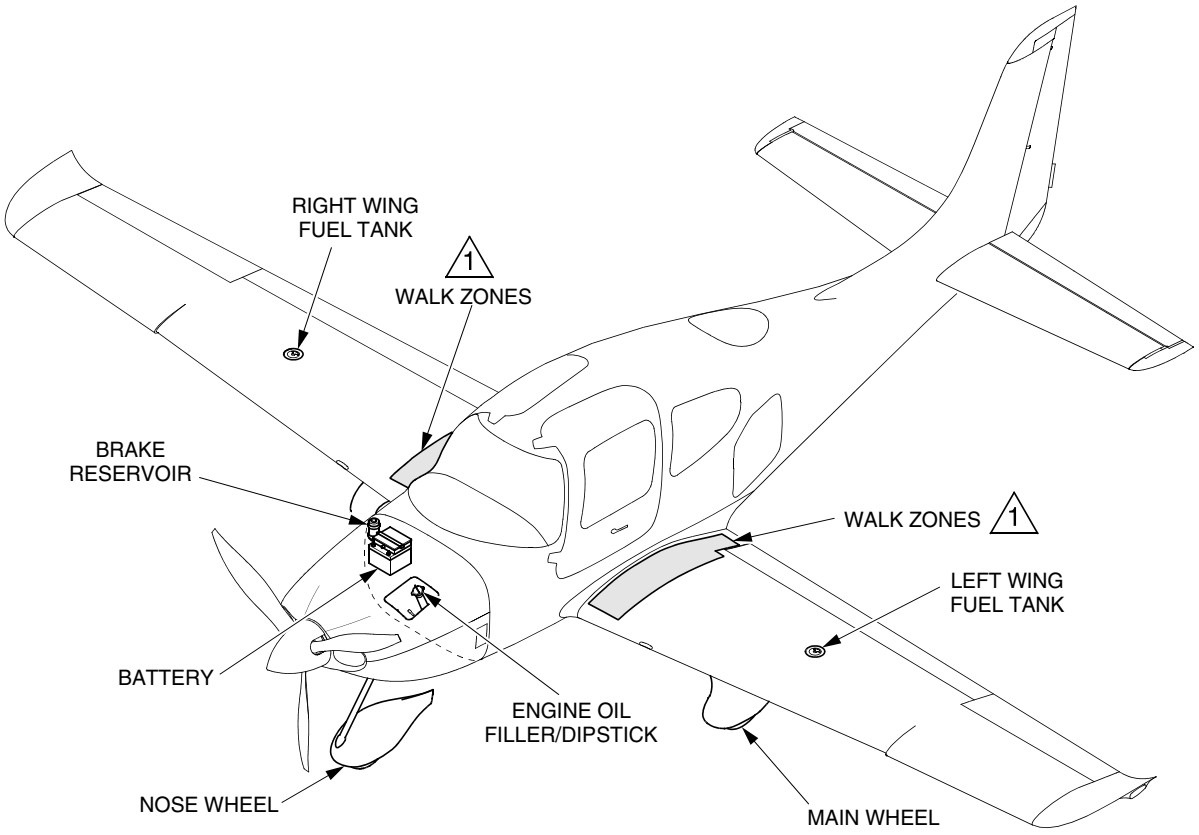
The information in this chapter pertains to general servicing procedures and maintenance practices used when servicing the airplane. This chapter contains illustrations, descriptions and servicing procedures necessary to locate system or component service points and to replenish operating fluids or service the airplane as required. (See Figure 12-001)

For additional detailed information concerning unit servicing of the various airplane systems and components, refer to the applicable chapters. For electrical wiring diagrams, refer to the Wiring Diagram Manual.

The specified intervals in Chapter 5, are considered adequate to meet average requirements under normal operating conditions. It is advisable, however, to shorten service and maintenance intervals when operating under abnormal environmental conditions, such as high humidity and moisture, salt water environments, dusty atmospheric conditions, extreme temperature ranges, unimproved airport facilities, or other unusual operating requirements. In salt water areas, special care should be taken to keep the engine, accessories and airframe clean to help prevent oxidation.

CAUTION: The operation of the airplane can be seriously impaired if unapproved or contaminated fuel, oil, fluids, lubricants or materials are used. Adherence to instructions, cautions, and warnings can avoid injury to personnel and damage to the airplane or associated equipment. Mixing of various brands, types and weights of materials should be avoided. Specified lubricants will meet requirements for extreme hot or cold temperature operations. Use of substitutes or other lubricants may cause a malfunction when operating in extreme temperature conditions, or may cause excessive wear due to improper lubrication. As called out in the illustration, stepping or walking on most of the airplane outer surfaces is prohibited.

CAUTION: The airplane must be grounded to earth prior to performing any maintenance.



NOTE

1 All other surfaces are prohibited from being stepped on.

SR20_MM12_1066A

Figure 12-001
Service Points

REPLENISHING

1. DESCRIPTION

This section covers the replenishing of fuel, engine oil, hydraulic brake fluid, tire pressure, battery electrolyte, air conditioning refrigerant, and oleo strut fluid and gas. (See Figure 12-101)

Description	P/N or Spec.	Capacity
Fuel	100 LL (Blue) or 100 (Green)	*Serials 1005 thru 1885:* Total Tank Capacity: 60.6 Gallons (229.0 L) total wing 30.3 Gallons (114.5 L) each wing Usable: 56.0 Gallons (212.0 L) total wing 28.0 Gallons (106.0 L) each wing Usable Filled To Tab: 26.0 Gallons (98.4 L) total wing 13.0 Gallons (49.2 L) each wing *Serials 1886 & subs:* Total Tank Capacity: 58.5 Gallons (221.5 L) total wing 29.25 Gallons (110.7 L) each wing Usable: 56.0 Gallons (212.0 L) total wing 28.0 Gallons (106.0 L) each wing Usable Filled To Tab: 26.0 Gallons (98.4 L) total wing 13.0 Gallons (49.2 L) each wing
Oil	SAE J1966 Mineral Oil (1st 25 Hours) See Approved Oil Listing (Refer to 12-10)	8.0 US Quarts (7.6 L)
Battery 1	Distilled Water	*Serials 1005 & subs w/ TCM Battery:* As Required
Brakes	*Serials 1005 thru 2240 before SB2X-32-21:* MIL-H-5606	0.25 US Quart (0.24 L)
	Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: MIL-PRF-87257	
Nose Tire	Dry Compressed Air	*Serials w/ tube tire:* 40+/-2 psi (276+/-15 kPa)
		Serials w/ tubeless tire: 30 - 35 psi (207 - 241 kPa)
Main Tires	Dry Compressed Air	*Serials w/ tube tires:* 62+2/-0 psi (427+/-15 kPa)
		Serials w/ tubeless tires: 60 - 65 psi (414 - 448 kPa)
Refrigerant	R134a	1.8 lb (0.82 kg)

Figure 12-101
Approved Materials and Service Capacities

Description	P/N or Spec.	Capacity
Caution: Polyester oil and polyalkyline glycol oil are not interchangeable. Air Conditioning Compressor	Polyalkyline Glycol Oil (PAG)	4 oz (0.12L)
Oleo Strut	AeroShell Fluid 41 Hydraulic Fluid	9.46 ±0.06 inch^3 (155.0 ±1.0 cm^3)
	Pressurized Nitrogen Gas	270.0 ±10.0 psi (1.86 ±0.07 MPa)

Figure 12-101
Approved Materials and Service Capacities

2. MAINTENANCE PRACTICES

A. Fuel System

(1) Safety Precautions

WARNING: A fire extinguisher must be available.

Ground exhaust pipe outlet and fuel service equipment prior to every fueling and defueling procedure.

Check wing fuel tank vents for obstruction before refueling.

Do not fill tanks within 100 feet (30.48 meters) of any energized electrical equipment capable of producing sparks.

Do not smoke or allow smoking or open flame within 100 feet (30.48 meters) of airplane or vehicle.

Do not operate electronic equipment or electrical switches during the fueling or defueling procedure.

Frequently check fuel for ice formation during cold weather operation.

Sample fuel after each refueling and before the first flight of the day for any moisture or contaminates. Wait at least five minutes for any moisture and sediment to settle before flushing fuel drain valves.

(2) Approved Fuels and Capacities (See Figure 12-101)

WARNING: Service the fuel tanks with 100 (green) or 100LL (blue) minimum grade fuel only. The use of lower octane rated fuel can result in destruction of an engine the first time high power is applied. If the airplane is inadvertently serviced with the wrong grade of fuel, the fuel system must be completely drained, properly serviced, and the proper engine inspection completed. Engine inspection should be performed as indicated in the Teledyne Continental Motors Overhaul Manual.

(3) Refueling Procedure

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fire Extinguisher (Type AB or ABC)	-	Any Source	Extinguish fire in an emergency.
Rubber Protective Cover	-	Any Source	Protect finish of airplane.
Fuel Sampler Cup	50627-001	Cirrus Design	Inspect fuel for contaminates.

WARNING: Place a fire extinguisher near the fuel tank to be serviced.

(b) Ground fuel truck or cart to suitable earth ground.

(c) Connect ground wire from fuel service nozzle to the engine exhaust pipe outlet.

(d) Place a rubber protective cover over upper portion of wing, around fuel tank filler.

CAUTION: Do not permit fuel nozzle to come in contact with bottom of fuel tanks. Keep fuel tanks full at all times to minimize condensation and moisture accumulation in tanks. In extreme humid areas the fuel should be checked frequently and drained of condensation to prevent potential problems.

(e) Remove fuel cap and fill fuel tank to desired level.

Note: If fuel is going to be added to only one fuel tank, the tank being serviced should be filled to the same level as the other fuel tank.

(f) Remove fuel service nozzle and install fuel cap.
(g) Move fire extinguisher, rubber protective cover, and fuel service nozzle to remaining tank to be filled.
(h) Place rubber protective cover over remaining fuel tank filler.
(i) Remove fuel cap and fill fuel tank to desired level.
(j) Remove fuel service nozzle and install fuel cap.
(k) Remove rubber protective cover from fuel tank servicing area.
(l) Remove ground wire from engine exhaust pipe outlet.
(m) Disconnect fuel truck or cart from suitable earth ground.
(n) Put fire extinguisher away.

(4) Airplane De-fueling - Siphoning Method

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Fire Extinguisher (Type AB or ABC)	-	Any Source	Extinguish fire.
Rubber Protective Cover	-	Any Source	Protect finish of airplane.
Fuel Drain Container	-	Any Source	Drain old fuel into.
Hand Operated Pump	-	Any Source	Siphon fuel.
Fuel Sampler Cup	50627-001	Cirrus Design	Drain collector tanks and gascolator.
Fuel Supply	100LL (Blue) 100 (Green)	Any Source	Fuel airplane.

(b) Position fuel drain container at fuel tank filler neck.
(c) Ground fuel drain container to exhaust pipe outlet and airplane to a suitable earth ground.
(d) Place a rubber protective cover over upper portion of wing around fuel tank servicing area.
(e) Remove filler cap.
(f) Remove all fuel using a hand operated siphoning pump.
(g) Install filler cap.
(h) Repeat for remaining fuel tank.
(i) To completely drain fuel system, use fuel sampler cup to remove all fuel and any contaminates from gascolator and collector tanks.
(j) Fuel airplane. (Refer to 12-10)
(k) Inspect complete fuel system for any signs of leaks and service as required.

CAUTION: If fuel system is drained or a fuel tank is empty for any reason, air may enter the system. To ensure proper engine operation, ground run engine for several minutes on each fuel tank until air is removed. Refer to the Pilot's Operating Handbook before starting and operating engine.

(l) Ground run engine to purge air from fuel system.

(m) Reinspect complete fuel system for any signs of leaks and service as required.

(5) Airplane De-fueling - Electric Fuel Pump Method

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Fire Extinguisher (Type AB, or ABC)	-	Any Source	Extinguish fire.
Fuel Drain Container	-	Any Source	Drain old fuel into.
Fuel Drain Hose (extension)	-	Any Source	Drain fuel.
Fuel Supply	100LL (Blue) 100 (Green)	Any Source	Fuel airplane.
Fuel Sampler Cup	50627-001	Cirrus Design	Drain collector tanks and gascolator.

(b) Position fuel drain container at electric fuel pump, located aft of engine.

(c) Ground fuel drain container to exhaust pipe outlet and airplane to a suitable earth ground.

(d) Disconnect fuel supply hose at electric fuel pump.

(e) Attach an auxiliary fuel drain hose extension to end of existing fuel supply hose.

(f) Place opposing end of fuel drain hose extension into fuel drain container.

(g) Set fuel selector valve to tank to be drained.

(h) Remove filler cap.

CAUTION: Never allow electric fuel pump to run dry.

(i) Set electric fuel pump switch to ON position. Allow fuel pump to operate until fuel tank is empty, then immediately set electric fuel pump switch to OFF position.

(j) Install filler cap.

(k) Repeat for remaining fuel tank.

(l) To completely drain fuel system, use fuel sampler cup to remove all fuel and any contaminates from gascolator and collector tanks.

(m) Remove auxiliary fuel drain hose extension.

(n) Secure fuel supply hose to engine driven fuel pump.

(o) Fuel airplane. (Refer to 12-10)

(p) Inspect complete fuel system for any signs of leaks and service as required.

CAUTION: If fuel system is drained or a fuel tank is empty for any reason, air may enter the system. To ensure proper engine operation, ground run engine for several minutes on each fuel tank until air is removed. Refer to the Pilot's Operating Handbook before starting and operating engine.

(q) Ground run engine to purge air from fuel system.

(r) Reinspect complete fuel system for any signs of leaks and service as required.

(6) Airplane De-fueling - Drain Valve Method

The fastest and most efficient way to de-fuel the airplane is by removing the fuel drain valves. For maintenance practices pertinent to the fuel drain valves, see Chapter 28, Fuel. (Refer to 28-10)

B. Engine Oil System (See Figure 12-101)

The Teledyne Continental IO-360-ES engine uses a wet sump pressurized lubrication system with an 8 quart (7.57 L) capacity. A dipstick is provided for determining the amount of oil in the crankcase.

CAUTION: The oil level should be brought to full before each long flight. Never fly the airplane with less than 6 quarts of oil (5.7 Liters) in the crankcase of the engine. Oil consumption tends to be higher during break-in periods on new engines. Under no circumstances should automotive oil be used, for such oils could cause engine damage. If the oil system becomes contaminated, the complete oil system must be flushed and the oil cooler replaced.

For the first 25 hours of operation (on a new or rebuilt engine) or until oil consumption stabilizes, use only straight mineral oil conforming to SAE J1966. After oil consumption stabilizes the mineral oil should be drained and an approved engine oil used. (Refer to 12-10)

Straight mineral oil conforming to MIL-C-6529 with a corrosion preventive compound added, can cause coking with extended use; therefore Cirrus Design does not recommend its use for break-in or post break-in. Oil conforming to MIL-P-46002 with a corrosion preventive compound added is recommended by TCM and Cirrus Design for indefinite storage. (Refer to 10-30)

(1) Oil System Replenishing

(a) Acquire necessary tools and equipment

Note: At Ambient Air Temperature (SL) below 40°F use SAE 30 or Multi Viscosity.

At Ambient Air Temperature (SL) above 40°F use SAE 50 or Multi Viscosity.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell (R) W	See Desc.	Shell Australia	Lubrication
Aeroshell Oil W Aeroshell Oil 15W-50 Anti-Wear Formulation	See Desc.	Shell Canada Ltd.	Lubrication
Aeroshell Oil W Aeroshell Oil 15W-50 Anti-Wear Formulation Aeroshell Oil W Plus	See Desc.	Shell Oil Company	Lubrication
BP Aero Oil	See Desc.	BP Oil Corporation	Lubrication
Castrol Aero AD Oil	See Desc.	Castrol	Lubrication
Castrol Aero AD Oil	See Desc.	Castrol Ltd. (Australia)	Lubrication
Chevron Aero Oil	See Desc.	Chevron U.S.A. Inc.	Lubrication
Conoco Aero S	See Desc.	Continental Oil	Lubrication
Delta Avoil Oil	See Desc.	Delta Petroleum Co.	Lubrication

Description	P/N or Spec.	Supplier	Purpose
Exxon Aviation Oil EE Exxon Elite	See Desc.	Exxon Company, U.S.A.	Lubrication
Gulfpride Aviation AD	See Desc.	Gulf Oil Company	Lubrication
Mobil Aero Oil	See Desc.	Mobil Oil Company	Lubrication
Pennzoil Aircraft Engine Oil	See Desc.	Pennzoil Company	Lubrication
Phillips 66 Aviation Oil Type A 100 AD, 120 AD X/C Aviation Multi Viscosity Oil SAE 20W-50, SAE 25W-60	See Desc.	Phillips Petroleum Company	Lubrication
Quaker State AD Aviation Oil	See Desc.	Quaker State Oil & Refining Co.	Lubrication
Red Ram X/C Aviation Oil 20W-50	See Desc.	Red Ram Ltd. (Canada)	Lubrication
Sinclair Avoil	See Desc.	Sinclair Oil Company	Lubrication
Texaco Aircraft Engine Oil - Premium AD	See Desc.	Texaco Inc.	Lubrication
Total Aero DM 15W-50	See Desc.	Total France	Lubrication
Turbonycoil 3570	See Desc.	NYCO S.A.	Lubrication
Union Aircraft Engine Oil HD	See Desc.	Union Oil Company of California	Lubrication

(b) Ensure airplane is sitting on a level surface with the engine off.

(c) Open access door on upper LH side of engine cowling.

Note: To install the oil filler cap/dipstick, point handle loop of dipstick towards the #2 cylinder (left, aft) and use both hands to guide, rotate, and install dipstick. Ensure minimum oil quantity is 6 quarts (5.7 Liters).

(d) Using filler cap dipstick, verify engine oil level.

(e) Add approved oil as necessary. (Refer to 12-10)

(f) Verify engine oil level and install filler cap.

(g) Secure access door to engine cowling.

(2) Changing Engine Oil and Filter

Note: During periods of prolonged operation in dusty areas or in cold climates, or when flights have been of short duration with prolonged idling time, change oil and filter every 25 hours.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Oil Filter Strap Wrench	GA340	Snap-on Tools Kenosha, WI	Remove oil filter.
Oil Drain Pan	-	Any Source	Drain used engine oil.
Safety Wire,0.032 Inch	MS20995	Any Source	Secure fasteners.
Safety Wire Plier	M-84	Genair Ltd.	Tension safety wire.
Flexible Oil Funnel	-	Any Source	Replenish engine oil.

(b) Warm engine to operating temperatures prior to changing oil.
(c) Remove engine cowling. (Refer to 71-10)
(d) Position oil drain pan under drain plug.

Note: A flexible oil funnel may be used to aid draining process.

(e) *Serials 1005 thru 1651, 1886 & subs:* Remove safety wire securing drain plug. Remove drain plug and allow oil to completely drain out.
(f) *Serials 1652 thru 1885:* Open drain valve and allow oil to completely drain out.
(g) Remove safety wire securing oil filter
(h) Remove oil filter from airplane.
(i) Lubricate seal with oil and secure new filter. Torque filter to 18 - 20 ft-lb (24.4 - 27.1 Nm).
(j) Safety wire oil filter.
(k) *Serials 1005 thru 1651, 1886 & subs:* Install drain plug using a new gasket. Torque drain plug to 17 ft-lb (23 Nm).
(l) *Serials 1005 thru 1651, 1886 & subs:* Safety wire drain plug. (Refer to 20-50)
(m) *Serials 1652 thru 1885:* Close drain valve.
(n) Replenish engine oil sump with approved oil. (Refer to 12-10)
(o) Using integral filler cap and dipstick, verify engine oil level.
(p) Install filler cap.
(q) Install engine cowling. (Refer to 71-10)
(r) Perform Inspection/Check - Oil System Leak. (Refer to 12-10)

(3) Inspection/Check - Oil System Leak

CAUTION: If oil pressure is not present after 10 seconds of running time, shut the engine down immediately.

(a) Start the engine in accordance with Pilot's Operating Handbook procedures and monitor the engine oil pressure gage for proper oil pressure. Allow engine to idle for a few minutes and shutdown engine in accordance with POH procedures.
(b) Remove engine cowling. (Refer to 71-10)
(c) Visually inspect engine for any obvious leaks. Repair leaks immediately.

(d) Verify engine oil level. Replenish as required.

(e) Secure filler cap.

(f) Install engine cowling. (Refer to 71-10)

(4) Inspection/Check - Oil Filter Particles

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Oil Filter Can Cutter	CT-470	Champion Spark Plug Toledo, OH	Inspecting oil filter element.

(b) Secure oil filter in a vise.

(c) Using a can cutter, secure cutter on filter mounting plate. Tighten knurled head screw until cutter blade meets metal can surface of filter.

(d) Rotate cutter 360° while observing that cutter blade is penetrating metal can portion of filter. Continue tightening knurled head screw and rotating cutter until filter mounting plate is free from canister.

(e) Carefully remove element from canister. Cut filter material from end caps.

(f) Carefully unfold element and inspect for abnormal metal particles trapped in filter element.

C. Hydraulic Brake System

The main wheels have hydraulically operated, single-disc type brakes, individually activated by floor mounted toe pedals at both pilot stations. A parking brake mechanism holds induced hydraulic pressure on the disc brake for parking. The brake reservoir is located on the right side of the firewall in the engine compartment. The fluid level should be checked periodically and at every inspection and replenished when necessary. If the entire system must be filled, fill with fluid under pressure from the brake end of the system. This will eliminate air in the system. If the system is low, the reason for loss of fluid must be determined before continued operation of the aircraft. For additional brake information refer to 32-42. (Refer to 32-42)

WARNING: **Never service the hydraulic reservoir while the parking brake is activated. Fluid in the wheel cylinders may be under high pressure due to expansion. Therefore, be sure parking brake is released and wheel chocks are in place, prior to beginning hydraulic system servicing. If the brake pedal feels spongy, the complete brake system must be bled. If the system is low, the reason for fluid loss, must be determined before continued operation of the airplane. Any spilled brake fluid must be removed immediately as it will damage any painted surface upon contact. Remove any dirt on the brake fluid reservoir filler cap before opening.**

(1) Brake Fluid Replenishing

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Hydraulic Fluid	*Serials 1005 thru 2240 before SB2X-32-21:* MIL-H-5606	Any Source	Replenish brake system.
	Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: MIL-PRF-87257		
Syringe	-	Any Source	Remove hydraulic fluid.

(b) Remove upper engine cowling. (Refer to 71-10)

(c) Remove any dirt from hydraulic brake fluid reservoir before opening filler cap.

(d) Remove filler cap and add hydraulic brake fluid to reservoir until full.

(e) Use syringe to remove approximately 0.24 oz (7 ml) of hydraulic fluid from brake reservoir.

(f) Install the filler cap.

(g) Inspect entire brake system for leakage or problems.

(h) Install engine cowling. (Refer to 71-10)

(2) Brake Fluid Draining

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drain Pans	-	Any Source	Fluid recovery.

(b) Place drain pans under LH and RH brake bleeder fitting on brake assemblies.

(c) Remove bleeder caps and screws from bleeder fittings.

(d) Pump brake pedals to drain brake fluid from system.

D. Tires

Always keep tires inflated to the rated pressure to assure maximum service and to reduce damage when landing on stones with sharp edges. When adjusting tire pressure, inspect the tires for any signs of abnormal wear, cuts, or bruises. If airplane tires should ever freeze to ground surface, use hot air or water to free tires before attempting to move airplane. For additional tire and wheel information refer to Chapter 32. (Refer to 32-41)

(1) Tire Air Pressure Replenishing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressed Air Supply	-	Any Source	Adding air pressure to tires.
Accurate Air Pressure Gage	-	Any Source	Checking tire pressure.
Wheel Chocks	-	Any Source	Securing airplane.

CAUTION: The following procedure must be performed in calm, warm weather, with the airplane sitting on a smooth and level surface. Always check air pressure using an accurate gage.

Note: Always consider load factor and ambient temperature when checking air pressure. Air pressure will increase when the tire is subjected to a load and when the temperature increases.

Whenever an air pressure specification is called out, but not defined as loaded or unloaded, it should be considered as unloaded.

Always service tires in a warm environment, this will keep the valve stem from freezing and eliminate the possibility of leaks through the valve core.

After inspecting or adjusting tire pressure, always inspect the valve core for leaks before reinstalling the valve cap.

Always install a valve cap to prevent contaminates from entering the valve core.

(b) Set parking brake and place wheel chocks into position.
(c) *Serials 1005 thru 2221:* Remove access plug from wheel pant.
(d) *Serials 2222 & subs:* Open access door on wheel pant.
(e) Release parking brake and remove wheel chocks.
(f) Move airplane until valve stem is accessible through wheel pant inspection hole.
(g) Place wheel chocks in position.
(h) Remove valve cap.
(i) Using an accurate gage, verify tire pressure. (See Figure 12-101)
(j) Add compressed air to tire as required to obtain recommended pressure. If tire is over inflated, push in on valve core and release air to obtain recommended pressure.
(k) Inspect valve core for leaking.
(l) Install valve cap.
(m) *Serials 1005 thru 2221:* Install access plug to wheel pant.
(n) *Serials 2222 & subs:* Close access door on wheel pant.
(o) Reset parking brake and place wheel chocks into position.

E. Battery System

Serials 1005 thru 1267: A 24-volt lead-acid battery is used for energy storage. The battery is located in the engine compartment. Electrolyte maintenance is required. Proper battery charging procedures, along with other pertinent information can be found in a Chapter 24. (Refer to 24-30)

Serials 1268 & subs w/ TCM Battery: Two batteries are used on this airplane for energy storage. Battery 1 is located in the engine compartment and is the only battery requiring electrolyte maintenance. Battery 2 is located aft of bulkhead 222 and is considered a sealed, maintenance free battery.

Serials 2016 & subs w/ Concorde Battery: Two batteries are used on this airplane for energy storage. Battery 1 is located in the engine compartment and is considered a sealed, maintenance free battery. Battery 2 is located aft of bulkhead 222 and is considered a sealed, maintenance free battery.

Visual inspection of battery 1 should be done every month or 25 flight hours until experience indicates a longer inspection interval. Check the battery, container, cover and connections for distortion or damage. Proper battery charging procedures for both types of batteries, along with other pertinent information can be found in Chapter 24. (Refer to 24-30)

WARNING: **Always wear a face shield and remove all jewelry before servicing the battery. Metal objects may fuse to electrical connections and cause severe burns. Neutralize electrolyte spills with a solution of baking soda and water, then rinse with clean water.**

Do not add acid to battery unless electrolyte has been lost by spillage. When it is necessary to add acid, the battery should be fully charged, on charge, and gassing freely. Specific gravity may then be adjusted by adding acid or distilled water, or drawing off electrolyte.

(1) Battery Electrolyte Level Check - *Serials 1005 & subs w/ TCM Battery*

(a) Remove battery 1. (Refer to 24-30)

(b) Remove battery cell caps.

(c) Visually inspect battery cells for proper electrolyte level.

Note: As an example, a warm battery condition would exist just after a bench charge or following a flight of ninety minutes or more.

1 If battery is warm and in a good state of charge, verify electrolyte level just touches or is slightly short of level indicator eyelet.

2 At all other times, verify electrolyte level is approximately 1/4 inch (6.4 mm) above the plates.

(d) If a battery cell is low, add distilled water to obtain proper electrolyte level and charge battery to mix the electrolyte. (Refer to 24-30)

(e) Perform Battery 1 Electrolyte Specific Gravity Check. (Refer to 12-10)

(f) Install battery cell caps.

(g) Install battery 1. (Refer to 24-30)

(2) Battery 1 Electrolyte Specific Gravity Check - *Serials 1005 & subs w/ TCM Battery*

Electrolyte is a diluted solution of sulfuric acid and distilled water with a specific gravity of 1.285. Pure distilled water has a specific gravity of 1.000 and concentrated sulfuric acid has a specific gravity of 1.835.

The specific gravity of the electrolyte in a battery cell is a good index to the state of charge in the cell, due to the fact that as the battery is discharged, the acid in the electrolyte is used up. A specific gravity reading from 1.285 to 1.295 usually indicates a fully charged cell. If the reading is from 1.220 to 1.260, the charge is considered low.

It must be noted that the specific gravity reading is not always an indication of the state of charge in a cell. If electrolyte is removed from a discharged cell and replaced with an electrolyte of high specific gravity, the cell will still be in a discharged condition even though the hydrometer indicates a full charge reading.

Note: Temperature must be considered when measuring specific gravity. Hydrometer readings will vary as the temperature goes above or below 80° F (26.70° C). The standard temperature used in rating lead acid battery performance is 77° F (25° C).

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Hydrometer	-	Any Source	Measure specific gravity.
Small Plastic Syringe	-	Any Source	Replenish electrolyte.
Distilled Water	-	Any Source	Replenish electrolyte.
Bicarbonate of Soda (baking soda)	-	Any Source	Neutralize electrolyte.
Rubber Apron and Gloves	-	Any Source	Prevent electrolyte exposure.
Face Shield and Goggles	-	Any Source	Prevent electrolyte exposure.

(b) Remove battery 1. (Refer to 24-30)

(c) Remove battery cell cap.

Note: If electrolyte level is too low for accurate hydrometer readings, add just enough distilled water to cover the plates. Charge battery to mix the electrolyte. Continue charging until the voltage and specific gravity readings are constant over three readings taken at 1/2 hour intervals.

(d) Draw electrolyte into hydrometer.

(e) Verify specific gravity of electrolyte measures 1.225 or above.

(f) Return electrolyte to same cell from which electrolyte was removed.

Note: To prevent contamination between cells, immediately install cell caps to original location after testing specific gravity.

(g) Install battery cell cap.

Note: Adjust electrolyte level at the end of a charge because the level will rise from acid coming back into the electrolyte mix, normal gassing, and expansion from the temperature rise.

(h) If necessary, adjust specific gravity of battery cell by adding distilled water or drawing off electrolyte.

(i) Repeat for remaining battery cells.

(j) Install battery 1. (Refer to 24-30)

F. Air Conditioning System - *Serials w/ Optional Installation*

(1) Inspection/Check - Refrigerant Level

Note: Check refrigerant level when ambient temperature is above 65°F.

(a) Start engine. (Refer to Pilot's Operating Handbook, Section 4)
(b) Set air conditioning switch to ON position.
(c) Run air conditioning system for at least 5 minutes.

Note: If outlet measures considerably cooler, the receiver/drier may be plugged and may require replacement.

(d) Verify temperature at receiver/drier inlet equals temperature at receiver/drier outlet.
(e) Verify sight glass is free of bubbles.
(f) Set air conditioning switch to OFF position.
(g) Shut down engine. (Refer to Pilot's Operating Handbook, Section 4)
(h) Replenish refrigerant level as necessary.

(2) Refrigerant Recharging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
R134a Compatible Recovery/Recycling/ Recharging Unit	-	Any Source	Recharge refrigerant.
Compressor Oil	(See Figure 12-101)	Any Source	Replenish compressor oil.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Pull COMPRESSOR/CONTROL PANEL circuit breaker.
(d) Pull EVAPORATOR FAN circuit breaker.
(e) Pull CONDENSER circuit breaker.
(f) Remove RH sidewall air duct trim. (Refer to 25-10)
(g) Empty oil drain bottle on recharging unit.
(h) At RH crew seat, remove caps from air conditioning service ports.
(i) Connect recharging unit pressure hoses to service ports.
(j) Open coupler valves on pressure hoses.

Note: Operate recharging unit in accordance with manufacturer's instructions.

(k) Recover refrigerant from system.

Note: Note the amount of oil collected in drain bottle during recovery. The same amount of oil must be added to system during recharging.

(l) Record amount of oil collected in drain bottle during recovery.
(m) Evacuate system for at least 15 minutes to remove any air, moisture, or contaminants.
(n) Perform recharging unit automated leak check.

CAUTION: Add the same amount of oil to system as was removed during recovery. Polyester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(o) Replenish system with same amount of oil as removed during recovery.

Note: To ensure a full charge is delivered, the recharging unit must be set to deliver slightly more than the recommended 1.8 lb (0.82 kg) to account for refrigerant that stays in the recharging unit lines. Consult manufacturer's instructions to determine specifics for the recharging unit being used.

(p) Recharge system with 1.8 lb (0.82 kg) of R134a refrigerant.
(q) Perform Inspection/Check - System Plumbing Refrigerant Leak Test. (Refer to 21-50)
(r) Close coupler valves on pressure hoses.
(s) Disconnect recharging unit pressure hoses from service ports.
(t) Cap air conditioning system service ports.
(u) Install RH sidewall air duct trim. (Refer to 25-10)
(v) Reset CONDENSER circuit breaker.
(w) Reset EVAPORATOR FAN circuit breaker.
(x) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(3) Refrigerant Discharging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
R134a Compatible Recovery/Recycling/ Recharging Unit	-	Any Source	Remove refrigerant.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Pull COMPRESSOR/CONTROL PANEL circuit breaker.
(d) Pull EVAPORATOR FAN circuit breaker.
(e) Pull CONDENSER circuit breaker.
(f) Empty oil drain bottle on recovery unit.
(g) Remove RH sidewall air duct trim. (Refer to 25-10)
(h) At RH crew seat, remove caps from air conditioning system service ports.
(i) Connect recovery unit pressure hoses to service ports.
(j) Open coupler valves on pressure hoses.
(k) Recover refrigerant from system.

Note: Note the amount of oil collected in drain bottle during recovery. The same amount of oil must be added to system during recharging.

(l) Record amount of oil collected in drain bottle during recovery.
(m) Close coupler valves on pressure hoses.
(n) Disconnect recovery unit pressure hoses from service ports.
(o) Cap air conditioning system service ports.

G. Oleo Strut - *Serials 2065 & subs*

(1) Servicing - Oleo Strut Fluid and Gas Replenishment **(See Figure 12-101)**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Clear Plastic Tubing, 5/16-inch I.D.	-	Any Source	Fill fluid.
Graduated Cylinder	-	Any Source	Fill fluid.
Hydraulic Fluid	AeroShell Fluid 4	Any Source	Fill fluid.
Pressurized Nitrogen Tank	-	Any Source	Fill nitrogen.
High-Pressure Hose w/ 5/16-inch Threaded Fitting	-	Any Source	Fill nitrogen.

(b) Remove engine cowling. (Refer to 71-10)

(c) Attach weighted jack stand at aft tail tiedown and raise nose of airplane. (Refer to 07-10)

(d) Remove cap nut from fill valve stem, and slowly open fill valve to bleed nitrogen from oleo strut.

(e) Allow one minute to de-pressurize oleo strut.

(f) If replenishing nitrogen gas only, close fill valve.

(g) If replenishing hydraulic fluid:

1 Fill clean, graduated cylinder with minimum 0.5 quart (0.47 liter) of hydraulic fluid.

2 Connect tight-fitting, clear plastic tubing to fill valve stem.

3 Immerse other end of tubing into graduated cylinder of hydraulic fluid.

4 Slowly raise wheel to fully compress piston rod and observe that during compression, entrapped gas and excess hydraulic fluid are expelled.

5 Slowly lower wheel to fully extend piston rod and observe that during extension, hydraulic fluid is drawn into oleo strut.

6 Repeat sequence of slowly raising and lowering wheel several times until all entrapped gas is eliminated and at least half of piston rod compression travel expels a steady stream of hydraulic fluid free of bubbles.

7 Slowly raise wheel to fully compress piston rod, expelling additional gas and excess hydraulic fluid. Maintain wheel support so that oleo strut remains fully compressed.

8 Close fill valve.

9 Disconnect plastic tubing from fill valve stem.

(h) Connect high-pressure hose from pressurized nitrogen tank to fill valve stem.

(i) Slowly open pressurized nitrogen tank valve to feed high-pressure hose with nitrogen to 20 psi (0.14 MPa).

(j) Slowly open fill valve and allow oleo strut to reach full extension.

CAUTION: Do not exceed pressure rate increase of 100 psi (0.69 MPa) per minute.

(k) Slowly regulate nitrogen intake into oleo strut to 270.0 ±10.0 psi (1.86 ±0.07 MPa).

(l) When nitrogen pressure limit is reached, maintain pressure and close fill valve. Torque to 45 - 70 in-lb (5.0 - 7.9 Nm).

(m) Close pressurized nitrogen tank valve and bleed high-pressure hose.

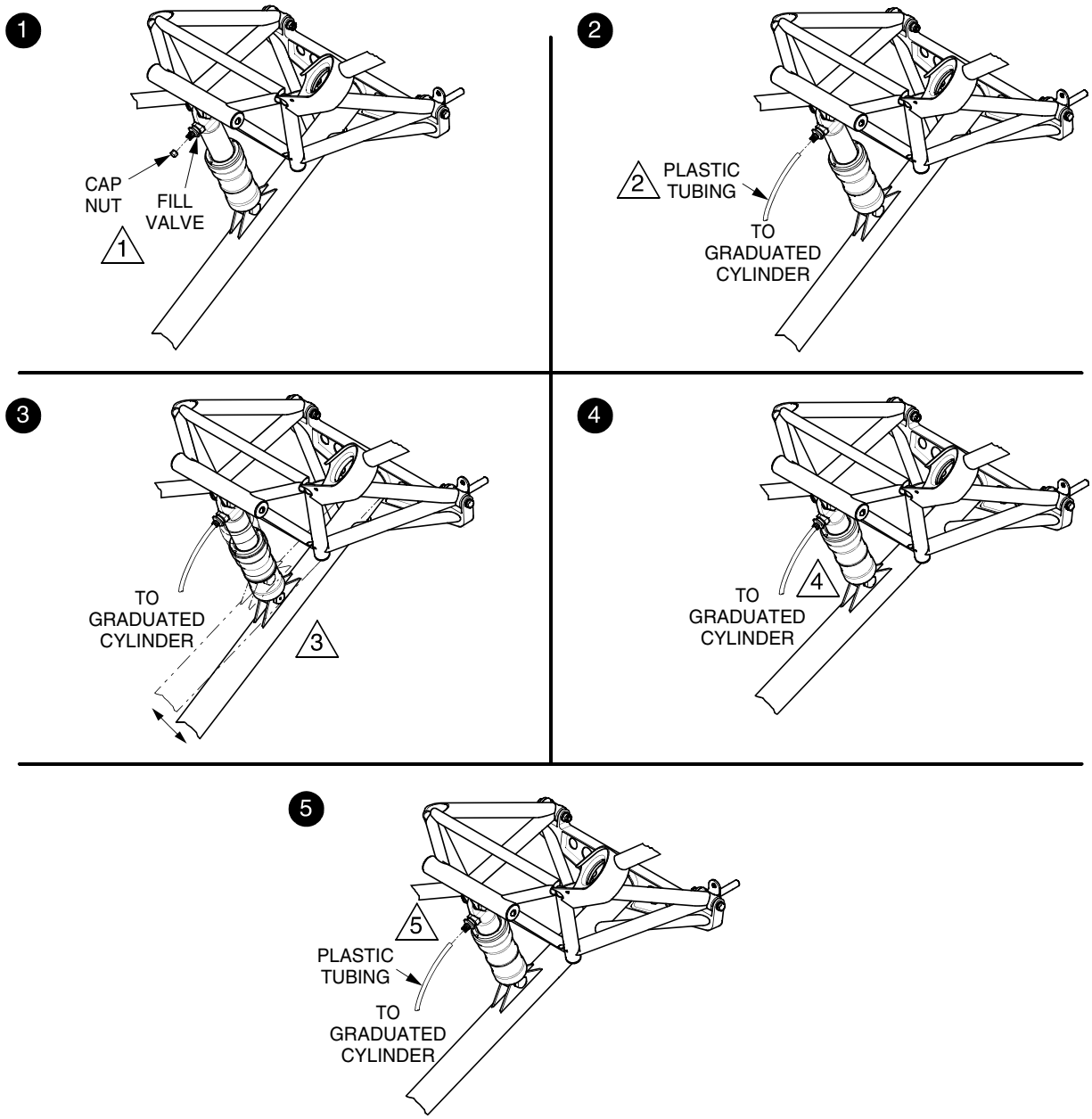
(n) Disconnect high-pressure hose from fill valve stem.

(o) Install cap nut on fill valve stem.

(p) Verify fill valve and sealing ring are tightly installed.

(q) Lower nose of airplane and remove weighted jack stand from aft tail tiedown. (Refer to 07-10)

(r) Install engine cowling. (Refer to 71-10)



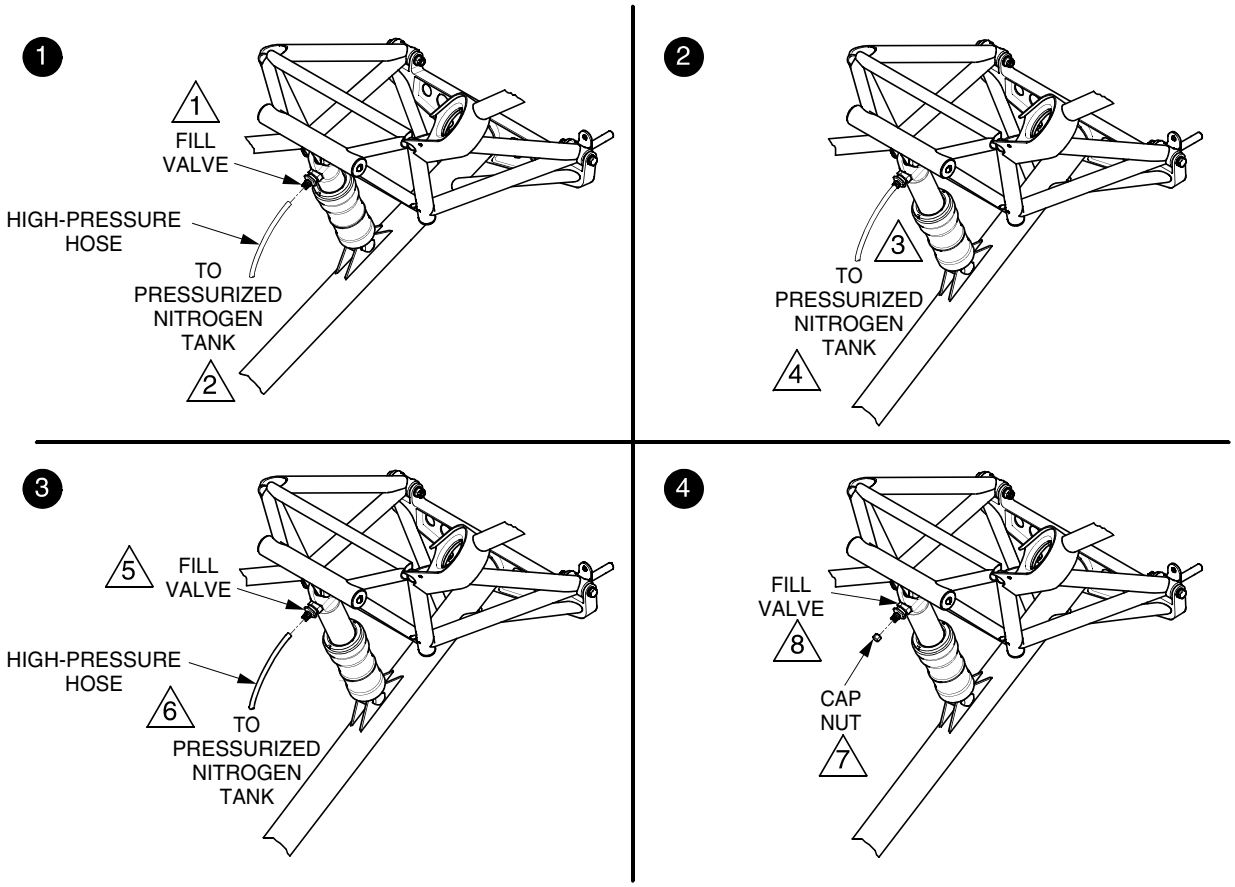
HYDRAULIC FLUID REPLENISHMENT

NOTE

1. Remove cap nut from fill valve stem, and slowly open fill valve to bleed nitrogen from oleo strut.
2. Connect tight-fitting, clear plastic tubing to fill valve stem. Immerse other end of tubing into graduated cylinder filled with 0.5 quart (0.47 liter) of hydraulic fluid.
3. Perform sequence of slowly raising and lowering wheel several times until all entrapped gas is eliminated and at least half of piston rod compression travel expels a steady stream of hydraulic fluid free of bubbles.
4. Slowly raise wheel to fully compress piston rod, expelling additional gas and excess hydraulic fluid. Maintain wheel support so that oleo strut remains fully compressed.
5. Close fill valve and disconnect plastic tubing from fill valve stem.

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Figure 12-102
Servicing - Oleo Strut Fluid and Gas Replenishment (Sheet 1 of 2)



NITROGEN GAS REPLENISHMENT

NOTE

1. Close fill valve. Connect high-pressure hose from pressurized nitrogen tank to fill valve stem.
2. Slowly open pressurized nitrogen tank valve to feed high-pressure hose with nitrogen to 20 psi (0.14 MPa).
3. Slowly open fill valve and allow oleo strut to reach full extension.
4. Slowly regulate nitrogen intake into oleo strut to 270.0 ±10.0 psi (1.86 ±0.07 MPa).
5. When nitrogen pressure limit is reached, maintain pressure and close fill valve. Torque to 45 - 70 in-lb (5.0 - 7.9 Nm).
6. Close pressurized nitrogen tank valve and bleed high-pressure hose. Disconnect high-pressure hose from fill valve stem.
7. Install cap nut on fill valve stem.
8. Verify fill valve and sealing ring are tightly installed.

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Figure 12-102
Servicing - Oleo Strut Fluid and Gas Replenishment (Sheet 2 of 2)

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SCHEDULED SERVICING

1. DESCRIPTION

This section contains information necessary to perform the scheduled servicing requirements of the airplane. A lubrication schedule and list of approved lubricants is provided. Additional information concerning corrosion protection and the cleaning of interior and exterior surfaces is also included.

2. MAINTENANCE PRACTICES

A. Lubrication (See Figure 12-201)

Lubrication and cleanliness should always be considered to be of utmost importance. To prevent rapid and unnecessary deterioration of metal components which are exposed to the elements of nature, the following should always be clean and lubricated.

CAUTION: Never mix lubricants of any kind. Only use lubricants recommended by the manufacturer. Keep threads free of grease to avoid degrading lock nut performance and torque readings. Only use lubricants recommended by the manufacturer.

ID	Item	P/N or Specification	Interval
	Engine Group		
A	Engine Control Cables	Dow Corning 33	As Required
	Engine Control Rod End Bearings	MIL-PRF-23827	100 Hrs
B	N/A	N/A	N/A
C	Battery Post	VV-P-236 (Petrolatum Jelly)	200 Hrs
D	Engine Cowling Access Panel Door	SS-G-659A (Powdered Graphite)	300 Hrs
E	*Serials with Air Conditioning* A/C Compressor Drive Shaft Spline	Molyshield (Preferred Industrial)	As Required

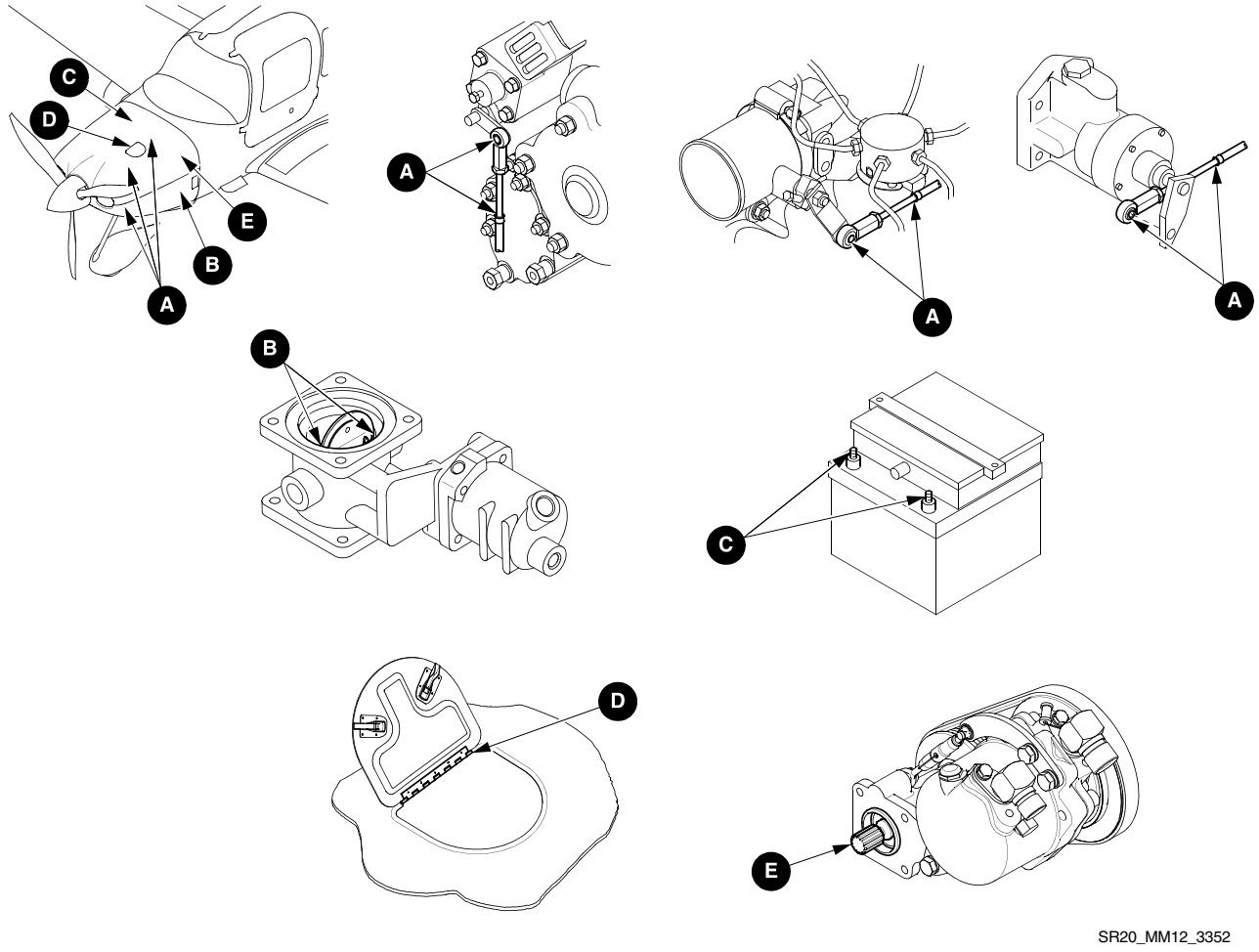


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Propeller Group		
A	Propeller Hub (Refer to Propeller ICA for additional detail) (Refer to 05-10)	MIL-PRF-24139	100 Hrs

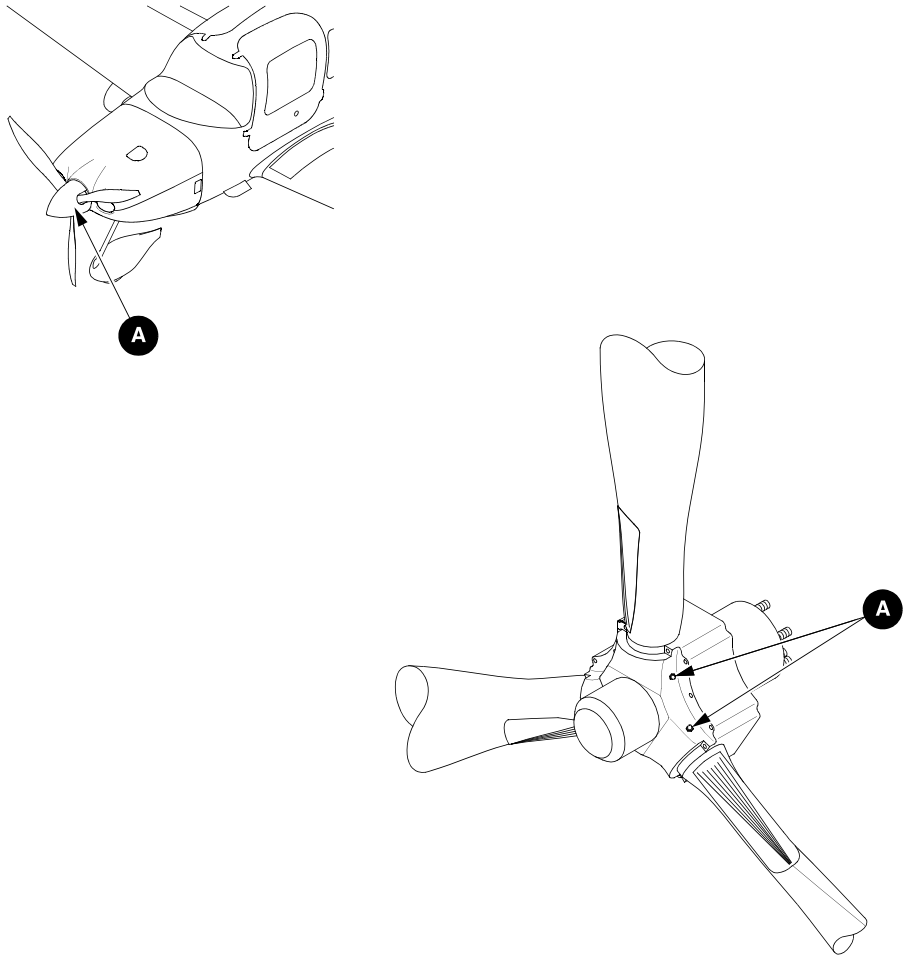


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Cabin Group		
A	Ignition Switch Assembly (Refer to 74-30)	Luberex 10-1206	2000 Hrs
B	Rudder Pedals	MIL-PRF-7870	200 Hrs
	Yaw Trim Cartridge	MIL-PRF-7870	200 Hrs/Annual
C	Control Column Bearings and Tube	MIL-PRF-7870	200 Hrs/Annual
D	Seat Tracks	Paraffin Wax	100 Hrs
E	Cabin Air Control Assembly	MIL-PRF-81322	500 Hrs or 5 Yrs
F	Flap Actuator Shaft	MIL-PRF-7870	100 Hrs/Annual

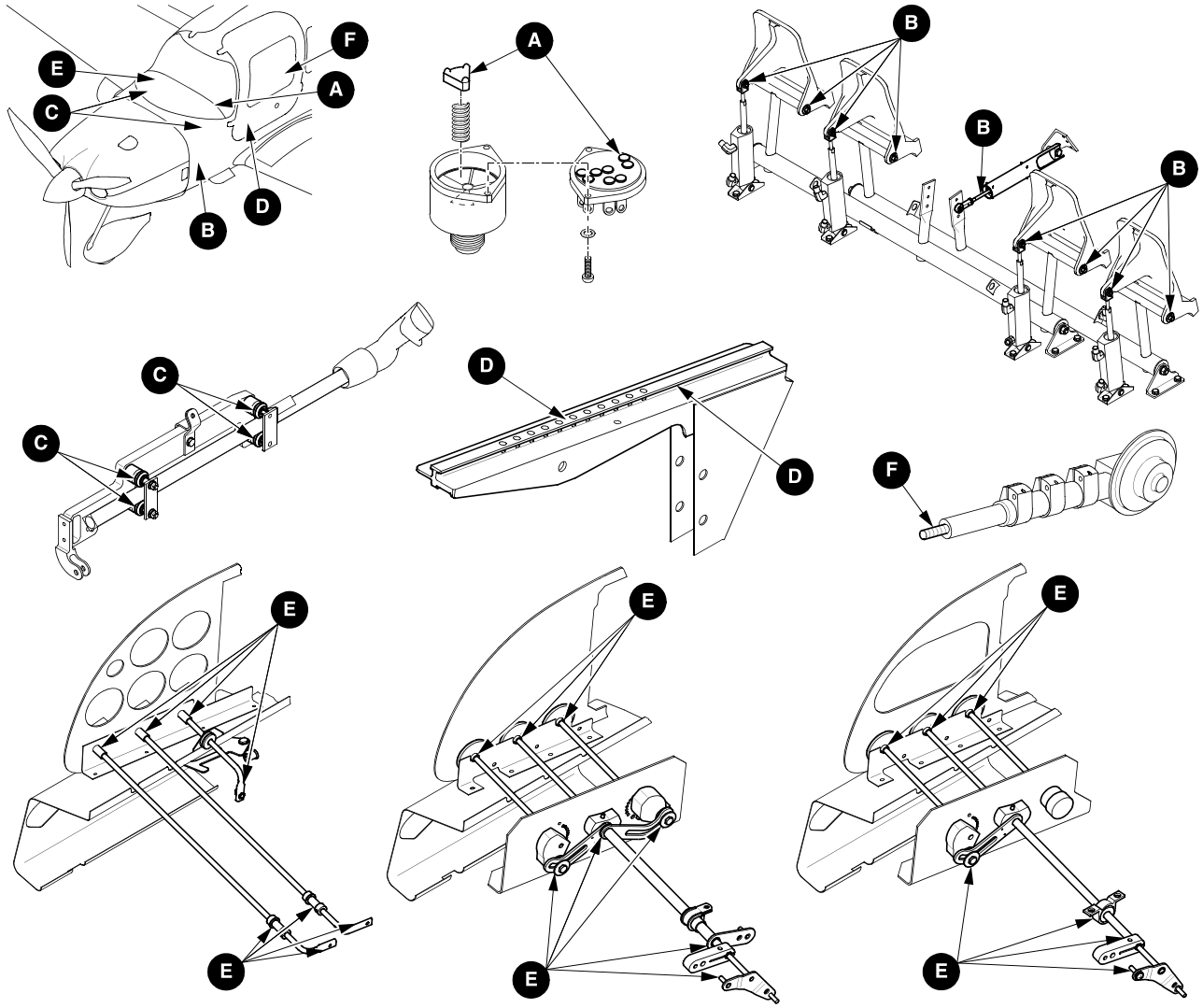


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Fuselage and Empennage Group		
A	Cabin Door Hinges	MIL-PRF-7870	100 Hrs
	Door Handle and Latch Assembly	MIL-PRF-81309	100 Hrs
B	Rudder Assembly and Rod Ends	MIL-PRF-81322	200 Hrs/Annual
C	Cargo Door Hinge	SS-G-659A (Powdered Graphite)	300 Hrs
D	Elevator Bellcranks and Rod Ends	MIL-PRF-81322	200 Hrs/Annual
	Elevator Trim Cartridge	LPS 02416	200 Hrs/Annual

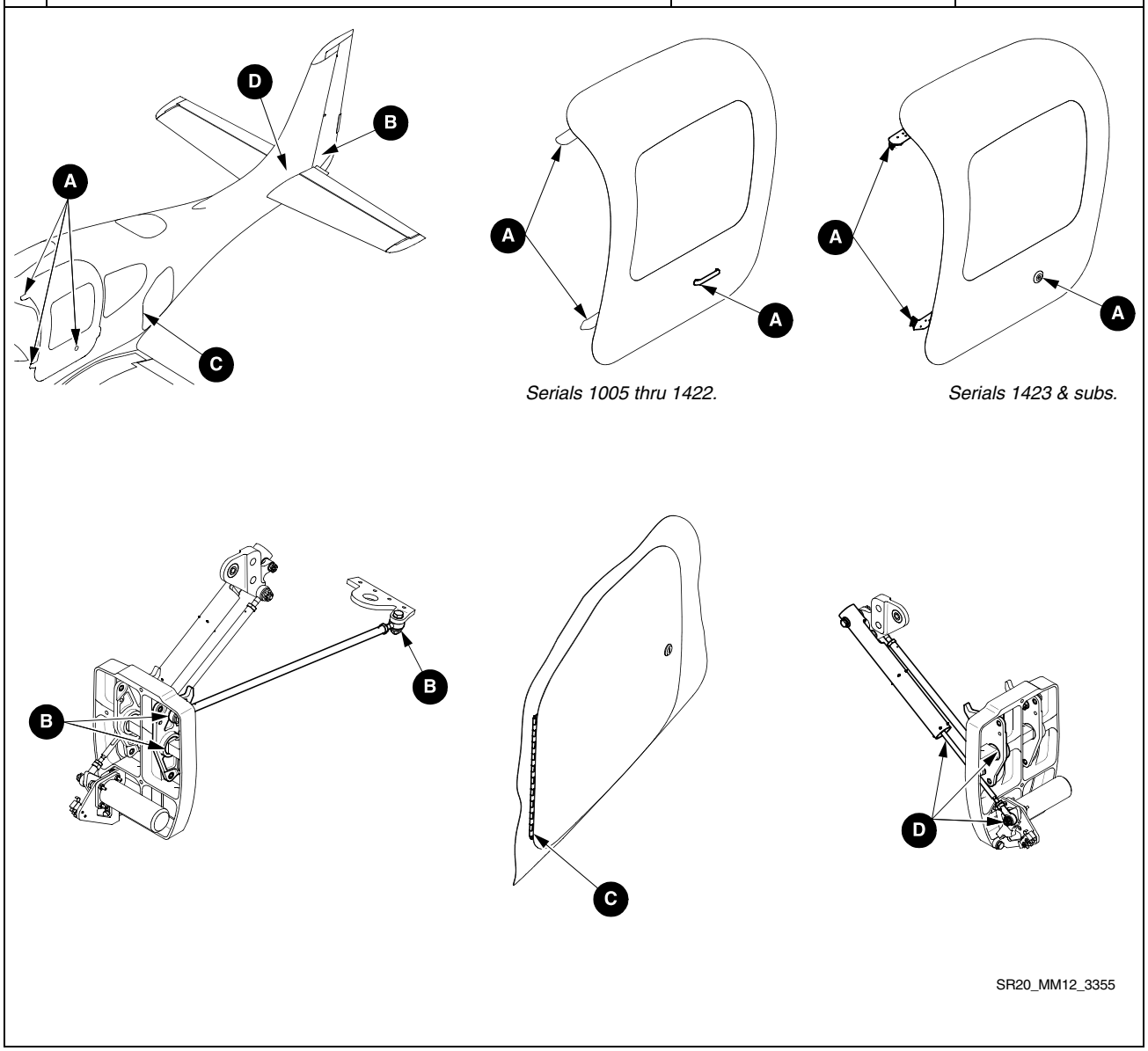


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Wing Group		
A	Roll Trim Cartridge	LPS 02416	200 Hrs/Annual

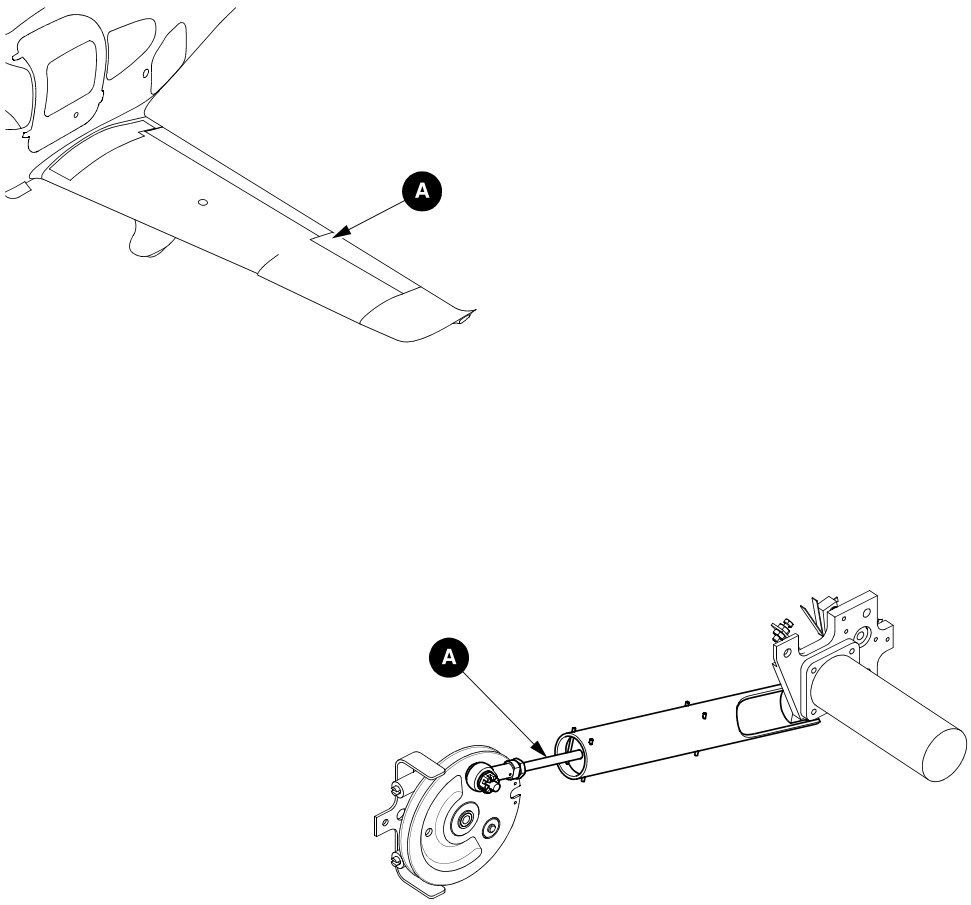


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Landing Gear Group		
A	Nose Wheel Spindle Thread	MIL-PRF-81322	100 Hrs
B	Wheel Bearings - 1005 thru 2240 before SB2X-32-21	SHC-100 or Aeroshell 22	100 Hrs
	Wheel Bearings (sealed) - 1005 thru 2240 after SB2X-32-21, 2241 & subs	N/A	
C	Brake Anchor Bolts	Dry Film Lubricant	On Assembly
	Brake Assembly O-Rings and Cylinder Bores - 1005 thru 2240 before SB2X-32-21	SAE-AMS-G-4343	On Assembly
	Brake Assembly O-Rings and Cylinder Bores - 1005 thru 2240 after SB2X-32-21, 2241 & subs	Thick Silicone Grease (-50°C to 200°C) compliant w/ FDA CFR 178.3570	On Assembly

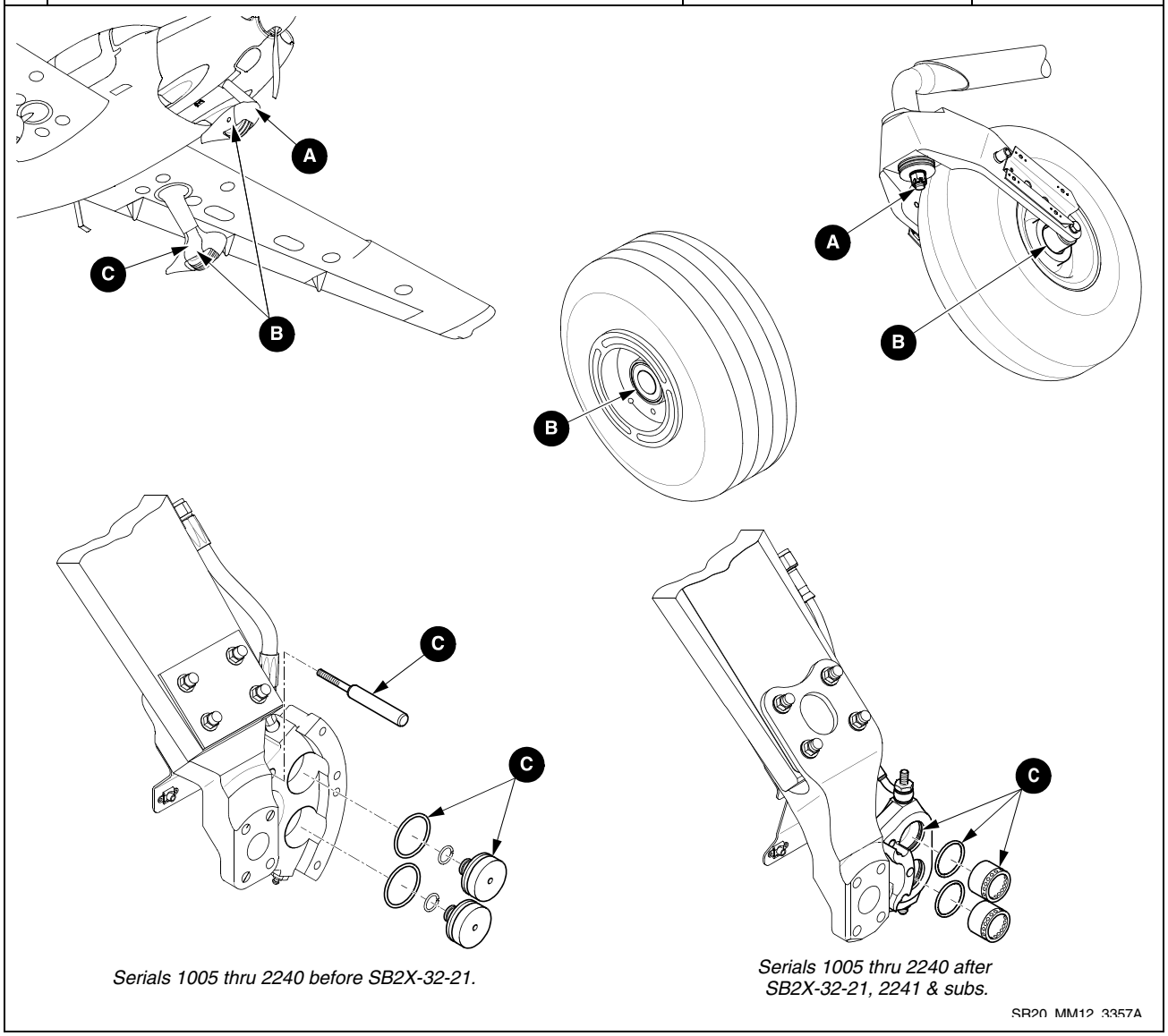
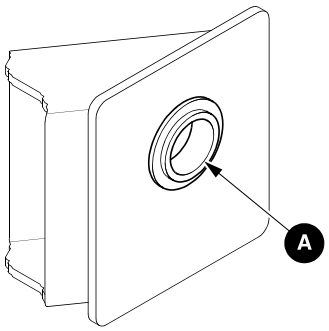
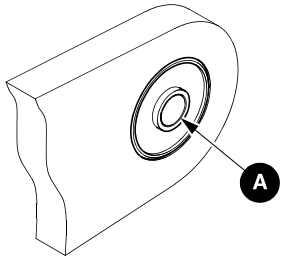


Figure 12-201
Lubrication Schedule

ID	Item	P/N or Specification	Interval
	Miscellaneous		
A	Plain Bearings and Bushing	MIL-PRF-7870	As Required & 500 Hrs



TYPICAL BUSHING DETAIL



TYPICAL BEARING DETAIL

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Figure 12-201
Lubrication Schedule

B. Cleaning

To maintain the flying characteristics of the airplane, the external surfaces of the airplane and propeller must remain clean, especially the leading edges of the wings. To aid in protecting the finish, insect residue should be immediately washed off after every flight. For best cleaning results on cured paint, (paint that has been in a warm climate for at least 90 days after being applied and prior to being washed with hot soapy water) use a generous amount of fresh warm water. If necessary, a mild non-abrasive aircraft cleaning agent may be used. Apply a heavy coating of wax to the leading edges of the nose section, wings and empennage. If any points of lubrication are washed away, they must be lubricated immediately after washing. Approximately once a year, the exterior (painted) surface of the airplane should be waxed and buffed using a good quality silicone free automotive wax.

CAUTION: Because wax seals paint from the outside air, a new paint job should not be waxed for a period of 90 days, in order to allow the paint to fully cure. Wash uncured painted surfaces with only cold or lukewarm water and a mild non-detergent soap. Any rubbing of the painted surface should be done gently and held to a minimum to avoid cracking the paint film.

Always test wash an inconspicuous area first, to determine the compatibility of the cleaning agent being used. Do not use household detergents to wash the exterior of the airplane, or damage to the finish may occur. Do not wax, use hot water, or apply soap to uncured paint, (paint which is less than 90 days old) or damage to the finish may occur. Some household spray cleaners may damage aluminum and other materials. Always refer to the manufacturer's instructions for proper usage for the product being used.

When washing the airplane with mild soap and water, use special care to avoid washing away grease from any lubricated area. After washing with solvent in the landing gear area, lubricate all lubrication points. Premature wear of lubricated surfaces may result if the above precautions are not taken. When fuel, hydraulic fluid, or other fluids containing dye are spilled on any painted surface they must be removed immediately to prevent staining.

Do not use polish or wax on graphics with matte or texture finish. Refer to Cleaning - Graphics. (Refer to 12-20)

(1) Exterior Wash

CAUTION: Do not allow wax or any other substance to restrict either static port orifice.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Mild Dishwasher Soap (abrasive free)	-	Any Source	Cleaning exterior of airplane and windows.
Automotive Paste Wax (silicone free)	-	Any Source	Waxing exterior of airplane and acrylic windows.
Cotton cloth (clean white, lint free)	-	Any Source	General cleaning.

(b) To prevent damage during washing, cover pitot head, brake discs, and static ports.

(c) Rinse away loose dirt and mud prior to washing airplane.

(d) Wash airplane with clean, fresh water.

(e) Rinse airplane with clean, fresh water.

(f) Dry airplane with a soft chamois.

(g) Uncover pitot head, brake discs, and static ports.

CAUTION: Verify no obstructions exist in the pitot head and static port orifices.

(2) Graphics

Graphics require care similar to any fine paint finish. Use high quality products designed specifically for use on automobile finishes. Use products in accordance with the manufacturer's instructions.

Graphics, like paint, are degraded by prolonged exposure to sun and atmospheric pollutants. Store the aircraft in a hangar, under a cloth cover, or in shaded area whenever possible. Protect the aircraft from dew and rain which may contain acidic pollutants (commonly found in large metropolitan areas).

CAUTION: If graphics start to discolor or turn brown as a result of exposure to acidic pollution, immediately have a professional remove the graphic from the aircraft to avoid staining the underlying paint.

(a) Regular Washing

Wash graphics whenever aircraft appears dirty. Contaminants allowed to remain on exterior may be more difficult to remove.

1 Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Wet, Non-abrasive Detergent	3M™ Car Wash Soap 39000	Any Source	Clean graphics.
	Meguiar's NXT Generation® Car Wash		
	Deep Crystal® Car Wash		
Cotton Cloth (clean, white, lint free)	-	Any Source	Clean graphics.
Silicone Squeegee	-	Any Source	Dry graphics.
Microfiber Cloth (clean, white, lint free)	-	Any Source	Dry graphics.

2 Rinse off as much dirt and grit as possible with a spray of water.

3 Clean graphic with wet, non-abrasive detergent and soft, clean cloth or sponge.

4 Rinse thoroughly with clean, fresh water.

5 To reduce water spotting, immediately use silicone squeegee to remove water.

6 Dry with clean microfiber cloth.

(b) Pressure Washing

Although hand washing is preferred, pressure washing may be used when necessary to remove dirt and contaminants. Pressure washing must be performed in accordance with the following procedure:

1 Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Silicone Squeegee	-	Any Source	Dry graphics.
Microfiber Cloth (clean, white, lint free)	-	Any Source	Dry graphics.

2 Ensure water pressure is less than 2000 psi (14 MPa).

3 Ensure water temperature is less than 180 °F (82 °C).

4 Use spray nozzle with 40 degree wide angle spray pattern.

CAUTION: Holding nozzle of pressure washer at an angle less than 90 degrees to graphic may lift edges of graphic.

5 Keep spray nozzle perpendicular to graphic, and at a distance of at least 1 foot (30 cm).

6 To reduce water spotting, immediately use silicone squeegee to remove water.

7 Dry with clean microfiber cloth.

(c) Removing Difficult Contaminants

Difficult contaminants such as bugs, bird droppings, or tree sap may require spot cleaning.

CAUTION: To prevent scratching the graphic, refrain from rough scrubbing and the use of abrasive tools.

1 Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Silicone Squeegee	-	Any Source	Dry graphics.
Microfiber Cloth (clean, white, lint free)	-	Any Source	Dry graphics.
Cleaning Solution	Meguiar's Gold Class™ Bug and Tar Remover	Any Source	Clean graphics.
	3M™ Citrus Base Cleaner		
	Mixture of two parts isopropyl alcohol to one part water (mix ratio 2:1)		
	Denatured alcohol		

2 Soften contaminants by soaking with hot, soapy water for several minutes.

3 Rinse thoroughly with clean, fresh water.

CAUTION: Initially test cleaning products on an inconspicuous area of the graphic to verify they will not cause damage.

4 If further cleaning is needed, clean graphic with cleaning solution. Immediately rinse off all residue with clean, fresh water after use.

5 To reduce water spotting, immediately use silicone squeegee to remove water.

6 Dry with clean microfiber cloth.

(d) Cleaning Fuel Spills

CAUTION: Immediately clean fuel spills to avoid degrading vinyl and adhesive used in graphic.

1 Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Wet, Non-abrasive Detergent	3M™ Car Wash Soap 39000	Any Source	Clean graphics.
	Meguiar's NXT Generation® Car Wash		
	Deep Crystal® Car Wash		
Cotton Cloth (clean, white, lint free)	-	Any Source	Clean graphics.
Silicone Squeegee	-	Any Source	Dry graphics.
Microfiber Cloth (clean, white, lint free)	-	Any Source	Dry graphics.

2 Wipe off spilled fuel.

3 Clean graphic with wet, non-abrasive detergent and soft, clean cloth or sponge.

4 Rinse thoroughly with clean, fresh water.

5 To reduce water spotting, immediately use silicone squeegee to remove water.

6 Dry with clean microfiber cloth.

(e) Graphic Restoration

If typical cleaning methods fail to produce satisfactory results, refer to recommended restoration products and mixtures below to help preserve condition of aircraft graphics.

CAUTION: Do not use abrasive polishes or cutting compounds.

Do not use polish or wax on graphics with matte or texture finish.

Initially test restoration products and mixtures on inconspicuous area of graphic to verify they will not cause damage.

Note: Use all-purpose cleaner to remove wax or wax residue.

Film or Finish Type	Product or Mixture
Smooth Gloss	3M™ Perfect-it™ Show Car Paste Wax 39526 or Meguiar's Gold Class™ Carnuaba Plus Premium Liquid Wax
Matte or Satin Texture	Mixture of two parts isopropyl alcohol to one part water (mix ratio 2:1)
Matte White (1080-M10) Carbon Fiber White Texture (1080-CF10)	Depending on type and degree of contamination to be removed, use one or more of the following solutions in the order shown: 1. Hot, soapy water solution 2. Mixture of two parts isopropyl alcohol to one part water (mix ratio 2:1) 3. Simple Green® All-Purpose Cleaner 4. Household chlorine bleach, followed by a mixture of two parts isopropyl alcohol to one part water (mix ratio 2:1) 5. Mineral spirits, followed by a mixture of two parts isopropyl alcohol to one part water (mix ratio 2:1)
Carbon Fiber or Brushed Metal Texture	3M™ Tire Restorer or Meguiar's Natural Shine Protectant
Carbon Fiber Black Texture (1080-CF12)	Meguiar's Ultimate Black Plastic Restorer

(3) Windshield/Windows

Always rinse an acrylic window free of all dust particles prior to wiping with a clean sponge or chamois. Never rub dry acrylic. Dull or scratched window coverings may be polished using a special acrylic polishing paste. Only clean acrylic windows with an antistatic acrylic cleaner. Remove grease or oil with a soft cloth saturated with kerosene.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Acrylic Polish and Sealant	SP-PL16	LP Aero Plastics, Inc. Jeannette, PA	Polishing outer window surface.
Acrylic Plastic Cleaner	SP-210A	LP Aero Plastics, Inc. Jeannette, PA	Polishing inner window surface.
Cotton Cloth (clean white, lint free)	-	Any Source	General cleaning.
Kerosene	-	Any Source	Grease and oil removal.

CAUTION: Never use de-icing fluid, household window cleaning sprays, lacquer thinner, gasoline, acetone, carbon tetrachloride, benzene, or fire extinguisher fluid to clean windows or windshields. The use of such chemicals will soften or craze an acrylic surface. Never use rain repellent on acrylic surfaces. Always cover the windshield and windows when applying any chemicals (near the vicinity) that may damage them. Never use sun shades or allow sunvisors to remain in the lowered position when the airplane is parked in direct sunlight or crazing and the formation of bubbles may occur.

Note: Prior to cleaning windows, place the airplane in a shaded area to allow the windows to cool down. When polishing an acrylic surface, use a polish meeting Federal Specification P-P-560.

(b) Using a soft cloth saturated with kerosene, remove any grease or oil. Rinse window with clean, fresh water.

(c) Rinse windshield free of dust and contaminates with clean, fresh water.

(d) Using a moist sponge or chamois, wipe windows clean of contaminates.

(e) Dry windows with a soft chamois.

(4) Engine

Accumulation of grease, dirt, oil, and other fluids in the engine compartment create higher engine compartment operating temperatures and can create a fire hazard. A dirty engine compartment will also hamper the inspection process.

CAUTION: The engine must be cool to the touch, prior to cleaning. Always inspect engine for leaks, loose hardware, and worn hardware prior to cleaning. Always cover all windows, magneto vents, engine electrical components and connections when washing any portion of the engine compartment. Remove the air filter and cover the air induction inlet prior to washing the engine compartment. Never use any flammable or corrosive cleaning solvents. Never allow the airplane to sit in freezing temperatures until the airplane has thoroughly dried.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Stoddard Solvent	PD-680 Type II	Any Source	Engine degreasing.
Cotton Cloth (clean white, lint free)	-	Any Source	General cleaning.

(b) Remove engine cowling. (Refer to 71-10)

(c) Inspect engine for leaks, and loose or worn hardware. Service as required.

(d) Remove air filter. (Refer to 71-60)

(e) Cover alternator, starter, vacuum pump, and air induction intakes.

(f) Place a large catch pan under engine.

CAUTION: Do not allow solvent to enter alternator, starter, vacuum pump, or air induction intakes.

(g) Apply degreasing solvent to engine and allow solvent to penetrate grease and grime per the manufacture's instructions.

(h) Rinse the engine clean with additional solvent and allow it to dry.

CAUTION: Do not operate engine until all solvent has evaporated or been removed.

(i) Uncover alternator, starter, vacuum pump, and air induction intakes.

(j) Install air filter. (Refer to 71-60)

(k) Remove catch pan from under engine.

(l) Install engine cowling. (Refer to 71-10)

(5) Interior

Seats, carpet, upholstery panels, and headliners should be vacuumed at regular intervals to remove surface dirt and dust. While vacuuming, use a fine bristle nylon brush to help loosen particles. Carpet may be cleaned like household carpet made with the same composition and similar weave. The headliner is made from polyester and may be cleaned using the same methods for cleaning any object made out of polyester. For smudges from dirty hands or tools, powdered laundry soap can work well.

CAUTION: Never use furniture polish on interior furnishings, because most contain solvents harmful to vinyl. Do not use alcohol or other strong solvents on interior plastics. Never allow alcohol to enter microphone or electrical connections. The interior furnishings can be easily damaged if cleaned with Methyl Ethel Ketone (MEK), naphtha, multi standard solvent, gasoline, lacquer thinner or other types of thinner. Never saturate any fabric with solution which could damage the backing or padding materials. When cleaning carpet, keep the foam as dry as possible and rub the carpet in circular motions. Never allow carpets to remain damp; always dry them thoroughly. Always follow the manufacturer's instructions on proper usage of their products.

Remove any sharp objects from pockets or clothing to avoid damaging interior panels or upholstery.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Mild Dishwasher Soap (abrasive free)	-	Any Source	Clean leather surfaces.
Cotton Cloth (clean white, lint free)	-	Any Source	General cleaning.
Whiskbroom	-	Any Source	General cleaning.
Vacuum Cleaner	-	Any Source	General cleaning.

(b) Using a whiskbroom, brush out large pieces of dirt and other foreign matter.

(c) Vacuum seats, carpet, upholstery panels, and headliners to remove small pieces of dirt and other foreign matter.

(d) Wipe plastic liners and leather surfaces clean with a moist cloth.

(e) Discard all trash.

(f) Clean leather with approved leather cleaner or a mild hand soap and water. Dry leather with a soft, clean cloth.

(6) Instrument Panel and Electronic Display Screens

The instrument panel, control knobs, and plastic trim need only be wiped clean with a soft damp cloth. The multi-function display, primary flight display, and other electronic display screens should be cleaned with Optimax - LCD Screen Cleaning Solution as follows:

CAUTION: To avoid solution dripping onto display, and possibly migrating into component, apply cleaning solution to cloth first, not directly to display screen.

Use only a lens cloth or nonabrasive cotton cloth to clean display screens. Paper towels, tissue, or camera lens paper may scratch the display screen.

Clean display screen with power off.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Optimax - LCD Screen Cleaning Solution	AMS 389	Photodon Traverse City, MI 49686 775-278-6741	Clean display screens.
Cotton Cloth (clean, white, lint free)	-	Any Source	General cleaning.

Note: Improper care may void the unit warranty.

(b) Gently wipe display with a clean, dry, cotton cloth.

(c) Moisten clean, cotton cloth with cleaning solution.

(d) Wipe soft cotton cloth across display in one direction, moving from top of display to bottom. Do not rub harshly.

(e) Gently wipe display with a clean, dry, cotton cloth.

(7) Leather Upholstery

Leather is the most durable and easily maintained upholstery material available. Like most other important investments, leather requires routine maintenance. For routine maintenance, occasional wiping with a soft, white, damp cloth is all the care your leather will need. The approved leather care products are available from Cirrus Design.

The approved leather cleaner is a water based solution especially formulated to remove stains. It will safely and effectively remove dirt, grime, and soil. It will remove some ink marks and grease stains; however, for stubborn ink marks and stains, use the ink remover available from Cirrus Design.

The approved leather conditioner cleans, conditions, and restores. Especially formulated to remove surface dirt and enhance the luster of naturally tanned leather, the unique wax-free formulation allows leather to breath and imparts a soft and supple tone. It also provides emollients, color restoration, water retardation, and ultraviolet ray protection, which decreases color fading. If applied regularly, the conditioner will enhance the natural luster of fine leather, while increasing the longevity of the product. The approved leather conditioner is safe for use on all colors.

CAUTION: The approved leather care kit contains leather cleaner, leather conditioner, ink remover, and a clean, soft, white cloth. Leather cleaner and leather conditioner were developed for use on protected or semi-aniline leather. Never use leather cleaner or leather conditioner on suede (napped) or pure aniline leathers.

Avoid using soaps as they contain alkaline which will alter the leather's pH balance. They can also cause leather to age prematurely by causing weakness, cracking, and discoloration. Not all cleaning products suggested for leather will protect and preserve the life of your upholstery. To avoid problems, use the Leather Care Kit available from Cirrus Design. Test in an inconspicuous area to ensure colorfastness. Never apply product directly to upholstery. Some stains can cause permanent discoloration even after cleaning. Never use the leather care kit in conjunction with cleaning products not approved by Cirrus Design.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
General Cleaning Solution	Laundry Detergent	Any Source	Remove fresh baby oil, ketchup, grape juice, coffee or tea stains.
	Fantastik® All Purpose Cleaner	Any Source	Remove fresh crayon or grease stains.
	Formula 409®	Any Source	Remove fresh crayon or grease stains.
	Sprayway® Vinyl and Leather Cleaner	Any Source	Remove dirt and grime.
	-Ammonia	Any Source	Remove fresh lipstick or yellow mustard stains.
	-Household Bleach (5% sodium hypochlorite)	Any Source	Remove fresh lipstick or yellow mustard stains.
Leather Care Kit	50689-001	Cirrus Design	General leather care.
Leather Cleaner	50684-001	Cirrus Design	Cleaning leather.
Ink Remover	50685-001	Cirrus Design	Removing ink.
Leather Conditioner	50686-001	Cirrus Design	Conditioning leather.
Spot and Stain Remover	50687-001	Cirrus Design	Removing spots.
Vinyl Finish Cleaner	50688-001	Cirrus Design	Cleaning vinyl.
Vinyl and Leather Cleaner	51479-001	Cirrus Design	Cleaning vinyl and leather.
Cotton Cloth (clean, white, lint free)	-	Any Source	General cleaning.

(8) Inflatable Restraint System

The inflatable restraint system must be cleaned on a regular basis to remove dirt and unwanted oil and grease. Routine cleaning will prolong the service life of the restraint system and prevent corrosion of metal parts. The webbing may be cleaned with fresh water and a mild soap. The metal fittings may be cleaned with a cloth moistened with isopropyl alcohol. The leather covering may be cleaned with the approved materials listed in the Leather Upholstery section. (Refer to 12-20)

After cleaning the restraint system, protect it from moisture, dirt, or other contamination until the restraint system is returned to service.

CAUTION: Do not machine-wash the restraint system. Machine-washing the restraint system will cause the webbing to shrink and performance characteristics will be changed significantly.

The restraint system may be dry-cleaned. However, repeated dry-cleaning will degrade the abrasion-resistance coating of the webbing, decreasing the service life of the restraint system.

When cleaning the restraint system, care must be taken to keep away foreign matter and cleaning media from the hardware assemblies.

No soap or water is to be used on metal parts.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Mild Dishwasher Soap (abrasive free)	-	Any Source	Clean webbing.
Sponge or Soft Brush	-	Any Source	Clean webbing.
Cotton Cloth (clean, white, lint free)	-	Any Source	Clean metal fittings.
Isopropyl Alcohol	-	Any Source	Clean metal fittings.

(b) Clean webbing.

1 Cover metal fittings with pieces of cloth.

2 Using sponge or soft brush, gently scrub webbing with cold, soapy water.

CAUTION: Do not dry webbing in sunlight or near any source of heat.

3 Allow webbing to air dry.

(c) Clean metal fittings.

1 Moisten a clean, lint-free cloth with isopropyl alcohol.

CAUTION: Do not allow isopropyl alcohol to contact webbing.

2 Wipe metal fittings.

(d) Clean leather covering.

For approved leather cleaning materials, refer to Leather Upholstery. (Refer to 12-20)

(9) Enhanced Vision System (EVS)

The EVS sensor is located on the underside of the LH wing. The three sensor windows are made of Germanium. In contrast to visible light energy, infrared energy typically passes through dirt on the windows. As such, the sensor windows require only occasional cleaning with mild liquid soap and water or isopropyl alcohol, and a soft cloth.

CAUTION: Do not use abrasive cleansers or cleaning pads on the germanium windows. Abrasive cleaning can damage the sensor window coating.

Do not use cleansers containing ammonia. Ammonia will remove the sensor window coating.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Mild Liquid Soap	-	Any Source	Clean sensor lens.
Cotton Cloth (clean, white, lint free)	-	Any Source	Clean sensor lens.
Isopropyl Alcohol	-	Any Source	Clean sensor lens.

(b) Moisten a clean, lint-free cloth with mild soapy water or isopropyl alcohol.

(c) Gently wipe sensor windows.

UNSCHEDULED SERVICING

1. DESCRIPTION

This section contains information on unscheduled servicing which includes snow and ice removal from parked aircraft, etc.

2. MAINTENANCE PRACTICES

A. Snow and Ice Removal

WARNING: **Prior to flight both upper and lower surfaces of the airplane must be completely free of ice and snow formation.**

Most anti-ice additives contain ethylene glycol monomethyl ether (EGME). Anti-icing additives containing ethylene glycol monomethyl ether can be extremely harmful if inhaled, swallowed, absorbed through the skin, or if eye contact is allowed. Vapors from EGME are dangerous to health when breathed or allowed to absorb into the skin. If exposure to EGME is experienced, contact Poison Control for emergency and first aid procedures.

CAUTION: Do not use sharp objects to remove snow or ice.

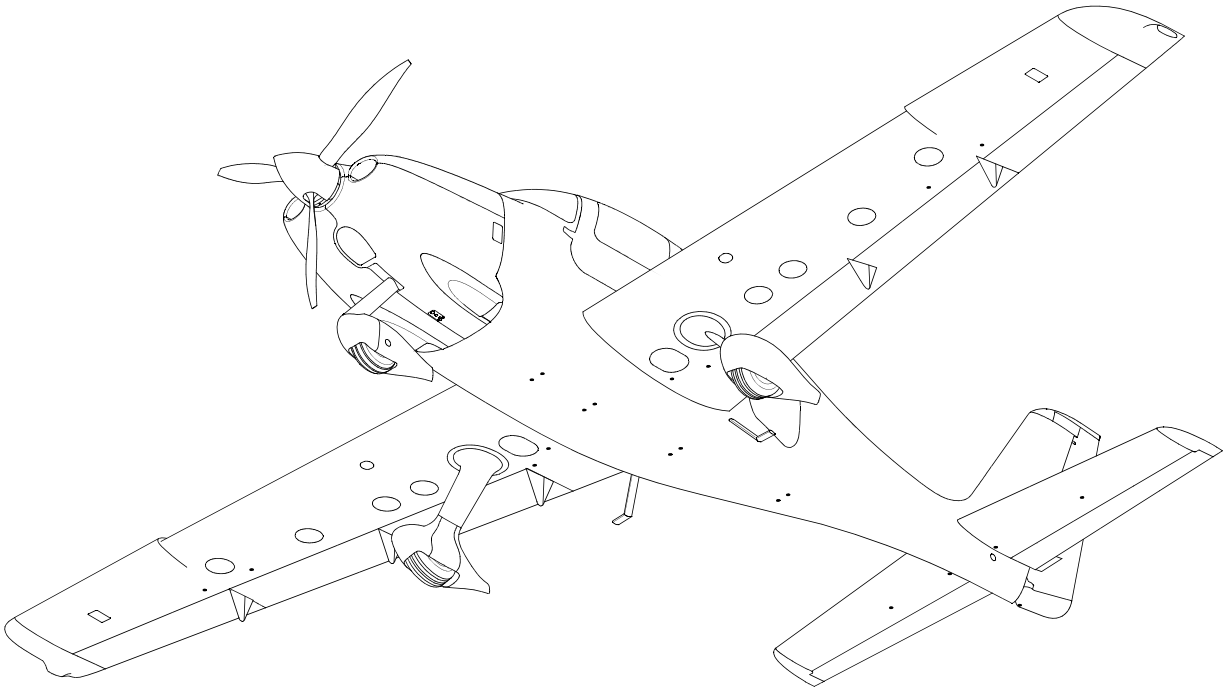
If snow or ice have accumulated, it is recommended to remove it by placing the airplane in a heated hanger. This will prevent melted snow and ice from refreezing on the surface, or in any gaps. De-icing fluids may be used to remove snow and ice deposits from the airplane. To enhance snow and ice removal, de-icing fluids may be heated to 150° F (65.6° C).

If an aircraft is parked in an area of blowing snow, special attention should be given to openings in the aircraft where snow can enter, freeze, and obstruct operations. The following areas should be free of snow and ice before flight:

- Areas where snow can freeze around flight control hinges, bearings, and pulleys
- Pitot tube
- Static system ports
- Wheel wells
- Engine intakes
- Fuel vents

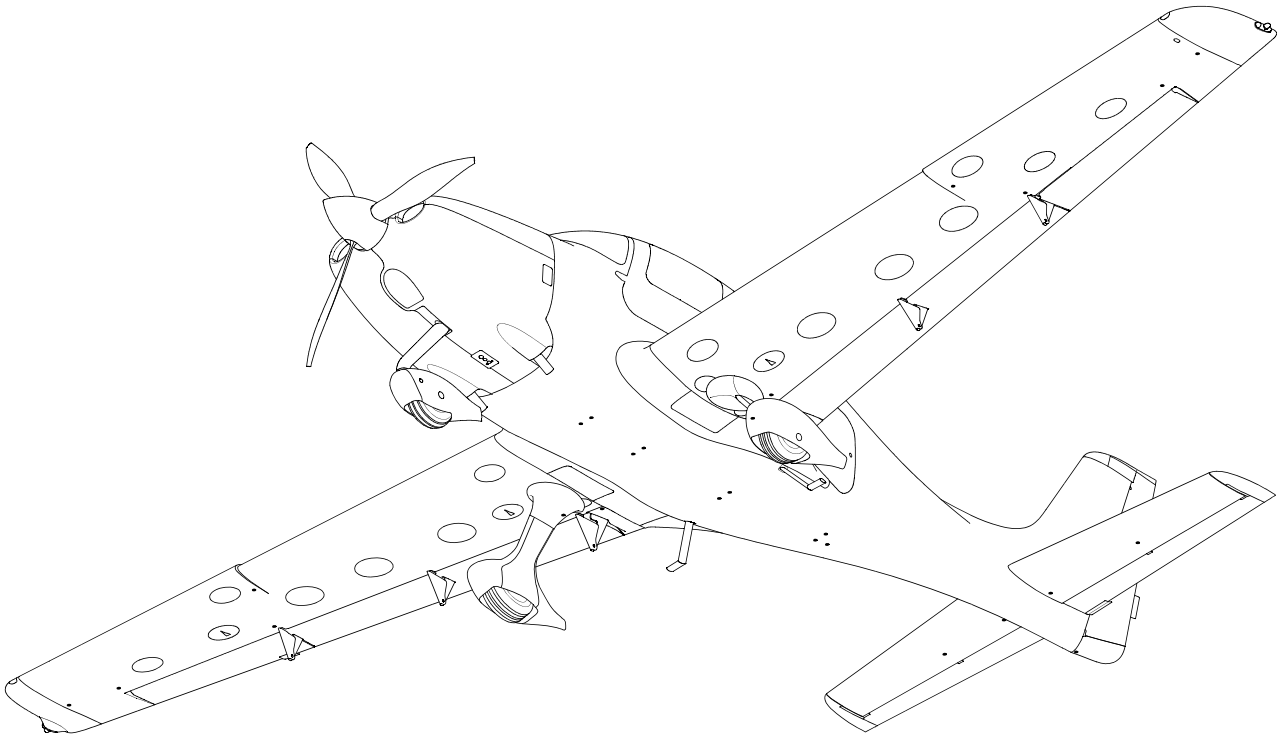
B. Drain Holes (See Figure 12-301)

Drain holes are located at various points on the fuselage and wings to allow moisture to drain from the airplane. Ensure all drain holes are clear and free of obstructions.



SR20_MM12_2774

Figure 12-301
Approximate Location of Drain Holes - Serials 1005 thru 1885 (Sheet 1 of 2)



SR20_MM12_2772

Figure 12-301
Approximate Location of Drain Holes - Serials 1886 & subs (Sheet 2 of 2)

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STANDARD PRACTICES - AIRFRAME

1. GENERAL

This chapter contains torque factors, torque tables and measuring techniques for various components. Instructions necessary for proper usage and identification of special tools, thread lock and fastening hardware are also provided.

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SEALANTS

1. DESCRIPTION

This section contains information which defines the proper usage, storage, shelf life, and application of sealants used on the airplane. Sealant is used to prevent the spread of fire or flames from the engine compartment to the airplane, prevent air leakage, prevent fastener corrosion, prevent water or dust intrusion, and to prevent fluid leakage. The following sealants are recommended by Cirrus Design Corporation.

A. Approved Sealants

The sealants shown in the referenced figure, when applied properly, have been approved by Cirrus Design for use in specified applications. These sealants are available from a variety of manufacturers and packaged in a variety of fashions - in bulk, in kits, and in premixed form. (See Figure 20-101)

CAUTION: Always observe the manufacturer's recommendations for the product being used.

B. Shelf Life

Shelf life refers to the period of time (usually from the date of manufacture) in which the sealant is usable. Shelf life is dependent on proper storage temperature and environmental factors, such as humidity and exposure to sunlight. Always observe the manufacturer's instructions for recommended use, storage, and testing of over-aged sealant.

C. Storage Criteria

All sealants must be stored under controlled temperature conditions to achieve maximum shelf life. Unmixed sealants should be stored at a controlled temperature of between 40°F (4.5° C) and 80°F (26.5° C). Never store sealants where the temperature exceeds 95° F or falls below 40° F. Unmixed sealants stored at temperatures exceeding 80°F (26.5° C) should be used within five weeks. All sealants should be used on a "first in, first out" basis.

Note: Containers must be tightly closed prior to placing them in the proper storage environment. Sealants must be stored as recommended by the manufacturer. Mixed sealants subjected to refrigerated storage may exhibit altered application life. Mark all material containers clearly with a "use by" date, consisting of the year and month.

(1) Refrigerated Storage - Mixed Sealants

When desired, store mixed sealants under refrigeration. Use of a quick-freeze technique is recommended to minimize the amount of application life that would be lost in a slower cooling procedure. To quick-freeze mixed sealant, immerse the filled cartridges in a slurry of dry ice and alcohol for 10 minutes.

(2) Thawing of Frozen Sealant

Frozen sealant is normally thawed by exposure to ambient temperature for 20 to 30 minutes. However, the rate of thawing may be accelerated by immersion in warm water, 120° F (49° C) maximum, for approximately 10 minutes. Sealants are subject to excessive slumping when heated to temperatures above 80°F (26.5° C). For best results, thawing time should be adjusted to give an extruded or thawed sealant temperature 60 - 80° F (15.5° C - 26.5° C). The time consumed by freezing and thawing operations reduce application life by approximately 30 minutes.

Further reduction in application life may result from duration and temperature during storage. It is recommended that all aspects of mixing, freezing, and thawing be considered before mixing and freezing material with less than one hour application life.

Note: Thawed sealant must not be re-frozen. All sealants must extrude freely before application to any surface. Adhesion may be lowered by condensation of moisture if the sealant is not thawed to an extruded temperature of at least 60° F

Type	P/N or Spec.	Manufacture	Application
RTV Silicone Sealant (high temperature)	RTV 736	Dow Corning	Non composite structure (firewall fitting).
Brushable Sealant	MIL-S-8802 Type 2 Class A* GC408A 890A EC1675A CS3204 C1.A PR1440A	 Goal CPS 3M Chem Seal Flame Master PRC Aerospace Sealants	Fuel tank repair surface seal.
Extrusion Gun Sealant	MIL-S-8802 Type 2 Class B or AMS3277 Type 2 Class B* CS3204 C1.B GC408B P/S 890B PR1440B EC1675B AC-240B	 Chem Seal - Flame Master Goal PRC Aerospace Sealants PRC Aerospace Sealants 3M Dynamold Aerospace	Fillet, faying surface, and injection seal in fuel tanks. Install and seal windows. Seal fuel system enclosure in cabin.
	AMS-S-83318 Class B* AC-250B P/S 860B	 3M PRC Aerospace Sealants	Access panel sealant.
Firewall Sealant	MIL-S-38249 Type 1 P/S 700 or P/R 812 Sealant AMS 3374 Dapco 2200 Sealant	PRC Aerospace Sealants Glendale, CA D Aircraft Products, Inc. Anaheim, CA	Perimeter seal firewall. Fuel flow transmitter assembly.
Thread Sealant	565	Loctite	To obtain a leak-free seal on non-fuel system metallic pipe threads
* When ordering MIL-S-8802 or AMS-S-83318 sealants make sure that an appropriate work life is specified. Work life is specified by adding the desired work life in the product dash number after the Class designation, e.g. A-1/2, A-2, B-1/2, B-2, etc.			

Figure 20-101
Approved Sealants

D. Sealant Properties (See Figure 20-102)

(1) Application Time / Work Life

Application time refers to the time a mixed compound remains at a consistency suitable for application. After this point, the sealant does not “wet” properly and may fail in adhesion (sealant “rolls up” ahead of the sealing gun or “draws up” behind the gun). Application times shown in Figure 20-1 are based upon an ambient temperature of 77° F (25° C) and a relative humidity of 50%. For fuel tank sealants, every 20° F (10.6° C) rise in temperature halves application time and every 20° F (10.6° C) decline in temperature doubles application time. High humidity during the mixing process will shorten application time.

(2) Tack-Free Time

Tack-free time is the time that a sealant requires to cure sufficiently to not stick to standard polyethylene film when the film is pressed into the sealant.

(3) Cure Time

The time require to sufficiently cure applied sealant depends upon the ambient temperature and relative humidity. Always observe the manufacturer’s recommendations for cure. Low humidity will extend the cure time. Optimum cure for most sealants will be obtained at 77° F (25° C) and 50% relative humidity. A high state of cure is developed after 14 days at this temperature and humidity. Cure may be hastened by applying heat up to 130° F. For fuel tank sealants, every 20° F (10.6° C) rise in temperature halves cure time and every 20° F (10.6° C) decline in temperature doubles cure time. Fuel tank sealant is considered to be sufficiently cured for pressure test when sealant is tack free, does not pit when firmly pressed, and feels firm to the touch (Rex Durometer reading of approximately 30 A).

Typical Sealant Properties				
Sealant	**Work Life (Hours)**	**Tack Free (Hours)**	**Testable Cure Time (Hours)**	**Standard Cure Time (Days)**
MIL-S-8802 A-1/2	1/2	<10	36	14
MIL-S-8802 A-2	2	<30	60	14
MIL-S-8802 B-1/2	1/2	<10	24	14
MIL-S-8802 B-1	1	<16	40	14
MIL-S-8802 B-2	2	<20	48	14
MIL-S-38249	2	<4	48	14
Above data based upon 77°F (25°C) and 50% relative humidity. Results can vary due to temperature, humidity, and mix proportions. Testable cure time based upon a Rex Durometer reading of at least 30A to 35 A.				

Figure 20-102
Typical Sealant Properties

E. Types of Seals

(1) Fillet Seals (See Figure 20-103)

Fillet sealing is the application of a bead of extrudable sealant to seams, joints, and intersecting planes or surfaces. Fillet seals are used in the integral fuel tank along the intersection of the wing skin ribs, along the intersection of the wing skin and the spar and aft shear web, around fasteners and fittings protruding into the tank. Fillet seals are also used around the firewall perimeter, and other places where weather, fume, or dust intrusion must be prevented and to seal wetted areas. Fillet seals are accomplished using extrudable sealants in an extrusion cartridge, tube, or spatula. Fillet seals may be tooled to improve appearance, fill voids and remove bubbles. A satisfactory fillet seal is indicated when the fillet overlaps the seam by the required dimension, is smooth in appearance, adheres to both sides of the seam, and is free of voids, bubbles, and overlaps. Fillet seals may be tooled immediately after application to achieve the seal.

(2) Faying Surface Seals (See Figure 20-104)

Faying surface seals are used between surfaces where an absolute seal cannot be obtained by sealing around fasteners or by applying fillet seals. A faying surface seal around a fastener prevents fuel or liquids from reaching the fastener thread or shaft. The faying surface seal does not completely seal the fastener which must also be sealed. Faying surface seals are used during the manufacture of the airplane to seal areas that are difficult or impossible to seal after assembly. Faying surface seals may be applied by brushing on sealant or using and extrusion cartridge, tube, or spreading the sealant using a spatula. A satisfactory faying surface seal is indicated when a small amount of sealant is extruded on both sides of the joint after assembly of the faying surfaces.

(3) Injection Seals (See Figure 20-104)

Injection seals are used to fill holes, joggles, channels and other voids. Injection seals may be applied to provide continuity where fillet seals are interrupted by structure. Injection sealing forces air out of a cavity and fills the vacated space with sealant. Injection seals are accomplished by injecting the area with an extrudable sealant through an extrusion cartridge or a tube.

(4) Brush Seals

Brush sealing is used in the fuel tank to reseal surface areas after a structural repair to the wing exterior skins. The wet area inside the tank must be sanded, cleaned and free of all dust and contaminates. The sealant is applied using a stiff-bristle brush to the repair and surrounding area.

F. Method of Application

Sealants may be applied with a brush, a roller, an extrusion gun, or with a spatula. Extrusion guns are available as either hand operated or pneumatic powered. Some extrudable sealants are also available in squeezable tubes. Each application method has advantages in particular situations.

(1) Brush Application

A stiff-bristle brush (not nylon) is used to apply the sealant to the surface to be sealed. Brushed on sealant application may be used for faying surface sealing, fastener sealing, and surface sealing.

(2) Roller Application

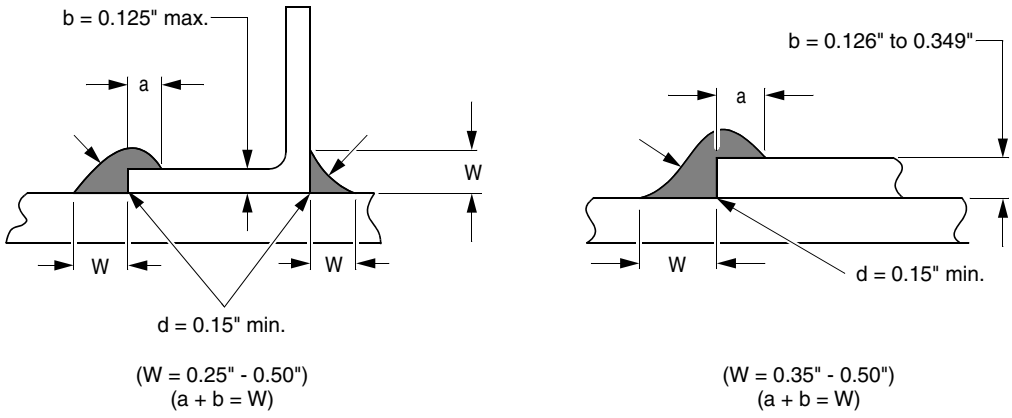
Faying surface and brushable sealant may be applied using a roller. For some applications where a thin even coat of sealant is to applied, a roller is the preferred method of application.

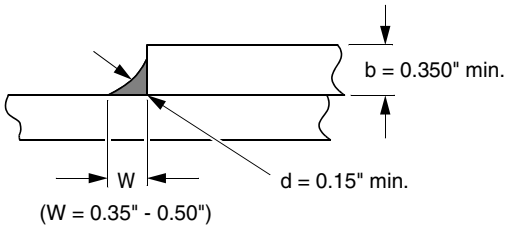
(3) Extrusion Application

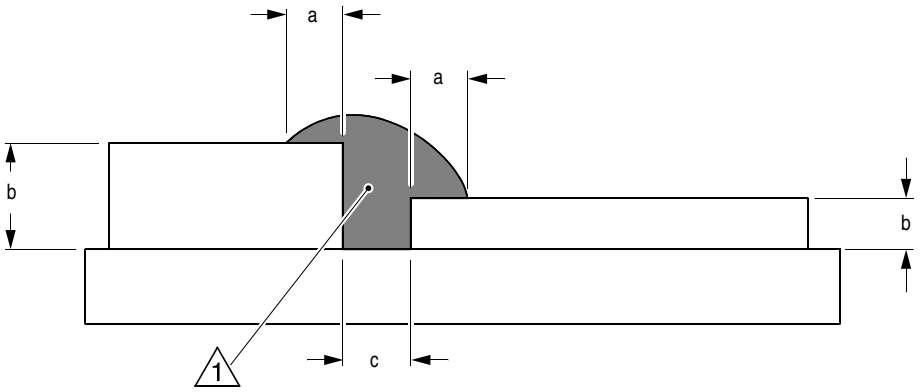
Fillet and faying surface seals may be applied with an extrusion gun. Injection seals must be applied using an injection gun. Some extrusion guns are available with a variety of nozzles for various applications. Nozzle tips may be shaped as required by the mechanic to provide a bead of sealant with the shape and dimensions for the specific seal.

(4) Spatula Application

A spatula is used to spread sealant material for faying surface and fillet seals. Normally, a spatula cannot be used to provide an injection seal. Small repair fillet seals may be applied with a spatula if an extrusion gun is not available or will not fit in the area to be sealed. Spatulas may be manufactured by the mechanic to tool fillet seals applied with a extrusion gun to fill voids, even the bead, and/or to remove bubbles.





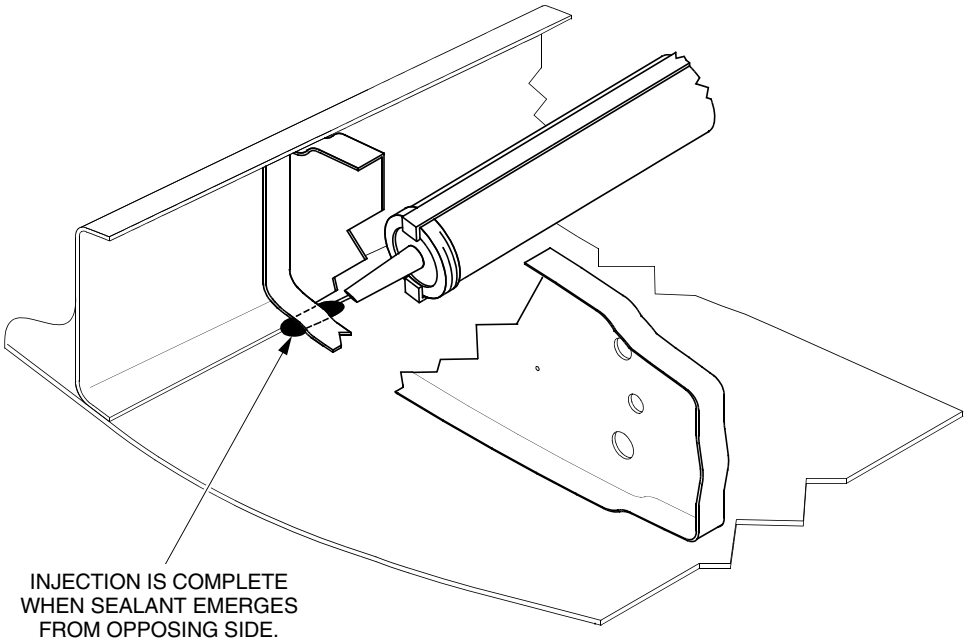


NOTE
1 Gap must be filled not bridged.

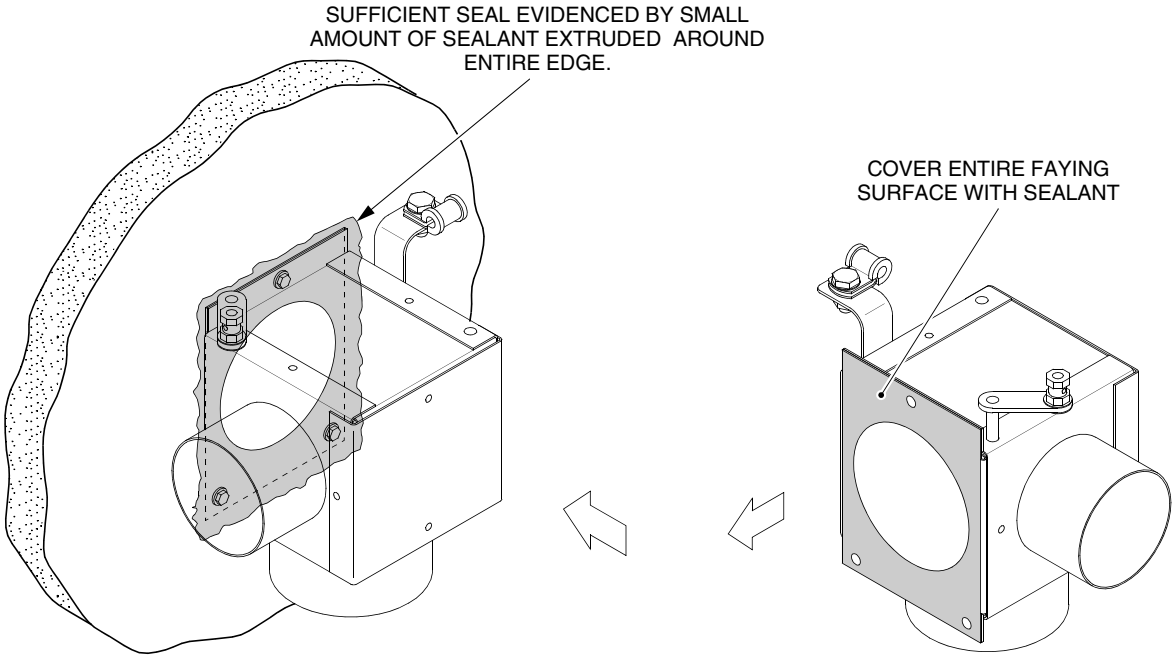
DETAIL A

SR22_MM20_1970

Figure 20-103
Fillet Sealing



INJECTION SEALING



FAYING SURFACE SEALING

SR22_MM20_1971

Figure 20-104
Injection & Faying Surface Sealing

2. MAINTENANCE PRACTICES

A. Preparation for Sealing

(1) General Procedure

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant Removal and Cutting Tools	-	Locally manufacture	Remove sealant.
Pipe Cleaners	-	Any Source	Remove sealant in injectable gaps.
Bristle Brush (non-nylon)	-	Any Source	Clean up.
Sandpaper, Aluminum Oxide	200 grit	Any Source	Prep composite surfaces.
Cotton cloth (clean, lint free)	-	Any Source	Surface cleaning.
Isopropyl Alcohol	99% or higher purity	Any Source	Surface clean acrylic windows or composite materials.
Acetone	ASTM D-329	Any Source	Surface clean composite materials.
Protective Gloves	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(b) Determine if structural repair is required. (Refer to 51-10)

(c) If repair is required, repair structure in accordance the standard structural repair practices. (Refer to 51-70)

(d) Examine seal in suspect area and determine the seal level and seal plane in adjacent structure.

Note: The seal plane is the boundary plane through any assembly of structural items that presents a continuous barrier to the flow of liquids or gases.

(e) Identify the type of sealant used in the area of the defect.

CAUTION: Do not interchange sealing compounds. Best results are obtained by using the sealant compound originally applied to make repairs.

(f) Determine the type of seal (faying surface, fillet, injection, or brushed) required for the repair.

(g) Use sealant cutting tools to remove or notch the sealant in the defective area. Sufficient sealant must be removed to produce a solid, intact seal on each side of the affected area.

CAUTION: Cutting tools must be made only from non-ferrous materials that are softer than the surrounding structure. Use hardwood or acrylic tools for composite structure and polyethylene, polypropylene, or Teflon around acrylic windows.

(h) Examine rework area for clean cuts, adequate notching, and for access. All loose pieces of sealant in the repair area must be removed. If required, the area can be lightly sanded or brushed briskly with a stiff-bristle brush to remove sealant.

CAUTION: Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for composite repair.

(i) Solvent clean area to be sealed. (Refer to 20-30)

B. Mixing Sealants

WARNING: **Keep all sealants away from open flames or other sources of ignition.**

Mix and use sealants only in areas with adequate ventilation.

Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.

Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.

Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.

CAUTION: The expiration date is stamped on each sealant container. Never use expired sealant. Do not stir air into mixture. If air bubbles appear, they must be removed. Mixing containers must be clean and free of all contaminates.

All equipment used in mixing sealant must be clean and dust free to avoid contamination of sealant. Clean equipment immediately after use.

Note: Proper mixing and correct proportions are extremely important to obtain optimum results. Always observe sealant manufacturer's recommendations for mixing sealant.

(1) Materials

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Clean, Wax Free Container	-	Any Source	Hand mix sealant.
Spatula	-	Any Source	Hand mix sealant.
Scales, Accuracy ± 2%	-	Any Source	Proportion sealant.
Rotary Mixer	1384	Semco Application Systems PRC-DeSoto Intl Inc. Glendale, CA	Mix sealant.

Description	P/N or Spec.	Supplier	Purpose
Extrusion Gun Cartridge	-	Any Source	Load sealant.
Protective Gloves	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(2) Hand Mixing Mil-S-38249, Type I Firewall Sealant

(a) Weigh the amount of base material desired into a clean, wax free container. Mix in accordance to the noted ratios.

• For P/S 700 sealant, add accelerator to the base material at the ratio of 2.5 parts by weight of accelerator to 100 parts by weight of the base. Application life of P/S 700 is 2 hours when used at 75° F (24° C).

• For PR-812 firewall sealant, add accelerator to the base material at a ratio of 2.5 parts by weight of accelerator to 100 parts by weight of the base. Application life of PR-812 is 8 hours when used at 75° F (24° C).

(b) Stir as required to thoroughly mix the two components. After thorough and proper mixing, the mixed sealant shall be uniform in color and viscosity.

Note: Be sure to scrape the sides and bottom of the container in order to include all the base material in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

The MIL-S-38249 firewall sealant has a one year storage life when stored at temperatures below 80°F (26.5° C) in their original unopened containers.

(3) Hand Mixing Mil-S-8802, Type II, Class A Brushable Fuel Tank Sealant

Sealant is furnished in premeasured and proportioned kits. If the entire kit is not needed, sealant can be proportioned by combining ten parts of the base compound with one part accelerator (by weight). Use an accurate scale when mixing base and accelerator.

CAUTION: A clean, wax-free container must be used.

(a) Stir the accelerator to absorb all floating liquid before it is mixed with the sealant. The accelerator can then be poured into the container of sealant for mixing, otherwise, a wax-free container must be used.

(b) Thoroughly stir accelerator in its container until even consistency is obtained.

(c) Slowly stir accelerator into the base compound and thoroughly mix for approximately 7 to 10 minutes.

Note: Be sure to scrape the sides and bottom of the container in order to include all the compound in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

(4) Alternate Mixing Procedure for Mil-S-8802, Type II, Class A Brushable Sealant

(a) As an alternate procedure, a custom quantity may be mixed by weighing into a clean, wax-free container. Weigh the correct amount of base and accelerator immediately prior to mixing.

Note: The scales and weighing procedure must be controlled within 2% to insure good quality. A standard gallon-capacity paint shaker (1350 vibrations/minute) may be used to mix all kit sizes. Full containers should not be mixed on a paint shaker.

(b) Add accelerator to the base compound, replace lid, and vibrate 3-1/2 minutes to 5 minutes in an upright position.

(c) Remove container, open, and scrape down the sides with a spatula or putty knife. Replace lid and vibrate in an inverted position for 3-1/2 to 5 minutes.

(d) Use sealant or freeze for storage as required.

(5) Mixing of Mil-S-8802, Type II, Class B Extrusion Gun Sealant

Sealant is furnished in premeasured and proportioned kits and in two-part cartridges. If the two-part cartridges are used a special extrusion gun may be required to apply sealant. If a premeasured kit is used and the entire kit is not needed, the sealant can be proportioned by combining ten parts of the base compound with one part accelerator (by weight). Use an accurate scale when mixing base and accelerator. Extrusion gun sealant supplied in proportioned kits may be hand mixed as follows when suitable mechanical pressure mixers are not available.

CAUTION: Mixing must not be performed in a paint shaker. Slow hand mixing is recommended. The compound may be mixed by a slow-speed mechanical mixer. A high-speed mechanical mixer will generate internal heat and reduce application life.

(a) Stir the accelerator to absorb all floating liquid before it is mixed with the sealant. The accelerator can then be poured into the container of sealant for mixing, otherwise, a wax-free container must be used.

(b) Thoroughly stir accelerator in its container until even consistency is obtained.

(c) Slowly stir accelerator into the base compound and thoroughly mix for approximately 7 to 10 minutes.

Note: Be sure to scrape the sides and bottom of the container in order to include all the compound in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

(d) Fill new cartridge with mixed sealant and apply or freeze for storage as required.

C. Application of Sealants

(1) General Procedure

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent cleaning.
Acetone	ASTM D-329	Any Source	Solvent cleaning.

Description	P/N or Spec.	Supplier	Purpose
Parting Agent (silicone-free automotive wax)	-	Any Source	Prevent sealant from adhering to parts.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Gloves (clean, powder free and lint free)	-	Any Source	Handling cleaned surfaces.
Bristle Brush (non-nylon)	-	Any Source	Apply brushable sealant.
Pipe Cleaners	-	Any Source	Clean injection seals.
Sandpaper, Aluminum Oxide	200 grit	Any Source	Prep composite surfaces.
Extrusion Gun	Semco #850	Semco Application Systems PRC-Desoto Intl Inc. Glendale, CA	Apply extrudable sealant.
Polyethylene Cartridge	-	Semco Application Systems PRC-DeSoto Intl Inc. Glendale, CA	Hold sealant for extrusion gun.
Polyethylene Nozzles	-	Semco Application Systems PRC-Desoto Intl Inc. Glendale, CA	Apply sealant.
Roller	-	Any Source	Apply faying surface sealant.
Spatula	-	Any Source	Apply sealant.
Gloves, Protective	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(b) Lightly sand any composite areas to be sealed with 200 grit sandpaper.

CAUTION: Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for repair.

(c) Remove metal and composite chips, shavings, and lint using stiff bristle brushes or vacuum.

(d) Solvent clean all surfaces using acetone or isopropyl alcohol. (Refer to 20-30)

WARNING: **Keep all sealants away from open flames or other sources of ignition.**

Mix and use sealants only in areas with adequate ventilation.

Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.

Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.

Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.

(e) Mix sealant as required.

(f) Apply sealant using the appropriate sealing techniques. (Refer to 20-10)

(g) Allow sealant to cure before handling.

D. Sealing Techniques

(1) Repairing Faying Surface Seal

The faying surface, is the overlapping area of the adjoining surfaces. Fay surface sealing is accomplished by applying sealant to one mating part before assembly. Sufficient sealant must be applied so it will squeeze out completely around the joint when the parts are fastened together. In order to accomplish an adequate seal in an efficient manner, the following sealing and cleaning procedures must be performed as specified. Examples of faying surface seals are at the firewall attachment of the hot air valve and window installation.

(a) Disassemble components from structure to be sealed.

(b) If not already accomplished remove all sealant from faying surfaces with cutting tools and suitable hardwood or plastic scrapers as described in “Preparation for Sealing.” (Refer to 20-10)

(c) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(d) Solvent clean surfaces to be sealed. (Refer to 20-30)

CAUTION: Do not apply parting agent over paints, primers, or on acrylics.Parting agents will lift paints and most primers and will craze acrylics. Epoxy primers are unaffected by parting agent.

(e) Removable seals shall be applied with the use of a parting agent. For fuel tank access plates, apply parting agent to both surfaces. In all other cases, apply parting agent to one surface only. When parting agent is dry to the touch, the parts may be faying surface sealed and assembled.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60° F (15.5° C) or to a structure that is below 60° F (15.5° C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured.

(f) Using an extrusion gun, roller, or spatula, apply sealant to one mating surface. Spread sealant over entire faying surface.

(g) Place parts in assembly position and install fasteners within the sealant work life.

Note: Sufficient sealant shall have been applied so that the space between the faying surfaces is completely filled with sealant and a small amount of sealant is extruded continuously along the joint.

(h) Fair out extruded sealant to leave a smooth fillet along joint.

(i) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(j) Allow sealant to cure.

(2) Repairing Injection Seal

Injection seals are used to fill holes, joggles, channels and other voids. Injection seals may be applied to provide continuity where fillet seals are interrupted by structure. Injection sealing forces air out of a cavity and fills the vacated space with sealant. Injection seals are accomplished by injecting the area with an extrudable sealant through an extrusion cartridge or a tube. An example of an injection seal is the seal applied in the fuel tank where the joggle at the end of a rib intersects the wing skin interior and the spar or shear web.

(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in “Preparation for Sealing.”

Note: (Refer to 20-10)The injection channel must be cleared all the way through as trapped air will prevent complete filling of the channel. A pipe cleaner or hooked wire may be used to clear sealant debris from inside the seal channel.

(b) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(c) Solvent clean joints to be sealed. Remove all solvent residue and thoroughly dry area. (Refer to 20-30)

CAUTION: Ensure that extrusion gun cartridge has sufficient sealant to make a complete seal with one injection without any break. Stopping and starting an injection seal will cause air to be entrapped in the seal and is cause for rework.

Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60° F (15.5° C) or to a structure that is below 60° F (15.5° C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured.

(d) Apply injection seal by injecting cavity with sealant from one end until sealant emerges from the other.

(e) Remove excess sealant with a fairing tool and smooth ends of seal.

(f) Fair out extruded sealant to leave a smooth fillet along joint.

(g) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(h) Allow seal to cure.

(3) Repairing Fillet Seal

Fillet seals are used in the integral fuel tank along the intersection of the wing skin ribs, along the intersection of the wing skin and the spar and aft shear web, around fasteners and fitting protruding into the tank. Fillet seals are also used around the firewall perimeter, and other places where weather, fume, or dust intrusion must be prevented and to seal wetted areas. Fillet seals produce a smooth junction. All joints, joggles, voids, and fasteners in wet areas must be fillet sealed. Fillets laid on intersecting joints must be joined together to produce a continuous seal.

(a) If not already accomplished, remove all sealant from damaged seal with cutting tools and suitable scrapers as described in “Preparation for Sealing.” (Refer to 20-10)

Note: The injection channel must be cleared all the way through as trapped air will prevent complete filling of the channel. A pipe cleaner or hooked wire may be used to clear sealant debris from inside the seal channel.

(b) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(c) Solvent clean channel to be sealed using pipe cleaners. The channel should be cleaned at least twice and all residue removed. Dry channel using pipe cleaners.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60° F (15.5° C) or to a structure that is below 60° F (15.5° C). Handle sealed structures carefully and do not move until sealant is tack-free. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

(d) Use the extrusion gun to lay a bead along joint. Point the extrusion gun into the seam and maintain it nearly perpendicular to the line of travel. A bead of sealant shall precede the extrusion gun nozzle tip. Work out all entrapped air with a small paddle.

Note: Sealant must be applied so that it provides an airtight seal. Ensure that folds, laps, and entrapped air are not created during sealing. The fillet can be moved slightly to ensure that the highest portion of the fillet is over the edge of the structure.

(e) A fillet may be applied in two or more applications. A small fillet should be applied first and allowed to partially cure, followed by a second application of sealant sufficient to form the final fillet. The final fillet must be smooth and should have the dimensions as specified.

CAUTION: Lubrication in any form shall not be used to assist in smoothing the fillet.

(f) Work out all entrapped air and remove excess sealant with a fairing tool. Fair out extruded sealant to leave a smooth fillet along joint and at ends. The tool should be pressed against the sealant and moved parallel to the bead.

(g) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(h) Allow seal to cure

(4) Fastener Sealing in Wet and Non-Wet Areas (See Figure 20-105)

The following procedure is used primarily for sealing bolts, nuts, and domed nutplates in wet areas with MIL-S-8802 Class B fuel tank sealant. However, this procedure is also applicable to bolt sealing with RTV 736 sealant in non-wet areas, such as the firewall.

(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in “Preparation for Sealing.” (Refer to 20-10)

(b) Ensure that fastener is properly installed and torqued.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(c) Solvent clean area to be sealed. The fastener and surrounding area should be cleaned at least twice and all residue removed. (Refer to 20-30)

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60° F (15.5° C) or to a structure that is below 60° F (15.5° C). Handle sealed structures carefully and do not move until sealant is tack free. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

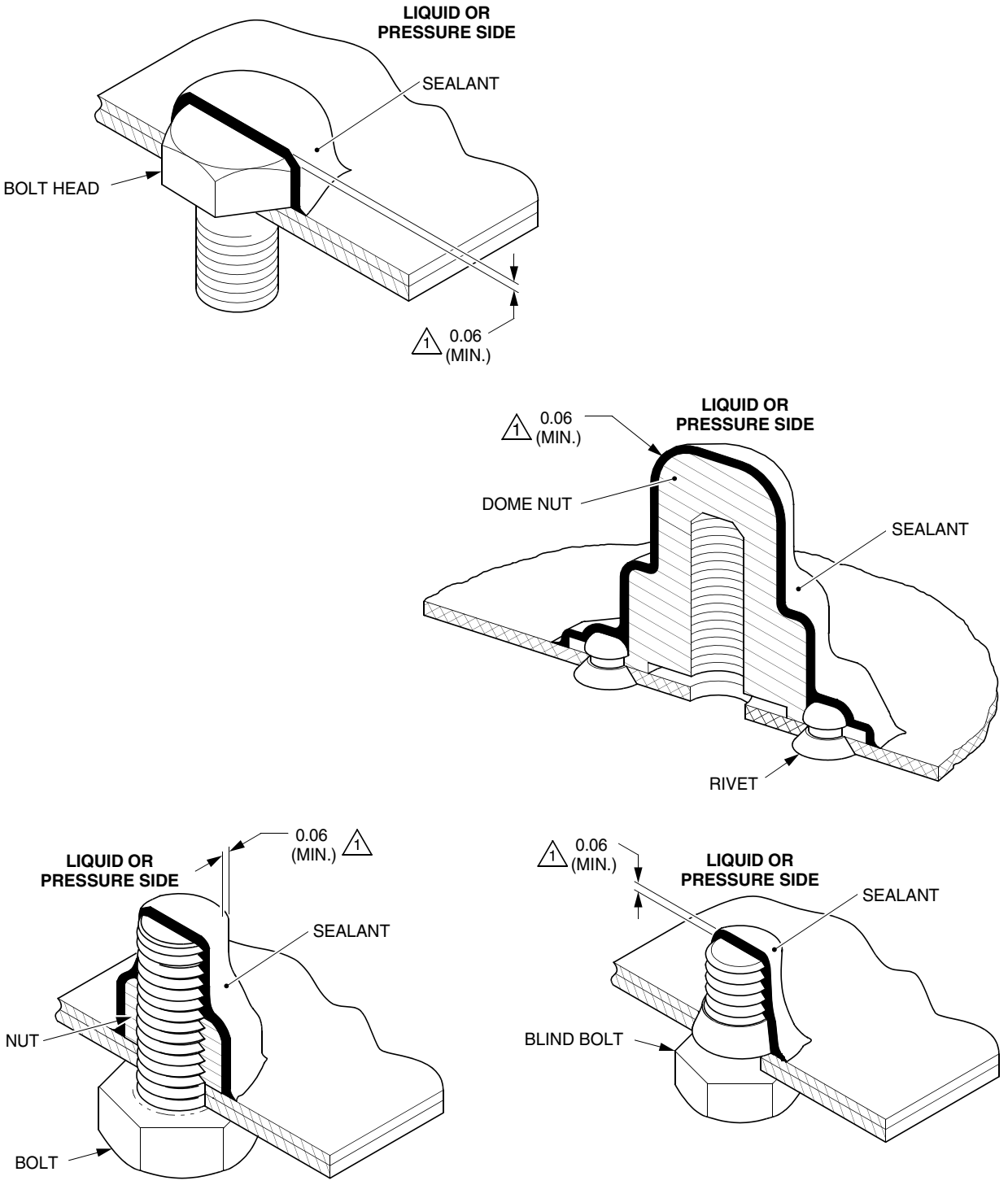
(d) Use extrusion gun or spatula to apply sealant around the base and over the fastener. If necessary, the sealant may be worked with a tool so that the sealant has a minimum thickness as specified.

Note: Sealant must be applied so that it provides an airtight seal. Ensure that folds, laps, and entrapped air are not created during the process. The fillet can be moved slightly to insure that the highest portion of the fillet is over the edge of the structure.

(e) Work out all entrapped air and remove excess sealant with a fairing tool.

(f) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(g) Allow seal to cure.



NOTE

1 Optional to cover nut, thread or bolt with sealant. Keep sealant thickness to a minimum: however, it is permissible to have more than 0.06" minimum thickness.

2 Eliminate any visible voids or bubble areas around the base of the fastener.

SR22_MM20_1972

Figure 20-105
Fastener Sealing

(5) Tube Fitting Seals in Fuel Tank Bulkheads (See Figure 20-106)

Bulkhead tube fittings installed in fuel tank bulkheads with the bulkhead nut on the wet side of the bulkhead, shall be sealed by applying sealant to the threaded area of the fitting prior to installing the bulkhead nut and o-ring. Bulkhead fittings which are installed with the nut on the dry side of the tank bulkhead shall be fillet sealed only.

(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in “Preparation for Sealing.” (Refer to 20-10)

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(b) Solvent clean area and fitting to be sealed. The fastener and surrounding area should be cleaned at least twice and all residue removed. (Refer to 20-30)

(c) Apply a small amount of sealant on fitting threads before installing nut. Ensure that bulkhead fitting is properly installed with O-ring and nut is on wet side of bulkhead and nut is properly torqued.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60° F (15.5° C) or to a structure that is below 60° F (15.5° C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

Note: Application time is the period in which the sealant can be satisfactorily applied. After this point, the material does not “wet” properly and may fail in adhesion (sealant “rolls up” ahead of the sealing gun or “draws up” behind the gun).

(d) Use extrusion gun or spatula to apply sealant around the base and over the nut on the wet side. If necessary, the sealant may be worked with a tool so that the sealant has a minimum thickness as specified.

Note: Sealant must be applied so that it provides an airtight seal. Care must be exercised so that folds, laps, and entrapped air are not created during the process. All air bubbles must be worked out of the sealant. The fillet can be moved slightly to insure that the highest portion of the fillet is over the edge of the structure.

(e) Work out all entrapped air and remove excess sealant with a fairing tool.

(f) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(g) Allow seal to cure.

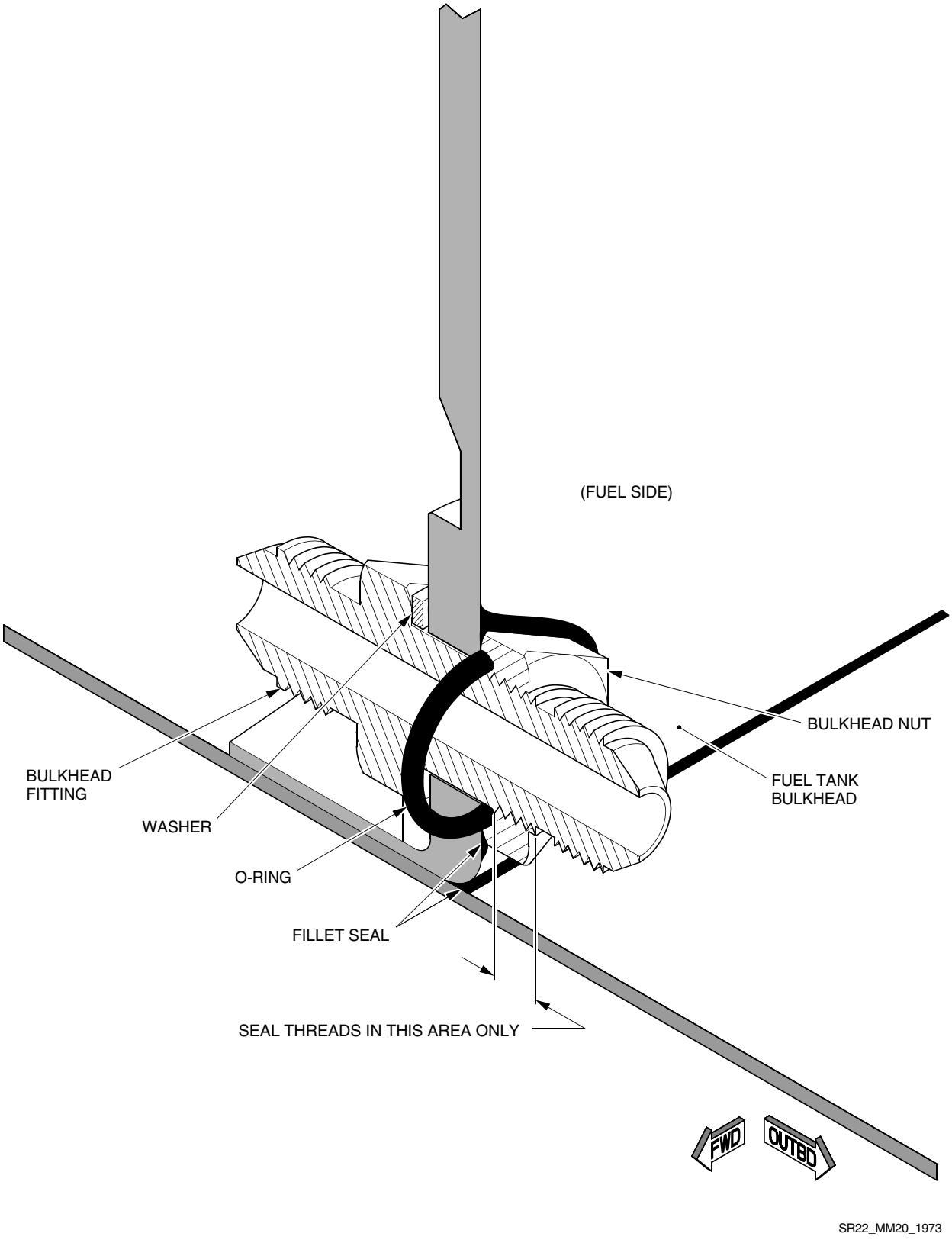


Figure 20-106
Bulkhead Fitting Seal

EFFECTIVITY:
All

(6) Cable Pass-Through (See Figure 20-107)

Serials 0002 thru 1601, 1603 thru 1820, 1822 thru 1839, 1841 thru 1862: The hot air valve control cable, alternate air control cable, mixture control cable, throttle control cable, and governor control cables all pass-through the firewall.

Serials 1602, 1821, 1840, 1863 & subs: The alternate air control cable, mixture control cable, throttle control cable, and governor control cables all pass-through the firewall.

When any of these cables are removed, the cable pass-through must be properly fillet sealed to ensure an airtight seal.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove sealant.
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean cable pass-through and firewall.
1/8” Fiberfrax Paper	970J or TON0146	UniFrax Corporation Niagara Falls, NY 14305 716-278-3800	Firewall insulation.
High Temperature Silicone Sealant	RTV 736	Dow Corning Corporation Midland, MI 48686-0994 989-496-4400	Sealant.

(b) Remove all old sealant from cable pass-through and firewall.

(c) Tighten nuts and washers securing cable pass-through to firewall.

(d) Using isopropyl alcohol, solvent clean cable pass-through and firewall. (Refer to 20-30)

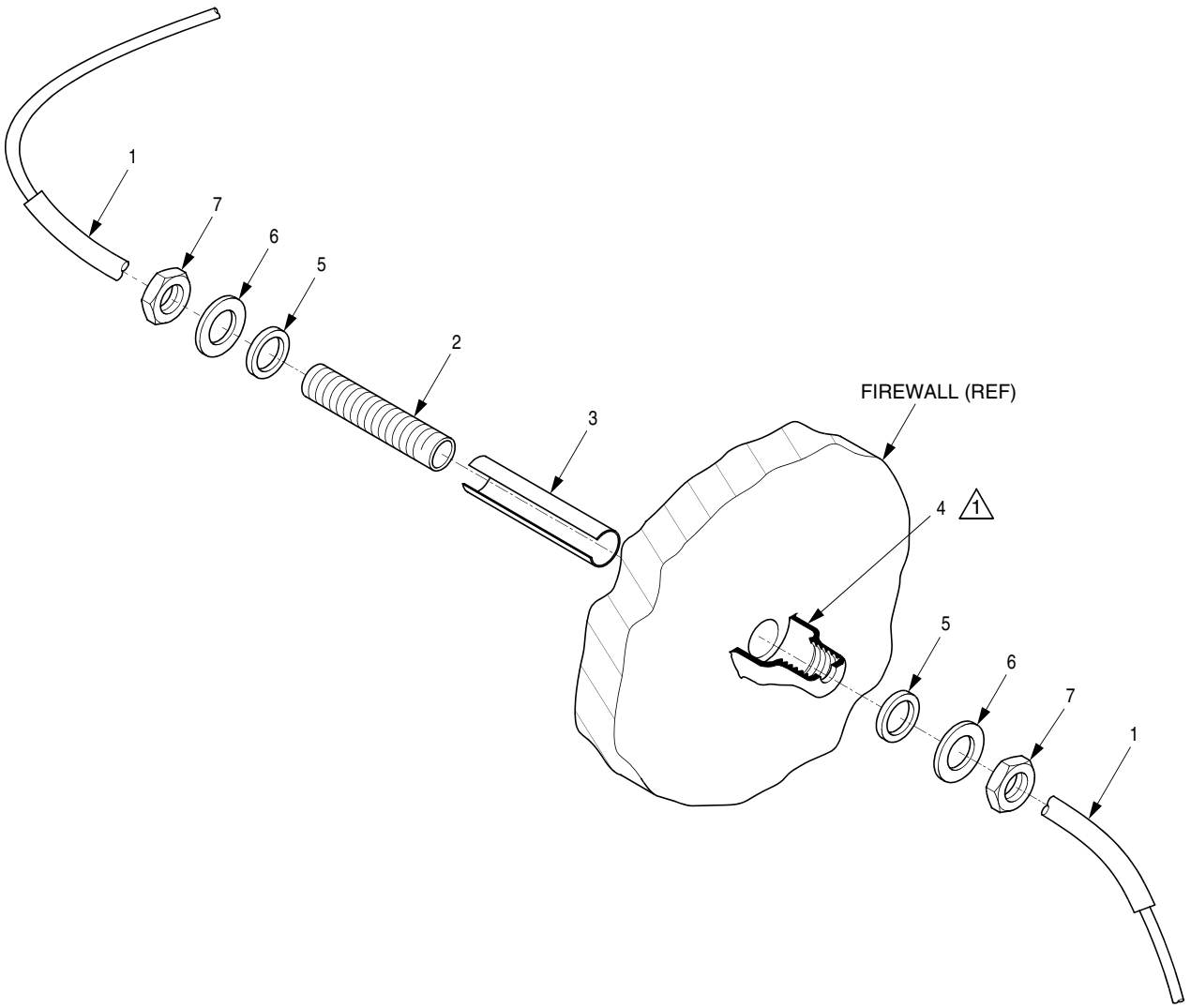
(e) Wrap Fiberfrax paper around portion of control cable that passes through firewall so a tight fit exists between control cable and cable pass-through.

CAUTION: When routing control cable, ensure cable does not interfere with airplane control rigging, wires, or hoses.

(f) Route and secure control cable.

(g) Fillet seal and cover entire cable pass-through on both sides of firewall with high temperature silicone sealant. (Refer to 20-10)

(h) Allow sealant to cure.



LEGEND

1. Control Cable
2. Cable Pass-Through
3. Fiberfrax Paper
4. Sealant
5. Fiber Washer
6. Washer
7. Nut

NOTE

1 Eliminate visible voids or bubble areas around base of fastener.

SR22_MM20_1400B

Figure 20-107
Cable Pass-Through Sealing

(7) Reseal Integral Fuel Tank After a Structural Repair

The fuel tank was manufactured with a resin coating on all skin surfaces of the tank with injection and fillet seals using MIL-S-8802 Class B extrudable sealant along all bond lines and at all penetrations for tubing, fuel filler, and fuel level float. After a repair has been made to the composite structure of the fuel tank, it will be necessary to reseal the tank in the area of the repair.

Access covers are faying surface sealed with MIL-S-8802 Class B sealant with parting agent applied to both faying surfaces as described under “Faying Surface Seals.” (Refer to 20-10)

Repairing seals at joggles at rib-spar intersections and along bond lines will be accomplished using MIL-S-8802 Class B extrudable sealant in accordance with “Repairing Injection Seal,” and “Repairing Fillet Seal.” (Refer to 20-10) (Refer to 20-10)

Repairs to seals around fasteners in the fuel tank will be accomplished using MIL-S-8802 Class B sealant in accordance with “Fastener Sealing in Wet and Non-Wet Areas.” (Refer to 20-10)

Repairs to bulkhead penetrations will be accomplished using MIL-S-8802 Class B sealant in accordance with “Tube Fitting Seals in Fuel Tank Bulkheads.” (Refer to 20-10)

Repairs to the surface of the wing structure will be made from the outside and the inside wing surfacers must be resealed using MIL-S-8802 Class A brushable sealant using the following procedure:

(a) Preclean all surfaces using acetone or isopropyl alcohol solvent. (Refer to 20-30)

(b) Lightly sand the repaired area and adjacent area with 200 grit sandpaper.

CAUTION: Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for composite repair.

(c) Remove metal and composite chips, shavings, and lint using stiff bristle brushes and vacuum.

(d) Solvent clean all surfaces using acetone or isopropyl alcohol. Thoroughly dry surfaces and remove all residue. (Refer to 20-30)

WARNING: **Keep all sealants away from open flames or other sources of ignition.**

Mix and use sealants only in areas with adequate ventilation.

Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.

Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.

(e) Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.

(f) Mix sealant as required.

(g) Apply a coat of MIL-S-8802 Class A sealant to the prepared area. Apply sealant with a brush, stroking in two directions to thoroughly coat the area with sealant 5 to 15 mils thick (0.005 to 0.015 inch). Small areas, drips, or runs in excess of the 15 mils (0.015 inch) are acceptable in isolated cases. No greater than 10% of the area being coated shall exceed the maximum thickness.

(h) Allow sealant to cure.

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SOLVENT CLEANING

1. DESCRIPTION

This section covers solvent cleaning procedures for metallic and non-metallic materials. These procedures may be used for general cleaning when solvents are required and must be used to clean surfaces prior to the application of adhesive, resin, or sealants.

WARNING: **Cleaning solvents are toxic and flammable. Therefore, special precautions must be used whenever solvents are used for any purpose.**

Always follow the solvent manufacturer's directions.

A fire extinguisher must be immediately available when using solvents.

Adequate ventilation shall be provided and fresh air masks shall be used in all closed areas with marginal or insufficient ventilation.

Skin protection in the form of protective gloves and eye protection must be worn when pouring or applying solvents.

When solvent cleaning closed areas such as fuel tanks, eliminate spark hazards, electrically ground the aircraft, and fill the enclosed area with an inert gas such as argon or nitrogen. Apply the inert gas continuously until the tank is clean and dry.

Always check the MSDS for the solvent being used for additional requirements and/or precautions to be followed when using a particular solvent.

Special procedures may be required to dispose of used solvents.

2. MAINTENANCE PRACTICES

A. Solvent Cleaning Metal Parts

WARNING: Cleaning solvents are toxic and flammable. Skin protection and eye protection are required. Additionally, adequate ventilation and/or fresh air masks shall be used in all closed areas.

(1) Approved Materials

(a) Solvents

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Preliminary and final cleaning.
Acetone	ASTM D-329	Any Source	Preliminary and final cleaning.
Mineral Spirits	TT-T-291 I, II, or III	Any Source	Preliminary and final cleaning.
Aliphatic Naptha	TT-N-95 Type II	Any Source	Preliminary and final cleaning.

(b) Miscellaneous

Description	P/N or Spec.	Supplier	Purpose
Sealant Removal and Cutting Tools	-	Any Source	Remove sealant.
Pipe Cleaners	-	Any Source	Remove sealant in injectable gaps.
Bristle Brush (non-nylon, non-metallic)	-	Any Source	Clean up.
Solvent Dispensers (polyethylene squirt bottle)	-	Any Source	Dispense solvents.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Cotton Gloves (clean, white, lint free)	-	Any Source	Handle cleaned surfaces.
Protective Gloves (neoprene rubber)	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(2) Preliminary Cleaning

(a) Remove excess material (metal chips, shavings, lint, etc.) using a vacuum sweeper, clean bristle brush, etc.

(b) Clean area with a clean cloth dampened with cleaning solvent and immediately wipe area dry with a clean dry cloth. Do not allow cleaning solvent to air dry as a residue will remain on the surface.

(3) Final Cleaning

Note: Final cleaning must be accomplished prior to applying any adhesive, or sealant. All surfaces shall be thoroughly cleaned and dried before application of any adhesive or sealant. When handling cleaned surfaces, wear clean, white cotton gloves to prevent surface contamination. Surfaces shall be recleaned in the event of contamination.

(a) Fold clean lint-free cloths in such a manner as to eliminate raw edges to reduce the possibility of lint contaminating the surface to be cleaned.

(b) Dampen one cloth with cleaning solvent from polyethylene squirt bottle. The cloth should not be saturated to a point where solvent drips.

CAUTION: Extreme care is needed to clean hard to reach areas, corners, gaps, etc. A small paint brush, pipe cleaners, or cloth wrapped around wooden or phenolic tools may be used for slots, recesses, and other hard to reach areas.

Do not allow cleaning solvent to air dry as a residue will remain on the surface, contaminating a following process.

CAUTION: Never pour or spray cleaning solvent on aircraft structure because it will run back between structural layers, then run back out again after the cleaning operations are completed, bringing contamination to surfaces previously cleaned.

(c) Thoroughly clean small areas at a time and immediately wipe area dry with a clean, dry, lint-free cloth.

Note: If adhesive or sealant is to be applied, always clean an area wider than the width of final product being applied.

(d) Continue cleaning process until no discoloration is noted on the drying cloth.

Note: If primer is removed during cleaning and if the exposed metal surface will be completely covered by the sealing process, the exposed metal surface need not be further treated.

B. Solvent Cleaning Composite Materials

WARNING: **If fuel tank interior is to be cleaned, ground aircraft to suitable earth ground. Evacuate oxygen from fuel tank by filling tank with an inert gas such as nitrogen or argon. Gas should be applied continuously until tank is clean and dry. Laminates that come in contact with moisture must be dried before performing composite repairs.**

WARNING: **Cleaning solvents are toxic and flammable. Skin protection and eye protection are required. Additionally, adequate ventilation and/or fresh air masks shall be used in all closed areas.**

CAUTION: Isopropyl alcohol is the only cleaning agent recommended when preparing composite surfaces (excluding fuel compartments) for repair. When cleaning a composite surface in any of the fuel compartments, acetone is the recommended cleaning agent.

CAUTION: *Serials 2438 & subs:* Do not allow isopropyl alcohol to contact fuel quantity sensor dial or cracking and crazing will occur.

CAUTION: *Serials 3026 & subs w/ Ice Protection and Perspective Avionics:* Do not allow acetone to contact glycol quantity sensor dial or cracking and crazing will occur.

(1) Approved Materials

(a) Solvents

Description	P/N or Spec.	Supplier	Purpose
Cleaner	DX320, DX330, DX394, DX440, and SX1005	PPG Industries, Inc.	Cleaning repair surfaces before apply paint manufactured by PPG Industries.
Isopropyl Alcohol	99% or higher purity	Any Source	Preliminary and final cleaning of composites before bonding process.
Acetone	ASTM D-329	Any Source	Preliminary and final cleaning.
Mineral Spirits	TT-T-291 I, II, or III	Any Source	Preliminary and final cleaning.
Aliphatic Naptha	TT-N-95 Type II	Any Source	Preliminary and final cleaning.

(b) Miscellaneous

Description	P/N or Spec.	Supplier	Purpose
Sealant Removal and Cutting Tools	-	Any Source	Remove sealant.
Pipe Cleaners	-	Any Source	Remove sealant in injectable gaps.
Bristle Brush (non-nylon, non-metallic)	-	Any Source	Clean up.

Description	P/N or Spec.	Supplier	Purpose
Solvent Dispensers (polyethylene squirt bottle)	-	Any Source	Dispense solvents.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Cotton Gloves (clean, white, lint free)	-	Any Source	Handle cleaned surfaces.
Protective Gloves (neoprene rubber)	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(2) Preliminary Cleaning

(a) Remove excess material (chips, shavings, lint, etc.) using a vacuum sweeper, clean bristle brush, etc.

(b) Clean area with a clean cloth dampened with solvent and immediately wipe area dry with a clean dry cloth. Do not allow solvent to air dry as a residue will remain on the surface.

(3) Final Cleaning

Note: Final cleaning must be accomplished prior to applying adhesive, resin, or sealant. All surfaces shall be thoroughly cleaned and dried before application of any adhesive, resin, or sealant. When handling cleaned surfaces, wear clean, white cotton gloves to prevent surface contamination. Surfaces shall be recleaned in the event of contamination.

(a) Absorb all visible moisture on the laminate using a clean, lint-free, cotton cloth.

(b) Fold clean lint-free cloths in such a manner as to eliminate raw edges to reduce the possibility of lint contaminating the surface to be cleaned.

(c) Wipe affected area with solvent using a clean, lint-free, cotton cloth.

(d) Dampen one cloth with solvent. The cloth should not be saturated to a point where solvent drips.

CAUTION: Extreme care is needed to clean hard to reach areas, corners, gaps, etc. A small paint brush, pipe cleaners, or cloth wrapped around wooden or phenolic tools may be used for slots, recesses, and other hard to reach areas.

CAUTION: Do not allow cleaning solvent to air dry as a residue will remain on the surface, contaminating a following process.

CAUTION: Never pour or spray cleaning solvent on aircraft structure because it will run back between structural layers, then run back out again after the cleaning operations are completed, bringing contamination to surfaces previously cleaned.

(e) Thoroughly clean small areas at a time and immediately wipe area dry with a clean, dry, lint-free cloth.

Note: If adhesive, resin, or sealant is to be applied, always clean an area wider than the width of final product being applied.

(f) Continue cleaning process until no discoloration is noted on the drying cloth.

C. Solvent Cleaning Acrylic Surfaces

WARNING: **Cleaning solvents are toxic and flammable. Skin protection and eye protection are required. Additionally, adequate ventilation and/or fresh air masks shall be used in all closed areas.**

CAUTION: Do not use any solvent other than aliphatic naphtha or Isopropyl alcohol to clean acrylic parts, as crazing may occur. Isopropyl alcohol can also craze acrylic if instructions are not carefully followed.

CAUTION: *Serials 2438 & subs:* Do not allow isopropyl alcohol to contact fuel quantity sensor dial or cracking and crazing will occur.

CAUTION: *Serials 3026 & subs w/ Ice Protection and Perspective Avionics:* Do not allow acetone to contact glycol quantity sensor dial or cracking and crazing will occur.

Note: If sealant is to be applied, use cleaning solvent only on portions of acrylic parts necessary to facilitate a proper sealing procedure.

(1) Materials

(a) Solvents

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Preliminary and final cleaning.
Aliphatic Naptha	TT-N-95 Type II	Any Source	Preliminary and final cleaning.
Acrylic Polish and Sealant	SP-PL16	LP Aero Plastics	Polish exterior window surface.
210 Plastic Cleaner And Polish	SP-210A	LP Aero Plastics	Polish interior window surface.

(b) Miscellaneous

Description	P/N or Spec.	Supplier	Purpose
Bristle Brush (non-nylon, non-metallic)	-	Any Source	Clean up.
Solvent Dispensers (polyethylene squirt bottle)	-	Any Source	Dispense solvents.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Cotton Gloves (clean, white, lint Free)	-	Any Source	Handle cleaned surfaces.
Protective Gloves (neoprene rubber)	-	Any Source	Protect hands from chemicals.

Description	P/N or Spec.	Supplier	Purpose
Goggles	-	Any Source	Protect eyes from chemicals.

(2) Cleaning

(a) Fold clean lint-free cloths in such a manner as to eliminate raw edges to reduce the possibility of lint contaminating the surface to be cleaned.

(b) Dampen one cloth with cleaning solvent from polyethylene squirt bottle. The cloth should not be saturated to a point where solvent drips.

CAUTION: Never pour or spray cleaning solvent on aircraft structure because it will run back between structural layers, then run back out again after the cleaning operations are completed, bringing contamination to surfaces previously cleaned.

(c) Thoroughly clean small areas at a time. Wipe area dry with a clean, dry, lint-free cloth. Do not allow solvent to air dry as a residue will remain on the surface, contaminating a following process.

CAUTION: After thoroughly cleaning surfaces to be sealed, personnel should wear clean white gloves to prevent contaminating the surfaces to be sealed. If contamination occurs, surfaces shall be recleaned.

Note: If sealant is to be applied, always clean an area wider than the width of finally applied sealant. Allow acrylic surfaces to completely dry, without contaminants, prior to sealing.

(d) Continue cleaning until no discoloration is evident on the drying cloth.

D. Solvent Cleaning Painted or Primed Surfaces for Placard Application

WARNING: **Cleaning solvents are toxic and flammable. Skin protection and eye protection are required. Additionally, adequate ventilation and/or fresh air masks shall be used in all closed areas.**

(1) Materials

(a) Solvents

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Preliminary and final cleaning.

(b) Miscellaneous

Description	P/N or Spec.	Supplier	Purpose
Solvent Dispensers (polyethylene squirt bottle)	-	Any Source	Dispense solvents.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Cotton Gloves (clean, white, lint free)	-	Any Source	Handle cleaned surfaces.
Protective Gloves (neoprene rubber)	-	Any Source	Protect hands from chemicals.
Goggles	-	Any Source	Protect eyes from chemicals.

(2) Cleaning

(a) Fold clean lint-free cloths in such a manner as to eliminate raw edges to reduce the possibility of lint contaminating the surface to be cleaned.

(b) Dampen one cloth with cleaning solvent from polyethylene squirt bottle. The cloth should not be saturated to a point where solvent drips.

Note: Never pour or spray cleaning solvent on aircraft structure because it will run back between structural layers, then run back out again after the cleaning operations are completed, bringing contamination to surfaces previously cleaned.

(c) Thoroughly clean small areas at a time. Wipe area dry with a clean, dry, lint-free cloth. Do not allow solvent to air dry as a residue will remain on the surface, contaminating a following process.

CAUTION: After thoroughly cleaning surfaces to be sealed, personnel should wear clean white gloves to prevent contaminating the surfaces to be sealed. If contamination occurs, surfaces shall be recleaned.

(d) Continue cleaning until no discoloration is evident on the drying cloth.

THREADLOCKER/THREAD SEALANT AND TORQUE SEAL

1. DESCRIPTION

This section contains surface preparations and cleaning procedures for the usage of threadlocker, thread sealant, and torque sealing agents.

2. MAINTENANCE PRACTICES

A. Threadlocker/Thread Sealant

(1) Shelf Life

Threadlocker/thread sealant itself has no designated maximum shelf life when stored at room temperature in a unopened container. Once the container is opened, temperature and environmental factors, such as humidity and exposure to sunlight, have a major affect on shelf life. Observe shelf life recommendations for threadlocker/thread sealant stored in previously opened containers. Normally, threadlocker/thread sealant stored within the shelf life parameters will be acceptable for use provided there is no contamination or jelling of the substance.

(2) Application

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean surfaces.
Primer	7471 Grade T	Any Source	Prime surfaces
Threadlocker/Thread Sealant	(Refer to 51-30)	(Refer to 51-30)	Lock/bond threads as required by application

(b) Bearing surfaces and threads to receive threadlocker/thread sealant shall be clean, free of dust, grease, condensation, moisture, or other contaminating substances. Solvent clean surfaces with isopropyl alcohol. (Refer to 20-30)

(c) Prime surfaces with 7471 Grade T primer.

(d) Use care to keep threadlocker/thread sealant out of bearings.Threadlocker/thread sealant may be applied by brushing, dipping, tumbling, or by running the nozzle over the threads. Either the nut or the bolt may be coated. However, for blind hole applications, the sides of the blind hole and the first two threads of the male fastener shall be coated. Parts shall then be assembled using normal torque. Excess threadlocker/thread sealant must be wiped off with a rag moistened with isopropyl alcohol.

Note: When specified, threaded fasteners in the fuel tank area shall be installed with Loctite 242 and 7471 Grade T primer.

(3) Usage and Specifications

For directions and specifications, refer to the product labeling/packaging for limitations regarding part number, typical use, standardization, color, viscosity, application temperature, cure time (handling/full), and recommended primer. If label guidelines are not available, contact the manufacturer for additional information.

(4) Shelf Life

For optimal storage, maintain threadlocker/thread sealant at a temperature within the range specified on the product labeling. If label guidelines are not available, contact the manufacturer for additional information.

B. Torque Seal

Torque seal should be applied to all jam nuts. Inspect torque sealed components when ever accessible and during each specified inspection period. Inspect the component for any signs of loosening. If the torque seal is broken, the component must be immediately inspected and serviced.

SAFETYING

1. DESCRIPTION

This section contains information on the proper safetying techniques and procedures used when fastening hardware.

2. MAINTENANCE PRACTICES

A. Safety Wiring

There are two basic forms of safety wiring. The single-wire method and the double-twist method. Safety wire comes in four types which are identified by size and color. The four types are classified by use. Inconel and Monel wire is used for general safety wiring and is identified by a natural wire color. Monel can withstand temperatures up to 800°F; Inconel can withstand temperatures up to 1500°F. Copper that is cadium-plated and dyed yellow is used for shear and seal wiring applications. Aluminum Alloy (Alclad 5056) is dyed blue and is used exclusively for safety-wiring magnesium parts. Stainless steel (grade 302) is silver colored and used for safety-wiring where corrosion-resistance is required.

Size of wire is dependent on material and purpose of installation. Use a 0.020” diameter copper wire for shear and seal applications. Use a 0.020” diameter wire to safety wire parts with tie holes smaller than 0.045” or on parts with a tie hole diameter between 0.045” and 0.062” when spacing between parts is less than two inches or, when bolts and screws of 0.250” diameter or less are closely spaced. Use a 0.032” diameter wire (minimum) for general purpose safety wiring.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: Use a 0.041” diameter wire (minimum) for brake disc safety wiring.

Shear applications are those where it is necessary to break or shear wire to permit operation or actuation of emergency devices. Seal applications are where wire is used with a lead seal to prevent tampering or use of a device without indication.

(1) Single Wire Method (See Figure 20-501)

The single wire method has a limited application. Single-wire method is used for shear and seal wiring applications. The single wire method is most commonly used on emergency equipment. The single wire method is also used when a series of three or more parts, usually small screws or bolts, are in a closely spaced geometric pattern (square, rectangle, or circle). Closely spaced is defined as the spacing of two inches or less between the centerline of parts. The wire in this application is strong enough to safety the part, but can be easily broken when use of the emergency equipment is required. A third application of the single wire method is safetying hard to reach parts which are impractical to double wire. Single-wire method is accomplished by passing a single wire through tie holes and back with the ends then twisted together. Wire twisting pliers are used to obtain a uniformly tight twist in the wire.

Note: When using single-wire method of safety wiring, the largest wire that will fit the tie holes should be used.

(2) Double Wire Method (See Figure 20-502)

The double-twist method is the most common method of safety wiring. When double wire safetying in a series, the direction of twist must be reversed at each unit. When safetying widely spaced series using this method, the maximum number of units is three. Safety wiring by the double-twist method is really one wire twisted on itself several times and is accomplished by inserting one end of the wire through the tie holes of the bolt head and firmly loop around the bolt head. This does not necessarily apply to castellated nuts when the slot is close to the top of the nut. The wire will be more secure if it is made to pass along side of the stud. While taut, twist the strands to within 1/8” of the next part. The twisting keeps the wires taut without overstressing and prevents the wire from becoming nicked, kinked, or mutilated. After the last tie hole, the wire is twisted three to five times to form a pigtail. Cut off any excess wire and bend the pigtail towards the part.

Note: Widely spaced multiple groups shall mean those in which fasteners are from four to six inches apart.

(3) General Installation Procedures

CAUTION: Screws in closely spaced geometric pattern which secure hydraulic or air seals, hold hydraulic pressure, or are used in critical areas should use the double-twist method of lockwiring. Lockwiring shall not be used to secure fasteners or fittings which are spaced more than six inches apart, unless tie points are provided on adjacent parts to shorten the span of safety wire to less than six inches. When safety wiring closely spaced multiple groups, the number of units that can be safety wired by a 24-inch length of wire shall be the maximum number in a series.

Note: Safety wire 0.020 inch (0.5 mm) in diameter shall have 10 to 13 twists per one inch (25.4 mm).

Safety wire 0.032 inch (0.8 mm) in diameter shall have 6 to 12 twists per one inch (25.4 mm).

Safety wire 0.041 inch (1.0 mm) in diameter shall have 3 to 5 twists per one inch (25.4 mm).

(a) Ensure fasteners to be safetied are correctly tightened and, where specified, torqued.

(b) Start and finish twisting the safety wire within 0.109 inch (3 mm) of the wire locking hole in either part (when using the double wire method).

Note: Safety wire between the parts must be tight. The safety wire at the head of the part must not be capable of being pulled over its head by using finger tension. The end of the safety-tie (pigtail) must contain a minimum of five twists, but not to exceed 0.703 inch (18 mm) in length. Twist slightly more wire than needed for the pigtail.

(c) Cut pigtails square to prevent snagging.

Note: Pigtails should be made without sharp bends to prevent fractures and to prevent them from touching other components. Use new wire for each application, never re-use old wire. Parts should be safety wired so that the wire is placed in tension (pulled on) if a part attempts to loosen.

(4) Required Installations of Safety Wire

(a) Bolts and other fasteners securing critical parts that affect airplane safety and operation.

Note: In blind-tapped hole applications of bolts or castellated nuts on studs, lockwiring is installed in the same manner as described for bolt heads. Hollow head bolts are safetied in the same manner as regular bolts.

(b) Drain plugs and cocks may be safetied to a bolt, nut, or other part having a free tie hole.

(c) External snap rings may be locked if necessary using general locking principles as illustrated.

Note: Internal snap rings should not be safety wired.

(d) When locking is required on electrical connectors which use threaded coupling rings, or on plugs which employ screws or rings to fasten individual parts of which plug together, they shall be safety wired with 0.020” diameter wire in accordance with locking principles as described and illustrated.

Note: It is preferable to safety wire all electrical connectors individually. Do not safety wire one connector to another unless it is necessary to do so.

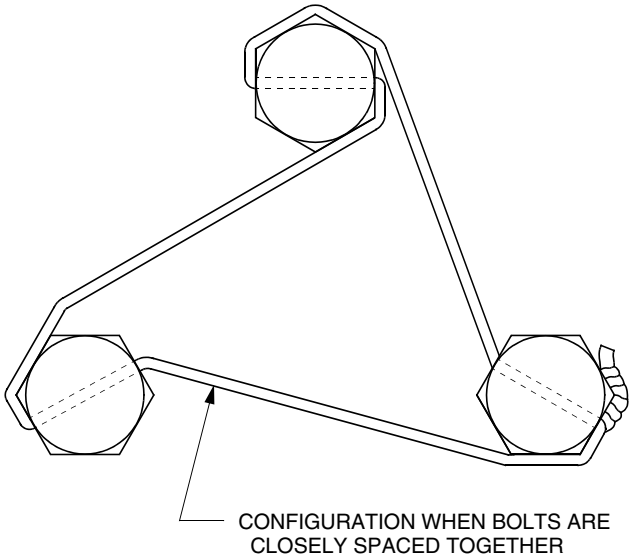
(e) Drilled head bolts and screws need not be safety wired if installed into self-locking nuts or installed with lockwashers. Castellated nuts with cotter pins or safety wire are preferred on bolts or studs with drilled shanks.

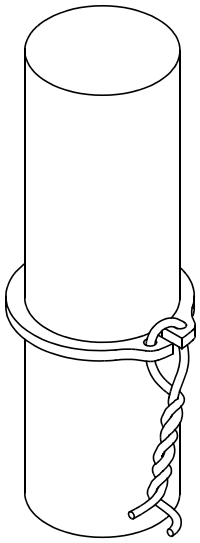
WARNING: **Do not use stainless steel, monel, carbon steel, or aluminum alloy safety wire to secure emergency mechanisms such as handles, switches, and guards that operate emergency devices (e.g. fire extinguishers). If security of emergency mechanisms is required, use copper or brass safety wire (0.020 inch diameter) only. If successful emergency operation of this equipment is dependent on shearing or breaking of the safety wire, ensure safetying does not prevent emergency operation.**

Ensure safety wire doesn't interfere with any controls, structures, wires or other objects.

SINGLE WIRE SAFETYING METHOD

NOTE RIGHT-HAND THREADED PARTS SHOWN. REVERSE FOR LEFT-HAND THREADED PARTS.





EXTERNAL SNAP RING

SR20_MM20_1071

Figure 20-501
Single Twist Safety Wiring

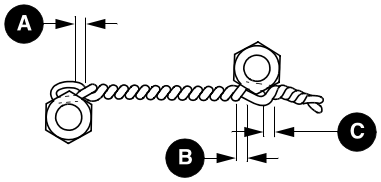
DOUBLE TWIST SAFETYING

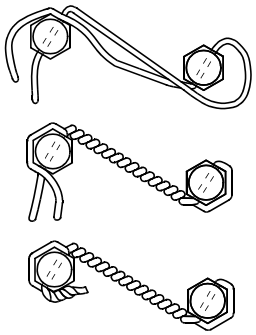
NOTE RIGHT-HAND THREADED PARTS SHOWN. REVERSE DIRECTION FOR LEFT-HANDED THREADS.

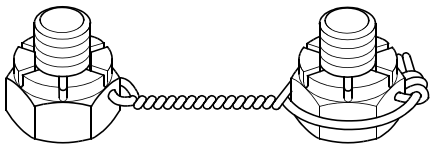
A TWISTING MUST START WITHIN 0.109 INCH (3MM) OF THE LOCKING WIRE HOLE.

B TWISTING MUST END WITHIN 0.109 INCH (3MM) OF THE LOCKING WIRE HOLE

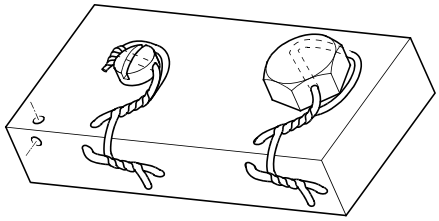
C TWISTING OF THE PIGTAIL MUST START WITHIN 0.109 INCH (3 MM) OF THE LOCKING WIRE HOLE.







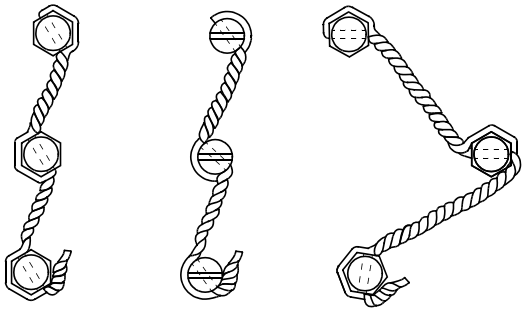
CASTELLATED NUTS ON DRILLED STUDS

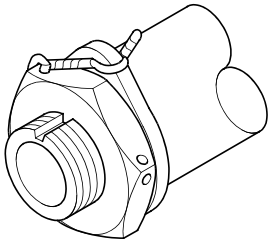


FILLISTER-HEAD SCREW

SINGLE HEX HEAD FASTENER APPLICATION

MULTIPLE FASTENER APPLICATION





SAFETY LOCK WASHER

NOTE AS A GENERAL RULE, NO MORE THAN THREE BOLTS SHOULD BE SAFETY WIRED TOGETHER.

SR20_MM20_1072

Figure 20-502
Double Twist Safety Wiring

FASTENER IDENTIFICATION AND TORQUE DATA

1. DESCRIPTION

This section contains information on the correct usage and identification of bolts, flat washers, lock washers, nuts, lock nuts, fittings and torque data. The nuts, bolts, and washers used on the airplane are in accordance with Air Force Navy Specifications, Military Specifications, and National Aircraft Standards.

2. MAINTENANCE PRACTICES

A. Bolts

Bolts can be identified by the marking(s) located on the head of each bolt. When securing a fastener, use the torque specifications from the following tables. (See Figure 20-601)

When torquing fasteners which do not have a specific torque pattern called out, refer to the general torque patterns shown. (See Figure 20-602)

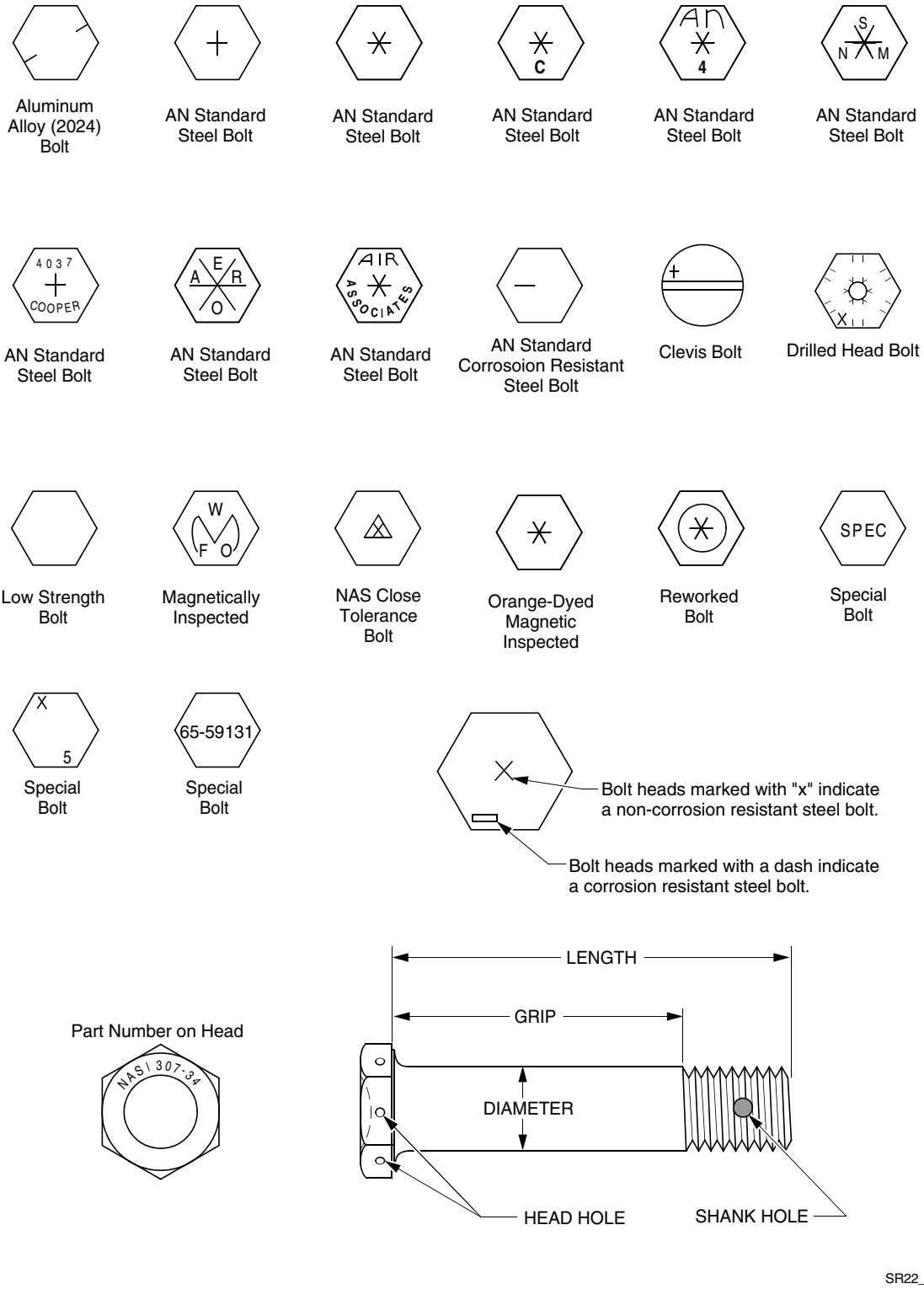
CAUTION: Composite and non-composites require different torque values. Make sure to select the correct torque table.

B. Self Locking Nuts

When torquing a self-locking nut, the nut should be run down on the threads of the bolt until the nut almost contacts the mating surface. The amount of torque required to run the nut down (friction drag torque) should be measured and added to the amount of torque specified for the fastener.

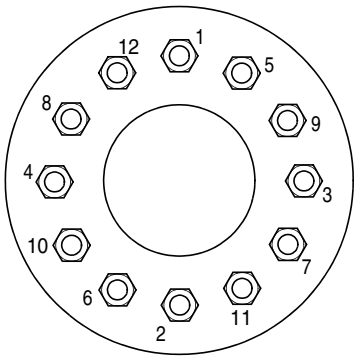
Repeated removal and installation will cause the self-locking nut to lose its locking feature. They should be replaced when they are no longer capable of maintaining the minimum prevailing torque.

CAUTION: Never use a tap in a self locking nut or nutplate. Discard these parts, if this has occurred. Never install a self locking nut or nutplate backwards on a bolt. Discard these parts if this has occurred.

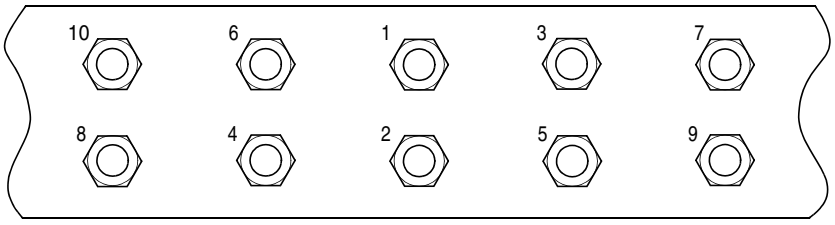


SR22_MM20_1976

Figure 20-601
Bolt Identification



TYPICAL CIRCULAR PATTERN TORQUING SEQUENCE



TYPICAL LINEAR PATTERN TORQUING SEQUENCE

SR22_MM20_1977

Figure 20-602
General Torque Pattern

Item	AMM Chapter/ Section Reference	Inch Pounds		Nm	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
Propeller mounting nuts	61-10	840.0	960.0	92.4	105.6
Propeller mounting bolts	61-10	264.0	264.0	29.0	29.0
Propeller governor nuts	61-20	155	175	17.0	19.2
Spark plugs	72-00	300.0	360.0	33.9	40.7
Engine mount to firewall bolts (1/4”)	71-20	75.0	100.0	8.5	11.3
Engine mount to firewall bolts (1/2”)	71-20	456.0	480.0	50.1	52.8
Nose landing gear spindle nut	32-20	(Refer to 32-20)	(Refer to 32-20)	(Refer to 32-20)	(Refer to 32-20)
Nose wheel axle nut	32-20	Preload 200 Final 20	Preload 200 Final 150	Preload 17.0 Final 2.3	Preload 17.0 Final 4.5
Main Landing Wheel Nut	32-41	(Refer to 32-41)	(Refer to 32-41)	(Refer to 32-41)	(Refer to 32-41)
Main landing gear upper attach fitting to rib fitting nuts	32-10	25	50	2.82	5.65
Main landing gear fitting to canted rib clamp bolts	32-10	160	190	18.1	21.5
Main wing attachment bolts	57-10	400	500	45.2	56.5
Main wing spanner nuts	57-10	1200	1400	135.6	158.2
Brass exhaust nuts	78-10	100	110	11.0	12.1
Nose landing gear aft mounting bolts	32-20	480	690	52.8	75.9
Engine mount bolts (1/2 inch)	71-20	468	480	51.5	52.8

Figure 20-603
Specific Torque Requirements

NON-COMPOSITE STRUCTURE Torque Specifications for High Strength Steel Tension Nuts and Bolts with FINE Threads					
Item	**Thread Size**	**Inch Pounds**		**Nm**	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL TENSION NUTS AN310 AN315 AN363 AN365 MS17825 MS20365 MS21045 NAS1021 NAS679 NAS1291 STEEL TENSION BOLTS MS20004 thru MS20024 NAS144 thru NAS158 NAS333 thru NAS340 NAS583 thru NAS590 NAS624 thru NAS644 NAS1303 thru NAS1320 NAS6603 thru 6620 NAS172 NAS174 NAS517	10-32	25	30	2.8	3.3
	1/4”-28	80	100	8.8	11.0
	5/16”-24	120	145	13.2	16.0
	3/8”-24	200	250	22.0	27.5
	7/16”-20	520	630	57.2	69.3
	1/2”-20	770	950	84.7	104.5
	9/16”-18	1,100	1,300	121.0	143.0
	5/8”-18	1,250	1,550	137.5	170.5
	3/4”-16	2,650	3,200	291.5	352.0
	7/8”-14	3,550	4,350	390.5	478.5
	1”-14	4,500	5,500	495.0	605.0
	1-1/8”-12	6,000	7,300	660.0	803.0
	1-1/4”-12	11,000	13,400	1210.0	1474.0

Figure 20-604
Torque Specifications (Sheet 1 of 8)

NON-COMPOSITE STRUCTURE Torque Specifications for High Strength Steel Shear Nuts and Bolts with FINE Threads					
Item	Thread Size	Inch Pounds		Nm	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL SHEAR NUTS AN320 AN364 NAS1022 MS17826 MS20364 STEEL SHEAR BOLTS NAS464 NAS6203 thru NAS6220 NAS1103 thru NAS1120	10-32	15	20	1.7	2.2
	1/4”-28	50	60	5.5	6.6
	5/16”-24	70	90	7.7	9.9
	3/8”-24	120	150	13.2	16.5
	7/16”-20	300	400	33.0	44.0
	1/2”-20	450	550	49.5	60.5
	9/16”-18	650	800	71.5	88.0
	5/8”-18	750	950	82.5	104.5
	3/4”-16	1,600	1,900	176.0	209.0
	7/8”-14	2,100	2,600	231.0	286.0
	1”-14	2,700	3,300	297.0	363.0
	1-1/8”-12	3,600	4,400	396.0	484.0
	1-1/4”-12	6,600	8,000	726.0	880.0

Figure 20-604
Torque Specifications (Sheet 2 of 8)

NON-COMPOSITE STRUCTURE Torque Specifications for Standard Steel Shear Nuts with FINE Threads					
Item	Thread Size	Inch Pounds		Nm	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL SHEER NUTS AN320 AN364 NAS1022 MS17826 MS20364 MS21042 MS21083 MS21245	8-36	7	9	0.8	1.0
	10-32	12	15	1.3	1.7
	1/4”-28	30	40	3.3	4.4
	5/16”-24	60	85	6.6	9.4
	3/8”-24	95	110	10.5	12.1
	7/16”-20	270	300	29.7	33.0
	1/2”-20	290	410	31.9	45.1
	9/16”-18	480	600	52.8	66.0
	5/8”-18	660	780	72.6	85.8
	3/4”-16	1,300	1,500	143.0	165.0
	7/8”-14	1,500	1,800	165.0	198.0
	1”-14	2,200	3,300	242.0	363.0
	1-1/8”-12	3,000	4,200	330.0	462.0
	1-1/4”-12	5,400	6,600	594.0	726.0

Figure 20-604
Torque Specifications (Sheet 3 of 8)

NON-COMPOSITE STRUCTURE Torque Specifications for Standard Steel Tension Nuts and Bolts with FINE Threads					
Item	**Thread Size**	**Inch Pounds**		**Nm**	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL TENSION NUTS AN310 AN315 AN363 AN365 NAS1021 MS17825 MS21044 MS21045 MS21046 MS20365 MS20500 NAS679 STEEL TENSION BOLTS AN3 thru AN20 AN42 thru AN49 AN73 thru AN81 AN173 thru AN186 MS20033 thru MS20046 MS20073 MS20074 AN509NK9 MS24694 AN525NK525 MS27039	8-36	12	15	1.3	1.7
	10-32	20	25	2.2	2.8
	1/4”-28	50	70	5.5	7.7
	5/16”-24	100	140	11.0	15.4
	3/8”-24	160	190	17.6	20.9
	7/16”-20	450	500	49.5	55.0
	1/2”-20	480	690	52.8	75.9
	9/16”-18	800	1,000	88.0	110.0
	5/8”-18	1,100	1,300	121.0	143.0
	3/4”-16	2,300	2,500	253.0	275.0
	7/8”-14	2,500	3000	275.0	330.0
	1”-14	3,700	4,500	407.0	495.0
	1-1/8”-12	5,000	7,000	550.0	770.0
	1-1/4”-12	9,000	11,000	990.0	1210.0

Figure 20-604
Torque Specifications (Sheet 4 of 8)

NON-COMPOSITE STRUCTURE Torque Specifications for Standard Steel Tension Nuts and Bolts with COARSE Threads					
Item	**Thread Size**	**Inch Pounds**		**Nm**	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL TENSION NUTS AN310 AN315 AN363 AN365 NAS1021 MS17825 MS21044 MS21045 MS21046 MS20365 MS20500 NAS679 STEEL TENSION BOLTS AN3 thru AN20 AN42 thru AN49 AN73 thru AN81 AN173 thru AN186 MS20033 thru MS20046 MS20073 MS20074 AN509NK9 MS24694 AN525NK525 MS27039	8-32	12	15	1.3	1.7
	10-24	20	25	2.2	2.8
	1/4”-20	40	50	4.4	5.5
	5/16”-18	80	90	8.8	9.9
	3/8”-16	160	185	17.6	20.4
	7/16”-14	235	255	25.9	28.0
	1/2”-13	400	480	44.0	52.8
	9/16”-12	500	700	55.0	77.0
	5/8”-11	700	900	77.0	99.0
	3/4”-10	1,150	1,600	126.5	176.0
	7/8”-9	2,200	3,000	242.0	330.0
	1”-8	3,700	5,000	407.0	550.0
	1-1/8”-8	5,500	6,500	605.0	715.0
	1-1/4”-8	6,500	8,000	715.0	880.0

Figure 20-604
Torque Specifications (Sheet 5 of 8)

NON-COMPOSITE STRUCTURE Torque Specifications for Standard Steel Shear Nuts with COARSE Threads					
Item	Thread Size	Inch Pounds		Nm	
		Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
STEEL SHEER NUTS AN320 AN364 NAS1022 MS17826 MS20364 MS21042 MS21083 MS21245	8-32	7	9	0.8	1.0
	10-24	12	15	1.3	1.7
	1/4”-20	25	30	2.8	3.3
	5/16”-18	48	55	5.3	6.1
	3/8”-16	95	110	10.5	12.1
	7/16”-14	140	155	15.4	17.1
	1/2”-13	240	290	26.4	31.9
	9/16”-12	300	420	33.0	46.2
	5/8”-11	420	540	46.2	59.4
	3/4”-10	700	950	77.0	104.5
	7/8”-9	1,300	1,800	143.0	198.0
	1”-8	2,200	3,000	242.0	330.0
	1-1/8”-8	3,300	4,000	363.0	440.0
	1-1/4”-8	4,000	5,000	440.0	550.0

Figure 20-604
Torque Specifications (Sheet 6 of 8)

COMPOSITE STRUCTURE Torque Specifications For FINE Thread Hex-head Tension And Shear Bolts, Or Any Bolted Structure With Combinations Of Composite And Metallic Parts				
Thread Size	Inch Pounds		Nm	
	Minimum Dry Torque	Maximum Dry Torque	Minimum Dry Torque	Maximum Dry Torque
10-32	15	20	1.7	2.2
1/4”-28	25	30	2.8	3.3
5/16”-24	50	60	5.5	6.6
3/8”-24	80	95	8.8	10.5
7/16”-20	150	170	16.5	18.7
1/2”-20	220	245	24.2	27.0

Figure 20-604
Torque Specifications (Sheet 7 of 8)

Minimum Prevailing Drag Torque for Reused Self-locking Nuts					
Fine Thread			Course Thread		
Thread Size	Inch-Pounds	Nm	Thread Size	Inch-Pounds	Nm
7/16”-20	8	0.9	7/16”-14	8	0.9
1/2”-20	10	1.1	1/2”-13	10	1.1
9/16”-18	13	1.5	9/16”-12	14	1.6
5/8”-18	18	2.0	5/8”-11	20	2.3
3/4”-16	27	3.1	3/4”-10	27	3.1
7/8”-14	40	4.5	7/8”-9	40	4.5
1”-14	55	6.2	1”-8	51	5.8
1-1/8”-12	73	8.2	1-1/8”-8	68	7.7
1-1/4”-12	94	10.6	1-1/4”-8	88	9.9

Figure 20-604
Torque Specifications (Sheet 8 of 8)

C. Calculating Torque (See Figure 20-605)

CAUTION: Over-torquing of fasteners can result in failed fasteners and/or components. Under torquing a fastener can result in premature wear of the fastener and/or the fastening material which can result in failure of the component and/or fastener.

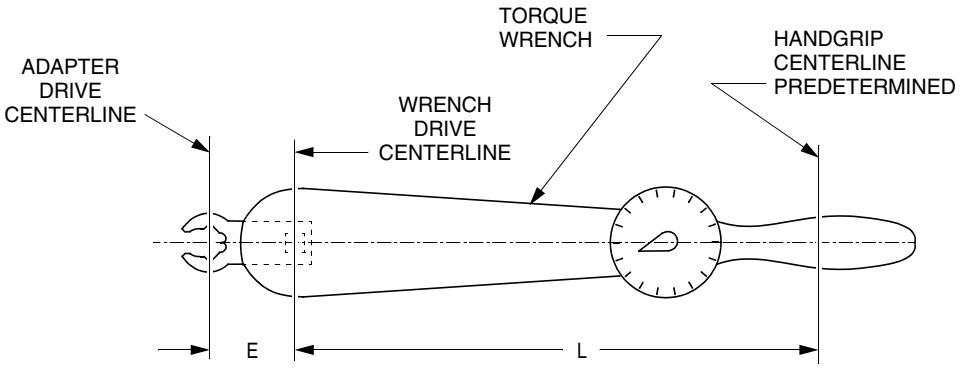
Note: Observe torque values and the installation of the recommended safetying device for every fastener. Impact-type wrenches should never be used on any fastener whose torque is crucial. If a nut is slightly over torqued, it must be loosened and then re-torqued to the correct value. Never back off a nut or a bolt and leave it un-torqued. Exceeding the maximum recommend torque is not permissible.

To assure an accurate torque measurement, a smooth and even motion must be applied. Whenever a bolt is torqued on the head side instead of torquing the nut, additional resistance (friction drag torque) may occur due to the friction of the shank during rotation. This could result in an under-torqued fastener. The value (friction drag torque) observed from the torque wrench indicator during the initial tightening phase of the bolt (before seating of the bolt has been accomplished), must be added to the torque value given in the specified torque table. When checking friction drag torque, use a torque wrench which allows the friction drag torque to fall in the middle of the overall range of the torque wrench.

When using a torque wrench with an adapter that changes the distance from the torque wrench drive centerline to the adapter centerline, compensation must be made for the extra leveraged gained. New torque specifications must be calculated before the wrench is used. To calculate the new torque specifications, use the formula in Figure 20-605. (See Figure 20-605)

(1) Requirements for Calculating Torque

- (a) When selecting a torque wrench, select one that has the required torque specification in the middle of the overall range of the torque wrench. When lower torque specifications are called out, always use an inch-pound torque wrench or a smaller foot-pound torque wrench. Use only calibrated torque wrenches that have been certified.
- (b) Calibrate the torque wrench and recheck calibration frequently to assure accuracy.
- (c) Thoroughly clean and dry all threads and fasteners prior to torquing.
- (d) Torque only to the specified range; stopping instantly at the correct torque.
- (e) When using a torque wrench adapter be certain to allow for the additional extension length when torquing.
- (f) Sheet metal screws and screws tightened to nutplates should be tightened firmly.
- (g) Always start the nut or bolt by hand prior to the torquing process.
- (h) Screws using dimpled washers should be drawn tight enough to eliminate the crown of the washer.
- (i) Specified torques must be considered dry torques.
- (j) Castellated nuts requiring cotter pins should be tightened to low torque value. Torque can be increased to install cotter pin, but should never exceed maximum torque value.
- (k) When nut cannot be tightened within given torque values to install cotter pins, remove nut, install a washer, then reinstall nut.



Formula $\frac{T \times L}{L + E} = Y$

T = 135 LB. IN.

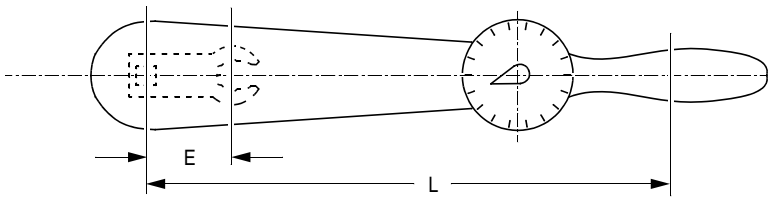
Y = Unknown

L = 10.0 IN.

E = 1.5 IN.

$Y = \frac{135 \times 10}{10 + 1.5} = \frac{1350}{11.5} = 117.39$

Y = 117 lb IN.



Formula $\frac{T \times L}{L - E} = Y$

T = 135 LB. IN.

Y = Unknown

L = 10.0 IN.

E = 1.5 IN.

$Y = \frac{135 \times 10}{10 - 1.5} = \frac{1350}{8.5} = 158.82$

Y = 159 lb IN.

LEGEND

T = Desired Torque
Y = Indicated Torque
L = Effective Length Lever
E = Effective Length Of Extension

SR22_MM20_1978

Figure 20-605
Torque Wrench Adapter

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FASTENER AND HARDWARE GENERAL REQUIREMENTS

1. DESCRIPTION

This section contains general requirements for common hardware installation. Covered are selection and installation of cotter pins, installation of turnbuckle locking clips, rod end inspection requirements, self-locking nut installation requirements, fastener length substitution requirements, fastener flushness requirements, and installation and usage requirements for washers and lockwashers.

2. MAINTENANCE PRACTICES

A. Cotter Pins (See Figure 20-701)

The preferred method to secure a pin or castellated nut is by the use of a cotter pin. Safety wiring is also an acceptable method to secure pins or castellated nuts.

CAUTION: Cadmium-plated cotter pins should not be used in applications bringing them in contact with fuel, hydraulic fluid, or synthetic lubricants.

(1) Proper Usage of Cotter Pins

(a) Select cotter pin material in accordance with temperature, atmosphere, and service limitations.

(b) Cotter pins shall be new upon each application.

(c) When nuts are to be secured to a fastener with cotter pins, tighten nut to low side (minimum) of applicable specified or selected torque range unless otherwise specified, and if necessary, continue tightening until slot aligns with hole. In no case shall the high side (maximum) torque range be exceeded.

(d) If more than 50% of cotter pin diameter is above nut castellation, a washer should be used under nut or a shorter fastener should be used. A maximum of two washers may be permitted under a nut.

(e) The largest diameter cotter pin which the hole and slot will accommodate should be used. In no application shall cotter pin size be less than size called out on the following table.

(f) Install cotter pin with head firmly in slot of nut with axis of eye at right angles to bolt shank. Bend prongs so that head and upper prong are firmly seated against bolt.

(g) In pin applications, install cotter pin with axis of eye parallel to shank of clevis pin or rod end. Bend prongs around shank of pin or rod end.

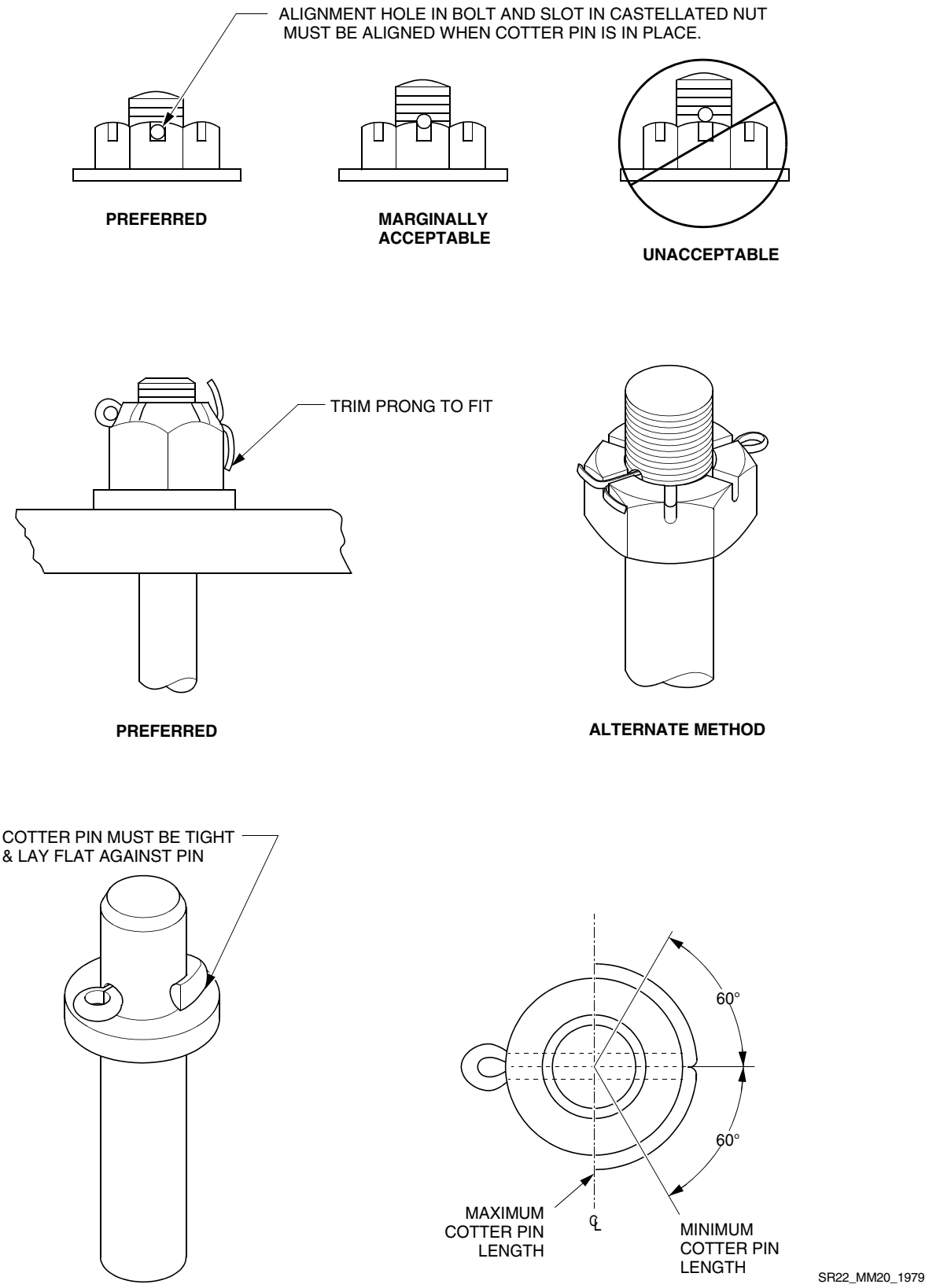


Figure 20-701
Cotter Pin Safetying

B. Locking Clip (See Figure 20-702)

(1) Proper use of Locking Clips

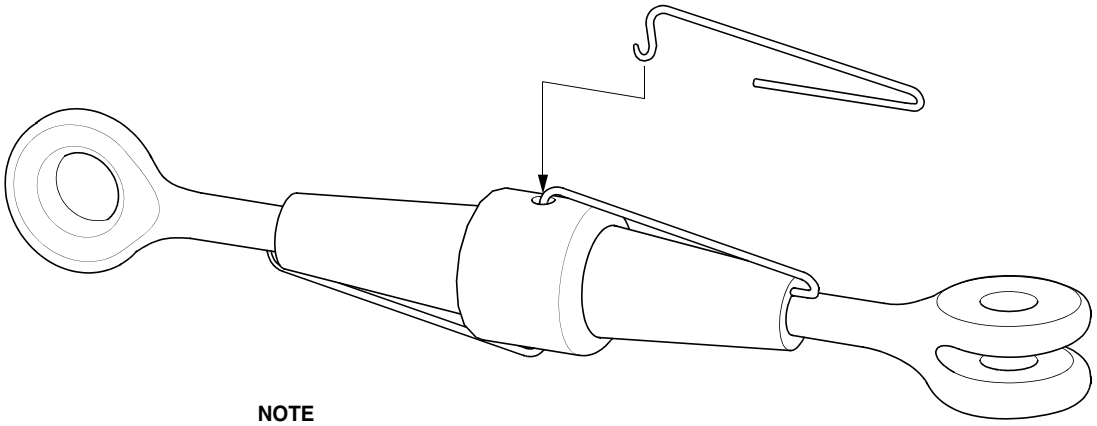
(a) Prior to safetying, both threaded terminals shall be screwed an equal distance into the turnbuckle body and shall be screwed in at least so that not more than three threads of any terminal are exposed outside of body.

(b) After the turnbuckle has been adjusted to its locking position, (with slot indicator groove on terminals and slot indicator notch on body aligned) insert the end of locking clip into terminal and body until the U-curved end of locking clip is over the hole and in the center of the body.

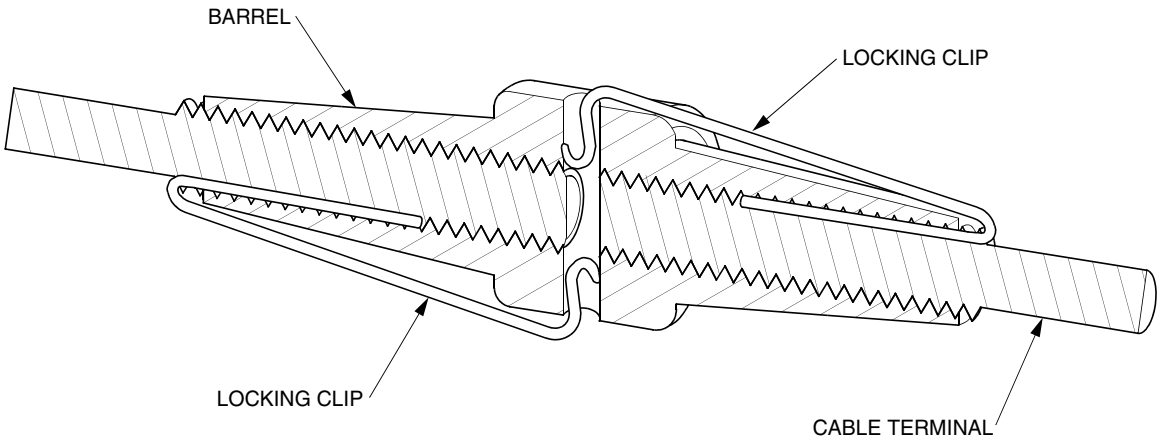
(c) Press locking clip into hole until it's fully seated (curved end of locking clip will expand and latch in body slot).

(d) To check proper seating of locking clip, attempt to remove pressed "U" end from body with fingers only.

Note: Both locking clips may be inserted in same hole of turnbuckle body or in opposite holes of turnbuckle body. Locking clips are for one time use only and shall not be re-used.



NOTE
Locking clips can be used on safety turnbuckles if the barrel and terminal are notched to accept them.



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Figure 20-702
Locking Clip Safetying

C. Rod Ends (See Figure 20-703)

Rod end assemblies are subject to a variety of environmental conditions and forms of deterioration that ultimately may be easy to recognize such as a failed rod end. The not so readily visible types of deterioration include wear, corrosion and/or distortion. The critical area on a female rod end is the internal thread of the rod end.

(1) Inspecting

It will be necessary to remove the rod end from the corresponding control cable to properly inspect it for internal wear and corrosion as this condition is usually not evident on the outer surface of the rod end.

Note: Before removing rod ends with inspection holes, ensure the rod ends are properly seated onto the control cable. The control cable must be installed beyond the inspection hole. When removing rod ends without inspection holes, leave the jam nut in its original position. Measure the distance from the face of the jam nut (side which was tightened against the rod end) to the end of the control cable. This distance is referred to as the thread engagement depth. Rod ends with a hole diameter of 0.190 inch or 0.250 inch (4.8 mm or 6.4 mm) must be threaded onto the control cable to a minimum thread engagement depth of 0.312 inch (7.9 mm).

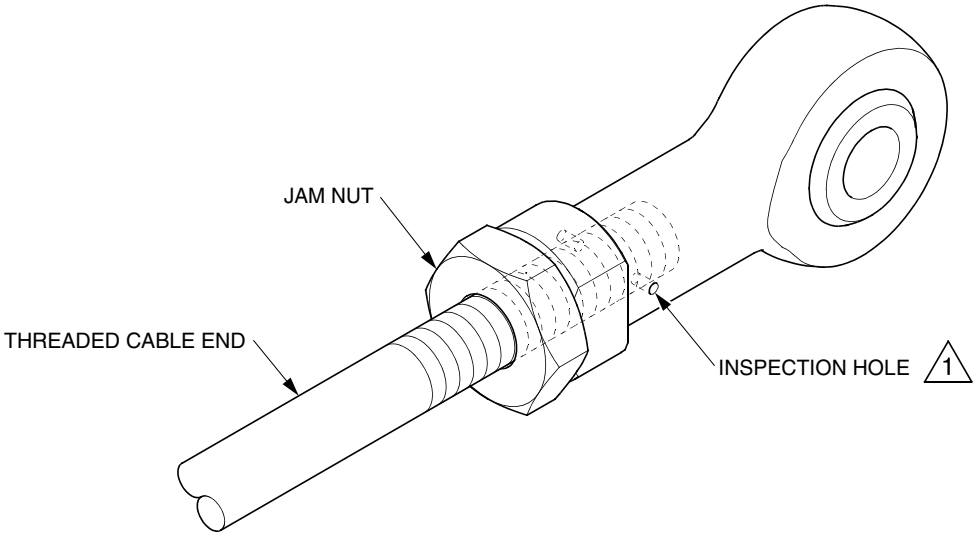
(a) Examine all rod ends for proper depth installation and then remove the rod ends.

(b) Carefully examine the exterior of all rod ends for wear, corrosion, damage, and/or distortion. Replace all rod ends having signs of wear, corrosion, damage, and/or distortion.

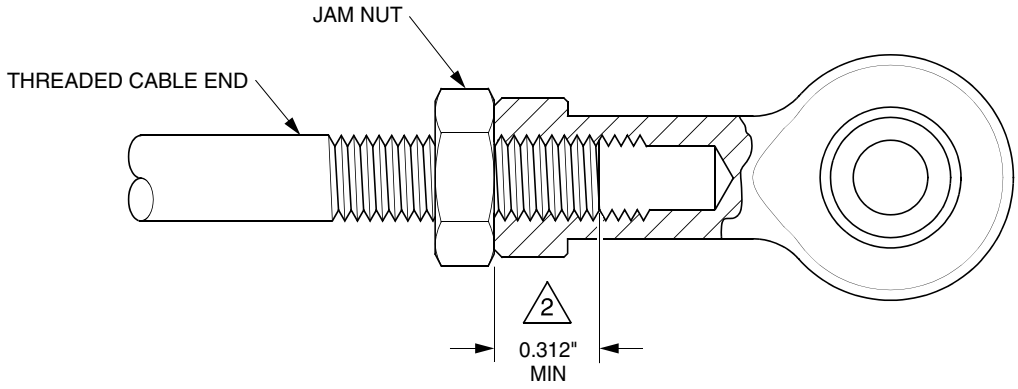
(c) Carefully examine all rod ends for internal wear, corrosion, damage, and/or distortion. Replace all rod ends having signs of internal wear, corrosion, damage, and/or distortion.

(d) Carefully examine the threaded portion of rod end for damaged threads. Replace all rod ends having signs of damage to the threads.

Note: If damaged threads or premature/excessive wear is found or suspected, replace the rod end.



ROD END
(WITH INSPECTION HOLE)



ROD END
(WITHOUT INSPECTION HOLE)

NOTE

1 Threaded cable end must completely block inspection hole.

2 Rod ends without inspection holes must be threaded onto 0.190" and 0.250" diameter threaded cable ends to a minimum thread engagement of 0.312".

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Figure 20-703
Rod End

D. Self Locking Nuts

(1) Restrictions

(a) Do not use reworked or reprocessed self-locking nuts for any application.

(b) Do not use at joints in a control system for singular attachment points.

(c) Do not use on externally threaded parts that serve as an axle of rotation for another part where tensional (torque) loads can cause nut to loosen and/or become separated. Examples are pulleys, levers linkages, and cam followers.

Note: Self-locking nuts can be used when threaded parts are held by a positive locking device that requires shearing or rupture before torsional loads can act on threaded parts.

(d) Do not use where a loose nut, bolt, or screw, could fall or be drawn into an area that would impede or damage or otherwise distort operation.

(e) Do not use for access panels, doors or to assemble components that are routinely disassembled or removed for access and servicing.

(f) Do not use a self-locking nut where the loss of a bolt will affect the safety of flight.

(g) Bolts, studs, or screws, excluding Hi-Locks, must extend 1/32-inch through self-locking nuts, for a length equivalent of approximately two threaded pitches. This length includes chamfer.

(h) Self-locking nuts which are attached to the structure shall be attached in a positive manner to eliminate possibility of their rotation or misalignment when tightening is to be accomplished by rotating bolts to structure, and permit replacement of nuts.

E. Threaded Fastener Length (See Figure 20-704)

It is permissible to substitute a longer or shorter bolt or screw than specified provided the following requirements are met.

(1) Substitution Requirements

(a) In structural applications no threads shall be allowed in bearing in sheet material or fittings. If the joint is dimpled, threads are permitted in bearing in gages 0.100 inch (2.5 mm) and under. Threads are permitted in bearing if the joint is countersunk to a “knife-edge” condition, or the sheet thickness minus the countersink depth is 0.020 inch (0.50 mm) and under.

(b) Bolts and screws with flat ends must extend through the nut or nutplate at least 1/32 inch.

(c) Bolts and screws with round or chamfered ends must extend through the nut or nutplate the full round or chamfer.

(d) Washers must be of the same type of material as the adjacent structure or compatible with the adjacent structure as defined in MIL-STD-889. For example, cad plated steel or aluminum washers to aluminum structure, steel washers to steel structure, etc.

F. Fastener Flushness (See Figure 20-704)

(1) Flush Head Screws

(a) The gap under the head of screws and bolts, and under nuts, shall be 0.002 inch (0.05 mm) maximum for no more than 40% of the circumference. The heads of flush rivets, screws and Hi-Loks on the exterior of the airplane shall be flush with the local skin contour to within the tolerances specified. For fasteners installed in the exterior skin, head protrusion for flush head screws shall meet the following requirements. Heads shall not be shaved. Check gaps at the outer periphery of the intended bearing surfaces as indicated by the darkened areas. Gaps of any thickness shall not be continuous for more than 40% of the peripheral distance of the head or nut.

(2) Driven Rivets

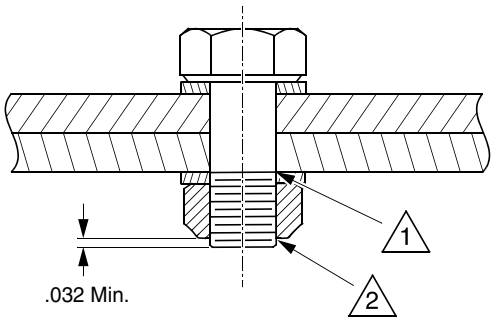
(a) The aforementioned rivets should be flush with the exterior finish. Driven rivets must never protrude the surface more than 0.005 inch (0.13 mm).

(3) Blind Rivets, Screws and Hi-Loks

(a) The aforementioned fasteners may be countersunk in the exterior finish no more than 0.005 inch (0.13 mm). These fasteners must never protrude above the finish by more than 0.005 inch (0.13 mm).

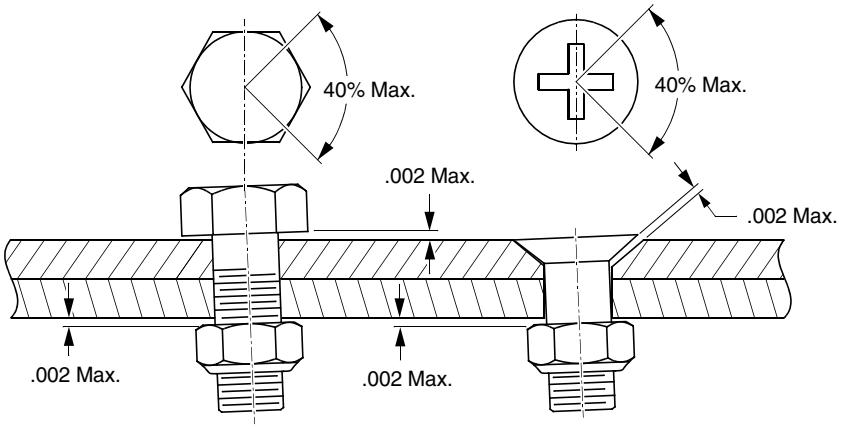
(4) Camlocks

(a) The aforementioned fasteners may be countersunk in the exterior finish no more than 0.020 inch (0.5 mm). These fasteners must never protrude above the finish by more than 0.010 inch (0.25 mm).



NOTE

1. In structural applications no threads shall be allowed in bearing of sheet material or fittings. If the joint is dimpled, threads are permitted in bearing of gages 0.100 and under. Threads are permitted in bearing if the joint is countersunk to a "knife-edge" condition, or the sheet thickness minus the countersink depth is 0.020 and under.
2. Bolts and screws with round or chamfered ends must extend through the nut the full round or chamfer.



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Figure 20-704
Fastener Length and Flushness

G. Washers (See Figure 20-705)

Do not use washers under the head of flush screws unless specifically called out. When installing a countersunk MS20002 washer under the head of bolts, the washer shall be installed so that the countersunk side faces the bolt head. A maximum of two AN960 (thick or thin) washers may be used under a nut on all bolts, except when a AN 970 washer is specified; then a maximum of only one additional AN960 washer may be used between the nut and AN970 washer. A maximum of one AN960 (thick or thin) washer may be used under the head of a bolt, except when a countersunk MS20002 washer or a AN970 washer is specified, in which case no additional washers are allowed.

H. Lockwashers

(1) Lockwasher Usage

(a) When loosening of threaded parts would not endanger safety of airplane or people.

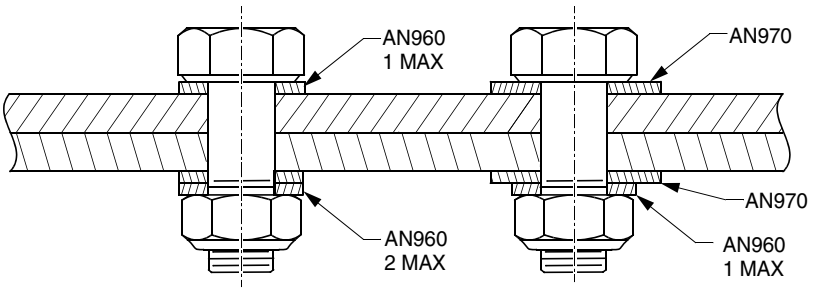
(b) When the self-locking feature cannot be provided in externally or internally threaded parts.

(c) When safety wire cannot be used to prevent loosening of threaded parts.

(d) When a cotter pin cannot be used to prevent rotation of internal threads with respect to external threads.

(e) When fastening is not used for fabrication of primary structure.

(f) When corrosion encouraged by gouging aluminum or magnesium alloys by edges of teeth on tooth-locked washers would not cause malfunctioning of parts being fastened together.



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Figure 20-705
Washer Placement

FLARED TUBING

1. DESCRIPTION

This section contains the proper torque specifications for hydraulic fittings.

2. MAINTENANCE PRACTICES

A. Hydraulic Fittings (See Figure 20-801)

Hydraulic fittings must be torqued to the following specifications to prevent loosening while in flight, or damage due to over tightening.

CAUTION: The tube nut must never be used to pull the tube assembly to seat against the fitting.

Torque for AN-818 Nuts with Steel Tubing					
Dash #	Tube OD	Inch-Pounds		Nm	
		Minimum	Maximum	Minimum	Maximum
-3	3/16	95	105	10.7	11.9
-4	1/4	135	150	15.3	16.9
-6	3/8	270	300	30.5	33.9
-8	1/2	450	500	50.8	56.5
-10	5/8	650	700	73.4	79.0
-12	3/4	900	1000	101.7	112.9

Torque for AN-818 Nuts with Aluminum Alloy Tubing					
Dash #	Tube OD	Inch-Pounds		Nm	
		Minimum	Maximum	Minimum	Maximum
-3	3/16	25	35	2.8	3.9
-4	1/4	50	65	5.6	7.3
-6	3/8	110	130	12.4	14.7
-8	1/2	230	260	25.9	29.4
-10	5/8	330	360	37.3	40.6
-12	3/4	460	500	52.0	56.4

Torque for AN-818 Nuts with Flexible Hoses Aluminum/Brass Fittings					
Dash #	Tube OD	Inch-Pounds		Nm	
		Minimum	Maximum	Minimum	Maximum
-3	3/16	70	105	7.9	11.9
-4	1/4	100	140	11.3	15.8
-6	3/8	150	195	16.9	22.0
-8	1/2	270	350	30.5	39.5
-10	5/8	360	430	40.7	48.6
-12	3/4	460	550	52.0	62.1

Figure 20-801
Hydraulic Fittings Torque Values (Sheet 1 of 2)

Torque for AN-818 Nuts with Flexible Hoses Steel Fittings					
Dash #	Tube OD	Inch-Pounds		Nm	
		Minimum	Maximum	Minimum	Maximum
-3	3/16	95	140	10.7	15.8
-4	1/4	135	190	15.3	21.5
-6	3/8	215	280	24.3	31.6
-8	1/2	470	550	53.1	62.1
-10	5/8	620	745	70.1	84.2
-12	3/4	855	1055	96.6	119.1

Torque for Bulkhead Fittings							
Dash #	Tube OD	Gasketed Fittings		Jamnuts and Fittings without Gaskets			
		Aluminum or Steel		Aluminum		Steel	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
-3	3/16	50	75	65	80	70	90
-4	1/4	55	80	90	105	110	130
-6	3/8	100	150	125	145	225	275
-8	1/2	180	230	240	280	400	450
-10	5/8	250	350	330	370	550	650
-12	3/4	420	600	540	660	800	960

Figure 20-801
Hydraulic Fittings Torque Values (Sheet 2 of 2)

CABLE INSPECTION AND IDENTIFICATION

1. DESCRIPTION

This section covers procedures necessary for the proper inspection and identification of control cables.

2. MAINTENANCE PRACTICES

A. Control Cables

Control cable assemblies are subject to a variety of environmental conditions and forms of deterioration that ultimately may be easy to recognize such as wire/strand breakage. The not so readily visible types of deterioration include corrosion and/or distortion. The following information will aid in detecting these cable conditions. Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear-producing airframe components such as pulleys, fairleads, rub blocks, etc. It may be necessary to remove and bend cable to properly inspect it for internal strand corrosion as this condition is usually not evident on outer surface of cable. Replace any cable that has internal corrosion. If a cable has been wiped clean of its corrosion-preventive lubricant and metal-brightened, the cable shall be examined closely for corrosion.

(1) Inspecting (See Figure 20-901)

(a) Examine cables for broken wires by passing a cloth along the entire length of the cable. Broken wires will be detected if the cloth snags on cable. Critical areas for wire breakage are those sections of cable which pass through fairleads, across rub blocks, and around pulleys. If no snags are found, then no further inspection is required. If snags are found or broken wires are suspected, then a more detailed inspection is necessary which requires that the cable be bent in a loop to confirm broken wires. Loosen or remove cable to allow it to be bent in a loop as shown. While rotating cable, inspect bent area for broken wires.

(b) Individual broken wires are acceptable in primary and secondary control cables at random locations. No more than six broken wires in any given ten-inch cable length is allowable.

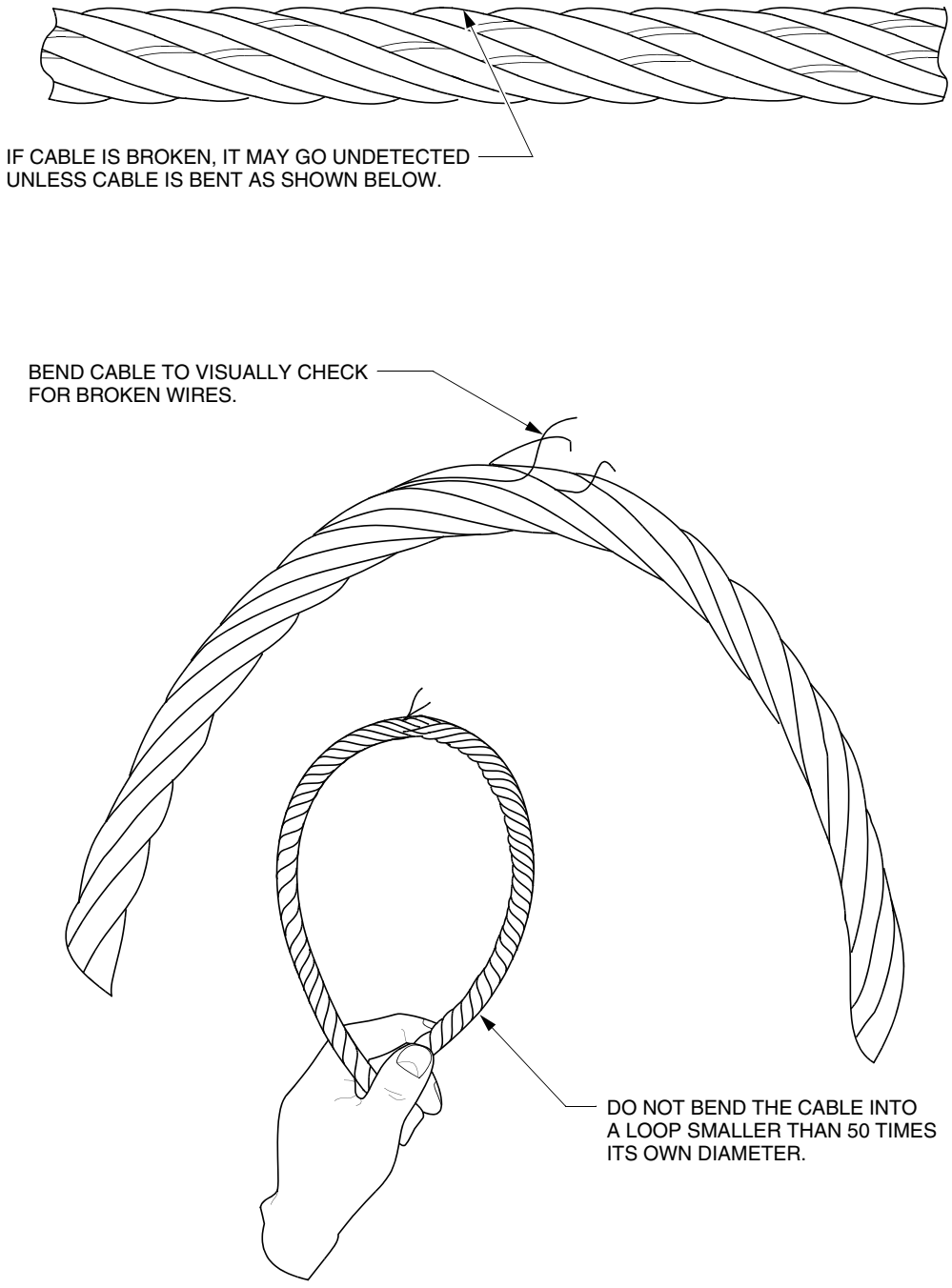


Figure 20-901
Control Cable Inspection

(2) Color-Coded Identification - *Serials 0498 & subs*

Elevator and rudder empennage bellcranks, rudder pedal torque tubes, elevator torque tube coupler weldments, cable clevices, and cable turnbuckle ends must be painted to allow visual verification of proper cable assembly and installation.

Parts and Areas	Color
Top Rudder Empennage Bellcrank Left Rudder Pedal Torque Tube Cable Clevices and Turnbuckle Ends	Primary Blue
Bottom Rudder Empennage Bellcrank Right Rudder Pedal Torque Tube Cable Clevices and Turnbuckle Ends	Primary Yellow
Top Elevator Empennage Bellcrank Forward Elevator Torque Tube Coupler Weldment Cable Clevices and Turnbuckle Ends	Primary Red
Bottom Elevator Empennage Bellcrank Aft Elevator Torque Tube Coupler Weldment Cable Clevices and Turnbuckle Ends	Black

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Commercial Grade	-	Any Source	Identify

CAUTION: Removal of lubricant from bearings or control cables is not allowed.

(b) Solvent clean areas to be painted.

Note: The bellcranks and cables may be painted either as individual parts or completed assemblies. Painting of associated hardware (including turnbuckles is allowed but not required. Painting is not required if the part's finish meets the color requirements.

(c) Apply paint per the manufacturer's instructions.

CAUTION: Paint shall be applied such that it is easily visible and identifiable upon inspection of the completed installation. Both sides of clevices shall be painted.

CAUTION: Paint shall not interfere with the proper operation of any system. Avoid paint on parts with close tolerance fits. Avoid excessive thickness between clevices and bellcranks. Avoid painting areas of fasteners.

CAUTION: The paint shall not render any placards or identification of illegible.

CHAPTER

21

ENVIRONMENTAL SYSTEMS

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ENVIRONMENTAL SYSTEMS

1. GENERAL

This section covers those systems and components used to furnish a means of heating, cooling, and treating the air used to ventilate the areas of the fuselage within the pressure seals. Includes equipment cooling, heater, valves, and ducts.

A. Cabin Air System - *Serials 1005 thru 1638* (See Figure 21-001)

The cabin air distribution system consists of fresh air inlets in each wing, a heat exchanger around the RH engine exhaust muffler, an air mixing chamber, air ducting for distribution, a windshield diffuser, and crew and passenger air vents.

Fresh air enters the cabin air distribution system through inlets located in each wing leading edge and is ducted to the crew and passenger air vents. Screens in the wing inlet ducts prevents large objects from entering the cabin air system. Fresh air also enters the upper RH cowl inlet, flows through the upper cowl, and is ducted to a heat exchanger surrounding the RH engine exhaust muffler. The heated air is then routed to the hot air valve, mounted to the forward side of the firewall, that allows the heated air to enter the cabin air distribution system.

The heated air from the hot air valve and the fresh air from the wing inlets are allowed to mix in the air mixing chamber mounted to the rear side of the firewall behind the instrument panel. The mixed air is then distributed by ram air to the passenger outlets and/or to the windshield diffuser. Airflow is ducted directly to all panel air vents.

The crew panel air vents are chest high outlets mounted in the RH and LH bolster panels. The crew floor air vents are mounted to the bottom of each kick plate. The passenger panel air vents are chest high outlets mounted in the armrests integral to the LH and RH cabin wall trim panels. The passenger floor air vents are mounted to the bottom portion of the LH and RH cabin wall trim panels. The windshield diffuser, located in the glareshield assembly, directs conditioned air to the base of the windshield.

Temperature, volume, and flow selection are regulated by manipulation of the cabin temperature and cabin air selector knobs on the lower RH side of the instrument panel.

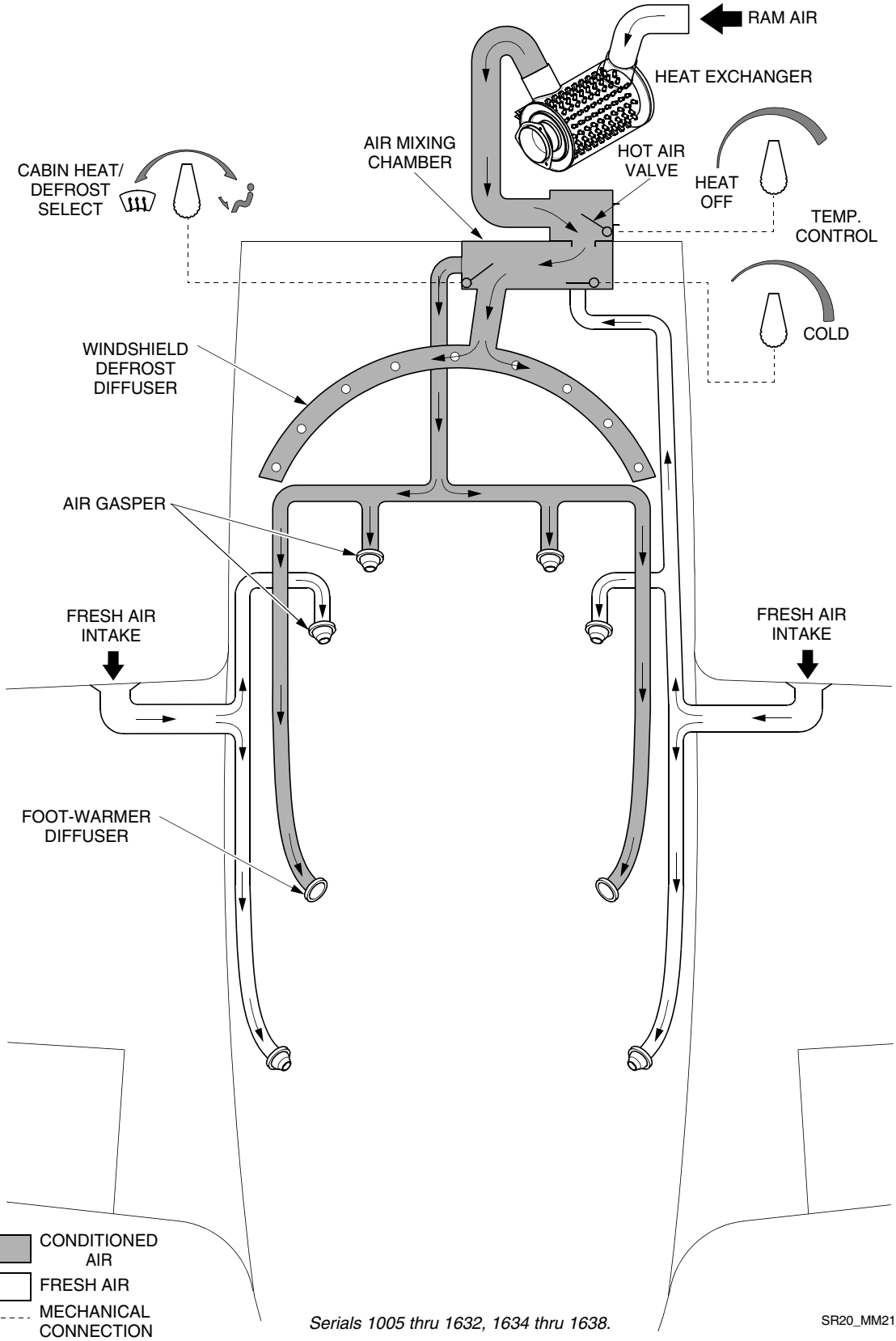


Figure 21-001
Heating and Ventilation System - Serials 1005 thru 1638

B. Cabin Air System - *Serials 1639 thru 1885* (See Figure 21-002)

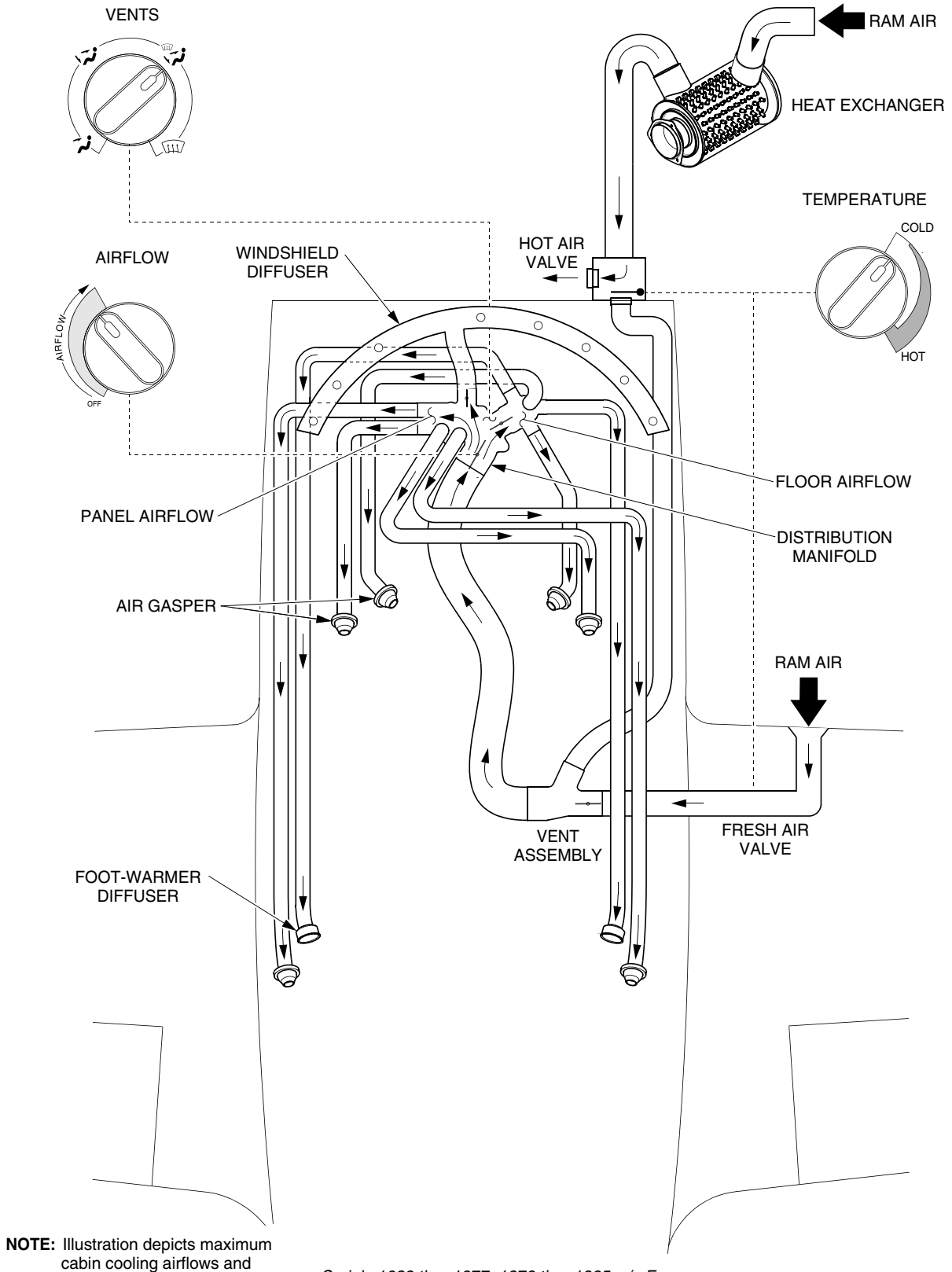
The cabin air distribution system consists of a fresh air inlet in the RH wing, a heat exchanger around the RH engine exhaust muffler, an air mixing chamber, air ducting for distribution, a distribution manifold, a windshield diffuser, and crew and passenger air vents. An optional blower fan may also be installed.

Fresh air enters the cabin air distribution system through an inlet on the inboard, leading edge of the RH wing and is ducted to the air mixing chamber. A screen in the wing inlet duct prevents large objects from entering the cabin air system. Fresh air also enters the upper RH cowl inlet, flows through the upper cowl, and is ducted to a heat exchanger surrounding the RH engine exhaust muffler. The heated air is then routed to the hot air valve, mounted to the forward side of the firewall, that allows the heated air to enter the cabin air distribution system.

The heated air from the hot air valve and the fresh air from the wing inlet are allowed to mix in the air mixing chamber located under the RH crew seat. The mixed air is then distributed by either ram air or by optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The distribution manifold uses butterfly valves to control airflow to the floor and defrost vents. Airflow is ducted directly to all panel air vents.

The crew panel air vents are chest high outlets mounted in the RH and LH bolster panels. The crew floor air vents are mounted to the bottom of each kick plate. The passenger panel air vents are chest high outlets mounted in the armrests integral to the LH and RH cabin wall trim panels. The passenger floor air vents are mounted to the bottom portion of the LH and RH cabin wall trim panels. The windshield diffuser, located in the glareshield assembly, directs conditioned air to the base of the windshield.

Temperature, volume, and flow selection are regulated by manipulation of the cabin airflow, cabin vents, and cabin temperature selector knobs on the lower RH side of the instrument panel.



NOTE: Illustration depicts maximum cabin cooling airflows and selector settings.

Serials 1639 thru 1877, 1879 thru 1885 w/o Fan.

SR20_MM21_2302A

Figure 21-002
Heating and Ventilation System - Serials 1639 thru 1885 w/o Fan (Sheet 1 of 2)

EFFECTIVITY:
Serials 1639 thru 1885 w/o Fan

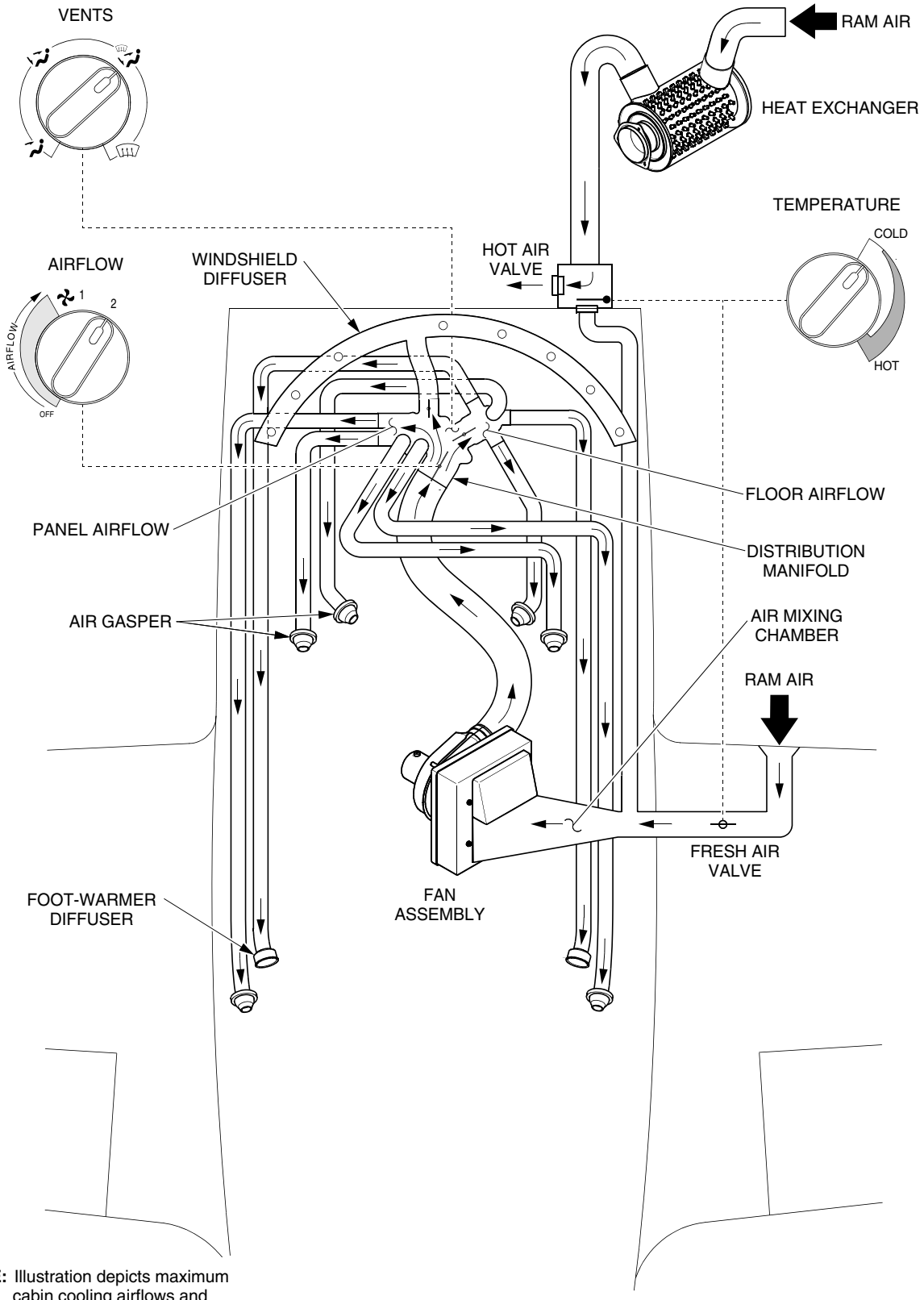


Figure 21-002
Heating and Ventilation System - Serials 1639 thru 1885 w/ fan (Sheet 2 of 2)

EFFECTIVITY:
Serials 1639 thru 1885 w/ fan

C. Cabin Air System - *Serials 1886 & subs* (See Figure 21-003)

The cabin air distribution system consists of a fresh air inlet in the lower RH cowl, a heat exchanger around the RH engine exhaust muffler, an air mixing chamber, air ducting for distribution, a distribution manifold, a windshield diffuser, and crew and passenger air vents. An optional blower fan may also be installed.

Fresh air enters the cabin air distribution system through a NACA vent on the RH lower cowl and is ducted to the air mixing chamber mounted to the forward side of the firewall. Fresh air also enters the upper RH cowl inlet, flows through the upper cowl, and is ducted to a heat exchanger surrounding the RH engine exhaust muffler. The heated air is routed to the air mixing chamber to be mixed with the fresh air. The mixed air is then distributed by either ram air or by optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The distribution manifold uses butterfly valves to control airflow to the floor and defrost vents. Airflow is ducted directly to all panel air vents.

The crew panel air vents are chest high outlets mounted in the RH and LH bolster panels. The crew floor air vents are mounted to the bottom of each kick plate. The passenger panel air vents are chest high outlets mounted in the armrests integral to the LH and RH cabin wall trim panels. The passenger floor air vents are mounted to the bottom portion of the LH and RH cabin wall trim panels. The windshield diffuser, located in the glareshield assembly, directs conditioned air to the base of the windshield.

Serials 2016 & subs w/ Perspective Avionics: Additional crew vents are located at LH and RH display panels.

Temperature, volume, and flow selection are regulated by manipulation of the cabin airflow, cabin vents, and cabin temperature selector controls on the lower RH side of the instrument panel.

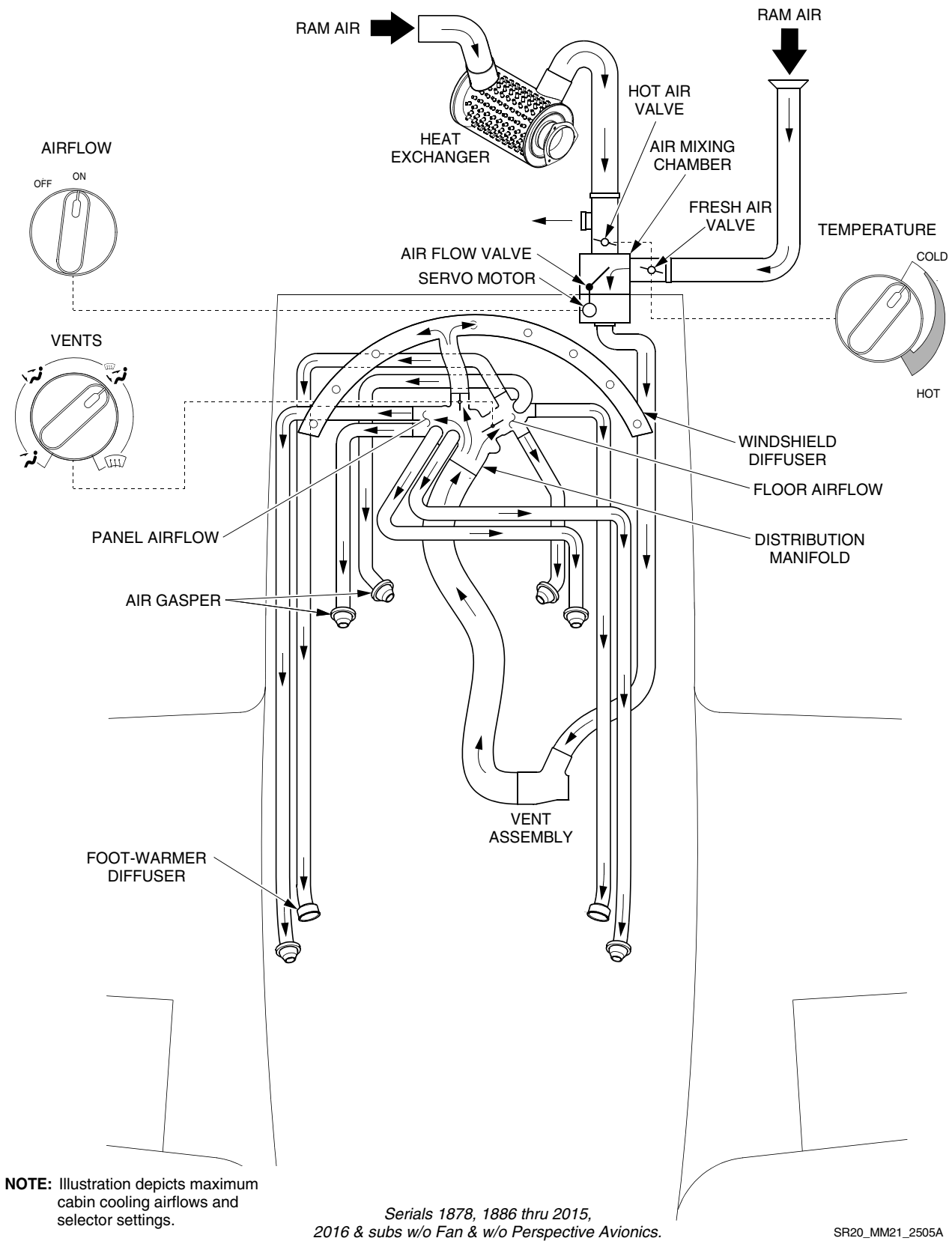
(1) Air Conditioning System - *Serials 2065 & subs w/ Perspective Avionics*

An optional air conditioning system is available on these airplanes. The air conditioning system consists of an engine driven compressor, condenser assembly with integral blower fan and receiver-drier, evaporator assembly with integral expansion valve assembly, and all associated plumbing and control mechanisms.

The R134A refrigerant enters the engine mounted compressor as a vapor and is pressurized until the heat-laden vapor reaches a point much hotter than the outside air. The compressor then pumps the vapor to the condenser where it cools, changes to a liquid, and passes to the receiver-drier. The receiver-drier's function is to filter, remove moisture, and ensure a steady flow of liquid refrigerant into the evaporator through the expansion valve - a temperature controlled metering valve which regulates the flow of liquid refrigerant to the evaporator. Inside the evaporator, the liquid refrigerant changes state to a gas and in doing so, absorbs heat. The evaporator then absorbs the heat from the air passing over the coils and the moisture from the air condenses and is drained overboard through the belly of the aircraft. From the evaporator, the refrigerant vapor returns to the compressor where the cycle is repeated.

During normal air-conditioning operation, ram air from the fresh air intake flows into the evaporator assembly, is cooled as it passes through the evaporator coils, and is then ducted forward to the distribution manifold. During maximum air-conditioning operation - or recirculation mode - the fresh air valve closes and valves in the evaporator assembly open allowing cabin air to be recirculated and further cooled as the air passes through the evaporator coils and ducted forward to the distribution manifold.

Conditioned air is circulated through the system by ram air or by the blower fan mounted adjacent to the evaporator.



NOTE: Illustration depicts maximum cabin cooling airflows and selector settings.

Serials 1878, 1886 thru 2015, 2016 & subs w/o Fan & w/o Perspective Avionics.

SR20_MM21_2505A

Figure 21-003

Heating and Ventilation System - Serials 1886-2015, 2016 & subs w/o Fan, w/o Perspective Avionics (Sheet 1 of 5)

EFFECTIVITY:
Serials 1886-2015, 2016 & subs w/o Fan, w/o Perspective Avionics

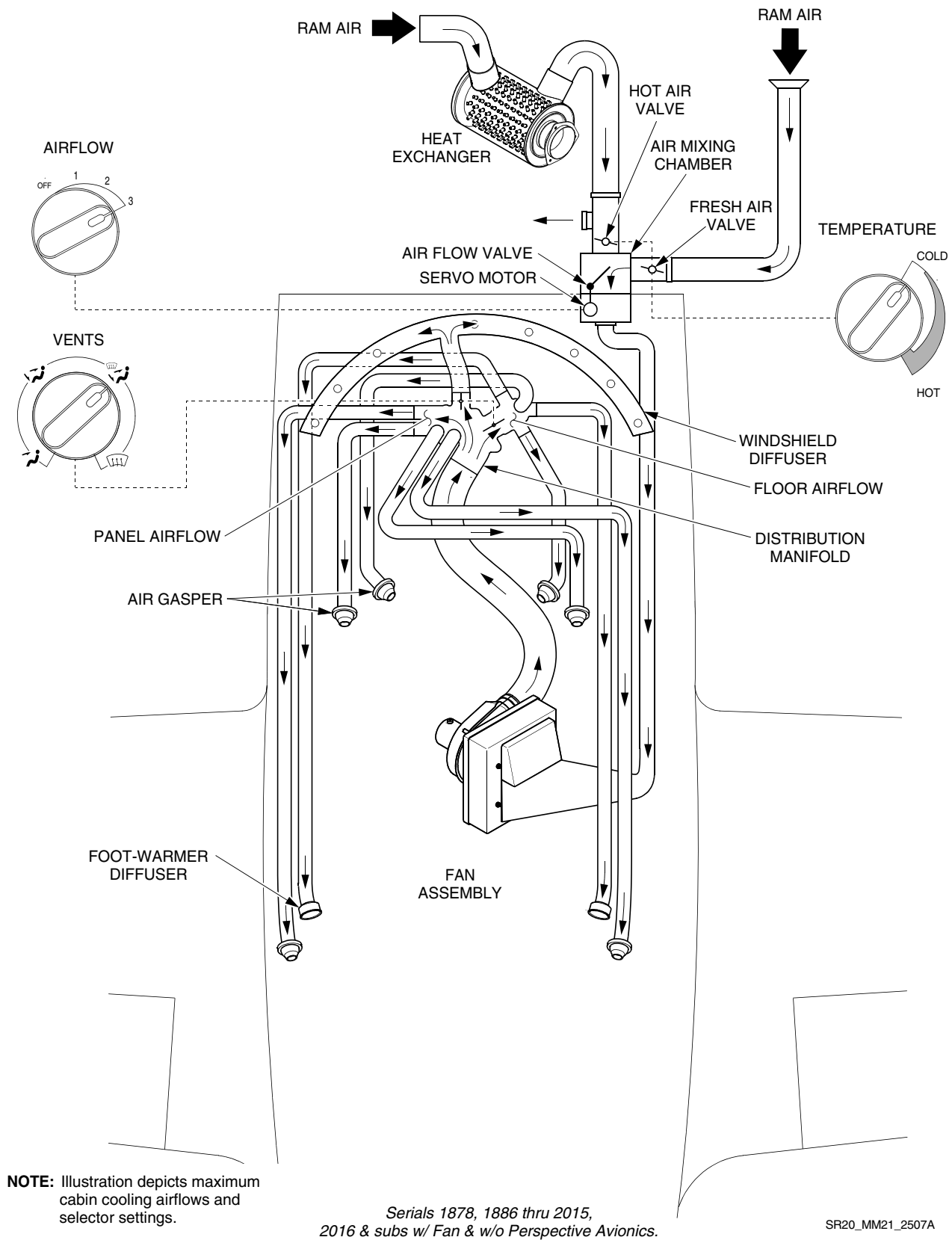
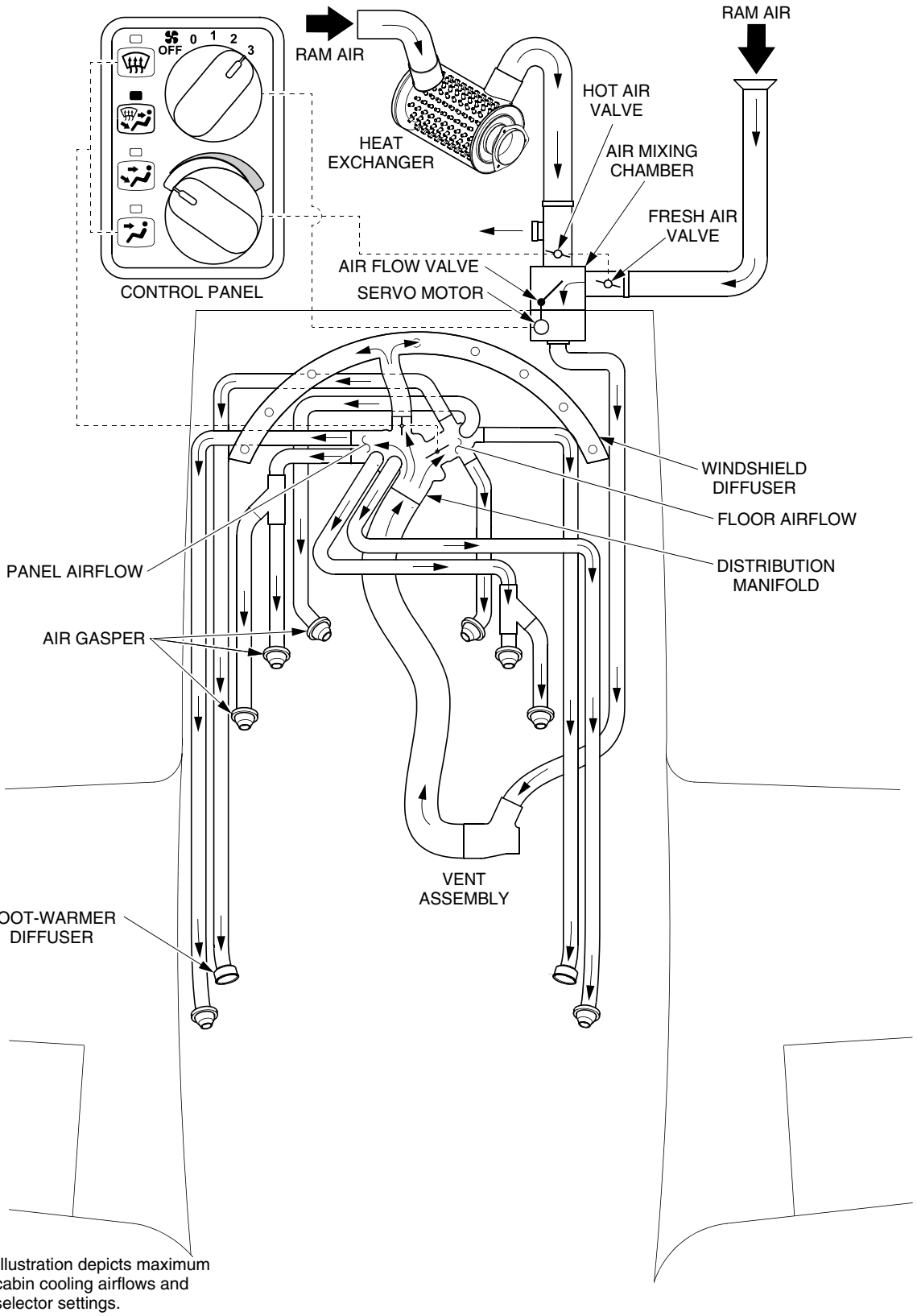


Figure 21-003

Heating and Ventilation System - Serials 1886-2015, 2016 & subs w/ Fan, w/o Perspective Avionics (Sheet 2 of 5)

EFFECTIVITY:
Serials 1886-2015, 2016 & subs w/ Fan, w/o Perspective Avionics



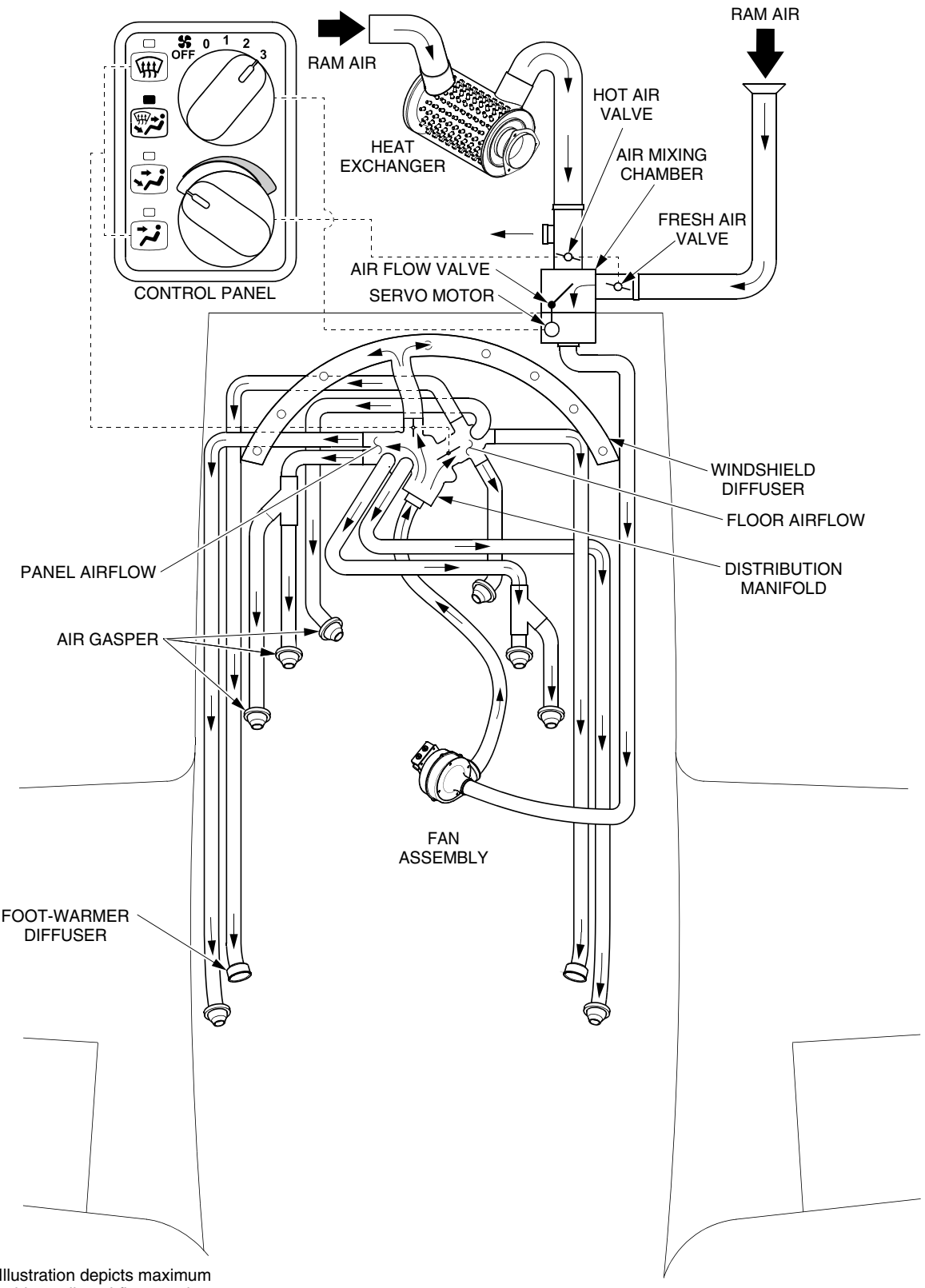
NOTE: Illustration depicts maximum cabin cooling airflows and selector settings.

SR20_MM21_2878

Serials 2016 & subs w/o Fan & w/ Perspective Avionics.

Figure 21-003
Heating and Ventilation System - Serials 2016 & subs w/o Fan, w/ Perspective Avionics (Sheet 3 of 5)

EFFECTIVITY:
Serials 2016 & subs w/o Fan, w/ Perspective Avionics

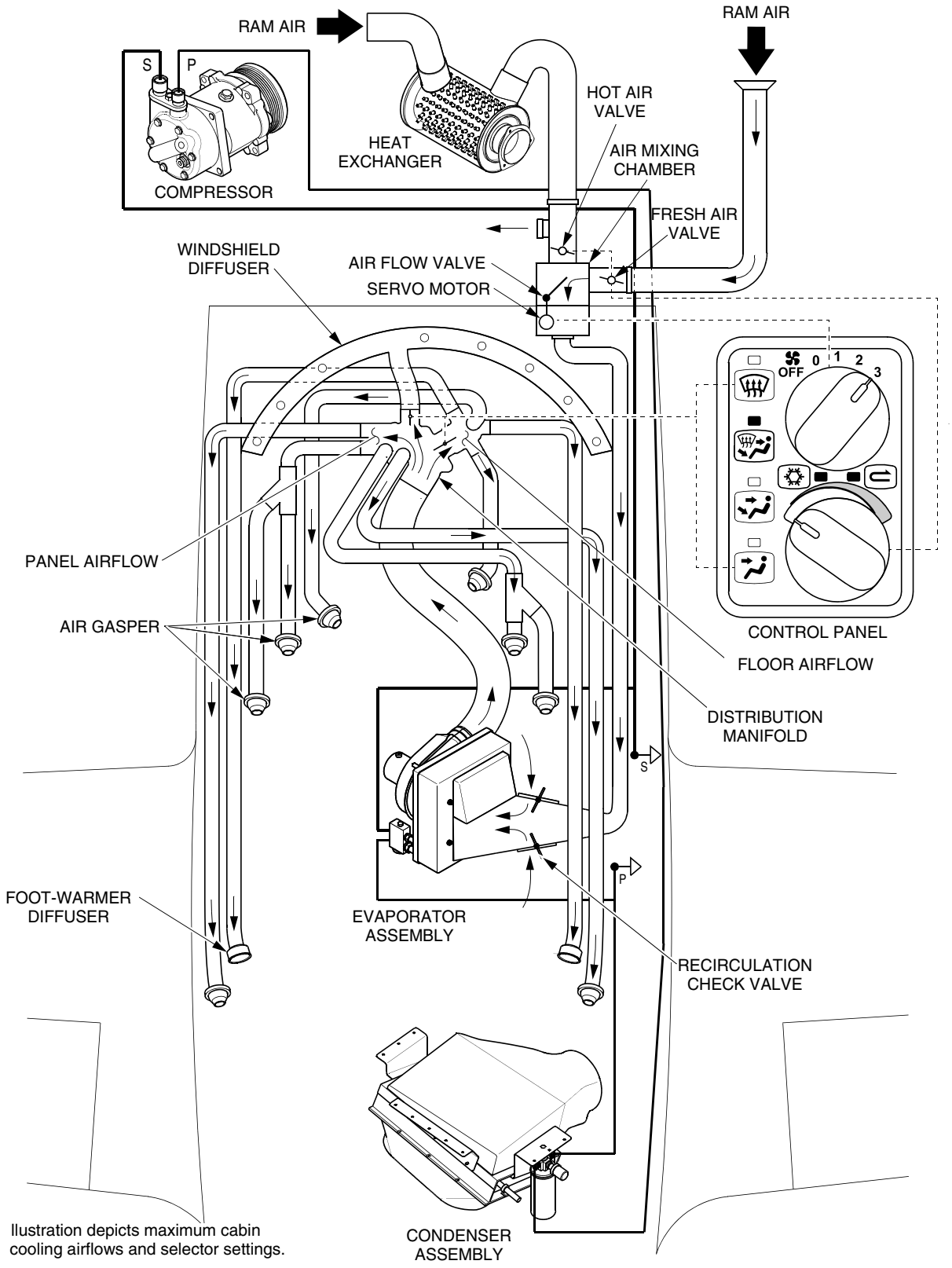


NOTE: Illustration depicts maximum cabin cooling airflows and selector settings.

Serials 2016 & subs w/ Fan & w/ Perspective Avionics.

SR20_MM21_2876

Figure 21-003
Heating and Ventilation System - Serials 2016 & subs w/ Fan, w/ Perspective Avionics (Sheet 4 of 5)



Serials 2065 & subs w/ Air Conditioning & w/ Perspective Avionics.

Figure 21-003
Heating and Ventilation System - Serials 2065 & subs w/ Air Conditioning, w/ Perspective (Sheet 5 of 5)

EFFECTIVITY:
Serials 2065 & subs w/ Air Conditioning, w/ Perspective

AIR DISTRIBUTION SYSTEM

1. DESCRIPTION

This section covers those systems and components used to induct and distribute air. Includes equipment rack cooling systems and items such as blowers, ducting, inlets, check valves, and wiring.

A. Cabin Air Distribution System - *Serials 1005 thru 1638*

Fresh air enters into the cabin distribution system through the leading edge air inlets located on each wing and/or the hot air valve on the firewall. After mixing in the air mixing chamber, air is ducted to the cabin through eyeball outlets, foot-warmer diffusers, and the windshield diffuser by ram air pressure. The vent selector on the system control panel is capable of selecting combinations of floor and defrost outputs. Air is also ducted directly to all panel and armrest eyeball outlets where airflow is controlled separately by pilot and passenger input.

B. Cabin Air Distribution System - *Serials 1639 thru 1885*

Fresh air enters into the cabin distribution system through the RH leading edge air inlet and/or the hot air valve on the firewall. After mixing in the air mixing chamber, air is ducted to the cabin through eyeball outlets, foot-warmer diffusers, and the windshield diffuser by ram air pressure or optional blower fan. The vent selector on the system control panel is capable of selecting combinations of floor and defrost outputs. Air is also ducted directly to all panel and armrest eyeball outlets where airflow is controlled separately by pilot and passenger input.

The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system through mechanical linkage to a butterfly valve in the distribution manifold. When the selector dial exceeds the full open position, the optional blower fan is turned on.

C. Cabin Air Distribution System - *Serials 1886 & subs*

Fresh air enters into the cabin distribution system through the air mixing chamber on the firewall. The air is ducted to the cabin through eyeball outlets, foot-warmer diffusers, and the windshield diffuser by ram air pressure or optional blower fan. The vent selector on the system control panel is capable of selecting combinations of floor and defrost outputs. Air is also ducted directly to all panel and armrest eyeball outlets where airflow is controlled separately by pilot and passenger input.

Serials 2016 & subs w/ Perspective Avionics: Additional crew vents are located at LH and RH display panels.

The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system. An electrical servo actuates a flapper valve in the air mixing chamber, allowing air to pass through the firewall to be ducted to the distribution manifold. Rotating the selector dial to “1” opens the flapper valve fully and the blower fan is turned on. Rotating the selector dial to “2” and “3” increases the fan speed.

D. Cooling Fan - *Serials 0002 thru 2015, 2016 & subs w/o Perspective Avionics*

A cooling fan, located behind the radio module assembly, provides airflow via a series of cooling ducts to prevent the avionics from overheating. 28 VDC is supplied through the 7.5-amp PITOT HEAT/ COOLING FAN circuit breaker on the Non-Essential Bus.

E. Cooling Fans - *Serials 2016 & subs w/ Perspective Avionics*

Two cooling fan systems are installed on the aircraft: Two display fans and one avionics fan.

The display cooling fans are located behind the MFD and PFD. Each fan is mounted to the upper RH corner of the console assembly display support brackets and provides aft airflow to prevent the MFD and PFD from overheating. For the MFD display cooling fan, 28 VDC is supplied through the 3-amp AVIONICS FAN 1 circuit breaker on the Non-Essential Bus. For the PFD display cooling fan, 28 VDC is supplied through the 5-amp AVIONICS FAN 2 circuit breaker on the Main Bus 2.

The avionics cooling fan is installed under the LH console assembly, forward from the bolster panel and provides airflow via a series of cooling ducts to prevent the avionics from overheating. 28 VDC is supplied through the 5-amp AVIONICS FAN 2 circuit breaker on the Main Bus 2.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Cabin fresh air inoperable.	Cabin panel vents closed, blocked, or faulty.	Open, remove restriction, or replace cabin panel vent.
	Air inlet on wing covered, plugged, or restricted.	Remove restriction.
	Fresh air inlet duct disconnected or collapsed.	Connect or replace duct. (Refer to 21-20)
	Cabin panel ducts disconnected or collapsed.	Connect or replace ducts. (Refer to 21-20)
	Control linkage misaligned or disconnected.	Adjust or connect control linkage. (Refer to 21-60)
Poor temperature control.	Duct work disconnected, damaged, or collapsed.	Connect or replace duct work. (Refer to 21-20)
	Control linkage misaligned or disconnected.	Adjust or connect control linkage. (Refer to 21-60)
	Faulty fan assembly.	Repair or replace fan assembly. (Refer to 21-20)
No running sound is discernible from cooling fan(s).	Inoperative cooling fan.	Access cooling fan, check connectors, and replace as required.

Serials 2016 & subs w/ Perspective Avionics:

Trouble - Cooling Fan	Probable Cause	Remedy
“PFD FAN FAIL - Cooling fan for the PFD is inoperative” annunciation is indicated on PFD.	Inoperative cooling fan.	Verify PFD FAN circuit breaker is closed.
		Access display cooling fan, check connectors, and replace as required.
“MFD FAN FAIL - Cooling fan for the MFD is inoperative” annunciation is indicated on MFD.	Inoperative cooling fan.	Verify AVIONICS FAN circuit breaker is closed.
		Access display cooling fan, check connectors, and replace as required.
“AVIONICS FAN - Cooling fan for remote avionics is inoperative” annunciation is indicated on PFD.	Inoperative cooling fan.	Verify AVIONICS FAN circuit breaker is closed.
		Access avionics cooling fan, check connectors, and replace as required.

Trouble - Cooling Fan	Probable Cause	Remedy
"PFD1 COOLING - has poor cooling. Reducing power usage" annunciation is indicated on PFD.	PFD has exceeded operating temperature range.	Access display cooling fan, check connectors, and replace as required.
		Replace PFD. (Refer to 31-60)
"MFD1 COOLING - has poor cooling. Reducing power usage" annunciation is indicated on MFD.	MFD has exceeded operating temperature range.	Access display cooling fan, check connectors, and replace as required.
		Replace MFD. (Refer to 31-60)
"COM1 TEMP - COM1 over temp. Reducing transmitter power" annunciation is indicated on PFD.	The COM1 board in GIA 63W 1 is over temperature.	Access avionics cooling fan, check connectors, and replace as required.
		Replace GIA 63W 1. (Refer to 31-40)
"COM2 TEMP - COM2 over temp. Reducing transmitter power" annunciation is indicated on PFD.	The COM2 board in GIA 63W 2 is over temperature.	Access avionics cooling fan, check connectors, and replace as required.
		Replace GIA 63W 2. (Refer to 31-40)
"GIA1 COOLING - GIA1 temperature too low" annunciation is indicated on PFD.	GIA 63W 1 operating temperature is too low.	Allow system to warm up.
"GIA2 COOLING - GIA2 temperature too low" annunciation is indicated on PFD.	GIA 63W 2 operating temperature is too low.	Allow system to warm up.
"GIA1 COOLING - GIA1 over temperature" annunciation is indicated on PFD.	GIA 63W 1 has exceeded its operating temperature range.	Access avionics cooling fan, check connectors, and replace as required.
		Replace GIA 63W 1. (Refer to 31-40)
"GIA2 COOLING - GIA2 over temperature" annunciation is indicated on PFD.	GIA 63W 2 has exceeded its operating temperature range.	Access avionics cooling fan, check connectors, and replace as required.
		Replace GIA 63W 2. (Refer to 31-40)

3. MAINTENANCE PRACTICES

A. Fresh Air Inlet Duct - *Serials 1005 thru 1885* (See Figure 21-201)

(1) Removal - Fresh Air Inlet Duct

(a) Remove wing access panel RW6. (Refer to 06-00)

(b) Remove sidewall air duct trim. (Refer to 25-10)

(c) Loosen clamp securing duct to fresh air inlet.

(d) *Serials 1005 thru 1638:* Remove latex caulk securing duct to fresh air inlet tee and fuselage.

(e) *Serials 1639 thru 1885:* Remove latex caulk securing duct to fuselage.

(f) *Serials 1639 thru 1885 w/o Fan:* Remove cable tie securing duct to vent assembly.

(g) *Serials 1639 thru 1885 w/ Fan:* Remove cable tie securing duct to fan assembly.

(h) Remove duct from airplane.

(2) Installation - Fresh Air Inlet Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 Inch	Any Source	Secure air duct.
Latex Caulk	C850A 151-8273	Sherwin Williams Cleveland, OH 44115 216-566-2000	Seal duct to fuselage.

(b) Route duct through wing ribs and into position.

(c) *Serials 1639 thru 1885 w/o Fan:* Position duct to vent assembly and secure with cable tie.

(d) *Serials 1639 thru 1885 w/ Fan:* Position duct to fan assembly and secure with cable tie.

(e) Position duct to fresh air inlet and secure with clamp. Torque screw to 35 - 45 in-lb (4.0 - 5.0 Nm).

(f) *Serials 1005 thru 1638:* Using latex caulk, seal duct to fuselage and fresh air inlet tee.

(g) *Serials 1639 thru 1885:* Using latex caulk, seal duct to fuselage.

(h) Install sidewall air duct trim. (Refer to 25-10)

(i) Install wing access panel RW6. (Refer to 06-00)

B. Crew Panel Air Vent - *Serials 1005 thru 1638* (See Figure 21-202)

(1) Removal - Crew Panel Air Vent

(a) Remove bolster panel to gain access to back side of eyeball air vent. (Refer to 25-10)

(b) Remove retaining nut and o-ring from vent.

(c) Remove vent.

(2) Installation - Crew Panel Air Vent

(a) Insert outlet into bolster panel.

(b) Place o-ring over back side of vent.

(c) Secure vent with retaining nut.

(d) Place bolster panel into position and secure. (Refer to 25-10)

C. Passenger Panel Air Vent - *Serials 1005 thru 1638* (See Figure 21-202)

(1) Removal - Passenger Panel Air Vent

(a) Remove armrest interior trim panel and disconnect passenger fresh air duct from vent. (Refer to 25-10)

CAUTION: Use care when drilling out old rivets to prevent damaging leather interior panel.

(b) Drill out rivets securing armrest assembly to interior trim panel.

(c) Remove retaining nut hose assembly and o-ring from vent.

(d) Remove vent.

(2) Installation - Passenger Panel Air Vent

(a) Insert vent into interior trim panel.

(b) Place o-ring over back side of vent.

(c) Secure vent with retaining nut hose assembly.

(d) Secure armrest assembly to interior trim panel with rivets.

(e) Place armrest interior trim panel into position, secure fresh air duct to vent, and secure panel. (Refer to 25-10)

D. Mixing Chamber Air Ducts - *Serials 1005 thru 1638* **(See Figure 21-203)**

(1) Removal - Mixing Chamber Air Ducts

(a) Remove MFD. (Refer to 31-60)

(b) Remove kick plate. (Refer to 25-10)

(c) Remove cable ties securing air duct.

(d) Remove air duct from airplane.

(2) Installation - Mixing Chamber Air Ducts

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	8 inch	Any Source	Retain air duct.

CAUTION: Ensure air duct routing does not interfere with other components.

(b) Install air duct into position.

(c) Secure air duct with cable ties.

(d) Visually inspect air ducts to ensure no interference with flight controls, brackets or any other linkage.

(e) Install kick plate. (Refer to 25-10)

(f) Install MFD. (Refer to 31-60)

E. Side Panel Air Ducts - *Serials 1005 thru 1638* **(See Figure 21-202)**

(1) Removal - Side Panel Air Ducts

(a) Remove sidewall air duct trim. (Refer to 25-10)

(b) Remove sidewall air duct.

(c) Remove cable ties and disconnect air duct from each end. Remove air duct.

(2) Installation - Side Panel Air Ducts

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	8 inch	Any Source	Retain air duct.
Isopropyl Alcohol	99% or higher purity	Any Source	Prepare mating surface for double-sided tape.
Double-sided Tape	VHB-4956	3M Company	Adhere sidewall air duct.

(b) Install air duct and secure at both ends.

(c) Clean all remaining double-sided tape off fuselage and sidewall air duct using isopropyl alcohol. (Refer to 20-30)

(d) Install double-sided tape on fuselage.

(e) Place sidewall air duct into position and secure.

(f) Install sidewall air duct trim. (Refer to 25-10)

F. Kick Plate Air Ducts - *Serials 1005 thru 1638* **(See Figure 21-202)**

(1) Removal - Kick Plate Air Duct

(a) Remove kick plate. (Refer to 25-10)

(b) Remove clamp securing duct to ball louver assembly.

(c) Remove inner ball louver from outer housing to remove ball louver assembly from kick plate.

(2) Installation - Kick Plate Air Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	425	Any Source	Retain air duct.

(b) Apply Loctite® to threads of inner ball louver.

(c) Position ball louver assembly to kick plate and install inner ball louver to outer housing.

(d) Position duct to ball louver assembly and secure with clamp.

(e) Install kick plate. (Refer to 25-10)

G. Passenger Heat Ducts - *Serials 1005 thru 1638* **(See Figure 21-201)**

(1) Removal - Passenger Heat Duct

(a) Remove sidewall air duct trim. (Refer to 25-10)

(b) Remove armrest interior trim. (Refer to 25-10)

(c) Remove MFD. (Refer to 31-60)

(d) Remove cable ties and disconnect air duct from each end.

(e) Remove air duct.

(2) Installation - Passenger Heat Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	8 inch	Any Source	Retain air duct.

CAUTION: Ensure air duct routing does not interfere with other components.

(b) Install air duct into position.

(c) Secure duct with cable ties at both ends.

(d) Install MFD. (Refer to 31-60)

(e) Secure armrest interior trim. (Refer to 25-10)

(f) Install sidewall air duct trim. (Refer to 25-10)

H. Air Mixing Chamber - *Serials 1005 thru 1638* **(See Figure 21-203)**

(1) Removal - Air Mixing Chamber

(a) Remove RH kick plate. (Refer to 25-10)

(b) Remove MFD. (Refer to 31-60)

(c) Remove cable ties securing ducts to mixing chamber.

(d) Disconnect ducts from mixing chamber.

(e) Disconnect temperature control linkage.

(f) Loosen screws securing mixing chamber and console rib to firewall.

(g) Remove screws securing mixing chamber to firewall. Remove mixing chamber from airplane.

(2) Installation - Air Mixing Chamber

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	8 inch	Any source	Secure air duct.

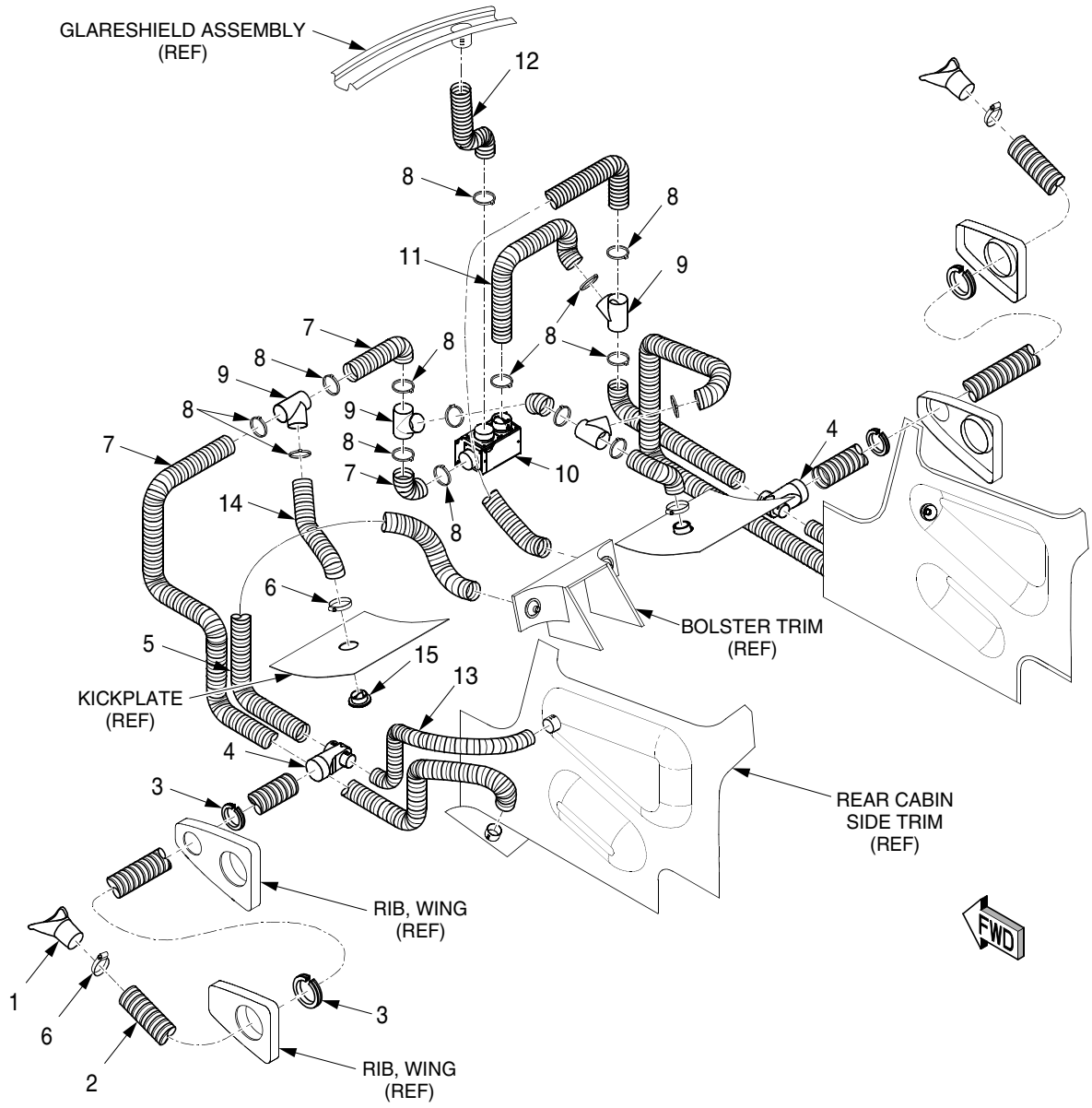
(b) Position mixing chamber to firewall and secure with screws.

(c) Position ducts to mixing chamber and secure with cable ties.

(d) Perform Adjustment/Test - Hot Air Valve Control Cable. (Refer to 21-60)

(e) Install MFD. (Refer to 31-60)

(f) Install RH kick plate. (Refer to 25-10)



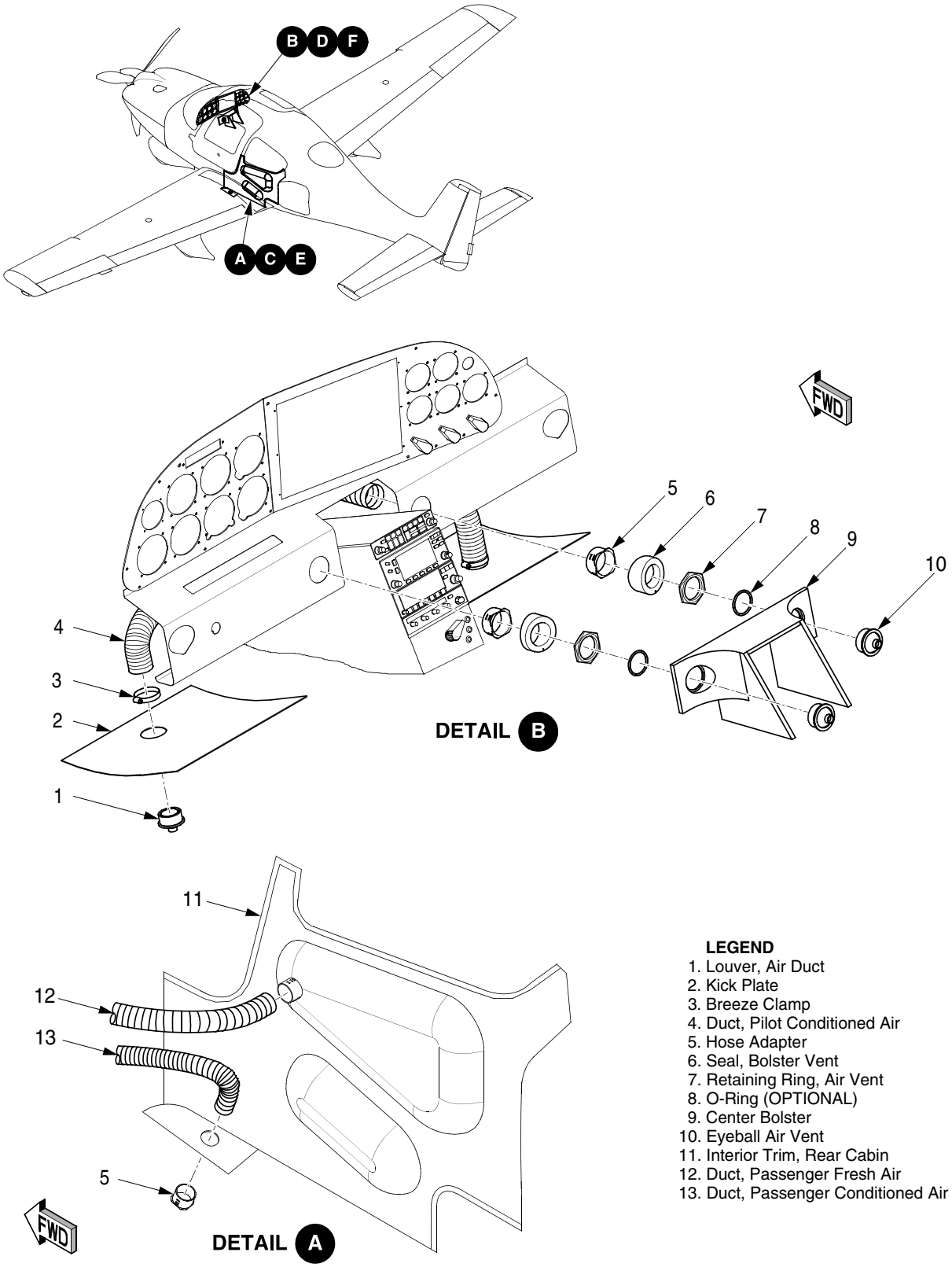
LEGEND

1. Fresh Air Inlet
2. Fresh Air Inlet Duct
3. Grommet
4. Fresh Air Inlet Tee
5. Crew Panel Duct
6. Breeze Clamp
7. Passenger Floor Duct
8. Cable Tie
9. Y Connector
10. Air Mixing Chamber
11. Fresh Air Inlet to Air Mixing Chamber Duct
12. Defrost Duct
13. Passenger Panel Duct
14. Crew Floor Duct
15. Air Vent

Serials 1005 thru 1632, 1634 thru 1638.

SR20_MM21_1218B

Figure 21-201
Cabin Air Distribution System - Serials 1005 thru 1638

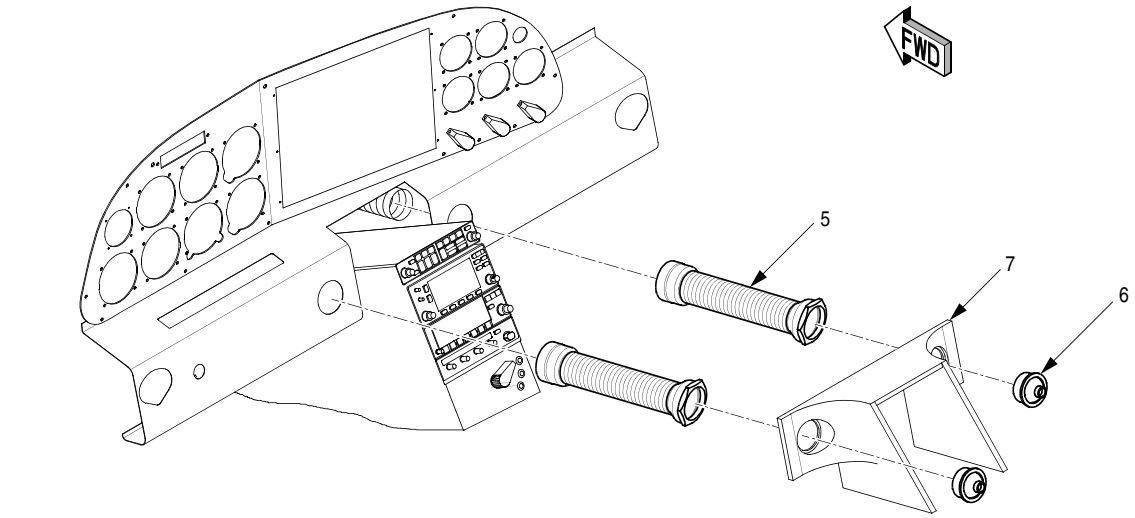


Serials 1005 thru 1053.

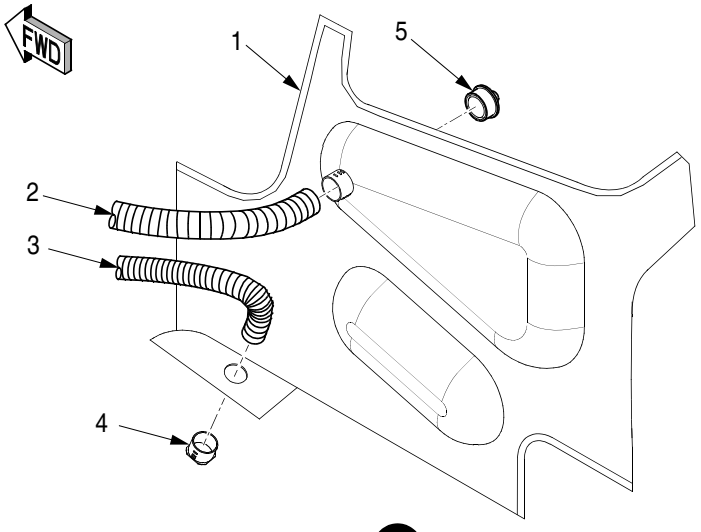
SR20_MM21_1134C

Figure 21-202
Cabin Air Vents - Serials 1005 thru 1053 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1053



DETAIL D



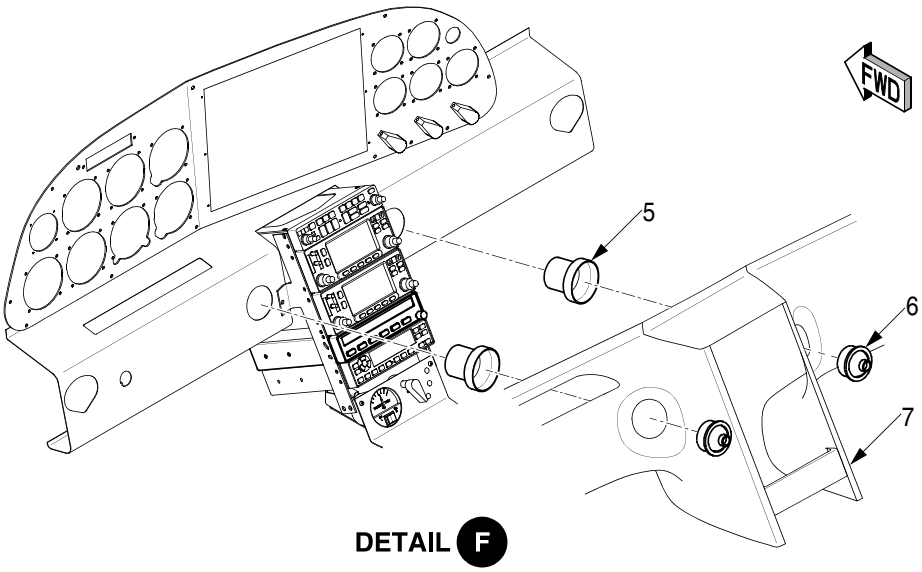
DETAIL C

Serials 1054 thru 1267.

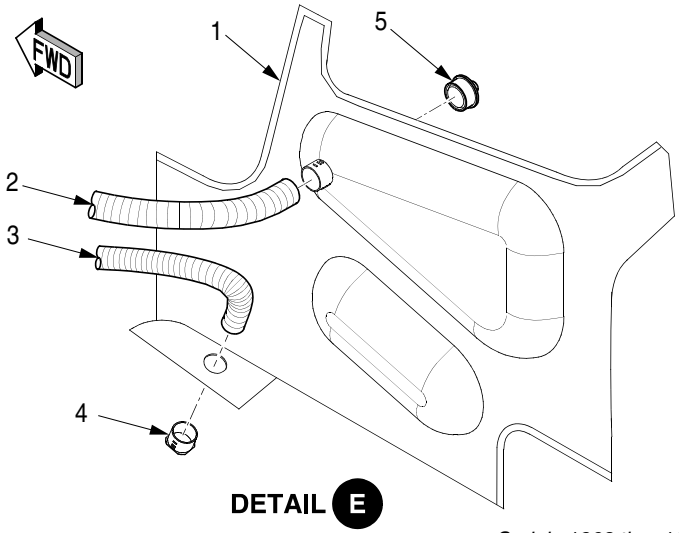
LEGEND
1. Interior Trim, Rear Cabin
2. Duct, Passenger Fresh Air
3. Duct, Passenger Conditioned Air
4. Hose Adapter
5. Vent Assembly
6. Part of Item 5
7. Center Bolster

SR20_MM21_1984B

Figure 21-202
Cabin Air Vents - Serials 1054 thru 1267 (Sheet 2 of 3)



DETAIL F



DETAIL E

Serials 1268 thru 1638.

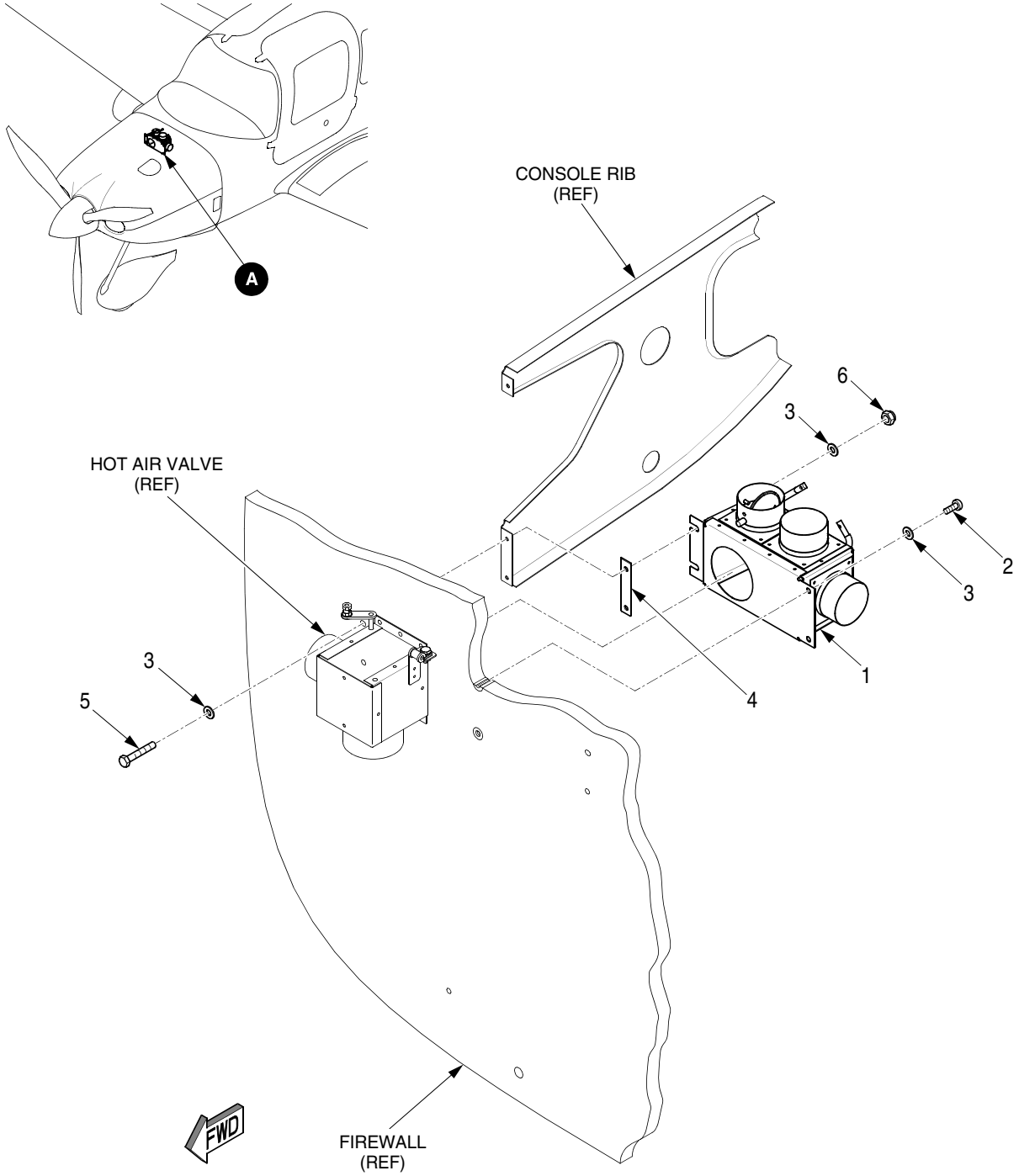
LEGEND

1. Interior Trim, Rear Cabin
2. Duct, Passenger Fresh Air
3. Duct, Passenger Conditioned Air
4. Hose Adapter
5. Vent Assembly
6. Part of Item 5
7. Center Bolster

SR2_MM21_1586B

Figure 21-202
Cabin Air Vents - Serials 1268 thru 1638 (Sheet 3 of 3)

EFFECTIVITY:
Serials 1268 thru 1638



LEGEND
1. Air Mixing Chamber
2. Screw
3. Washer
4. Shim
5. Bolt
6. Nut

DETAIL A

Serials 1005 thru 1632, 1634 thru 1638.

SR20_MM21_2334B

Figure 21-203
Air Mixing Chamber Installation - Serials 1005 thru 1638

I. Fresh Air Inlet Duct - Serials 1886 & subs (See Figure 21-204)

(1) Removal - Fresh Air Inlet Duct

(a) Remove engine cowling. (Refer to 71-10)

(b) Loosen clamp securing duct to fresh air inlet.

(c) Loosen clamp securing duct to air mixing chamber.

(d) Remove duct from airplane.

(2) Installation - Fresh Air Inlet Duct

(a) Position duct to air mixing chamber and secure with clamp.

(b) Position duct to fresh air inlet and secure with clamp.

(c) Install engine cowling. (Refer to 71-10)

J. Distribution Manifold - *Serials 1639 & subs* (See Figure 21-204)

(1) Removal - Distribution Manifold

(a) Remove glareshield. (Refer to 25-10)

(b) Remove RH kick plate. (Refer to 25-10)

(c) *Serials 1639 thru 1885:* Remove bolt, washer, and wire stop securing coupler linkage to manifold.

(d) Remove nut, washers, and spacer securing airflow linkage to manifold.

(e) Remove nut, washers, and spacer securing defrost linkage to manifold.

(f) Remove nut, washers, and spacer securing heat linkage to manifold.

(g) Remove cable ties securing ducts to manifold.

(h) Remove bolt and washers securing manifold to firewall. Remove manifold from airplane.

(2) Installation - Distribution Manifold

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position manifold to firewall and secure with bolt and washers.

(c) Position ducts to manifold and secure with cable ties.

(d) Position heat linkage to manifold and secure with spacer, washers, and nuts.

(e) Position defrost linkage to manifold and secure with spacer, washers, and nuts.

(f) Position air flow linkage to manifold and secure with spacer, washers, and nuts.

(g) *Serials 1639 thru 1885:* Position coupler linkage to manifold and secure with bolt, washer, and wire stop.

(h) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(i) Install RH kick plate. (Refer to 25-10)

(j) Install glareshield. (Refer to 25-10)

K. Vent Assembly - *Serials 1639 & subs w/o Fan* **(See Figure 21-204)**

(1) Removal - Vent Assembly

(a) Remove RH crew seat. (Refer to 25-10)

(b) *Serials 1639 thru 2054:* Remove bolts and washers securing vent assembly cover and floor cover to fuselage.

(c) *Serials 2055 & subs:* Remove bolts and washers securing floor cover to fuselage.

(d) *Serials 1639 thru 1885:* Remove screw securing coupler linkage to vent assembly.

(e) *Serials 1639 thru 1885:* Remove cable tie securing wing inlet duct to vent assembly.

(f) Remove clamp securing coupler duct to vent assembly.

(g) Remove cable tie securing vent duct to vent assembly.

(h) *Serials 1639 thru 2054:* Remove bolts and washers securing vent assembly to floor cover.

(i) *Serials 2055 & subs:* Remove cable tie securing vent assembly to cable tie anchor on fuselage skin.

(2) Installation - Vent Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) *Serials 1639 thru 2054:* Position vent assembly to floor cover and secure with bolts and washers.

(c) *Serials 2055 & subs:* Position vent assembly to fuselage skin and secure to cable tie anchor with cable tie.

(d) Position vent duct to vent assembly and secure with cable tie.

(e) Position coupler duct to vent assembly and secure with clamp.

(f) *Serials 1639 thru 1885:* Position wing inlet duct to vent assembly and secure with cable tie.

(g) *Serials 1639 thru 1885:* Position coupler linkage to vent assembly and secure with screw.

(h) *Serials 1639 thru 2054:* Position vent assembly cover and floor cover to fuselage and secure with bolts and washers.

(i) *Serials 2055 & subs:* Position floor cover to fuselage and secure with bolts and washers.

(j) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(k) Install RH crew seat. (Refer to 25-10)

L. Fan Assembly - *Serials 1639 & subs w/ Fan* **(See Figure 21-204)**

(1) Removal - Fan Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove RH crew seat. (Refer to 25-10)

(c) *Serials 1639 thru 1885:* Remove bolts and washers securing fan assembly cover and fan assembly to fuselage floor.

(d) *Serials 1886 & subs:* Remove bolts and washers securing fan assembly cover, floor cover, and fan assembly to fuselage floor.

(e) Disconnect fan assembly connector from wire harness connector.

(f) *Serials 1639 thru 1885:* Remove screw securing coupler linkage to fan assembly.

(g) *Serials 1639 thru 1885:* Remove cable tie securing fresh air inlet duct to fan assembly.

(h) Remove clamp securing coupler duct to fan assembly.

(i) Remove cable tie securing fan duct to fan assembly.

(j) Remove fan assembly from airplane.

(2) Disassembly - Fan Assembly

(a) Remove bolts and washers securing blower motor assembly to fan assembly.

(b) Remove blower wheel from blower motor shaft.

(3) Assembly - Fan Assembly

(a) Install blower wheel onto blower motor shaft.

(b) Position blower motor assembly to fan assembly and secure with bolts and washers.

(4) Installation - Fan Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position fan duct to fan assembly and secure with cable tie.

(c) Position coupler duct to fan assembly and secure with clamp.

(d) *Serials 1639 thru 1885:* Position fresh air inlet duct to fan assembly and secure with cable tie.

(e) *Serials 1639 thru 1885:* Position coupler linkage to fan assembly and secure with screw.

(f) Connect fan assembly connector to wire harness connector.

(g) *Serials 1639 thru 1885:* Position fan assembly cover to fan assembly and secure cover and fan to fuselage with bolts and washers.

(h) *Serials 1886 & subs:* Position fan assembly, floor cover, and fan assembly cover to fuselage floor and secure with bolts and washers.

(i) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(j) Install RH crew seat. (Refer to 25-10)

M. Fan Duct - *Serials 1639 & subs w/ Fan* **(See Figure 21-204)**

(1) Removal - Fan Duct

(a) Remove RH crew seat. (Refer to 25-10)

(b) Remove access panel CF1R. (Refer to 06-00)

(c) Remove bolts and washers securing fan assembly cover and fan assembly to fuselage floor.

(d) Remove cable tie securing fan duct to fan assembly.

(e) Remove cable tie securing fan duct to aft duct.

(f) Gently twist fan duct to loosen slip joint with aft duct. Remove fan duct from airplane.

(2) Installation - Fan Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position aft duct to fan duct and secure with cable tie.

(c) Position fan duct to fan assembly and secure with cable tie.

(d) Position fan assembly cover and fan assembly to fuselage and secure with bolts and washers.

(e) Install access panel CF1R. (Refer to 06-00)

(f) Install RH crew seat. (Refer to 25-10)

N. Crew Panel Air Vent - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Crew Panel Air Vent

(a) Remove bolster trim. (Refer to 25-10)

(b) Remove cable tie securing duct to air vent.

(c) Remove air vent backshell securing air vent to bolster trim. Remove air vent from airplane.

(2) Installation - Crew Panel Air Vent

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position air vent to bolster trim and secure with air vent backshell.

(c) Position duct to air vent and secure with cable tie.

(d) Install bolster trim. (Refer to 25-10)

O. Crew Display Air Vent - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-204)**

(1) Removal - Crew Display Air Vent

(a) Remove glareshield. (Refer to 25-10)

(b) Remove cable tie securing duct to air vent.

(c) Remove air vent backshell securing air vent to bolster trim. Remove air vent from airplane.

(2) Installation - Crew Display Air Vent

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position air vent to bolster trim and secure with air vent backshell.

(c) Position duct to air vent and secure with cable tie.

(d) Install glareshield. (Refer to 25-10)

P. Passenger Panel Air Vent - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Passenger Panel Air Vent

(a) Remove rear cabin side trim. (Refer to 25-10)

(b) Remove cable tie securing duct to air vent.

(c) Remove air vent backshell securing air vent to rear cabin side trim. Remove air vent from airplane.

(2) Installation - Passenger Panel Air Vent

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position air vent to rear cabin side trim and secure with air vent backshell.

(c) Position duct to air vent and secure with cable tie.

(d) Install rear cabin side trim. (Refer to 25-10)

Q. Crew Floor Air Vent - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Crew Floor Air Vent

(a) Remove kick plate. (Refer to 25-10)

(b) Remove cable tie securing duct to air vent.

(c) Remove air vent backshell securing air vent to kick plate. Remove air vent from airplane.

(2) Installation - Crew Floor Air Vent

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position air vent to kick plate and secure with air vent backshell.

(c) Position duct to air vent and secure with cable tie.

(d) Install kick plate. (Refer to 25-10)

R. Passenger Floor Air Vent - *Serials 1639 & subs* (See Figure 21-204)

(1) Removal - Passenger Floor Air Vent

(a) Remove rear cabin side trim. (Refer to 25-10)

(b) Remove cable tie securing duct to vent outlet sleeve.

(c) Remove vent outlet sleeve from rear cabin side trim.

(2) Installation - Passenger Floor Air Vent

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Insert vent outlet sleeve in rear cabin side trim.

(c) Position duct to vent outlet sleeve and secure with cable tie.

(d) Install rear cabin side trim. (Refer to 25-10)

S. Crew Panel Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Crew Panel Duct

(a) Remove bolster trim. (Refer to 25-10)

(b) Remove glareshield. (Refer to 25-10)

(c) Remove cable tie securing duct to air vent.

(d) Remove cable tie securing duct to distribution manifold. Remove duct from airplane.

(2) Installation - Crew Panel Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to air vent and secure with cable tie.

(d) Install glareshield. (Refer to 25-10)

(e) Install bolster trim. (Refer to 25-10)

T. Crew Display Duct - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-204)**

(1) Removal - Crew Display Duct

(a) Remove glareshield. (Refer to 25-10)

(b) Remove cable tie securing duct to air vent.

(c) Remove cable tie securing duct to distribution manifold. Remove duct from airplane.

(2) Installation - Crew Display Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to air vent and secure with cable tie.

(d) Install glareshield. (Refer to 25-10)

U. Passenger Panel Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Passenger Panel Duct

(a) Remove sidewall air duct trim. (Refer to 25-10)

(b) Remove rear cabin side trim. (Refer to 25-10)

(c) Remove glareshield. (Refer to 25-10)

(d) Remove cable tie securing duct to air vent.

(e) Remove cable tie securing duct to distribution manifold.

(f) Remove cable ties securing duct to console and fuselage. Remove duct from airplane.

(2) Installation - Passenger Panel Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to air vent and secure with cable tie.

(d) Position duct to console and fuselage and secure with cable ties.

(e) Install glareshield. (Refer to 25-10)

(f) Install rear cabin side trim. (Refer to 25-10)

(g) Install sidewall air duct trim. (Refer to 25-10)

V. Crew Floor Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Crew Floor Duct

(a) Remove glareshield. (Refer to 25-10)

(b) Remove kick plate. (Refer to 25-10)

(c) Remove cable tie securing duct to air vent.

(d) Remove cable tie securing duct to distribution manifold. Remove duct from airplane.

(2) Installation - Crew Floor Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to air vent and secure with cable tie.

(d) Install kick plate. (Refer to 25-10)

(e) Install glareshield. (Refer to 25-10)

W. Passenger Floor Duct - *Serials 1639 & subs* (See Figure 21-204)

(1) Removal - Passenger Floor Duct

(a) Remove sidewall air duct trim. (Refer to 25-10)

(b) Remove rear cabin side trim. (Refer to 25-10)

(c) Remove glareshield. (Refer to 25-10)

(d) Remove cable tie securing duct to ventilation outlet sleeve.

(e) Remove cable tie securing duct to distribution manifold.

(f) Remove cable ties securing duct to console and fuselage. Remove duct from airplane.

(2) Installation - Passenger Floor Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to ventilation outlet sleeve and secure with cable tie.

(d) Position duct to console and fuselage and secure with cable ties.

(e) Install glareshield. (Refer to 25-10)

(f) Install rear cabin side trim. (Refer to 25-10)

(g) Install sidewall air duct trim. (Refer to 25-10)

X. Defrost Duct - *Serials 1639 & subs* (See Figure 21-204)

(1) Removal - Defrost Duct

(a) Remove glareshield. (Refer to 25-10)

(b) *Serials w/ Perspective Avionics:* Remove bolts and washers securing defrost vent to C-channel.

(c) *Serials w/ Perspective Avionics:* Remove cable tie securing defrost vent to defrost duct.

(d) Remove cable tie securing duct to lower windshield assembly.

(e) Remove cable tie securing duct to distribution manifold. Remove duct from airplane.

(2) Installation - Defrost Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position duct to distribution manifold and secure with cable tie.

(c) Position duct to lower windshield assembly and secure with cable tie.

(d) *Serials w/ Perspective Avionics:* Position and secure defrost vent to defrost duct with cable tie.

(e) *Serials w/ Perspective Avionics:* Install bolts and washers securing defrost vent to C-channel.

(f) Install glareshield. (Refer to 25-10)

Y. Forward Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Forward Duct

(a) Remove RH kick plate. (Refer to 25-10)

(b) Remove right mid console trim. (Refer to 25-10)

(c) Remove cable tie securing forward duct to distribution manifold.

(d) Gently twist forward duct to loosen slip joint with mid duct. Remove forward duct from airplane.

(2) Installation - Forward Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position forward duct to mid duct and gently twist to tighten slip joint.

(c) Position forward duct to distribution manifold and secure with cable tie.

(d) Install right mid console trim. (Refer to 25-10)

(e) Install RH kick plate. (Refer to 25-10)

Z. Mid Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Mid Duct

(a) Remove RH kick plate. (Refer to 25-10)

(b) Remove right mid console trim. (Refer to 25-10)

(c) Remove bolts and washers securing duct mounting bracket to fuselage floor.

(d) Gently twist mid duct to loosen slip joint with forward duct.

(e) Gently twist mid duct to loosen slip joint with aft duct. Remove mid duct from airplane.

(2) Installation - Mid Duct

(a) Position mid duct to aft duct and gently twist to tighten slip joint.

(b) Position mid duct to forward duct and gently twist to tighten slip joint.

(c) Position duct mounting bracket to fuselage floor and secure with bolts and washers.

(d) Install right mid console trim. (Refer to 25-10)

(e) Install RH kick plate. (Refer to 25-10)

AA. Aft Duct - *Serials 1639 & subs* **(See Figure 21-204)**

(1) Removal - Aft Duct

(a) Remove access panel CF1R. (Refer to 06-00)

(b) *Serials 1639 & subs w/o Fan:* Remove cable tie securing aft duct to vent duct.

(c) *Serials 1639 & subs w/ Fan:* Remove cable tie securing aft duct to fan duct.

(d) *Serials 2065 & subs w/ Air Conditioning:* Remove cable tie securing aft duct to evaporator duct.

(e) Remove nut and washers securing aft duct support to stud on fuselage belly.

(f) Gently twist aft duct to loosen slip joint with mid duct. Remove aft duct from airplane.

(2) Installation - Aft Duct

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

(b) Position aft duct to mid duct and gently twist to tighten slip joint.

(c) *Serials 1639 & subs w/o Fan:* Position aft duct to vent duct and secure with cable tie.

(d) *Serials 1639 & subs w/ Fan:* Position aft duct to fan duct and secure with cable tie.

(e) *Serials 2065 & subs w/ Air Conditioning:* Position aft duct to evaporator duct and secure with cable tie.

(f) Position duct support to stud on fuselage belly and secure with washers and nut.

(g) Install access panel CF1R. (Refer to 06-00)

AB. Vent/Fan/Evaporator Duct - *Serials 1639 & subs* (See Figure 21-204)

Note: Removal and installation of Fan Duct and Evaporator Duct are identical to Vent Duct.
Serials 1639 & subs w/ Fan: Perform the following procedure for removal and installation of Fan Duct.
Serials 2065 & subs w/ Air Conditioning: Perform the following procedure for removal and installation of Evaporator Duct

(1) Removal - Vent Duct
- (a) Remove RH crew seat. (Refer to 25-10)
- (b) Remove access panel CF1R. (Refer to 06-00)
- (c) *Serials 1639 thru 2054:* Remove bolts and washers securing vent assembly cover and floor cover to fuselage.
- (d) *Serials 2055 & subs:* Remove bolts and washers securing floor cover to fuselage.
- (e) Remove cable tie securing vent duct to vent assembly.
- (f) Remove cable tie securing vent duct to aft duct.
- (g) Gently twist vent duct to loosen slip joint with aft duct. Remove vent duct from airplane.

(2) Installation - Vent Duct
- (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	4 inch	Any Source	Secure air duct.

- (b) Position aft duct to vent duct and secure with cable tie.
- (c) Position vent duct to vent assembly and secure with cable tie.
- (d) *Serials 1639 thru 2054:* Position vent assembly cover and floor cover to fuselage and secure with bolts and washers.
- (e) *Serials 2055 & subs:* Position floor cover to fuselage and secure with bolts and washers.
- (f) Install access panel CF1R. (Refer to 06-00)
- (g) Install RH crew seat. (Refer to 25-10)

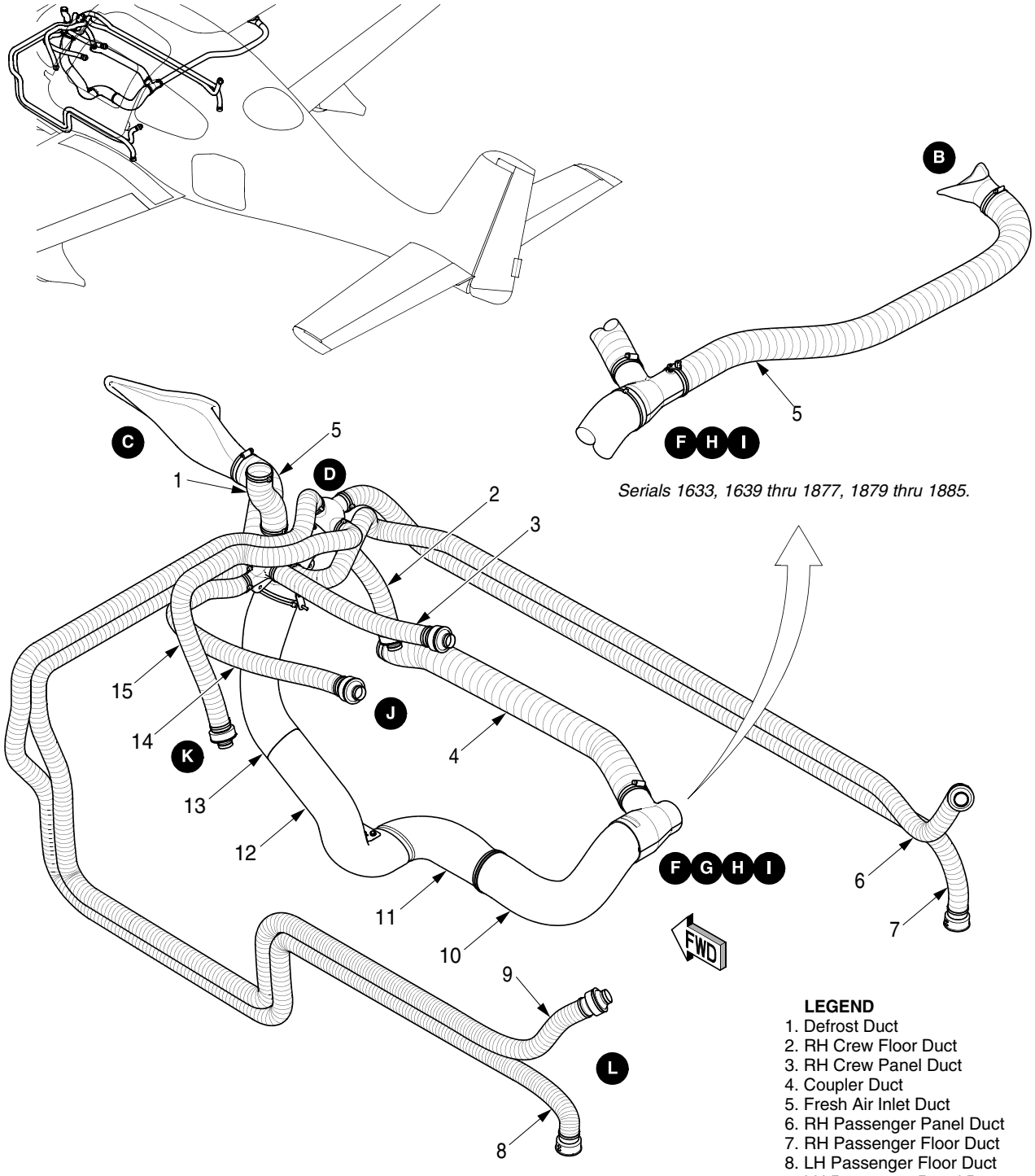
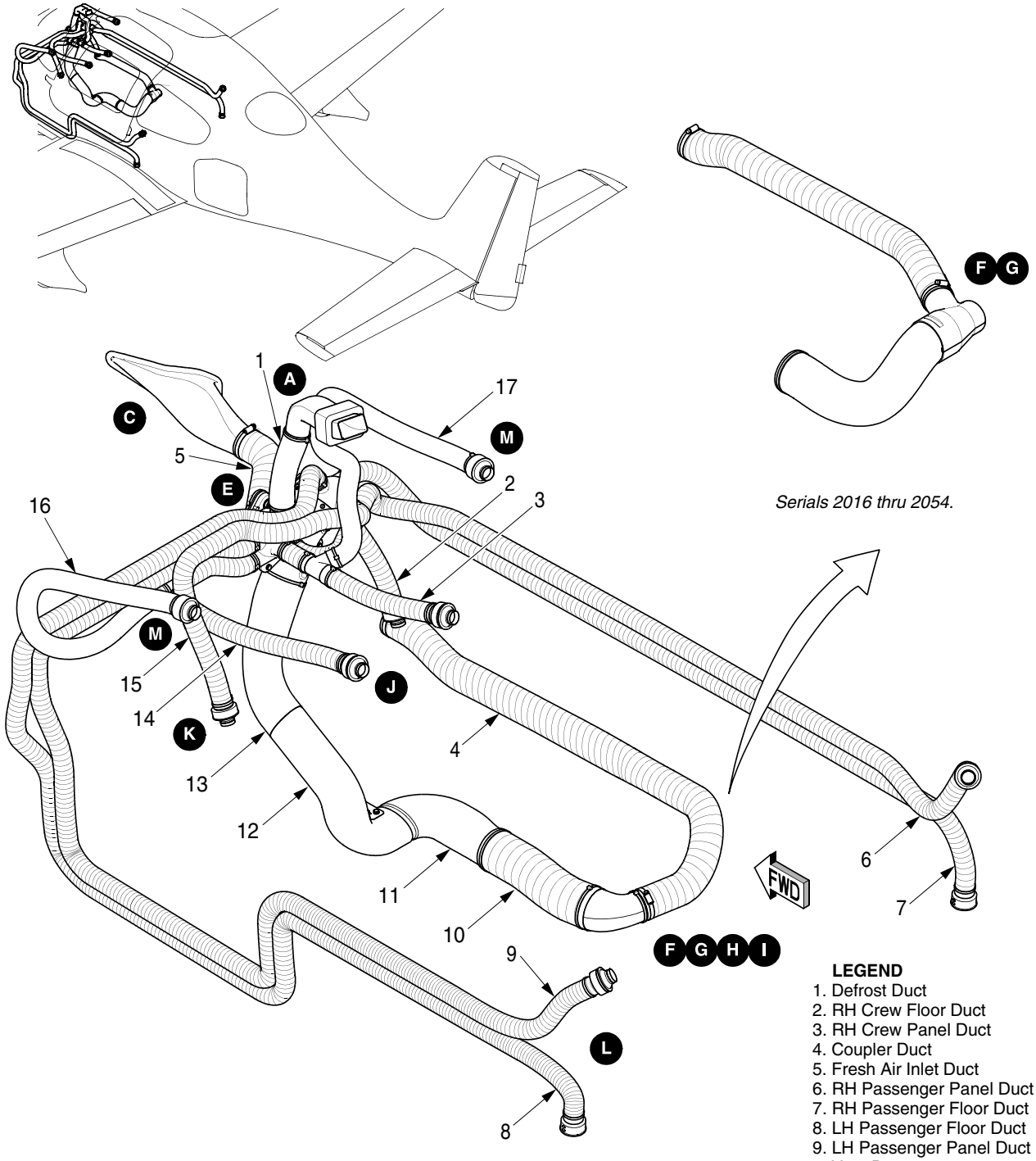


Figure 21-204
Cabin Air Distribution System - Serials 1639 & subs w/o Perspective Avionics (Sheet 1 of 10)

EFFECTIVITY:
Serials 1639 & subs w/o Perspective Avionics



Serials 2016 thru 2054.

Serials 2016 & subs w/ Perspective Avionics.

LEGEND

1. Defrost Duct
2. RH Crew Floor Duct
3. RH Crew Panel Duct
4. Coupler Duct
5. Fresh Air Inlet Duct
6. RH Passenger Panel Duct
7. RH Passenger Floor Duct
8. LH Passenger Floor Duct
9. LH Passenger Panel Duct
10. Vent Duct
11. Aft Duct
12. Mid Duct
13. Forward Duct
14. LH Crew Panel Duct
15. LH Crew Floor Duct
16. LH Crew Display Duct
17. RH Crew Display Duct

SR20_MM21_2922B

Figure 21-204
Cabin Air Distribution System - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 10)

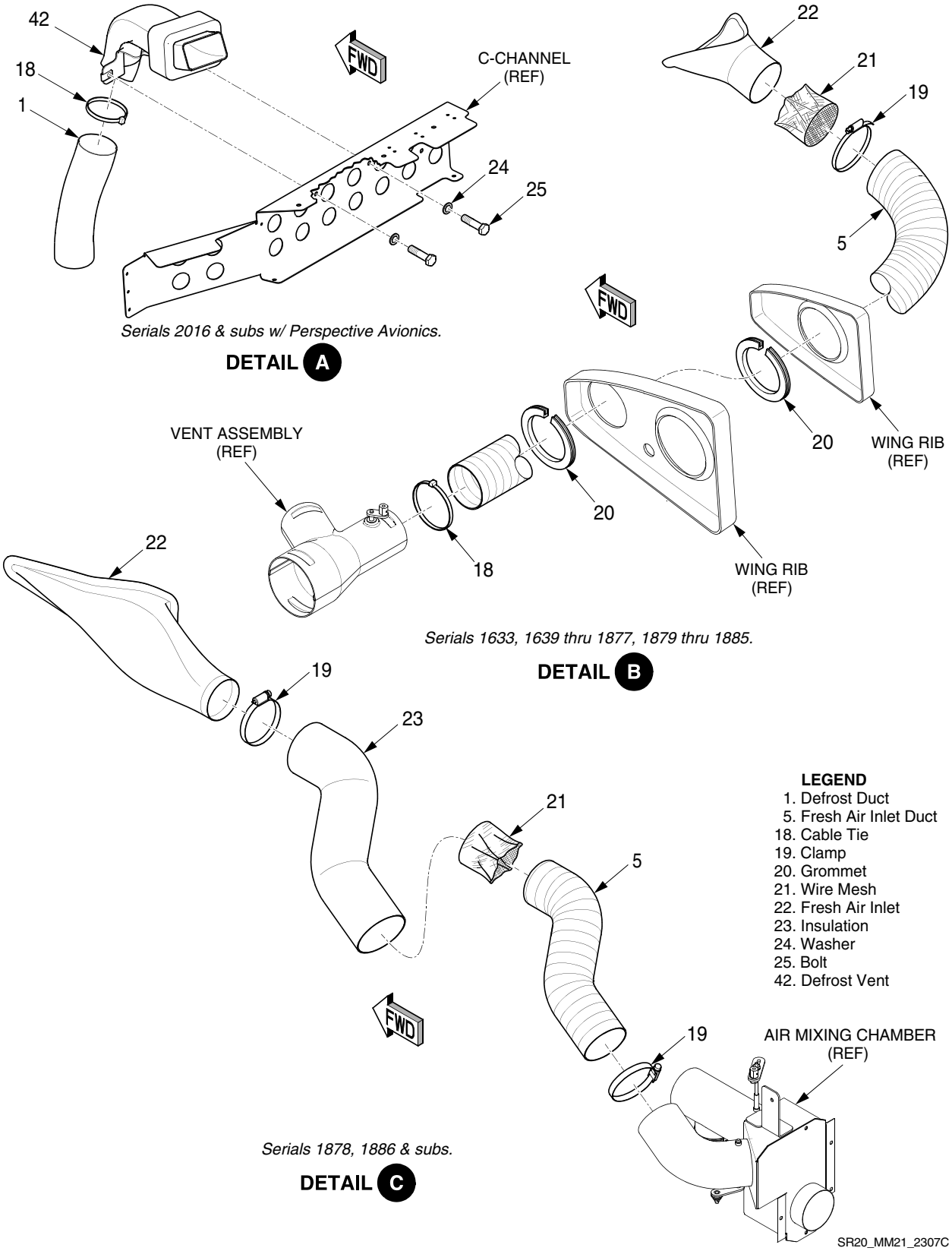
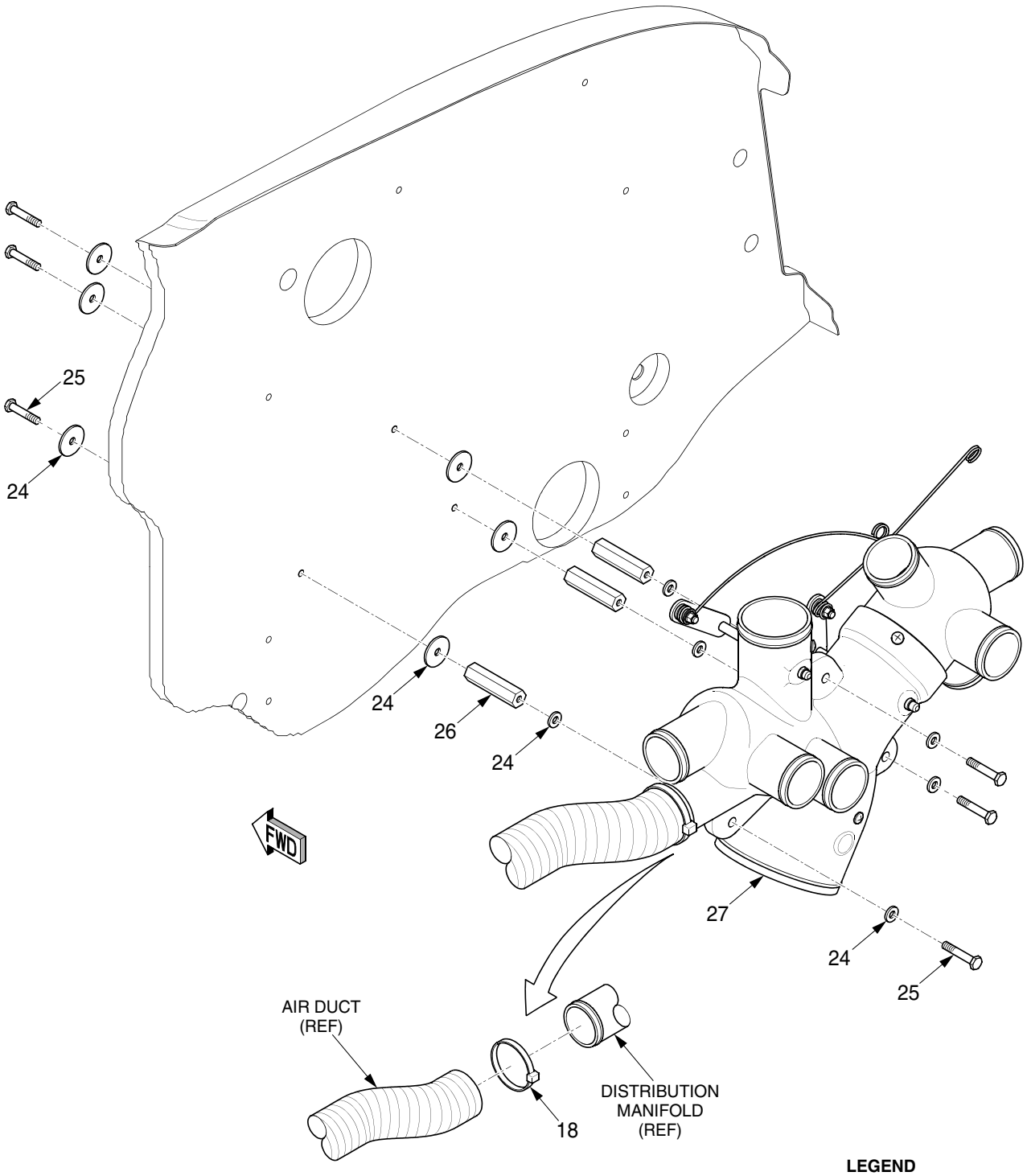


Figure 21-204
Cabin Air Distribution System: Fresh Air Inlet - Serials 1639 & subs (Sheet 3 of 10)

EFFECTIVITY:
Serials 1639 & subs



TYPICAL INSTALLATION

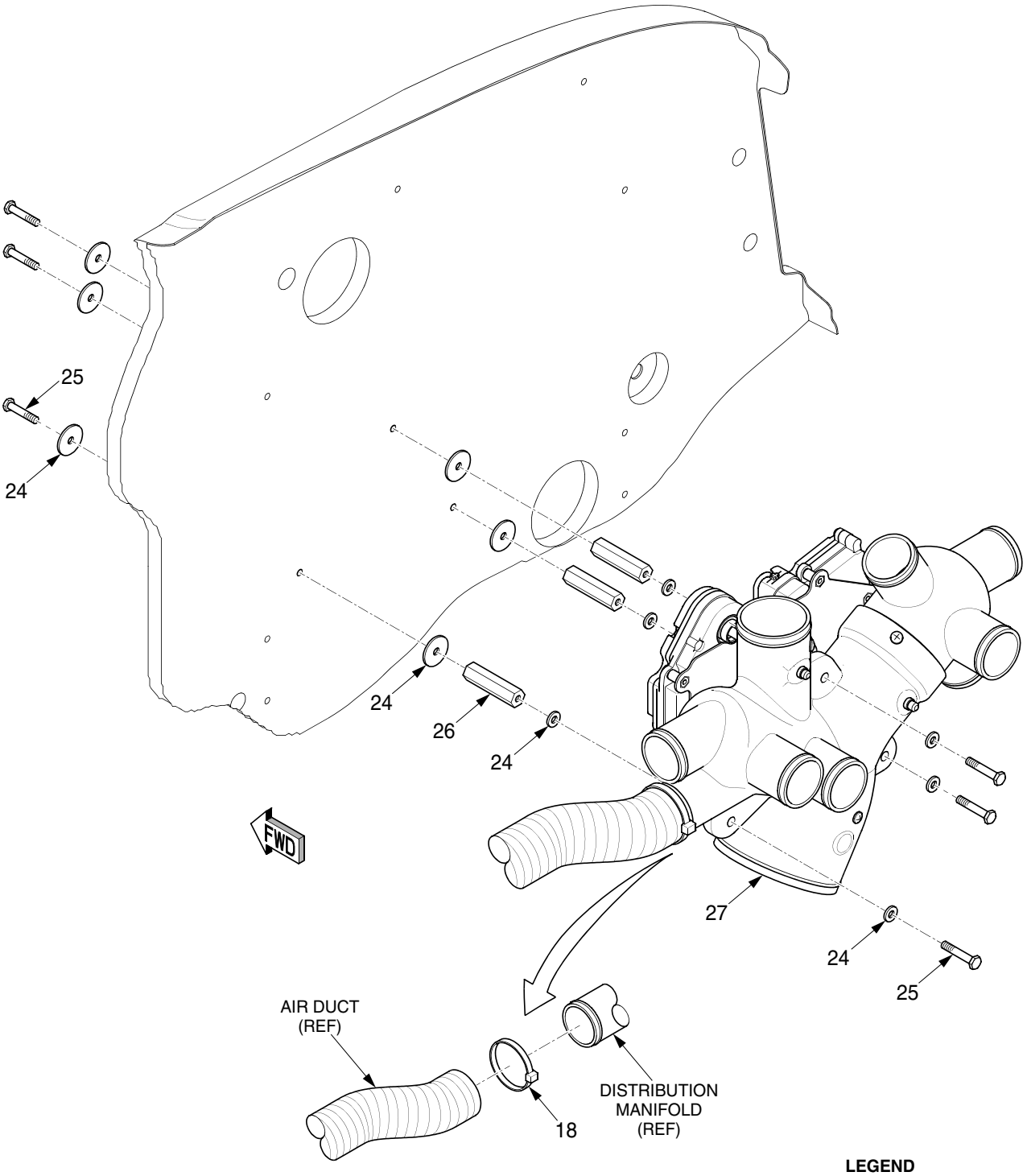
LEGEND
16. Cable Tie
24. Washer
25. Bolt
26. Standoff
27. Distribution Manifold

DETAIL D

Serials 1633, 1639 & subs w/o Perspective Avionics.

SR20_MM21_2309C

Figure 21-204
Cabin Air Distribution System: Distribution Manifold - Serials 1639 & subs w/o Perspective Avionics (Sheet 4 of 10)



TYPICAL INSTALLATION

LEGEND
18. Cable Tie
24. Washer
25. Bolt
26. Standoff
27. Distribution Manifold

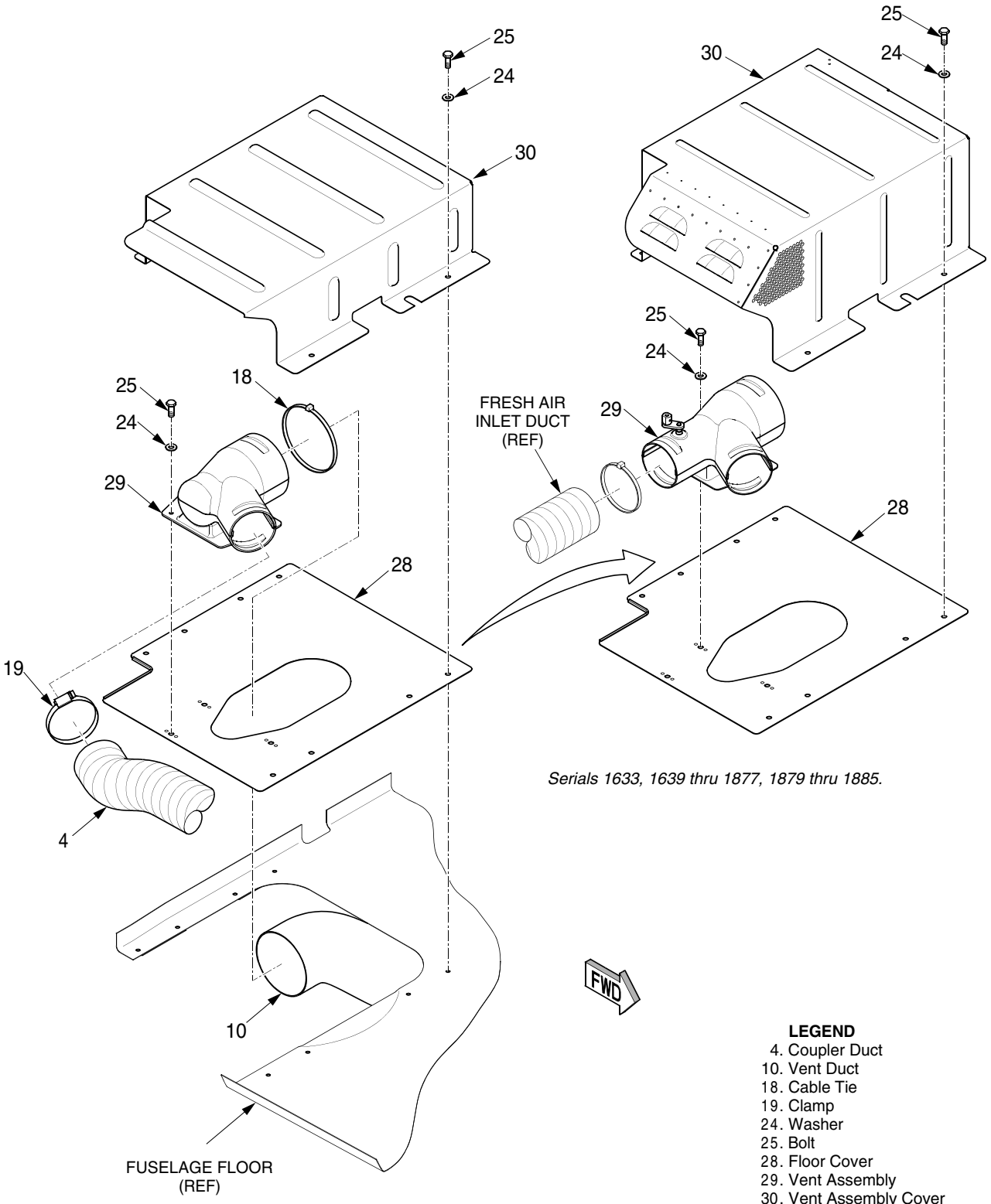
DETAIL E

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM21_2912A

Figure 21-204
Cabin Air Distribution System: Distribution Manifold - Serials 2016 & subs w/ Perspective Avionics (Sheet 5 of 10)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics



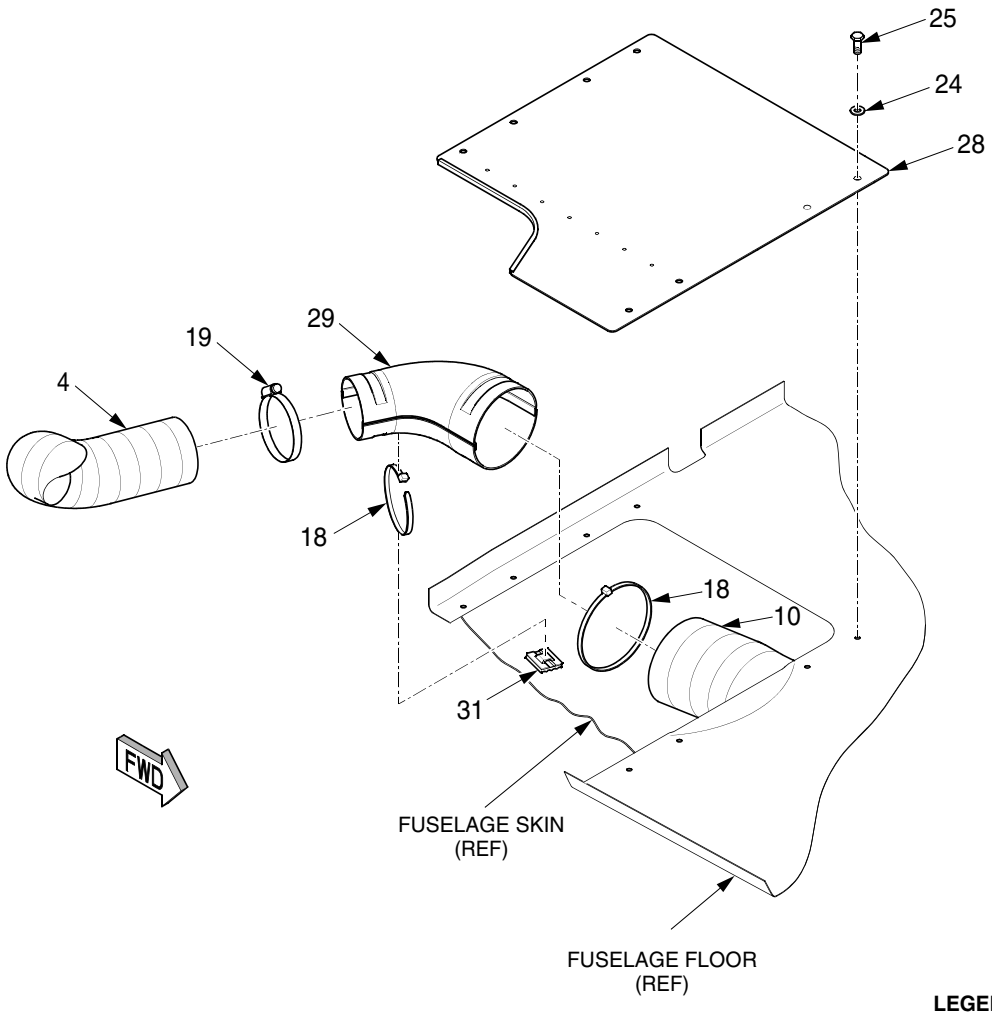
Serials 1633, 1639 thru 1877, 1879 thru 1885.

DETAIL F

Serials 1633, 1639 thru 2054 w/o Fan.

SR20_MM21_2640C

Figure 21-204
Cabin Air Distribution System: Vent Assembly - Serials 1639 thru 2054 w/o Fan (Sheet 6 of 10)



LEGEND
4. Coupler Duct
10. Vent Duct
18. Cable Tie
19. Clamp
24. Washer
25. Bolt
28. Floor Cover
29. Vent Assembly
31. Cable Tie Anchor

Serials 2055 & subs w/o Fan.

DETAIL G

SR20_MM21_3443A

Figure 21-204
Cabin Air Distribution System: Vent Assembly - Serials 2055 & subs w/o Fan (Sheet 7 of 10)

EFFECTIVITY:
Serials 2055 & subs w/o Fan

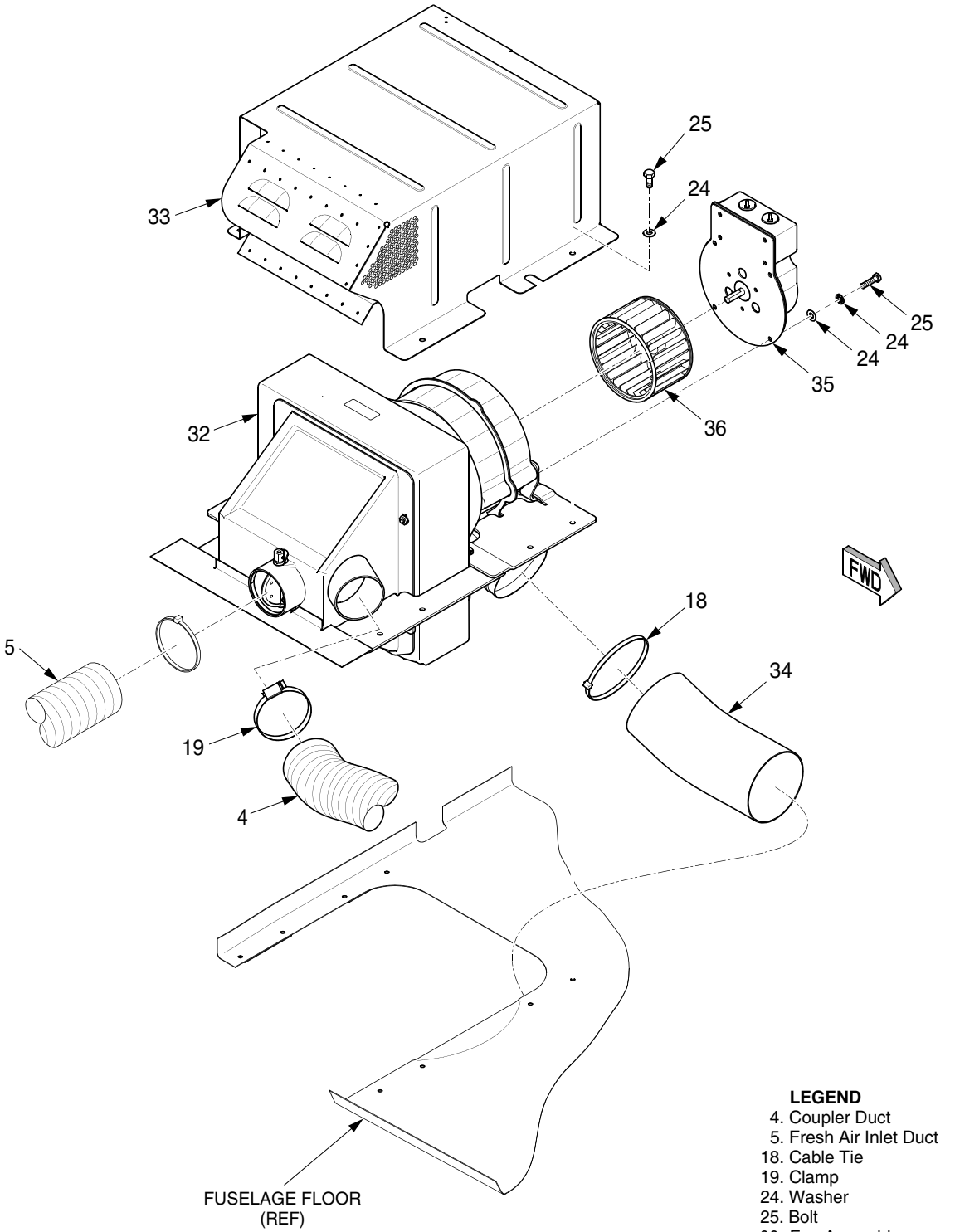


Figure 21-204
Cabin Air Distribution System: Fan Assembly - Serials 1639 thru 1885 w/ Fan (Sheet 8 of 10)

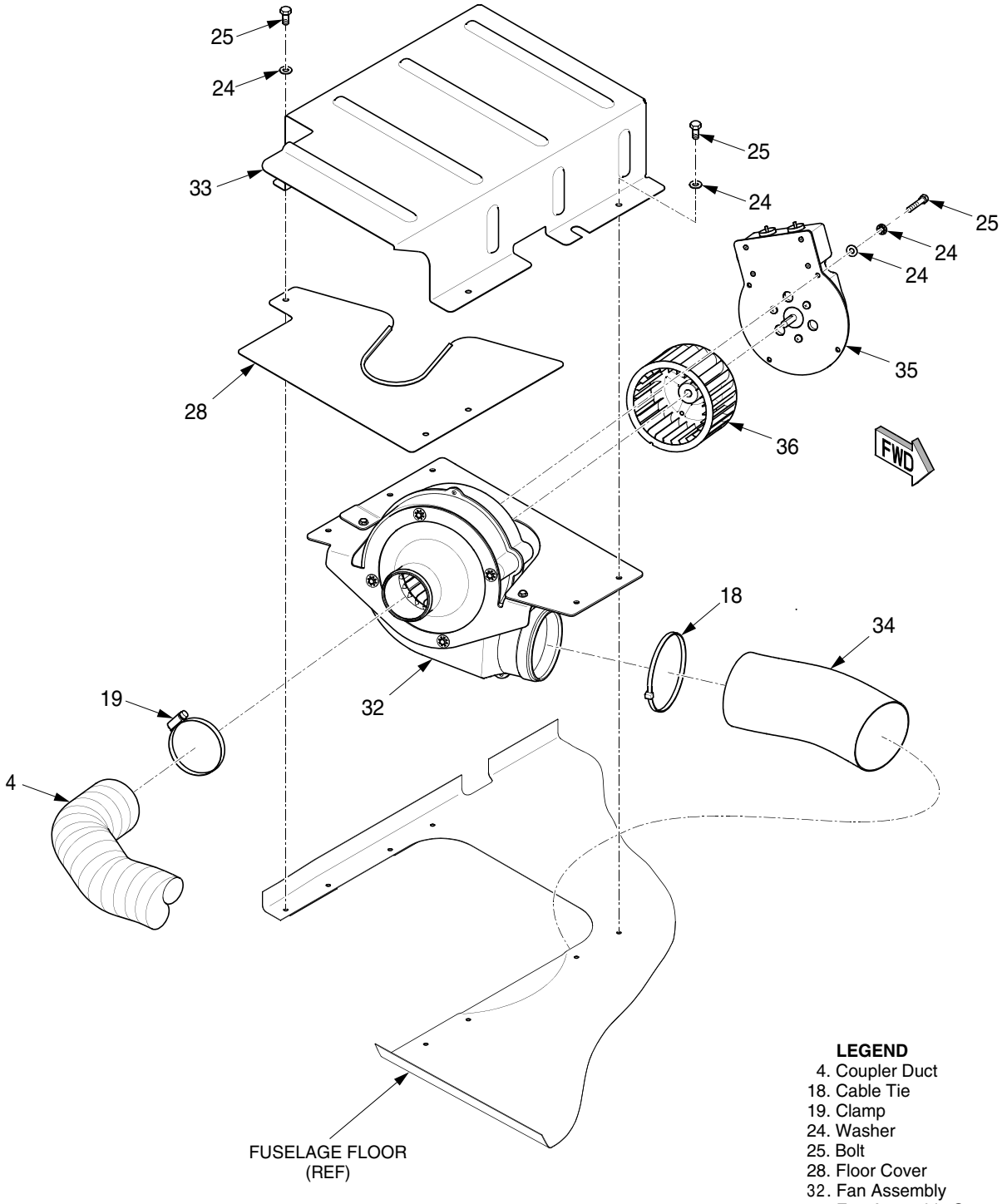


Figure 21-204
Cabin Air Distribution System: Fan Assembly - Serials 1886 & subs w/ Fan (Sheet 9 of 10)

EFFECTIVITY:
Serials 1886 & subs w/ Fan

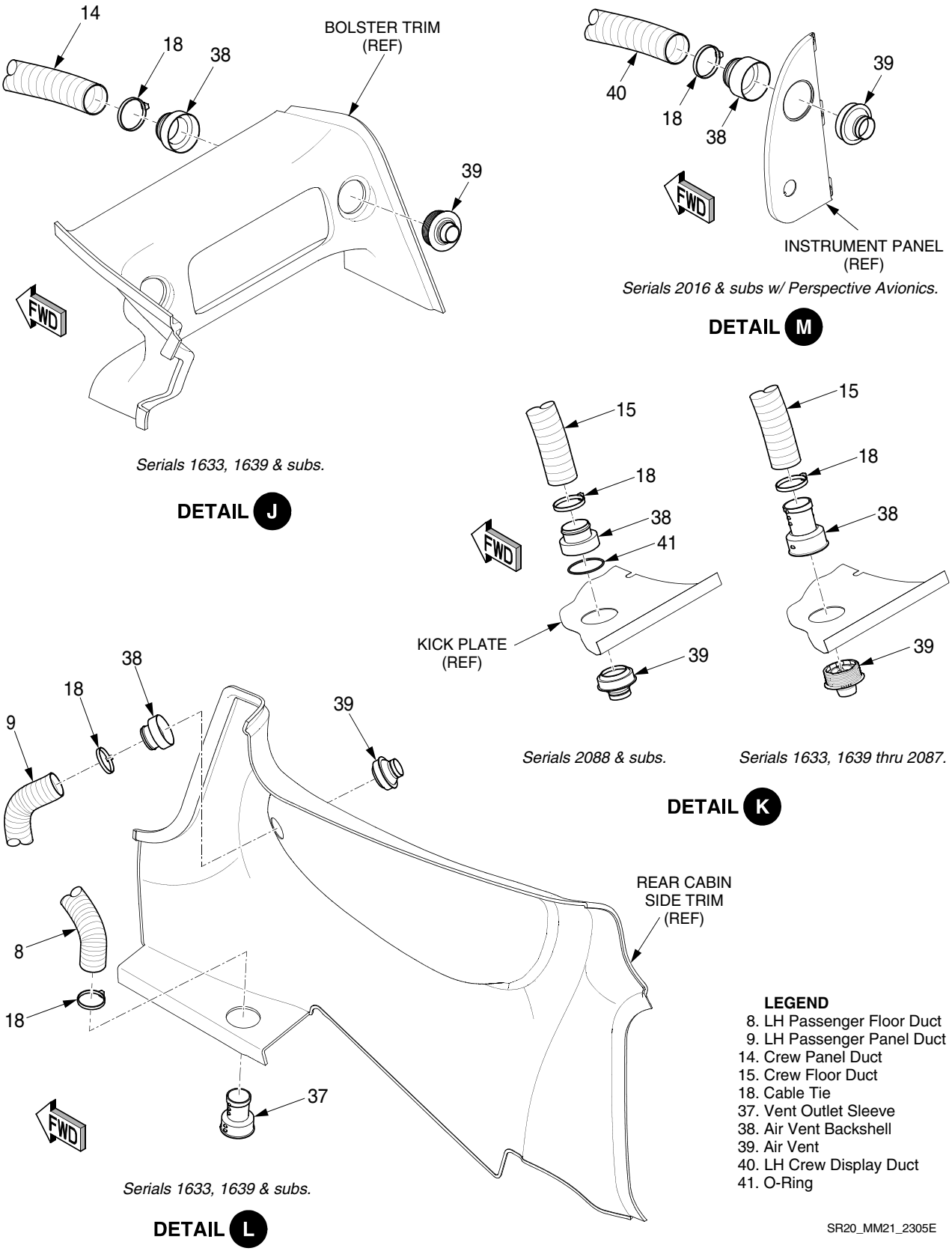


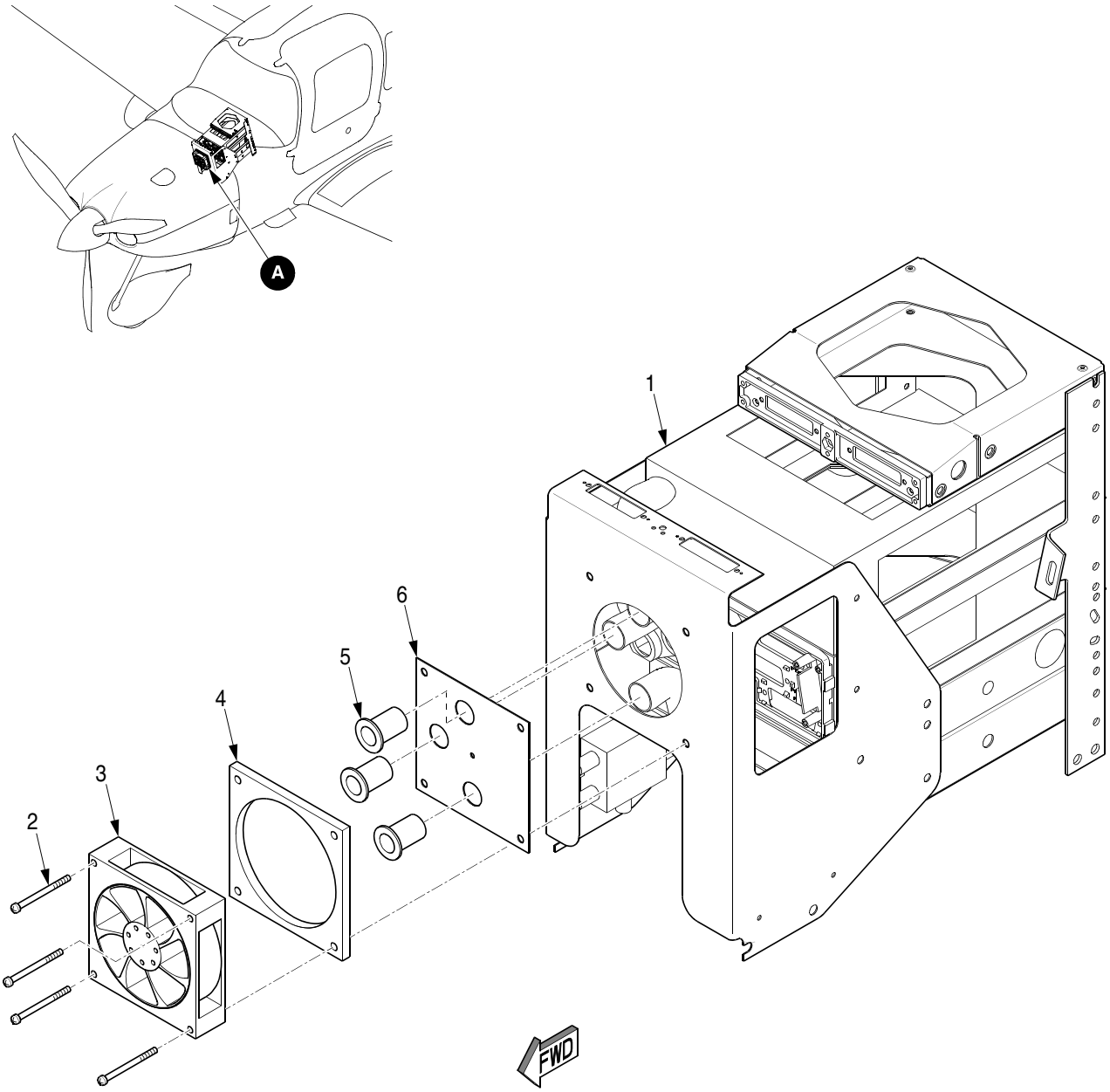
Figure 21-204
Cabin Air Distribution System: Panel Ducts - Serials 1639 & subs (Sheet 10 of 10)

AC. Cooling Fan - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 21-205)**

(1) Removal - Cooling Fan
  (a) Remove radio module assembly. (Refer to 25-10)
  (b) Remove screws securing cooling fan and spacer to radio module assembly.
  (c) Disconnect cooling hoses from fan plate bushings.
  (d) Remove fan plate and bushings from radio module assembly.

(2) Installation - Cooling Fan
  (a) Position fan plate to radio module assembly.
  (b) Insert bushings through installation holes in fan plate and radio module assembly.
  (c) Connect cooling hoses to fan plate bushings.
  (d) Position spacer and cooling fan to radio module assembly and secure with screws.
  (e) Install radio module assembly. (Refer to 25-10)

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics



LEGEND
1. Radio Module Assembly
2. Screw
3. Cooling Fan
4. Spacer
5. Bushing
6. Fan Plate

DETAIL A

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics.

SR20_MM21_2089

Figure 21-205
Cooling Fan Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

AD. Display Cooling Fan - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-206)**

(1) Removal - Display Cooling Fan
  (a) To gain access to LH fan, remove PFD. (Refer to 31-60)
  (b) To gain access to RH fan, remove MFD. (Refer to 31-60)
  (c) Remove screws and washers securing fan to RH support bracket.
  (d) Remove cable ties securing wire harness to clamp.
  (e) Disconnect electrical connector from fan.

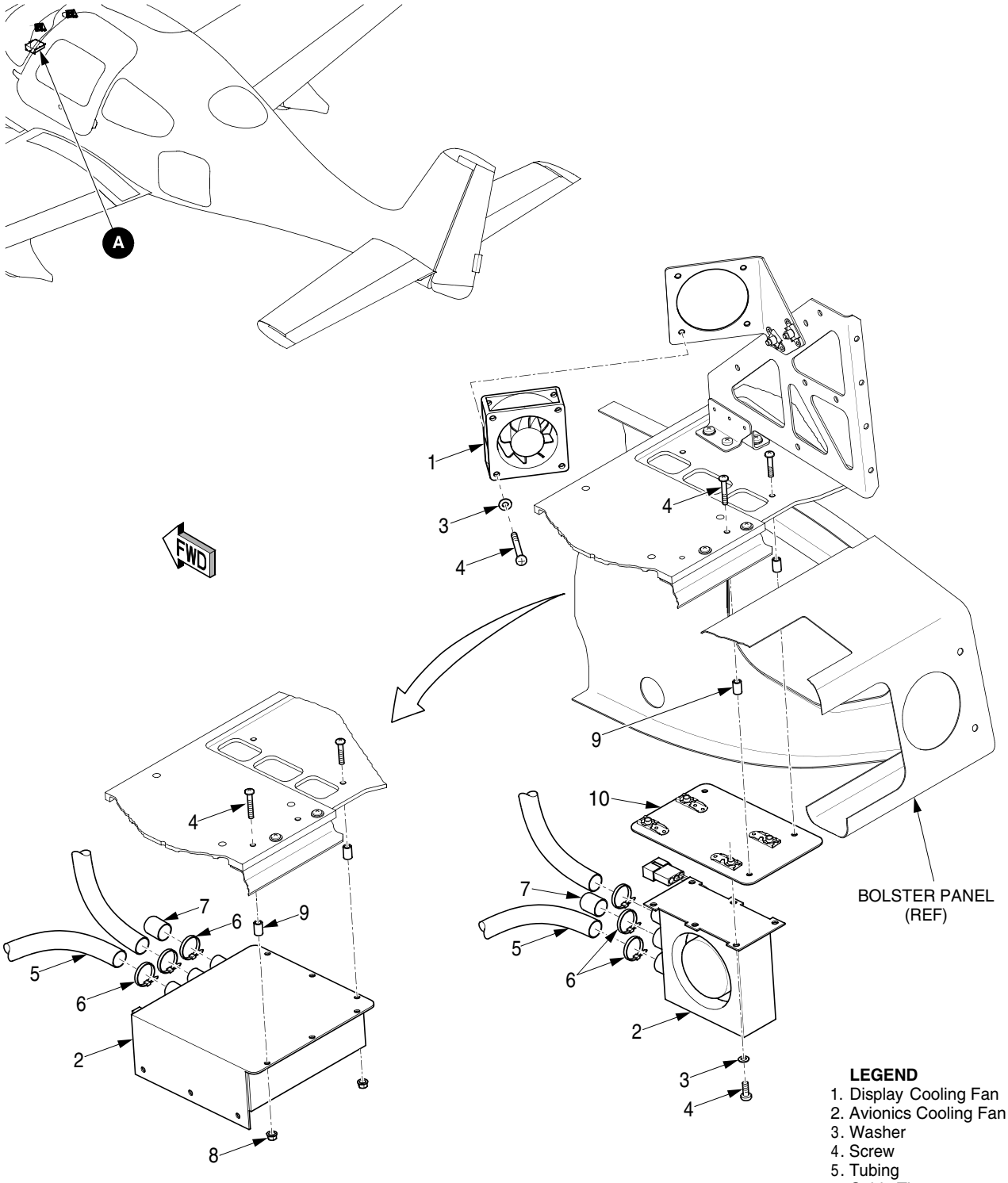
(2) Installation - Display Cooling Fan
  (a) Connect electrical connector to fan.
  (b) Position fan to RH support bracket and secure with screws and washers.
  (c) Route and secure wire harness to clamp with cable ties.
  (d) Perform Operational Test - Cooling Fan. (Refer to 21-20)
  (e) If removed, install PFD. (Refer to 31-60)
  (f) If removed, install MFD. (Refer to 31-60)

AE. Avionics Cooling Fan - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-206)**

(1) Removal - Avionics Cooling Fan
- (a) Remove PFD. (Refer to 31-60)
- (b) Remove LH kick plate. (Refer to 25-10)
- (c) Remove bolt, washer, and nut securing wire harness clamp to fan.
- (d) *Serials 2016 thru 2032:* Remove screws, spacers, and nuts securing fan to console assembly.
- (e) *Serials 2033 & subs:* Remove screws and washers securing fan to mounting plate.
- (f) Disconnect cooling hoses and electrical connector from fan.

(2) Installation - Avionics Cooling Fan
- (a) Connect cooling hoses and electrical connector to fan.
- (b) *Serials 2016 thru 2032:* Position fan to console assembly and secure with screws, spacers, and nuts.
- (c) *Serials 2033 & subs:* Position fan to console assembly and secure with screws and washers.
- (d) Install bolt, washer, and nut securing wire harness clamp to fan.
- (e) Perform Operational Test - Cooling Fan. (Refer to 21-20)
- (f) Remove LH kick plate. (Refer to 25-10)
- (g) Install PFD. (Refer to 31-60)

(3) Operational Test - Cooling Fan - *Serials 2016 & subs w/ Perspective Avionics*
- (a) Pull PFD and MFD circuit breakers.
- (b) Set AVIONICS switch to ON position.
- (c) Verify that fan is running by visual or audible inspection.
- (d) Set AVIONICS switch to OFF position.
- (e) Reset PFD and MFD circuit breakers.



Serials 2016 thru 2032.

DETAIL A

LEGEND

1. Display Cooling Fan
2. Avionics Cooling Fan
3. Washer
4. Screw
5. Tubing
6. Cable Tie
7. Cap
8. Nut
9. Spacer
10. Mounting Plate

SR20_MM21_2800A

Figure 21-206
Cooling Fan Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

HEATING

1. DESCRIPTION

The cabin air heating system is covered in this section.

- *Serials 1005 thru 1638:* Heated air is available at floor level for all occupants. Positive pressure inside the engine cowling causes airflow from the inlet at the rear engine baffle to the engine exhaust muffler. The airflow is then ducted to the hot air valve mounted to the forward RH side of the firewall. When the hot air valve damper is closed, the heated air exits into the engine compartment and is exhausted overboard with the engine cooling airflow. When the hot air valve damper is open, heated air flows from the hot air valve into the air mixing chamber. The heated air is conditioned in the air mixing chamber by mixing it with fresh air (if desired) from the fresh air inlet on the right wing. From the air mixing chamber, the conditioned air is ducted to either the defroster or passengers. Defroster outlet holes are located in the glareshield just aft of the windshield. Forward passenger conditioned air enters the cabin through outlets in the kick panel at each position. Conditioned air for rear passengers is ducted to outlets on the sidewalls near floor level.

  The amount of heated air allowed into the air mixing chamber is controlled by rotating the Cabin Heat Control, located inboard of the Cabin Air Selector. The control is mechanically linked to a damper in a hot air valve between the heat exchanger and air mixing chamber. Rotating the control full counterclockwise (HEAT OFF) bypasses heated air from the heat exchanger into the engine compartment. Rotating the control clockwise opens the door in the hot air valve allowing heated air to enter the mixing chamber. The proportion of heated air to ventilation air mixed in the air mixing chamber is regulated by manipulating the Cabin Heat Control and Cabin Cold Control to obtain the desired temperature and flow. The pilot and co-pilot control the conditioning (mixing) of the heated and fresh air.

- *Serials 1639 thru 1885:* Ram air from the upper RH cowl inlet flows through the upper cowl and is ducted to a heat exchanger surrounding the RH exhaust muffler. The heated air is routed to a hot air valve mounted to the forward side of the firewall. The hot air valve controls the entry of hot air into the cabin distribution system. When the hot air valve damper is open, the heated air flows into the air mixing chamber and is mixed with fresh air from the RH wing air inlet. When the hot air valve damper is closed, the heated air exits into the engine compartment and is exhausted overboard with the engine cooling airflow.

  Cabin heat is regulated by controlling the volume of hot air admitted into the distribution system's air mixing chamber. The proportion of heated air to fresh air is accomplished using the temperature selector mounted on the RH instrument panel. Conditioned air can be directed to passengers and/or the windshield diffuser by manipulating the cabin vent selector mounted on the RH instrument panel.

  The conditioned air enters the cabin through adjustable air vents located in each kick plate and through non-adjustable, floor level vents located in the rear cabin trim side panels. Conditioned air can also be distributed to the windshield diffuser in the glareshield.

- *Serials 1886 & subs:* Ram air from the upper RH cowl inlet flows through the upper cowl and is ducted to a heat exchanger surrounding the RH exhaust muffler. The heated air is then routed to the air mixing chamber mounted to the forward side of the firewall. In the air mixing chamber, the heated air is mixed with fresh air from the NACA vent on the RH lower cowl. The mixed air is then distributed by either ram air or by optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The distribution manifold uses butterfly valves to control airflow to the floor and defrost vents.

  Cabin heat is regulated by controlling the volume of hot air admitted into the distribution system's air mixing chamber. The proportion of heated air to fresh air is accomplished using the temperature selector mounted on the RH instrument panel. Conditioned air can be directed to passengers and/or the windshield diffuser by manipulating the cabin vent selector mounted on the RH instrument panel.

  The conditioned air enters the cabin through adjustable air vents located in each kick plate and through non-adjustable, floor level vents located in the rear cabin trim side panels. Conditioned air can also be distributed to the windshield diffuser in the glareshield.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Cabin heat inoperable.	Hot air valve duct disconnected or collapsed.	Connect or replace duct. (Refer to 21-40)
	Control linkage misaligned or disconnected.	Adjust and secure control linkage. (Refer to 21-60)
	Faulty hot air valve damper.	Replace hot air valve. (Refer to 21-40)
	Cabin floor duct disconnected or collapsed.	Connect or replace duct. (Refer to 21-20)
	Cabin floor vents closed, blocked, or faulty.	Open, remove restriction, or replace cabin floor vent. (Refer to 21-20)
Defroster system inoperable.	Control linkage misaligned or disconnected.	Adjust and secure control linkage. (Refer to 21-60)
	Defroster vent holes blocked.	Remove restriction.
	Hot air valve duct disconnected or collapsed.	Connect or replace duct. (Refer to 21-40)
Cabin occupants become disoriented, tired, or nauseated. Complaints of headaches.	Exhaust gases leaking into heater muffler.	Perform Adjustment/Test - Heat Exchanger. (Refer to 78-20)

3. MAINTENANCE PRACTICES

A. Hot Air Valve - *Serials 1005 thru 1638* (See Figure 21-401)

(1) Removal - Hot Air Valve

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove clamp securing duct to hot air valve.

(c) Disconnect hot air valve control cable from hot air valve.

(d) Remove screws and washers securing hot air valve to firewall.

(e) *Serials 1148 & subs:* Remove gasket from hot air valve.

(2) Installation - Hot Air Valve

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	8 inch	Any Source	Secure air duct.
High Temperature Silicone Sealant	RTV 736	Dow Corning Corporation Midland, MI 48686-0994 989-496-4400	Provide air-tight seal between cabin and engine compartment.

(b) Solvent clean hot air valve and firewall mating surfaces. (Refer to 20-30)

(c) Apply sealant to back side of hot air valve. (Refer to 20-10)

(d) Position gasket on back side of hot air valve.

(e) Apply sealant to back side of gasket.

(f) Position hot air valve to firewall and secure with screws and washers.

(g) Perform Adjustment/Test - Hot Air Valve Control Cable. (Refer to 21-60)

(h) Position duct to hot air valve and secure with clamp.

(i) Install engine cowling. (Refer to 71-10)

B. Hot Air Valve - *Serials 1639 thru 1885* **(See Figure 21-401)**

(1) Removal - Hot Air Valve

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flashlight	-	Any Source	Inspection.
Inspection Mirror	-	Any Source	Inspection.

(b) Remove engine cowling. (Refer to 71-10)

(c) Remove hose clamp securing duct to hot air valve.

(d) Set temperature control knob to maximum HOT position.

(e) At hot air valve, remove RTV sealant covering bolt heads.

(f) Remove bolts and washers securing hot air valve and gasket to firewall.

(g) Using inspection mirror and flashlight, observe orientation of linkage hook and flapper door eyelet.

(h) Rotate hot air valve 90° clockwise to disengage linkage hook from flapper door eyelet. Remove hot air valve.

(2) Installation - Hot Air Valve

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tongue Depressor	-	Any Source	Fixture.
Clamp	-	Any Source	Fixture.
6-inch Scale	-	Any Source	Measure.
Dow Corning Silicone Sealant	RTV 736	Any Source	Seal.

(b) To facilitate hot air valve installation, secure flapper door to closed position.

1 Rotate hot air valve flapper door to closed position.

2 Position tongue depressor into hot air valve firmly against closed flapper door.

3 Using clamp, secure tongue depressor to inner surface of hot air valve. Verify flapper door is secured to closed position.

(c) Position gasket to hot air valve. Orient hot air valve 90° clockwise to installation location.

(d) Latch linkage hook to flapper door eyelet on hot air valve.

(e) Rotate hot air valve 90° counter-clockwise to engage hook into eyelet.

(f) Remove clamp securing tongue depressor to hot air valve.

(g) At coupler, apply silicone sealant around inner circumference of firewall pass-through. (Refer to 20-10)

(h) Position hot air valve and new gasket to firewall and secure with bolts and washers.

(i) Position duct to hot air valve and secure with clamp.

(j) To secure attaching hardware, apply silicone sealant to bolt heads following installation.

(k) Install engine cowling. (Refer to 71-10)

C. Air Mixing Chamber - *Serials 1886 & subs* **(See Figure 21-402)**

(1) Removal - Air Mixing Chamber

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flashlight	-	Any Source	Inspection.
Inspection Mirror	-	Any Source	Inspection.

(b) Remove engine cowling. (Refer to 71-10)

(c) Remove clamp securing fresh air duct to air mixing chamber.

(d) Remove clamp securing heat exchanger duct to air mixing chamber.

(e) Remove bolt and wire stop securing temperature control cable to actuation arm on air mixing chamber.

(f) Remove bolt, washers, and nut securing temperature control cable and clamp to bracket on air mixing chamber.

(g) Set temperature control knob to maximum HOT position.

(h) At air mixing chamber, remove RTV sealant covering bolt heads.

(i) Remove bolts and washers securing air mixing chamber and gasket to firewall.

(j) Using inspection mirror and flashlight, observe orientation of linkage hook and flapper door eyelet.

(k) Rotate air mixing chamber 90° clockwise to disengage linkage hook from flapper door eyelet. Remove air mixing chamber from airplane.

(2) Installation - Air Mixing Chamber

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tongue Depressor	-	Any Source	Fixture.
Clamp	-	Any Source	Fixture.
6-inch Scale	-	Any Source	Measure.
Dow Corning Silicone Sealant	RTV 736	Any Source	Seal.

(b) To facilitate air mixing chamber installation, secure flapper door to closed position.

1 Rotate hot air valve flapper door to closed position.

2 Position tongue depressor into hot air valve firmly against closed flapper door.

3 Using clamp, secure tongue depressor to inner surface of air mixing chamber. Verify flapper door is secured to closed position.

(c) Position gasket to air mixing chamber. Orient air mixing chamber 90° clockwise to installation location.

(d) Latch linkage hook to flapper door eyelet on air mixing chamber.

(e) Rotate air mixing chamber 90° counter-clockwise to engage hook into eyelet.

(f) Remove clamp securing tongue depressor to hot air valve.

(g) At coupler, apply silicone sealant around inner circumference of firewall pass-through. (Refer to 20-10)

(h) Position air mixing chamber and new gasket to firewall and secure with bolts and washers.

(i) Position temperature control cable and clamp to bracket on air mixing chamber and secure with bolt, washers, and nut.

(j) Position temperature control cable and wire stop to actuation arm on air mixing chamber and secure with bolt.

(k) Position fresh air duct to air mixing chamber and secure with clamp.

(l) Position heat exchanger duct to air mixing chamber and secure with clamp.

(m) To secure attaching hardware, apply silicone sealant to bolt heads following installation.

(n) Install engine cowling. (Refer to 71-10)

D. Cabin Air Coupler - *Serials 1639 thru 1885* (See Figure 21-401)

(1) Removal - Cabin Air Coupler

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove RH kick plate. (Refer to 25-10)

(c) Remove clamp securing duct to coupler.

(d) Remove nut, washers, and spacer securing hot air valve linkage to coupler.

(e) Remove nut, washers, and spacer securing vent, fan, or evaporator linkage to coupler.

(f) Remove nut, washers, and spacer securing distribution manifold linkage to coupler actuation arm.

(g) Remove bolt, washer, and clamp securing distribution manifold linkage to coupler mounting plate.

(h) Remove bolts and washers securing coupler and gasket to firewall.

(2) Installation - Cabin Air Coupler

(a) Position coupler and new gasket to firewall and secure with bolts and washers.

(b) Position distribution manifold linkage to coupler actuation arm and secure with spacer, washers, and nut.

(c) Position distribution manifold linkage to coupler mounting plate and secure with bolt, washer, and clamp.

(d) Position vent, fan, or evaporator linkage to coupler and secure with spacer, washers, and nut.

(e) Position hot air valve linkage to coupler and secure with spacer, washers, and nut.

(f) Position duct to coupler and secure with clamp.

(g) Install RH kick plate. (Refer to 25-10)

(h) Install engine cowling. (Refer to 71-10)

E. Cabin Air Coupler - *Serials 1886 & subs* **(See Figure 21-402)**

(1) Removal - Cabin Air Coupler

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(c) Remove engine cowling. (Refer to 71-10)

(d) Remove RH kick plate. (Refer to 25-10)

(e) Disconnect coupler drive assembly electrical connectors.

(f) Remove clamp securing duct to coupler.

(g) Remove nut, washers, and spacer securing air mixing chamber linkage to coupler.

(h) Remove bolts and washers securing coupler and gasket to firewall. Remove coupler from airplane.

(2) Installation - Cabin Air Coupler

(a) Position coupler and new gasket to firewall and secure with bolts and washers.

(b) Position air mixing chamber linkage to coupler and secure with spacer, washers, and nut.

(c) Position duct to coupler and secure with clamp.

(d) Connect coupler drive assembly electrical connectors.

(e) Install RH kick plate. (Refer to 25-10)

(f) Install engine cowling. (Refer to 71-10)

(g) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

F. Baffle Duct - *Serials 1639 & subs* (See Figure 21-401)

(1) Removal - Baffle Duct

(a) Remove lower engine cowling. (Refer to 71-10)

(b) Remove bolt, washers, nut, and clamp securing duct to engine mount.

(c) Remove clamp securing duct to engine baffling.

(d) Remove clamp securing duct to heat exchanger. Remove duct from airplane.

(2) Installation - Baffle Duct

(a) Position duct to heat exchanger and secure with clamp.

(b) Position duct to engine baffling and secure with clamp.

(c) Position duct to engine mount and secure with clamp, bolt, washers, and nut.

(d) Install lower engine cowling. (Refer to 71-10)

G. Hot Air Valve Duct - *Serials 1639 thru 1885* (See Figure 21-401)

(1) Removal - Hot Air Valve Duct

(a) Remove lower engine cowling. (Refer to 71-10)

(b) Remove clamp securing duct to heat exchanger.

(c) Remove clamp securing duct to hot air valve. Remove duct from airplane.

(2) Installation - Hot Air Valve Duct

(a) Position duct to hot air valve and secure with clamp.

(b) Position duct to heat exchanger and secure with clamp.

(c) Install lower engine cowling. (Refer to 71-10)

H. Air Mixing Chamber Duct - *Serials 1886 & subs* **(See Figure 21-402)**

(1) Removal - Air Mixing Chamber Duct

(a) Remove lower engine cowling. (Refer to 71-10)

(b) Remove clamp securing duct to heat exchanger.

(c) Remove clamp securing duct to air mixing chamber. Remove duct from airplane.

(2) Installation - Air Mixing Chamber Duct

(a) Position duct to air mixing chamber and secure with clamp.

(b) Position duct to heat exchanger and secure with clamp.

(c) Install lower engine cowling. (Refer to 71-10)

I. Cabin Air Coupler Duct - *Serials 1639 & subs* (See Figure 21-401)

(1) Removal - Cabin Air Coupler Duct

(a) Remove RH kick plate. (Refer to 25-10)

(b) Remove sidewall air duct trim. (Refer to 25-10)

(c) Remove clamp securing duct to coupler.

(d) *Serials 1639 & subs w/o Fan:* Remove clamp securing duct to vent assembly.

(e) *Serials 1639 & subs w/ Fan:* Remove clamp securing duct to fan assembly.

(f) *Serials 2065 & subs w/ Air Conditioning:* Remove clamp securing duct to evaporator.

(g) Remove cable ties securing duct to fuselage. Remove duct from airplane.

(2) Installation - Cabin Air Coupler Duct

(a) Position duct to vent assembly and secure with clamp.

(b) *Serials 1639 & subs w/o Fan:* Position duct to vent assembly and secure with clamp.

(c) *Serials 1639 & subs w/ Fan:* Position duct to fan assembly and secure with clamp.

(d) *Serials 2065 & subs w/ Air Conditioning:* Position duct to evaporator and secure with clamp.

(e) Position duct to coupler and secure with clamp.

(f) Position duct to fuselage and secure with cable ties.

(g) Install sidewall air duct trim. (Refer to 25-10)

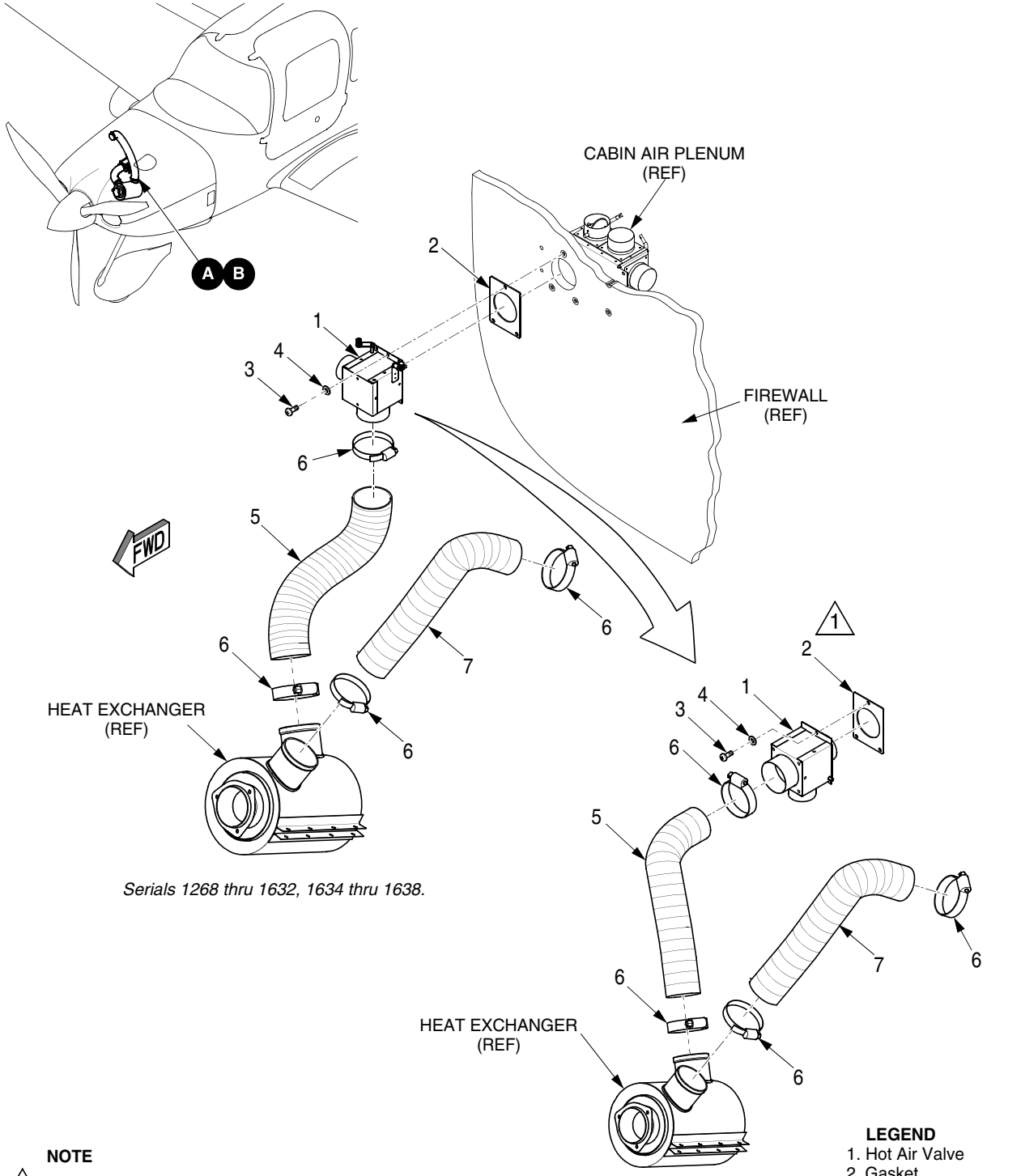
(h) Install RH kick plate. (Refer to 25-10)

J. Defrost Diffuser

The defrost diffuser is integral to the lower windshield trim assembly. For maintenance practices pertinent to the lower windshield trim assembly, see Chapter 25, Cabin. (Refer to 25-10)

K. Heat Exchanger

For maintenance practices pertinent to the heat exchanger, see Chapter 78, Noise Suppressor. (Refer to 78-20)



Serials 1268 thru 1632, 1634 thru 1638.

Serials 1005 thru 1267.

NOTE

1 *Serials 1005 thru 1147:* Gasket not installed on these airplanes.

LEGEND

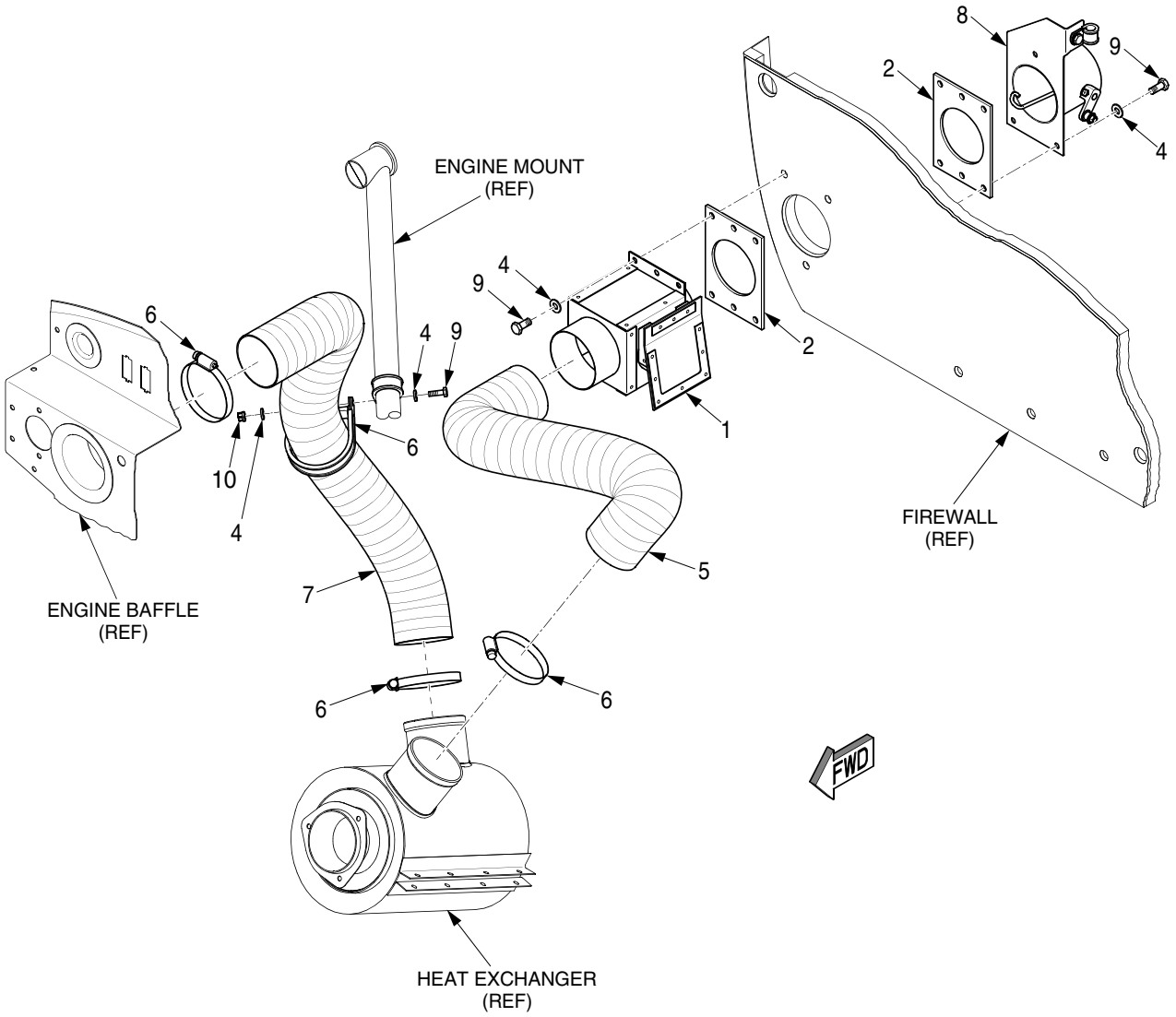
1. Hot Air Valve
2. Gasket
3. Screw
4. Washer
5. Hot Air Valve Duct
6. Clamp
7. Baffle Duct

DETAIL A

Serials 1005 thru 1638.

SR20_MM21_1135D

Figure 21-401
Hot Air Valve Installation - Serials 1005 thru 1638 (Sheet 1 of 2)



LEGEND

1. Hot Air Valve
2. Gasket
4. Washer
5. Hot Air Valve Duct
6. Clamp
7. Baffle Duct
8. Cabin Air Coupler
9. Bolt
10. Nut

DETAIL B

Serials 1633, 1639 thru 1877, 1879 thru 1885.

SR20_MM21_2321B

Figure 21-401
Hot Air Valve Installation - Serials 1639 thru 1885 (Sheet 2 of 2)

EFFECTIVITY:
Serials 1639 thru 1885

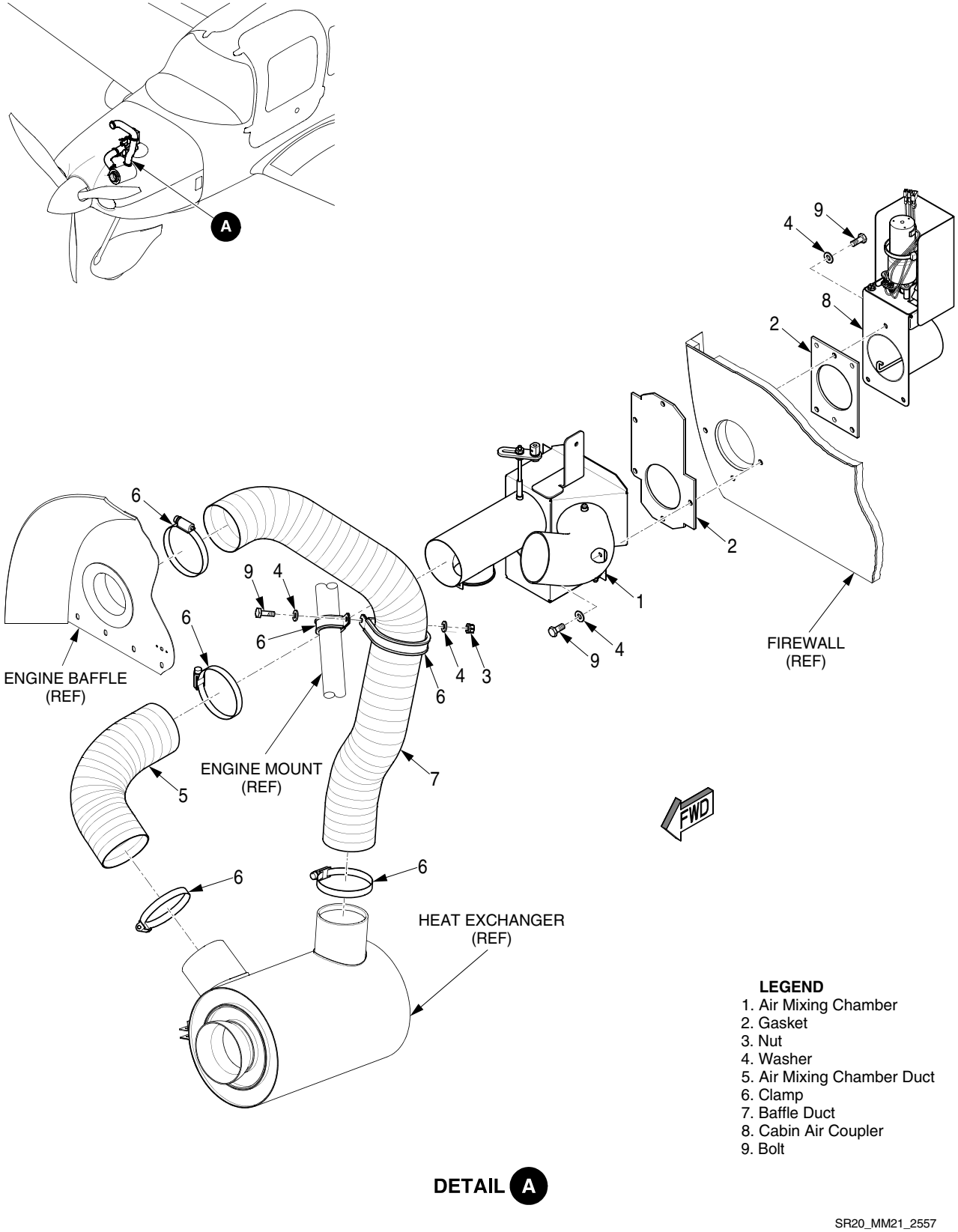


Figure 21-402
Air Mixing Chamber Installation - Serials 1886 & subs

EFFECTIVITY:
Serials 1886 & subs

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COOLING

1. DESCRIPTION

On aircraft Serials 2065 and subsequent w/ Perspective Avionics, an optional air-conditioning system is available. This section covers those systems and components used to supply cooled air. Includes items such the cooling unit, indicating systems related to cooler operation, and wiring.

Cabin ventilation and cooling is provided by ram air admitted through the NACA vent on the RH lower cowl and/or a vapor cycle air-conditioning system. The aircraft engine must be running for the air-conditioning system to operate.

The air conditioning system consists of an engine driven compressor, condenser assembly with integral blower fan and receiver-dryer, evaporator assembly with integral expansion valve assembly, and all associated plumbing and control mechanisms.

The air-conditioning system uses refrigerant R134A. The refrigerant enters the engine mounted compressor as a vapor. The compressor pressurizes the heat-laden vapor until the pressure and heat reach a point much hotter than the outside air. The compressor then pumps the vapor to a condenser mounted under the baggage compartment floor, where the vapor cools and changes to a liquid. The liquid then passes to the receiver-dryer. The receiver-dryer's function is to filter, remove any moisture, and ensure a steady flow of liquid refrigerant into an expansion valve and evaporator mounted under the RH crew seat. The expansion valve is a temperature controlled metering valve which regulates the flow of liquid refrigerant to the evaporator. Inside the evaporator, the liquid refrigerant changes state to a gas and, in doing so, absorbs heat. The evaporator then absorbs the heat from the air passing over the coils. Moisture from the air condenses in the evaporator and is drained overboard through the belly of the aircraft. From the evaporator, the refrigerant vapor returns to the compressor where the cycle is repeated.

During normal air condition operation, ram air from the fresh air intake flows into the evaporator assembly. The air is cooled as it passes through the evaporator coils, and is then ducted forward to the distribution manifold. Conditioned air is circulated through the system by ram air or a by blower fan adjacent to the evaporator.

During maximum air conditioning operation, the fresh air intake valve closes and valves in the evaporator assembly open allowing cabin air to be recirculated and further cooled as the air passes through the evaporator coils and ducted forward to the distribution manifold. Conditioned air is circulated through the system by ram air or by a blower fan adjacent to the evaporator.

28 VDC for air conditioning system operation is supplied through the 15-amp CONDENSER breaker on A/C Bus 1, the 15-amp FAN breaker on A/C Bus 2, and the 7.5-amp COMPRESSOR/CONTROL breaker on A/C Bus 2.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Insufficient cooling.	Refrigerant low or leaking.	Perform Inspection/Check - System Plumbing Refrigerant Leak Test. Repair leak as necessary. (Refer to 21-50)
	Air in system.	Perform Air Conditioning System Flushing. (Refer to 21-50)
	Faulty condenser.	Inspect condenser for dirty and/or bent fins. (Refer to 21-50)
	Blocked high pressure line.	Remove restriction.
	Plugged receiver/dryer.	Replace condenser. (Refer to 21-50)
	Faulty compressor.	Replace compressor. (Refer to 21-50)
	Excessive oil in system.	Perform Air Conditioning System Flushing. (Refer to 21-50)
Moisture in system.	Excessive moisture in receiver/dryer.	Replace condenser. (Refer to 21-50)
	Ice buildup in expansion valve.	Perform Air Conditioning System Flushing. (Refer to 21-50)
	Refrigerant flow restricted.	Remove restriction.
Water blown out of evaporator.	Blocked evaporator drain.	Remove restriction in drain line.
No cooling.	Faulty evaporator expansion valve.	Replace evaporator. (Refer to 21-50)
Sweating or frosted suction line.	Faulty evaporator expansion valve.	Replace evaporator. (Refer to 21-50)
Sweating or frosted expansion valve outlet.	Faulty evaporator expansion valve.	Replace evaporator. (Refer to 21-50)
Conditioned air feels warm.	Hot air valve not sealing tight in HEAT OFF position.	Adjust or connect control linkage. (Refer to 21-60) Replace hot air valve. (Refer to 21-40)

Note: During extended use, the air conditioning system may cycle on and off to prevent components from freezing up. This cyclic behavior is considered normal and is not indicative of a problem.

3. MAINTENANCE PRACTICES

A. Compressor (See Figure 21-501)

(1) Servicing - Compressor

If compressor has been disconnected and exposed to air for an extended period of time, or an unapproved oil has been added to compressor, perform the following procedure to flush and lubricate the compressor.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Flush compressor.
Vacuum Pump	-	Any Source	Flush compressor.
Compressor Oil	(See Figure 12-101)	Any Source	Replenish compressor oil.

(b) Remove compressor. (Refer to 21-50)
(c) Remove caps from high and low pressure fittings on compressor.
(d) Remove drain plug from compressor.
(e) Rotate compressor shaft several times and tilt compressor to drain oil.
(f) Pour isopropyl alcohol into high pressure, low pressure, and drain ports.
(g) Slosh, tilt, and rotate compressor shaft while alcohol drains out.
(h) Repeat previous steps until alcohol runs out clear.
(i) Using dry nitrogen or dry air, blow out ports to evaporate remaining alcohol.
(j) Install compressor drain plug.
(k) Connect vacuum pump to high and low pressure fittings on compressor.
(l) Operate pump for 30 minutes to evacuate compressor.
(m) Remove vacuum pump.

CAUTION: Polyolester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(n) Replenish compressor with approved oil. (See Figure 12-101)
(o) Install caps to high and low pressure fittings on compressor.
(p) Install compressor. (Refer to 21-50)

(2) Removal - Compressor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(b) Pull COMPRESSOR/CONTROL circuit breaker.
(c) Discharge air conditioning system. (Refer to 12-10)
(d) Remove engine cowling. (Refer to 71-10)
(e) Remove compressor assembly guard shield. (Refer to 21-50)

CAUTION: Before disconnecting plumbing, ensure vacuum in system is minimal or the O-rings could be pulled into the system.

(f) Disconnect compressor hoses from firewall. Discard O-rings.
(g) Cap fittings and hoses.
(h) Remove clamps securing hoses to engine mount.
(i) Disconnect resistor wire from wire harness.

(j) Remove bolt, washer, and clamp securing resistor wire to aft engine baffle.

(k) Remove screws, washers, and nuts securing resistor to aft engine baffle.

(l) Remove bolt, spacer, clamp, washer, and nut securing alternate air cable to compressor.

(m) Adjust turnbuckle to reduce belt tension and remove drive belt from drive unit pulley and compressor clutch pulley.

(n) Remove bolt, washer, and nut securing compressor link to drive unit.

(o) Remove bolt, washers, and spacers securing compressor to drive unit. Remove compressor assembly from airplane.

Note: At upper attachment of aft lifting ring, retain spacer installed between aft lifting ring and starter drive adapter.

(p) To remove pulley from drive unit:

1 Remove bolt and washer securing pulley to drive unit.

CAUTION: Bolt is left-hand threaded.

(q) To remove link plate from drive unit:

1 Remove bolt, clamp, washer, and nut securing throttle cable to bracket.

2 Remove nuts, lock washers, and washers securing link plate, gasket, and bracket to drive unit.

(r) To remove mounting plate from drive unit:

1 Remove nuts and washers securing mounting plate to drive unit.

(3) Disassembly - Compressor (See Figure 21-502)

(a) Remove bolt, washers, and nut securing turnbuckle and link to compressor weldment arm.

(b) Remove bolt, washer, and nut securing weldment arm to compressor.

(c) Perform Inspection/Check - Compressor. (Refer to 21-50)

(4) Assembly - Compressor (See Figure 21-502)

(a) Position weldment arm to compressor and secure with bolt, washers, and nut.

(b) Position turnbuckle and link to compressor weldment arm and secure with bolt, washers, and nut.

(5) Installation - Compressor

CAUTION: If replacement compressor uses a different oil type than the previously installed compressor, the entire air conditioning system must be flushed. (Refer to 21-50)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressor Oil	(See Figure 12-101)	Any Source	Lubricate O-rings.

(b) To install mounting plate to drive unit:

1 Position mounting plate to drive unit and secure with nuts and washers. Torque nuts to 90 - 110 in-lb (10.2 - 12.4 Nm).

(c) To install link plate to drive unit:

1 Position gasket, link plate, and bracket to drive unit and secure with nuts, lock washers, and washers. Torque nuts to 90 - 110 in-lb (10.2 - 12.4 Nm).

2 Position throttle cable to bracket and secure with bolt, clamp, washer, and nut.

(d) To install pulley to drive unit:

1 Position pulley to drive unit and secure with bolt and washer. Torque bolt to 600 - 650 in-lb (67.8 - 73.4 Nm).

CAUTION: Bolt is left-hand threaded.

(e) Position compressor assembly to drive unit and secure with bolt, washers, and spacers.

Note: At upper attachment of aft lifting ring, ensure spacer is installed to provide spacing between aft lifting ring and starter drive adapter.

(f) Position compressor link to drive unit and secure with bolt, washer, and nut.
(g) Install drive belt between drive unit pulley and compressor clutch pulley.
(h) Perform Adjustment/Test - Compressor Drive Belt Tensioning. (Refer to 21-50)
(i) At bolt securing compressor assembly to drive unit, torque bolt to 155 - 175 in-lb (17.5 - 19.7 Nm).
(j) Safety wire bolt. (Refer to 20-50)
(k) Position alternate air cable to compressor and secure with bolt, spacer, clamp, washer, and nut.
(l) Position resistor to aft engine baffle and secure with screws, washers, and nuts.
(m) Connect resistor wire to wire harness.
(n) Position resistor wire to aft engine baffle and secure with bolt, washer, and clamp.
(o) Remove caps from fittings and hoses.

CAUTION: Polyolester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(p) Lubricate new O-rings with compressor oil.

CAUTION: When lubricating O-rings, use extreme care to keep oil away from fitting threads.

(q) Connect 5/8 inch (19 mm) compressor hose to firewall. Torque hose and fittings to 250 - 350 in-lb (28.2 - 39.5 Nm).
(r) Connect 1/2 inch (16 mm) compressor hose to firewall. Torque hose and fittings to 180 - 240 in-lb (20.3 - 27.1 Nm).
(s) Install clamps securing hoses to engine mount.
(t) Charge air conditioning system. (Refer to 12-10)
(u) Perform Inspection/Check - System Plumbing Refrigerant Leak Test. (Refer to 21-50)
(v) Install compressor assembly guard shield. (Refer to 21-50)
(w) Install engine cowling. (Refer to 71-10)
(x) Reset COMPRESSOR/CONTROL circuit breaker.
(y) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

(6) Inspection/Check - Compressor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Corrosion Inhibitor (aerosol)	MIL-C-81309 Type II or III	Any Source	Prevent corrosion.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull COMPRESSOR/CONTROL circuit breaker.

(d) Remove engine cowling. (Refer to 71-10)

(e) Using soft utility brush and/or vacuum, remove any accumulated, lint, dirt, dust and other foreign matter from the compressor.

Note: A small stiff brush such as a tooth brush can be used to break loose any caked on dirt.

If it is difficult to distinguish casting features from cracks, refer to Advisory Circular 43.13-1B Acceptable Methods, Techniques, and Practices - Aircraft Inspection And Repair for additional non-destructive testing.

(f) Using inspection mirror and flashlight, visually inspect all surfaces of compressor for cracks, deformation, or signs of distress.

(g) Visually inspect compressor drive assembly for corrosion. Clean minor corrosion as necessary.

1 Using wire brush, remove minor corrosion from compressor drive assembly.

2 Apply corrosion inhibitor to compressor drive assembly.

(h) Visually inspect compressor belt for cracks and improper wear.

(i) Visually inspect compressor shaft seal for leaks (excessive oil spray).

(j) Install engine cowling. (Refer to 71-10)

(k) Reset COMPRESSOR/CONTROL circuit breaker.

(7) Adjustment/Test - Compressor Drive Belt Tensioning

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Spring Scale	5A354	Chatillon Kew Gardens, NY 11415 718-847-5000	Tension drive belt.
Straight Edge	-	Any Source	Tension drive belt.

(b) Position straight edge across drive unit pulley and compressor clutch pulley.

(c) Attach spring scale to compressor drive belt midway between drive unit pulley and compressor clutch pulley.

(d) Pull compressor drive belt downward in a straight line until spring scale indicates approximately 8.0 lb (3.6 kg).

(e) Verify deflection of belt to straight edge measures 0.25 inch (6.4 mm) at mid span of belt.

(f) Adjust compressor turnbuckle as necessary to obtain proper drive belt tension. (Refer to 20-70)

B. Compressor Assembly Guard Shield (See Figure 21-501)

(1) Removal - Compressor Assembly Guard Shield

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove bolts and washers securing guard shield to firewall.

(2) Installation - Compressor Assembly Guard Shield

(a) Position guard shield to firewall and secure with bolts and washers.

(b) Install engine cowling. (Refer to 71-10)

C. Evaporator (See Figure 21-501)

(1) Removal - Evaporator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull COMPRESSOR/CONTROL and FAN circuit breakers.

(c) Discharge air conditioning system. (Refer to 12-10)

(d) Remove RH crew seat. (Refer to 25-10)

(e) Remove RH sidewall air duct trim. (Refer to 25-10)

(f) Remove RH rear cabin side trim. (Refer to 25-10)

(g) Remove bolts and washers securing evaporator cover and evaporator to fuselage.

(h) Disconnect wire harness connector from evaporator.

CAUTION: Before disconnecting plumbing, ensure vacuum in system is minimal or the O-rings could be pulled into the system.

(i) Disconnect evaporator hose from firewall. Discard O-ring.

(j) Disconnect evaporator hose from plumbing bulkhead. Discard O-ring.

(k) Cap fittings and hoses.

(l) Remove cable ties securing evaporator hoses to fuselage.

(m) Remove cable ties securing ducts to evaporator.

(n) Remove clamp securing drain hose to fuselage rivnut.

(o) Remove evaporator from airplane.

(2) Disassembly - Evaporator

(a) Remove bolts and washers securing blower motor assembly to evaporator.

(b) Remove blower wheel from blower motor shaft.

(3) Assembly - Evaporator

(a) Install blower wheel onto blower motor shaft.

(b) Install bolts and washers securing blower motor assembly to evaporator.

(4) Installation - Evaporator

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressor Oil	(See Figure 12-101)	Any Source	Lubricate O-rings.
Thread Sealant Primer	(Refer to 51-30)	(Refer to 51-30)	Seal fitting threads.
Thread Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal fitting threads.

(b) Position evaporator to fuselage.

(c) Position drain hose to fuselage rivnut and secure with clamp.

(d) Position ducts to evaporator and secure with cable ties.

(e) Remove caps from fittings and hoses.

CAUTION: Polyolester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(f) Lubricate new O-rings with compressor oil.

CAUTION: When lubricating O-rings, use extreme care to keep oil away from fitting threads.

(g) Using a wire brush and cleaning solvent, completely remove old thread sealant. Apply a thin layer of thread sealant primer to fitting threads.
(h) Apply 1-2 drops of thread sealant to male port threads.
(i) Connect evaporator hose to firewall. Torque hose and fittings to 250 - 350 in-lb (28.2 - 39.5 Nm).
(j) At plumbing bulkhead, connect evaporator hose to hose from condenser. Torque hose and fittings to 120 - 160 in-lb (13.6 - 18.0 Nm).
(k) Install cable ties securing evaporator hoses to fuselage.
(l) Connect wire harness connector to evaporator.
(m) Position cover to evaporator and secure evaporator and cover to fuselage with bolts and washers.
(n) Install RH rear cabin side trim. (Refer to 25-10)
(o) Install RH sidewall air duct trim. (Refer to 25-10)
(p) Install RH crew seat. (Refer to 25-10)
(q) Perform Inspection/Check - System Plumbing Refrigerant Leak Test. (Refer to 21-50)
(r) Charge air conditioning system. (Refer to 12-10)
(s) Reset COMPRESSOR/CONTROL and FAN circuit breakers.
(t) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

(5) Inspection/Check - Evaporator

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vacuum Cleaner	-	Any Source	Clean evaporator coil.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Pull COMPRESSOR/CONTROL and FAN circuit breakers.
(d) Remove RH crew seat. (Refer to 25-10)
(e) Remove bolts and washers securing evaporator cover and evaporator to fuselage.
(f) Open recirculation valves to access evaporator coil.
(g) Visually inspect evaporator inlet for airflow restrictions.
(h) Visually inspect evaporator for bent or dirty fins. Straighten and clean fins as necessary.
(i) Visually inspect evaporator coil for dirt and debris.
(j) Using vacuum cleaner, remove large debris from evaporator coil.
(k) Close recirculation valves.
(l) Position evaporator and cover to fuselage floor and secure with bolts and washers.
(m) Install RH crew seat. (Refer to 25-10)
(n) Reset COMPRESSOR/CONTROL and FAN circuit breakers.
(o) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

D. Condenser (See Figure 21-501)

(1) Removal - Condenser

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONDENSER and COMPRESSOR/CONTROL circuit breakers.

(c) If removing condenser to perform Inspection/Check or to access pitch trim servo, flap actuator, condenser intake screen, or condenser exhaust screen, perform the following:

Note: Refrigerant discharging is not required. Hose length allows condenser to be removed from fuselage floor with refrigerant plumbing still connected.

1 Remove access panel CF5. (Refer to 06-00)

2 Remove bolt, washer, and nut securing intake screen grounding strap to condenser.

3 Remove screws securing condenser to fuselage floor.

4 Remove condenser from fuselage floor as necessary to perform Inspection/Check or to access pitch trim servo, flap actuator, condenser intake screen, or condenser exhaust screen.

(d) If removing condenser for replacement, perform the following:

1 Discharge air conditioning system. (Refer to 12-10)

2 Remove access panel CF5. (Refer to 06-00)

3 Remove RH rear cabin side trim. (Refer to 25-10)

CAUTION: Before disconnecting plumbing, ensure vacuum in system is minimal or the O-rings could be pulled into the system.

4 Disconnect condenser hoses from plumbing bulkhead. Discard O-rings.

5 Cap fittings and hoses.

6 Remove cable ties securing condenser hoses to fuselage.

7 Remove bolt, washer, and nut securing grounding strap to condenser intake screen.

8 Remove screws securing condenser to fuselage floor. Remove condenser from airplane.

(2) Disassembly - Condenser

(a) Outlet Duct

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Break sealant.

2 Remove bolts, washers, and nuts securing outlet duct to condenser blower.

3 Using putty knife to break sealant, carefully remove outlet duct from condenser blower.

(b) Condenser Blower

1 Disassemble outlet duct from condenser blower. (Refer to 21-50)

2 Remove hose clamp securing condenser blower to coupler.

(c) Coupler

1 Remove hose clamps securing coupler to condenser blower.

(d) Receiver/dryer

1 Disconnect pressure hoses from receiver/dryer.

2 Remove clamp securing receiver/dryer to condenser.

(3) Assembly - Condenser

(a) Outlet Duct

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
General-Purpose Acetoxy Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal mating surfaces.

2 Clean outlet duct and condenser blower with isopropyl alcohol to remove any dirt, dust, and existing sealant.

3 Apply thin bead of sealant to mating surface of outlet duct, and position outlet duct to condenser blower.

4 Install bolts, washers, and nuts securing outlet duct to condenser blower.

(b) Condenser Blower

1 Assemble outlet duct to condenser blower. (Refer to 21-50)

2 Position condenser blower assembly to coupler.

3 Install hose clamp securing condenser blower assembly to coupler.

(c) Coupler

1 Position coupler between condenser blower and condenser.

2 Install hose clamps securing coupler to condenser and condenser blower.

(d) Receiver/dryer

1 Position receiver/dryer to condenser.

2 Connect pressure hoses to receiver/dryer.

3 Install clamp securing receiver/dryer to condenser.

(4) Installation - Condenser

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressor Oil	(See Figure 12-101)	Any Source	Lubricate O-rings.

(b) Position condenser to fuselage floor and secure with screws.

(c) Position intake screen grounding strap to condenser and secure with bolt, washer, and nut.

(d) If condenser was disconnected from refrigerant plumbing, perform the following:

1 Remove caps from fittings and hoses.

CAUTION: Polyolester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

2 Lubricate new O-rings with compressor oil.

CAUTION: When lubricating O-rings, use extreme care to keep oil away from fitting threads.

3 At plumbing bulkhead, connect condenser hose to compressor hose. Torque hose and fittings to 180 - 240 in-lb (20.3 - 27.1 Nm).

4 At plumbing bulkhead, connect condenser hose to evaporator hose. Torque hose and fittings to 120 - 160 in-lb (13.6 - 18.0 Nm).

5 Install cable ties securing condenser hoses to fuselage.

(e) Perform Inspection/Check - System Plumbing Refrigerant Leak Test. (Refer to 21-50)

1 Install RH rear cabin side trim. (Refer to 25-10)

2 Charge air conditioning system. (Refer to 12-10)

(f) Install access panel CF5. (Refer to 06-00)

(g) Reset CONDENSER and COMPRESSOR/CONTROL circuit breakers.

(h) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

(5) Inspection/Check - Condenser

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vacuum Cleaner	-	Any Source	Clean condenser coil.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull CONDENSER and COMPRESSOR/CONTROL circuit breakers.

(d) Remove access panel CF5. (Refer to 06-00)

(e) Remove clamps and sleeve securing exhaust duct to condenser.

(f) Remove bolt, washer, and nut securing grounding strap to condenser intake screen.

(g) Remove screws securing condenser to fuselage floor.

(h) Raise condenser out of fuselage floor as necessary to inspect and clean.

(i) Visually inspect condenser inlet for airflow restrictions.

(j) Visually inspect condenser for bent or dirty fins. Straighten and clean fins as necessary.

(k) Visually inspect condenser coil for dirt and debris.

(l) Using vacuum cleaner, remove large debris from condenser coil.

(m) Position exhaust duct to condenser and secure with cable tie.

(n) Position grounding strap to intake screen and secure with bolt, washer, and nut.

(o) Position condenser to fuselage floor and secure with screws.

(p) Install access panel CF5. (Refer to 06-00)

(q) Reset CONDENSER and COMPRESSOR/CONTROL circuit breakers.

(r) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

E. Exhaust Screen (See Figure 21-501)

(1) Removal - Exhaust Screen

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Remove condenser. (Refer to 21-50)

(c) Remove screws securing exhaust screen to interior skin of baggage compartment.

(d) Remove exhaust screen and air deflector from airplane.

(e) Remove residue from exhaust screen installation areas using scraper and cleaner.

(f) Solvent clean installation areas on fuselage. (Refer to 20-30)

(2) Installation - Exhaust Screen

CAUTION: Ensure perimeter of exterior screw installation holes have been burnished to expose EMM. If not, using 80 grade sand paper or finer to burnish EMM until shiny. Frequently clean surface of contaminants using vacuum and paint brush to ensure EMM is not damaged.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal exhaust screen to fuselage.

(b) Apply 0.12 inch (3.05 mm) minimum continuous bead of sealant to mating surfaces of exhaust screen and air deflector.

(c) At interior of fuselage floor, position air deflector to forward installation location of exhaust screen.

(d) Position exhaust screen over air defector at installation hole. From exterior, install screws securing exhaust screen and air deflector to interior skin of baggage compartment.

(e) Install condenser. (Refer to 21-50)

F. Intake Screen (See Figure 21-501)

(1) Removal - Intake Screen

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Remove condenser. (Refer to 21-50)

(c) Remove screws securing intake screen to interior skin of baggage compartment.

(d) Remove intake screen from airplane.

(e) Remove residue from intake screen installation areas using scraper and cleaner.

(f) Solvent clean installation areas on fuselage. (Refer to 20-30)

(2) Disassembly - Intake Screen

(a) Remove pem stud, washer, and nut securing grounding strap to intake screen.

(3) Reassembly - Intake Screen

(a) *For new exhaust screens:* Burnish grounding strap installation area on screen.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sandpaper	600-grit	Any Source	Abrade.

2 *For new intake screens:* Prior to grounding strap installation, use 600-grit sandpaper to burnish a 1.0 inch (2.54 cm) minimum diameter area around hole on stud side of intake screen until gloss of anodization is removed.

(b) Position grounding strap to intake screen and secure with pem stud, washer, and nut.

(4) Installation - Intake Screen

CAUTION: Ensure perimeter of exterior screw installation holes have been burnished to expose EMM. If not, using 80 grade sand paper or finer to burnish EMM until shiny. Frequently clean surface of contaminants using vacuum and paint brush to ensure EMM is not damaged.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal intake screen to fuselage.

(b) Apply 0.12 inch (3.05 mm) minimum continuous bead of sealant to mating surface of intake screen.

(c) At interior of fuselage floor, position intake screen at installation hole. From exterior, install screws securing intake screen to interior skin of baggage compartment.

(d) Install condenser. (Refer to 21-50)

G. System Plumbing (See Figure 21-501)

(1) Removal - System Plumbing

(a) Discharge air conditioning system. (Refer to 12-10)

(b) Remove RH sidewall air duct trim. (Refer to 25-10)

(c) Remove RH rear cabin side trim. (Refer to 25-10)

(d) Remove cable ties securing plumbing to fuselage.

CAUTION: Before disconnecting plumbing, ensure vacuum in system is minimal or the O-rings could be pulled into the system.

(e) Disconnect plumbing.

(f) Discard O-rings.

(g) Cap fittings and hoses.

(2) Installation - System Plumbing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressor Oil	(See Figure 12-101)	Any Source	Lubricate O-rings.

(b) Remove caps from fittings and hoses.

CAUTION: Polyolester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(c) Lubricate new O-rings with compressor oil.

CAUTION: When lubricating O-rings, use extreme care to keep oil away from fitting threads.

(d) Connect plumbing.

1 Torque 3/8 inch (13 mm) hose and fittings to 120 - 160 in-lb (13.6 - 18.0 Nm).

2 Torque 1/2 inch (16 mm) hose and fittings to 180 - 240 in-lb (20.3 - 27.1 Nm).

3 Torque 5/8 inch (19 mm) hose and fittings to 250 - 350 in-lb (28.2 - 39.5 Nm).

(e) Position plumbing to fuselage and secure with cable ties.

(f) Install RH sidewall air duct trim. (Refer to 25-10)

(g) Install RH rear cabin side trim. (Refer to 25-10)

(h) Charge air conditioning system. (Refer to 12-10)

(i) Perform Operational Test - Air Conditioning System. (Refer to 21-50)

(3) Inspection/Check - System Plumbing Refrigerant Leak Test

Note: Perform Inspection/Check - Refrigerant Leak Test when ambient temperature is above 65°F.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Refrigerant Detector	-	Any Source	Detect leaks.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Pull COMPRESSOR/CONTROL, FAN, and CONDENSER circuit breakers.
(d) Remove engine cowling. (Refer to 71-10)
(e) Remove RH crew seat. (Refer to 25-10)
(f) Remove RH sidewall air duct trim. (Refer to 25-10)
(g) Remove RH rear cabin side trim. (Refer to 25-10)
(h) Remove floor access panel CF5. (Refer to 06-00)
(i) Using electronic refrigerant detector, check all plumbing connections and components for leaks.
(j) If leak is detected, perform the following:
1 Discharge air conditioning system. (Refer to 12-10)
2 Repair or replace components and plumbing as needed.

Note: Ensure oil from leak is cleaned up and any residual refrigerant has dissipated prior to recharging air conditioning system.

3 Charge air conditioning system. (Refer to 12-10)
4 Repeat leak check.
(k) Install floor access panel CF5. (Refer to 06-00)
(l) Install RH rear cabin side trim. (Refer to 25-10)
(m) Install RH sidewall air duct trim. (Refer to 25-10)
(n) Install RH crew seat. (Refer to 25-10)
(o) Install engine cowling. (Refer to 71-10)
(p) Reset COMPRESSOR/CONTROL, FAN, and CONDENSER circuit breakers.

H. Servicing - Air Conditioning System

(1) Air Conditioning System Flushing

If any air conditioning component has been disconnected and exposed to air for an extended period of time, an unapproved compressor oil has been added to the system, or if replacement compressor uses a different oil type than the previously installed compressor, perform the following procedure to flush the air conditioning system.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Receiver/Dryer Test Fitting	Contact manufacturer[1]	Keith Products Addison, Texas 75001 972-407-1234	Flush air conditioning system.
Open Expansion Valve Test Fitting	Contact manufacturer[1]	Enviro Systems Inc. Seminole, OK 74868 405-382-0731	Flush air conditioning system.
Flushing Pump	-	Any Source	Flush air conditioning system.
Flushing Container	-	Any Source	Flush air conditioning system.
Isopropyl Alcohol	99% or higher purity	Any Source	Flush air conditioning system.
Compressor Oil	(See Figure 12-101)	Any Source	Lubricate O-rings.
Thread Sealant Primer	(Refer to 51-30)	(Refer to 51-30)	Seal fitting threads.
Thread Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal fitting threads.

1. Acquire necessary fitting and hose per manufacturer's specifications to assemble required coupling.

(b) Discharge air conditioning system. (Refer to 12-10)

CAUTION: Before disconnecting plumbing, ensure vacuum in system is minimal or the O-rings could be pulled into the system.

(c) Disconnect expansion valve from evaporator. Discard O-rings.
(d) Connect open expansion valve test fitting to evaporator.
(e) Disconnect receiver/dryer from condenser. Discard O-rings.
(f) Connect receiver/dryer test fitting to condenser.
(g) Disconnect hoses from compressor. Discard O-rings.
(h) Cap expansion valve, receiver/dryer, and compressor fittings.
(i) Connect high pressure hose to flushing pump.
(j) Insert low hose into flushing container.
(k) Pump 3 to 4 quarts of isopropyl alcohol through system.
(l) Disconnect flushing pump.
(m) Using dry nitrogen or dry air with regulator set to 25 to 30 PSI, blow through system for 5 minutes to evaporate remaining alcohol.

(n) Remove caps from expansion valve, receiver/dryer, and compressor fittings.

CAUTION: Polyester oil and polyalkyline glycol oil are not interchangeable. Verify compressor part number to determine which oil type to use. (See Figure 12-101)

(o) Lubricate new O-rings with compressor oil.

CAUTION: When lubricating O-rings, use extreme care to keep oil away from fitting threads.

(p) Connect 5/8 inch (19 mm) hose to compressor. Torque hose and fittings to 250 - 350 in-lb (28.2 - 39.5 Nm).

(q) Connect 1/2 inch (16 mm) hose to compressor. Torque hose and fittings to 180 - 240 in-lb (20.3 - 27.1 Nm).

(r) Disconnect receiver/dryer test fitting from condenser.

(s) Using a wire brush and cleaning solvent, completely remove old thread sealant. Apply a thin layer of thread sealant primer to fitting threads.

(t) Apply 1-2 drops of thread sealant to receiver/dryer port threads.

(u) Connect receiver/dryer to condenser. Torque fittings to 120 - 160 in-lb (13.6 - 18.0 Nm).

(v) Disconnect open expansion valve test fitting from evaporator.

(w) Connect expansion valve to evaporator.

(x) Charge air conditioning system. (Refer to 12-10)

I. Operational Test - Air Conditioning System

(1) Operational Test - Air Conditioning System

(a) Start engine in accordance with Pilot's Operating Handbook procedures.

(b) Open cabin air panel vents.

(c) Set temperature control knob to the snowflake symbol position.

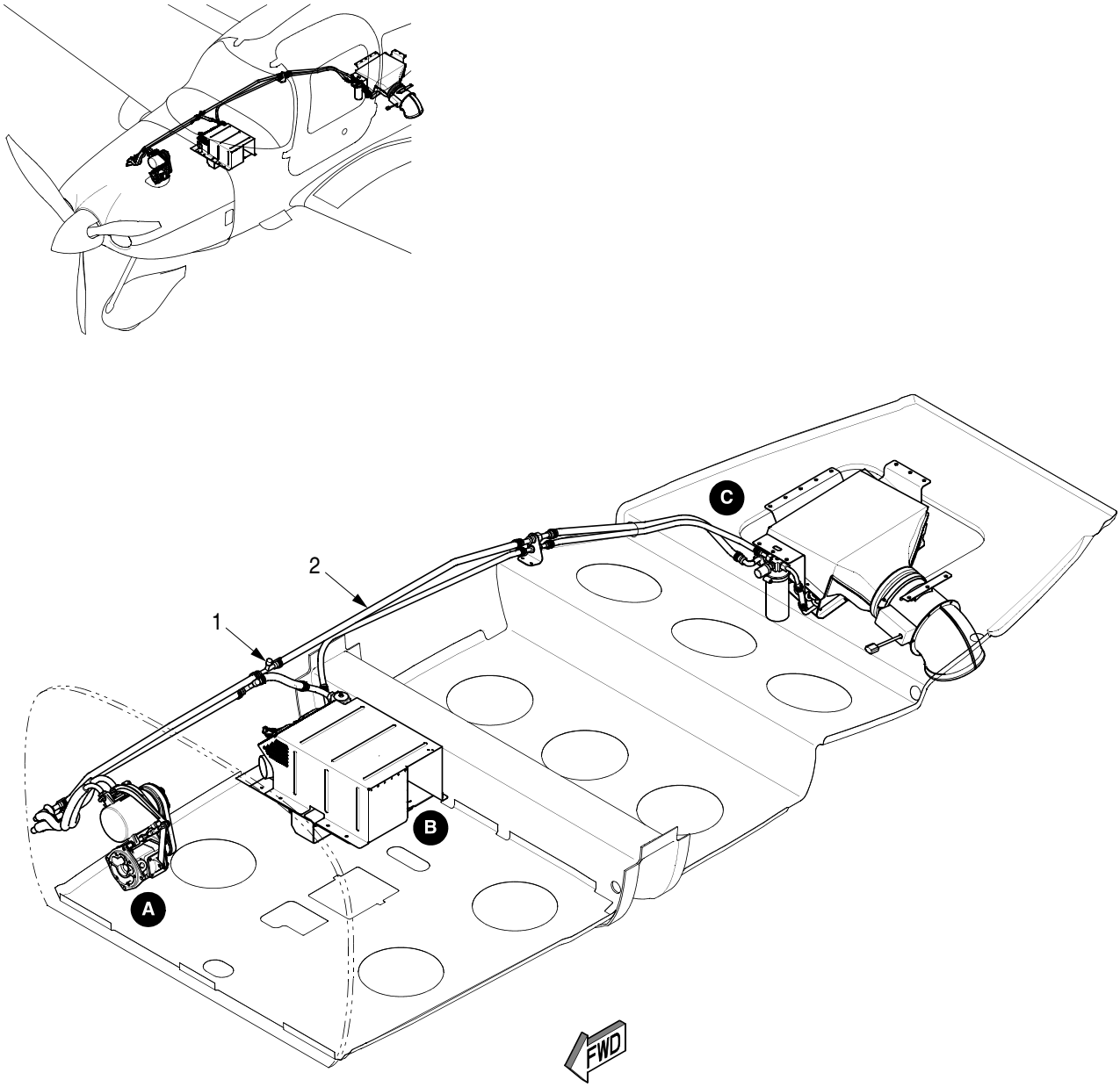
(d) Verify AC ON light illuminates.

(e) At 5 minutes, verify cool air exits cabin air panel vents.

(f) Rotate airflow control knob through all fan positions. Verify fan operates at all speeds and airflow increases at each position.

(g) Rotate temperature control knob to turn off air conditioning system.

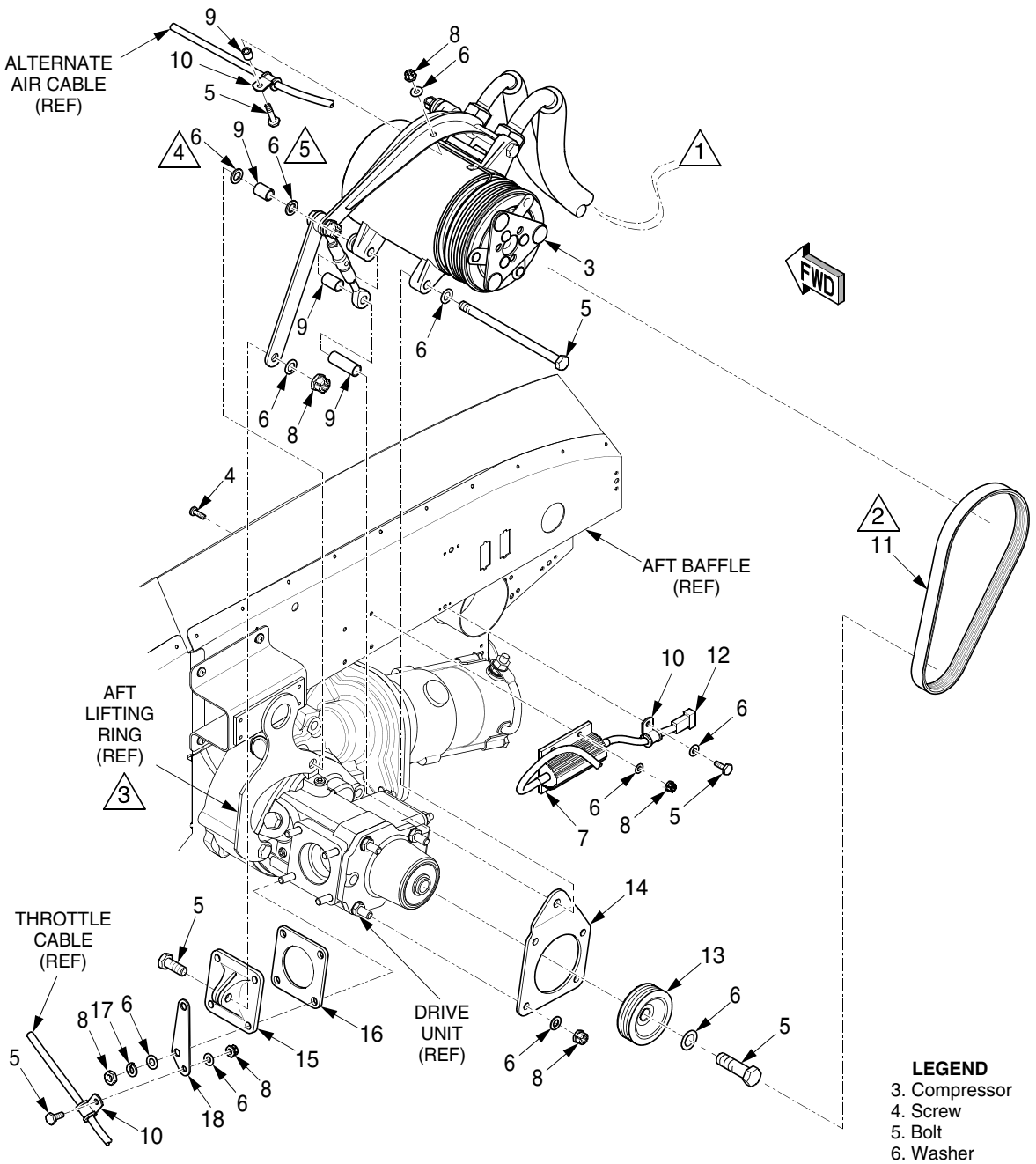
(h) Shutdown engine in accordance with Pilot's Operating Handbook procedures.



LEGEND
1. Service Ports
2. Pressure Line

SR20_MM21_3344A

Figure 21-501
Air Conditioning System (Sheet 1 of 5)



NOTE

1. Refer to sheet 3 of 5 for continuation.
2. Verify compressor drive belt tension equals approximately 8.0 lbs (3.6 kg) with 0.25 inch (6.40 mm) of deflection at mid span of belt.
3. At upper attachment of aft lifting ring, ensure spacer is installed to provide spacing between aft lifting ring and starter drive adapter.
4. *Serials 2072 & subs*.
5. *Serials 2284 & subs.*

DETAIL A

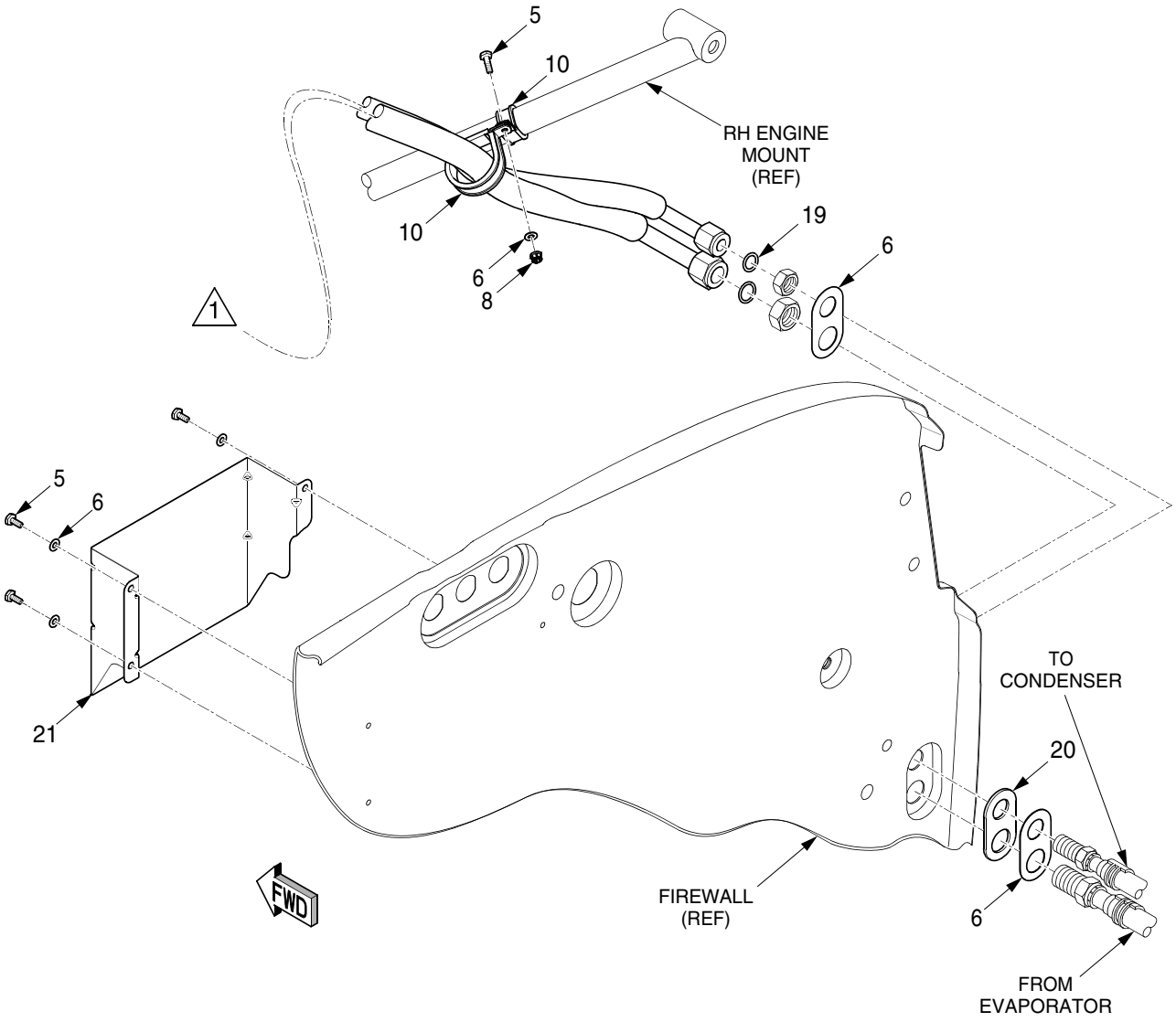
LEGEND

3. Compressor
4. Screw
5. Bolt
6. Washer
7. Resistor
8. Nut
9. Spacer
10. Clamp
11. Belt
12. Connector
13. Pulley
14. Mounting Plate
15. Link Plate
16. Gasket
17. Lock Washer
18. Bracket

SR20_MM21_3345B

Figure 21-501
Air Conditioning System (Sheet 2 of 5)

EFFECTIVITY:
All



LEGEND

5. Bolt
6. Washer
8. Nut
10. Clamp
19. O-Ring
20. Seal
21. Guard Shield

NOTE

1 Refer to sheet 2 of 5 for continuation.

DETAIL A

SR20_MM21_3369A

Figure 21-501
Air Conditioning System (Sheet 3 of 5)

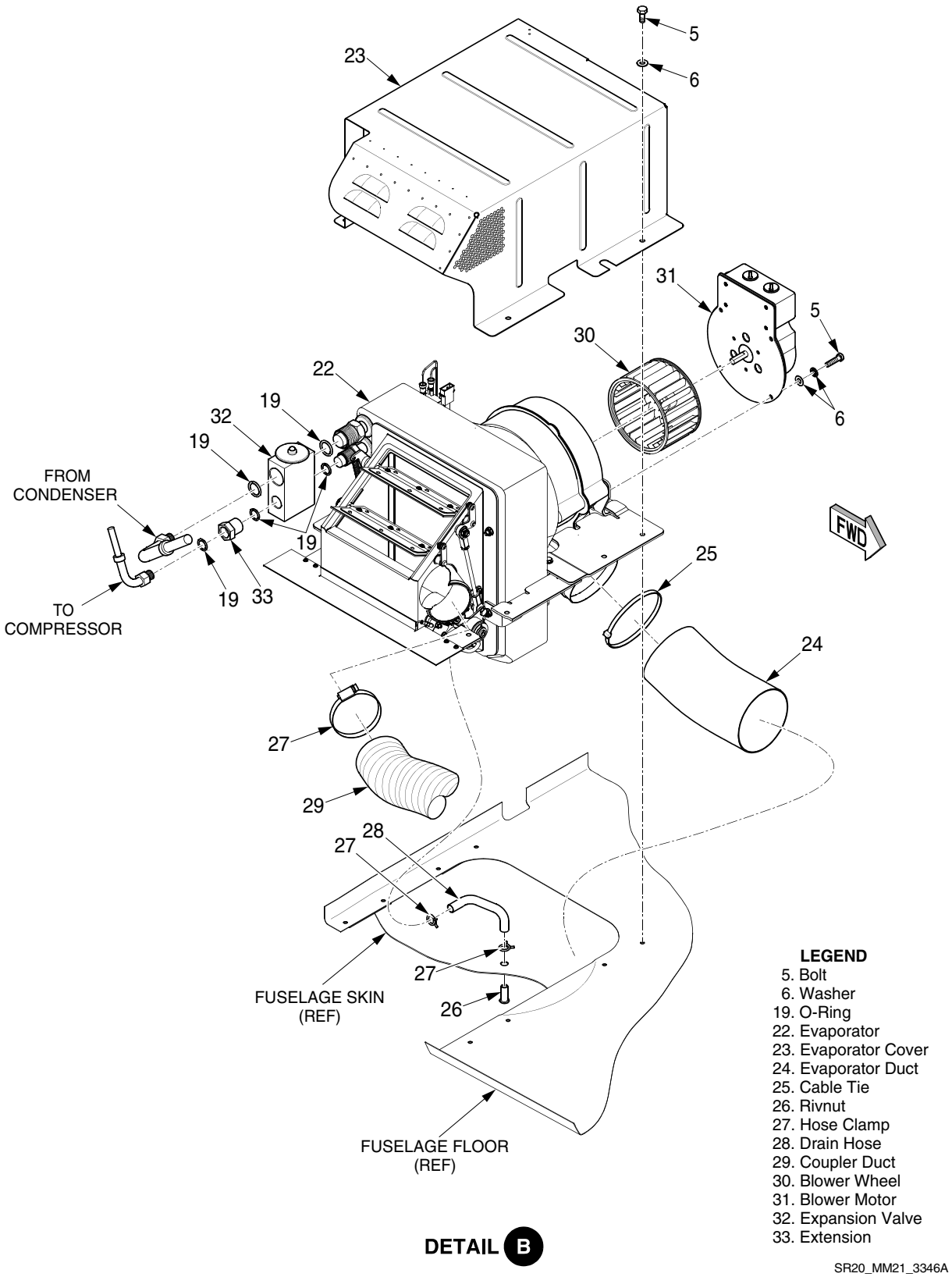
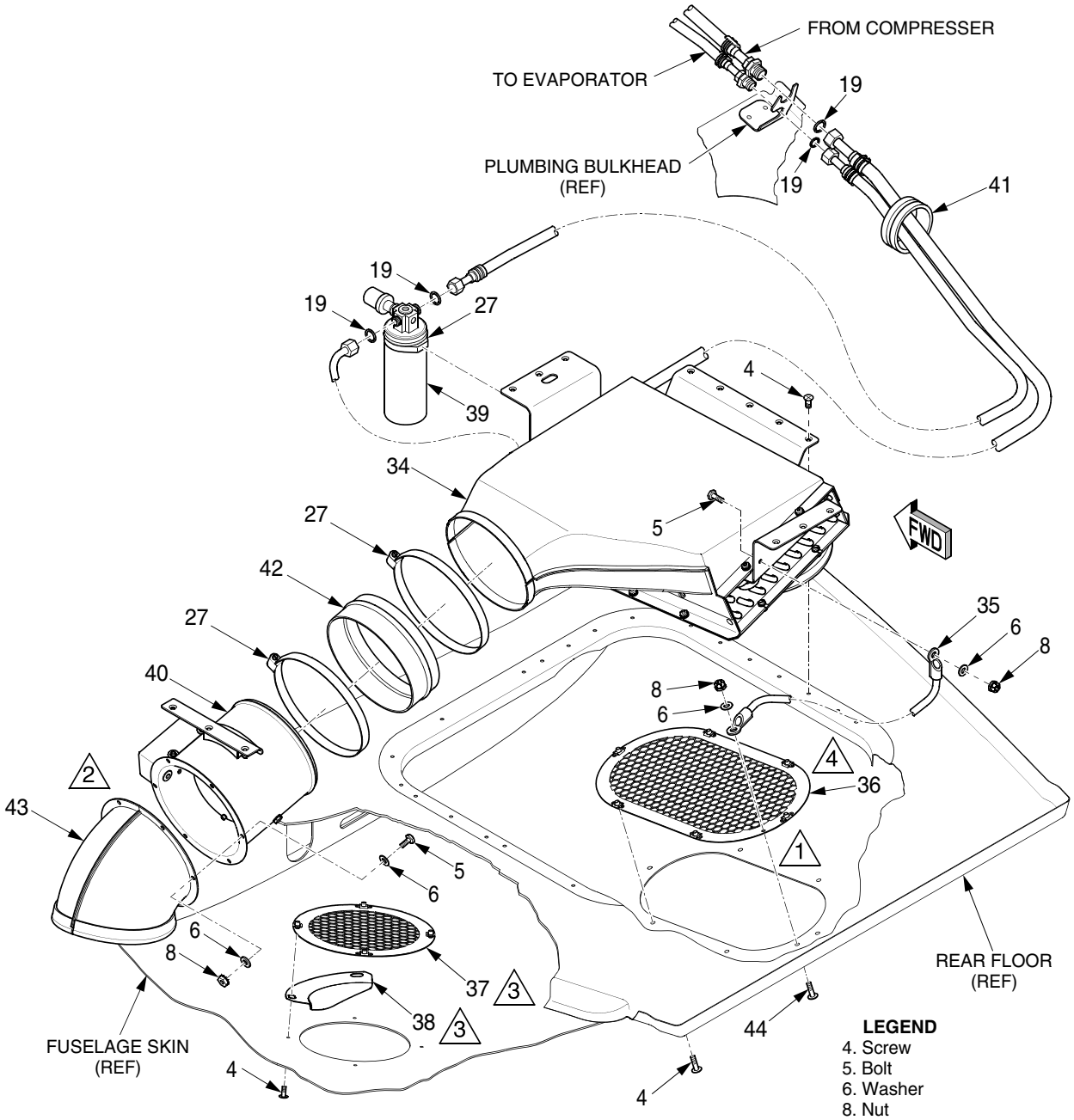


Figure 21-501
Air Conditioning System (Sheet 4 of 5)



NOTE

1. *For new intake screens:* Prior to grounding strap installation, use 600-grit sandpaper to abrade a 1.0 inch (2.54 cm) minimum diameter area around hole on stud side of condenser screen until gloss of annodization is removed.
2. Apply thin bead of sealant to mating surface of outlet duct prior to installation.
3. Apply 0.12 inch (3.05 mm) minimum continuous bead of sealant to mating surfaces of exhaust screen and air deflector.
4. Apply 0.12 inch (3.05 mm) minimum continuous bead of sealant to mating surface of intake screen.

DETAIL C

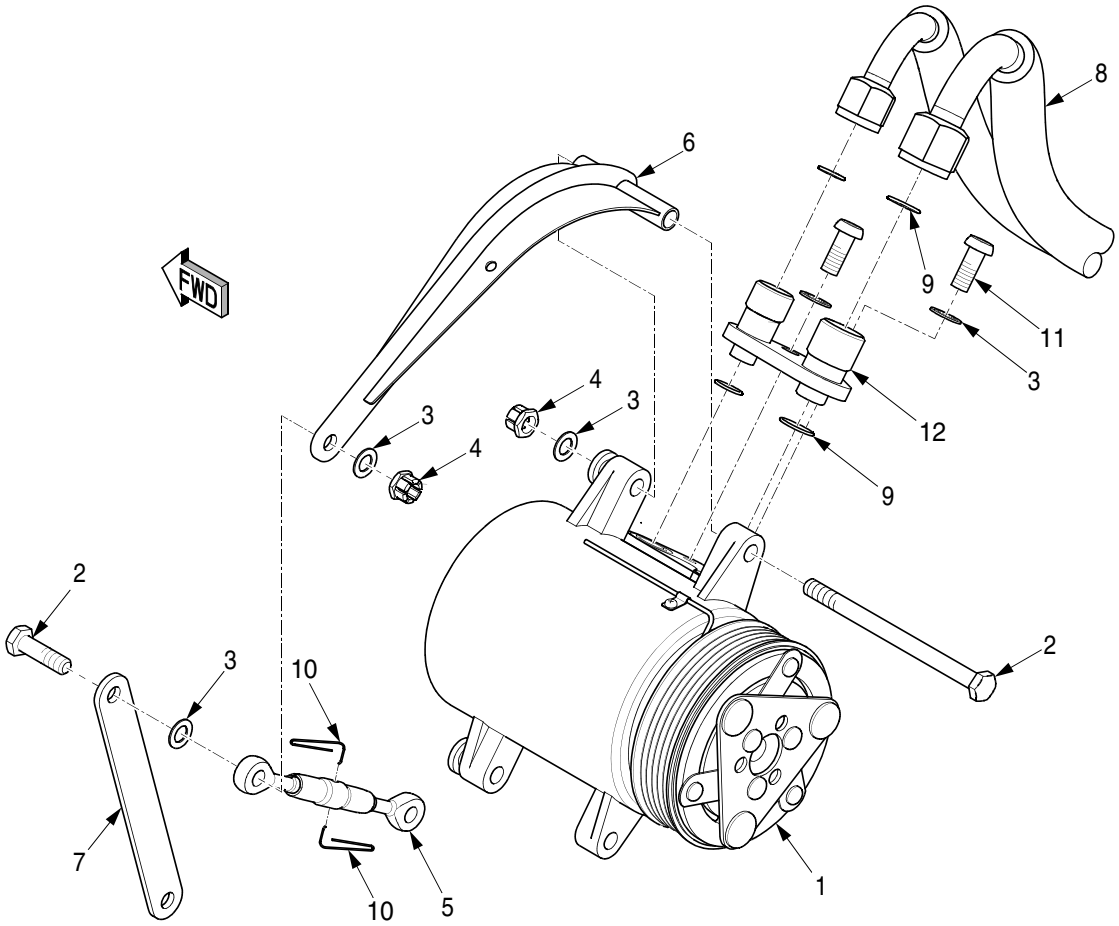
LEGEND

4. Screw
5. Bolt
6. Washer
8. Nut
19. O-Ring
27. Hose Clamp
34. Condenser
35. Intake Grounding Strap
36. Intake Screen
37. Exhaust Screen
38. Air Deflector
39. Receiver/Dryer
40. Condenser Blower
41. Grommet
42. Coupling
43. Outlet Duct
44. Pem Stud

SR20_MM21_3343A

Figure 21-501
Air Conditioning System (Sheet 5 of 5)

I



LEGEND

1. Compressor
2. Bolt
3. Washer
4. Nut
5. Turnbuckle
6. Weldment Arm
7. Link
8. Hose
9. O-Ring
10. Locking Clip
11. Screw
12. Fitting

SR20_MM21_3348

Figure 21-502
Compressor Assembly

TEMPERATURE CONTROL

1. DESCRIPTION

This section covers those systems and components used to control the temperature of the air. Includes items such as control valves, switches, indicators, and wiring.

A. Temperature Control System - *Serials 1005 thru 1638*

The temperature, volume, and flow selection are regulated by manipulation of the cabin temperature and cabin air selector knobs on the lower right side of the instrument panel.

Conditioned air from the mixing chamber can be proportioned and directed to the windshield or passengers by manipulating the cabin air selector. The control is linked to a door at the outlet end of the mixing chamber. Rotating the control full counterclockwise to the miniature windshield shuts off airflow to the passenger air distribution system and allows maximum airflow to the windshield diffuser. Rotating the knob full clockwise to the seated person icon shuts off airflow to the windshield diffuser and allows maximum airflow to the passenger air distribution system. The control can be positioned to allow any proportion of windshield and passenger air.

Conditioned air for the forward seats is routed to outlets under the instrument panel at knee level. Conditioned air for the aft seats is ducted to outlets beneath the forward seats near the door posts and exits at floor level.

The amount of heated air allowed into the air mixing chamber is controlled by rotating the Cabin Heat Control, located inboard of the Cabin Air Selector. The control is mechanically linked to a door in a heater box between the heater muff and the mixing chamber. Rotating the control full counterclockwise bypasses heated air from the heater muff into the engine compartment. Rotating the control clockwise opens the door in the heater box allowing heated air to enter the mixing chamber.

The amount of cooling air allowed into the air mixing chamber is controlled by rotating the cabin cool control, located outboard of the cabin air selector. The control is mechanically linked to a butterfly valve at the fresh air entrance to the mixing chamber. Rotating the control full counterclockwise shuts down cooling airflow to the mixing chamber from the fresh air inlet in the right wing root. Rotating the control clockwise opens the butterfly allowing fresh cooling air to enter the mixing chamber. Rotating the knob to the full clockwise position provides maximum cooling airflow to the mixing chamber.

B. Temperature Control System - *Serials 1639 thru 2015, 2016 & subs w/o Perspective Avionics*

The airflow, vent, and temperature selection are regulated by manipulation of the cabin air selector knobs on the lower right side of the instrument panel.

Serials 1639 thru 1885: The airflow selector regulates the volume of airflow allowed into the cabin distribution system through mechanical linkage to a butterfly valve in the distribution manifold. If option installed, the 2-speed blower fan is turned on when the selector dial exceeds the full open position.

Serials 1886 & subs: The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system through the use of an electro-mechanical linkage to a flapper valve in the mixing chamber on the forward firewall. When the airflow selector fan speed is moved to the 1, 2, or 3 position the electro-mechanical linkage actuates the flapper valve to the full open position. The air is then distributed by the variable speed blower fan to the distribution manifold mounted to the center, aft side of the firewall.

Conditioned air from the distribution manifold can be proportioned and directed to passengers and/or the windshield by manipulating the cabin vent selector. The selector is mechanically linked to butterfly valves at the entrances to the windshield diffuser and the cabin floor ducting. There is continuous airflow to the panel and armrest eyeball outlets. Each occupant can control the flow rate from 'off' to maximum by rotating the nozzle.

When the vent selector is in the far left position, both butterfly valves are closed providing maximum airflow to the panel and armrest eyeball outlets. Rotating the selector a quarter-turn clockwise opens the cabin floor butterfly valve allowing airflow to the rear seat foot warmer diffusers and the front seat

outlets mounted to the underside of each kickplate. Rotating the selector another quarter-turn clockwise opens the windshield diffuser butterfly valve which permits shared airflow to the defrosting mechanism and cabin floor outlets. When the selector is in the far right position, the cabin floor butterfly valve is closed providing maximum airflow to the windshield diffuser.

The temperature selector is mechanically linked to the hot air intake valve and fresh air intake valve. Rotating the selector simultaneously opens and closes the two valves, permitting hot and cold air to mix and enter the distribution system. Rotating the selector clockwise, permits warmer air to enter the system - counterclockwise, cooler air.

C. Temperature Control System - Serials w/o Air Conditioning and w/ Perspective Avionics

The airflow, vent, and temperature selection are regulated by manipulation of the cabin air selector knobs and buttons on the lower right side of the instrument panel.

The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system. When the airflow selector is moved past the OFF position an electro-mechanical linkage actuates a valve in the mixing chamber on the forward firewall to the full open position. The air is then distributed by either ram air or by an optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The optional blower fan system includes 0 (ram air), 1 (low fan), 2 (med fan), and 3 (high fan) airflow settings.

Air from the distribution manifold is proportioned and directed to passengers and/or the windshield by pressing the cabin vent selector buttons which electrically actuate butterfly valves at the entrances to the windshield diffuser and the cabin floor ducting. When the Temperature Selector is in the blue “cool” zone, there is continuous ram airflow to the panel and armrest eyeball outlets. Each occupant can control the flow rate from 'off' to maximum by rotating the nozzle.

When the Panel selector button is pushed, both butterfly valves are closed providing maximum airflow to the instrument panel and armrest eyeball outlets. Pressing the Panel-Foot selector button opens the cabin floor butterfly valve allowing airflow to the rear seat foot warmer diffusers and the front seat outlets mounted to the underside of each kick plate. Selecting Panel-Foot-Windshield button opens the windshield diffuser butterfly valve which permits shared airflow to the defrosting mechanism and cabin floor outlets. When the Windshield selector button is pushed the cabin floor butterfly valve is closed providing maximum airflow to the windshield diffuser.

The temperature selector is electrically linked to the hot and cold air valves. Rotating the selector simultaneously opens and closes the two valves, permitting hot and cold air to mix and enter the distribution system. Rotating the selector clockwise, permits warmer air to enter the system - counterclockwise, cooler air.

D. Temperature Control System - *Serials w/ Air Conditioning & w/ Perspective Avionics*

The air conditioning system is regulated by manipulation of the cabin air selector knobs and buttons on the lower right side of the instrument panel.

The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system. When the airflow selector is moved past the OFF position an electro-mechanical linkage actuates a valve in the mixing chamber on the forward firewall to the full open position. The air is then distributed by either ram air or by an optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The optional blower fan system includes 0 (ram air), 1 (low fan), 2 (med fan), and 3 (high fan) airflow settings.

Air from the distribution manifold is proportioned and directed to passengers and/or the windshield by pressing the cabin vent selector buttons which electrically actuate butterfly valves at the entrances to the windshield diffuser and the cabin floor ducting. When the Temperature Selector is in the blue “cool” zone, there is continuous ram airflow to the panel and armrest eyeball outlets. Each occupant can control the flow rate from 'off' to maximum by rotating the nozzle.

When the Panel selector button is pushed, both butterfly valves are closed providing maximum airflow to the instrument panel and armrest eyeball outlets. Pressing the Panel-Foot selector button opens the

cabin floor butterfly valve allowing airflow to the rear seat foot warmer diffusers and the front seat outlets mounted to the underside of each kick plate. Selecting Panel-Foot-Windshield button opens the windshield diffuser butterfly valve which permits shared airflow to the defrosting mechanism and cabin floor outlets. When the Windshield selector button is pushed the cabin floor butterfly valve is closed providing maximum airflow to the windshield diffuser.

The temperature selector is electrically linked to the hot and cold air valves. Rotating the selector simultaneously opens and closes the two valves, permitting hot and cold air to mix and enter the distribution system. Rotating the selector clockwise, permits warmer air to enter the system - counterclockwise, cooler air.

When the air conditioning button (snowflake) is pushed, the valve on the firewall completely closes and the air-conditioner is activated. When recirculation button is pushed, the fresh air valve completely closes and cabin air is recirculated to provide for maximum air conditioning operation. When the air conditioning system is on and the temperature selector is rotated approximately three-quarters to the full cool position, recirculating mode is automatically switched on to provide maximum cabin cooling. Air conditioning or recirculating mode is not available when the airflow fan selector is in the “0” position. Recirculating mode is not available unless the air conditioning system is operating.

2. TROUBLESHOOTING

Serials 1639 thru 2015, 2016 & subs w/o Perspective Avionics:

Trouble	Probable Cause	Remedy
Controls stiff or binding.	Control cams binding with switch plate.	Perform Inspection/Check - Cabin Air Control Assembly. (Refer to 21-60)
Controls inoperable.	Control linkage misaligned or disconnected.	Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)
Poor airflow control.	Control linkage misaligned or disconnected.	Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)
	Faulty distribution manifold.	Replace or repair distribution manifold. (Refer to 21-20)
Vent selection inoperable.	Control linkage misaligned or disconnected.	Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)
	Faulty distribution manifold.	Replace or repair distribution manifold. (Refer to 21-20)
Poor temperature control.	Control linkage misaligned or disconnected.	Adjust or connect control linkage. (Refer to 21-60)
Fan inoperable.	Faulty or misaligned switch.	Replace or align switch. (Refer to 21-60)
Air conditioning inoperable.	Faulty or misaligned switch.	Replace or align switch. (Refer to 21-60)
Overly warm cabin heat in cold weather and/or poor performance of the air conditioning system in hot weather.	Incorrect cabin air coupler actuator rigging.	Re-rig temperature control linkage for cabin air coupler actuator. (Refer to 21-60)
Fresh air feels warm.	Hot air valve not sealing tight in HEAT OFF position.	Adjust or connect linkage for cabin air control assembly. (Refer to 21-60) Replace hot air valve. (Refer to 21-40)

Serials 2016 & subs w/ Perspective Avionics:

Trouble	Probable Cause	Remedy
Controls stiff or binding.	Faulty ECS display panel.	Replace ECS display panel.
Controls inoperable.	Faulty ECS display panel.	Replace ECS display panel.
Poor airflow control.	Loose electrical connection.	Verify electrical connections.
	Faulty ECS controller.	Replace ECS controller.
	Faulty ECS display panel.	Replace ECS display panel.
	Faulty distribution manifold.	Replace or repair distribution manifold. (Refer to 21-20)
Vent selection inoperable.	Faulty ECS display panel.	Replace ECS display panel.
	Loose electrical connection.	Verify electrical connections.
	Faulty ECS controller.	Replace ECS controller.
	Faulty ECS display panel.	Replace ECS display panel.
	Faulty distribution manifold.	Replace or repair distribution manifold. (Refer to 21-20)
Overly warm cabin heat in cold weather and/or poor performance of the air conditioning system in hot weather.	Incorrect cabin air coupler actuator rigging.	Re-rig temperature control linkage for cabin air coupler actuator. (Refer to 21-60)
Fresh or conditioned air feels warm.	Air mixing chamber not sealing tight in HEAT OFF position.	Adjust or connect linkage for cabin air control assembly. (Refer to 21-60) Replace air mixing chamber. (Refer to 21-40)

3. MAINTENANCE PRACTICES

A. Cabin Air Control Knobs - *Serials 1005 thru 1638* (See Figure 21-601)

(1) Removal - Cabin Air Control Knob

(a) Remove set screws securing control knob to linkage shaft. Discard set screws.

(b) Remove control knob from airplane.

(2) Installation - Cabin Air Control Knob

(a) Rotate linkage shaft fully counter-clockwise.

(b) Position control knob to linkage shaft in fully counter-clockwise position.

(c) Install new set screws securing control knob to linkage shaft.

(d) Perform Inspection/Check - Cabin Air Control Knob.

(3) Inspection/Check - Cabin Air Control Knob

(a) Ensure control knob rotates linkage shaft through full range of motion without excess binding, friction, or slippage.

B. Hot Air Valve Control Cable - *Serials 1005 thru 1638* (See Figure 21-601)

(1) Removal - Hot Air Valve Control Cable

(a) Remove engine cowling. (Refer to 71-10)

(b) Solvent clean adhesive (with alcohol) from cable pass-through on the forward side of the firewall. (Refer to 20-30)

(c) Loosen lower cable stop bolt from hot air valve actuation arm.

(d) Loosen cable stop bolt from inner core wire. Slide cable stop off heater cable core wire.

(e) Loosen clamp fastened to angle bracket and engine mount. Slide cable out of clamp.

(f) Remove MFD. (Refer to 31-60)

(g) Remove RH kick plate. (Refer to 25-10)

(h) Remove adhesive from cable pass-through on aft side of firewall.

(i) Remove the bolt, washers, and nut securing core wire to linkage shaft.

(j) Remove bolt, washers, and nut securing cable and clamp to cable bracket. Remove clamp.

(k) Pull hot air valve cable, cable stop, and Fiberfrax paper out of cable pass-through.

(2) Installation - Hot Air Valve Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fiber Frax paper 1/8”	970J, TON0146	UniFrax	Firewall insulation.
Dow Corning Silicone Sealant	RTV 736	Any Source	Provide air-tight seal between cabin and engine compartment.
Isopropyl Alcohol	99% or higher purity	Any Source	Remove adhesive.

(b) Insert hot air valve cable (wrapped with Fiberfrax) through cable pass-through and into position. (Refer to 20-10)

(c) Slide cable through clamp mounted to the angle bracket and engine mount.

Note: Ensure clamp is positioned properly and that controls do not interfere with any other components.

(d) Secure cable and clamp to the angle bracket.

(e) Slide lower cable stop over the inner core wire.

(f) Secure lower cable stop bolt and inner core wire to hot air valve actuation arm.

(g) Apply silicone adhesive over entire cable pass-through on both sides of firewall. (Refer to 20-10)

(h) Secure cable to linkage shaft with bolt, washers, and nut.

(i) Wrap clamp around upper end of hot air valve control cable.

(j) Tighten bolt, washers, and nut to secure cable and clamp to cable bracket.

(k) Adjust and secure the inner core wire cable stop. (Refer to 21-60)

(l) Install MFD. (Refer to 31-60)

(m) Install RH kick plate. (Refer to 25-10)

(n) Install engine cowling. (Refer to 71-10)

(o) Verify proper operation of temperature controls.

(3) Adjustment/Test - Hot Air Valve Control Cable

(a) Remove MFD. (Refer to 31-60)

(b) *Serials 1005 thru 1007:* Loosen the upper cable stop.

(c) Remove engine cowling. (Refer to 71-10)

(d) Loosen cable stop bolt from inner core wire (located above hot air valve actuation arm).

(e) Loosen hot air valve actuation arm cable stop bolt.

(f) Set temperature control knob to full heat position.

(g) Position hot air valve flap in the full heat position by pushing down on the control arm.

(h) Secure heater cable core wire to hot air valve actuation arm by tightening bolt into actuation arm cable stop.

(i) Set temperature control knob to full off position.

(j) Slide lower cable stop up to outer cable housing and secure cable stop bolt.

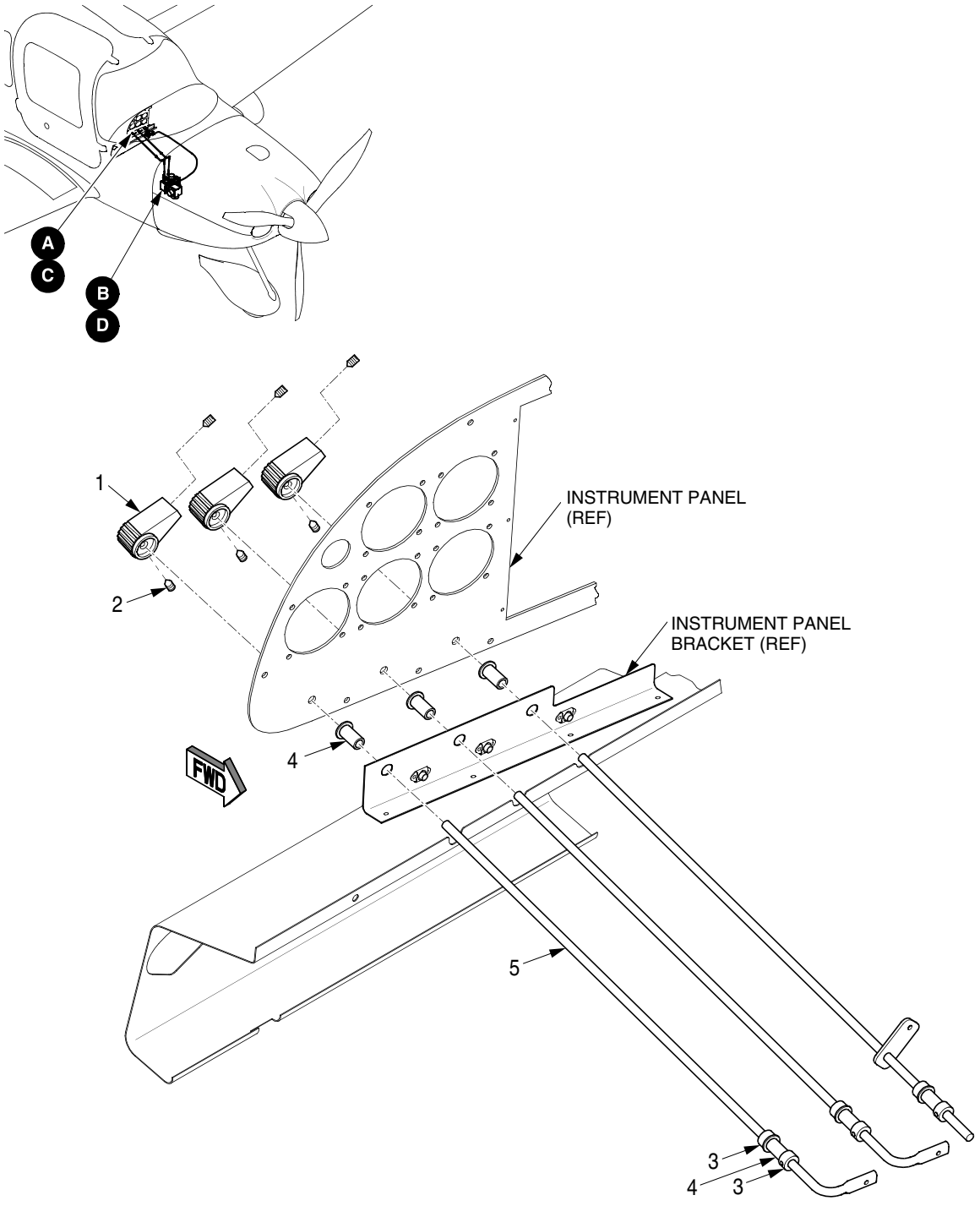
(k) *Serials 1005 thru 1007:* Slide upper cable stop against linkage shaft mounting bolt assembly.

(l) Verify hot air valve is fully closed with no gap.

(m) Install MFD. (Refer to 31-60)

(n) Install engine cowling. (Refer to 71-10)

(o) Verify proper operation of temperature controls.



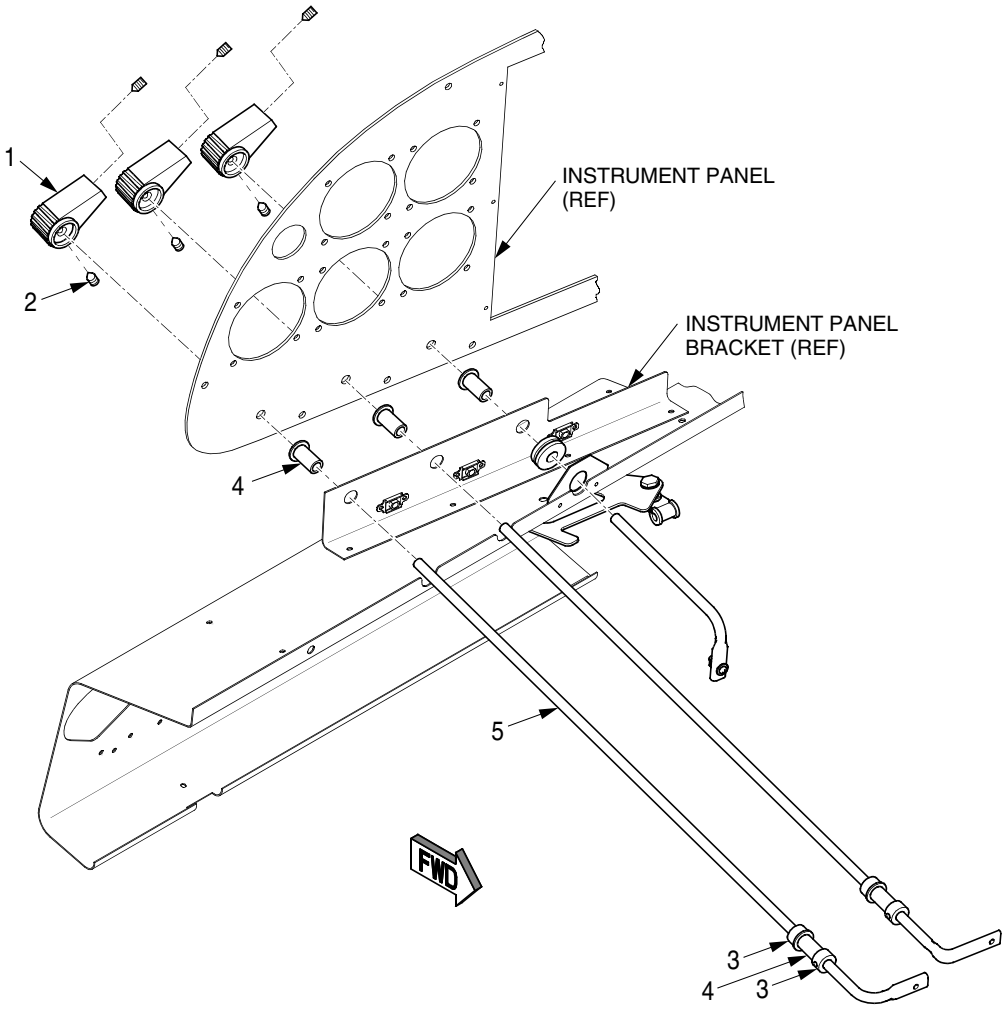
LEGEND
1. Control Knob
2. Set Screw
3. Shaft Collar
4. Bushing
5. Linkage Shaft

Serials 1005 thru 1267.

DETAIL A

SR20_MM21_1136A

Figure 21-601
Cabin Air Control Assembly - Serials 1005 thru 1267 (Sheet 1 of 4)



LEGEND
1. Control Knob
2. Set Screw
3. Shaft Collar
4. Bushing
5. Linkage Shaft

Serials 1268 thru 1632, 1634 thru 1638.

DETAIL C

SR20_MM21_1985A

Figure 21-601
Cabin Air Control Assembly - Serials 1268 thru 1638 (Sheet 2 of 4)

EFFECTIVITY:
Serials 1268 thru 1638

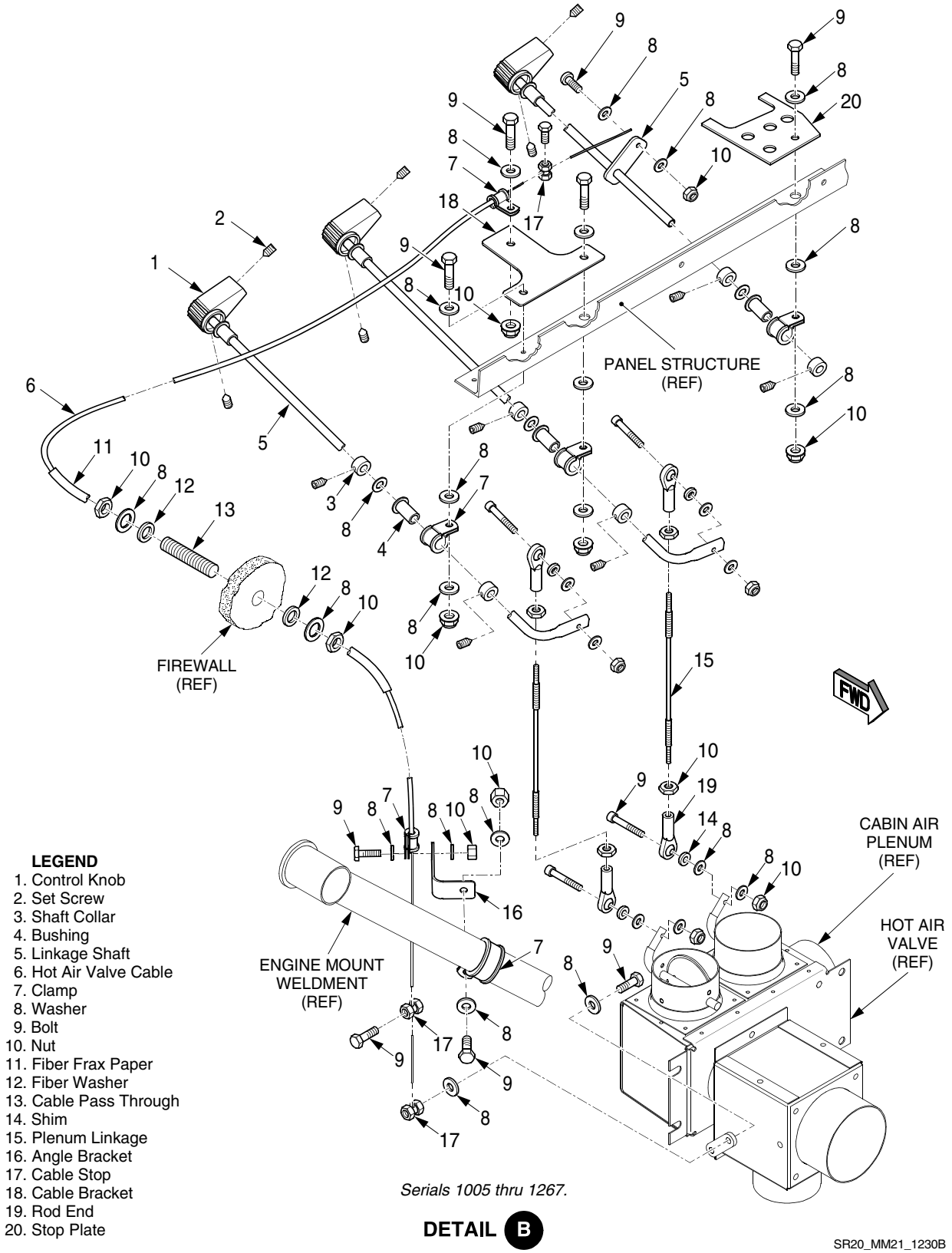
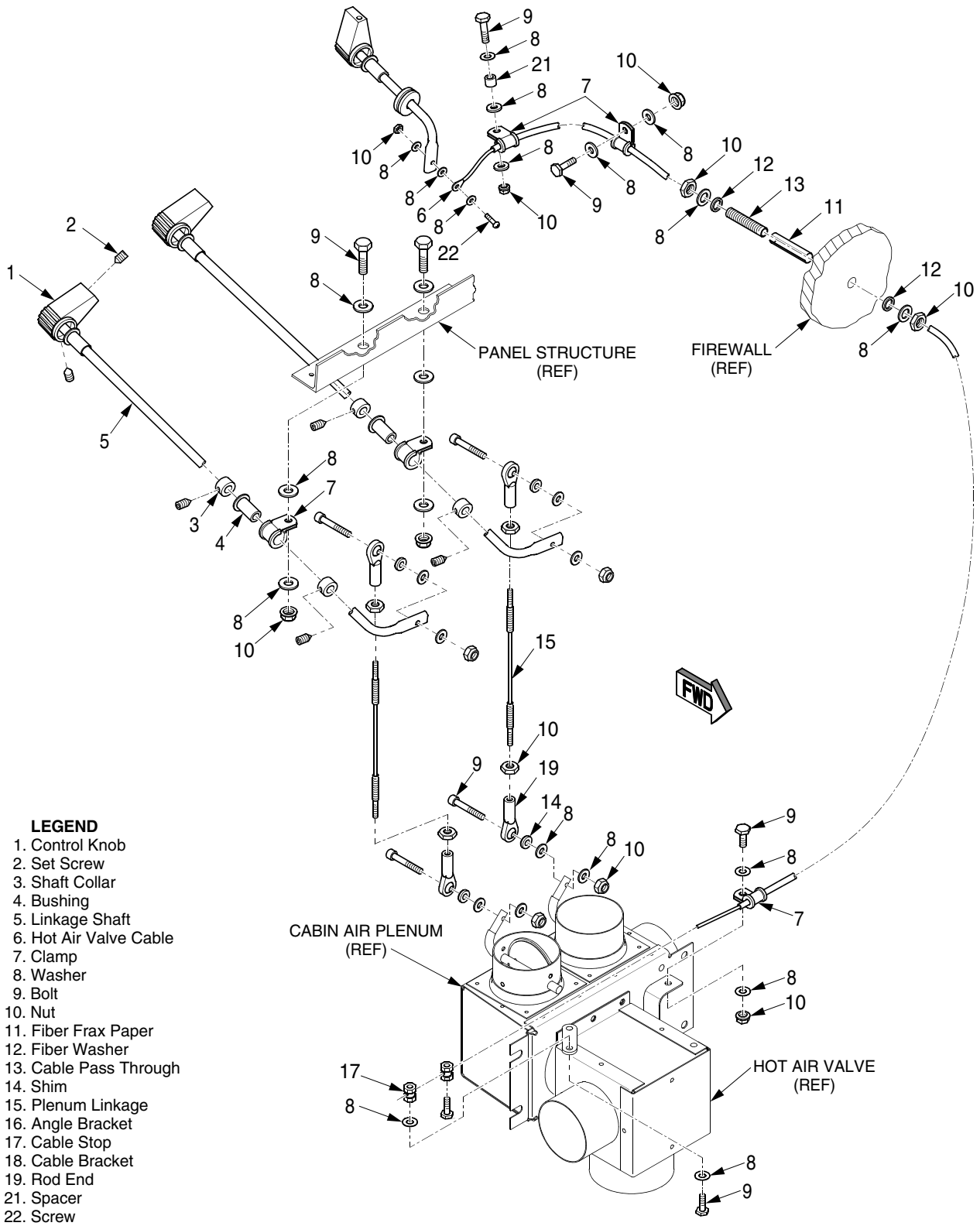


Figure 21-601
Cabin Air Control Assembly Installation - Serials 1005 thru 1267 (Sheet 3 of 4)



Serials 1268 thru 1632, 1634 thru 1638.

DETAIL D

SR20_MM21_1986A

Figure 21-601
Cabin Air Control Assembly Installation - Serials 1268 thru 1638 (Sheet 4 of 4)

C. Cabin Air Control Knobs - *Serials 1639 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 21-602)**

(1) Removal - Cabin Air Control Knob

(a) Loosen set screw securing control knob to cam shaft assembly.

(b) Remove knob from airplane.

(2) Installation - Cabin Air Control Knob

(a) Rotate cam shaft assembly fully counter-clockwise.

(b) Position control knob to cam shaft assembly in fully counter-clockwise position.

(c) Install set screw securing control knob to cam shaft assembly.

(d) Perform Inspection/Check - Cabin Air Control Knob. (Refer to 21-60)

(3) Inspection/Check - Cabin Air Control Knob

(a) Verify control knob orientation aligns with corresponding function on graphic overlay.

(b) Ensure control knob rotates cam shaft assembly through full range of motion without excess binding, friction, or slippage.

D. Cabin Air Control Assembly - *Serials 1639 thru 1885* (See Figure 21-602)

(1) Removal - Cabin Air Control Assembly

(a) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(b) Remove glareshield. (Refer to 25-10)

(c) Remove cabin air control knobs. (Refer to 21-60)

(d) Remove bolt, washer, and wire stop securing cabin air coupler linkage to air flow control lever.

(e) Remove nut, washers, and spacer securing airflow linkage to airflow cam lever.

(f) Remove nut, washers, and spacer securing defrost linkage to vent bellcrank.

(g) Remove nut, washers, and spacer securing heat linkage to vent bellcrank.

(h) Remove bolt, washers, clamp, and nut securing cabin air control assembly rod to wire loom.

(i) Remove screws and washers securing cabin air control assembly to bracket. Remove cabin air control assembly from airplane.

(2) Disassembly - Cabin Air Control Assembly

(a) Remove bolt, washers, and spacer securing temperature cam lever to cam assembly.

(b) Remove bolt, washers, and spacer securing airflow cam lever to cam assembly.

(c) Remove shaft collar, spring, and washer securing vent cam assembly, nylon ball, and detent spring to switch plate.

(d) Remove shaft collar, spring, and washer securing temperature cam assembly, nylon ball, and detent spring to switch plate.

(e) Remove shaft collar, spring, and washer securing airflow cam assembly, nylon ball, and detent spring to switch plate.

(3) Assembly - Cabin Air Control Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell ASG22	MIL-G-81322	Any Source	Lubricate control assembly.

(b) Position airflow cam assembly to switch plate and secure with shaft collar, spring, and washer. Compress spring such that shaft collar is flush to switch plate bushing. Tighten set screw.

(c) Position temperature cam assembly to switch plate and secure with shaft collar, spring, and washer. Compress spring such that shaft collar is flush to switch plate bushing. Tighten set screw.

(d) Position vent cam assembly, washer, spring, and shaft collar to switch plate but do not tighten.

(e) Insert detent spring into vent cam.

(f) Position control assembly vertically with bellcranks facing up.

(g) Position nylon ball in detent hole between vent cam and switch plate.

(h) Press vent cam and detent spring down to ball and fully compress while pressing shaft collar flush to switch plate bushing. Tighten set screw.

(i) Insert nylon ball and detent spring into temperature cam.

(j) While compressing detent spring with washers, position temperature cam lever to cam assembly and secure with bolt, washers, and spacer.

(k) Insert nylon ball and detent spring into airflow cam.

(l) While compressing detent spring with washers, position airflow cam lever to cam assembly and secure with bolt, washers, and spacer.

(m) Perform Inspection/Check - Cabin Air Control Assembly. (Refer to 21-60)

(n) Ensure proper operation of airflow control cam assembly.

1 Verify knob moves freely through full range of motion from stop to stop.

2 Verify no detectable or significant friction change or binding exists between cam and cam lever.

3 Verify cam reaches end stop pins before reaching end travel within cam lever slot.

4 Verify knob rotates outer tri-axial control lever.

(o) Ensure proper operation of vent control cam assembly.

1 Verify no detectable or significant friction change or binding exists between cam and cam lever.

2 Verify knob rotates inner tri-axial control lever.

(p) Ensure proper operation of temperature control cam assembly.

1 Verify knob moves freely through full range of motion from stop to stop.

2 Verify no detectable or significant friction change or binding exists between cam and cam lever.

3 Verify cam reaches end stop pins before reaching end travel within cam lever slot.

4 Verify knob rotates middle tri-axial control lever.

(4) Installation - Cabin Air Control Assembly

(a) Set air flow control to OFF position.

(b) Set vent control to DEFROST position.

(c) Set temperature control to HOT position.

(d) Position cabin air control assembly to instrument panel bracket and secure with screws and washers.

(e) Position cabin air control assembly rod to wire loom and secure with bolt, washers, clamp, and nut.

(f) Position heat linkage to control bellcrank and secure with spacer, washers, and nut.

(g) Position defrost linkage to control bellcrank and secure with spacer, washers, and nut.

(h) Position airflow linkage to airflow cam lever assembly and secure with spacer, washers, and nut.

(i) Position cabin air coupler linkage to air flow control lever and secure with bolt, washer, and wire stop.

(j) Install cabin air control knobs. (Refer to 21-60)

(k) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(l) Install glareshield. (Refer to 25-10)

(m) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(5) Inspection/Check - Cabin Air Control Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell ASG22	MIL-G-81322	Any Source	Lubricate control assembly.

(b) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

Note: Lubricant is allowed between control cam assemblies and microswitch rollers but is not required.

(d) Lubricate cabin air control assembly.
1 Apply lubricant between control cam assemblies and face of switch plate.
2 Apply lubricant between spacer and inside of temperature and airflow cam lever slots.
3 Apply lubricant between detent balls, springs, control cam assemblies, and switch plate.
(e) Rotate control knobs through all positions to facilitate distribution of lubricant.
(f) Verify control knobs move through full range of motion without excess binding or friction.
(g) Install glareshield. (Refer to 25-10)
(h) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(6) Adjustment/Test - Cabin Air Control Assembly
(a) Set airflow control knob to OFF position.

CAUTION: Any gap when control is in off position is unacceptable.

(b) Verify distribution manifold airflow valve is in the closed position.
(c) Set airflow control knob to MAXIMUM AIRFLOW position available without selecting fan.
(d) Verify distribution manifold airflow valve is in the open position.
(e) Ensure airflow control knob moves through full range of motion without excess binding or friction.
(f) *Serials 1639 thru 1885 w/ Fan:* Verify fan operation.
1 Rotate airflow control knob through all FAN positions.
2 Verify all fan positions are selectable and micro switches engage as appropriate for selected function.
3 Verify distribution manifold airflow valve demonstrates no appreciable motion when selecting between fan positions.
(g) Rotate all eyeball outlets counter-clockwise to open positions.
(h) Set vent control knob fully counter-clockwise to PANEL VENTS ONLY position.
(i) At distribution manifold, verify windshield defroster and floor vent valves are closed, and panel vent valve is open.
(j) Rotate vent control knob 90° clockwise to PANEL AND FLOOR VENTS ONLY position.
(k) Verify windshield defroster valve is closed, and panel and floor vent valves are open.
(l) Rotate vent control knob 90° clockwise to DEFROSTER, FLOOR VENTS, AND PANEL VENTS position.
(m) At distribution manifold, verify windshield defroster, panel and floor vent valves are open.
(n) Rotate vent control knob 90° clockwise to DEFROSTER ONLY position.
(o) Rotate all eyeball outlets clockwise to closed positions.
(p) At distribution manifold, verify windshield defroster valve is open, and panel and floor vent valves are closed.
(q) Ensure vent control knob moves through full range of motion without excess binding or friction.
(r) Set temperature control knob to HEAT OFF position.
1 Verify hot air valve is fully closed with no gap.
2 Verify fresh air valve is fully open.
3 Verify no control assembly micro switches are engaged.
4 Verify angle between airflow control lever and cabin air coupler/distribution manifold linkage is approximately a 5 - 15°.

5 Verify coupler torque tube lever is rotated aft and angle between hot air valve/coupler linkage and coupler torque tube lever is approximately 10 - 15°.

(s) Set temperature control knob to MAXIMUM HEAT position.

1 Verify hot air valve is fully open.

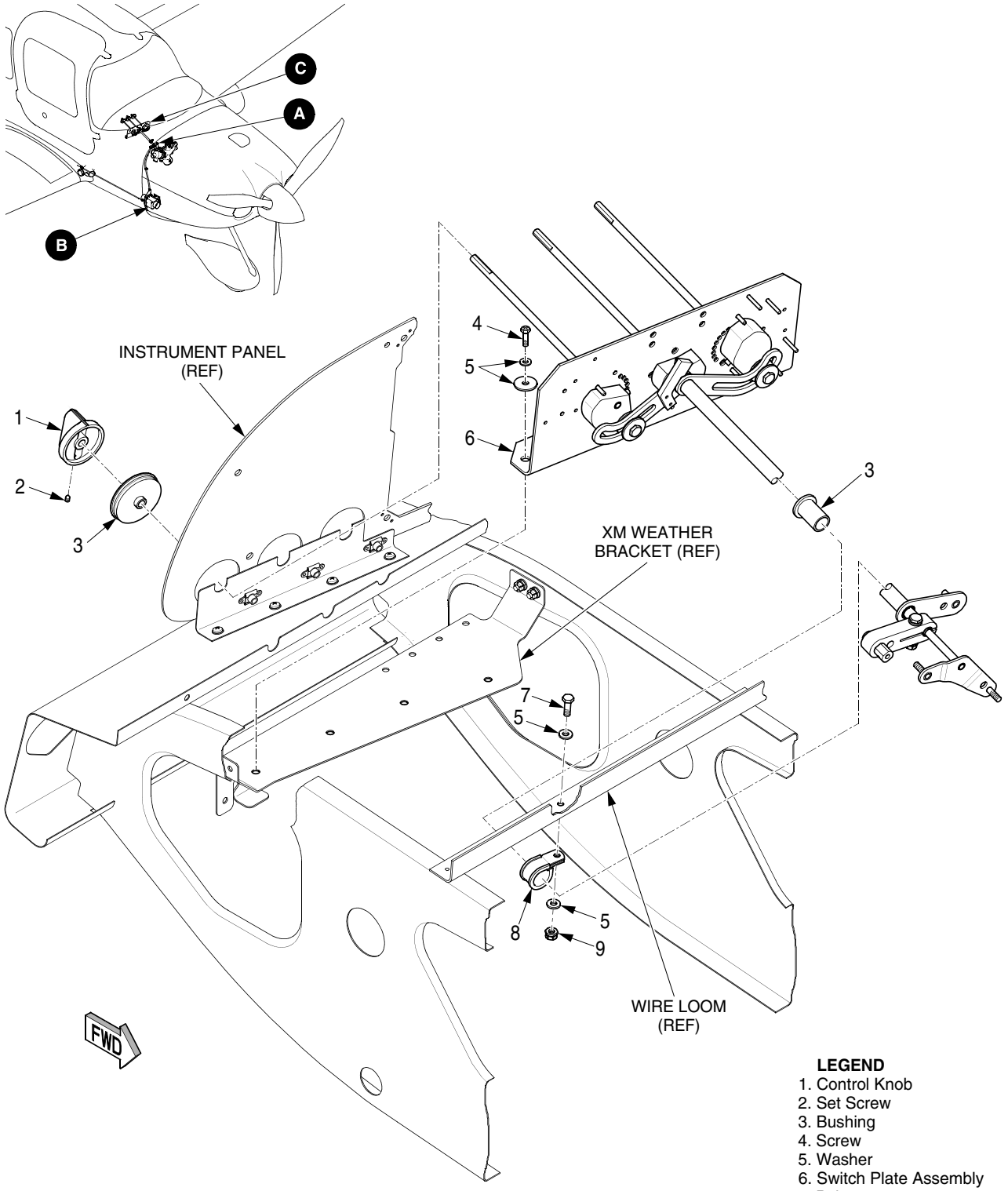
2 Verify fresh air valve is fully closed.

(t) If control knob range of travel is can not be achieved smoothly, the flapper door range of travel must be increased.

1 Verify full travel exists at fresh air valve. If full travel is not present, perform Adjustment/Test - Cabin Air Coupler/Fresh Air Valve Linkage to adjust tension. (Refer to 21-60)

2 Verify full travel exists at hot air valve. If full travel is not present, perform Adjustment/Test - Cabin Air Coupler/Distribution Manifold Linkage to adjust tension. (Refer to 21-60)

(u) Ensure temperature control knob moves through full range of motion without excess binding or friction.



LEGEND
1. Control Knob
2. Set Screw
3. Bushing
4. Screw
5. Washer
6. Switch Plate Assembly
7. Bolt
8. Clamp
9. Nut

DETAIL A

SR20_MM21_2317A

Serials 1633, 1639 thru 1877, 1879 thru 1885.

Figure 21-602
Cabin Air Control Assembly Installation - Serials 1639 thru 1885 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1639 thru 1885

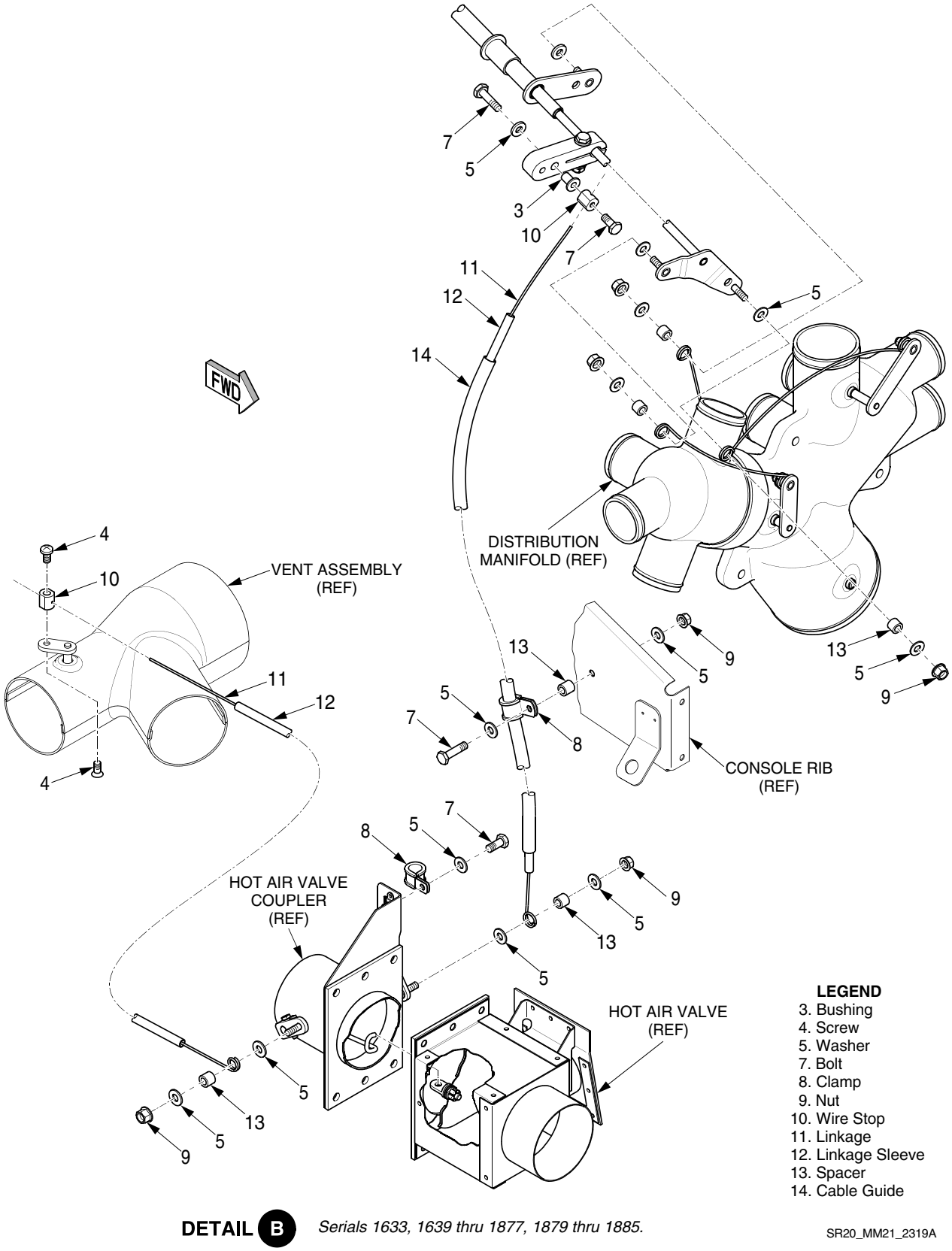
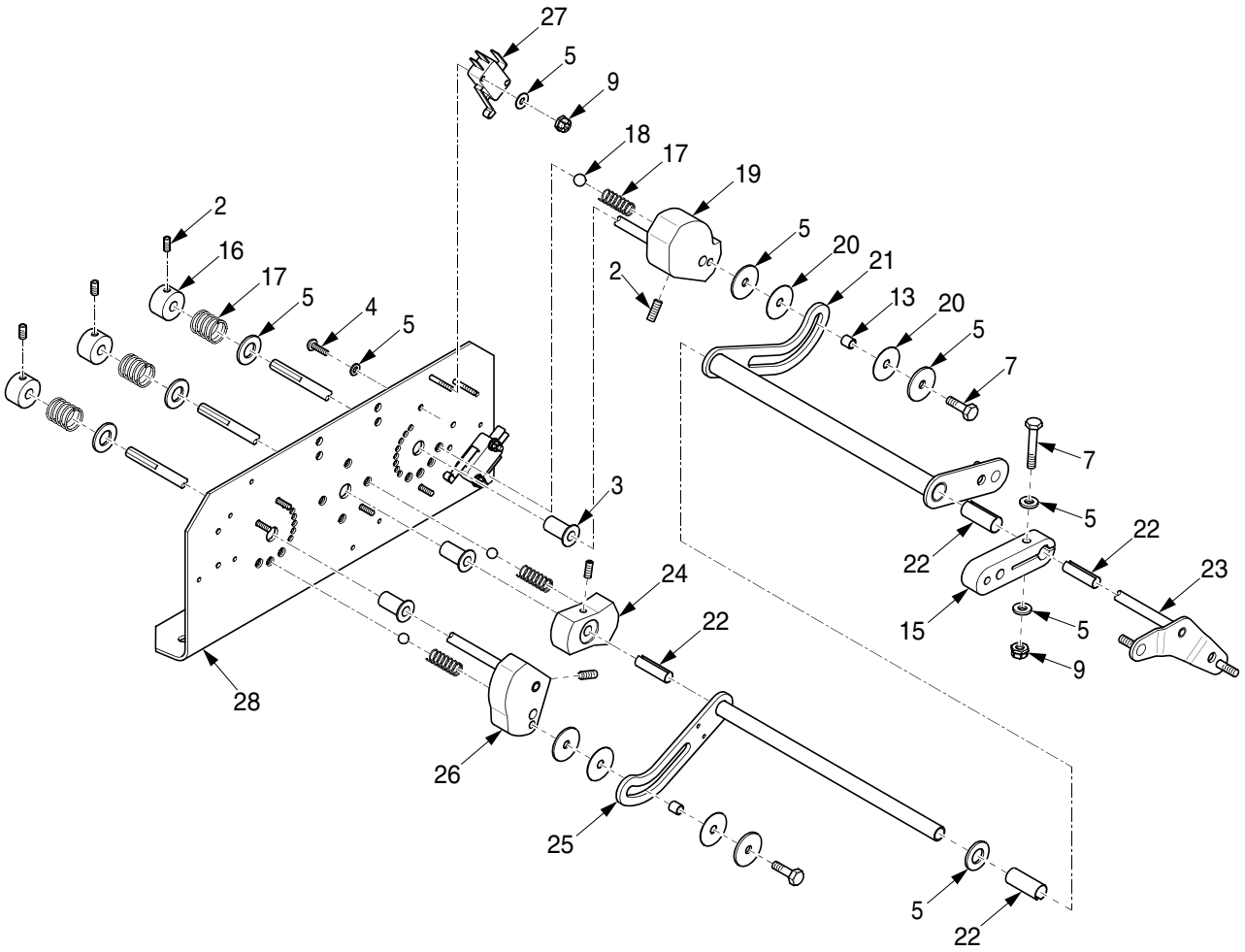


Figure 21-602
Cabin Air Control Assembly Installation - Serials 1639 thru 1885 (Sheet 2 of 3)



LEGEND

2. Set Screw
3. Bushing
4. Screw
5. Washer
7. Bolt
9. Nut
13. Spacer
15. Airflow Control Lever
16. Shaft Collar Assembly
17. Spring
18. Nylon Ball
19. Fan Control Cam
20. Teflon Washer
21. Air Flow Cam Lever
22. Nylon Strip
23. Vent Bellcrank
24. Vent Control Cam
25. Temperature Cam Lever
26. Temperature Control Cam
27. Limit Switch
28. Switch Plate

DETAIL C

Serials 1633, 1639 thru 1877, 1879 thru 1885.

SR20_MM21_2332B

Figure 21-602
Cabin Air Control Assembly Installation - Serials 1639 thru 1885 (Sheet 3 of 3)

EFFECTIVITY:
Serials 1639 thru 1885

E. Cabin Air Coupler/Distribution Manifold Linkage - *Serials 1639 thru 1885* **(See Figure 21-603)**

(1) Removal - Cabin Air Coupler/Distribution Manifold Linkage

(a) Remove glareshield. (Refer to 25-10)

(b) Remove RH kick plate. (Refer to 25-10)

(c) Remove nut, washers, and spacer securing linkage to cabin air coupler.

(d) Remove bolt, washer, and clamp securing linkage, sleeve, and cable guide to cabin air coupler.

(e) Remove bolt, washers, spacer, nut, and clamp securing linkage, sleeve, and cable guide to console.

(f) Remove bolt, washer, and wire stop securing linkage to airflow control lever.

(2) Installation - Cabin Air Coupler/Distribution Manifold Linkage

(a) Position linkage to cabin air coupler and secure with spacer, washers, and nut.

(b) Position linkage, sleeve, and cable guide to cabin air coupler and secure with bolt, washer, and clamp.

(c) Position linkage, sleeve, and cable guide to console and secure with bolt, washers, spacer, nut, and clamp.

(d) Position linkage to distribution manifold and secure with bolt, washer, and wire stop. Ensure approximately 0.5 inch (1.27 cm) of wire extends beyond wire stop.

(e) Perform Adjustment/Test - Cabin Air Coupler/Distribution Manifold Linkage. (Refer to 21-60)

(f) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(g) Install RH kick plate. (Refer to 25-10)

(h) Install glareshield. (Refer to 25-10)

(3) Adjustment/Test - Cabin Air Coupler/Distribution Manifold Linkage (See Figure 21-603)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wet/Dry Vacuum	-	Any Source	Provide Airflow.
Duct Tape	-	Any Source	Seal.

Note: To provide maximum airflow, ensure any gaps between vacuum nozzle and intake are sealed.

(b) Using duct tape, attach vacuum exhaust nozzle to hot air valve intake.

(c) Remove MFD. (Refer to 31-60)

(d) Remove glareshield. (Refer to 25-10)

(e) Remove lower windshield trim. (Refer to 25-10)

(f) Set temperature control knob to maximum COLD position. (Refer to 21-00)

(g) Set vacuum to exhaust function and turn on vacuum.

(h) At cabin air control assembly, locate hot air valve arm at forward end of control rod.

(i) Loosen arm clamping bolt securing clamp to control rod.

CAUTION: Ensure wire stop remains stationary when loosening wire stop bolts.

(j) Loosen forward wire stop bolt. If necessary, loosen aft wire stop bolt until wire stop is free.

(k) Ensure cable passes through wire stop freely.

(l) Looking forward, position arm upward to 3 o'clock position.

WARNING: **If flapper door does not completely close, firewall protection of the airplane is compromised.**

(m) Push cable downward to close flapper door on hot air valve completely.

(n) If length of wire does not permit any necessary adjustment to reduce tension, replace wire linkage.

(o) Tighten forward wire stop bolt (and aft, if loosened).

(p) Verify airflow in cabin has been reduced or eliminated.

(q) Set temperature control knob to maximum HOT position. (Refer to 21-00)

(r) Adjust hot air valve arm upward to open flapper door on hot air valve completely.

(s) Tighten arm clamping bolt securing clamp to control rod.

(t) Verify wire at aft side of firewall is not bowing or bent. If so, loosen arm clamping bolt and reduce wire tension. Re-tighten arm clamping bolt and re-inspect wire for bend.

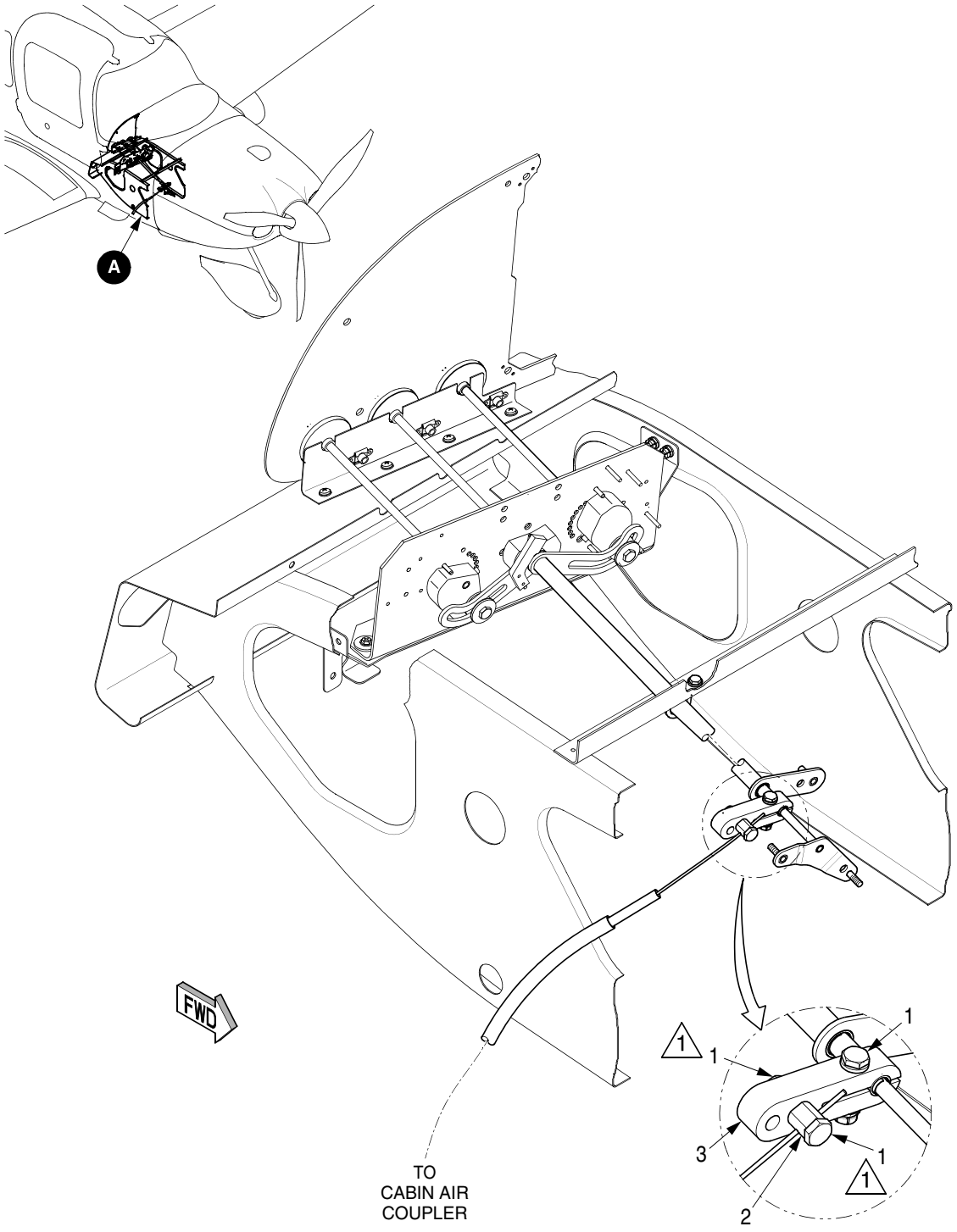
(u) Verify airflow is present in cabin.

(v) Turn off vacuum. Remove duct tape securing vacuum nozzle to intake.

(w) Install lower windshield trim. (Refer to 25-10)

(x) Install glareshield. (Refer to 25-10)

(y) Install MFD. (Refer to 31-60)



NOTE

1 Loosen forward wire stop bolt. If necessary, loosen aft wire stop bolt until wire stop is free.

LEGEND

1. Bolt
2. Wire Stop
3. Arm

DETAIL A

Serials 1633, 1639 thru 1877, 1879 thru 1885.

SR20_MM21_2422A

Figure 21-603
Cabin Air Coupler/Distribution Manifold Linkage - Serials 1639 thru 1885

EFFECTIVITY:
Serials 1639 thru 1885

F. Cabin Air Coupler/Fresh Air Valve Linkage - *Serials 1639 thru 1885* (See Figure 21-604)

(1) Removal - Cabin Air Coupler/Fresh Air Valve Linkage

(a) Remove RH kick plate. (Refer to 25-10)

(b) Remove sidewall air duct trim. (Refer to 25-10)

(c) Remove nut, washers, and spacer securing linkage to cabin air coupler.

(d) Remove screw securing linkage to wire stop on fresh air valve.

(e) Remove cable ties securing linkage to fuselage. Remove linkage from airplane.

(2) Installation - Cabin Air Coupler/Fresh Air Valve Linkage

(a) Position linkage to fresh air valve and secure to wire stop with screw. Ensure approximately 0.5 inch (1.27 cm) of wire extends beyond wire stop.

(b) Position linkage to cabin air coupler and secure with spacer, washers, and nut.

(c) Rotate cabin air coupler arm aft as far as limit will allow, then position linkage sleeve over linkage approximately 1.0 inch (2.54 cm) from arm and secure with cable tie approximately 3.0 inch (7.62 cm) from end of linkage sleeve.

(d) Rotate fresh air valve arm forward as far as limit will allow, then position linkage sleeve over linkage approximately 1.0 inch (2.54 cm) from arm and secure with cable tie approximately 4.0 inch (10.16 cm) from end of linkage sleeve.

(e) Install cable ties securing linkage to fuselage.

(f) Perform Adjustment/Test - Cabin Air Coupler/Fresh Air Valve Linkage. (Refer to 21-60)

(g) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(h) Install sidewall air duct trim. (Refer to 25-10)

(i) Install RH kick plate. (Refer to 25-10)

(3) Adjustment/Test - Cabin Air Coupler/Fresh Air Valve Linkage. (See Figure 21-604)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wet/Dry Vacuum	-	Any Source	Provide Airflow.
Duct Tape	-	Any Source	Seal.

Note: To provide maximum airflow, ensure any gaps between vacuum nozzle and inlet are sealed.

(b) Using duct tape, attach vacuum exhaust nozzle to ram air inlet on RH wing.

(c) Set temperature control knob to maximum HOT position. (Refer to 21-00)

(d) Set vacuum to exhaust function and turn on vacuum.

(e) Remove bottom section of door seal to expose upper seam of sidewall duct cover. (Refer to 25-10)

(f) At upper seam of sidewall duct cover, use flashlight to locate arm on fresh air valve.

CAUTION: Ensure wire stop remains stationary when loosening wire stop screws.

(g) Loosen upper wire stop screw. If loosening upper wire stop screw does not free up wire stop, lower wire stop screw must be loosened.

1 Remove RH cabin seat. (Refer to 25-10)

2 Remove RH sidewall air duct trim. (Refer to 25-10)

3 Loosen lower wire stop screw until wire stop is free.

(h) Ensure cable passes through wire stop freely.

EFFECTIVITY:
Serials 1639 thru 1885

Note: Using inboard line-of-sight as the 12 o'clock position, the fully closed position for the flapper door is obtained with the fresh air valve arm positioned at 8 o'clock.

(i) Adjust fresh air valve arm to rotate flapper door to nominal position between current and closed position.

(j) If length of wire does not permit any necessary adjustment to reduce tension, replace wire linkage.

(k) Tighten upper wire stop screw.

(l) If lower wire stop screw was loosened:

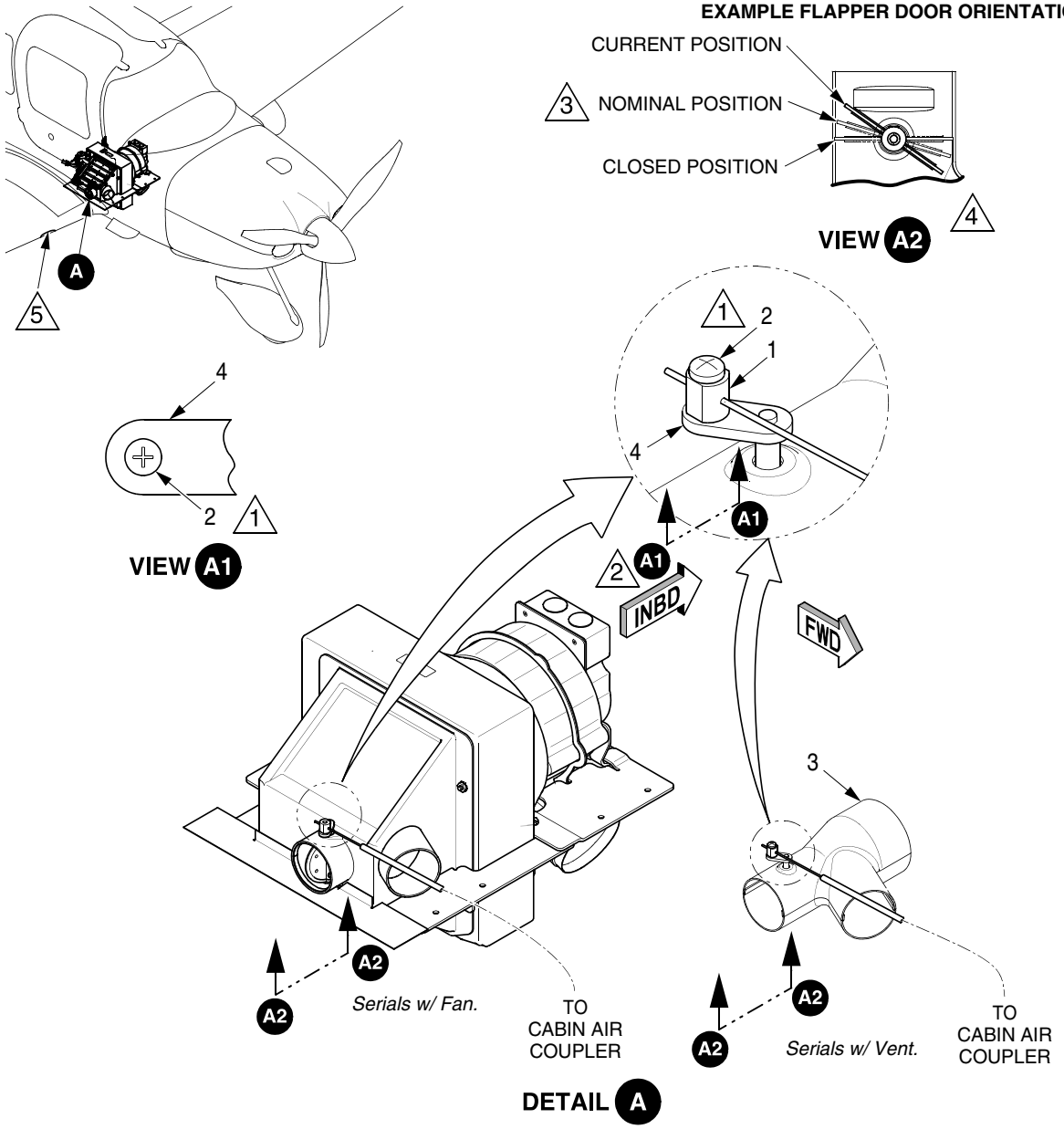
1 Tighten lower wire stop screw.

2 Install RH sidewall air duct trim. (Refer to 25-10)

3 Install RH cabin seat. (Refer to 25-10)

(m) Verify airflow in cabin has been reduced or eliminated.

(n) Turn off vacuum. Remove duct tape securing vacuum nozzle to inlet.



Serials 1633, 1639 thru 1877, 1879 thru 1885.

NOTE

1. Loosen upper wire stop bolt. If necessary, loosen lower wire stop bolt until wire stop is free.
2. Using inboard line-of-sight as the 12 o'clock position, the fully closed position for the flapper door is obtained with the fresh air valve arm positioned at 8 o'clock.
3. Adjust fresh air valve arm to rotate flapper door to nominal position between current and closed position.
4. Bottom of fresh air valve removed for clarity.
5. Using duct tape, attach vacuum exhaust nozzle to ram air inlet on RH wing.

LEGEND

1. Wire Stop
2. Screw
3. Fresh Air Valve
4. Arm

SR20_MM21_2424A

Figure 21-604
Cabin Air Coupler/Fresh Air Valve Linkage - Serials 1639 thru 1885

G. Cabin Air Control Assembly - *Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 21-605)

(1) Removal - Cabin Air Control Assembly

(a) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(b) Remove glareshield. (Refer to 25-10)

(c) Remove cabin air control knobs. (Refer to 21-60)

(d) Disconnect wire harness from coupler drive assembly.

(e) Remove nut, washers, and spacer securing defrost linkage to vent bellcrank.

(f) Remove bolt, washers, spacer, and nut securing heat linkage to vent bellcrank.

(g) Remove bolt, washers, and nut securing cabin air control assembly rod bearing to wire loom.

(h) Remove screws and washers securing cabin air control assembly to bracket. Remove cabin air control assembly from airplane.

(2) Disassembly - Cabin Air Control Assembly

(a) Remove bolt, washers, and spacer securing temperature cam lever to cam assembly.

(b) Remove shaft collar, spring, and washer securing vent cam assembly, nylon ball, and detent spring to switch plate.

(c) Remove shaft collar, spring, and washer securing temperature cam assembly, nylon ball, and detent spring to switch plate.

(d) Remove set screws securing coupler to airflow shaft and switch.

(e) Remove nut and washers securing airflow switch to switch plate.

(3) Assembly - Cabin Air Control Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell ASG22	MIL-G-81322	Any Source	Lubricate control assembly.

(b) Position airflow switch to switch plate and secure with washers and nut.

(c) Position airflow coupler and shaft to airflow switch and secure with set screws.

(d) Position temperature cam assembly to switch plate and secure with shaft collar, spring, and washer. Compress spring such that shaft collar is flush to switch plate bushing. Tighten set screw.

(e) Position vent cam assembly, washer, spring, and shaft collar to switch plate but do not tighten.

(f) Insert detent spring into vent cam.

(g) Position control assembly vertically with bellcranks facing up.

(h) Position nylon ball in detent hole between vent cam and switch plate.

(i) Press vent cam and detent spring down to ball and fully compress while pressing shaft collar flush to switch plate bushing. Tighten set screw.

(j) Insert nylon ball and detent spring into temperature cam.

(k) While compressing detent spring with washers, position temperature cam lever to cam assembly and secure with bolt, washers, and spacer.

(l) Perform Inspection/Check - Cabin Air Control Assembly. (Refer to 21-60)

(m) Ensure proper operation of airflow switch assembly.

1 Verify knob moves freely through full range of motion from stop to stop.

2 Verify no detectable or significant friction change or binding exists.

(n) Ensure proper operation of vent control cam assembly.

1 Verify no detectable or significant friction change or binding exists between cam and cam lever.

2 Verify knob rotates inner bi-axial control lever.

(o) Ensure proper operation of temperature control cam assembly.

1 Verify knob moves freely through full range of motion from stop to stop.

2 Verify no detectable or significant friction change or binding exists between cam and cam lever.

3 Verify cam reaches end stop pins before reaching end travel within cam lever slot.

4 Verify knob rotates outer bi-axial control lever.

(4) Installation - Cabin Air Control Assembly

(a) Set airflow control to OFF position.

(b) Set vent control to DEFROST position.

(c) Set temperature control to HOT position.

(d) Position cabin air control assembly to bracket and secure with screws and washers.

(e) Position cabin air control assembly rod bearing to wire loom and secure with bolt, washers, and nut.

(f) Position heat linkage to vent bellcrank and secure with bolt, washers, spacer, and nut.

(g) Position defrost linkage to vent bellcrank and secure with spacer, washers, and nut.

(h) Connect wire harness from coupler drive assembly.

(i) Install cabin air control knobs. (Refer to 21-60)

(j) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(k) Install glareshield. (Refer to 25-10)

(l) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(5) Inspection/Check - Cabin Air Control Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell ASG22	MIL-G-81322	Any Source	Lubricate control assembly.

(b) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

Note: Lubricant is allowed between control cam assemblies and microswitch rollers but is not required.

(d) Lubricate cabin air control assembly.

1 Apply lubricant between control cam assemblies and face of switch plate.

2 Apply lubricant between spacer and inside of temperature cam lever slot.

3 Apply lubricant between detent balls, springs, control cam assemblies, and switch plate.

(e) Rotate control knobs through all positions to facilitate distribution of lubricant.

(f) Verify control knobs move through full range of motion without excess binding or friction.

(g) Install glareshield. (Refer to 25-10)

(h) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(6) Adjustment/Test - Cabin Air Control Assembly

(a) Set airflow control knob to OFF position.

CAUTION: Any gap when control is in off position is unacceptable.

(b) Verify mixing chamber firewall flapper is in the closed position.

(c) Set airflow control knob to first detent clockwise from OFF position.

(d) Verify mixing chamber firewall flapper is in the open position.

(e) Ensure airflow control knob moves through full range of motion without excess binding or friction.

(f) *Serials w/ Fan:* Verify fan operation.

1 Rotate airflow control knob through all FAN positions.

2 Verify all fan positions are selectable and fan operates as appropriate for selected function.

3 Verify mixing box firewall flapper demonstrates no appreciable motion when selecting between fan positions.

(g) Rotate all eyeball outlets counter-clockwise to open positions.

(h) Set vent control knob fully counter-clockwise to PANEL VENTS ONLY position.

(i) At distribution manifold, verify windshield defroster and floor vent valves are closed, and panel vent valve is open.

(j) Rotate vent control knob 90° clockwise to PANEL AND FLOOR VENTS ONLY position.

(k) Verify windshield defroster valve is closed, and panel and floor vent valves are open.

(l) Rotate vent control knob 90° clockwise to DEFROSTER, FLOOR VENTS, AND PANEL VENTS position.

(m) At distribution manifold, verify windshield defroster and floor vent valves are open.

(n) Rotate vent control knob 90° clockwise to DEFROSTER ONLY position.

(o) Rotate all eyeball outlets clockwise to closed positions.

(p) At distribution manifold, verify windshield defroster valve is open, and floor vent valves are closed.

(q) Ensure vent control knob moves through full range of motion without excess binding or friction.

(r) Set temperature control knob to HEAT OFF position.

1 Verify mixing chamber hot air intake valve is fully closed with no gap.

2 Verify mixing chamber fresh air intake valve is fully open.

3 Verify no control assembly micro switches are engaged.

(s) Set temperature control knob to MAXIMUM HEAT position.

1 Verify mixing chamber hot air intake valve is fully open.

2 Verify mixing chamber fresh air intake valve is fully closed.

(t) Ensure temperature control knob moves through full range of motion without excess binding or friction.

H. Temperature Control Linkage - *Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 21-605)

(1) Removal - Temperature Control Linkage

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove glareshield. (Refer to 25-10)

(c) Remove RH kick plate. (Refer to 25-10)

(d) Remove bolts, washers, nuts, and clamps securing linkage, sleeve, and cable guide to console.

(e) Remove bolt, washers, spacer, and nut securing linkage to temperature control lever.

(f) Remove bolt, washers, and wire stop securing linkage to mixing chamber lever.

(g) Remove bolt, washers, nut, and clamp securing linkage to mixing chamber guide bracket.

(h) Remove sealant from cable pass-through.

(i) Pull temperature control cable and Fiberfrax paper out of cable pass-through.

(2) Installation - Temperature Control Linkage

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove sealant.
1/8” Fiberfrax Paper	970J or TON0146	UniFrax Corporation Niagara Falls, NY 14305 716-278-3800	Firewall insulation.
High Temperature Silicone Sealant	RTV 736	Dow Corning Corporation Midland, MI 48686-0994 989-496-4400	Sealant.

(b) Remove all old sealant from cable pass-through and firewall.

(c) Tighten nuts and washers securing cable pass-through to firewall.

(d) Using isopropyl alcohol, solvent clean cable pass-through and firewall. (Refer to 20-30)

(e) Wrap Fiberfrax paper around portion of control cable sleeve that passes through firewall so a tight fit exists between control cable sleeve and cable pass-through.

(f) Position linkage to temperature control lever and secure with bolt, washers, spacer, and nut.

(g) Position linkage to mixing chamber lever and secure with bolt, washers, and wire stop. Ensure approximately 0.5 inch (1.27 cm) of wire extends beyond wire stop.

(h) Position linkage to mixing chamber guide bracket and secure with bolt, washers, nut, and clamp.

(i) Position linkage, sleeve, and cable guide to console and secure with bolts, washers, nuts, and clamps.

(j) Fillet seal and cover entire cable pass-through on both sides of firewall with high temperature silicone sealant. (Refer to 20-10)

(k) Allow sealant to cure.

(l) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(m) Install RH kick plate. (Refer to 25-10)

(n) Install glareshield. (Refer to 25-10)

(o) Install engine cowling. (Refer to 71-10)

(p) Verify proper operation of temperature controls.

EFFECTIVITY:
Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics

(3) Adjustment/Test - Temperature Control Linkage

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wire Cutter	-	Any Source	Trim linkage wire.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(c) Connect 28 ±1 VDC external power to external power receptacle.
(d) Set BAT 1 switch to ON position.
(e) Remove engine cowling. (Refer to 71-10)
(f) Remove clamps securing fresh air duct and heat exchanger duct to air mixing chamber. Disconnect ducts. (Refer to 21-40)
(g) Loosen wire stop on linkage wire.
(h) Set temperature control knob to full cold.
(i) Position heat control arm on air mixing chamber so that hot air valve is fully closed.
(j) Tighten wire stop on linkage wire.
(k) Rotate temperature control knob from full cold to full hot.
(l) Verify fresh air valve is fully closed.
(m) Cycle temperature control knob a few times to verify hot and fresh air valves open/close fully without binding.

Note: If fresh air valve does not close fully, verify aircraft batteries are sufficiently charged (supplying 20 volts minimum). If charge is sufficient, repeat Adjustment/Test - Temperature Control Linkage to reposition linkage wire as required until both valves close fully.

(n) Verify approximately 0.5 inch (1.3 cm) of wire extends beyond wire stop. Use wire cutter to
(o) remove any excess wire length.
(p) Position fresh air duct and heat exchanger duct to air mixing chamber, and secure with clamps. (Refer to 21-40)
(q) Install engine cowling. (Refer to 71-10)
(r) Set BAT 1 switch to OFF position.
(s) Disconnect 28 ±1 VDC external power from external power receptacle.
(t) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

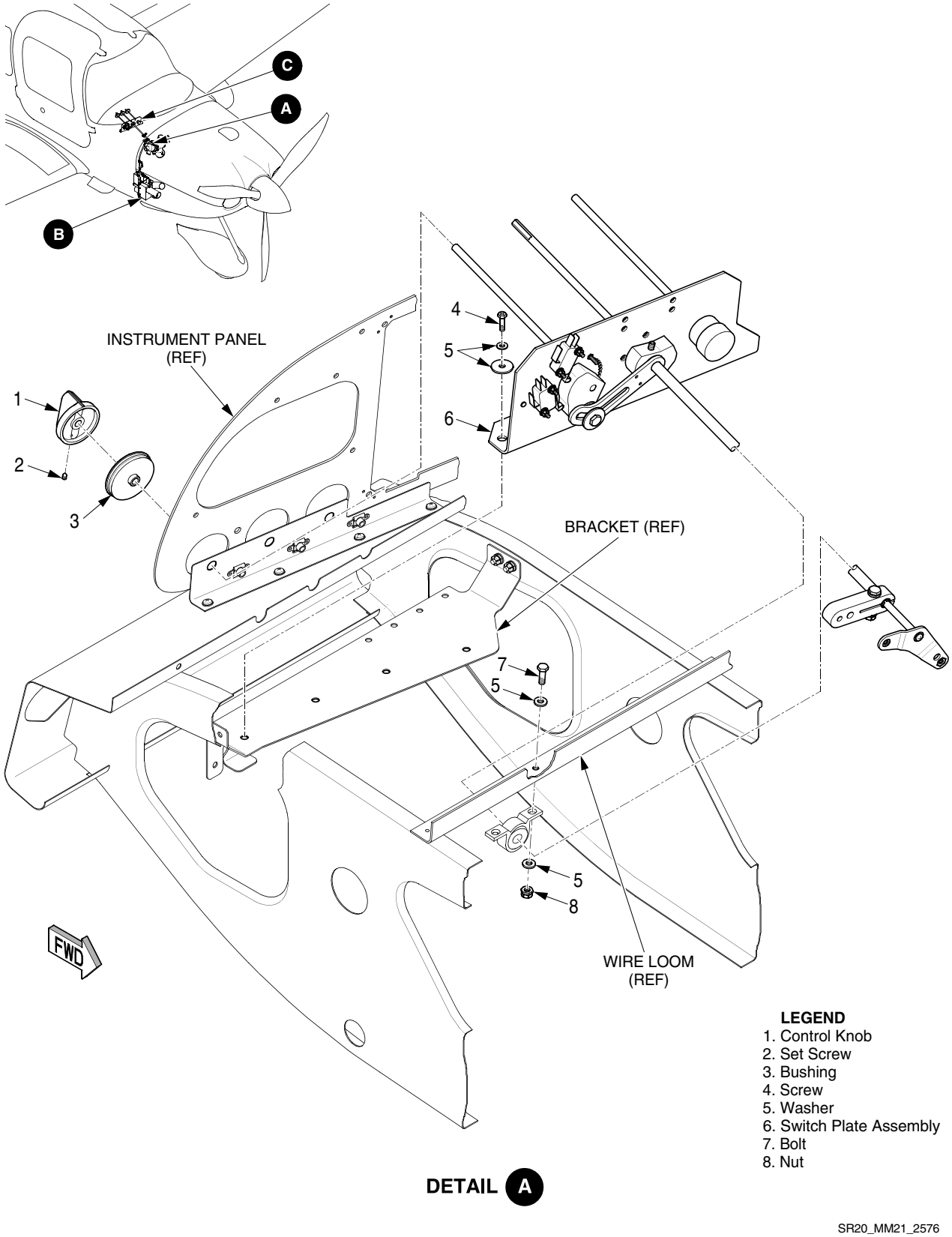


Figure 21-605
Cabin Air Control Assembly - Serials 1886 & subs w/o Perspective Avionics (Sheet 1 of 3)

EFFECTIVITY:
Serials 1886 & subs w/o Perspective Avionics

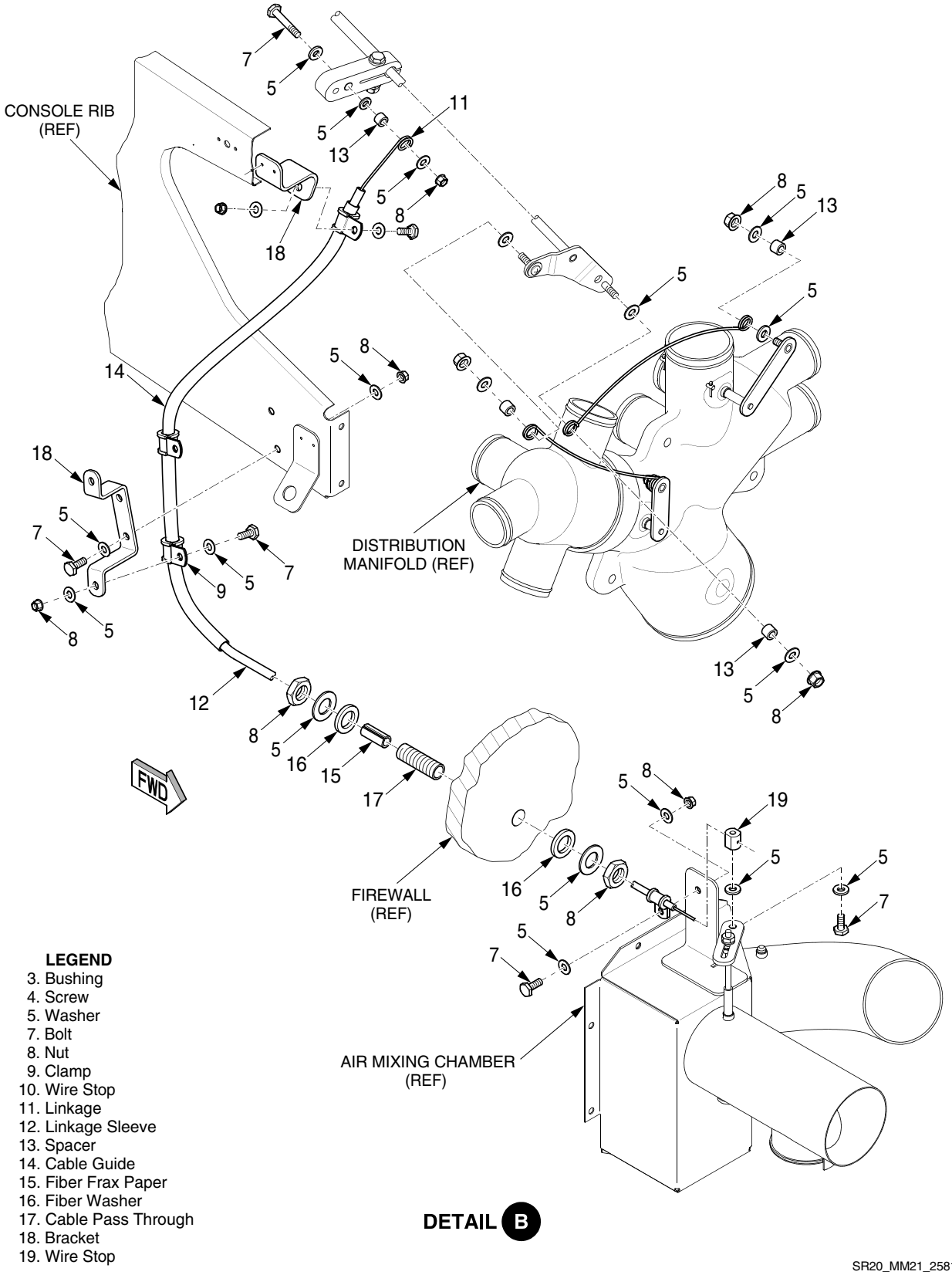
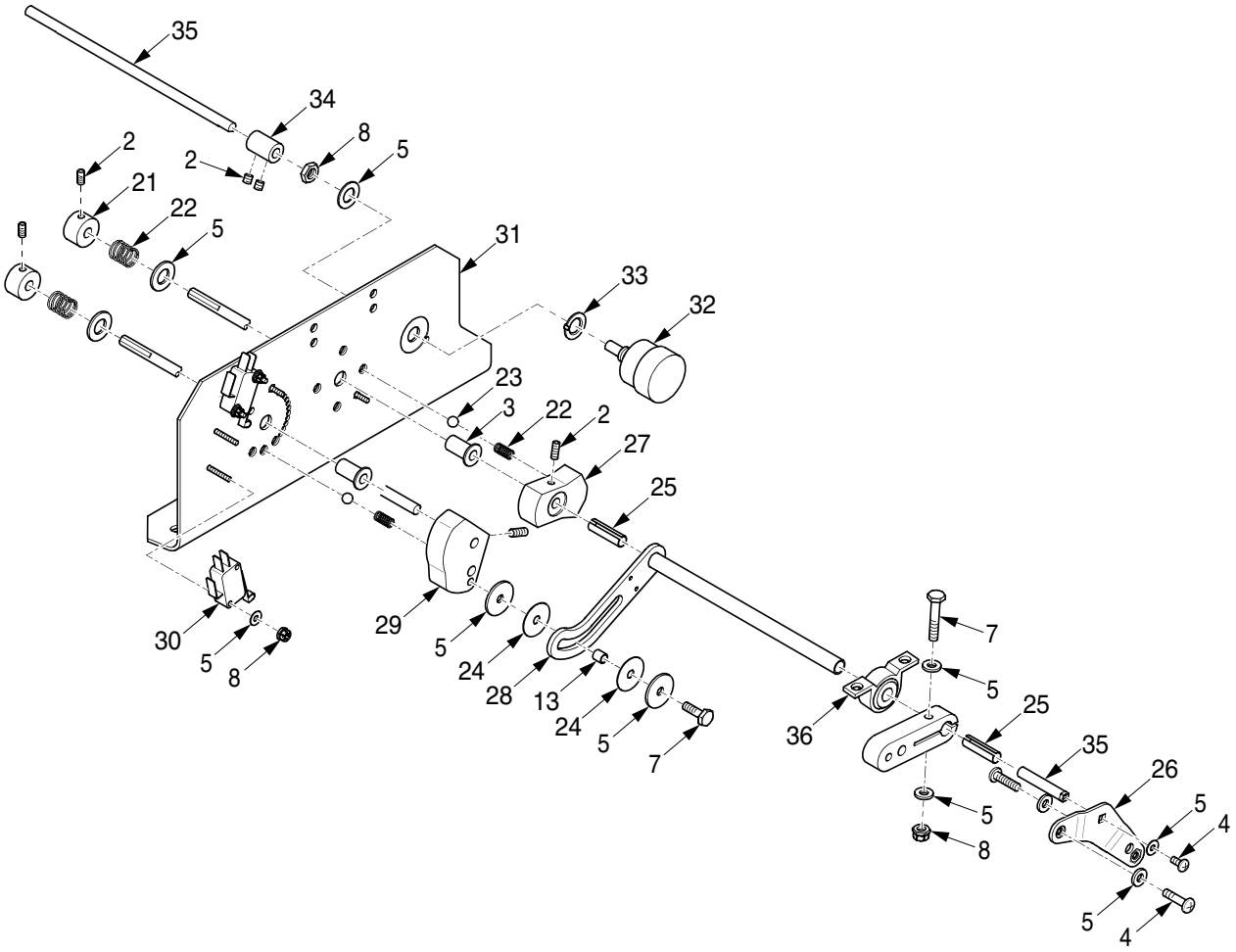


Figure 21-605
Cabin Air Control Assembly - Serials 1886 & subs w/o Perspective Avionics (Sheet 2 of 3)



LEGEND

2. Set Screw
3. Bushing
4. Screw
5. Washer
7. Bolt
8. Nut
13. Spacer
20. Airflow Control Lever
21. Shaft Collar Assembly
22. Spring
23. Nylon Ball
24. Teflon Washer
25. Nylon Strip
26. Vent Bellcrank
27. Vent Control Cam
28. Temperature Cam Lever
29. Temperature Control Cam
30. Limit Switch
31. Switch Plate
32. Switch
33. Tab Washer
34. Coupler
35. Shaft
36. Bearing

DETAIL C

SR20_MM21_2582

Figure 21-605
Cabin Air Control Assembly - Serials 1886 & subs w/o Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 1886 & subs w/o Perspective Avionics

I. Control Assembly Switches - *Serials 1639 & subs w/ Fan and w/o Perspective Avionics* **(See Figure 21-602) (See Figure 21-605)**

(1) Removal - Control Assembly Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull COMPRESSOR/CONTROL PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect wire harness connectors from switch.

(e) Remove nuts and washers securing switch to switch plate.

(2) Installation - Control Assembly Switch

(a) Position switch to switch plate and secure with washers and nuts.

(b) Connect wire harness connectors to switch.

(c) Rotate control knobs through all positions, ensuring switches engage as appropriate for selected function.

(d) Install glareshield. (Refer to 25-10)

(e) Reset COMPRESSOR/CONTROL PANEL circuit breaker.

J. Relays - *Serials 1639 & subs w/ Fan and w/o Perspective Avionics* **(See Figure 21-606)**

(1) Removal - Relays

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONDENSER, COMPRESSOR/CONTROL, and FAN circuit breakers.

(c) Remove MFD. (Refer to 31-60)

(d) Remove relay from relay socket.

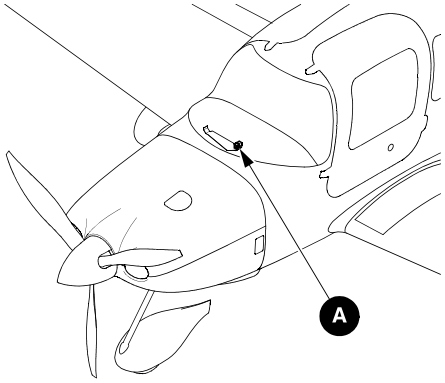
(2) Installation - Relays

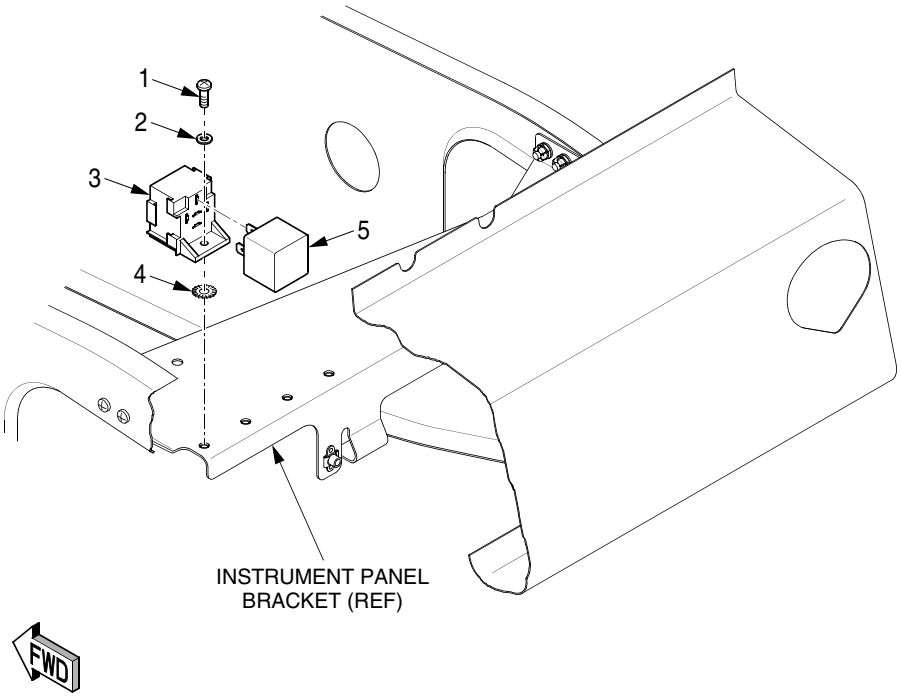
(a) Position relay to relay socket and press firmly to secure.

(b) Install MFD. (Refer to 31-60)

(c) Reset CONDENSER, COMPRESSOR/CONTROL, and FAN circuit breakers.

EFFECTIVITY:
Serials 1639 & subs w/ Fan and w/o Perspective Avionics





LEGEND
1. Screw
2. Washer
3. Relay Socket
4. Star Washer
5. Relay

DETAIL A

Serials 1639 & subs w/ Fan and w/o Perspective Avionics.

SR20_MM21_2344

Figure 21-606
Relay Installation - Serials 1639 and subs w/ Fan and w/o Perspective Avionics

K. ECS Display Panel - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-607)**

(1) Removal - ECS Display Panel

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ECS FAN circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect electrical connector from ECS controller.

(e) Remove nuts and washers securing ECS display panel to instrument panel. Remove display panel from airplane.

(2) Installation - ECS Display Panel

(a) Position ECS display panel to instrument panel and secure with washers and nuts.

(b) Connect electrical connector to ECS controller.

(c) Install glareshield. (Refer to 25-10)

(d) Reset ECS FAN circuit breaker.

L. ECS Controller - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 21-607)**

(1) Removal - ECS Controller

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ECS FAN circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect electrical connector from ECS controller.

(e) Remove screws and washers securing ECS controller to bracket. Remove controller from airplane.

(2) Installation - ECS Controller

(a) Position ECS controller to bracket and secure with screws and washers.

(b) Connect electrical connector to ECS controller.

(c) Install glareshield. (Refer to 25-10)

(d) Reset ECS FAN circuit breaker.

M. Cabin Air Control Assembly - *Serials w/ Perspective Avionics* **(See Figure 21-607)**

(1) Removal - Cabin Air Control Assembly

(a) Remove glareshield. (Refer to 25-10)

(b) Remove RH kick plate. (Refer to 25-10)

(c) Cabin air coupler actuator

1 Remove nut, washers, and spacer securing linkage to cabin air coupler actuator lever.

2 Disconnect electrical connectors from cabin air coupler actuator.

3 Remove screws and washers securing cabin air coupler actuator to cabin air coupler.

(d) Dual actuator

1 Disconnect electrical connectors from dual actuator.

2 Remove distribution manifold. (Refer to 21-20)

3 Remove bolt, washers, and spacer securing dual actuator to distribution manifold.

(2) Installation - Cabin Air Control Assembly

(a) Cabin air coupler actuator

1 Position cabin air coupler actuator to cabin air coupler and secure with screws and washers.

2 Connect electrical connectors to cabin air coupler actuator.

3 Position linkage to cabin air coupler actuator lever and secure with nut, washers, and spacer.

(b) Dual actuator

1 Position dual actuator to distribution manifoldand secure with bolt, washers, and spacer.

2 Install distribution manifold. (Refer to 21-20)

3 Connect electrical connectors to dual actuator.

(c) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(d) Install RH kick plate. (Refer to 25-10)

(e) Install glareshield. (Refer to 25-10)

(f) Verify proper operation of temperature controls.

(3) Adjustment/Test - Cabin Air Control Assembly

(a) Set airflow control knob to OFF position.

CAUTION: Any gap when control is in off position is unacceptable.

(b) Verify mixing chamber firewall flapper is in the closed position.

(c) Set airflow control knob to first detent clockwise from OFF position.

(d) Verify mixing chamber firewall flapper is in the open position.

(e) Ensure airflow control knob moves through full range of motion without excess binding or friction.

(f) *Serials w/ Fan or Air Conditioning:* Verify fan operation.

1 Rotate airflow control knob through all FAN positions.

2 Verify all fan positions are selectable and fan operates as appropriate for selected function.

3 Verify mixing box firewall flapper demonstrates no appreciable motion when selecting between fan positions.

(g) Rotate all eyeball outlets counter-clockwise to open positions.

(h) Set vent control knob fully counter-clockwise to PANEL VENTS ONLY position.

(i) At distribution manifold, verify windshield defroster and floor vent valves are closed, and panel vent valve is open.

(j) Rotate vent control knob 90° clockwise to PANEL AND FLOOR VENTS ONLY position.

(k) Verify windshield defroster valve is closed, and panel and floor vent valves are open.

(l) Rotate vent control knob 90° clockwise to DEFROSTER, FLOOR VENTS, AND PANEL VENTS position.

(m) At distribution manifold, verify windshield defroster and floor vent valves are open.

(n) Rotate vent control knob 90° clockwise to DEFROSTER ONLY position.

(o) Rotate all eyeball outlets clockwise to closed positions.

(p) At distribution manifold, verify windshield defroster valve is open, and floor vent valves are closed.

(q) Ensure vent control knob moves through full range of motion without excess binding or friction.

(r) Set temperature control knob to HEAT OFF position.

1 Verify mixing chamber hot air intake valve is fully closed with no gap.

2 Verify mixing chamber fresh air intake valve is fully open.

3 Verify no control assembly micro switches are engaged.

(s) Set temperature control knob to MAXIMUM HEAT position.

1 Verify mixing chamber hot air intake valve is fully open.

2 Verify mixing chamber fresh air intake valve is fully closed.

(t) *Serials w/ Air Conditioning:* Set temperature control knob to AIR CONDITIONING position.

1 Verify air conditioning micro switch engages.

2 Verify air conditioning recirculation micro switch does not engage.

3 Verify mixing chamber hot air intake valve is fully closed with no gap.

4 Verify mixing chamber fresh air intake valve is fully open.

(u) *Serials w/ Air Conditioning:* Set temperature control knob to RECIRCULATION position.

1 Verify air conditioning micro switch engages.

2 Verify air conditioning recirculation micro switch engages.

3 Verify mixing chamber hot air valve is fully closed with no gap.

4 Verify mixing chamber fresh air valve is fully open.

5 Verify mixing chamber firewall flapper is fully closed with no gap.

6 Verify evaporator recirculation doors are fully open.

(v) Ensure temperature control knob moves through full range of motion without excess binding or friction.

N. Temperature Control Linkage - *Serials w/ Perspective Avionics* (See Figure 21-607)

(1) Removal - Temperature Control Linkage

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove glareshield. (Refer to 25-10)

(c) Remove RH kick plate. (Refer to 25-10)

(d) Remove nut, washers, and spacer securing linkage to cabin air coupler actuator lever.

(e) Remove bolt, washers, and wire stop securing linkage to mixing chamber lever.

(f) Remove bolt, washers, nut, and clamp securing linkage to mixing chamber guide bracket.

(g) Remove sealant from cable pass-through.

(h) Pull temperature control cable and Fiberfrax paper out of cable pass-through.

(2) Installation - Temperature Control Linkage

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove sealant.
1/8” Fiberfrax Paper	970J or TON0146	UniFrax Corporation Niagara Falls, NY 14305 716-278-3800	Firewall insulation.
High Temperature Silicone Sealant	RTV 736	Dow Corning Corporation Midland, MI 48686-0994 989-496-4400	Sealant.

(b) Remove all old sealant from cable pass-through and firewall.

(c) Tighten nuts and washers securing cable pass-through to firewall.

(d) Using isopropyl alcohol, solvent clean cable pass-through and firewall. (Refer to 20-30)

(e) Wrap Fiberfrax paper around portion of control cable sleeve that passes through firewall so a tight fit exists between control cable sleeve and cable pass-through.

(f) Position linkage to cabin air coupler actuator lever and secure with nut, washers, and spacer.

(g) Position linkage to mixing chamber lever and secure with bolt, washers, and wire stop. Ensure approximately 0.5 inch (1.27 cm) of wire extends beyond wire stop.

(h) Position linkage to mixing chamber guide bracket and secure with bolt, washers, nut, and clamp.

(i) Fillet seal and cover entire cable pass-through on both sides of firewall with high temperature silicone sealant. (Refer to 20-10)

(j) Allow sealant to cure.

(k) Perform Adjustment/Test - Cabin Air Control Assembly. (Refer to 21-60)

(l) Install RH kick plate. (Refer to 25-10)

(m) Install glareshield. (Refer to 25-10)

(n) Install engine cowling. (Refer to 71-10)

(o) Verify proper operation of temperature controls.

(3) Adjustment/Test - Temperature Control Linkage

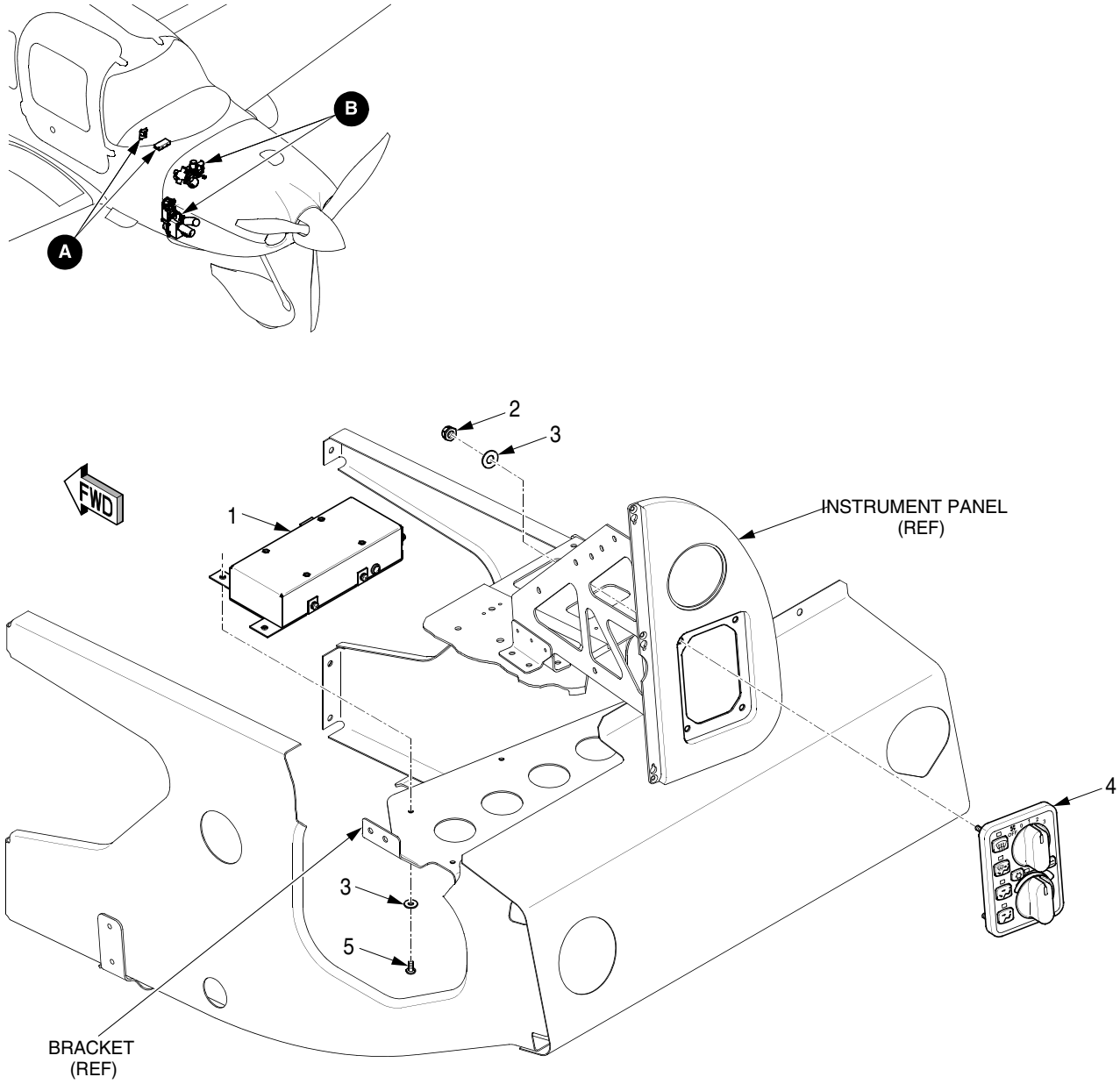
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wire Cutter	-	Any Source	Trim linkage wire.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(c) Connect 28 ±1 VDC external power to external power receptacle.
(d) Set BAT 1 switch to ON position.
(e) Remove engine cowling. (Refer to 71-10)
(f) Remove clamps securing fresh air duct and heat exchanger duct to air mixing chamber. Disconnect ducts. (Refer to 21-40)
(g) Loosen wire stop on linkage wire.
(h) Set temperature control knob to full cold.
(i) Position heat control arm on air mixing chamber so that hot air valve is fully closed.
(j) Tighten wire stop on linkage wire.
(k) Rotate temperature control knob from full cold to full hot.
(l) Verify fresh air valve is fully closed.
(m) Cycle temperature control knob a few times to verify hot and fresh air valves open/close fully without binding.

Note: If fresh air valve does not close fully, verify aircraft batteries are sufficiently charged (supplying 20 volts minimum). If charge is sufficient, repeat Adjustment/Test - Temperature Control Linkage to reposition linkage wire as required until both valves close fully.

(n) Verify approximately 0.5 inch (1.3 cm) of wire extends beyond wire stop. Use wire cutter to
(o) remove any excess wire length.
(p) Position fresh air duct and heat exchanger duct to air mixing chamber, and secure with clamps. (Refer to 21-40)
(q) Install engine cowling. (Refer to 71-10)
(r) Set BAT 1 switch to OFF position.
(s) Disconnect 28 ±1 VDC external power from external power receptacle.
(t) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.



LEGEND
1. ECS Controller
2. Nut
3. Washer
4. ECS Display Panel
5. Screw

DETAIL A

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM21_2753

Figure 21-607
ECS Display Panel and Controller Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

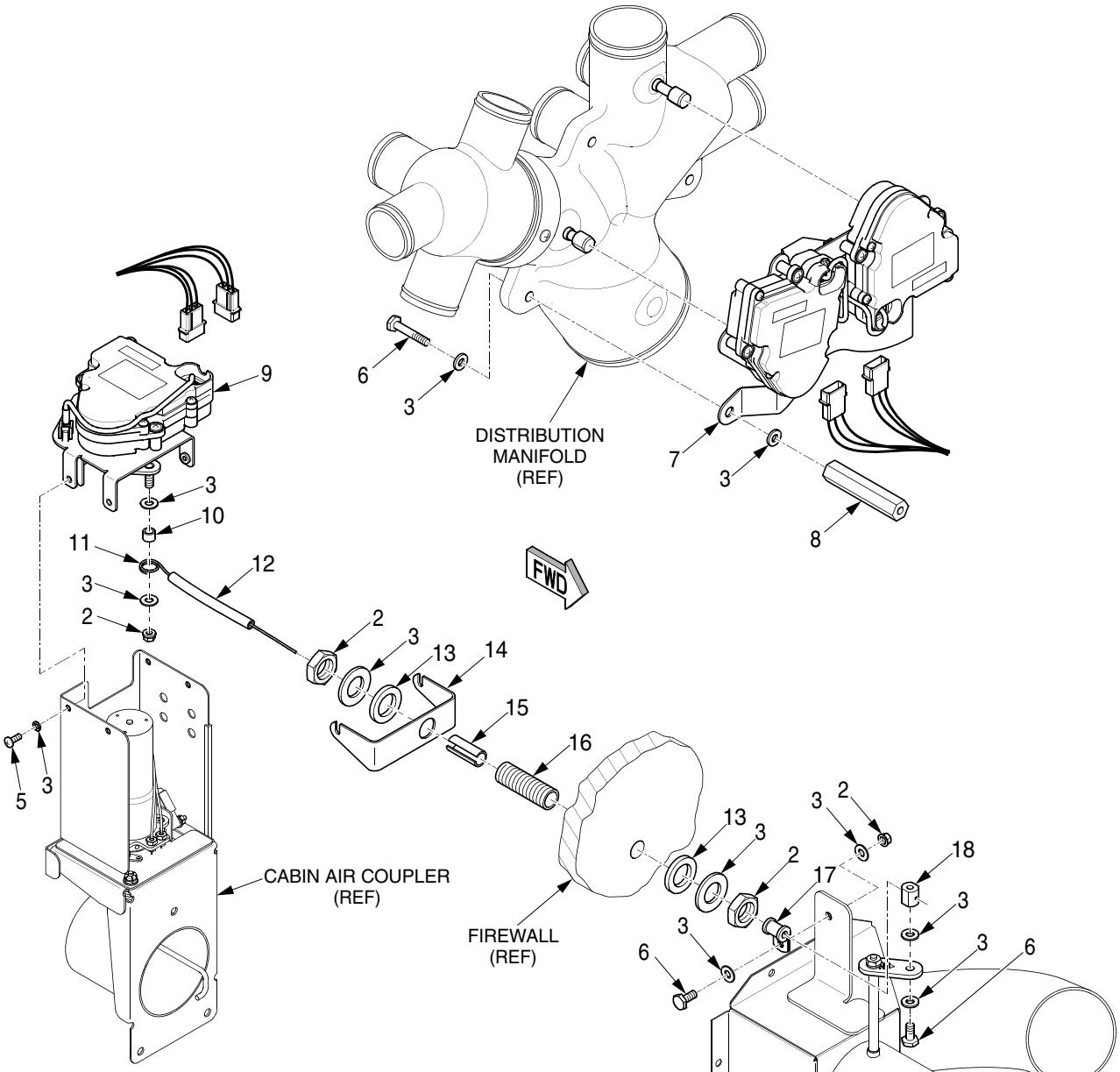


Figure 21-607
ECS Display Panel and Controller Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

O. Relays - *Serials 2016 & subs w/ Fan or Air Conditioning, and Perspective Avionics* (See Figure 21-608)

(1) Removal - Relays

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONDENSER, COMPRESSOR/CONTROL, and FAN circuit breakers.

(c) Remove MFD. (Refer to 31-60)

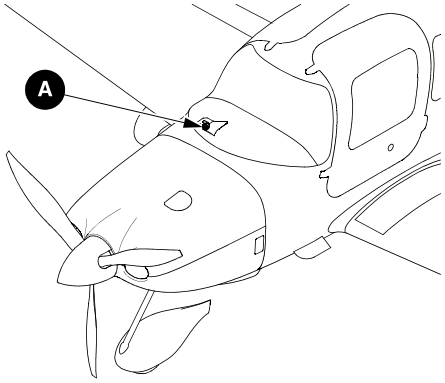
(d) Remove relay from relay socket.

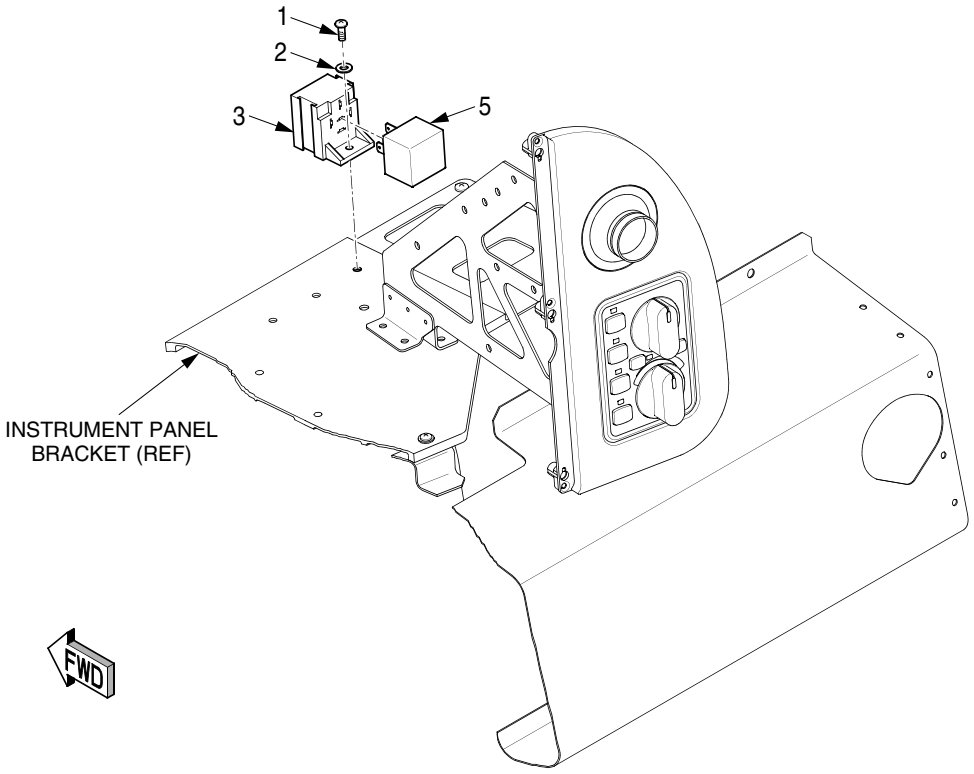
(2) Installation - Relays

(a) Position relay to relay socket and press firmly to secure.

(b) Install MFD. (Refer to 31-60)

(c) Reset CONDENSER, COMPRESSOR/CONTROL, and FAN circuit breakers.





LEGEND
1. Screw
2. Washer
3. Relay Socket
5. Relay

DETAIL A

Serials 2016 & subs w/ Fan or Air Conditioning, and w/ Perspective Avionics.

SR20_MM21_3155

Figure 21-608
Relay Installation - Serials 2016 and subs w/ Fan or Air Conditioning, and Perspective Avionics

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CHAPTER

22

AUTO FLIGHT

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AUTOFLIGHT

1. GENERAL

This chapter describes the airplane's automated guidance system. These systems offer a means of automatically or manually controlling the flight of the airplane by providing directional, heading, altitude, and attitude control.

Depending on the avionics package, the airplane may be equipped with the S-TEC System Twenty Autopilot System, S-TEC System Thirty Autopilot System, S-TEC System 55 Autopilot System, S-TEC System 55SR Autopilot System, S-TEC System 55X Autopilot System, or the Garmin GFC 700 Autopilot System.

The GFC 700 Autopilot System includes a Take-Off/Go-Around (TO/GA) switch providing speed-attitude correction.

System Twenty is described in 22-10. (Refer to 22-10)

System Thirty is described in 22-11. (Refer to 22-11)

System 55, 55SR, and 55X are described in 22-12. (Refer to 22-12)

GFC 700 Autopilot is described in 22-13. (Refer to 22-13)

TO/GA Switch is described in 22-20. (Refer to 22-20)

For additional information on the autopilot system integration, refer to the S-TEC System Twenty, S-TEC System Thirty, S-TEC System 55, 55SR, and 55X, or Perspective Integrated Avionics System Pilot's Guide for a complete description of the system, its operating modes, and additional detailed operating procedures. (Refer to 05-10)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Turn coordinator/roll computer annunciator lights fail to respond.	Master switch OFF.	Check switch is ON.
	Defective mechanism.	Check circuit breaker and correct. Replace instrument.
Turn coordinator/roll computer ball sluggish in returning to center.	Flat spot on ball.	Replace instrument.
Turn coordinator/roll computer incorrect sensitivity.	Out of calibration.	Replace instrument.
Turn coordinator/roll computer ball not centered when airplane is correctly trimmed.	Instrument not level in panel.	Level instrument.
Noisy gyro.	High voltage.	Check voltage in indicator and correct.
	Loose or defective rotor bearings.	Replace instrument.
In cold temperatures, turn coordinator/roll computer wing pointer fails to respond or is sluggish.	Oil in indicator too thick.	Replace instrument
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage in indicator and correct.
Needle not centered in TRK mode	Roll Centering out of adjustment.	Adjust Roll Centering.

SYSTEM TWENTY AUTOPILOT

1. DESCRIPTION

The S-TEC System Twenty (See Figure 22-101) is a single axis autopilot system that provides roll stability, heading hold, and NAV/GPS tracking capabilities controlled via the roll-trim cartridge. (Refer to 27-00). The system components consist of an electric turn coordinator/roll computer and a directional gyro (DG) or horizontal situation indicator (HSI) for heading hold. Roll axis information is sensed by the turn coordinator gyro. Heading information is provided to the autopilot by the DG or HSI. The operating controls for the S-TEC System Twenty Autopilot are located on the turn coordinator/roll computer mounted on the instrument panel.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Unexpected flight characteristics with autopilot engaged.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing (Refer to 34-10).

3. MAINTENANCE PRACTICES

A. Turn Coordinator/Roll Computer - *Serials 1005 thru 1336, 1337 & subs w/o PFD* (See Figure 22-102)

(1) Removal - Turn Coordinator/Roll Computer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull TURN COORDINATOR circuit breaker.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect instrument light connector and cable assembly from back of turn coordinator/roll computer.

(e) Remove set screw from multi-function knob and remove knob.

(f) While supporting turn coordinator/roll computer, remove screws and washers securing unit to instrument panel.

(g) Remove turn coordinator/roll computer from airplane.

(2) Installation - Turn Coordinator/Roll Computer

(a) Position turn coordinator/roll computer in instrument panel and install screws and washers.

(b) Connect connector and cable assembly.

(c) Install LH kick plate. (Refer to 25-10)

(d) Reset TURN COORDINATOR circuit breaker.

B. Autopilot Disconnect Switch

The autopilot disconnect switch is integral to the control yoke. For maintenance practices pertinent to the control yoke, see Flight Controls. (Refer to 27-10)

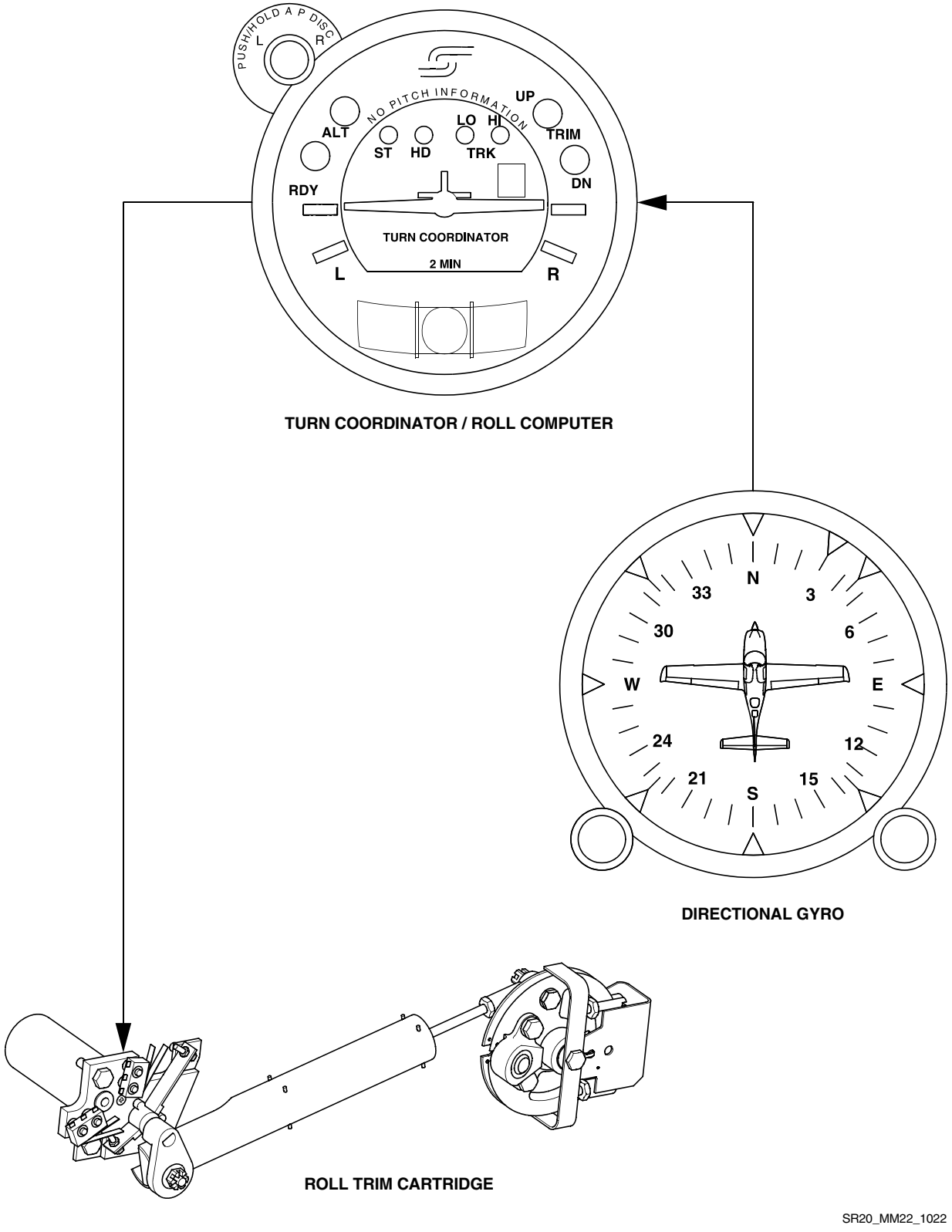


Figure 22-101
System Twenty Schematic

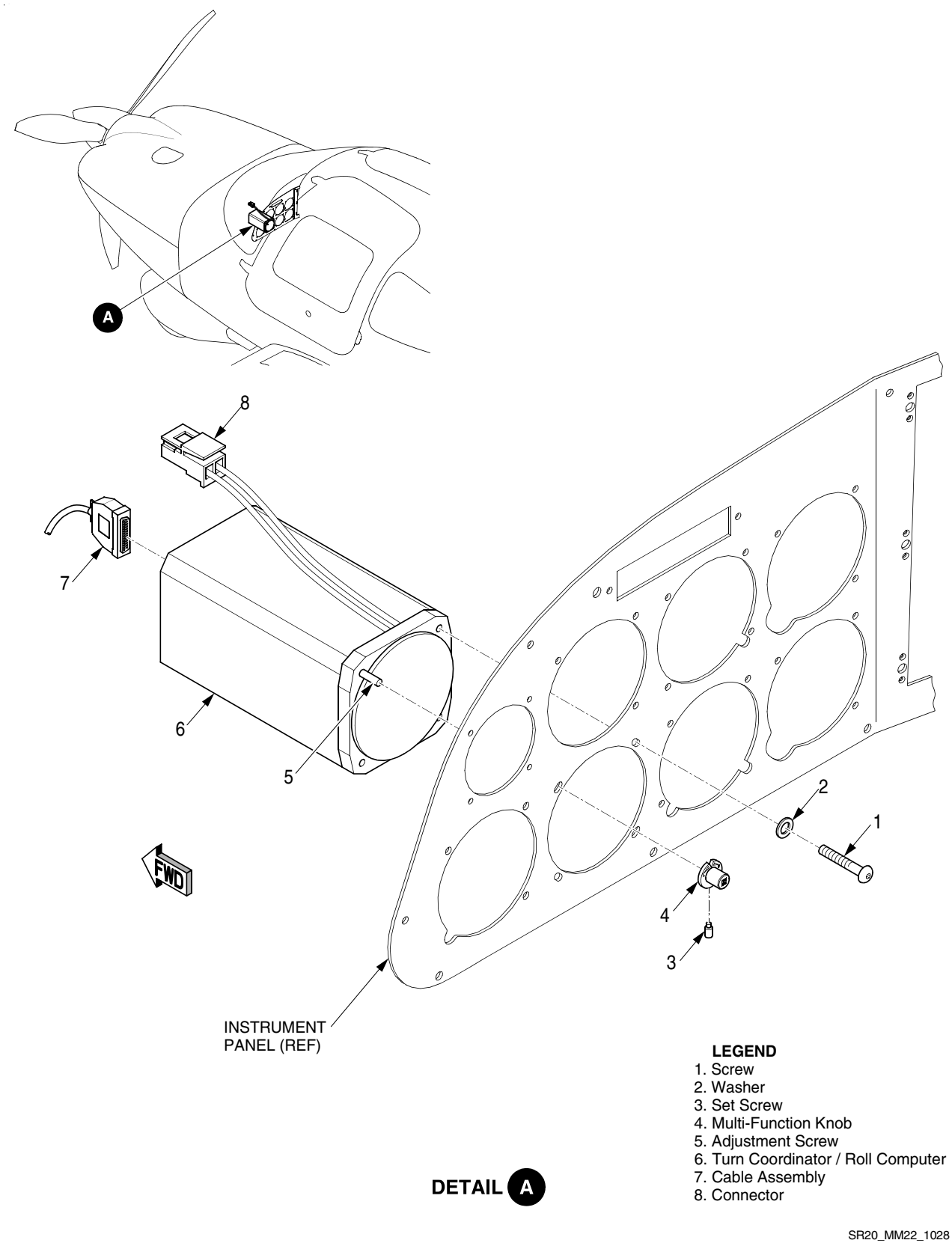


Figure 22-102
Turn Coordinator/Roll Computer Installation

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SYSTEM THIRTY AUTOPILOT

1. DESCRIPTION

This section covers those systems and components which use inputs to the system to automatically control the flight path of the aircraft through adjustment to the pitch/roll axis or wing lift characteristics and provide visual cues for flight path guidance. This includes the System Thirty Autopilot system.

The S-TEC System Thirty is a dual axis autopilot system that provides roll stability, heading hold, NAV/GPS tracking capabilities, and altitude hold capabilities controlled via the roll-trim cartridge and pitch servo. (See Figure 22-111)

The system components consist of an electric turn coordinator/roll computer, altitude transducer, pitch computer, and an HSI or DG for heading hold. Roll axis information is sensed by the turn coordinator gyro. Pitch axis information is sensed by the pitch axis computer. Heading information is provided to the autopilot by the HSI or DG. The operating controls for the S-TEC System Thirty Autopilot are located on the turn coordinator/roll axis computer mounted on the instrument panel.

The Multi-function Control Knob is a rotary knob with an integrated push-button feature. The rotary function or the knob controls the turn command. Depressing the control knob allows the operator to highlight and scroll through the system modes.

Roll Stabilization Mode is active when “ST” is illuminated. Wings are held level and the Turn command knob is activated for autopilot commanded turns up to 90 percent standard rate.

Nav/GPS Track Mode is active when “LO” or “HI” is illuminated. The “LO” and “HI” lights indicate system gain levels. Dependent on the navigational aid used, the operator selects the appropriate gain level.

Heading Hold is active when “HD” is illuminated. Heading Hold is facilitated by the HSI to provide heading information to the system

Serials 1005 thru 1705: The Autopilot Disconnect Switch is integral to the 4-way trim switch on the control yoke. To disengage the autopilot depress the 4-way trim switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1706 & subs: To disengage the autopilot depress the Autopilot Disconnect Switch or depress and hold the multi-function control knob for approximately 3 seconds.

Altitude Hold is engaged by a switch on the control yoke and is active when “ALT” is illuminated. Flight altitude data is derived by the pressure transducer and relayed to the pitch computer to provide altitude hold.

The Global Positioning System Steering (GPSS) Converter is an autopilot accessory unit that provides direct digital coupling between the GPS navigator and the autopilot, enabling a pilot to switch between heading and GPS navigational signals.

For additional information on the autopilot system integration, see the S-TEC System Thirty Pilot’s Operating Handbook. (Refer to 05-10)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Unexpected flight characteristics with autopilot engaged.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing (Refer to 34-10).

3. MAINTENANCE PRACTICES

A. Turn Coordinator/Roll Computer (Refer to 22-10)

B. Pitch Computer (See Figure 22-112)

(1) Removal - Pitch Computer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull PITCH TRIM, and ROLL TRIM circuit breakers.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect cable from pitch computer.

(e) Remove screws, washers, and nuts securing pitch computer to console.

(f) Remove pitch computer from airplane.

(2) Installation - Pitch Computer

(a) Align pitch computer over mounting holes. Ensure data connector is pointed aft.

(b) Install screws, washers, and nuts attaching pitch computer to console.

(c) Connect cable assembly.

(d) Install MFD. (Refer to 31-60)

(e) Reset PITCH TRIM, and ROLL TRIM circuit breakers.

C. Altitude Transducer (See Figure 22-112)

(1) Removal - Altitude Transducer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AUTOPILOT circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect cable from altitude transducer.

(e) Disconnect static line from altitude transducer.

(f) Remove screws and washers securing altitude transducer to console rib.

(g) Remove altitude transducer from airplane.

(2) Installation - Altitude Transducer

(a) Align altitude transducer over console rib mounting holes and secure with washers and screws.

(b) Connect static line to attitude transducer.

(c) Connect cable to altitude transducer.

(d) Perform Adjustment/Test - Pitot System Leak Test. (Refer to 34-10)

(e) Perform Adjustment/Test - Static System Leak Test. (Refer to 34-10)

(f) Install MFD. (Refer to 31-60)

(g) Reset AUTOPILOT circuit breaker.

D. Autopilot Disconnect Switch

The autopilot disconnect switch is integral to the control yoke. For maintenance practices pertinent to the control yoke, see Flight Controls. (Refer to 27-10)

E. Altitude Hold Switch - *Serials 1005 thru 1705*

The autopilot hold switch is integral to the control yoke. For maintenance practices pertinent to the control yoke, see Flight Controls. (Refer to 27-10)

F. GPSS 429 Converter (See Figure 22-112)

(1) Removal - GPSS 429 Converter

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Disconnect battery. (Refer to 24-30)

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect electrical cables from GPSS 429 converter.

(e) Remove screws, washers, and nuts securing GPSS 429 converter to wire loom.

(2) Installation - GPSS 429 Converter

(a) Install screws, washers, and nuts securing GPSS 429 converter to wire loom.

(b) Connect electrical cables to GPSS 429 converter.

(c) Install glareshield. (Refer to 25-10)

(d) Connect battery. (Refer to 24-30)

G. Remote GPSS Switch (See Figure 22-112)

(1) Removal - Remote GPSS Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Disconnect battery. (Refer to 24-30)

(c) Remove glareshield. (Refer to 25-10)

(d) Remove screws securing GPSS switch to instrument panel.

(e) Disconnect electrical cable from back of GPSS switch and remove switch from airplane.

(2) Installation - Remote GPSS Switch

(a) Connect electrical cable to back of GPSS switch.

(b) Install screws securing GPSS switch to instrument panel.

(c) Install glareshield. (Refer to 25-10)

(d) Connect battery. (Refer to 24-30)

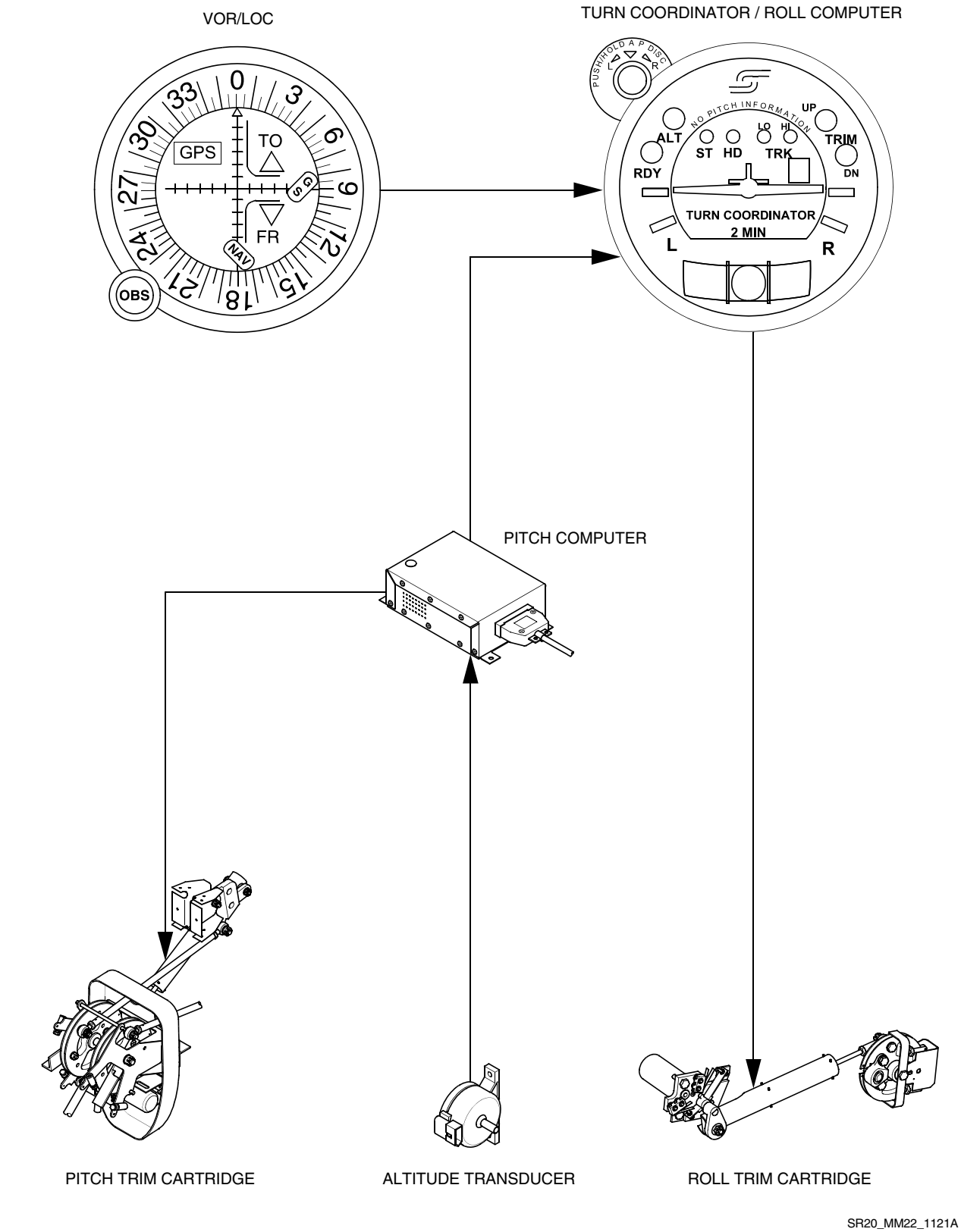
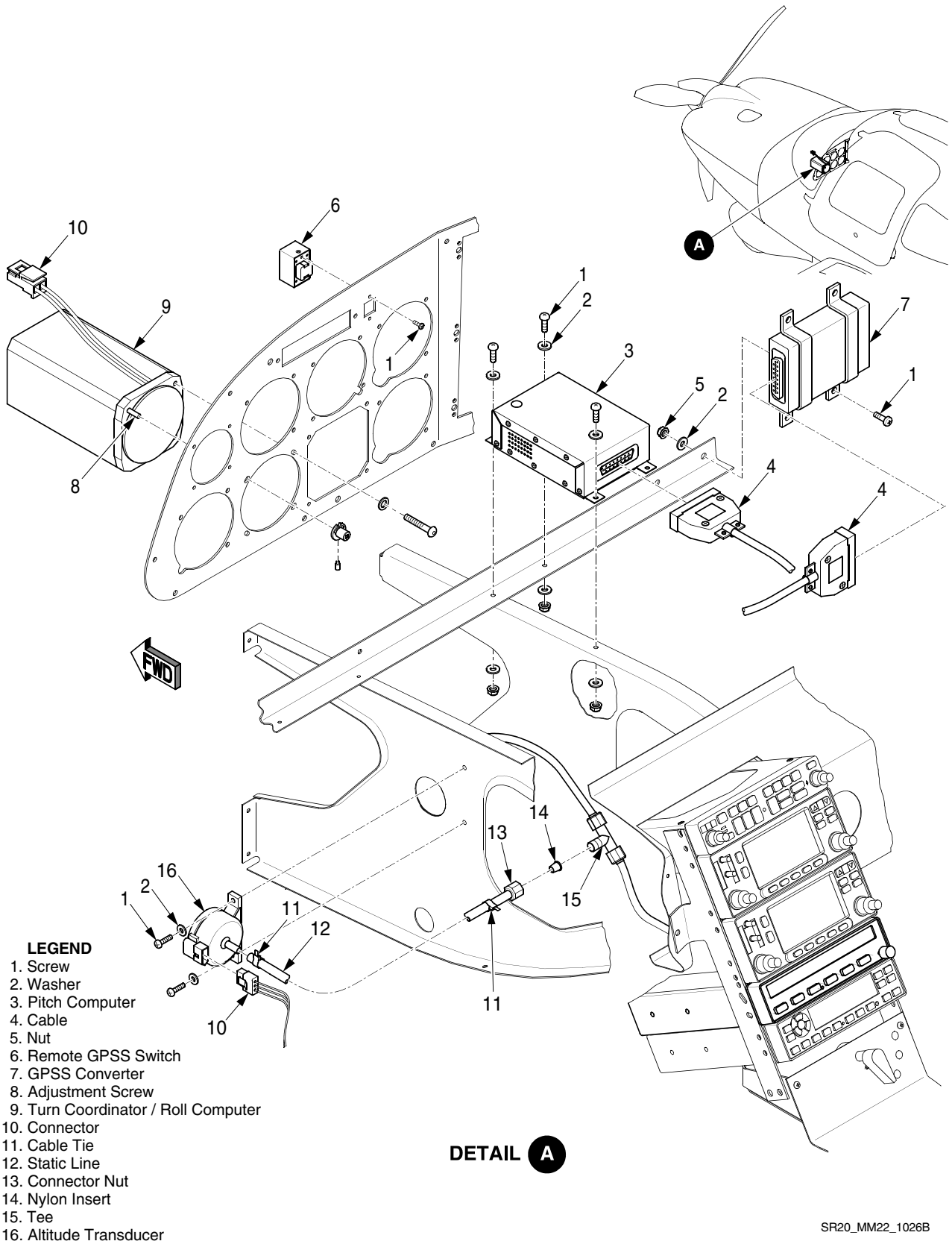


Figure 22-111
System Thirty Schematic



LEGEND

1. Screw
2. Washer
3. Pitch Computer
4. Cable
5. Nut
6. Remote GPSS Switch
7. GPSS Converter
8. Adjustment Screw
9. Turn Coordinator / Roll Computer
10. Connector
11. Cable Tie
12. Static Line
13. Connector Nut
14. Nylon Insert
15. Tee
16. Altitude Transducer

Figure 22-112
System 30 w/ GPSS Installation

SYSTEM 55 AUTOPILOT

1. DESCRIPTION

This section covers those systems and components which use inputs to the system to automatically control the flight path of the aircraft through adjustment to the pitch/roll axis or wing lift characteristics and provide visual cues for flight path guidance. This includes the System 55, System 55X, and System 55SR Autopilot system.

For additional information on the autopilot system integration, see the S-TEC System 55 (55/55X/55SR) Autopilot Pilot's Operating Handbook. (Refer to 05-10)

A. S-TEC System 55 - *Serials 1005 thru 1146*

The S-TEC System 55 is a dual axis autopilot system that provides roll stability, heading hold, NAV tracking, altitude hold, vertical speed selection, automatic glideslope capture, and automatic 45° intercept to desired flight path capabilities controlled via the roll, and pitch-trim cartridges. (See Figure 22-121)

The system components consist of a Flight Guidance Programmer/Computer, Altitude Selector/Alerter, Altitude Transducer, Turn Coordinator, and HSI/PFD. The operating controls for the autopilot are located on the Flight Guidance Programmer/Computer.

Through panel mounted switches and the vertical speed knob, the Flight Guidance Programmer/Computer serves the function of converting operator commands to logic signals for the roll and pitch computer functions. The roll computer receives signal inputs from the Turn Coordinator and HSI/PFD to compute roll commands for stabilization, turns, radio intercepts, heading and tracking. The pitch computer receives signal inputs from the Altitude Transducer, accelerometer, glideslope deviations, and Altitude Selector/Alerter.

The Autopilot Disconnect Switch is integral to the 4-way trim switch on the control yoke. To disengage the autopilot depress the 4-way trim switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1005 thru 1146 after SB 2X-22-06: Automatic disconnect of the autopilot is also provided when the stall warning horn is activated.

The S-TEC System 55 is powered by 28 VDC through the 5-amp AUTOPILOT circuit breaker on the Essential Avionics Bus.

B. S-TEC System 55X - *Serials 1147 & subs*

The S-TEC System 55X is a dual axis autopilot system that provides roll stability, heading hold, NAV/GPS tracking, altitude hold, vertical speed selection, automatic glideslope capture, and automatic 45° intercept to desired flight path capabilities controlled via the roll, pitch-trim cartridges, and (*Serials 1886 & subs*) pitch servo. (See Figure 22-121)

The system components consist of a Flight Guidance Programmer/Computer, Altitude Selector/Alerter, Altitude Transducer, Turn Coordinator, and HSI/PFD/GIA2. The operating controls for the autopilot are located on the Flight Guidance Programmer/Computer.

Through panel mounted switches and the vertical speed knob, the Flight Guidance Programmer/Computer serves the function of converting operator commands to logic signals for the roll and pitch computer functions. The roll computer receives signal inputs from the Turn Coordinator and HSI/PFD/GIA2 to compute roll commands for stabilization, turns, radio intercepts, heading and tracking. The pitch computer receives signal inputs from the Altitude Transducer, accelerometer, glideslope deviations, and Altitude Selector/Alerter.

Serials 1494 & subs, Serials 1337 & subs after SB 2X-22-03: The Avidyne Flight Director is a visual reference displayed on the Primary Flight Display (PFD) to simplify flight by instrument navigation with or without the autopilot coupled. This feature requires System 55X Autopilot and PFD. The Flight Director display consists of a wedged Reference Symbol, indicating airplane attitude, and inverted-

wedge Command Bars, indicating the recommended course attitude. To maintain selected course while in manual flight mode, the pilot maneuvers the airplane so the top of the Reference Symbol fits into the notch of the Command Bars.

The autopilot generates Flight Director Command Bars from modes selected on the Autopilot Computer, including HDG (Heading), NAV (VOR, LOC, or GPS), GPSS (GPS Steering), ALT (Altitude Hold), GS (Glideslope), and VS (Vertical Speed). The system consists of two lighted push buttons mounted on the upper LH instrument panel for uncoupling and recoupling the autopilot, and wiring harnesses for System 55X Autopilot and PFD communication.

Serials 1147 thru 1705: The Autopilot Disconnect Switch is integral to the 4-way trim switch on the control yoke. To disengage the autopilot depress the 4-way trim switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1706 & subs: To disengage the autopilot depress the Autopilot Disconnect Switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1147 thru 1705 after SB 2X-22-06, Serials 1706 & subs: Automatic disconnect of the autopilot is also provided when the stall warning horn is activated.

Serials w/ Avidyne Avionics: The S-TEC System 55X is powered by 28 VDC through the 5-amp AUTOPILOT circuit breaker on the Essential Avionics Bus.

Serials w/ Perspective Avionics: The S-TEC System 55X is powered by 28 VDC through the 5-amp KEYPADS / AP CTRL circuit breaker on the Essential Avionics Bus.

C. S-TEC System 55SR - *Serials 1337 & subs*

The S-TEC System 55SR is a dual axis autopilot system that provides roll stability, heading hold, NAV/GPS tracking, altitude hold, and vertical speed selection. (See Figure 22-121)

The system components consist of a Flight Guidance Programmer/Computer, Altitude Transducer, Turn Coordinator, and HSI/PFD/GIA2. The operating controls for the autopilot are located on the Flight Guidance Programmer/Computer.

Through panel mounted switches and the vertical speed knob, the Flight Guidance Programmer/Computer serves the function of converting operator commands to logic signals for the roll and pitch computer functions. The roll computer receives signal inputs from the Turn Coordinator and HSI/PFD/GIA2 to compute roll commands for stabilization, turns, radio intercepts, heading and tracking. The pitch computer receives signal inputs from the Altitude Transducer, and accelerometer.

Serials 1337 thru 1705: The Autopilot Disconnect Switch is integral to the 4-way trim switch on the control yoke. To disengage the autopilot depress the 4-way trim switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1706 & subs: To disengage the autopilot depress the Autopilot Disconnect Switch or depress and hold the multi-function control knob for approximately 3 seconds.

Serials 1337 thru 1705 after SB 2X-22-06, Serials 1706 & subs: Automatic disconnect of the autopilot is also provided when the stall warning horn is activated.

Serials w/ Avidyne Avionics: The S-TEC System 55SR is powered by 28 VDC through the 5-amp AUTOPILOT circuit breaker on the Essential Avionics Bus.

Serials w/ Perspective Avionics: The S-TEC System 55SR is powered by 28 VDC through the 5-amp KEYPADS / AP CTRL circuit breaker on the Essential Avionics Bus.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Unexpected flight characteristics with autopilot engaged.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing (Refer to 34-10).

3. MAINTENANCE PRACTICES

A. Flight Guidance Programmer/Computer (See Figure 22-122)

(1) Removal - Flight Guidance Programmer/Computer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AUTOPILOT circuit breaker.

(c) Insert hex wrench into front panel bolt hole and engage locking screw.

(d) Turn locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out 0.25 inch and disengage from the electrical connectors.

(e) Pull Flight Guidance Programmer/Computer from mounting tray.

(2) Installation - Flight Guidance Programmer/Computer

(a) With light to medium pressure, push Flight Guidance Programmer/Computer into mounting tray to engage electrical connectors.

(b) Insert hex wrench into front panel bolt hole and engage locking screw.

(c) Turn locking screw clockwise to tighten locking cam.

(d) Reset AUTOPILOT circuit breaker.

(e) If Flight Guidance Programmer/Computer has been replaced with a new or different unit, perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)

(3) Functional Test - Flight Guidance Programmer/Computer

(a) *Serials equipped with HSI only;* Ensure Flight Guidance Programmer/Computer is configured as a NSD-360 compatible unit.

(b) *Serials equipped with PFD only;* Ensure Flight Guidance Programmer/Computer is configured as a KCS-55 compatible unit.

Note: The following steps are to be performed in-flight in VFR smooth air.

(c) *Serials equipped with PFD and serials equipped with HSI:* While NAV (without GPSS) mode is engaged on the System 55x, using a GNS-430 GPS source, insert an appropriately sized screwdriver into the slotted hole to perform alignment procedures in accordance with the STEC installation instructions.

Note: The following steps are required for airplanes equipped with PFD only.

(d) Engage the 55x in HDG mode and allow aircraft to "settle on heading bug". If heading bug agrees with aircraft heading, the system is calibrated. Otherwise, complete the remaining calibration steps.

(e) Turn both GNS-430 units off.

(f) Enter the setup mode on the PFD by simultaneously pressing and holding L1 and L3 line select keys until the count down timer in the lower left corner of the display indicates zero seconds.

(g) Turn both GNS-430's units back on.

(h) Press R3 line select key “Perform A/P Cal”.

(i) Press L1 line select key "Sync HDG". Autopilot should immediately command aircraft to turn toward heading bug.

(j) Press L4 line select key “Back to PFD".

(k) Verify HDG mode accurately tracks heading bug. If autopilot does not track heading bug correctly, repeat previous calibration steps.

(l) Engage NAV (without GPSS) mode on autopilot.

(m) Enter flight plan or waypoint and verify NAV mode accurately tracks flight plan. If autopilot does not track NAV mode correctly, repeat previous calibration steps.

B. Altitude Selector/Alerter (See Figure 22-122)

(1) Removal - Altitude Selector/Alerter

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AUTOPILOT circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect cable from Altitude Selector/Alerter.

(e) Remove screws securing Altitude Selector/Alerter to instrument panel.

(f) Remove Altitude Selector/Alerter from airplane.

(2) Installation - Altitude Selector/Alerter

(a) Align Altitude Selector/Alerter over instrument panel mounting holes and secure with screws.

(b) Connect cable to Altitude Selector/Alerter.

(c) Install MFD. (Refer to 31-60)

(d) Reset AUTOPILOT circuit breaker.

C. Altitude Transducer (Refer to 22-11)

D. Turn Coordinator (Refer to 34-20)

E. Autopilot Disconnect Switch

The autopilot disconnect switch is integral to the control yoke. For maintenance practices pertinent to the control yoke, see Flight Controls. (Refer to 27-10)

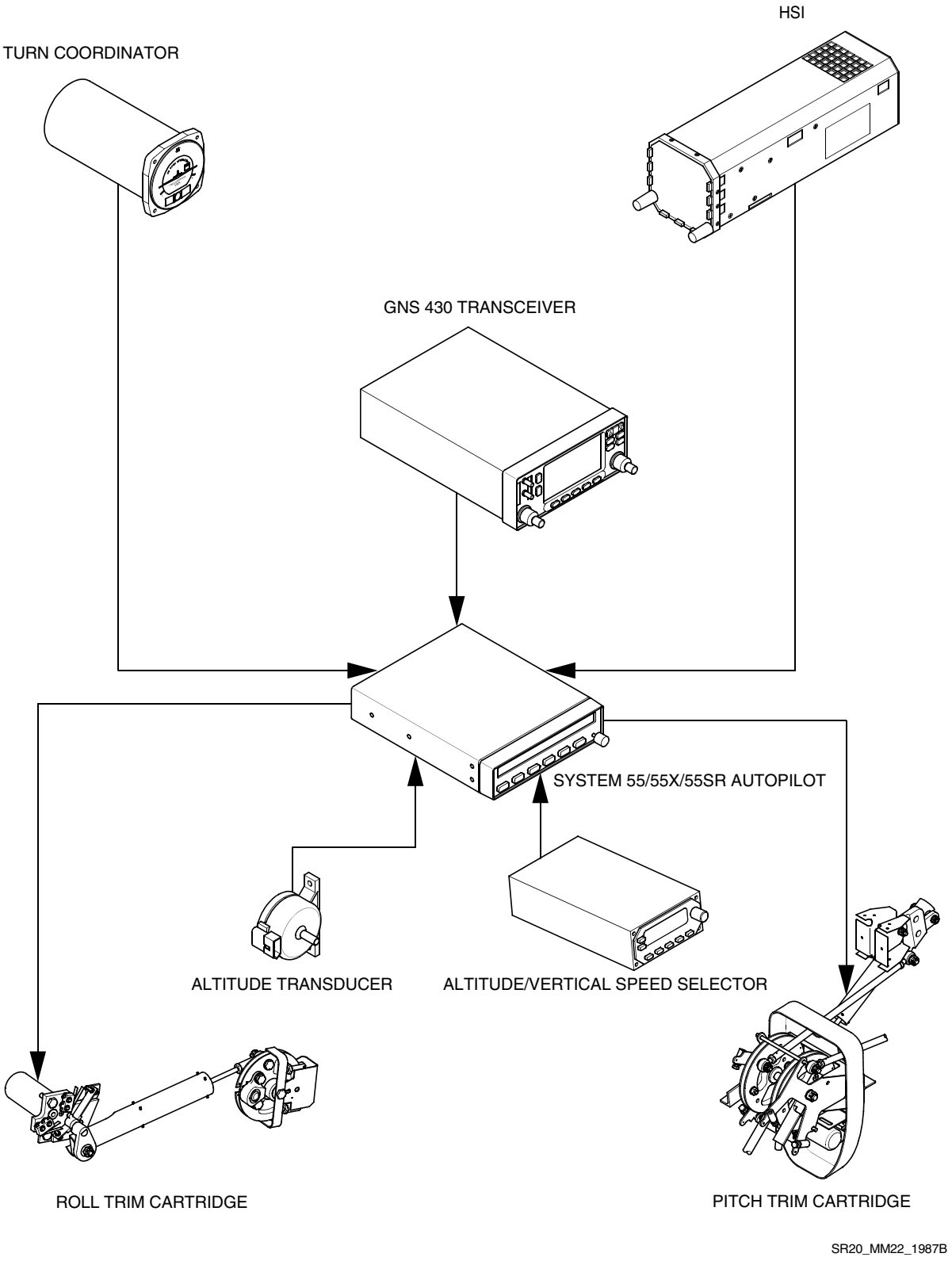


Figure 22-121
System 55 (55/55X/55SR) Schematic - Serials w/o PFD (Sheet 1 of 3)

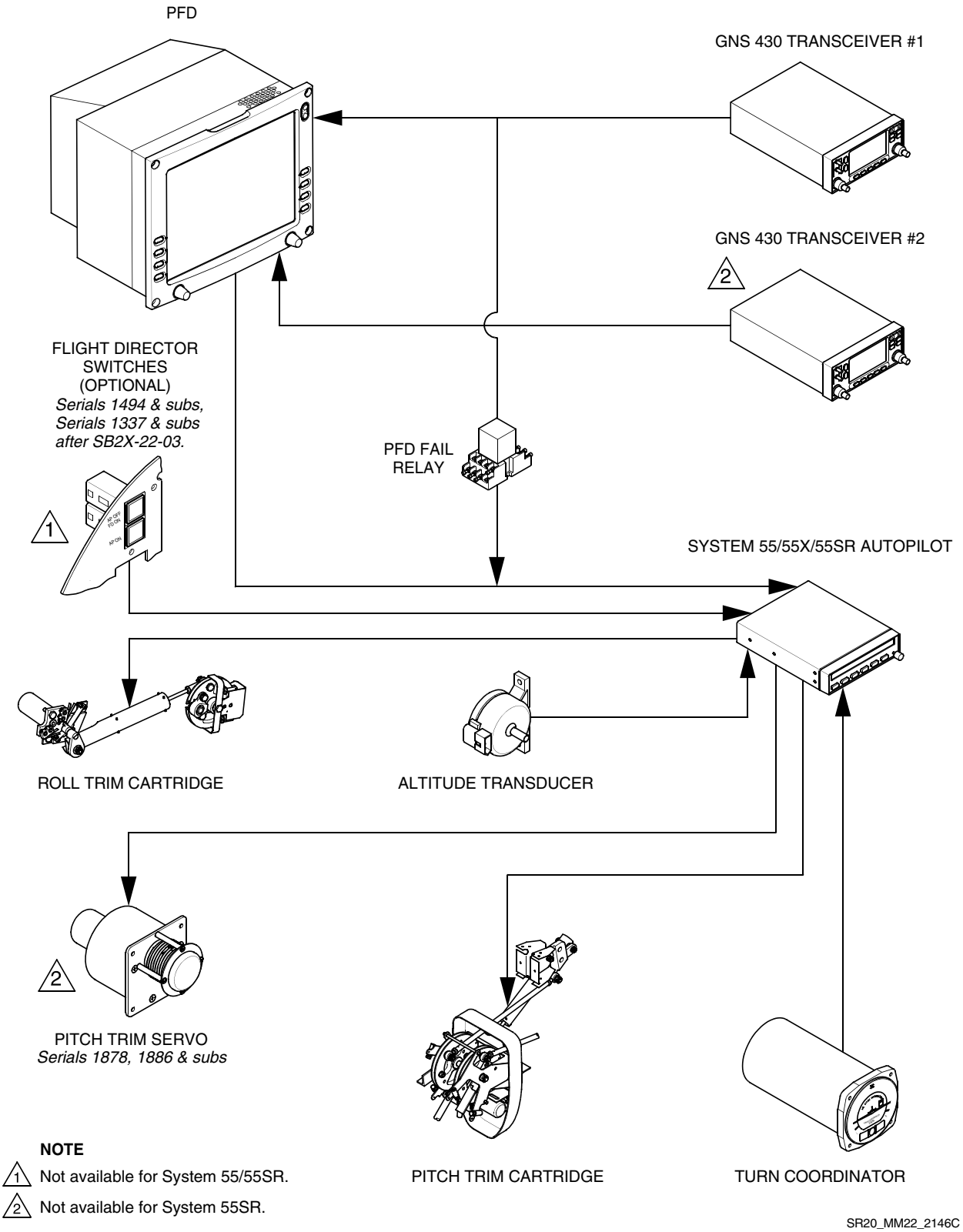
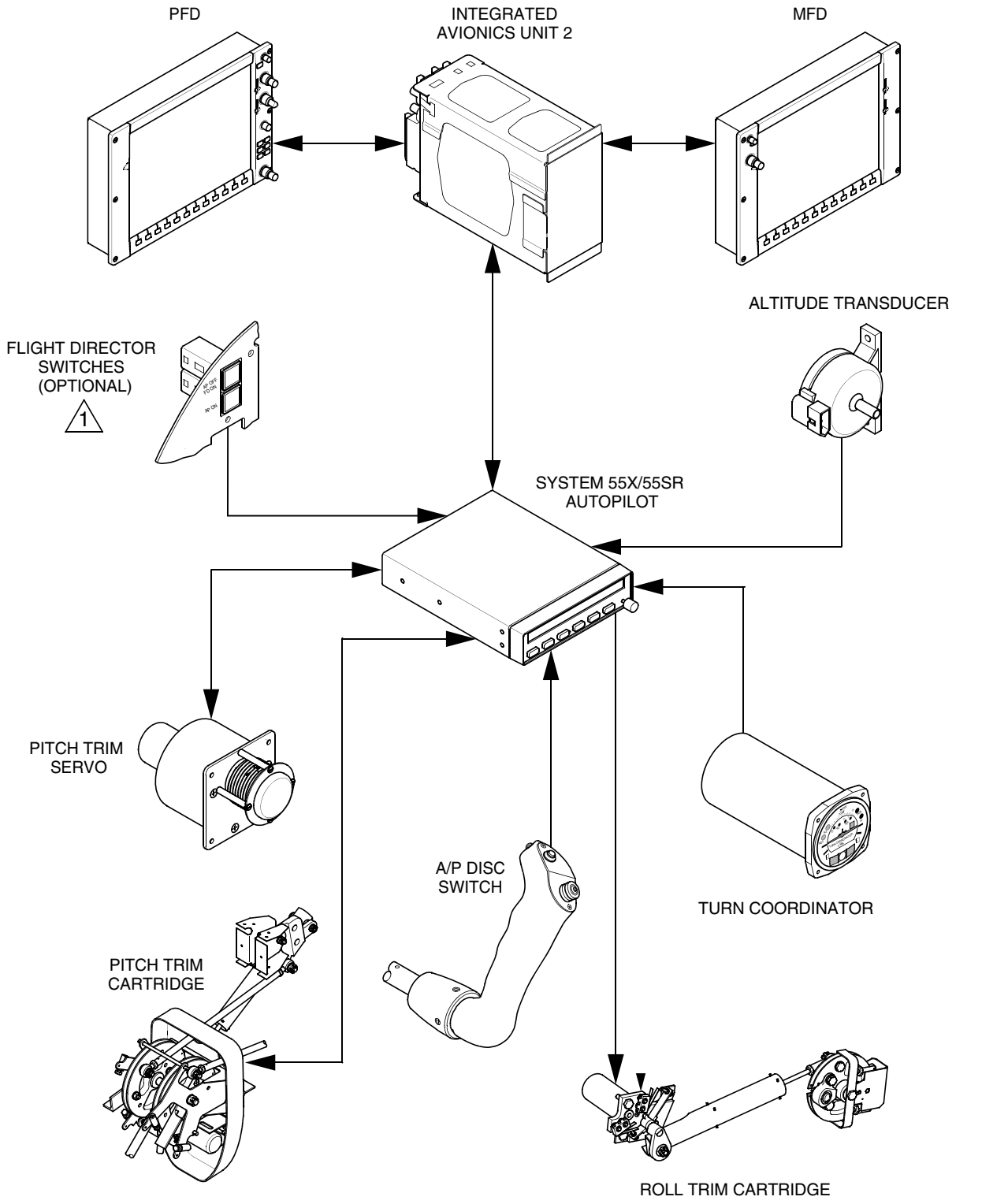


Figure 22-121
System 55 (55/55X/55SR) Schematic - Serials w/ PFD and Avidyne Avionics (Sheet 2 of 3)



NOTE

1 Not available for System 55SR.

SR20_MM22_3017

Figure 22-121
System 55 (55X/55SR) Schematic - Serials w/ PFD and Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials w/ PFD and Perspective Avionics

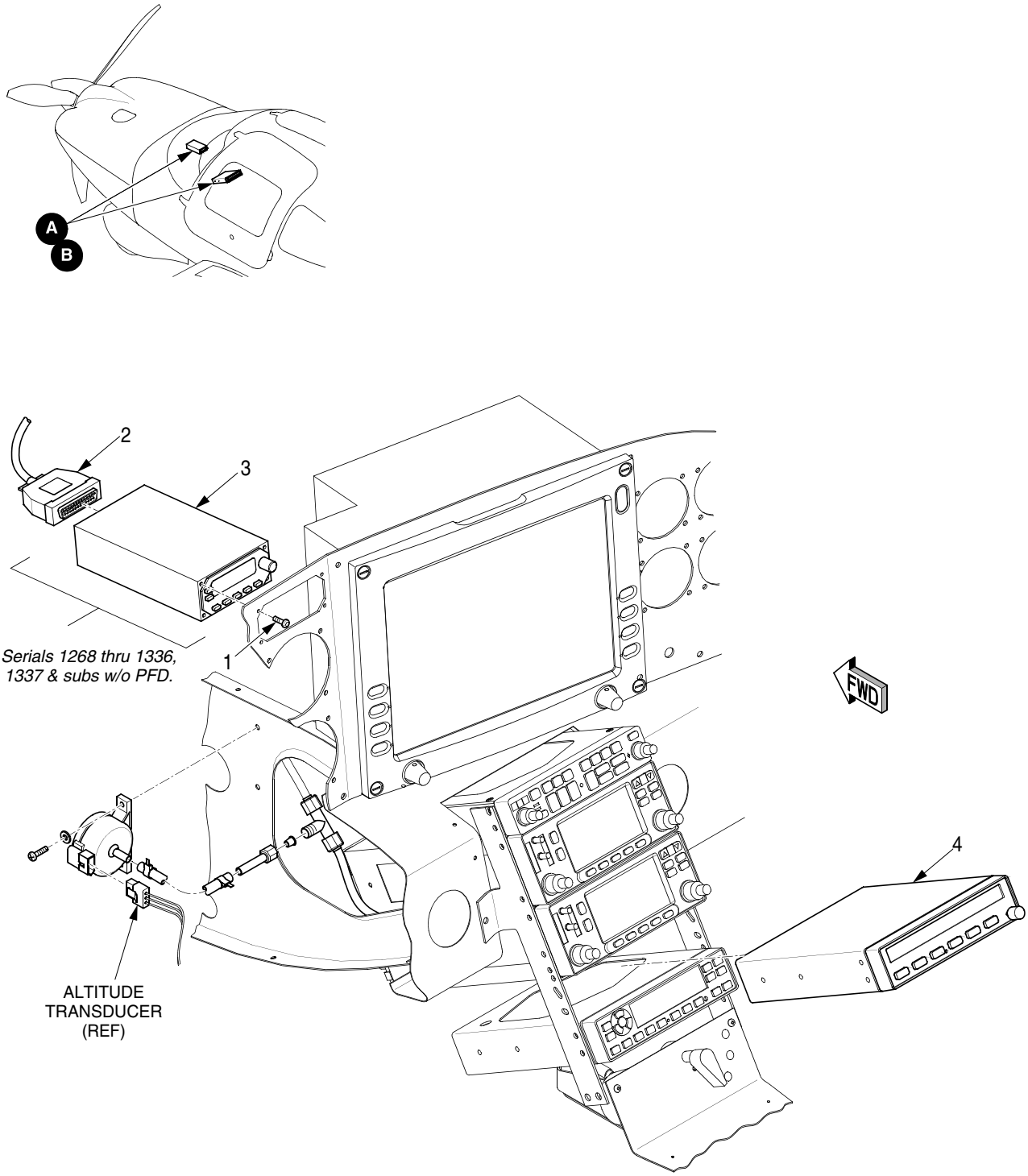
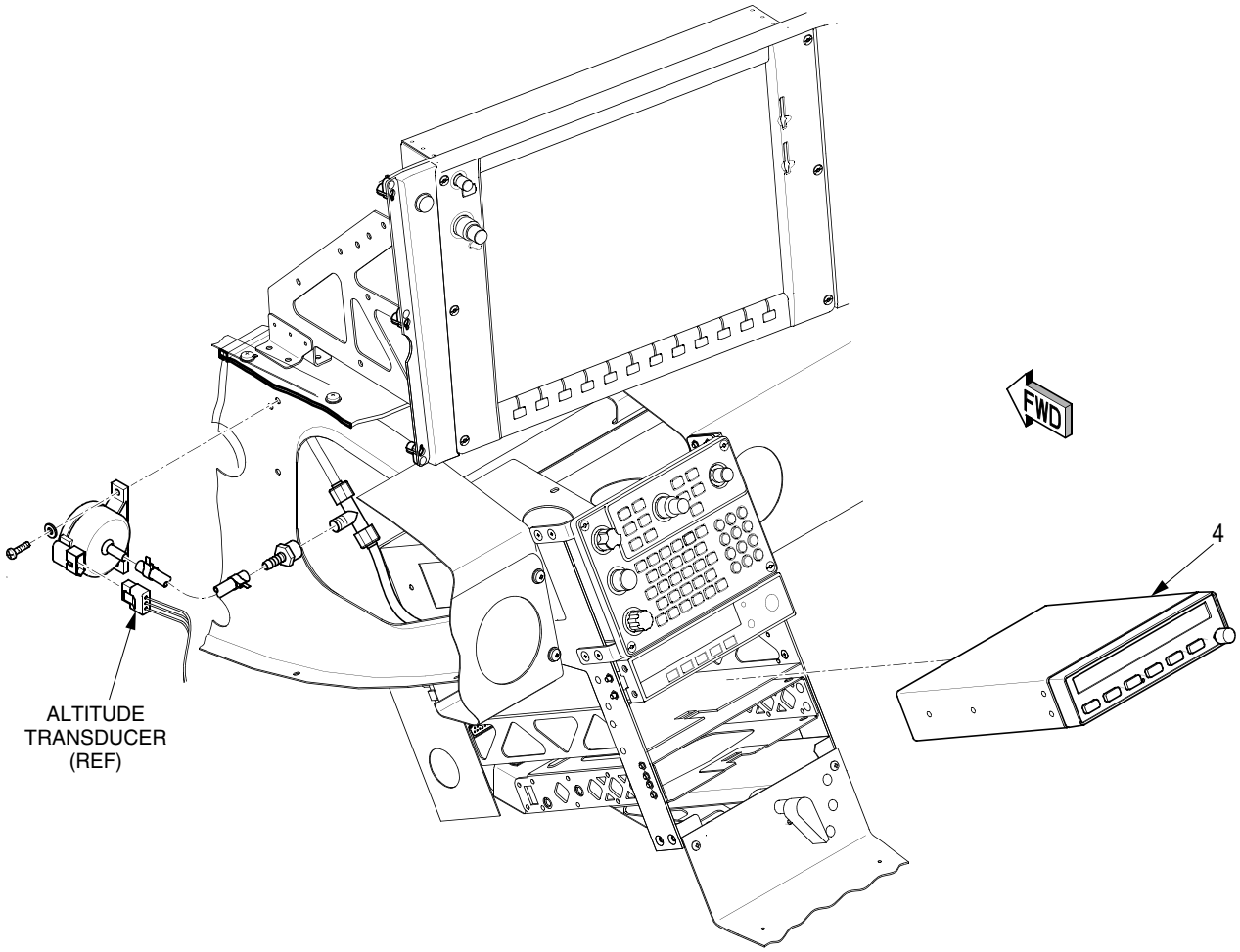


Figure 22-122
System 55 (55/55X/55SR) w/ Avidyne Avionics Installation (Sheet 1 of 2)



LEGEND
4. Flight Guidance Program/Computer

DETAIL B

Serials 2016 & subs w/ System 55X/55SR & Perspective Avionics.

SR20_MM22_3021

Figure 22-122
System 55 (55X/55SR) w/ Perspective Avionics Installation (Sheet 2 of 2)

EFFECTIVITY:
All

F. Pitch Servo (See Figure 22-123) - *Serials 1886 & subs*

(1) Removal - Pitch Servo

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AUTOPILOT circuit breaker.

(c) Remove access panel CF5. (Refer to 06-00)

(d) *Serials 2065 & subs w/ Air Conditioning:* Remove condenser. (Refer to 21-50)

(e) Disconnect pitch servo plug from socket.

Note: Note location of bridle cable clamps on elevator cable to facilitate reinstallation.

(f) Remove bolts, nuts, and clamps securing bridle cable to elevator cable.

(g) *Serials 2065 & subs w/ Air Conditioning:* Remove screws, washers, and nuts securing fairleads, bridle cable, and elevator cable to fairlead bracket.

(h) Remove bolts and washers securing pitch servo to mounting bracket and remove pitch servo from airplane.

(2) Disassembly - Pitch Servo

(a) Remove screws and washers securing capstan cover to capstan.

(b) Remove cable guards.

(c) *Serials 2065 & subs w/ Air Conditioning:* Remove cotter pin, nut, washers, spacer, and bolt securing pulley and cable keeper to mounting bracket.

(d) Remove cotter pin, nut, and washer securing tension washers to capstan.

(e) Loosen set screw securing bridle cable stop-ball to capstan recess.

(f) Remove stop-ball from capstan recess and unwrap bridle cable from capstan.

(g) Remove screw and washer securing cover to servo motor.

(3) Reassembly - Pitch Servo

(a) Place tension washers on capstan and secure with washer and nut.

(b) Perform Adjustment/Test - Pitch Servo Torque. (Refer to 22-12)

(c) Insert and depress bridle cable stop-ball into capstan recess and tighten set screw.

(d) Wrap bridle cable around servo capstan.

1 On servo capstan, position bridle cable stop-ball at 3 o'clock position (stop-ball at back of capstan), and wrap long end of bridle cable 660° clockwise.

2 On servo capstan, position bridle cable stop-ball at 3 o'clock position (stop-ball at back of capstan), and wrap short end of bridle cable 660° counter-clockwise.

Note: Align cable keeper so arm extends through mounting bracket hole but does not contact pulley or mounting bracket.

(e) *Serials 2065 & subs w/ Air Conditioning:* Position pulley and cable keeper to mounting bracket and secure with bolt, washers, spacer, nut, and cotter pin.

(f) Install cable guards.

(g) Position capstan cover to capstan and secure with screws and washers.

(h) Position cover to servo motor and secure with screw and washer.

(4) Installation - Pitch Servo

(a) Position pitch servo to mounting bracket and secure with bolts and washers.

(b) Perform Adjustment/Test - Bridle Cable Tension. (Refer to 22-12)

(c) Connect pitch servo plug to socket.

(d) *Serials 2065 & subs w/ Air Conditioning:* Install condenser. (Refer to 21-50)

(e) Install access panel CF5. (Refer to 06-00)

(f) Reset AUTOPILOT circuit breaker.

(5) Adjustment/Test - Pitch Servo Torque

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spanner Adapter (1 of 2)	6622-1	S-TEC Corporation Mineral Wells, TX 76067	Torque adjustment.
Spanner Adapter (2 of 2)	6624-1	S-TEC Corporation Mineral Wells, TX 76067	Torque adjustment.

(b) Insert pins of spanner adapter into capstan tooling holes.

(c) Position dial torque wrench to spanner adapter.

(d) Push servo flapper down and adjust clutch torque to 35.0 ± 3.0 in-lb (3.9 ± 0.3 Nm).

Note: If it is necessary to rotate nut for cotter pin installation, it is allowable to remove thinnest (0.032”) tension washer from stackup to maintain specified torque.

(e) Install new cotter pin. If capstan nut must be rotated to install cotter pin, verify clutch torque is within recommended torque settings.

(6) Adjustment/Test - Bridle Cable Tension

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092	Cable tension determination.
Rigging Lockout Tool	14905-001	Cirrus Design Duluth, MN 55811 218-727-2737	Lockout elevator bellcrank.
3/16” Lockout Pin	-	Any Source	Lockout elevator bellcrank.

(b) Remove access panel RE1. (Refer to 06-00)

(c) Using rigging lockout tool and pin, lockout elevator empennage bellcrank.

(d) Using tensiometer, verify elevator control cable tension. (See Figure 06-001) If elevator control cable tension falls outside specified tolerance, perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)

(e) On servo capstan, position bridle cable stop-ball at 3 o’clock position (stop-ball at back of capstan).

Note: Use a ratcheting open-end wrench and socket for tightening bridle cable clamp assembly to elevator cable.

Install outboard clamp assembly with bolt heads facing inboard and inboard clamp assembly with bolt heads facing outboard. Align bolt shafts approximately perpendicular to 0.0 buttock line. Ensure maximum gap of 0.01 inch (0.25 mm) between aft end of clamp and bridle cable end fitting.

(f) Position short end of bridle cable and clamp assembly to outboard elevator cable and secure with bolts and nuts. Torque nuts to 55 ± 5 in-lb (6.2 ± 0.6 Nm). With elevator at 0° deflection, ensure forward end of clamp is a minimum of 5.5 in (14.0 cm) from aft edge of servo.

(g) *Serials 2065 & subs w/o Air Conditioning:* Position long end of bridle cable and clamp assembly to inboard elevator cable and loosely secure with bolts and nuts. With elevator at 0° deflection, ensure forward end of clamp assembly is a minimum of 19.0 in (48.2 cm) from aft edge of servo.

(h) *Serials 2065 & subs w/ Air Conditioning:* Route long end of bridle cable through mounting bracket hole and between pulley and cable keeper.

(i) *Serials 2065 & subs w/ Air Conditioning:* Position long end of bridle cable and clamp assembly to inboard elevator cable and loosely secure with bolts and nuts. With elevator at 0° deflection, ensure forward end of clamp assembly is a minimum of 18.4 in (46.7 cm) from aft edge of servo.

(j) While pushing long end of bridle cable and clamp assembly aft, tighten clamp to elevator cable. Torque nuts to 55 ± 5 in-lb (6.2 ± 0.6 Nm).

(k) Using tensiometer, verify bridle cable tension forward of bridle cable clamps is set to 25.0 ± 5.0 lb (11.3 ± 2.3 kg). If bridle cable tension falls outside specified tolerance, loosen aft clamp assembly and adjust bridle cable as required to obtain 25.0 ± 5.0 lb (11.3 ± 2.3 kg).

(l) Using tensiometer, verify elevator control cable tension forward of the bridle cable clamp assemblies. (See Figure 06-001)

(m) *Serials 2065 & subs w/ Air Conditioning:* Position fairleads and cables to fairlead bracket and secure with screws, washers, and nuts.

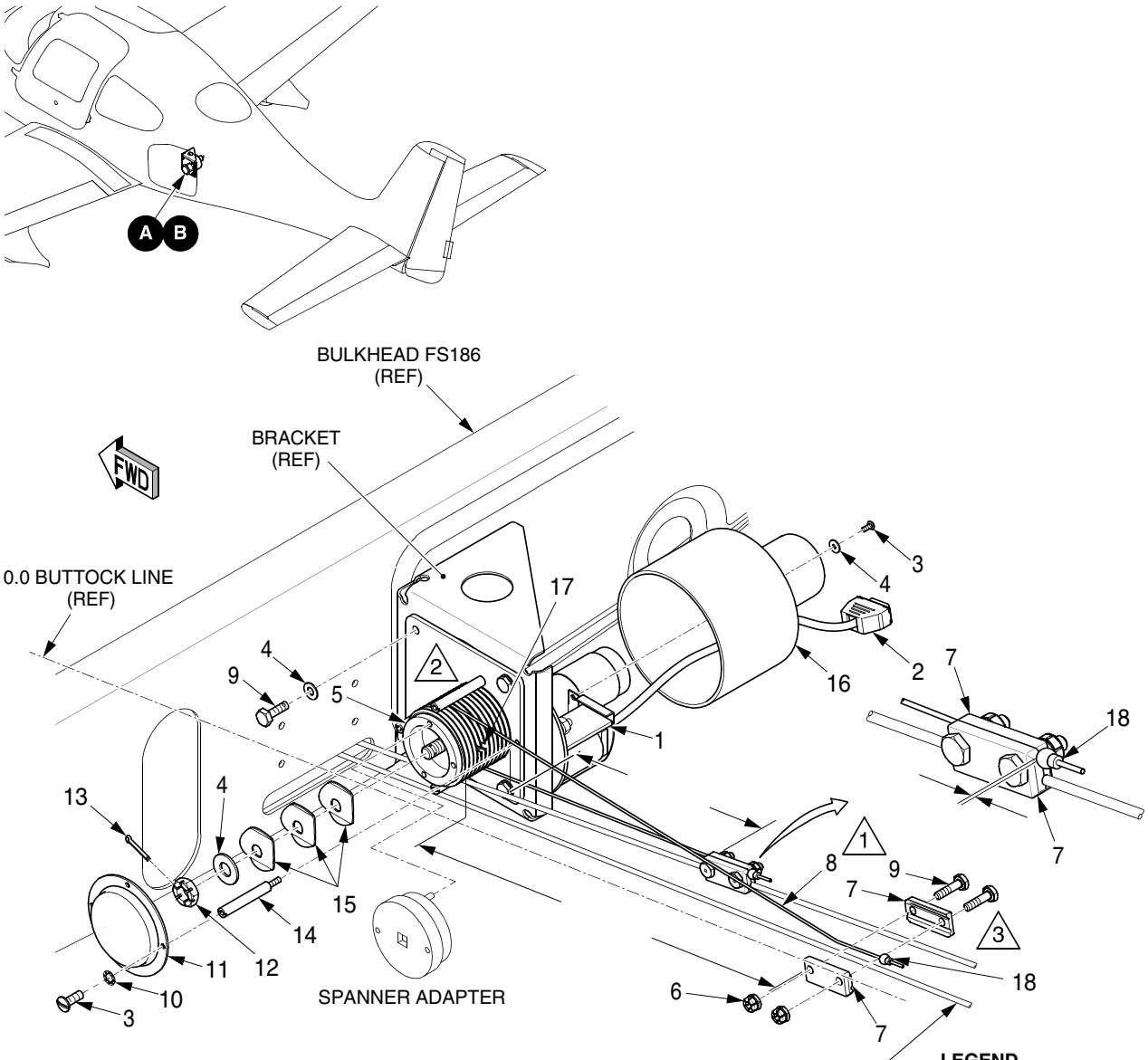
(n) Remove rigging lockout pin and tool from elevator empennage bellcrank.

(o) Ensure flight control systems operate through full range of travel without binding, obstruction, or excessive friction.

(p) Ensure bridle cable remains in capstan grooves during full elevator and pitch servo travel and bridle cable moves freely through cable guards without chafing.

(q) *Serials 2065 & subs w/ Air Conditioning:* Ensure bridle cable moves freely through mounting bracket without chafing.

(r) Install access panel RE1. (Refer to 06-00)



LEGEND

1. Flapper
2. Plug
3. Screw
4. Washer
5. Capstan
6. Nut
7. Clamp
8. Bridle Cable
9. Bolt
10. Star Washer
11. Capstan Cover
12. Castellated Nut
13. Cotter Pin
14. Cable Guard
15. Tension Washer
16. Servo Motor Cover
17. Bridle Cable Stop-Ball
18. Bridle Cable End Fitting

NOTE

1. Before disassembly, mark location of bridle cable.
2. Ensure bridle cable does not rub on cable guards.
3. Install outboard clamp assembly with bolt heads facing inboard and inboard clamp assembly with bolt heads facing outboard. Align bolt shafts approximately perpendicular to 0.0 buttock line.

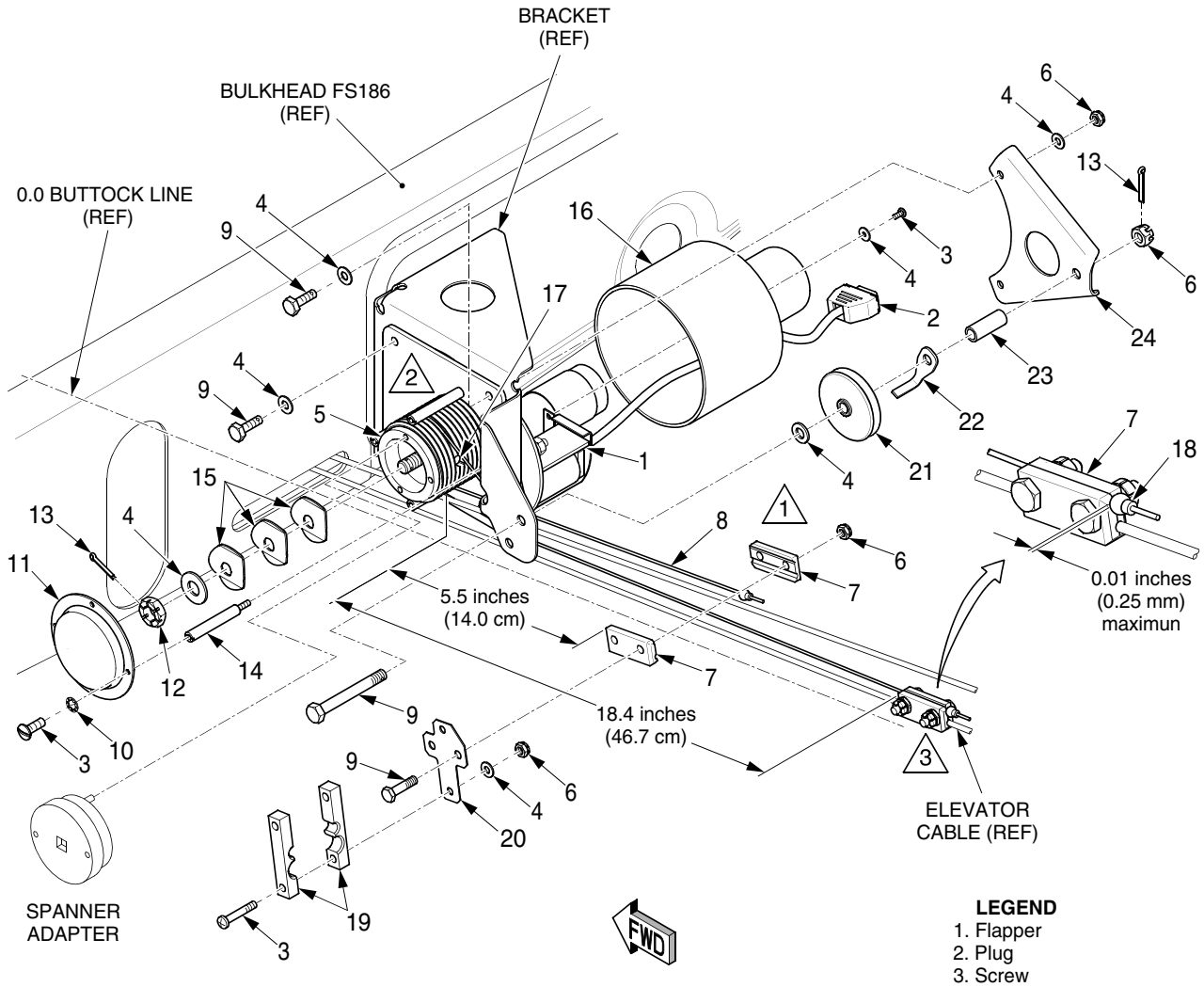
DETAIL A

Serials 1886 & subs w/o Air Conditioning.

SR20_MM22_2763A

Figure 22-123
Pitch Servo Installation - Serials 1886 & subs w/o Air Conditioning (Sheet 1 of 2)

EFFECTIVITY:
Serials 1886 & subs w/o Air Conditioning



LEGEND

1. Flapper
2. Plug
3. Screw
4. Washer
5. Capstan
6. Nut
7. Clamp
8. Bridle Cable
9. Bolt
10. Star Washer
11. Capstan Cover
12. Castellated Nut
13. Cotter Pin
14. Cable Guard
15. Tension Washer
16. Servo Motor Cover
17. Bridle Cable Stop-Ball
18. Bridle Cable End Fitting
19. Fairlead
20. Bracket
21. Pulley
22. Cable Keeper
23. Spacer
24. Servo Bracket Plate

NOTE

1. Before disassembly, mark location of bridle cable.
2. Ensure bridle cable does not rub on cable guards.
3. Install outboard clamp assembly with bolt heads facing inboard and inboard clamp assembly with bolt heads facing outboard. Align bolt shafts approximately perpendicular to 0.0 buttock line.

DETAIL B

Serials 2065 & subs w/ Air Conditioning.

SR20_MM22_3358

Figure 22-123
Pitch Servo Installation - Serials 2065 & subs w/ Air Conditioning (Sheet 2 of 2)

G. Flight Director System - *Serials 1337 thru 1493 after SB 2X-22-03, 1494 & subs w/ option installed* (See Figure 22-124)

(1) Removal - Flight Director Switch Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) *Serials w/ Avidyne Avionics:* Remove MFD. (Refer to 31-60)

(d) *Serials w/ Perspective Avionics:* Remove MFD. (Refer to 31-60)

(e) Remove glareshield. (Refer to 25-10)

(f) *Serials w/ Avidyne Avionics:* Remove PFD. (Refer to 31-60)

(g) *Serials w/ Perspective Avionics:* Remove PFD. (Refer to 31-60)

Note: To facilitate reinstallation, label wiring to ensure connectors are reattached with the correct switches.

(h) Rotate locking screws on back of switch assembly counter-clockwise to disconnect switch assembly from connector. Repeat for other switch assembly.

Note: To facilitate reinstallation, label push button to ensure switches are reassembled with the correct push button.

(i) Remove push button from switch assembly. Repeat for other switch assembly.

(j) Rotate locking screws inside front of switch assembly counter-clockwise to disassemble mounting sleeve, spacers, and seals from switch assembly. Repeat for other switch assembly.

(2) Installation - Flight Director Switch Assembly

(a) Orient switch assembly so section labeled “TOP” is facing up and insert switch assembly through lower section of instrument panel cut-out. Repeat for other switch assembly through upper section of instrument panel cut-out.

Note: It may be necessary to discard one seal and spacer if attaching parts securing switch to instrument panel are too tight for cam engagement.

(b) Slide seals, spacers, and mounting sleeve onto switch assembly. Repeat for other switch assembly.

(c) Position switches so that switch flanges are aligned with each other and installation area.

(d) Secure switch to instrument panel by rotating locking screws inside front of switch assembly clockwise. Torque to 8 - 12 oz-in (576 - 864 gm-cm). Repeat on other switch assembly.

(e) Install push buttons to front of switch assemblies.

(f) Connect wiring harness connectors to switch assemblies.

(g) Secure switch to connector by rotating locking screws on back of connector assembly clockwise. Torque to 8 - 12 oz-in (576 - 864 gm-cm). Repeat on other switch assembly.

(h) *Serials w/ Avidyne Avionics:* Install PFD. (Refer to 31-60)

(i) *Serials w/ Perspective Avionics:* Install PFD. (Refer to 31-60)

(j) Install glareshield. (Refer to 25-10)

(k) *Serials w/ Avidyne Avionics:* Install MFD. (Refer to 31-60)

(l) *Serials w/ Perspective Avionics:* Install MFD. (Refer to 31-60)

(m) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(n) *Serials w/ Avidyne Avionics:* Perform Operational Test - Flight Director (Avidyne). (Refer to 22-12)

(o) *Serials w/ Perspective Avionics:* Perform Operational Test - Flight Director (Perspective Avionics and System 55X). (Refer to 22-12)

EFFECTIVITY:
Serials 1337 thru 1493 after SB 2X-22-03, 1494 & subs w/ option installed

(3) Operational Test - Flight Director (Avidyne)
- (a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
- (b) Connect 28 ±1 VDC external power to external power receptacle.
- (c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
- (d) On Flight Guidance Programmer/Computer, press [HDG].
  - 1 On PFD, verify “HDG” is indicated and no command bars appear.
  - 2 At lower Flight Director switch, verify [AP ON] push button is lit.
- (e) On Flight Guidance Programmer/Computer, press [ALT].
  - 1 On PFD, verify “ALT” is indicated and solid magenta command bars (autopilot coupled) appear.
- (f) Verify flight control functions.
  - 1 On PFD, press [HDG Bug].
  - 2 Rotate right knob counter-clockwise to position heading bug left.
    Command bars should bank left, and yoke should rotate left.
  - 3 Rotate right knob clockwise to position heading bug right.
    Command bars should bank right, and yoke should rotate right.
  - 4 Adjust right knob to center heading bug.
    Command bars should return to center at wings level, and yoke should have little to no movement.
  - 5 Press [VSI Bug].
  - 6 Adjust right knob to position VSI bug to "+1000".
  - 7 On Flight Guidance Programmer/Computer, press [VS].
    On PFD, “VS” is indicated and command bars should climb. Yoke should move aft.
  - 8 On PFD, adjust right knob to position VSI bug to "-1000".
    Command bars should descend, and yoke should move forward.
- (g) At upper Flight Director switch, press [AP OFF FD ON] push button.
  - 1 Verify autopilot disconnect tone (two beeps) is heard.
  - 2 On PFD, verify command bars turn green (autopilot uncoupled).
  - 3 At upper Flight Director switch, verify [AP OFF FD ON] push button is lit.
- (h) Repeat flight control functions verification.
  - 1 Verify command bars respond, but yoke does not move.
- (i) On yoke, press autopilot disconnect switch to turn off autopilot.
  - 1 On PFD, verify command bars disappear.
  - 2 At upper Flight Director switch, verify [AP OFF FD ON] push button remains lit.
- (j) At lower Flight Director switch, press [AP ON] push button.
  - 1 At upper Flight Director switch, verify [AP OFF FD ON] push button is not lit.
  - 2 At lower Flight Director switch, verify [AP ON] push button is not lit.
- (k) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (l) Disconnect 28 ±1 VDC external power from external power receptacle.
- (m) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(4) Operational Test - Flight Director (Perspective Avionics and System 55X)
- (a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
- (b) Connect 28 ±1 VDC external power to external power receptacle.
- (c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
- (d) On Flight Guidance Programmer/Computer, press [HDG].
  - 1 On PFD, verify “HDG” is indicated and no command bars appear.

2 At lower Flight Director switch, verify [AP ON] push button is lit.

(e) On Flight Guidance Programmer/Computer, press [ALT].

1 On PFD, verify “ALT” is indicated and solid magenta command bars (autopilot coupled) appear.

(f) Verify flight control functions.

1 On FMS Controller, rotate HDG knob counter-clockwise to position heading bug left.
Command bars should bank left, and yoke should rotate left.

2 Rotate HDG knob clockwise to position heading bug right.
Command bars should bank right, and yoke should rotate right.

3 Press HDG knob to center heading bug.
Command bars should return to center at wings level, and yoke should have little to no movement.

4 On Flight Guidance Programmer/Computer, press [VS].

5 Adjust right knob to position VSI bug to "+100".
On PFD, “VS” is indicated and command bars should climb. Yoke should move aft.

6 On Flight Guidance Programmer/Computer, adjust right knob to position VSI bug to “-100”.
Command bars should descend, and yoke should move forward.

(g) At upper Flight Director switch, press [AP OFF FD ON] push button.

1 Verify autopilot disconnect tone (two beeps) is heard.

2 On PFD, verify command bars turn green (autopilot uncoupled).

3 At upper Flight Director switch, verify [AP OFF FD ON] push button is lit.

(h) Repeat flight control functions verification.

1 Verify command bars respond, but yoke does not move.

(i) On yoke, press autopilot disconnect switch to turn off autopilot.

1 On PFD, verify command bars disappear.

2 At upper Flight Director switch, verify [AP OFF FD ON] push button remains lit.

(j) At lower Flight Director switch, press [AP ON] push button.

1 At upper Flight Director switch, verify [AP OFF FD ON] push button is not lit.

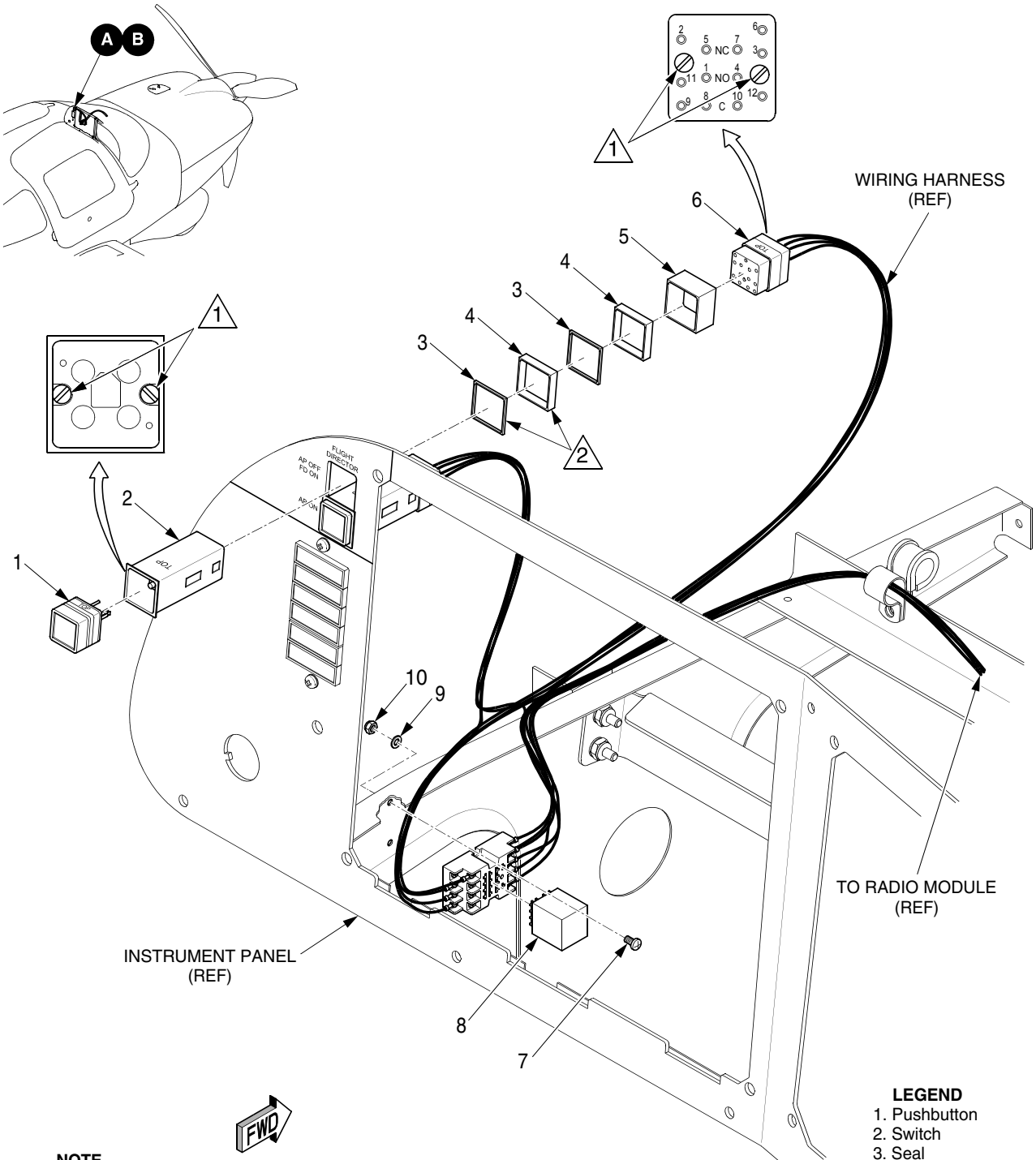
2 At lower Flight Director switch, verify [AP ON] push button is not lit.

(k) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(l) Disconnect 28 ±1 VDC external power from external power receptacle.

(m) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

EFFECTIVITY:
Serials 1337 thru 1493 after SB 2X-22-03, 1494 & subs w/ option installed



NOTE

1. To release/engage cams, rotate locking screws clockwise/counter-clockwise.
2. To facilitate switch installation, discard one seal and spacer if required.

LEGEND

1. Pushbutton
2. Switch
3. Seal
4. Spacer
5. Mounting Sleeve
6. Connector
7. Screw
8. Relay
9. Washer
10. Nut

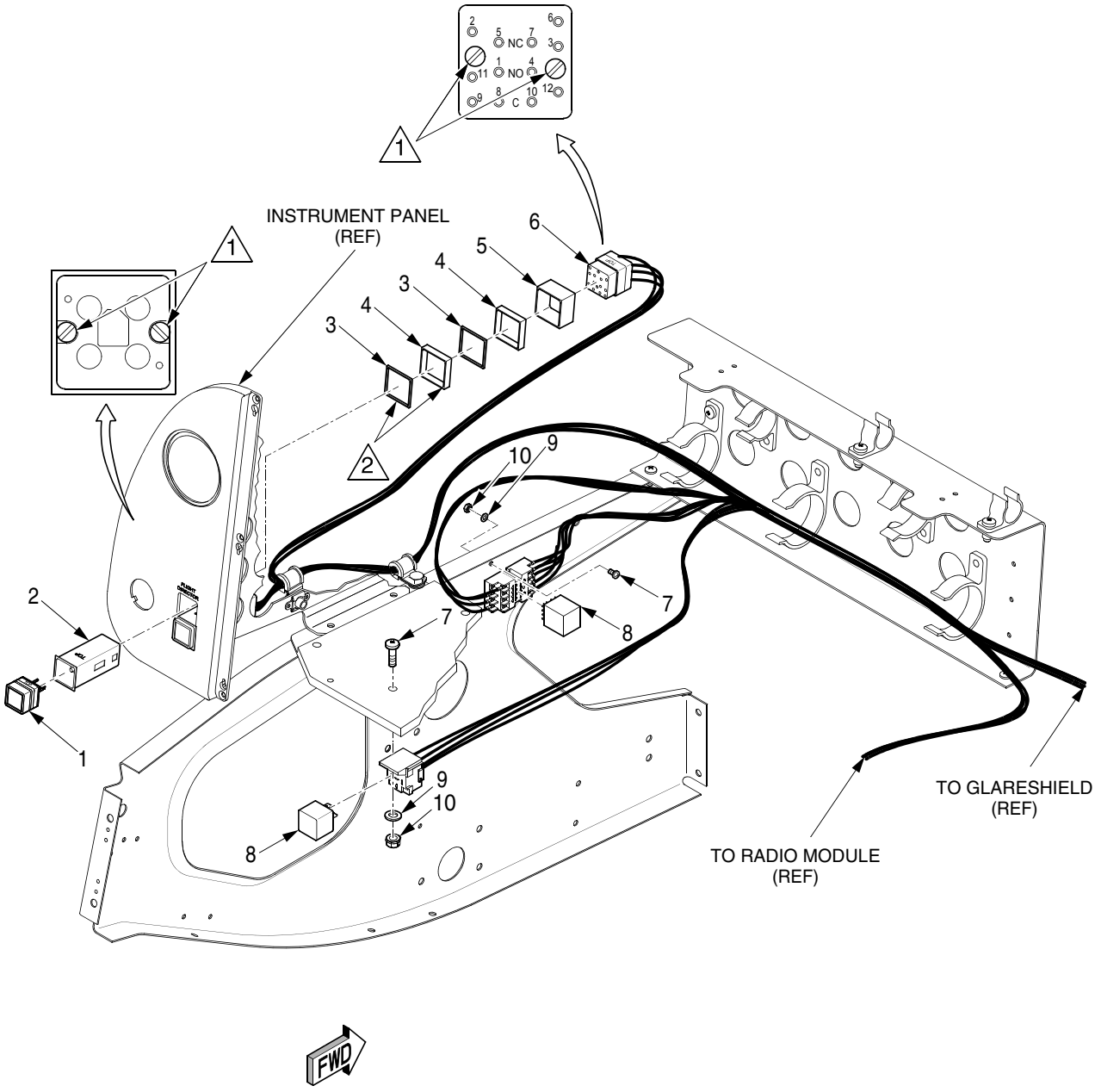
DETAIL A

Serials 1337 thru 1493 after SB 2X-22-03, Serials 1494 & subs w/ Avidyne Avionics.

SR20_MM22_2065B

Figure 22-124
Flight Director - Serials 1337 - 1493 after SB 2X-22-03, 1494 & subs w/ Avidyne Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 1337 - 1493 after SB 2X-22-03, 1494 & subs w/ Avidyne Avionics



NOTE

1. To release/engage cams, rotate locking screws clockwise/counter-clockwise.
2. To facilitate switch installation, discard one seal and spacer if required.

LEGEND

1. Pushbutton
2. Switch
3. Seal
4. Spacer
5. Mounting Sleeve
6. Connector
7. Screw
8. Relay
9. Washer
10. Nut

DETAIL B

Serials w/ Perspective Avionics and System 55X.

SR20_MM22_3042A

Figure 22-124
Flight Director - Serials w/ Perspective Avionics and System 55X (Sheet 2 of 2)

EFFECTIVITY:
Serials w/ Perspective Avionics and System 55X

GFC 700 AUTOMATED FLIGHT CONTROL SYSTEM (AFCS)

1. DESCRIPTION

This section covers those systems and components which use inputs to the system to automatically control the flight path of the aircraft through adjustment to the pitch and roll axes or wing lift characteristics and provide visual cues for flight path guidance. This includes the Garmin GFC 700 Autopilot system.

The Garmin GFC 700 digital Automatic Flight Control System (AFCS) Autopilot system is a fully digital, dual channel, fail-passive digital flight control system composed of multiple Line-Replaceable Units (LRUs) and servos. The GFC 700 is fully integrated within the Cirrus Perspective Integrated Avionics System architecture and is used to stabilize the aircraft pitch and roll axes. Pitch autotrim provides trim commands to the pitch trim servo to relieve any long-term effort required by the pitch servo. The system consists of the following components:

- GMC 705 Automatic Flight Control System (AFCS) Mode Controller
- GCU 478 Flight Management System (FMS) Keyboard
- Pitch Servo
- Roll Servo
- Dual GIA 63W Integrated Avionics Computers
- GTA 82 Pitch Trim Adapter
- Autopilot Disconnect Switch
- 4-Way Trim Switch
- Take-Off/Go-Around (GA) Switch

The GIA 63W Integrated Avionics computer contains Autopilot/Flight Director algorithms and the MFD/PFD provides autopilot annunciation. The GRS 77 AHRS provides valid attitude, angular rate and acceleration information. The GDC 74A ADC provides air data for flight instrumentation. The GSA 81 servos are used in the pitch and roll axes. The servos position the aircraft controls in response to commands generated by the internal GIA 63W autopilot calculations. The GTA 82 pitch trim adapter drives the pitch trim cartridge. The operating controls for the autopilot are located on the mode controller/keyboard. The autopilot disconnect and 4-way trim switches provide input to disconnect/override autopilot guidance. (See Figure 22-131)

The GFC 700 AFCS can be divided into two primary operating functions:

Flight Director - The Flight Director provides pitch and roll commands to the AFCS system and displays them on the PFD. With the Flight Director activated, the pilot can hand-fly the aircraft to follow the path shown by the command bars. Flight Director operation takes place within GIA 63W Integrated Avionics Units and provides:

- Mode annunciation
- Vertical reference control
- Pitch and roll command calculation
- Pitch and roll command display

Autopilot - The Autopilot controls the aircraft pitch and roll attitudes, while following commands received from the Flight Director. Autopilot operation occurs within the trim servos and provides:

- Autopilot engagement and annunciation
- Autopilot command and control
- Auto-trim operation
- Manual electric trim

- Two axis airplane control (pitch and roll), including approaches
- Level (LVL) mode engagement command of zero roll and zero vertical speed

For maintenance practices pertinent to the MFD/PFD, AHRS, ADC, or display controller, see Central Display Systems. (Refer to 31-60)

For maintenance practices pertinent to the GIA 63W Integrated Avionics Computer, see Central Computers. (Refer to 31-40)

For additional information on the autopilot system integration, see the Cirrus Perspective Integrated Avionics System Pilot's Guide. (Refer to 05-10)

The GFC 700 AFCS is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

A. GMC 705705 AFCS Mode Controller - *Serials 2016 & subs w/ Perspective Avionics*

The GFC 705 AFCS Mode Controller, located in the upper section of the center console, provides primary control of autopilot modes. A pitch wheel is included for adjustment of pitch mode reference.

Through the mode controller, the GIA 63W Integrated Avionics computer serves the function of converting operator commands to logic signals for the roll and pitch computer functions.

28 VDC for mode controller operation is supplied through the 5-amp KEYPADS / AP CTRL circuit breaker on Main Bus 1.

B. GTA 82 Pitch Trim Adapter - *Serials 2016 & subs w/ Perspective Avionics*

The Pitch Trim Adapter, located below the passenger seat, takes input from the trim switches, Integrated Avionics Units, and the pitch servo to allow the GFC 700 to drive the pitch servo.

The trim adapter interfaces with the dual GIA 63W Integrated Avionics computers through serial communication on separate RS-485 ports. Trim commands from the yoke switches are routed through the GTA 82 when autopilot is disconnected.

28 VDC for pitch trim adapter operation is supplied through the 2-amp PITCH TRIM circuit breaker on Main Bus 1.

C. Pitch Servo - *Serials 2016 & subs w/ Perspective Avionics*

The pitch servo, located below the baggage compartment at access panel CF5, provides automatic control of the pitch axis. The pitch computer receives signal inputs to compute pitch commands for stabilization, turns, radio intercepts, heading and tracking.

The pitch servo is an electromechanical unit that provides automatic control of the pitch flight axis. The pitch servo receives data from dual GIA 63W Integrated Avionics computers containing Autopilot/Flight Director algorithms. The GRS 77 AHRS and the GDC 74A Air Data Computer are fed inputs used to drive autopilot. The pitch servo consists of a GSA 81 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for pitch axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

28 VDC for pitch servo operation is supplied through the 5-amp AP SERVOS circuit breaker on Main Bus 1.

D. Roll Servo - *Serials 2016 & subs w/ Perspective Avionics*

The roll servo, located below the passenger seat at access panel CF4C, provides automatic control of the roll axis. The roll computer receives signal inputs to compute roll commands for stabilization, turns, radio intercepts, heading and tracking.

The roll servo is an electromechanical unit that provides automatic control of the roll flight axis. The roll servo receives data from dual GIA 63W Integrated Avionics computers containing Autopilot/Flight Director algorithms. The GRS 77 AHRS and the GDC 74A Air Data Computer are fed inputs used to drive autopilot. The roll servo consists of a GSA 81 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for roll axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

28 VDC for roll servo operation is supplied through the 5-amp AP SERVOS circuit breaker on Main Bus 1.

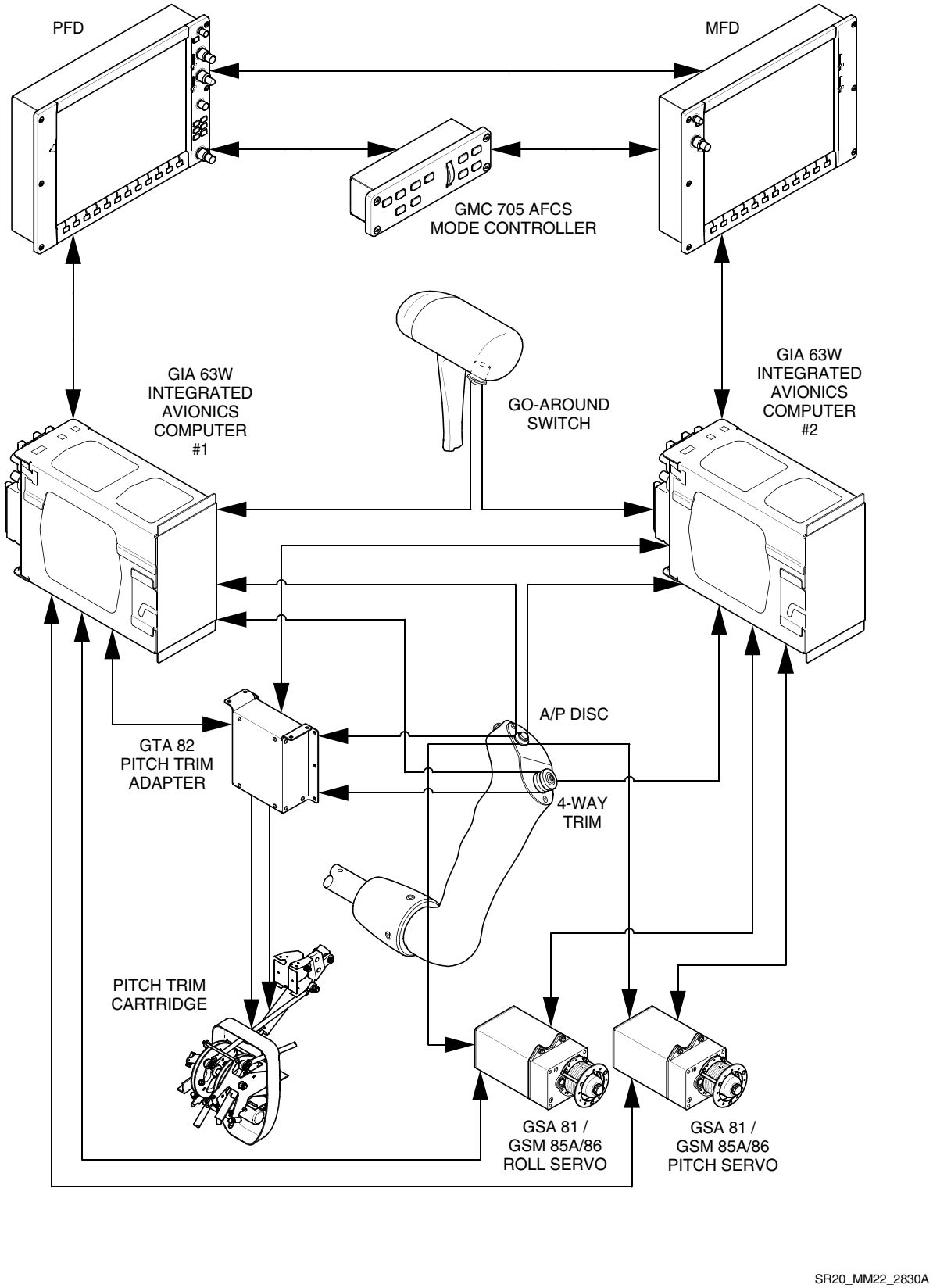


Figure 22-131
GFC 700 Autopilot System Schematic - Serials 2016 & subs w/ Perspective Avionics

2. TROUBLESHOOTING

Trouble - GFC 700 Autopilot System	Probable Cause	Remedy
"AFCS" (white text on red background) annunciation is displayed on PFD.	AFCS system failure has occurred.	Ensure Perspective Avionics system is in proper working order. Check for proper operation of GIA Integrated Avionics Unit, GRS AHRS, GDC Air Data Computer, and all GSA servos.
		Verify no red X's are displayed on MFD and PFD.
		Verify no related alert messages are displayed on PFD (press [ALERTS]).
		Check AUX – SYSTEM STATUS page on MFD to verify all LRUs are online (green check).
		Isolate fault to an LRU. Replace this LRU and confirm resolution of annunciation.
"PFT" (black text on white background) annunciation is displayed on PFD.	Pre-flight test is in progress.	Allow system to complete pre-flight tests. The preflight test should finish within 2 minutes. If it does not pass, red 'PFT' annunciation is displayed on PFD.
"PFT" (white text on red background) annunciation is displayed on PFD.	Pre-flight test has failed.	Ensure Perspective Avionics system is in proper working order. Check for proper operation of GIA Integrated Avionics Unit, GRS AHRS, GDC Air Data Computer, and all GSA servos.
		Verify no red X's are displayed on MFD and PFDs.
		Verify no related alert messages are displayed on PFD (press [ALERTS]).
		Check AUX – SYSTEM STATUS page on MFD to verify all LRUs are online (green check).
		Isolate fault to an LRU. Replace this LRU and confirm resolution of annunciation.

Trouble - GFC 700 Autopilot System	Probable Cause	Remedy
No aural alert is heard after successful pre-flight test.	Audio operation fault has occurred.	Repeat autopilot engagement, followed by disengagement to confirm audio operation fault.
		Verify connections for GIA 1/GMA 1 and GIA 2/GMA 2 audio interface.
Autopilot clutches cannot be overpowered.	Servo clutch torque settings are incorrect.	Check the servo clutch torque settings.
		Perform Adjustment/Test - GSM 85A/86 Servo Clutch Test. (Refer to 22-13)
Trim hesitates during trim switch operation.	Excessive friction on aircraft pitch trim system.	Press trim switch on yoke in one direction until it reaches the stop. Using stop watch, time trim speed from one end of travel to opposite stop. Verify elapsed time measures 20 ±3 seconds for each direction.

Trouble - GMC 705 AFCS Mode Controller	Probable Cause	Remedy
"GMC CNFG – GMC Config error. Config service req'd." annunciation is displayed on PFD.	The Perspective Avionics system has detected a GMC 705 configuration mismatch.	For GMC 705, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Replace GMC 705. (Refer to 22-13)
"GMC FAIL – GMC is inoperative." annunciation is displayed on PFD.	The Perspective Avionics system has detected a failure in the GMC 705.	Check GMC 705 wiring and connector.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Replace GMC 705. (Refer to 22-13)
"MANIFEST – GMC software mismatch. Communication halted." annunciation is displayed on PFD.	The Perspective Avionics system has detected an incorrectly loaded software version.	Check software version on AUX – SYSTEM STATUS page on MFD.
		For GMC 705, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

Trouble - GTA 82 Pitch Trim Adapter	Probable Cause	Remedy
"PIRM" (white text on red background) annunciation is displayed on PFD.	Pitch trim axis failure has occurred.	Check AUX – SYSTEM STATUS page on MFD to verify pitch servo is online (green check).
		Verify pitch servo is receiving power.
		Check pitch servo wiring and connector.
		Replace pitch trim adapter. (Refer to 22-13)
		Replace pitch servo. (Refer to 22-13)

Trouble - GSA 81 / GSM 85A/86 Pitch Servo	Probable Cause	Remedy
"PITCH" (white text on red background) annunciation is displayed on PFD.	Pitch axis failure has occurred.	Check AUX – SYSTEM STATUS page on MFD to verify pitch servo is online (green check).
		Verify pitch servo is receiving power.
		Check pitch servo wiring and connector.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Replace pitch servo. (Refer to 22-13)
"↓ELE" (black text on yellow background) annunciation is displayed on PFD.	The elevator is mis-trimming down.	Check AUX – SYSTEM STATUS page on MFD to verify pitch servo is online (green check).
		Verify pitch servo is receiving power.
		Check pitch servo wiring and connector.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Check elevator pitch control rigging. (Refer to 22-13)
		Replace pitch servo. (Refer to 22-13)

Trouble - GSA 81 / GSM 85A/86 Pitch Servo	Probable Cause	Remedy
"↑ELE" (black text on yellow background) annunciation is displayed on PFD.	The elevator is mis-trimming up.	Check AUX – SYSTEM STATUS page to verify pitch servo is online (green check).
		Verify pitch servo is receiving power.
		Check pitch servo wiring and connector.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Check elevator pitch control rigging. (Refer to 22-13)
		Replace pitch servo. (Refer to 22-13)

Trouble - GSA 81 / GSM 85A/86 Roll Servo	Probable Cause	Remedy
"ROLL" (white text on red background) annunciation is displayed on PFD.	Roll axis failure has occurred.	Check AUX – SYSTEM STATUS page on MFD to verify roll servo is online (green check).
		Verify roll servo is receiving power.
		Check roll servo wiring and connector.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Replace roll servo. (Refer to 22-13)
"AIL→" (black text on yellow background) annunciation is displayed on PFD.	The aileron is mis-trimming to right.	Check for possible fuel imbalance.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Check aileron roll control rigging. (Refer to 22-13)
		Replace roll servo. (Refer to 22-13)

Trouble - GSA 81 / GSM 85A/86 Roll Servo	Probable Cause	Remedy
"←AIL" (black text on yellow background) annunciation is displayed on PFD.	The aileron is mis-trimming to left.	Check for possible fuel imbalance.
		Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)
		Check aileron control rigging. (Refer to 22-13)
		Replace roll servo. (Refer to 22-13)

3. MAINTENANCE PRACTICES

A. GMC 705 AFCS Mode Controller - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 22-132)

(1) Removal - GMC 705 AFCS Mode Controller

(a) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(b) Pull KEYPADS / AP CTRL circuit breaker.

(c) Insert hex wrench into front panel bolt holes and engage locking screws.

(d) Turn locking screws ¼ turn counter-clockwise to loosen locking cams.

(e) Disconnect electrical connector from back of mode controller. Remove mode controller.

(2) Installation - GMC 705 AFCS Mode Controller

(a) Connect electrical connector to back of mode controller.

(b) Position mode controller flush to instrument panel.

(c) Insert hex wrench into front panel bolt holes and engage locking screws.

(d) Turn locking screws ¼ turn clockwise to tighten locking cams.

(e) Reset KEYPADS / AP CTRL circuit breaker.

(f) If GMC 705 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(g) Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)

B. GCU 478 Flight Management System (FMS) Keyboard - *Serials 2016 & subs w/ Perspective Avionics*

The GCU 478 FMS keyboard is an alphanumeric, softkey keyboard that provides the primary interface for data entry for the MFD and is used to control NAV/COM radios, transponder, and FMS entry. Heading, course and altitude select are also provided. For maintenance practices pertinent to the GCU 478 FMS keyboard, see Flight Management Computing. (Refer to 34-60)

C. 4-Way Trim Switch - *Serials 2016 & subs w/ Perspective Avionics*

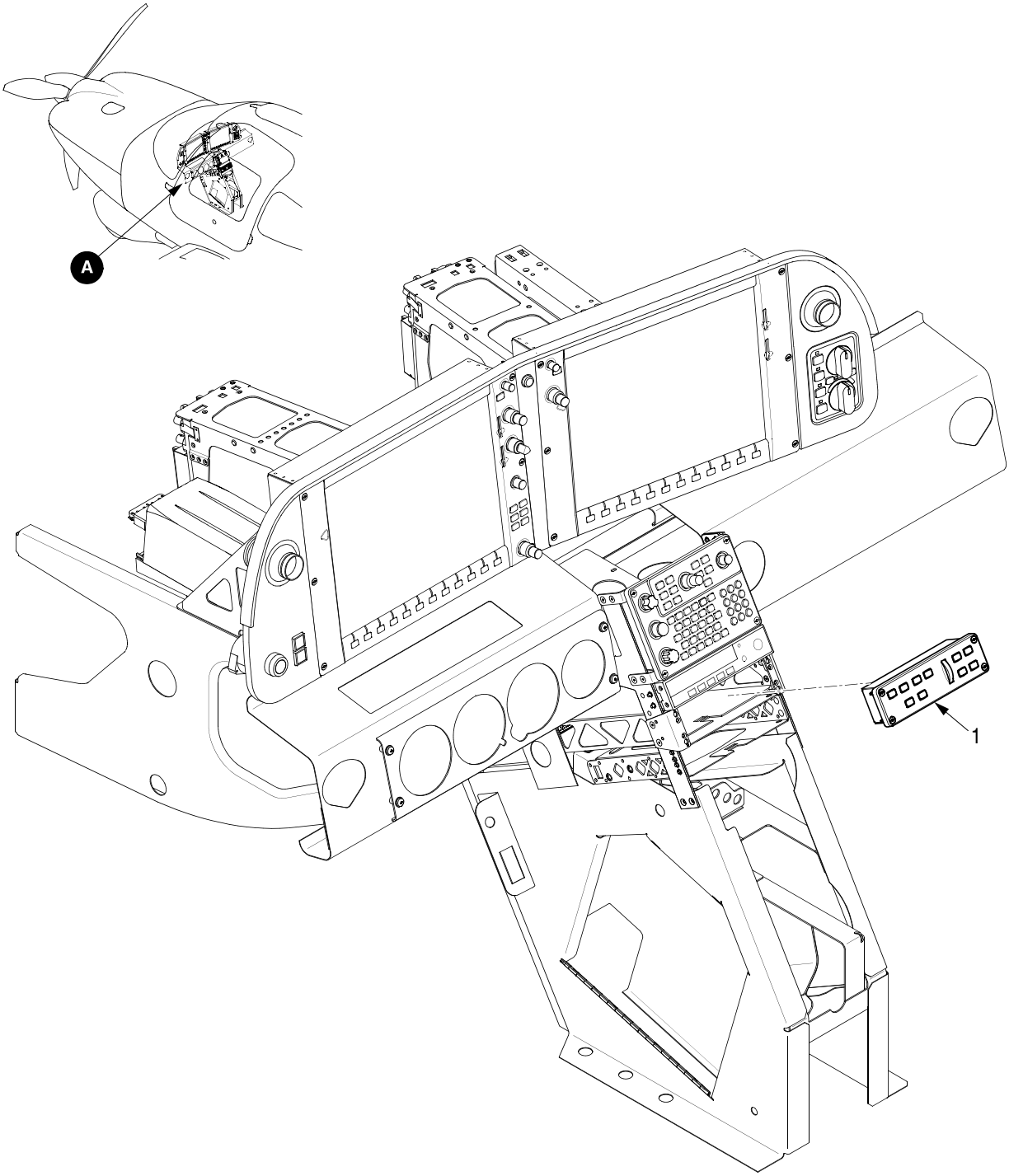
The 4-way trim switch is integral to the control yoke and is used to command manual electric pitch/roll trim. For maintenance practices pertinent to the 4-way trim switch, see Aileron And Roll Trim System. (Refer to 27-10)

D. Take-Off/Go-Around (TO/GA) Switch - *Serials 2016 & subs w/ Perspective Avionics*

The Take-Off/Go-Around (TO/GA) switch is integral to the throttle and is used to disengage the autopilot and select Take-Off/Go-Around mode on the Flight Director. For maintenance practices pertinent to the TO/GA switch, see Speed-attitude Correction. (Refer to 22-20)

E. Autopilot Disconnect Switch - *Serials 2016 & subs w/ Perspective Avionics*

The autopilot disconnect switch is integral to the control yoke and is used to disengage the autopilot and mute the aural alert associated with an autopilot disconnect. For maintenance practices pertinent to the autopilot disconnect switch, see Aileron And Roll Trim System. (Refer to 27-10)



DETAIL A

LEGEND
1. GMC 705 Mode Controller

SR20_MM22_2831

Figure 22-132
GMC 705 AFCS Mode Controller Installation - Serials 2016 & subs w/ Perspective Avionics

F. GTA 82 Pitch Trim Adapter - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 22-133)

(1) Removal - GTA 82 Pitch Trim Adapter

(a) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(b) Pull PITCH TRIM circuit breaker.

(c) Remove access panels CF4C and CF4R. (Refer to 06-00)

(d) Disconnect electrical connector from pitch trim adapter.

(e) Remove bolts, washers, spacers, and nuts securing pitch trim adapter assembly to RH aft longeron. Remove trim adapter assembly from airplane.

(2) Disassembly - GTA 82 Pitch Trim Adapter

(a) Remove screws and washers securing pitch trim adapter to mounting plate.

(3) Assembly - GTA 82 Pitch Trim Adapter

(a) Position mounting plate to pitch trim adapter and secure with screws and washers.

(4) Installation - GTA 82 Pitch Trim Adapter

(a) Position pitch trim adapter assembly to RH aft longeron and secure with bolts, washers, spacers, and nuts.

(b) Connect electrical connector to pitch trim adapter.

(c) Reset PITCH TRIM circuit breaker.

(d) If GTA 82 has been replaced with a new or different unit, or original unit has been repaired, perform Functional Test - GTA 82 Pitch Trim Adapter Software and Configuration Loading. (Refer to 22-13)

(e) Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)

(f) Install access panel CF4C and CF4R. (Refer to 06-00)

(5) Adjustment/Test - GTA 82 Pitch Trim Adapter Software and Configuration Loading

Note: No software loading is required if the removed pitch trim adapter is reinstalled in the same position. This does not include units that were returned for repair as the software and configuration files are deleted during the repair testing process.

If a new, repaired, or exchanged GTA 82 pitch trim adapter is installed, load software and gains files from the Cirrus Perspective software loader card.

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

CAUTION: Failure to remove database cards may result in cards becoming corrupted.

(c) Remove Cirrus Safety Screen SD card from top slot of MFD.

(d) Remove Garmin Terrain/Obstacle/Safe Taxi/Flight Chart SD cards from bottom slots of MFD and PFD.

(e) Insert Cirrus Perspective software loader card into top slot of PFD.

(f) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

3 On PFD, press [NO] softkey at “DO YOU WANT TO UPDATE SYSTEM FILES?” prompt.

4 On PFD, press [NO] softkey at “DO YOU WANT TO UPDATE SYSTEM SPLASH SCREEN?”

(g) After System Status page appears on PFD, use inner [FMS] knob to select System Upload page.

(h) Press inner [FMS] knob to activate cursor.

(i) Rotate inner [FMS] knob to display list of AIRFRAME choices, highlight “Options” in pop-up window, then press [ENT] key.

(j) In FILE window, rotate inner [FMS] knob to display list of FILE choices. In pop-up window, highlight GFC 700 (with or without YD) configuration file that matches aircraft configuration, and press [ENT] key.

(k) Press [CLR ALL] softkey.

Note: Pressing [ENT] key will check and uncheck highlighted software and configuration boxes.

(l) Using [FMS] knob and [ENT] key, select following files:

- Pitch Trim software
- Pitch Trim gains

(m) Once files are selected, press [LOAD] softkey.

(n) When upload is complete, press [ENT] key to select OK in UPLOAD COMPLETE window.

(o) Set BAT 1 and AVIONICS switches to OFF positions.

CAUTION: Wait for “flash” of display screens or 5 seconds to ensure backup capacitors have discharged before removing software loader card.

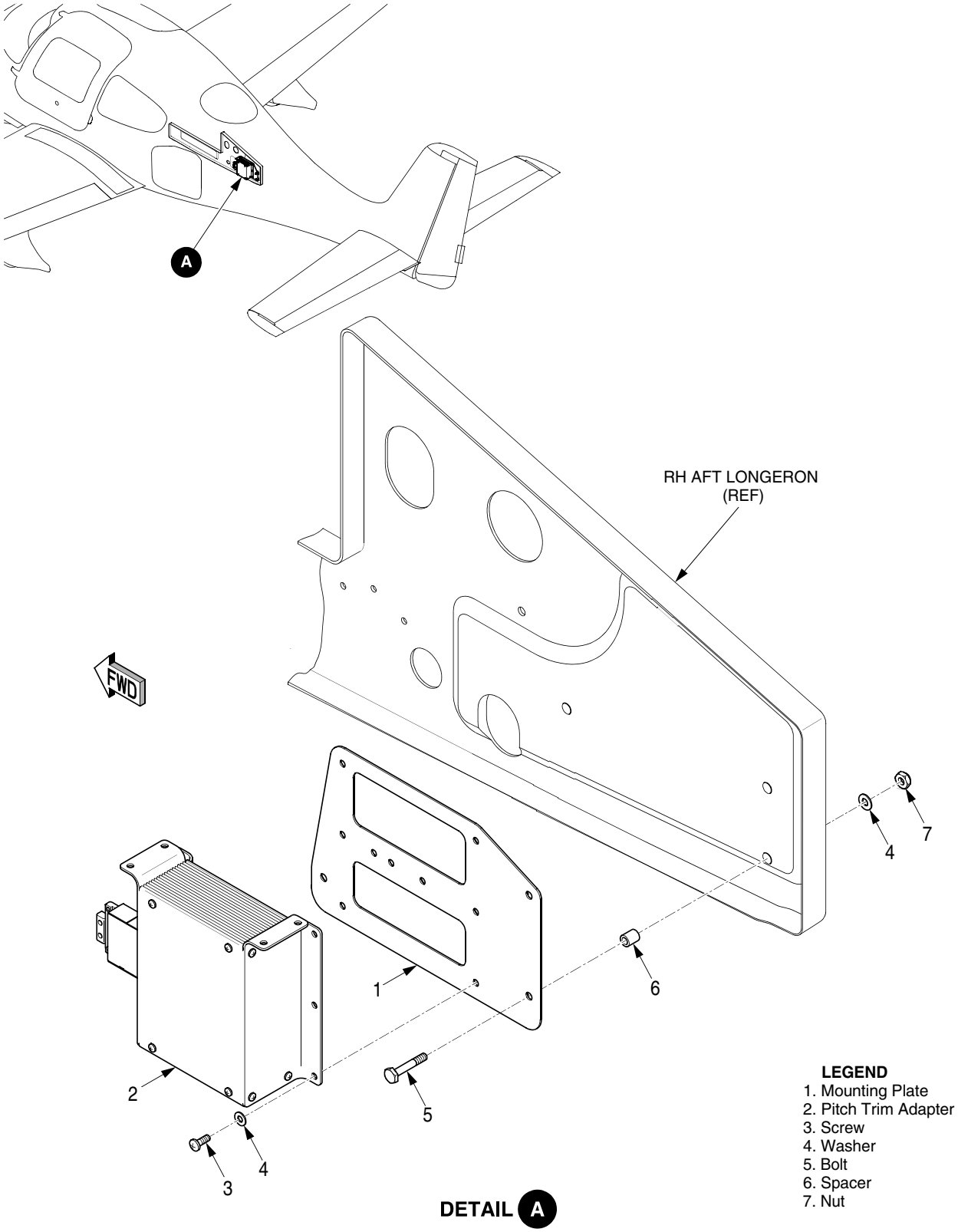
(p) Remove Cirrus Perspective software loader card from PFD.

(q) Insert Garmin Terrain/Obstacle/Safe Taxi/Flight Chart SD cards into lower slots of MFD and PFD.

(r) Insert Cirrus Safety Screen SD card into top slot of MFD.

(s) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(t) Disconnect 28 ±1 VDC external power from external power receptacle.



Serials 2016 & subs w/ Perspective Avionics.

SR20_MM22_2838

Figure 22-133
GTA 82 Pitch Trim Adapter Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

G. GSA 81 Servo Actuator - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 22-134) (See Figure 22-135)**

(1) Removal - GSA 81 Servo Actuator

(a) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(b) Pull AP SERVOS circuit breaker.

(c) *For pitch servo:* Remove access panel CF5. (Refer to 06-00)

(d) *For roll servo:* Remove access panel CF4C. (Refer to 06-00)

(e) Disconnect servo actuator connector from aircraft harness.

(f) Remove bolts and washers securing servo actuator to servo mount.

(2) Installation - GSA 81 Servo Actuator

(a) Perform Inspection/Check - GSA 81 Servo Actuator. (Refer to 22-13)

(b) Carefully align servo actuator with servo mount.

CAUTION: The servo actuator and servo mount must fit flush together with no gaps before tightening mounting bolts. Do not under any circumstances try to close gap by tightening mounting bolts or the servo mount will be damaged.

Note: To facilitate gear alignment, use the correct orientation.

(c) Install bolts and washers securing servo actuator to servo mount.

(d) *Serials w/ GSM 85A:* Torque bolts to 45.0 ±5.0 in-lb (5.1 ±0.6 Nm). (Refer to 20-60)

(e) *Serials w/ GSM 86:* Torque bolts to 35.0 ±5.0 in-lb (3.95 ±0.56 Nm). (Refer to 20-60)

(f) Connect servo actuator connector to aircraft harness.

Note: Ensure that harness is properly secured to the airframe.

(g) Reset AP SERVOS circuit breaker.

(h) If GSA 81 has been replaced with a new or different unit, or original unit has been repaired, perform Functional Test - GSA 81 Servo Software and Configuration Loading. (Refer to 22-13)

(i) Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)

(j) *For pitch servo:* Install access panel CF5. (Refer to 06-00)

(k) *For roll servo:* Install access panel CF4C. (Refer to 06-00)

(3) Inspection/Check - GSA 81 Servo Actuator

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean, lint free)	-	Any Source	Remove excess grease.
Paint Brush	-	Any Source	Apply grease.
Grease	AeroShell 17 (or equivalent that meets MIL-G-21164D)	Shell Aviation London, United Kingdom +44-20-7934-8264	Lubrication.

(b) Remove GSA 81 servo actuator. (Refer to 22-13)

(c) Using lint-free cloth, remove excess grease build-up from servo output gear.

CAUTION: Do not use solvents to clean the output gear.

Note: It is not necessary to remove all grease from output gear.

(d) Using brush or other applicator, apply a thin coat of grease to servo output gear.

(e) Install GSA 81 servo actuator. (Refer to 22-13)

(4) Adjustment/Test - GSA 81 Servo Software and Configuration Loading

Note: No software loading is required if the removed servo is reinstalled in the same position. This does not include units that were returned for repair as the software and configuration files are deleted during the repair testing process.

If a new, repaired, or exchanged GSA 81 servo is installed, load software and gains files from the Cirrus Perspective software loader card.

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

CAUTION: Failure to remove database cards may result in cards becoming corrupted.

(c) Remove Cirrus Safety Screen SD card from top slot of MFD.

(d) Remove Garmin Terrain/Obstacle/Safe Taxi/Flight Chart SD cards from bottom slots of MFD and PFD.

(e) Insert Cirrus Perspective software loader card into top slot of PFD.

(f) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

3 On PFD, press [NO] softkey at “DO YOU WANT TO UPDATE SYSTEM FILES?” prompt.

4 On PFD, press [NO] softkey at “DO YOU WANT TO UPDATE SYSTEM SPLASH SCREEN?”

(g) After System Status page appears on PFD, use inner [FMS] knob to select System Upload page.

(h) Press inner [FMS] knob to activate cursor.

(i) Rotate inner [FMS] knob to display list of AIRFRAME choices, highlight “Options” in pop-up window, then press [ENT] key.

(j) In FILE window, rotate inner [FMS] knob to display list of FILE choices. In pop-up window, highlight GFC 700 (with or without YD) configuration file that matches aircraft configuration, and press [ENT] key.

(k) Press [CLR ALL] softkey.

Note: Pressing [ENT] key will check and uncheck highlighted software and configuration boxes.

(l) *For pitch servo:* Using [FMS] knob and [ENT] key, select following files:

- Pitch software
- Pitch gains

(m) *For roll servo:* Using [FMS] knob and [ENT] key, select following files:

- Roll software
- Roll gains

(n) Once are selected, press [LOAD] softkey.

(o) When upload is complete, press [ENT] key to select OK in UPLOAD COMPLETE window.

(p) Set BAT 1 and AVIONICS switches to OFF positions.

CAUTION: Wait for “flash” of display screens or 5 seconds to ensure backup capacitors have discharged before removing software loader card.

(q) Remove Cirrus Perspective software loader card from PFD.

(r) Insert Garmin Terrain/Obstacle/Safe Taxi/Flight Chart SD cards into lower slots of MFD and PFD.

(s) Insert Cirrus Safety Screen SD card into top slot of MFD.

(t) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(u) Disconnect 28 ±1 VDC external power from external power receptacle.

H. GSM 85A/86 Pitch Servo Mount - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 22-134)**

(1) Removal - GSM 85A/86 Pitch Servo Mount

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AP SERVOS circuit breaker.

(c) Remove access panel CF5. (Refer to 06-00)

(d) *Serials w/ Air Conditioning:* Remove condenser. (Refer to 21-50)

(e) Disconnect pitch servo plug from socket.

Note: Note location of bridle cable clamps on elevator cable to facilitate reinstallation.

(f) Remove bolts, nuts, and clamps securing bridle cable to elevator cable.

(g) Remove bolts and washers securing pitch servo to mounting bracket and remove pitch servo from airplane.

(2) Disassembly - GSM 85A/86 Pitch Servo Mount

(a) Remove screws and washers securing stiffener ring to capstan cable guards.

(b) Remove cable guards.

(c) *Serials w/ GSM 85A:* Disassemble capstan cover.

1 Remove screws and washers securing outer capstan cover and gasket to capstan.

2 Remove cotter pin, nuts, o-ring, and washer securing inner capstan cover to capstan. Remove capstan cover and gasket.

(d) *Serials w/ GSM 86:* Disassemble capstan.

1 Remove bolt and washer securing capstan assembly to servo mount.

2 Remove retaining ring securing slip clutch cartridge to capstan.

(e) Remove cotter pin, nut, washers, spacer, and bolt securing pulley and cable keeper to mounting bracket.

(f) Remove stop-ball from capstan recess and unwrap bridle cable from capstan.

(3) Reassembly - GSM 85A/86 Pitch Servo Mount

(a) *Serials w/ GSM 85A:* If pitch servo mount is a different unit from the originally installed pitch servo mount:

1 Perform Adjustment/Test - GSM 85A Servo Mount Torque. (Refer to 22-13)

(b) Insert and depress bridle cable stop-ball into capstan recess.

(c) Wrap bridle cable around servo capstan.

1 On servo capstan, position bridle cable stop-ball at 9 o'clock position (stop-ball at forward side of capstan), and wrap long end of bridle cable approximately 480° counter-clockwise such that cable exits bottom of capstan.

2 On servo capstan, position bridle cable stop-ball at 9 o'clock position (stop-ball at forward side of capstan), and wrap short end of bridle cable approximately 480° clockwise such that cable exits bottom of capstan.

Note: Align cable keeper so arm extends through mounting bracket hole but does not contact pulley or mounting bracket.

(d) Position pulley and cable keeper to mounting bracket and secure with bolt, washers, nut, and new cotter pin.

(e) *Serials w/ GSM 85A:* Reassemble capstan cover.

1 Position capstan cover and gasket onto capstan. Install new cotter pin, nuts, o-ring, and washer securing inner capstan cover to capstan.

2 Install screws and washers securing outer capstan cover and gasket to capstan. Torque screws to 10.0 ±2.0 in-lb (1.13 ±0.23 Nm).

(f) *Serials w/ GSM 86:* Reassemble capstan.

1 Position slip clutch cartridge into capstan.

2 Install retaining ring securing slip clutch cartridge to capstan.

3 Position capstan assembly to servo mount.

4 Install bolt and washer securing capstan assembly to servo mount. Torque bolt to 35.0 ±5.0 in-lb (3.95 ±0.56 Nm).

(g) Install cable guards.

(h) Position stiffener ring to capstan cable guards and secure with screws and washers. Torque screws to 10.0 ±2.0 in-lb (1.13 ±0.23 Nm).

(4) Installation - GSM 85A/86 Pitch Servo Mount

(a) Position pitch servo to mounting bracket and secure with bolts and washers.

(b) *Serials w/ GSM 85A:* Torque bolts to 45.0 ±5.0 in-lb (5.1 ±0.6 Nm). (Refer to 20-60)

(c) *Serials w/ GSM 86:* Torque bolts to 35.0 ±5.0 in-lb (3.95 ±0.56 Nm). (Refer to 20-60)

(d) Perform Adjustment/Test - GSM 85A/86 Pitch Servo Mount Bridle Cable Tension. (Refer to 22-13)

(e) Connect pitch servo plug to socket.

(f) Reset AP SERVOS circuit breaker.

(g) Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)

(h) *Serials w/ Air Conditioning:* Install condenser. (Refer to 21-50)

(i) Install access panel CF5. (Refer to 06-00)

(5) Adjustment/Test - GSM 85A/86 Pitch Servo Mount Bridle Cable Tension

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092	Cable tension determination.
Rigging Lockout Tool	14905-001	Cirrus Design Duluth, MN 55811 218-727-2737	Lockout elevator bellcrank.
3/16” Lockout Pin	-	Any Source	Lockout elevator bellcrank.

(b) Remove access panel RE1. (Refer to 06-00)

(c) Using rigging lockout tool and pin, lockout elevator empennage bellcrank.

(d) Using tensiometer, verify elevator control cable tension. (See Figure 06-001) If elevator control cable tension falls outside specified tolerance, perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)

(e) On servo capstan, position bridle cable stop-ball at 9 o’clock position (stop-ball at forward side of capstan in the capstan recess).

(f) Ensure approximately two and one-half wraps of bridle cable exist around capstan and that stop-ball is in center of cable wrap when cable is at center of travel.

(g) Ensure that stop-ball can not become disengaged from capstan recess or that bridle cable exit length can not exceed full groove length of capstan.

Note: Use a ratcheting open-end wrench and socket for tightening bridle cable clamp assembly to elevator cable.

(h) Position long end of bridle cable and clamp assembly to outboard elevator cable and secure with bolts and nuts. Torque nuts to 50 ±5 in-lb (5.6 ±0.6 Nm).

(i) Route short end of bridle cable through mounting bracket hole and between pulley and cable keeper.

(j) Position short end of bridle cable and clamp assembly to inboard elevator cable and loosely secure with bolts and nuts.

(k) While pushing long end of bridle cable and clamp assembly aft, tighten clamp to elevator cable. Torque nuts to 50 ±5 in-lb (5.6 ±0.6 Nm).

(l) Using tensiometer, verify bridle cable tension forward of bridle cable clamps is set to 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg). If bridle cable tension falls outside specified tolerance, loosen aft clamp assembly and adjust bridle cable as required to obtain 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg).

(m) Using tensiometer, verify elevator control cable tension forward of the bridle cable clamp assemblies. (See Figure 06-001)

(n) Remove rigging lockout pin and tool from elevator empennage bellcrank.

(o) Ensure flight control systems operate through full range of travel without binding, obstruction, or excessive friction.

(p) Ensure bridle cable remains in capstan grooves during full elevator and pitch servo travel and bridle cable moves freely through cable guards without chafing.

(q) Ensure there is 0.005 inch (0.127 mm) minimum clearance between bridle cable clamps along main control cable side.

(r) Ensure bridle cable moves freely through mounting bracket without chafing.

(s) Install access panel RE1. (Refer to 06-00)

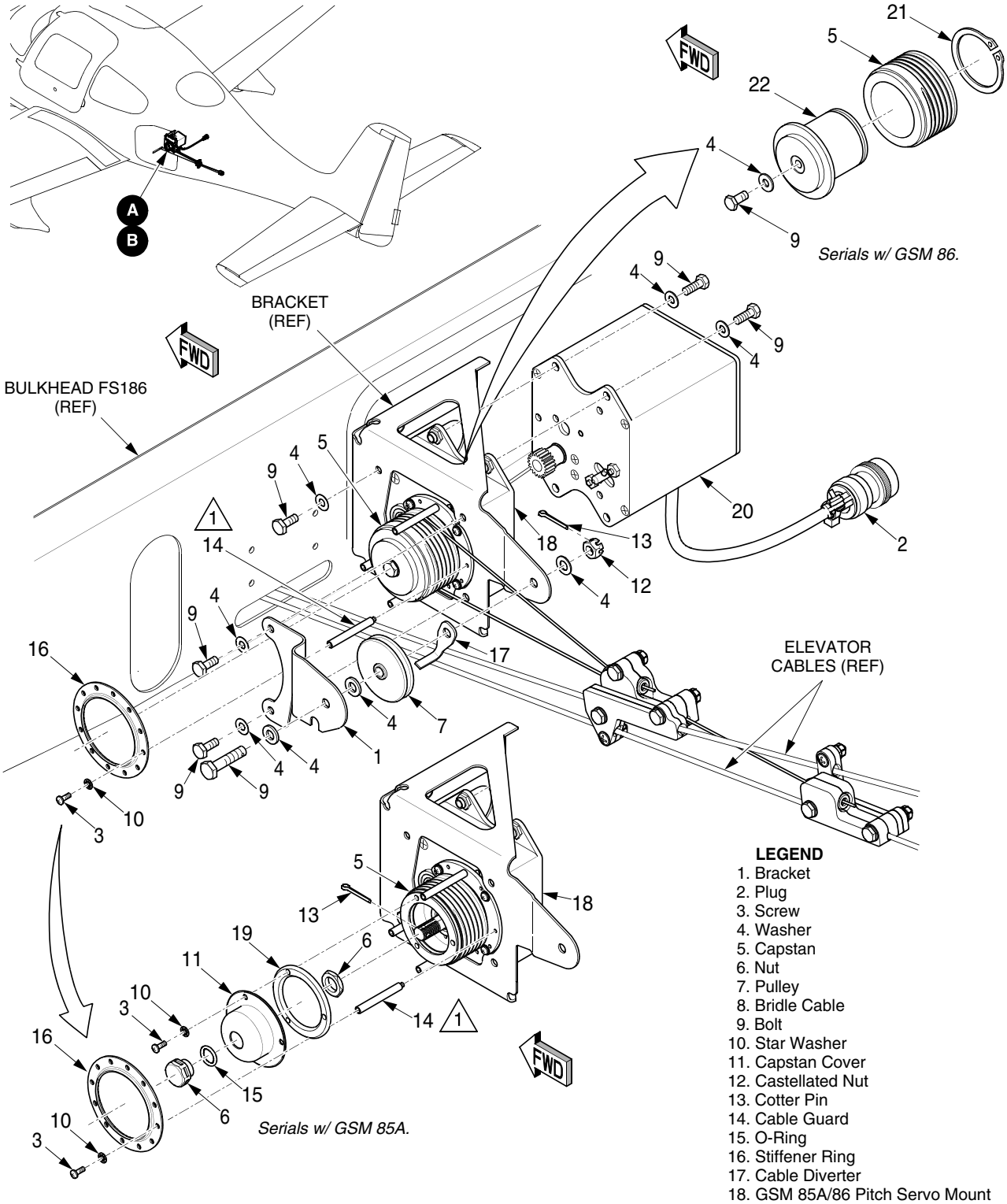
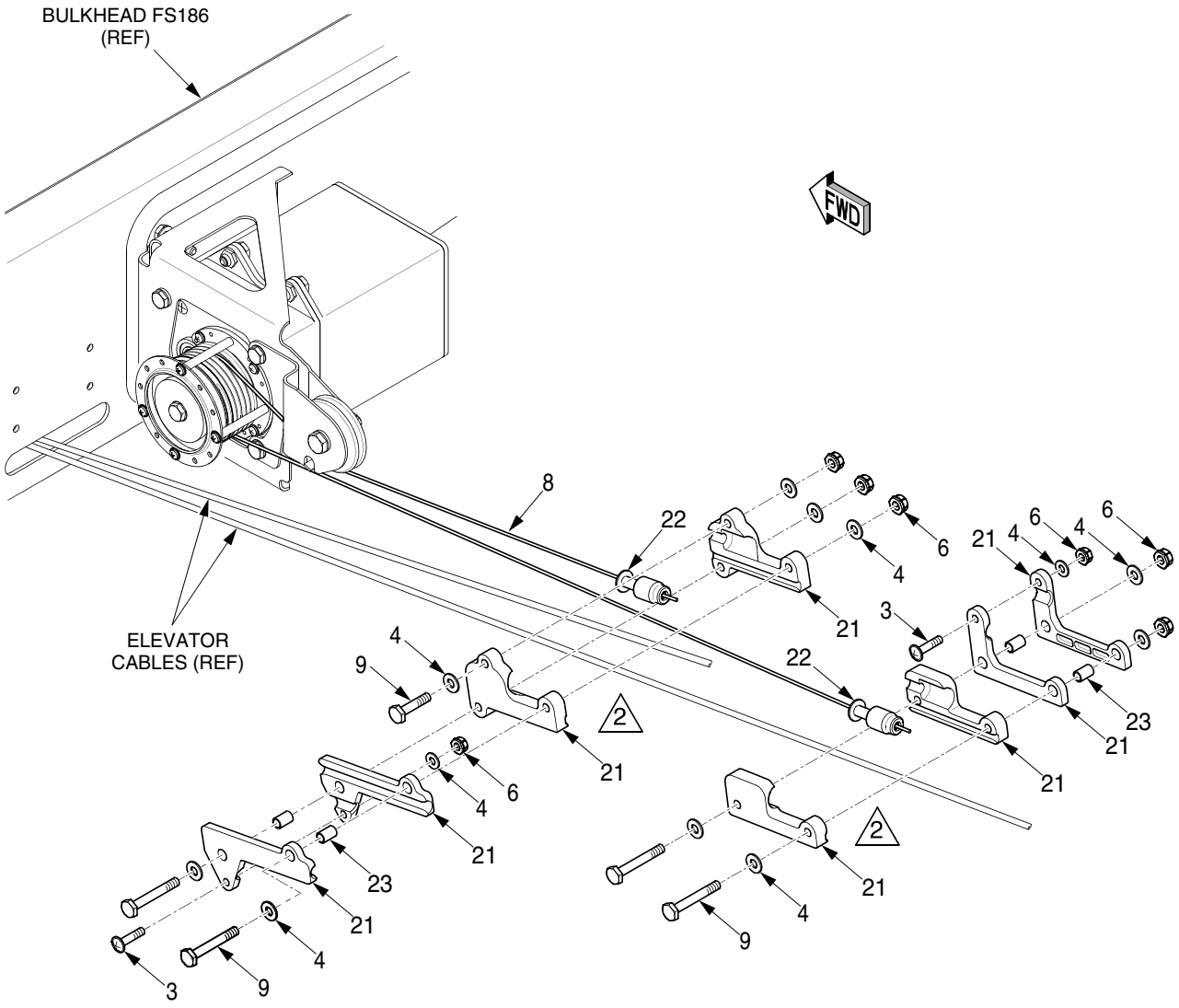


Figure 22-134
Pitch Servo Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 1 of 2)



NOTE

2 Before disassembly, mark location of bridle cable.

LEGEND

3. Screw
4. Washer
6. Nut
8. Bridle Cable
9. Bolt
21. Clamp
22. Bridle Cable End Fitting
23. Spacer

DETAIL B

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM22_2930A

Figure 22-134
Pitch Servo Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

I. GSM 85A/86 Roll Servo Mount - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 22-135)

(1) Removal - GSM 85A/86 Roll Servo Mount

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AP SERVOS circuit breaker.

(c) Remove access panels CF3C and CF4C. (Refer to 06-00)

(d) Disconnect roll servo plug from socket.

Note: Note location of bridle cable clamps on aileron cable to facilitate reinstallation.

(e) Remove bolts, nuts, and clamps securing bridle cable to aileron cable.

(f) Remove bolts and washers securing roll servo to mounting bracket and remove roll servo from airplane.

(2) Disassembly - GSM 85A/86 Roll Servo Mount

(a) Remove screws and washers securing stiffener ring to capstan cable guards.

(b) Remove cable guards.

(c) *Serials w/ GSM 85A:* Disassemble capstan cover.

1 Remove screws and washers securing outer capstan cover and gasket to capstan.

2 Remove cotter pin, nuts, o-ring, and washer securing inner capstan cover to capstan. Remove capstan cover and gasket.

(d) *Serials w/ GSM 86:* Disassemble capstan.

1 Remove bolt and washer securing capstan assembly to servo mount.

2 Remove retaining ring securing slip clutch cartridge to capstan.

(e) Remove stop-ball from capstan recess and unwrap bridle cable from capstan.

(3) Reassembly - GSM 85A/86 Roll Servo Mount

(a) *Serials w/ GSM 85A:* If roll servo mount is a different unit from the originally installed roll servo mount:

1 Perform Adjustment/Test - GSM 85A Servo Mount Torque. (Refer to 22-13)

(b) Insert and depress bridle cable stop-ball into capstan recess.

(c) Wrap bridle cable around servo capstan.

1 On servo capstan, position bridle cable stop-ball at 6 o'clock position (stop-ball at bottom of capstan), and wrap RH wing end of bridle cable approximately 540° counter-clockwise to exit at top of capstan.

2 On servo capstan, position bridle cable stop-ball at 6 o'clock position (stop-ball at bottom of capstan), and wrap LH wing end of bridle cable approximately 540° clockwise to exit at top of capstan.

(d) *Serials w/ GSM 85A:* Reassemble capstan cover.

1 Position capstan cover and gasket onto capstan. Install new cotter pin, nuts, o-ring, and washer securing inner capstan cover to capstan.

2 Install screws and washers securing outer capstan cover and gasket to capstan. Torque screws to 10.0 ±2.0 in-lb (1.13 ±0.23 Nm).

(e) *Serials w/ GSM 86:* Reassemble capstan.

1 Position slip clutch cartridge into capstan.

2 Install retaining ring securing slip clutch cartridge to capstan.

3 Position capstan assembly to servo mount.

4 Install bolt and washer securing capstan assembly to servo mount. Torque bolt to 35.0 ±5.0 in-lb (3.95 ±0.56 Nm).

(f) Install cable guards.

(g) Position stiffener ring to capstan cable guards and secure with screws and washers. Torque screws to 10.0 ±2.0 in-lb (1.13 ±0.23 Nm).

(4) Installation - GSM 85A/86 Roll Servo Mount

(a) Position roll servo to mounting bracket and secure with bolts and washers.

(b) *Serials w/ GSM 85A:* Torque bolts to 45.0 ±5.0 in-lb (5.1 ±0.6 Nm). (Refer to 20-60)

(c) *Serials w/ GSM 86:* Torque bolts to 35.0 ±5.0 in-lb (3.95 ±0.56 Nm). (Refer to 20-60)

(d) Perform Adjustment/Test - GSM 85A/86 Roll Servo Mount Bridle Cable Tension. (Refer to 22-13)

(e) Connect roll servo plug to socket.

(f) Reset AP SERVOS circuit breaker.

(g) Perform Operational Test - GFC 700 Autopilot. (Refer to 22-13)

(h) Install access panels CF3C and CF4C. (Refer to 06-00)

(5) Adjustment/Test - GSM 85A/86 Roll Servo Mount Bridle Cable Tension

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092	Cable tension determination.
3/16” Lockout Pin	-	Any Source	Lockout aileron pulleys.

(b) Remove carpet and access panels CF3C and CF4C. (Refer to 06-00)

(c) Insert rigging lockout pins at aileron actuation pulleys in LH and RH wing.

(d) Insert rigging lockout pin at aileron actuation pulley in center console.

(e) Using tensiometer, verify aileron control cable tension. (See Figure 06-001) If aileron control cable tension falls outside specified tolerance, perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(f) On servo capstan, position bridle cable stop-ball at 6 o’clock position (stop-ball at bottom of capstan in the capstan recess).

(g) Ensure three wraps of bridle cable exist around capstan, stop-ball is in center of cable wrap when cable is at center of travel, and LH wing and RH wing bridle cable ends exit from top of capstan.

(h) Ensure that stop-ball can not become disengaged from capstan recess or that bridle cable exit length can not exceed full groove length of capstan.

Note: Use a ratcheting open-end wrench and socket for tightening bridle cable clamp assembly to aileron cable.

Cable clamps may be rotated to ensure proper cable alignment on servo capstan. Locate clamps such that they do not travel through longeron hole.

(i) Position RH end of bridle cable and clamp assembly to RH aileron cable and secure with bolts and nuts. Torque nuts to 50 ±5 in-lb (5.6 ±0.6 Nm).

(j) Position LH end of bridle cable and clamp assembly to LH aileron cable and loosely secure with bolts and nuts.

(k) While pushing LH end of bridle cable and clamp assembly outboard, tighten clamp to aileron cable. Torque nuts to 50 ±5 in-lb (5.6 ±0.6 Nm).

(l) Using tensiometer, verify bridle cable tension inboard of bridle cable clamps is set to 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg). If bridle cable tension falls outside specified tolerance,

loosen LH clamp assembly and adjust bridle cable as required to obtain 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg).

(m) Using tensiometer, verify aileron control cable tension outboard of the bridle cable clamp assemblies. (See Figure 06-001)

(n) Remove rigging lockout pins from LH and RH aileron actuation pulleys.

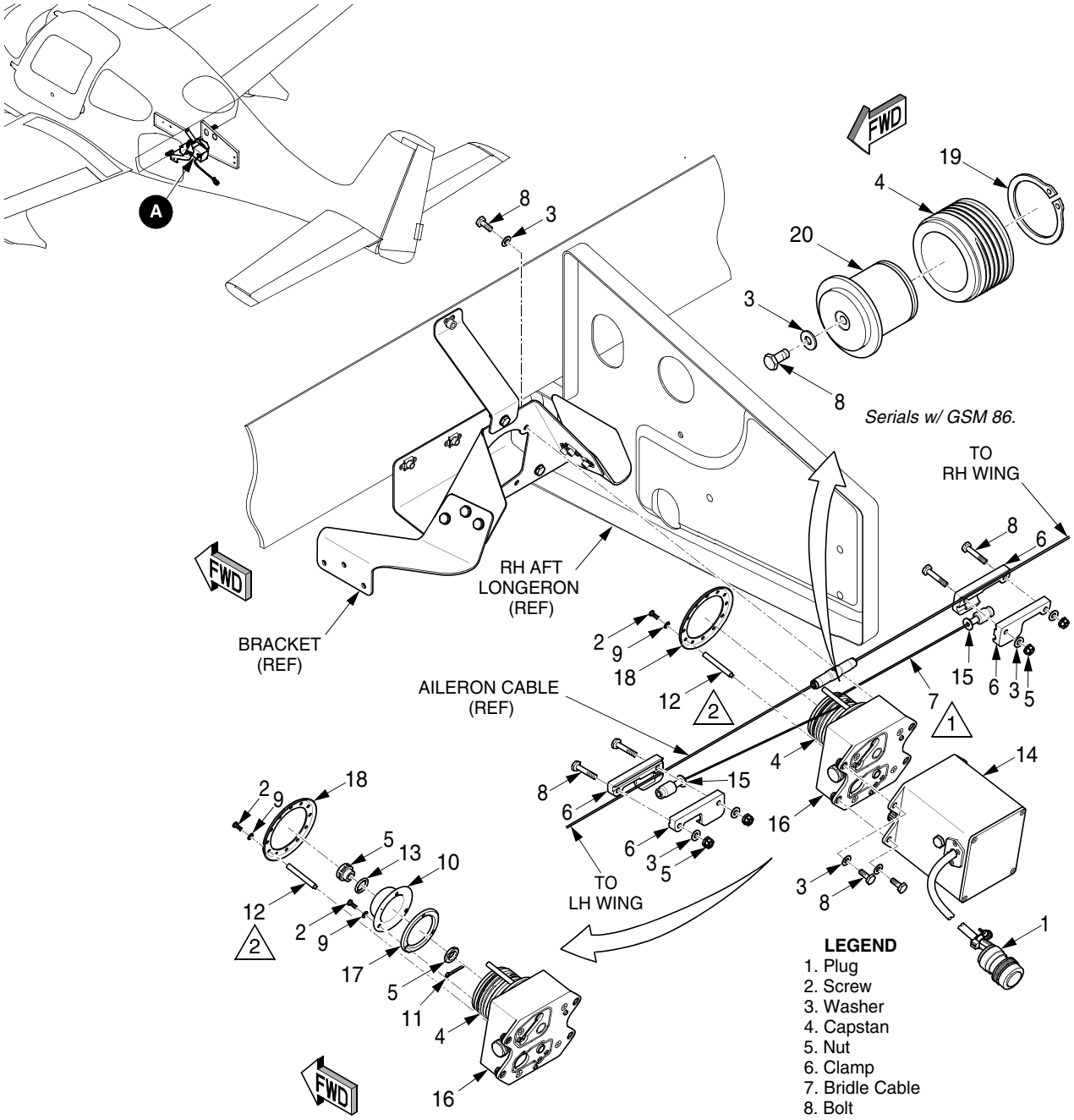
(o) Remove rigging lockout pin in center console aileron actuation pulley.

(p) Ensure flight control systems operate through full range of travel without binding, obstruction, or excessive friction.

(q) Ensure bridle cable remains in capstan grooves during full elevator and pitch servo travel and bridle cable moves freely through cable guards without chafing.

(r) Ensure there is 0.005 inch (0.127 mm) minimum clearance between bridle cable clamps along main control cable side.

(s) Install access panels CF3C and CF4C, and carpet. (Refer to 06-00)



LEGEND

1. Plug
2. Screw
3. Washer
4. Capstan
5. Nut
6. Clamp
7. Bridle Cable
8. Bolt
9. Star Washer
10. Capstan Cover
11. Cotter Pin
12. Cable Guard
13. O-Ring
14. GSA 81 Servo Actuator
15. Bridle Cable End Fitting
16. GSM 85A/86 Roll Servo Mount
17. Gasket
18. Stiffener Ring
19. Retaining Ring
20. Slip Clutch Cartridge

NOTE

1 Before disassembly, mark location of bridle cable.

2 Ensure bridle cable does not rub on cable guards.

DETAIL A

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM22_2833A

Figure 22-135
Roll Servo Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

J. Tests - *Serials 2016 & subs w/ Perspective Avionics*

(1) Operational Test - GFC 700 Autopilot

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set ALT master switch to OFF position.

(c) Connect 28 ±1 VDC external power to external power receptacle.

(d) Complete preflight test.

1 Set BAT 1 and AVIONICS switches to ON positions.

Note: AFCS (red) is displayed on PFD until AHRS and air data computer parameters become valid.

2 After AHRS and air data computer parameters become valid, verify PFT (white) annunciation is displayed on PFD.

3 Approximately 10 to 15 seconds after successful test completion, the PFT annunciation will clear.

(e) To verify trim switches are operating correctly, perform the following trim switch checks.

1 On pilot's yoke, momentarily actuate trim (roll) switch to the left. Verify yoke moves left.

2 Momentarily actuate trim (roll) switch to the right. Verify yoke moves right.

3 Actuate trim (roll) switch to the left until stop is reached.

4 Actuate trim (roll) switch to the right until stop is reached.

5 Actuate trim switch to the center.

6 Momentarily actuate trim (pitch) switch forward. Verify yoke moves forward.

7 Momentarily actuate trim (pitch) switch aft. Verify yoke moves aft.

8 Actuate trim (pitch) switch forward until stop is reached.

9 Actuate trim (pitch) switch aft until stop is reached.

10 Actuate trim switch to the center.

11 Repeat trim switch check on co-pilot's yoke.

(f) To verify AFCS systems buttons and switches are operating correctly, perform the following AFCS switch checks:

1 Press and hold [AP DISC] on yoke while actuating pitch trim switch. Verify trim does not run.

2 Release [AP DISC] on yoke.

3 Press [AP] on GMC 705 to engage autopilot.

4 Pull AP SERVOS, GPS NAV GIA 1, and GPS NAV GIA 2 circuit breakers to cause abnormal autopilot disengagement.

5 Verify a continuous disconnect tone is heard, and AP (flashing red/white) annunciation is displayed on PFD.

6 Verify no AFCS annunciations (e.g. AFCS, PFT, Mis-Trim) remain displayed on PFD.

7 Press [AP DISC] switch on yoke to cancel abnormal disengagement alert.

8 Reset AP SERVOS, GPS NAV GIA 1, and GPS NAV GIA 2 circuit breakers.

9 Wait for pre-flight test sequence to successfully complete again.

10 Press [TO/GA] button on power lever. Verify "TO" is annunciated on PFD for both pitch and roll modes and command bars indicate a wings-level, pitch-up attitude.

11 Press [FD] on GMC 705 to deactivate Go-Around mode and reset Flight Director.

12 Press [AP DISC] switch on yoke to disconnect autopilot.

13 Press [VS] on GMC 705 to engage VS mode.

14 Verify VS (green) annunciation and a pitch reference of '0 FPM' is displayed on PFD.

15 Press [IAS] on GMC 705 to engage IAS mode.

Note: The minimum speed reference for the GFC 700 is 80 KTS.

16 Verify IAS (green) annunciation and a speed reference of '80 KTS' is displayed on PFD.

17 Press [ALT] on GMC 705 to engage ALT mode.

18 Verify "ALT" annunciation and an altitude reference equal to the aircraft altitude (within the nearest 20 feet) is displayed on PFD.

19 Press [FD] on GMC 705 to engage FD mode.

20 Verify mode annunciations and command bars are removed from PFD.

(g) Verify autopilot clutch override operation.

1 Press [AP] on GMC 705 to engage autopilot.

2 Apply force to yoke to verify autopilot clutches can be overpowered in pitch and roll.

(h) Perform autopilot operation checks.

1 Press [AP] on GMC 705 to engage autopilot.

2 Press [HDG] on GMC 705 to synchronize heading bug to present aircraft heading on HSI.

Note: Due to aircraft not being perfectly level, very slow movement of yoke is acceptable.

3 Press [HDG] again to select Heading mode. Verify command bars are level and yoke is stationary.

4 Turn [HDG] knob on GMC 705 to left. Verify command bars move to left and yoke moves left.

5 Turn [HDG] knob on GMC 705 to right. Verify command bars move to right and yoke moves right.

6 Holding yoke lightly, rotate pitch command wheel on GMC 705 UP to increase pitch reference.

7 Verify command bars move up and yoke moves aft.

8 Rotate pitch command wheel on GMC 705 DN to decrease pitch reference.

9 Verify command bars move down and yoke moves forward.

10 Press [AP DISC] on yoke to disconnect autopilot.

11 Actuate trim switch to the center.

12 Press [AP] on GMC 705 to engage autopilot.

13 Rotate pitch command wheel on GMC 705 down to command full NOSE DN.

14 Hold yoke firmly and verify mis-trim annunciation is displayed on PFD.

15 While continuing to hold yoke, press [AP DISC]. Verify Flight Director command bars on PFD remain in view and autopilot disengages.

16 With Flight Director command bars in view, alternately command NOSE UP and NOSE DN by rotating pitch command wheel on GMC 705. Verify Flight director command bars on PFD show corresponding NOSE UP or NOSE DN indication.

(2) Adjustment/Test - GSM 85A/86 Servo Clutch Test

CAUTION: Once test is initiated, the tested servo begins to drive and corresponding flight surface begins to move. Ensure all flight surfaces are free from obstructions through their full range of motion prior to initiating test. If test must be stopped, press [AP DISC] on yoke to disconnect autopilot. (See Figure 27-103)

Note: Adjustment/Test - GSM 85A/86 Servo Clutch Test requires Garmin system software version 0764.08 or later.

Serials w/ GSM 85A and Garmin system software prior to version 0764.08: Do not perform Adjustment/Test - GSM 85A/86 Servo Clutch Test, and proceed directly to Adjustment/Test - GSM 85A Servo Mount Torque. (Refer to 22-13)

Flight control surfaces may need to be lockout pinned for automated test to complete successfully. (See Figure 27-102), (See Figure 27-306)

During testing, temperature conditions of 10° - 48°C (50° - 120°F) are required.

(a) Pull STARTER, FUEL PUMP, and PFD circuit breakers.
(b) Set ALT master switch to OFF position.
(c) Connect 28 ±1 VDC external power to external power receptacle.
(d) While holding far right softkey on PFD, reset PFD circuit breakers and hold softkey until “INITIALIZING SYSTEM” appears to restart PFD in Configuration mode.
(e) On instrument panel, press reversionary button to force MFD into reversionary mode.
(f) Acknowledge any flashing CAS messages on MFD.
(g) On PFD, rotate outer [FMS] knob to select GFC group.
(h) Rotate inner [FMS] knob to select GFC Status page.
(i) Select and test servo.
1 Press inner [FMS] knob to activate cursor.
2 Rotate inner [FMS] knob to highlight applicable servo in SELECT SERVO AXIS field, then press [ENT] key.
3 Verify that PFT status fields on GFC Status page display “PASSED”.
4 Press [TEST SVO] softkey on PFD.
5 Rotate inner [FMS] knob to highlight YES in popup window, then press [ENT] key.
Test begins a 50 second data collection period, where servo is driven at approximately 2.5 RPM while servo load cell measures clutch torque. During test, a pop-up window on PFD indicates test status for active axis and servo direction.
6 Monitor CURRENT, SPEED and TORQUE fields on PFD during test. Verify that values displayed within those fields are not equal to zero.
After data is collected and processed, minimum and maximum torque readings from initial direction of test are displayed on PFD. The servo immediately reverses direction and performs test in opposite direction.
7 If "COMPLETE" is displayed, the test for that servo has completed successfully.

Verify all displayed SLIP CLUTCH TEST RESULTS values are within specifications:

Servo/ Axis	GSM 85A Slip Clutch Torque		
	Nominal	Minimum Allowable	Maximum Allowable
Pitch	39.0 in-lb (4.4 Nm)	36.0 in-lb (4.1 Nm)	42.0 in-lb (4.7 Nm)
Roll	21.0 in-lb (2.4 Nm)	18.0 in-lb (2.1 Nm)	24.0 in-lb (2.7 Nm)

Servo/ Axis	GSM 86 Slip Clutch Torque		
	Nominal	Minimum Allowable	Maximum Allowable
Pitch	39.0 in-lb (4.4 Nm)	33.15 in-lb (2.3 Nm)	44.85 in-lb (5.0 Nm)
Roll	20.0 in-lb (2.3 Nm)	17.0 in-lb (1.9 Nm)	23.0 in-lb (2.6 Nm)

8 If "INCOMPLETE" is displayed or any result exceeds allowable limit, the test for that servo has failed.

Serials w/ GSM 85A: Perform Adjustment/Test - GSM 85A Servo Mount Torque. (Refer to 22-13)

Serials w/ GSM 86: Return slip clutch cartridge to Garmin for recalibration.

9 Press [ENT] key to acknowledge test complete prompt on PFD.

(j) Repeat selection and test for additional servo(s) as required.

(3) Adjustment/Test - GSM 85A Servo Mount Torque **(See Figure 22-136)**

The slip-clutch fixture consists of a motor-driven capstan connected by cable to an idler pulley. At the idler pulley, a torque wrench measures torque applied to the capstan. The observed torque value is used to adjust the slip-clutch by setting the clutch adjustment nut.

WARNING: **Keep fingers, hair, and clothing free of moving parts to prevent injury.**

Follow safe electrical service practices when operating this equipment.

Note: For optimal results, temperature conditions of 15° - 25°C (59° - 77°F) with a corresponding relative humidity less than 50% is recommended.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Slip-Clutch Adjustment Fixture	011-01085-XX	Garmin International, Inc. Olathe, KS 66062 888-606-5482	Torque adjustment.
Cable	233-20001-02	Garmin International, Inc. Olathe, KS 66062 888-606-5482	Torque adjustment.

Description	P/N or Spec.	Supplier	Purpose
Blue Point Torque Wrench[1] 75 in-lb, 1/4" drive 200 in-lb, 1/4" drive	TE6FUE TE25FUE	Snap-on Incorporated Kenosha, WI 53143 877-762-7661	Torque adjustment.
Socket, 13/16”	-	Any Source	Torque adjustment.
Wrench, 9/16”	-	Any Source	Torque adjustment.
DC Power Supply, 2 A, 24 V	-	Any Source	Provide power.

1. Use applicable torque rating.

(b) Set up slip-clutch adjustment fixture.

1 Set MOTOR and SOLENOID switches to OFF position.

2 Loosen fixture clamps and position GSM 85A servo mount onto fixture.

CAUTION: Do not force servo mount into position on fixture. Servo mount should easily be positioned flat on the top of fixture.

3 Engage clamps to secure GSM 85A servo mount to fixture.

Note: Adjust clamp height and position as required to ensure servo mount is secure.

4 At bottom of fixture capstan, insert swaged ball end of cable into bottom end slot. Starting at bottom, wrap cable around fixture capstan two full turns.

5 At center of servo capstan, wrap cable around GSM 85A servo mount capstan two and one half turns, with cable ball positioned to capstan recess.

6 At top of fixture capstan, wrap cable around fixture capstan two more full turns. Insert swaged ball end of cable into top end slot.

Note: Cable tension will be somewhat loose.

7 Tighten fixture adjustment knob to increase cable tension.

Note: Do not over-tighten knob. Some cable slack should remain to allow for approximately 0.25-inch deflection midway between fixture and servo mount capstans. Deflection can be obtained using finger pressure.

8 To secure fixture capstan and bearings to fixture, hand tighten wing-nuts on bottom of fixture while holding top thumb screw ends.

9 Using 13/16” socket, install torque wrench on top of fixture capstan.

Note: Ensure torque wrench is initially set to zero torque before placing it in the fixture.

10 Adjust torque wrench support as required to level torque wrench.

Note: Ensure torque wrench support is secured tightly to prevent movement of the support when torque is applied.

11 Connect 24V ±0.5 VDC from electrical power supply to slip-clutch adjustment fixture. Turn power supply on.

12 Set SOLENOID switch to ON position.

13 Set MOTOR switch to CW (clockwise) position.

14 Using 9/16” wrench, adjust castle nut until torque value indicates required setting.

(c) *For pitch servo:* Adjust slip-clutch.

1 Set MOTOR switch to CCW (counter clockwise) position. Adjust castle nut until torque value is within 39.0 ±3.0 in-lb (4.4 ±0.6 Nm).

2 Alternate motor direction back and forth and adjust castle nut as required until torque value of 39.0 ±3.0 in-lb (4.4 ±0.6 Nm) is obtained in both directions.

Note: Ensure holes in shaft are centered within notches of castle nut.

3 Run capstan two full turns in each direction while observing the torque reading. If torque reading does not remain within required range without any adjustment of castle nut, repeat slip-clutch adjustment.

(d) *For roll servo:* Adjust slip-clutch.

1 Set MOTOR switch to CCW (counter clockwise) position. Adjust castle nut until torque value is within 21.0 ±3.0 in-lb (2.4 ±0.3 Nm).

2 Alternate motor direction back and forth and adjust castle nut as required until torque value of 21.0 ±3.0 in-lb (2.4 ±0.3 Nm) is obtained in both directions.

Note: Ensure holes in shaft are centered within notches of castle nut.

3 Run capstan two full turns in each direction while observing the torque reading. If torque reading does not remain within required range without any adjustment of castle nut, repeat slip-clutch adjustment.

(e) Determine how much of cotter pin hole diameter is above the castle nut.

(f) If more than half of cotter pin diameter is above the nut castellation, install additional washer under the nut.

1 Position servo mount with the shaft pointing up.

2 Remove castle nut. Do not disassemble clutch or adjust position of capstan/hub.

3 Install additional washer on top of existing washer.

4 Hand tighten castle nut onto shaft. Install new cotter pin. If castle nut must be rotated to install cotter pin, verify clutch torque is within recommended torque settings.

CAUTION: To avoid torque wrench damage, relieve cable tension before turning off solenoid. Failure to do so may subject torque wrench to large shock loads.

(g) Relieve cable tension.

1 Set MOTOR switch to OFF position.

2 Briefly set MOTOR switch to opposite direction of previous operation for approximately ½ second or until tension is relieved in cable.

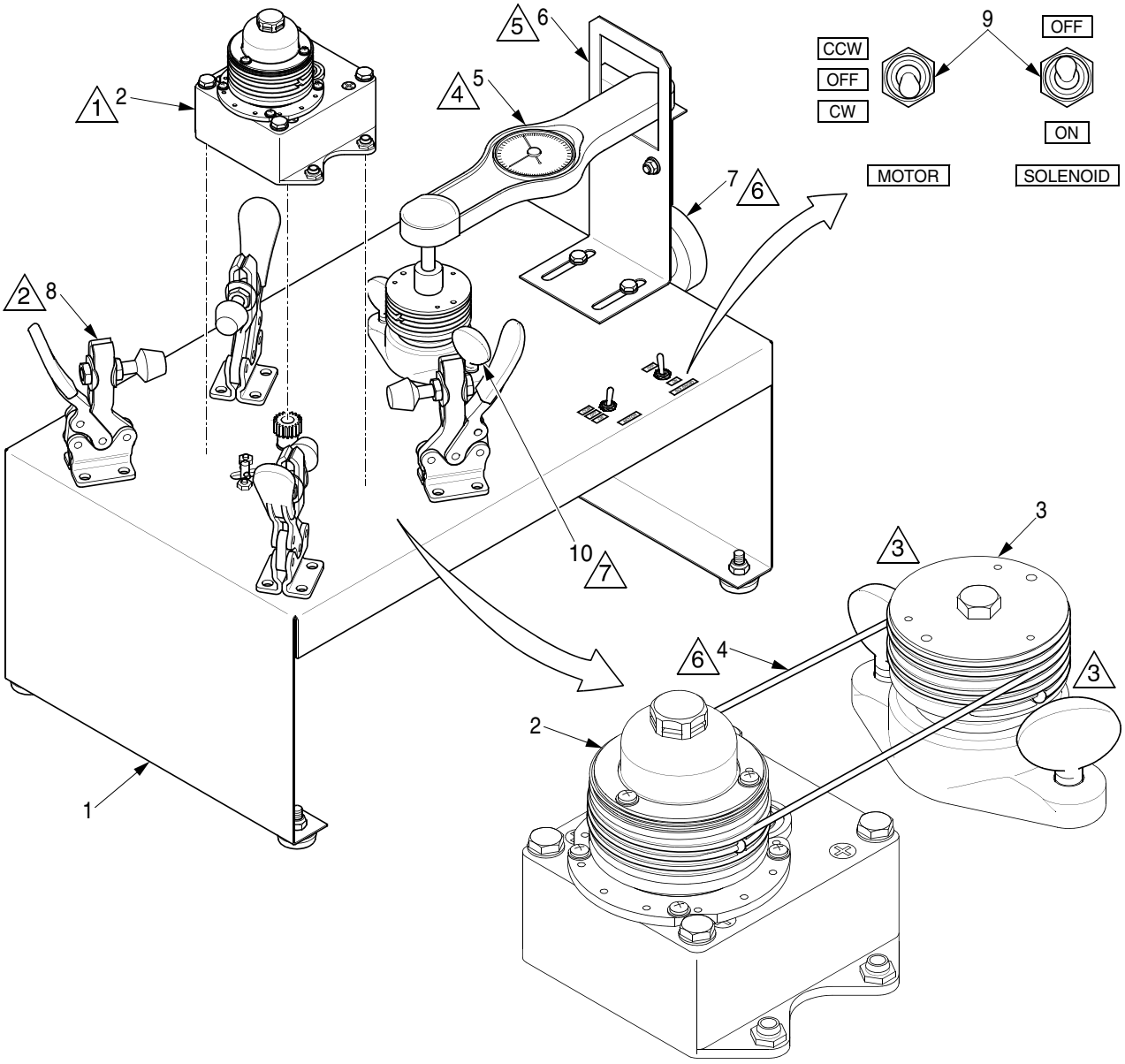
3 Set MOTOR switch to OFF position.

Note: The tension is relieved when torque wrench is loosened in the torque wrench support. Also, torque wrench reading should be zero or close to zero.

4 Set SOLENOID switch to OFF position.

(h) Disconnect electrical power supply from the slip-clutch adjustment fixture.

(i) Remove bolts securing torque wrench support to fixture.
(j) Loosen thumbscrews and wing-nuts securing fixture capstan and bearings to fixture.
(k) Rotate fixture adjustment knob to loosen cable tension.
(l) Remove swaged ball end from top end slot of fixture capstan and unwrap cable from servo mount capstan.
(m) Remove swaged ball end from bottom end slot of fixture capstan and remove cable.
(n) Disengage clamps to remove GSM 85A servo mount from fixture.



NOTE

1. Do not force GSM 85A servo mount onto fixture.
2. Engage clamps as required to secure GSM 85A servo.
3. Insert swaged ball end of cable into bottom and top end slot of fixture capstan.
4. Verify torque wrench is initially set to zero torque before securing it to the fixture.
5. Adjust torque wrench support as required to ensure torque wrench is level and secured tightly to prevent movement.
6. Adjust fixture adjustment knob to allow for approximately 0.25 inch deflection (using finger pressure) midway between the fixture capstan and the GSM 85A servo mount capstan. Do not over-tighten knob.
7. Hand tighten attaching parts securing fixture capstan to fixture.

LEGEND

1. Slip-Clutch Adjustment Fixture
2. GSM 85A Servo Mount
3. Fixture Capstan
4. Cable
5. Torque Wrench
6. Torque Wrench Support
7. Fixture Adjustment Knob
8. Clamp
9. Solenoid/ Motor Switches
10. Thumbscrew

SR20_MM22_2837

Figure 22-136
Adjustment/Test - GSM 85A Servo Mount Torque - Serials 2016 & subs w/ Perspective Avionics

SPEED-ATTITUDE CORRECTION

1. DESCRIPTION

This section covers those systems and components that automatically maintain safe flight conditions by correcting for effects of speed and out-of-trim conditions by such means as automatic trim, mach trim or speed stability and mach feel.

The Take-Off/Go-Around (TO/GA) switch is mounted on the throttle and activates TO/GA mode dependent on the autopilot approach state.

The TO switch is used to assist with take-off procedures. When the aircraft is on the ground, pressing the TO switch engages the Flight Director command bars in take-off mode. TO is annunciated in green in the active pitch and roll fields of the PFD. If the aircraft is on the ground, pressing the TO switch will disengage the autopilot, cancel all armed modes except ALT ARM, and activate Flight Director to pull the aircraft to a wings-level, pitch-up attitude.

The GA switch is used to abort landing procedures. When the aircraft is in the air, pressing the GA switch engages the Flight Director command bars in go around mode. GA is annunciated in green in the active pitch and roll fields of the PFD. If an approach procedure is loaded, pressing the GA switch will disengage the autopilot, cancel all armed modes except ALT ARM, and activate Flight Director to pull the aircraft to a wings-level, pitch-up attitude.

Note: Other roll modes may be selected after TO/GA engagement. Subsequent autopilot engagement is allowed.

For additional information on the TO/GA switch, refer to the Perspective Integrated Avionics System Pilot's Guide for a complete description of the system, its operating modes, and additional detailed operating procedures. (Refer to 05-10)

The TO/GA switch is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. MAINTENANCE PRACTICES

A. Take-Off/Go-Around (TO/GA) Switch

(1) Removal - Take-Off/Go-Around (TO/GA) Switch

(a) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(b) At aft side of engine control assembly, depin switch harness assembly wires from J982 connector.

(c) Disassemble power control. (Refer to 76-10)

(d) Remove TO/GA switch from threaded hole on LH knob cap.

(e) Remove switch harness assembly from power lever.

(2) Installation - Take-Off/Go-Around (TO/GA) Switch

(a) Feed switch harness assembly through threaded hole on LH knob cap.

(b) Install TO/GA switch to threaded hole on LH knob cap.

(c) Feed switch harness assembly through center knob, power lever, and out aft side of engine control assembly.

(d) Assemble power control. (Refer to 76-10)

(e) At aft side of engine control assembly, pin switch harness assembly wires to J982 connector.

(f) Perform Operational Test - Take-Off/Go-Around (TO/GA) Switch. (Refer to 22-20)

(3) Operational Test - Take-Off/Go-Around (TO/GA) Switch

(a) Set BAT 1, BAT 2, and AVIONICS master switches to ON positions.

(b) After autopilot pre-flight test completes, press [AP] on GMC 705 to engage autopilot.

(c) Verify AP (green) annunciation is displayed on PFD.

(d) Press TO/GA switch on power lever.

(e) Verify AP (flashing yellow) annunciation is displayed on PFD. A single disconnect tone is heard.

(f) Verify TO annunciation is displayed on PFD for both pitch and roll modes and command bars indicate wings-level climb to 7°.

(g) Verify FD annunciation is displayed on PFD.

(h) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

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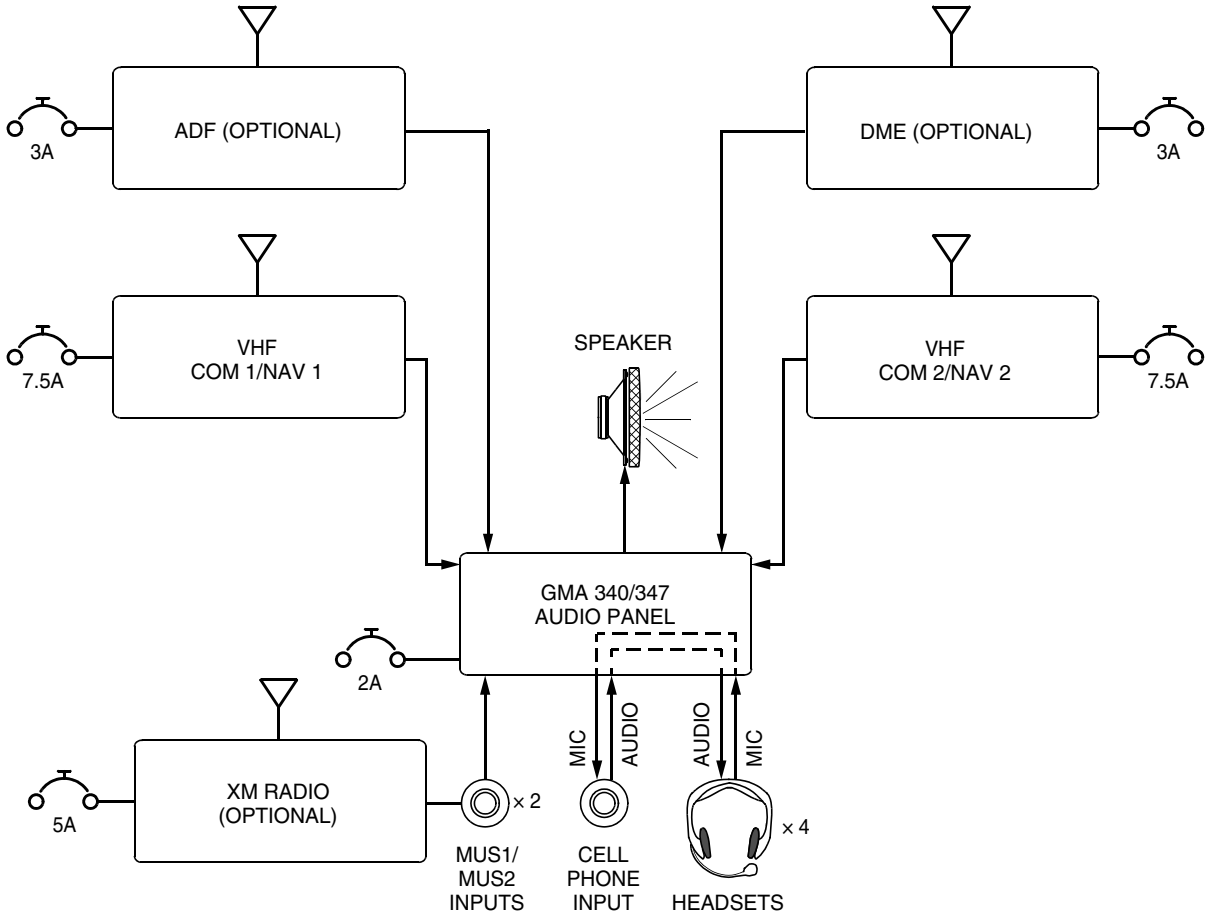
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COMMUNICATIONS

1. GENERAL

This chapter describes the systems, units, components which provide a means of communicating from one part of the airplane to another and between the airplane and other airplanes or ground stations. Included are voice and continuous wave communicating components and intercom. (See Figure 23-001)

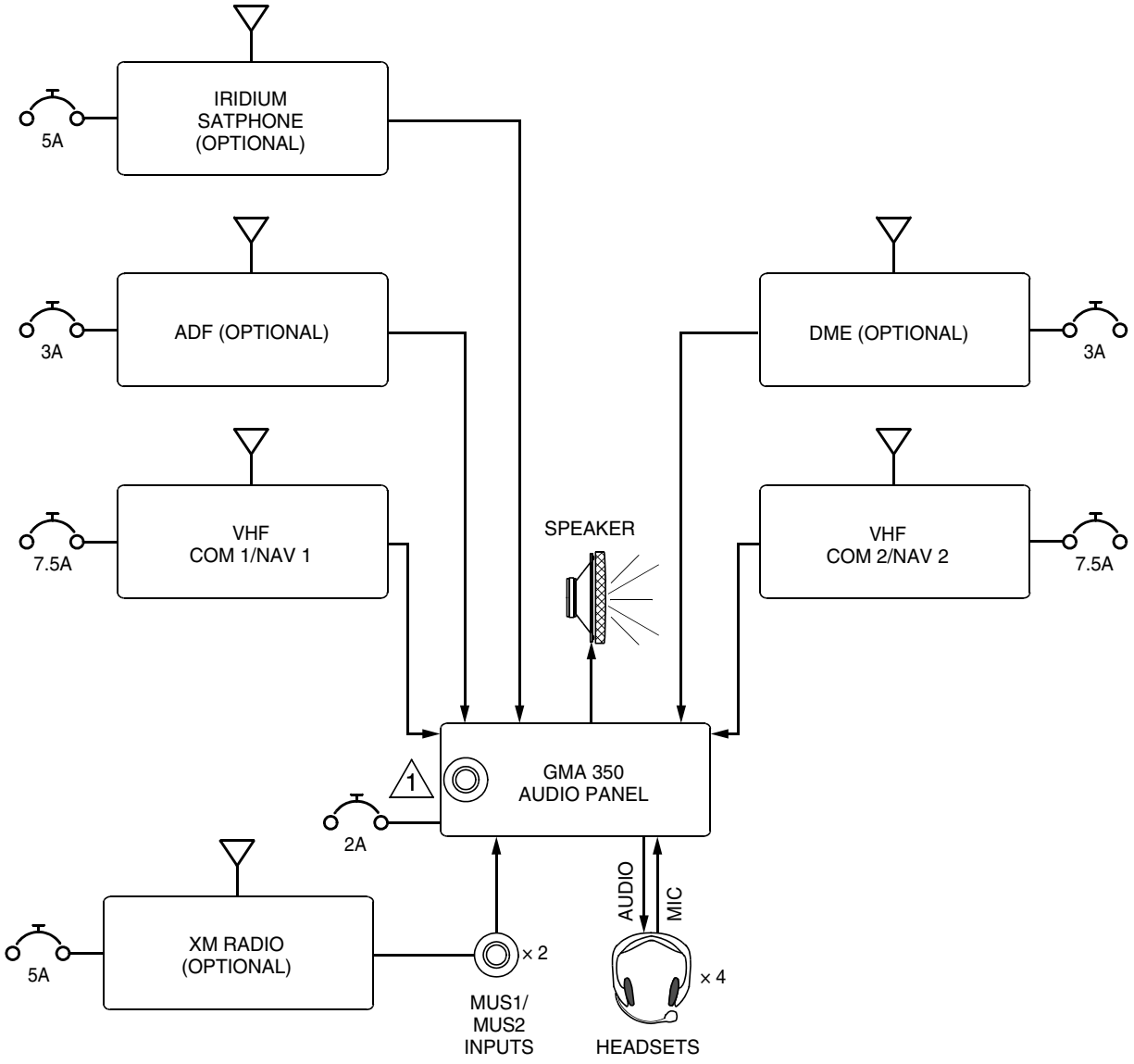


Serials 1005 thru 2126.

SR20_MM23_1024A

Figure 23-001
Communications System - Serials 1005 thru 2126 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 2126



NOTE

1 Front panel jack on GMA 350 for telephone/entertainment input.

Serials 2127 & subs.

SR20_MM23_3502

Figure 23-001
Communications System - Serials 2127 & subs (Sheet 2 of 2)

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SPEECH COMMUNICATIONS

1. DESCRIPTION

This section covers the systems which utilize the voice to transmit and/or receive messages from air-to-air or air-to-ground.

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: The speech communications system consists of two digitally-tuned integrated VHF communications (COM) transceivers. The tuning controls are collocated with the NAV at the left side of the transceiver front panel. Frequency tuning is accomplished by rotating the large and small concentric knobs to select a standby frequency and then transferring the frequency to the active window. The COM frequency display window is at the upper left corner of the transceiver display. Auto-tuning can be accomplished by entering a frequency from a menu.

The transceiver receives all narrow- and wide-band VHF communication transmissions transmitted within a frequency range of 118.000 MHz to 136.975 MHz in 25.0 kHz steps (720 channels). For European operations, the COM can be operator configured for 8.33 kHz channel spacing (2280 channels).

The COM 1 antenna is located above the cabin on the airplane centerline. The COM 2 antenna is located below the cabin on the airplane centerline.

28 VDC for transceiver operating is controlled through the Avionics Master Switch and supplied through the 7.5-amp COM1 and COM2 circuit breaker on the Avionics Essential Bus.

Serials 2016 & subs w/ Perspective Avionics: The speech communications system consists of two digitally tuned VHF communications (COM) receivers integral to the Garmin GIA 63 integrated avionics unit. Frequency tuning is accomplished through either the Flight Management System (FMS) keyboard or through the MFD or PFD display screens.

The transceiver receives all narrow- and wide-band VHF communication transmissions transmitted within a frequency range of 118.000 MHz to 136.975 MHz in 25.0 kHz steps (760 channels). For European operations, the COM can be operator configured for 8.33 kHz channel spacing (3040 channels).

The COM 1 antenna is located above the cabin on the airplane centerline. The COM 2 antenna is located below the cabin on the airplane centerline.

28 VDC for Integrated Avionics Unit 1 operation is supplied through the 7.5-amp COM 1 and 5-amp GPS NAV GIA 1 circuit breakers on Essential Bus 1. 28 VDC for Integrated Avionics Unit 2 operation is supplied through the 7.5-amp COM 2 and 5-amp GPS NAV GIA 2 circuit breakers on the Main Bus 2.

2. MAINTENANCE PRACTICES

A. Garmin GNS 430 GPS/COM/NAV - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The GNS 430 is an IFR certified VHF communications transceiver and Navigation Management System (NMS). The NMS includes GPS sensor, VOR/Localizer and Glideslope receivers. The GNS 430 includes two removable data cards, one with a Jeppesen data base, and second being a custom data card. GPS signals are received by an internally mounted antennas. NAV/LOC/GS signals are received by the VOR antenna. For installation and removal procedures refer to Dependent Position Determining. (Refer to 34-50)

B. Garmin GNC 420 GPS/COM - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The GNC 420 is an IFR certified VHF communications transceiver and GPS sensor. The GNC 420 includes GPS sensor and two removable data cards, one with a Jeppesen data base, and second being a custom data card. GPS signals are received by the low profile GA 56 antenna. For installation and removal procedures refer to Dependent Position Determining. (Refer to 34-50)

C. Garmin GNC 250XL GPS/COM - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The GNC 250XL is an VFR certified VHF communications transceiver and GPS sensor. The GNC 250XL includes a GPS sensor and removable data card. GPS signals are received by the low profile GA 56 antenna. For installation and removal procedures refer to Dependent Position Determining. (Refer to 34-50)

D. Garmin GIA 63W Integrated Avionics Unit - *Serials 2016 & subs w/ Perspective Avionics*

The GIA 63W Integrated Avionics Unit contains an IFR certified VHF communications transceiver and Navigation Management System (NMS). The NMS includes a WAAS certified GPS receiver, VOR/ILS localizer receiver, and ILS glideslope receiver. GPS signals are received by an internally mounted antenna just aft of the windshield and an externally mounted antenna located on top of the fuselage. NAV/LOC/GS signals are received by the VOR antenna. For installation and removal procedures refer to Central Computers. (Refer to 31-40)

UNIVERSAL ACCESS TRANSCEIVER

1. GENERAL

This section covers the GDL 88 UAT/ADS-B Transceiver.

A. GDL 88 UAT/ADS-B Transceiver - *Serials w/ GDL 88*

The optionally installed GDL 88 UAT/ADS-B Transceiver system consists of a Line Replaceable Unit (LRU) installed below the LH crew seat and a forward or aft antenna located on the bottom of the fuselage.

The GDL 88 is a universal access transceiver (UAT) that performs the following functions:

- UAT Transmission: The GDL 88 transmits ADS-B OUT data on the 978 MHz frequency to be received by other aircraft, vehicles, and ATC for situational and traffic awareness.
- UAT Reception: The GDL 88 receives ADS-B, ADS-R, and TIS-B data transmitted on the 978 MHz frequency from other aircraft, vehicles, and ground stations for traffic awareness. In addition, the GDL 88 receives FIS-B data to provide graphical and textual weather products.
- Mode-S Extended Squitter (ES) Reception: The GDL 88 receives ADS-B data transmitted by aircraft on the 1090 MHz frequency for traffic awareness.
- Output of graphical traffic and weather data to the MFD and PFD (ADS-B IN).

The GDL 88 directly interfaces with the PFD, GIA 63W integrated avionics units, and Flight Stream 210 (if installed). 28 VDC for GDL 88 UAT/ADS-B Transceiver operation is supplied through the 5-amp UAT circuit breaker on Main Bus 3.

The GDL 88 UAT/ADS-B Transceiver is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, see Integrated Modular Avionics. (Refer to 42-00)

For additional information on the GDL 88 UAT/ADS-B Transceiver, see Cirrus Perspective Integrated Avionics Pilot's Guide. (Refer to 05-10)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
No communication between GDL 88 and PFD or GIA.	Software or configuration error.	Check PFD alert window for GDL 88 configuration, software, or failed data path error messages. Correct any errors before proceeding. Refer to the manufacturer's approved Instructions for Continued Airworthiness. (Refer to 05-10)
	Disconnected or faulty wiring.	Check wiring connections and antenna cable connections.
UAT test set does not receive output from GDL 88.	Software or configuration error.	Check PFD alert window for GDL 88 configuration, software, or failed data path error messages. Correct any errors before proceeding. Refer to the manufacturer's approved Instructions for Continued Airworthiness. (Refer to 05-10)
	Disconnected or faulty wiring.	Check wiring connections and antenna cable connections.
	Satellite signal interference.	Ensure GPS antenna has unobstructed view of satellite constellation.
	Faulty antenna cable.	Replace antenna cable.
	Faulty antenna.	Replace antenna.
Aircraft does not receive generated traffic target from UAT test set.	Software or configuration error.	Check PFD alert window for GDL 88 configuration, software, or failed data path error messages. Correct any errors before proceeding. Refer to the manufacturer's approved Instructions for Continued Airworthiness. (Refer to 05-10)
	Disconnected or faulty wiring.	Check wiring connections and antenna cable connections.
	Faulty antenna cable.	Replace antenna cable.
	Faulty antenna.	Replace antenna.

3. MAINTENANCE PRACTICES

A. GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU) - *Serials w/ GDL 88* (See Figure 23-201)

(1) Removal - GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU)
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull UAT circuit breaker.
- (c) Remove LH crew seat. (Refer to 25-10)
- (d) Remove bolts securing cover panel and lanyard assembly to fuselage floor.
- (e) Loosen knurled nut on LRU rack to detach LRU and remove from airplane.

(2) Installation - GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU)
- (a) Slide LRU onto LRU rack and hand tighten knurled nut.
- (b) Position cover panel and lanyard assembly to fuselage floor and secure with bolts.
- (c) Reset UAT circuit breaker.
- (d) If LRU is a different unit from originally installed LRU:
  - 1 Perform Adjustment/Test - GDL 88 UAT/ADS-B Transceiver Software and Configuration Loading.
  - 2 Perform Operational Test - GDL 88 UAT/ADS-B Transceiver. (Refer to 23-20)
- (e) If LRU is the same unit as originally installed LRU:
  - 1 Perform Operational Test - GDL 88 UAT/ADS-B Transceiver. (Refer to 23-20)
- (f) Install LH crew seat. (Refer to 25-10)

(3) Operational Test - GDL 88 UAT/ADS-B Transceiver
- (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
UAT (978 MHz) Test Set[1]	-	Any Source	Test GDL 88 UAT/ADS-B Transceiver.

1. FIS-B testing capability is optional.

- (b) Connect 28 ±1 VDC external power to external power receptacle.
- (c) Pull STARTER, FUEL PUMP, and TRAFFIC circuit breakers.
- (d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

Note: Aircraft GPS antenna must have unobstructed view of satellite constellation.

- (e) Using test set, verify GDL 88 UAT/ADS-B Transceiver is transmitting aircraft position.
- (f) Using test set, generate UAT or 1090 MHz traffic target.
- (g) Verify traffic target is displayed on traffic screen.
- (h) If test set is capable, test FIS-B reception.
  - 1 Using test set, transmit sample METAR (FIS-B) weather.
  - 2 Verify METAR (FIS-B) weather is displayed on WPT - Airport Information page.
- (i) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (j) Reset STARTER, FUEL PUMP, and TRAFFIC circuit breakers.
- (k) Disconnect 28 ±1 VDC external power from external power receptacle.

(4) Adjustment/Test - GDL 88 UAT/ADS-B Transceiver Software and Configuration Loading
- (a) Connect 28 ±1 VDC external power to external power receptacle.
- (b) Pull STARTER and FUEL PUMP circuit breakers.

(c) Perform software and configuration loading in accordance with the Cirrus Perspective Line Maintenance Manual. (Refer to 05-10)

(d) Reset STARTER and FUEL PUMP circuit breakers.

(e) Disconnect 28±1 VDC external power from external power receptacle.

B. GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU) Rack - *Serials w/ GDL 88* (See Figure 23-201)

(1) Removal - GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU) Rack

(a) Remove GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU). (Refer to 23-20)

(b) Disconnect cables and wiring from GDL 88 rack connectors.

(c) *Serials w/ GTS 800:* Remove GTS 800 Line Replaceable Unit (LRU). (Refer to 34-40)

Note: Nutplates may be secured to cabin floor surface with 5-minute epoxy.

(d) Remove washers and bolts securing mounting brackets to nutplates and cabin floor.

(e) Remove screws securing LRU rack to mounting brackets.

(f) Remove retainer plates from slots in rack. Remove rack from airplane.

(2) Installation - Garmin GDL 88 Line Replaceable Unit (LRU) Rack

(a) Install retainer plates into slots in rack.

(b) Position mounting brackets to LRU rack and secure with screws.

Note: Nutplates may be secured to cabin floor surface with 5-minute epoxy.

(c) Position nutplates to installation area below cabin floor surface.

(d) Install bolts and washers securing mounting brackets to nutplates and cabin floor.

(e) *Serials w/ GTS 800:* Install GTS 800 Line Replaceable Unit (LRU). (Refer to 34-40)

(f) Connect wiring harness and antenna cable to GDL 88 rack connectors.

(g) Install GDL 88 UAT/ADS-B Transceiver Line Replaceable Unit (LRU). (Refer to 23-20)

C. GDL 88 UAT/ADS-B Transceiver Forward Antenna - *Serials w/ GDL 88 and Forward Antenna*
(See Figure 23-202)

(1) Removal - GDL 88 UAT/ADS-B Transceiver Forward Antenna
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull UAT circuit breaker.
- (c) Remove sealant from base of antenna.
- (d) Remove LH crew seat. (Refer to 25-10)
- (e) Remove left mid console circuit breaker trim. (Refer to 25-10)
- (f) Remove cabin floor covering. (Refer to 25-10)
- (g) Disconnect antenna cable from antenna.

CAUTION: When removing antenna, do not damage tin-plated copper tape.

- (h) Remove washers and nuts securing antenna to fuselage.
- (i) Remove antenna and gasket from bottom of fuselage.
- (j) Remove remaining sealant from fuselage.

(2) Installation - GDL 88 UAT/ADS-B Transceiver Forward Antenna
- (a) With arrow on antenna facing forward, place antenna and gasket into position.
- (b) Secure antenna using washers and nuts. Tighten each nut until gasket material is evenly compressed on all sides of antenna.

CAUTION: Ensure drain hole is unobstructed and free of sealant.

- (c) Connect cable to antenna.
- (d) Fillet seal antenna perimeter. (Refer to 20-10)
- (e) Install cabin floor covering. (Refer to 25-10)
- (f) Install left mid console circuit breaker trim. (Refer to 25-10)
- (g) Install LH crew seat. (Refer to 25-10)
- (h) Reset UAT circuit breaker.
- (i) Perform Operational Test - GDL 88 UAT/ADS-B Transceiver. (Refer to 23-20)

D. GDL 88 UAT/ADS-B Transceiver Aft Antenna - *Serials w/ GDL 88 and Aft Antenna* (See Figure 23-202)

(1) Removal - GDL 88 UAT/ADS-B Transceiver Aft Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull UAT circuit breaker.

(c) Remove sealant from base of antenna.

(d) Remove passenger seats. (Refer to 25-10)

(e) Remove cabin floor covering. (Refer to 25-10)

(f) Remove access panel CF4C. (Refer to 06-00)

(g) Disconnect antenna cable from antenna.

CAUTION: When removing antenna, do not damage tin-plated copper tape.

(h) Remove washers and nuts securing antenna to fuselage.

(i) Remove antenna and gasket from bottom of fuselage.

(j) Remove remaining sealant from fuselage.

(2) Installation - GDL 88 UAT/ADS-B Transceiver Aft Antenna

(a) With arrow on antenna facing forward, place antenna and gasket into position.

(b) Secure antenna using washers and nuts. Tighten each nut until gasket material is evenly compressed on all sides of antenna.

(c) Connect cable to antenna.

(d) Fillet seal antenna perimeter. (Refer to 20-10)

(e) Install access panel CF4C. (Refer to 06-00)

(f) Install cabin floor covering. (Refer to 25-10)

(g) Install passenger seats. (Refer to 25-10)

(h) Reset UAT circuit breaker.

(i) Perform Operational Test - GDL 88 UAT/ADS-B Transceiver. (Refer to 23-20)

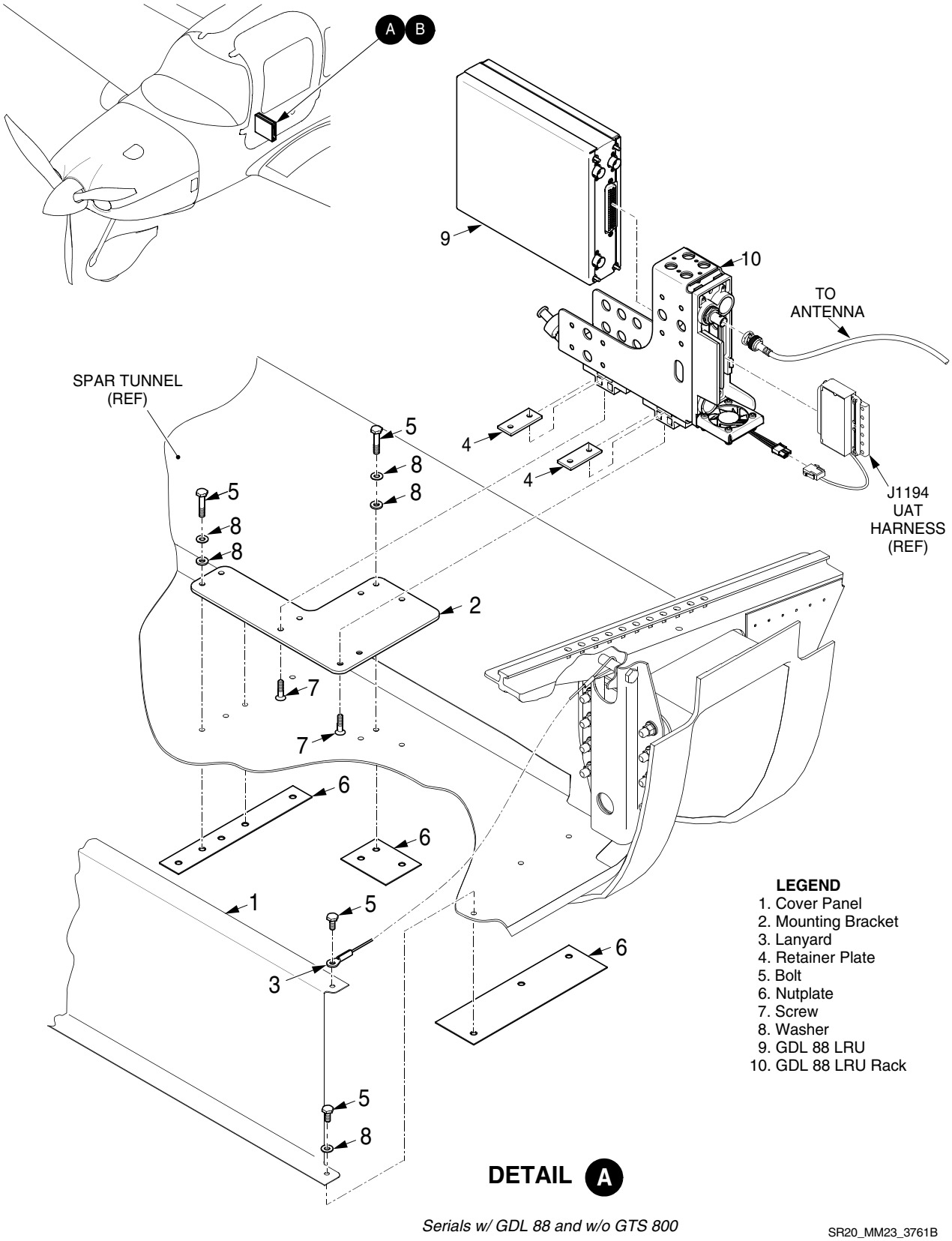


Figure 23-201
GDL 88 LRU and Rack Installation - Serials w/ GDL 88 and w/o GTS 800 (Sheet 1 of 2)

EFFECTIVITY:
Serials w/ GDL 88 and w/o GTS 800

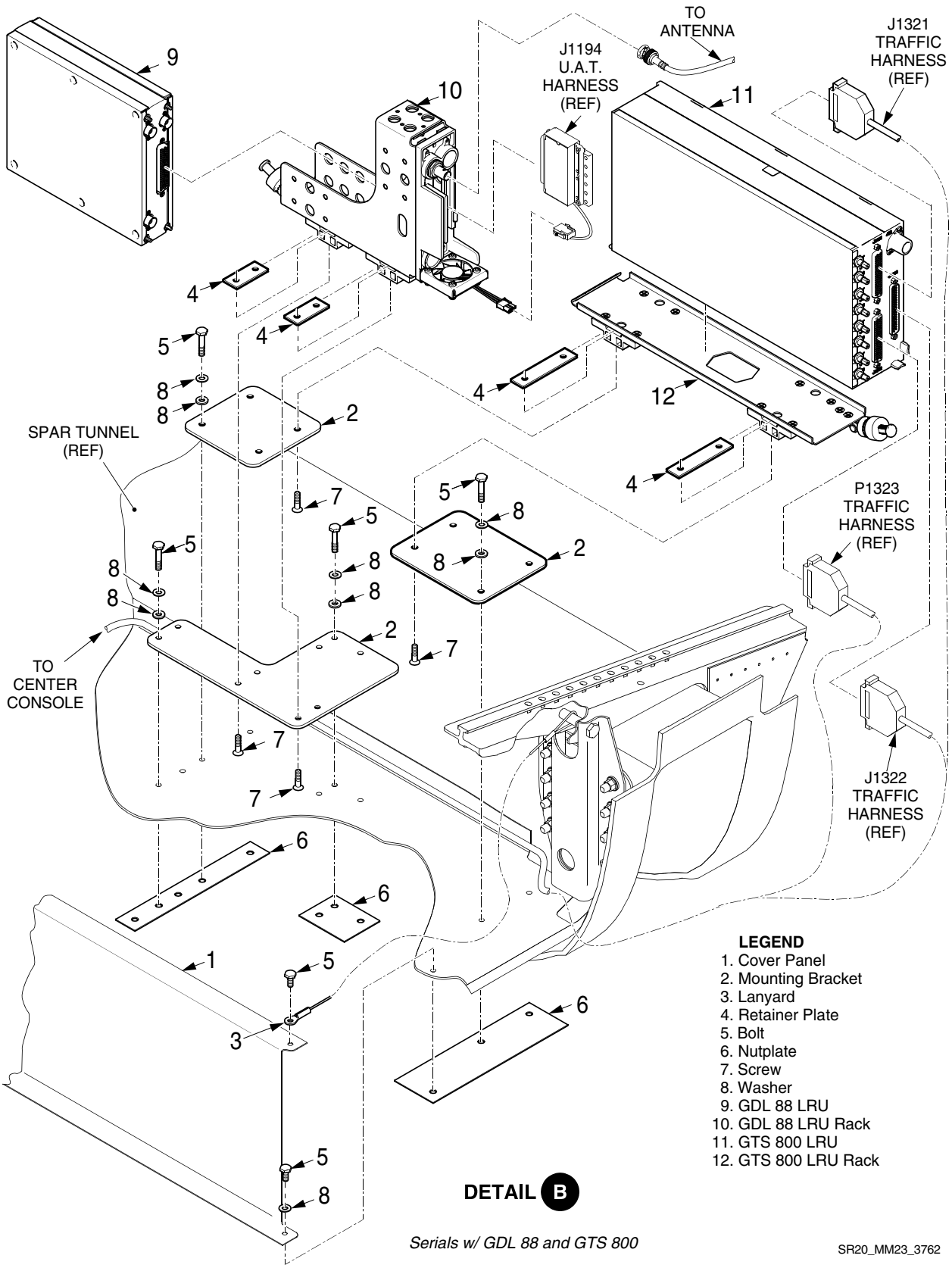
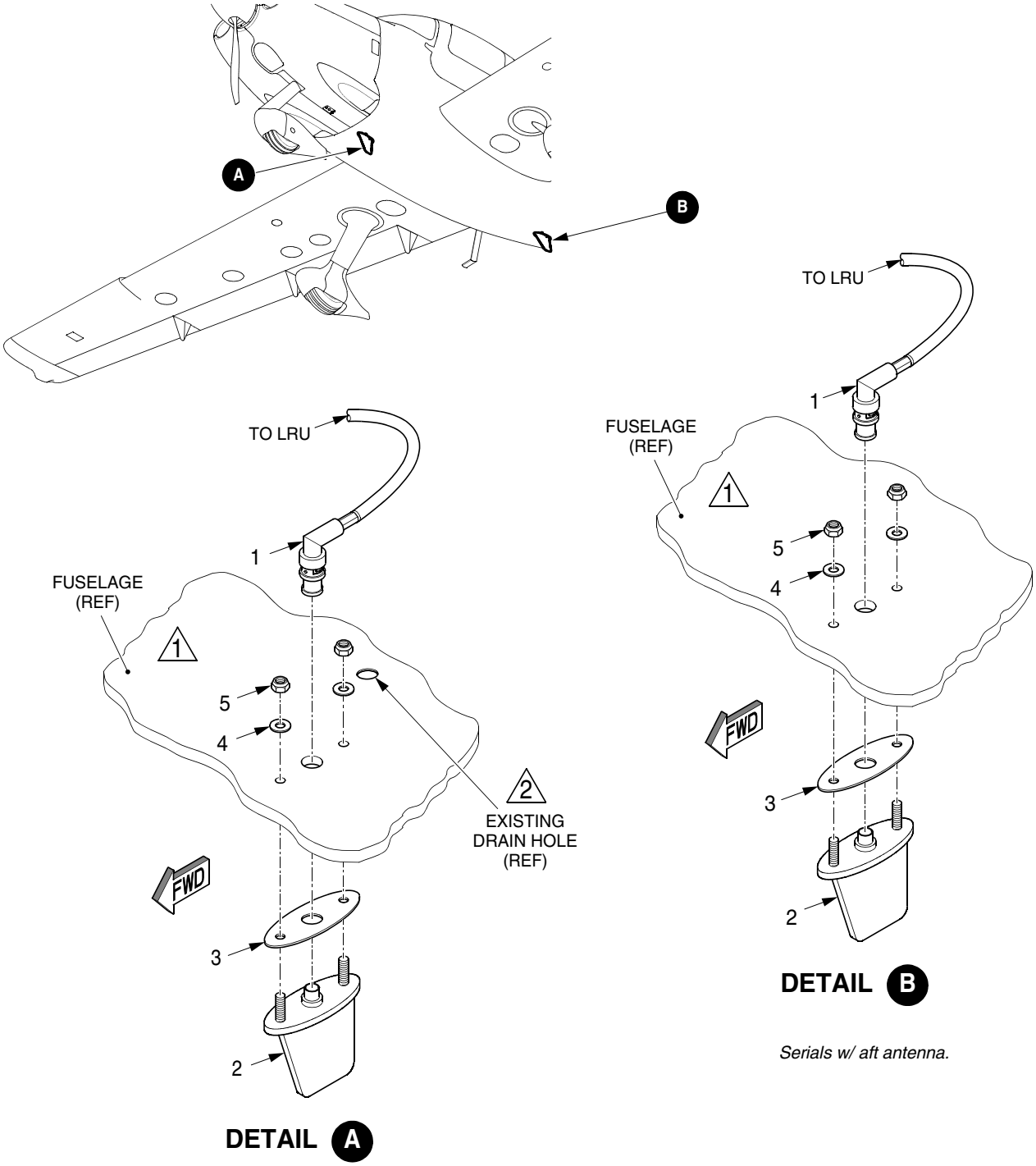


Figure 23-201
GDL 88 LRU and Rack Installation - Serials w/ GDL 88 and GTS 800 (Sheet 2 of 2)



NOTE

1. When removing antenna, do not damage tin-plated copper tape.
2. Ensure drain hole is unobstructed and free of sealant.

LEGEND

1. Antenna Cable
2. Antenna
3. Gasket
4. Washer
5. Nut

SR20_MM23_3760B

Figure 23-202
GDL 88 Antenna Installation - Serials w/ GDL 88

PASSENGER ADDRESS AND ENTERTAINMENT

1. DESCRIPTION

This section covers the systems used to entertain the passengers with music, video, information, games, etc. This includes the XM Radio system and Flight Stream 210.

Using the same receiver as the XM Weather system, the XM Radio system provides satellite broadcast audio entertainment and information to aircraft occupants via the GMA 340/347/350/350c Audio Control Unit while traveling anywhere within the contiguous United States of America.

The XM Radio system receives audio information via integral antenna from two geosynchronous XM broadcast satellites. The audio signal is then sent by wire to the Audio Control Panel's Music1 and Music2 AUDIO INPUT jacks.

A. XM Radio - *Serials w/o Perspective Avionics*

System operation is provided by a hand held, infra-red remote control.

The XM Radio system is powered by 28 VDC through the 3-amp WEATHER/STORMSCOPE circuit breaker on the Avionics Non-Essential Bus.

B. XM Radio - *Serials w/ Perspective Avionics*

Serials w/o Flight Stream 210: System operation is provided on the MFD or by a hand held remote control. An XM Radio transceiver, installed in the empennage, provides communication between the remote control and the XM Receiver.

For additional information on the XM Radio remote control, refer to the XM Radio Wireless Remote Controller Instructions. (Refer to 05-10)

Serials w/ Flight Stream 210: System operation is provided on the MFD or by mobile device via Flight Stream 210 Bluetooth™ transceiver connection. The Flight Stream 210, installed in the empennage, provides communication between mobile devices and the XM Receiver.

Serials 2016 thru 2126: The XM Radio system is powered by 28 VDC through the 3-amp WEATHER circuit breaker on the Avionics Non-Essential Bus.

Serials 2127 & subs: The XM Radio system is powered by 28 VDC through the 5-amp WEATHER/DATALINK circuit breaker on the Avionics Non-Essential Bus.

C. Flight Stream 210 - *Serials w/ Flight Stream 210*

The optionally installed Flight Stream 210 Bluetooth™ transceiver (wireless avionics interface) includes an internal Attitude and Heading Reference System (AHRS) and pressure transducer from which it can compute supplemental pitch, roll, heading, and altitude data to be broadcast to a compatible mobile device. Data output from the Flight Stream 210 can be used to provide additional situational awareness for the pilot and passengers. Flight plans can be transferred between compatible mobile devices and the integrated avionics system using supported mobile applications. The Flight Stream 210 also serves as a wireless GDL 69 controller through which the aircraft crew or passengers can select Sirius/XM audio channels and control volume. Up to four Bluetooth™ devices can be paired to the Flight Stream 210. It is mounted in the aft avionics bay and is hard-wire connected to the Perspective Integrated Avionics System. 28 VDC for Flight Stream 210 operation is supplied through the 5-amp DATA LINK/WEATHER circuit breaker on the Avionics Non-Essential Bus.

For additional information on the Flight Stream 210, see Cirrus Perspective Integrated Avionics Pilot's Guide. (Refer to 05-10)

For an overview of the Perspective Integrated Avionics system, see Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. MAINTENANCE PRACTICES

A. XM Radio System - *Serials w/o Perspective Avionics*

Note: The XM Radio System and XM Weather System share the same receiver. For maintenance practices pertinent to the XM receiver, refer to XM Weather System. (Refer to 34-50)

(1) Operational Test - XM Radio

Note: Tests should be performed using stereo headsets (set to stereo) and a stereo music source.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
External Audio Input Device	-	Any Source	Operational test.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(c) Connect 28 ±1 VDC external power to external power receptacle.
(d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
(e) Verify all external audio inputs are removed from forward and aft audio input jacks.
(f) On GMA Audio Control Unit, deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.
(g) Verify [PILOT] and [CREW] lights are off.
(h) Turn on XM Radio remote control.

Note: Adjust volume to a comfortable level on XM Radio remote control.

(i) Verify stereo XM Radio is heard in all headset jacks.
(j) Select local ATIS frequency in the active frequency on COM 1.
(k) Verify music is muted when airplane radio audio is received or PTT switch on yoke is pressed.
(l) Select [CREW] and deselect [PILOT] to set intercom (ICS) to CREW mode.
(m) Verify [CREW] light is on and [PILOT] light is off.
(n) Verify stereo XM Radio music is heard on all headset jacks.
(o) Select [PILOT] to set intercom (ICS) to PILOT mode.
(p) Verify [PILOT] light is on and [CREW] light is off.
(q) Verify stereo XM Radio music is heard on all but pilot's headset.
(r) At forward audio jacks, connect an external audio input device to AUDIO INPUT 1.
(s) Deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.
(t) Verify [PILOT] and [CREW] lights are off.
(u) Verify AUDIO INPUT 1 is heard on all headset jacks.
(v) Verify music is muted when airplane radio audio is received, or PTT switch on yoke is pressed and ICS squelch is broken.
(w) Select [PILOT] to set intercom (ICS) to PILOT mode.
(x) Verify [PILOT] light is on and [CREW] light is off.
(y) Verify AUDIO INPUT 1 is heard on all but pilot's headset.
(z) Select [CREW] and deselect [PILOT] to set intercom (ICS) to CREW mode.
(aa) Verify [CREW] light is on and [PILOT] light is off.

(ab) Verify AUDIO INPUT 1 is heard on pilot's and copilot's headsets, but XM Radio music is heard on rear passenger headsets.
(ac) At aft audio jacks, connect an external audio input device to AUDIO INPUT 2.
(ad) Select [CREW] and deselect [PILOT] to set intercom (ICS) to CREW mode.
(ae) Verify [CREW] light is on and [PILOT] light is off.
(af) Verify AUDIO INPUT 2 is heard on passenger headsets, but XM Radio music is heard on pilot's and copilot's headsets.
(ag) Remove all stereo audio inputs from forward and aft audio input jacks.
(ah) Select [CREW] and deselect [PILOT] to set intercom (ICS) to CREW mode.
(ai) Verify [CREW] light is on and [PILOT] light is off.
(aj) Turn off XM Radio remote control and verify XM Radio music is heard on all headset jacks.
(ak) Pull WEATHER/STORMSCOPE circuit breaker.
(al) Verify XM Radio music is not audible in any headset jack.
(am) Reset WEATHER/STORMSCOPE circuit breaker.
(an) Verify XM Radio music is not audible in any headset jack.
(ao) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(ap) Disconnect 28 ±1 VDC external power from external power receptacle.
(aq) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

B. XM Radio System - *Serials w/ Perspective Avionics* (See Figure 23-301)

(1) Removal - XM Radio Transceiver - *Serials w/o Flight Stream 210*

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 2016 thru 2126:* Pull WEATHER circuit breaker.

(c) *Serials 2127 & subs:* Pull WEATHER/DATALINK circuit breaker.

(d) Remove access panel RE3. (Refer to 06-00)

(e) Disconnect connector from transceiver.

(f) Remove screws and washers securing transceiver to mounting shelf. Remove transceiver from airplane.

(2) Installation - XM Radio Transceiver - *Serials w/o Flight Stream 210*

Note: If transceiver is different unit from originally installed transceiver, note serial number to aid transceiver setup. The transceiver serial number is located on bottom of transceiver.

(a) Position transceiver to mounting shelf and secure with screws and washers.

(b) Connect connector to transceiver.

(c) Install access panel RE3. (Refer to 06-00)

(d) *Serials 2016 thru 2126:* Reset WEATHER circuit breaker.

(e) *Serials 2127 & subs:* Reset WEATHER/DATALINK circuit breaker.

(f) Perform Operational Test - XM Radio. (Refer to 23-30)

(g) If transceiver is different unit from originally installed transceiver, perform Adjustment/Test - XM Radio Transceiver Setup. (Refer to 23-30)

(3) Operational Test - XM Radio

Note: Tests should be performed using stereo headsets (set to stereo) and a stereo music source.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
External Audio Input Device	-	Any Source	Operational test.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) Connect 28 ±1 VDC external power to external power receptacle.

(d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(e) Verify all external audio inputs are removed from forward and aft audio input jacks.

(f) *Serials 2016 thru 2126:* Set intercom (ICS) to ALL mode.

1 On GMA Audio Control Unit, deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.

2 Verify [PILOT] and [CREW] lights are off.

(g) *Serials 2127 thru 2302:* Set intercom (ICS) to ALL mode.

1 In Blue-Select mode, individually select [PILOT], [COPLT], and [PASS] for both [MUS1] and [MUS2] distribution options.

2 Exit Blue-Select mode and select [MUS1], [PILOT], [COPLT], and [PASS] .

3 Verify [MUS1], [PILOT], [COPLT], and [PASS] lights are on and [MUS2] light is off.

(h) *Serials w/o Flight Stream 210:* Turn on XM Radio remote control.

(i) *Serials w/ Flight Stream 210:* If desired, open Garmin Pilot on compatible mobile device.

(j) On MFD, rotate FMS knob to select AUX-XM Radio page.

(k) Press [RADIO], then press [CHNL]. Use [CH+] and [CH-] to select Channel 1 (XM Preview) in Channel box.

Note: Adjust volume to a comfortable level on MFD, XM Radio remote control, or mobile device.

(l) Verify stereo XM Radio is heard in all headset jacks.

(m) Select local ATIS frequency in the active frequency on COM 1.

(n) Verify music is muted when airplane radio audio is received or PTT switch on yoke is pressed.

(o) *Serials 2016 thru 2126:* Test distribution of audio.

1 Select [COPLT] and deselect [PILOT] to set intercom (ICS) to CREW mode.
2 Verify [COPLT] light is on and [PILOT] light is off.
3 Verify stereo XM Radio music is heard on all headset jacks.
4 Select [PILOT] to set intercom (ICS) to PILOT mode.
5 Verify [PILOT] light is on and [COPLT] light is off.
6 Verify stereo XM Radio music is heard on all but pilot's headset.
7 At forward audio jacks, connect an external audio input device to AUDIO INPUT 1.
8 Deselect [PILOT] and [COPLT] to set intercom (ICS) to ALL mode.
9 Verify [PILOT] and [COPLT] lights are off.
10 Verify AUDIO INPUT 1 is heard on all headset jacks.
11 Verify music is muted when airplane radio audio is received, or PTT switch on yoke is pressed and ICS squelch is broken.
12 Select [PILOT] to set intercom (ICS) to PILOT mode.
13 Verify [PILOT] light is on and [COPLT] light is off.
14 Verify AUDIO INPUT 1 is heard on all but pilot's headset.
15 Select [COPLT] and deselect [PILOT] to set intercom (ICS) to CREW mode.
16 Verify [COPLT] light is on and [PILOT] light is off.
17 Verify AUDIO INPUT 1 is heard on pilot's and co-pilot's headsets, but XM Radio music is heard on rear passenger headsets.
18 At aft audio jacks, connect an external audio input device to AUDIO INPUT 2.
19 Select [COPLT] and deselect [PILOT] to set intercom (ICS) to CREW mode.
20 Verify [COPLT] light is on and [PILOT] light is off.
21 Verify AUDIO INPUT 2 is heard on passenger headsets, but XM Radio music is heard on pilot's and co-pilot's headsets.
22 Remove all stereo audio inputs from forward and aft audio input jacks.
23 Select [COPLT] and deselect [PILOT] to set intercom (ICS) to CREW mode.
24 Verify [COPLT] light is on and [PILOT] light is off.
25 Turn off XM Radio remote control and verify XM Radio music is heard on all headset jacks.
26 Pull WEATHER circuit breaker.
27 Verify XM Radio music is not audible in any headset jack.
28 Reset WEATHER circuit breaker.
29 Verify XM Radio music is not audible in any headset jack.

(p) *Serials 2127 & subs:* Test distribution of audio.

1 In Blue-Select mode, de-select [PILOT], and select [COPLT] and [PASS] for [MUS1].
2 Exit Blue-Select mode. Verify [PILOT], [COPLT], [PASS], and [MUS2] lights are on and [MUS2] light is off.

3 Verify stereo XM Radio music is heard on all but pilot's headset.
4 At forward audio jacks, connect an external audio input device to AUDIO INPUT 1.
5 In Blue-Select mode, select [PILOT], [COPLT], and [PASS] for [MUS1].
6 Exit Blue-Select mode. Verify [PILOT], [COPLT], [PASS], and [MUS1] lights are on and [MUS2] light is off.
7 Verify AUDIO INPUT 1 is heard on all headset jacks.
8 Verify music is muted when airplane radio audio is received, or PTT switch on yoke is pressed and ICS squelch is broken.
9 In Blue-Select mode, de-select [PILOT], and select [COPLT] and [PASS] for [MUS1].
10 Exit Blue-Select mode. Verify [PILOT], [COPLT], [PASS], and [MUS1] lights are on and [MUS2] light is off.
11 Verify AUDIO INPUT 1 is heard on all but pilot's headset.
12 In Blue-Select mode, de-select [PASS], and select [COPLT] and [PILOT] for [MUS1].
13 In Blue-Select mode, de-select [PILOT] and [COPLT], and select [PASS] for [MUS2].
14 Exit Blue-Select mode and select [MUS2] in addition to previously selected keys.
15 Verify [PILOT], [COPLT], [PASS], [MUS1], and [MUS2] lights are on.
16 Verify AUDIO INPUT 1 is heard on co-pilot and pilot headset jacks, and XM Radio music is heard on passenger headset.
17 At aft audio jacks, move external audio input device from AUDIO INPUT 1 to AUDIO INPUT 2.
18 Verify [PILOT], [COPLT], [PASS], [MUS1], and [MUS2] lights are on.
19 Verify AUDIO INPUT 2 is heard on passenger headsets, but XM Radio music is heard on pilot's and co-pilot's headsets.
20 Remove all stereo audio inputs from forward and aft audio input jacks.
21 Verify [PILOT], [COPLT], [PASS], [MUS1], and [MUS2] lights are on.
22 *Serials w/o Flight Stream 210:* Turn off XM Radio remote control and verify XM Radio music is heard on all headset jacks.
23 *Serials w/ Flight Stream 210:* If application is open, close Garmin Pilot on mobile device and verify XM Radio music is heard on all headset jacks.
24 Pull WEATHER/DATALINK circuit breaker.
25 Verify XM Radio music is not audible in any headset jack.
26 Reset WEATHER/DATALINK circuit breaker.
27 Verify XM Radio music is not audible in any headset jack.

(q) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(r) Disconnect 28 ±1 VDC external power from external power receptacle.
(s) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(4) Adjustment/Test - XM Radio Transceiver Setup - *Serials w/o Flight Stream 210*

Note: This procedure configures the remote controller to communicate with the specific transceiver installed in the aircraft.

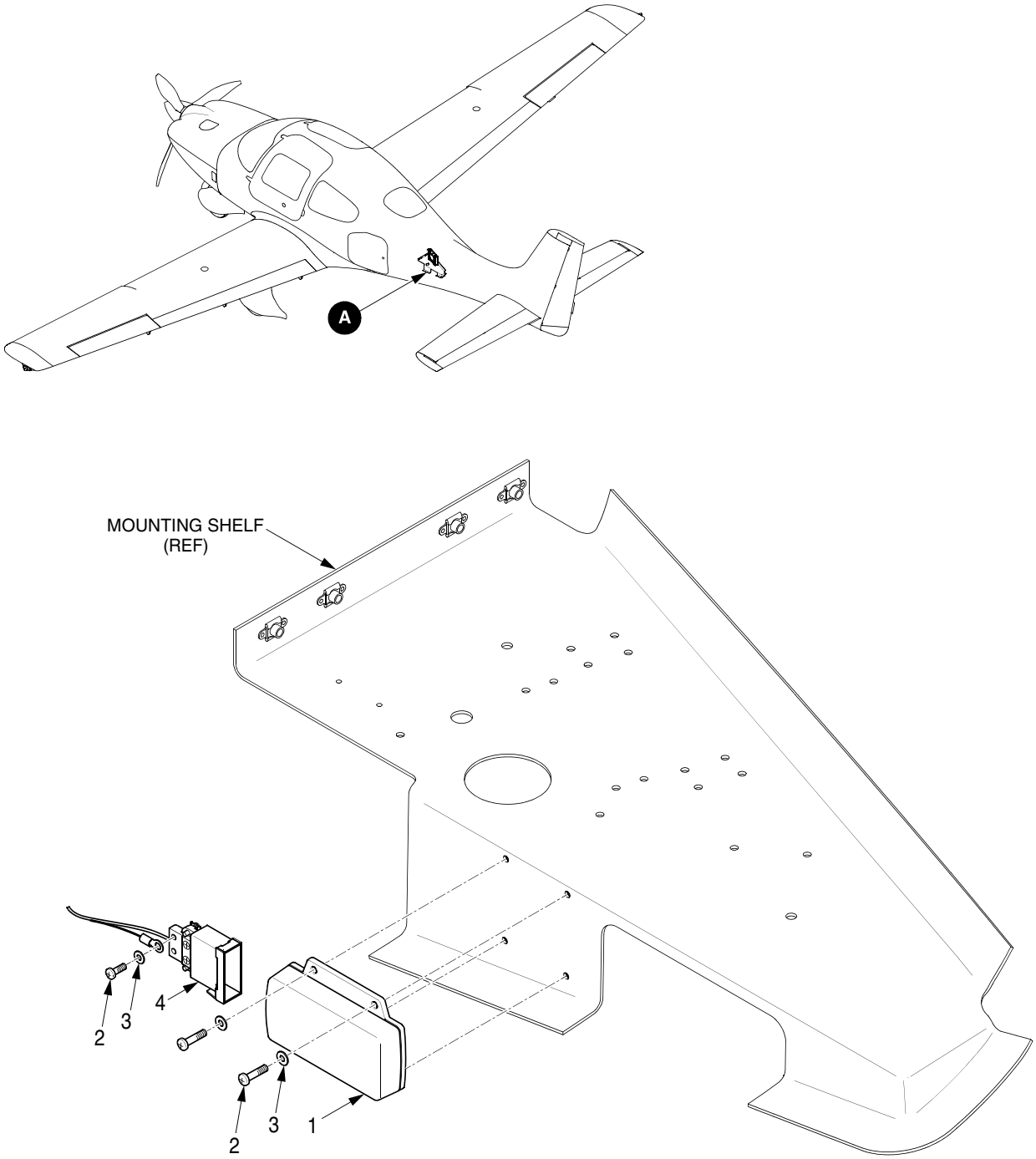
(a) Press any key on remote controller to turn it on.

(b) When the "GRT 10 not found" message is displayed on remote controller, press the following buttons in order: [UP], [DOWN], [LEFT], [RIGHT], [-], [+], [PSET].

(c) On remote controller, use arrow buttons to enter transceiver serial number.

(d) Press [XM] button to store transceiver serial number.

(e) Use remote controller to increase and decrease XM radio volume to verify remote controller is communicating with transceiver.



DETAIL A

LEGEND
1. XM Radio Transceiver
2. Screw
3. Washer
4. Connector

SR20_MM23_2791

Figure 23-301
XM Radio Transceiver Installation - Serials w/o Flight Stream 210

C. Flight Stream 210 - *Serials w/ Flight Stream 210* (See Figure 23-302)

(1) Removal - Flight Stream 210

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull DATA LINK/WEATHER circuit breaker.

(c) Remove access panel RE3. (Refer to 06-00)

(d) Disconnect connector from transceiver.

(e) Remove screws and washers securing transceiver to mounting shelf. Remove transceiver from airplane.

(2) Installation - Flight Stream 210

(a) Position transceiver to mounting shelf and secure with screws and washers.

(b) Connect connector to transceiver.

(c) Install access panel RE3. (Refer to 06-00)

(d) Reset DATA LINK/WEATHER circuit breaker.

(e) If transceiver is different unit from originally installed transceiver, perform Adjustment/Test - Flight Stream 210 Setup. (Refer to 23-30)

(f) *Serials w/ XM Radio:* Perform Operational Test - XM Radio. (Refer to 23-30)

(3) Adjustment/Test - Flight Stream 210 Software and Configuration Loading

(a) Connect 28±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

(c) Perform software and configuration loading in accordance with the Cirrus Perspective Line Maintenance Manual. (Refer to 05-10)

(d) Reset STARTER and FUEL PUMP circuit breakers.

(e) Disconnect 28±1 VDC external power from external power receptacle.

(4) Adjustment/Test - Flight Stream 210 Setup

For maintenance practices regarding Flight Stream 210 setup, see Cirrus Perspective Integrated Avionics Pilot's Guide. (Refer to 05-10)

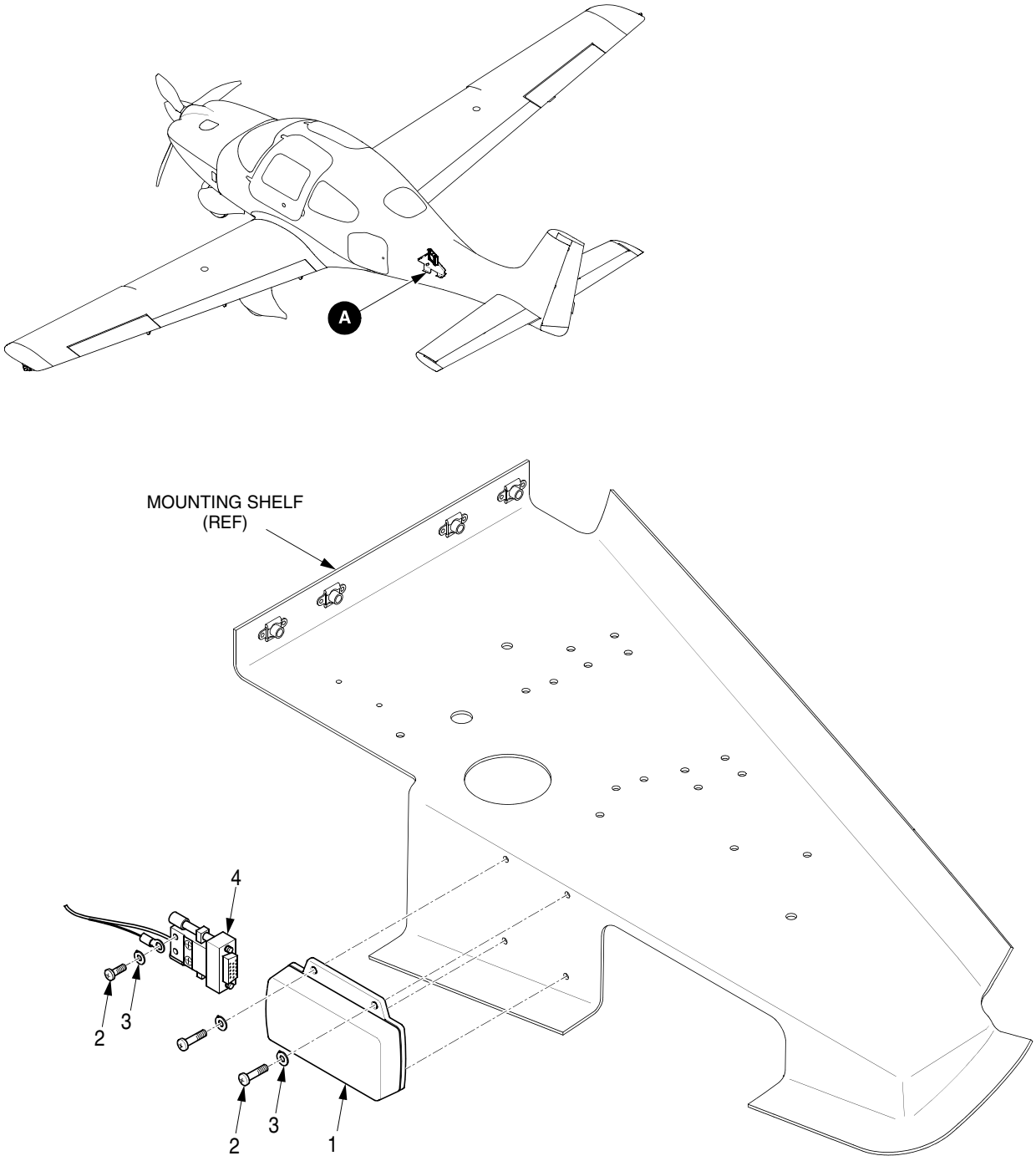


Figure 23-302
Flight Stream 210 Installation - Serials w/ Flight Stream 210

AUDIO INTEGRATING

1. DESCRIPTION

This section covers the portion of the system which controls the output of the communications and navigation receivers into the flight crew headphones and speakers, and the output of the flight crew microphones into the communications transmitters. Included are the audio control panel, audio jacks, cockpit loud speaker, and Push-To-Talk (PTT) switch.

A. Audio Control Unit

The audio control unit (GMA 340/347/350/350c) provides audio amplification, audio selection, marker beacon control, and a voice activated intercom system for the cabin speaker, headsets, and microphones. The system allows audio switching for up to three transceivers (COM 1, COM 2, and COM 3) and five receivers (NAV 1, NAV 2, ADF, DME, and MKR). Push-buttons select the receiver audio source provided to the headphones. A fail-safe mode connects the pilot headphone and microphone to COM 1 if power is removed or if [COM1 MIC] switch is deselected. The audio control unit is located on the center console, center-high.

Serials 2016 thru 2126 w/ Perspective Avionics: The GMA 347 audio panel also provides a digital voice recorder, automatic squelch, and full duplex phone interface.

Serials 2127 & subs w/ Perspective Avionics and GMA 350: The GMA 350 all-digital audio panel also provides a six-position intercom system (ICS), voice recognition, 3-D audio processing, digital voice recorder, advanced automatic squelch, and full duplex phone interface.

Serials w/ GMA 350c: The GMA 350 all-digital audio panel also provides a six-position intercom system (ICS), voice recognition, 3-D audio processing, digital voice recorder, advanced automatic squelch, full duplex phone interface, and Bluetooth™ capability.

28 VDC for audio panel operation is supplied through the 5-amp AUDIO PANEL circuit breaker on the Avionics Bus.

The GMA 347/350/350c audio panel is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Integrated Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

B. Headset and Microphone Jacks

Serials 1005 thru 2126: The airplane is equipped with provisions for four Active Noise Reduction (ANR) and four conventional (MIC/HEADPHONES) headsets. Headset jacks for the pilot and front seat passenger are located in the map case and on the aft portion of the center console for the rear passengers.

Serials 2127 & subs: The airplane is equipped with provisions for five Active Noise Reduction (ANR) and three conventional (MIC/HEADPHONES) headsets. Headset jacks for the pilot, front, and rear seat passenger are located in the map case.

The forward headset mics use the remote Push-To-Talk (PTT) switches located on the top of the associated control yoke grip. The rear headsets do not have COM transmit capabilities and do not require PTT switches. Audio to headsets is controlled by the individual audio selector switches on the audio control panel.

C. Audio Jacks

The aircraft contains multiple audio input jacks which can be used to connect personal entertainment devices into the cabin sound system. Two 3.5 mm audio input jacks (AUDIO INPUT) are provided on the center console. One jack is located near the convenience outlet for use by the pilot and forward passenger, and the other is located on the aft portion of the center console for the rear passengers.

Serials 1005 thru 2126: The pilot and co-pilot audio jacks are mounted inside the center console arm rest. The passenger audio jacks are mounted on the top, rear of the center console. A device connected to the forward jack is automatically distributed to pilot and copilot only. The rear jack is automat-

ically distributed to rear passengers audio only. Volume is controlled by the connected entertainment device.

Serials 2127 & subs: The pilot and co-pilot audio jacks are mounted inside the center console arm rest. The passenger audio jacks are mounted inside the center console arm rest and on the top, rear of the center console. Distribution of a device connected to the forward jack is through the MUS 1 selection on the audio panel. Distribution of the rear jack is by the MUS 2 selection on the audio panel. A third jack on the audio panel will also accept an entertainment input. A device connected to this jack is distributed by selecting the *ENTERTAINMENT* button (shown as a phone and music-note symbol) on the audio panel. Audio volume can be controlled by the device itself and can be further refined by the audio panel distribution volume control.

D. Cell Phone Input Jack

Serials 1005 thru 2126: One 2.5 mm cell phone jack (CELL PHONE INPUT) is provided on the aft portion of the center console near the convenience outlet and is distributed by the TEL selection on the audio panel.

Serials 2127 & subs: One 2.5 mm cell phone jack is located on the front of the audio panel and is distributed by selecting the *ENTERTAINMENT* button (shown as a phone and music-note symbol) on the audio panel. Volume is controlled by the volume selector on the audio panel.

E. Push-To-Talk (PTT) Switch

Push-To-Talk (PTT) switches, mounted on the control yokes, allow the pilot and co-pilot to transmit over the selected transceiver.

Serials w/o Perspective Avionics after SB 2X-23-01: A Rear Push-To-Talk jack has been installed on the aft left side of the center console to allow rear passenger push-to-talk capabilities.

F. Troubleshooting

Trouble - PA	Probable Cause	Remedy
Loud squeal is heard while testing PA.	Too much acoustic feedback between the speaker and the mic.	Place speaker and mic further apart.
		Use lower volume configuration.

Trouble - Headphones	Probable Cause	Remedy
Stereo headsets operating with monaural signal.	Any stereo listener loses one channel when another passenger plugs in a monaural headset.	Replace monaural headset with stereo headset.

Trouble - COM Operation - *Serials 1005 thru 2126*	Probable Cause	Remedy
When the pilot or the co-pilot transmit, no audio is heard on any other receiver.	Transmit interock is active. The pilot is communicating while the co-pilot transmits on another radio, and all pilot reception is cut off during the time of co-pilot transmission.	Deactivate transmit interlock.

Trouble - 3D Audio - *Serials 2127 & subs w/ Perspective Avionics*	Probable Cause	Remedy
“3D audio left” message heard in both ears. “3D audio right” message not heard.	Mono headset in use.	Use a stereo headset.
	Stereo headset in use with mono/stereo switch set to ‘mono’.	Set mono/stereo switch on headset to ‘stereo’.
	Aircraft wiring has left audio wired to both left and right channels of stereo headset jack.	Inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
“3D audio left” message heard in both ears, followed by “3D audio right” message heard in both ears.	Mono headset in use.	Use a stereo headset.
	Stereo headset in use with mono/stereo switch set to ‘mono’.	Set mono/stereo switch on headset to ‘stereo’.
	Incorrect aircraft wiring (left/right shorted together).	Inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
“3D audio right” message heard in both ears. “3D audio left” not heard.	Incorrect aircraft wiring (right channel used for mono instead of left or left/ right swapped).	Inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

Trouble - 3D Audio - *Serials 2127 & subs w/ Perspective Avionics*	**Probable Cause**	**Remedy**
“3D audio left” message heard in right ear only followed by “3D audio right” message heard in left ear only.	Stereo headset is on backwards.	Verify correct orientation from the left/right indication on each side of the headset or the position of the boom mic (usually attached on left side). If the headset is backwards left/right position information will be swapped.
	Incorrect aircraft wiring (left/right channels swapped).	Inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
“3D audio left” message heard in left ear only, no audio heard in right ear.	Aircraft wired for mono intercom.	Wire the installation for stereo headsets.
“3D audio right” message heard in right ear only, no audio heard in left ear.	Incorrect aircraft wiring (right channel used for mono instead of left, or left/right swapped).	Inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

2. MAINTENANCE PRACTICES

A. GMA 340 Audio Control Unit - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 23-501)

(1) Removal - GMA 340 Audio Control Unit

CAUTION: Ensure electrical power to airplane is off prior to performing maintenance.

(a) Insert allen wrench into front panel bolt hole and engage allen bolt.
(b) Turn locking screw counterclockwise to loosen locking cam. Cam will move the transceiver unit out 1/4” and disengage from the electrical connectors.
(c) Pull audio control unit from mounting tray

(2) Installation - GMA 340 Audio Control Unit

(a) With light to medium pressure, push audio control unit into mounting tray to engage electrical connectors.
(b) Insert allen wrench into front panel bolt hole and engage allen bolt.
(c) Turn bolt clockwise to tighten locking cam.
(d) Perform Functional Test - Garmin GMA 340 Audio Control Unit. (Refer to 23-50)
(e) Perform Operational Test - Garmin GMA 340 Audio Control Unit. (Refer to 23-50)

(3) Functional Test - GMA 340 Audio Control Unit

Note: Tests should be performed using stereo headsets (set to stereo) and a stereo music source.

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(b) Connect 28 ±1 VDC external power to external power receptacle.
(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
(d) On GMA 340, set [PILOT] knob to OFF position.
(e) Ensure proper operation of the fail-safe function.
1 Select local ATIS frequency in the active frequency on COM 1.
2 Listen with pilot's headset and verify proper reception.
3 Select unused frequency in the active frequency on COM 1. Select same frequency on COM 2.
4 On LH yoke, momentarily press PTT switch and verify TX (transmit) symbol on COM 1 and RX (receive) symbol on COM 2.
(f) Test lights.
1 On GMA 340, set inner volume dials on [PILOT] knob to ON position.
2 Press [TEST].
3 Verify all LED button annunciators and marker lamps illuminate.
4 While holding [TEST], cover photocell on front panel and verify that annunciator lights dim.
5 For INTERIOR/LIGHTS on the bolster panel, adjust INSTRUMENT knob.
6 Verify that instrumentation lighting is functioning and that intensity varies with adjustments to INSTRUMENT knob.
(g) Test intercom system.
1 On GMA 340, deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.
2 Verify [PILOT] and [CREW] lights are off.
3 Plug in headsets at each position, including ANR headset jacks.
4 For pilot position, adjust outer squelch dial on [PILOT] knob and inner volume dial on [PILOT] knob to verify intercom system is working properly.

5 For co-pilot position, adjust outer squelch dial on [COPILOT] knob and inner volume dial on [COPILOT] knob to verify intercom system is working properly.

6 For rear passengers, pull out inner volume dial on [COPILOT] knob to verify intercom system is working properly.

(h) Test headsets.

1 On GNS 430, set COM 1 and COM 2 to local ATIS frequency.

2 On GMA 340, press [COM1], then verify only [COM1] is selected.

3 Verify audio is heard in headsets. Repeat for [COM2].

4 On GNS 430, set active frequency for COM 1 and COM 2 to unused frequency.

5 On GMA 340, select [COM1] and [COM2].

6 Verify [COM1] and [COM2] lights are on.

7 Operate roll and pitch trim motors to verify no interference is heard in headsets or either COM displays RX.

8 On LH yoke, momentarily press PTT switch.

9 On GNS 430 for NAV 1, verify TX (transmit) symbol on COM 1 and RX (receive) symbol on COM 2

10 Set outer COM/VLOC dial on [C/V] knob to local VOR frequency.

11 On GMA 340, press [NAV1], then verify audio is heard in headsets.

12 On GNS 430 for NAV 1, press [V] knob for VLOC volume to toggle ENABLE/DISABLE identification tone.

13 Verify ID tone (morse code) is heard. Repeat for NAV 2 if GNC 420 is not installed.

(i) Test cabin speaker.

1 On GMA 340, press [SPKR], then verify any selected airplane radio audio is heard over cabin speaker.

2 Press [PA], then verify microphone audio is heard over cabin speaker when corresponding mic key is pressed.

(j) Test music system.

1 Connect a stereo music source to MUSIC1.

2 On audio control unit, deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.

3 Verify [PILOT] and [CREW] lights are off.

4 Verify stereo music is heard in all headset jacks and that music is muted when ICS squelch is broken.

5 Verify music is muted when any airplane radio audio is being received or PTT switch on LH yoke is pressed.

6 Select [PILOT] to set intercom (ICS) to PILOT mode.

7 Verify [PILOT] light is on and [CREW] light is off.

8 Verify AUDIO INPUT 1 is heard on all but pilot's headset.

9 Select [PILOT] and [CREW] to set intercom (ICS) to CREW mode.

10 Verify [PILOT] and [CREW] lights are on.

11 Verify AUDIO INPUT 1 is heard on pilot's & co-pilot's, but not rear passenger headsets.

12 Connect a stereo music source to AUDIO INPUT 2.

13 Select [CREW] and deselect [PILOT] to set intercom (ICS) to CREW mode.

14 Verify [CREW] light is on and [PILOT] light is off.

15 Verify stereo music is heard in passenger headsets, but not in pilot's or co-pilot's headsets.

16 Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

17 Disconnect 28 ±1 VDC external power from external power receptacle.

18 Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(4) Operational Test - GMA 340 Audio Control Unit

CAUTION: Verify proper operation of marker beacon under VFR conditions.

(a) After installing audio control unit conduct a performance flight test to ensure satisfactory performance of audio and marker beacon receiver functions. Verify proper operation of the marker lamps and marker audio including marker audio mute function. Check proper operation of the sensitivity selection (using the SENS button) by flying towards the outer marker position initially using HI sensitivity. When OM audio is just barely audible, switching to LO sensitivity should reduce or eliminate the audio.

(b) The following adjustments can be made via access holes in top cover of the audio panel:

1 Marker beacon audio level

2 Airplane radio speaker output level

3 Pilot PA microphone speaker output level

4 Copilot PA microphone speaker output level

5 MUSIC1 mute trip level

B. GMA 347 Audio Control Unit - *Serials 2016 thru 2126 w/ Perspective Avionics* (See Figure 23-501)

(1) Removal - GMA 347 Audio Control Unit

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Insert allen wrench into front panel bolt hole and engage allen bolt.

(c) Turn locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out 1/4-inch and disengage from the electrical connectors.

(d) Remove audio control unit from mounting tray.

(2) Installation - GMA 347 Audio Control Unit

(a) With light to medium pressure, push audio control unit into mounting tray to engage electrical connectors.

(b) Insert allen wrench into front panel bolt hole and engage allen bolt.

(c) Turn bolt clockwise to tighten locking cam.

(d) If GMA 347 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(e) Perform Operational Test - GMA 347 Audio Control Unit. (Refer to 23-50)

(3) Operational Test - GMA 347 Audio Control Unit

Note: Tests should be performed using stereo headsets (set to stereo) and a stereo music source.

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Test lights.

1 On audio control unit, set PILOT intercom volume knob to ON position.

2 Verify all annunciator lights temporarily illuminate during power up.

3 Cover photocell on front panel and verify that annunciator lights dim.

4 On bolster switch panel, adjust INSTRUMENT dimmer switch. Verify that instrumentation lighting is functioning and that intensity varies with adjustments to INSTRUMENT dimmer switch.

(e) Ensure proper operation of the fail-safe function.

1 Pull AUDIO PANEL circuit breaker.

2 On PFD, select local ATIS frequency for the active COM 1 frequency.

3 Listen with pilot's headset and verify proper reception.

4 ON PFD, select an unused frequency for the active frequency of both COM 1 and COM 2.

5 On LH yoke, momentarily press PTT switch and verify TX (transmit) symbol on COM 1 and RX (receive) symbol on COM 2.

6 Reset AUDIO PANEL circuit breaker.

(f) Test intercom system.

1 On audio control unit, deselect [PILOT] and [CREW] to set intercom (ICS) to ALL mode.

2 Verify [PILOT] and [CREW] lights are off.

3 Plug in headsets at each position, including ANR headset jacks.

4 For pilot position, adjust outer squelch dial on [PILOT] knob and inner volume dial on [PILOT] knob to verify intercom system is working properly.

5 For co-pilot position, adjust outer squelch dial on [COPILOT] knob and inner volume dial on [COPILOT] knob to verify intercom system is working properly.

6 For rear passengers, pull out inner volume dial on [COPILOT] knob to verify intercom system is working properly.

(g) Test headsets.

1 Set COM 1 to local ATIS frequency.

2 On audio control unit, press [COM1], then verify audio is heard in headsets.

3 Set COM 2 to local ATIS frequency.

4 On audio control unit, press [COM2], then verify audio is heard in headsets.

5 Select an unused frequency in the active frequency for both COM 1 and COM 2.

6 On audio control unit, select [COM1] and [COM2].

7 Verify [COM1] and [COM2] lights are on.

8 Operate roll and pitch trim motors to verify no interference is heard in headsets and neither COM 1 or COM 2 display RX on PFD.

9 On audio control unit, select [COM1 MIC] and [COM2].

10 Verify [COM1 MIC] and [COM2] lights are on.

11 On LH yoke, momentarily press PTT switch.

12 On PFD, verify TX (transmit) symbol on COM 1 and RX (receive) symbol on COM 2.

13 On audio control unit, press [NAV1], then verify audio is heard in headsets.

14 On MFD, press IDENT key to enable/disable IDENT tone. Verify ID tone (morse code) is heard.

15 On audio control unit, press [NAV2], then verify audio is heard in headsets.

16 On MFD, press IDENT key to enable/disable IDENT tone. Verify ID tone (morse code) is heard.

(h) Test cabin speaker.

1 On audio control unit, press [SPKR], then verify selected airplane radio audio is heard over cabin speaker.

2 Press and hold [SPKR] for 2 seconds, then verify microphone audio is heard over cabin speaker when corresponding mic key is pressed.

(i) Test digital voice recorder.

1 Allow COM1 to operate for at least two and a half minutes of active operation.

2 Press PLAY key once to play back latest recorded memory block of COM1 audio.

3 Press PLAY key again to play previous memory block of COM1 audio. Repeat until listening to first block of audio (a total of 2.5 minutes of audio is recorded).

(j) Test music system.

1 Connect a stereo music source to AUDIO INPUT 1.

2 On audio control unit, deselect [PILOT] and [COPLT] to set intercom (ICS) to ALL mode.

3 Verify [PILOT] and [COPLT] lights are off.

4 Verify stereo music is heard in pilot and copilot headset jacks.

5 Verify music is only muted when any airplane radio audio is being received or PTT switch on LH yoke is pressed and squelch is broken, but not during normal cabin conversation.

6 Select [PILOT] to set intercom (ICS) to PILOT mode.

7 Verify [PILOT] light is on and [COPLT] light is off.

8 Verify AUDIO INPUT 1 is heard on copilot headset only.

9 Select [PILOT] and [COPLT] to set intercom (ICS) to CREW mode.

10 Verify [PILOT] and [COPLT] lights are on.

11 Verify AUDIO INPUT 1 is not heard on pilot's & co-pilot's.

12 Connect a stereo music source to AUDIO INPUT 2.

13 Verify stereo music is heard in passenger headsets, but not in pilot's or co-pilot's headsets.

14 Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

15 Disconnect 28 ±1 VDC external power from external power receptacle.

16 Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

C. GMA 350 / GMA 350c Audio Control Unit - *Serials 2127 & subs w/ Perspective Avionics* (See Figure 23-501)

(1) Removal - GMA 350(c) Audio Control Unit

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Insert allen wrench into front panel bolt hole and engage allen bolt.

(c) Turn locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out 1/4-inch and disengage from the electrical connectors.

(d) Remove audio control unit from mounting tray.

(2) Installation - GMA 350(c) Audio Control Unit

(a) With light to medium pressure, push audio control unit into mounting tray to engage electrical connectors.

(b) Insert allen wrench into front panel bolt hole and engage allen bolt.

(c) Turn bolt clockwise to tighten locking cam.

(d) If GMA 350(c) has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(e) Perform Operational Test - GMA 350(c) Audio Control Unit. (Refer to 23-50)

(3) Operational Test - GMA 350(c) Audio Control Unit

Note: Tests should be performed using stereo headsets (set to stereo) and a stereo music source.

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Test lights.

1 Verify all annunciator lights temporarily illuminate during power up.

2 Cover photocell on front panel and verify that annunciator lights dim.

3 On bolster switch panel, adjust INSTRUMENT dimmer switch. Verify that instrumentation lighting is functioning and that intensity varies with adjustments to INSTRUMENT dimmer switch.

(e) Ensure proper operation of the fail-safe function.

1 Pull AUDIO PANEL circuit breaker.

2 Connect a mono headset to the pilot's headset output jack and pilot's mic jack.

Note: Use of a true mono headset is required for this test (not a stereo headset with a mono/stereo switch because headset manufactures differ on how they accomplish this switching).

3 On PFD, select local ATIS frequency for the active COM 1 frequency.

4 Listen with pilot's headset and verify proper reception.

5 ON PFD, select an unused frequency for the active frequency of both COM 1 and COM 2.

6 On LH yoke, momentarily press PTT switch and verify TX (transmit) symbol on COM 1 and RX (receive) symbol on COM 2.

7 Reset AUDIO PANEL circuit breaker.

(f) Verify installed transceivers (COMs) are able to transmit and receive.

1 Connect headset to pilot's headset output and mic input jack.

2 Verify that each installed transceiver (COM) can be heard when selected.

Note: Depending on settings, the mic selected COM may mute audio from other COMs.

3 Verify that each installed transceiver keys for transmission and transmits clear audio from pilot's mic when selected for transmission and PTT switch is pressed.

Note: Because audio panel can be configured to simulate received sidetone internally, verifying transmission with separate radio not in system is recommended.

Depending on configuration and sometimes COM system wiring, other transceivers may be muted during transmit. Also, audio panel may mute speaker during PTT.

4 Repeat transceiver transmit/receive test for co-pilot headset output and mic input jack.

Note: Testing any one installed transceiver is adequate (testing each is not necessary).

(g) Verify audio from installed receiver and alert sources.

1 Connect headset to pilot's headset output and mic input jack (depending on configuration and ICS mode, co-pilot or passenger positions may not hear all of these sources).

2 Verify each installed receiver (NAV/ADF/DME) can be heard when selected (use test signal generators/transmitters when necessary).

3 Verify each installed unswitched (alert) source can be heard when source is instructed to play a simulated alert/message.

(h) Test cabin speaker.

1 On audio control unit, press [SPKR], then verify selected airplane radio audio is heard over cabin speaker.

2 Press and hold [SPKR] for 2 seconds, then verify microphone audio is heard over cabin speaker when corresponding mic key is pressed.

(i) Test intercom system.

1 On audio control unit, select [PILOT], [COPLT], and [PASS] to set intercom (ICS) to ALL mode.

2 Verify [PILOT], [COPLT], and [PASS] lights are on.

3 Plug in headsets at each position, including ANR headset jacks.

4 For pilot position, adjust outer cursor dial on [VOL/CRSR] knob to select [PILOT] and inner volume dial on [VOL/CRSR] knob to set volume.

5 For co-pilot position, adjust outer cursor dial on [VOL/CRSR] knob to select [COPLT] and inner volume dial on [VOL/CRSR] knob to set volume.

6 For passenger position, adjust outer cursor dial on [VOL/CRSR] knob to select [PASS] and inner volume dial on [VOL/CRSR] knob to set volume.

7 From pilot headset position, verify pilot, co-pilot, and all passenger mic inputs can be heard in pilot's headset when speaking into mic input.

8 Speak into pilot's mic and verify that pilot mic audio is heard in co-pilot headset and in each passenger headset.

9 Speak into each passenger's mic and verify that passenger mic audio is heard in pilot headset, co-pilot headset and in other passenger headset.

(j) Test marker beacon operation.

1 With marker signal generator/transmitter test set, generate marker tones.

2 From the pilot headset position, verify that marker audio can be heard when selected.

3 If the system includes integrated lamp annunciation and/or if external lamps are installed, verify that each marker tone illuminates the proper lamp.

Outer Marker – Blue Lamp – 400 Hz (AM or received audio tone)

Middle Marker – Amber Lamp – 1300 Hz (AM or received audio tone)

Inner Marker – White Lamp – 3000 Hz (AM or received audio tone)

4 If the system is configured and/or wired to allow both HI and LO sensitivity operation, verify that during HI SENS operation, the RF threshold is more sensitive (marker audio/indication occurs as a lower RF power).

(k) Test digital voice recorder.

1 Allow COM1 to operate for at least two and a half minutes of active operation.

2 Press PLAY key once to play back latest recorded memory block of COM1 audio.

3 Press PLAY key again to play previous memory block of COM1 audio. Repeat until listening to first block of audio (a total of 2.5 minutes of audio is recorded).

(l) Test music system and telephone.

1 Connect a stereo music source to AUDIO INPUT 1.

2 If volume control cursor is not active press inner volume dial on [VOL/CRSR] knob to switch to Blue-Select mode. If the volume control cursor is active (white flashing cursor), press twice (once to cancel cursor, twice to activate Blue-Select mode).

Note: After approximately ten seconds with no input, Blue-Select mode will automatically cancel.

3 On audio control unit, select [PILOT], [COPLT], and [PASS] to set Blue-Select mode for all positions.

4 Verify [PILOT], [COPLT], and [PASS] annunciators are lit blue.

5 Adjust outer cursor dial on [VOL/CRSR] knob to select [MUS1].

6 Verify [MUS1] light is on.

7 Verify stereo music is heard in pilot, co-pilot, and passenger headset jacks.

8 Verify music is only muted when any airplane radio audio is being received or PTT switch on LH yoke is pressed and squelch is broken, but not during normal cabin conversation.

9 In Blue-Select mode, de-select [PILOT], and select [COPLT] and [PASS].

10 Verify [PILOT] light is off, and [COPLT] and [PASS] annunciators are lit blue.

11 Verify AUDIO INPUT 1 is heard on co-pilot and passenger headsets only.

12 In Blue-Select mode, de-select [PASS], and select [PILOT] and [COPLT].

13 Verify [PASS] light is off, and [PILOT] and [COPLT] annunciators are lit blue.

14 Verify AUDIO INPUT 1 is heard on pilot and co-pilot headsets only.

15 Connect a stereo music source to AUDIO INPUT 2.

16 In Blue-Select mode, de-select [PILOT] and [COPLT], and select [PASS].

17 Verify [PILOT] and [COPLT] lights are off, and [PASS] annunciator is lit blue.

18 Adjust outer cursor dial on [VOL/CRSR] knob to select [MUS2].

19 Verify [MUS2] light is on.

20 Verify AUDIO INPUT 2 is heard in passenger headsets, but not in pilot's or co-pilot's headsets.

21 Disconnect all audio sources.

22 In Blue-Select mode, de-select [PASS], and select [PILOT] and [COPLT].

23 Verify [PASS] light is off, and [PILOT] and [COPLT] annunciators are lit blue.

24 Adjust outer cursor dial on [VOL/CRSR] knob to select *ENTERTAINMENT* button (shown as a phone and music-note symbol).

25 Verify *ENTERTAINMENT* button light is on.

26 Connect cell phone to *ENTERTAINMENT* smartjack on the GMA 350(c) front panel.

27 From pilot's headset position, initiate a phone call and verify that two-way communication over telephone can be heard by pilot and co-pilot when selected.

28 Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

29 Disconnect 28 ±1 VDC external power from external power receptacle.

30 Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

D. Audio Jacks (See Figure 23-501)

(1) Removal - Cockpit Audio Jacks

(a) Open center console armrest and remove glove box. (Refer to 25-10)

(b) Remove nut, shoulder washer, and nylon washer securing jack to console.

(c) Disconnect audio harness leads from jack and remove from airplane.

(2) Installation - Cockpit Audio Jacks

(a) Connect audio harness lead to jack and position in console.

(b) Install nut, shoulder washer, and nylon washer securing jack to console.

(c) Insert glove box. (Refer to 25-10)

(3) Removal - Passenger Audio Jacks

(a) Remove aft console rear cover. (Refer to 25-10)

(b) *For Stereo Jack:* Remove nut securing jack to console.

(c) *For Headphone/Headset/Microphone Jacks:* Remove nut, shoulder washer, and nylon washer securing jack to console.

(d) Disconnect audio harness leads from jack and remove from airplane.

(4) Installation - Passenger Audio Jacks

(a) Connect audio harness lead to jack and position in console.

(b) *For Stereo Jack:* Install nut securing jack to console.

(c) *For Headphone/Headset/Microphone Jacks:* Install nut, shoulder washer, and nylon washer securing jack to console.

(d) Install aft console rear cover. (Refer to 25-10)

E. Cabin Speaker - *Serials 1005 thru 1124* (See Figure 23-501)

(1) Removal - Cabin Speaker

(a) Remove cabin speaker grill from overhead console.

(b) Remove screws securing cabin speaker to headliner.

(c) *Serial 1107:* Carefully disengage reclosable fasteners securing cabin speaker to headliner.

(d) Disconnect cabin speaker electrical connector.

(e) Remove cabin speaker from airplane.

(2) Installation - Cabin Speaker

(a) Connect cabin speaker electrical connector.

(b) *Serial 1107:* Position speaker to headliner and press firmly at reclosable fasteners.

(c) Install screws securing cabin speaker to headliner.

(d) Verify cabin speaker operation.

(e) Install cabin speaker grill.

F. Cabin Speaker - *Serials 1125 & subs* **(See Figure 23-501)**

(1) Removal - Cabin Speaker

(a) Remove screws, washers, and nuts securing speaker grill, foam pads, and cabin speaker to headliner.

(b) Disconnect cabin speaker electrical connector.

(c) Remove cabin speaker from airplane.

(2) Installation - Cabin Speaker

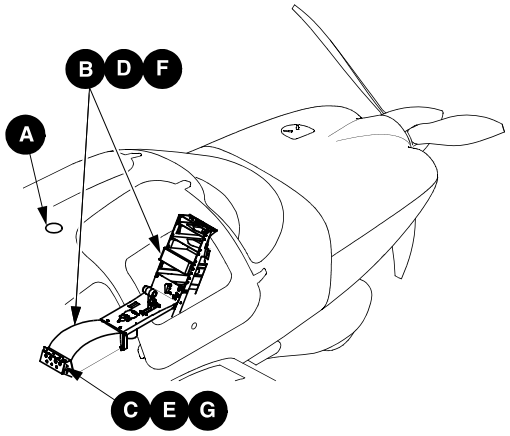
(a) Connect cabin speaker electrical connector.

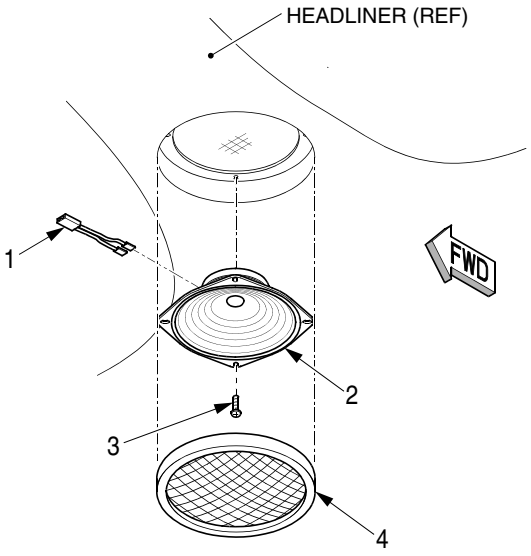
(b) Position speaker, foam pads and speaker grill to headliner and secure with screws, washers, and nuts.

(c) Verify cabin speaker operation.

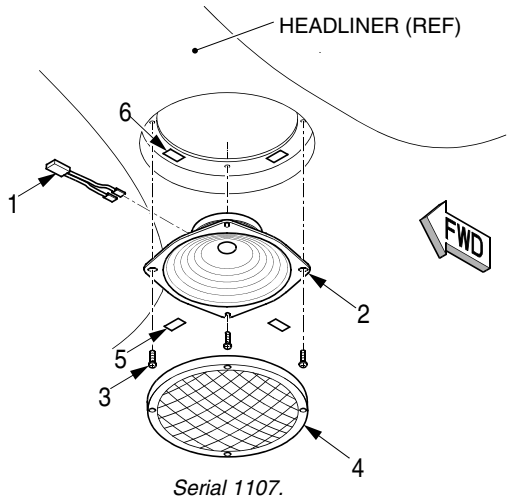
G. Push-To-Talk (PTT) Switch

The PTT switch is integral to the yoke grip assembly. For maintenance practices pertinent to PTT switch, see Flight Controls. (Refer to 27-10)

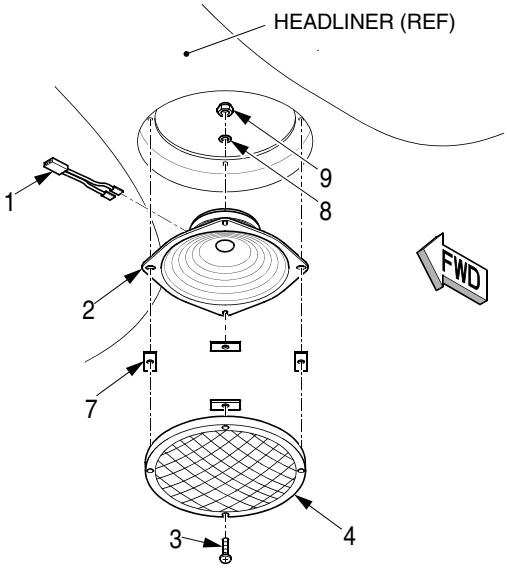




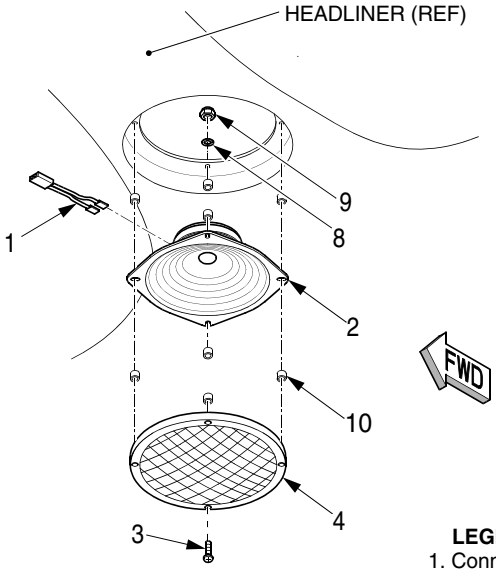
Serials 1005 thru 1106, 1108 thru 1124.



Serial 1107.



Serials 1125 thru 1422.



Serials 1423 & subs.

LEGEND

1. Connector
2. Speaker
3. Screw
4. Grill
5. Loop Tape
6. Hook Tape
7. Foam
8. Washer
9. Nut
10. Spacer

DETAIL A

SR20_MM23_1023B

Figure 23-501
Audio Integration (Sheet 1 of 4)

EFFECTIVITY:
All

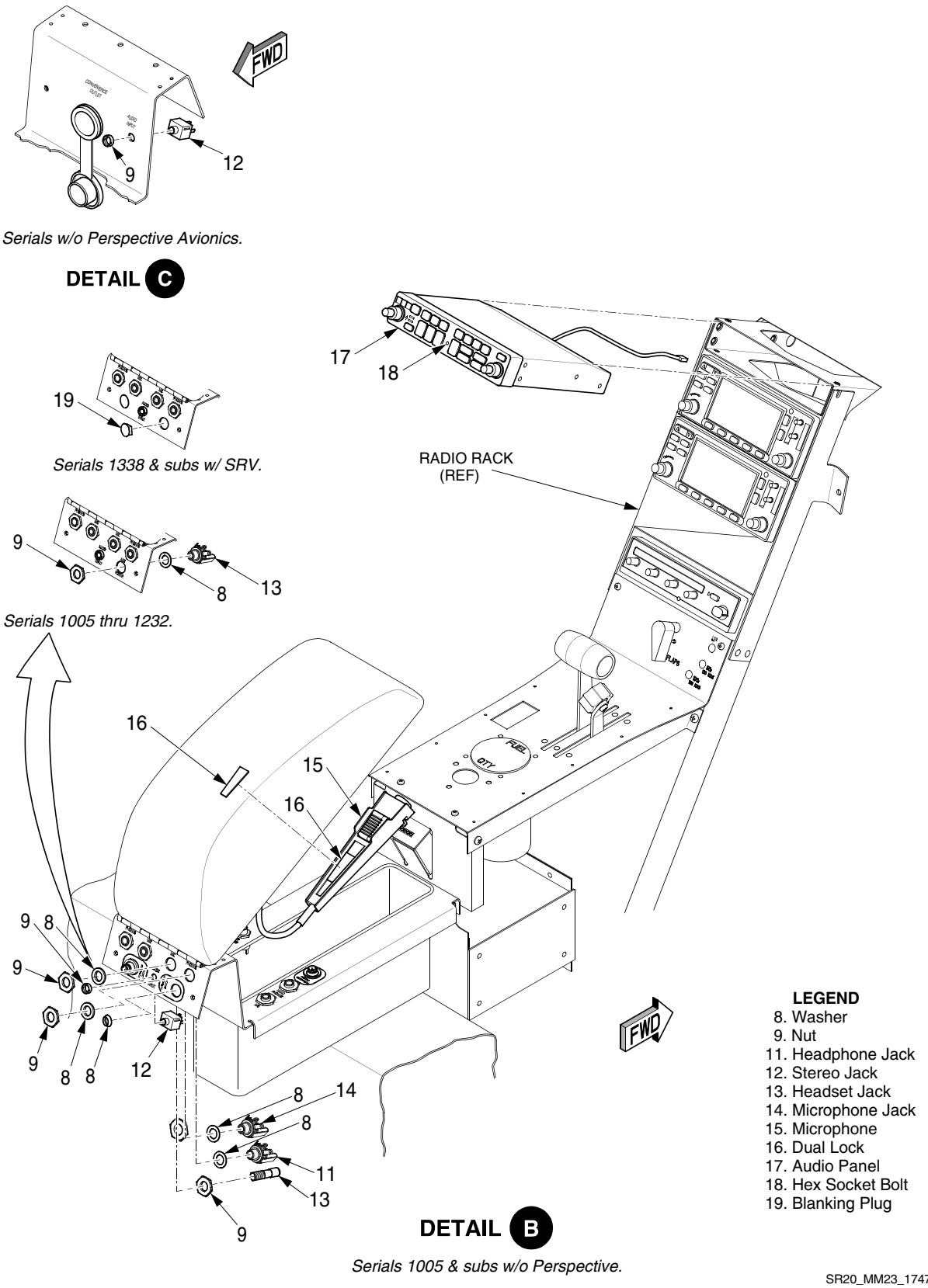
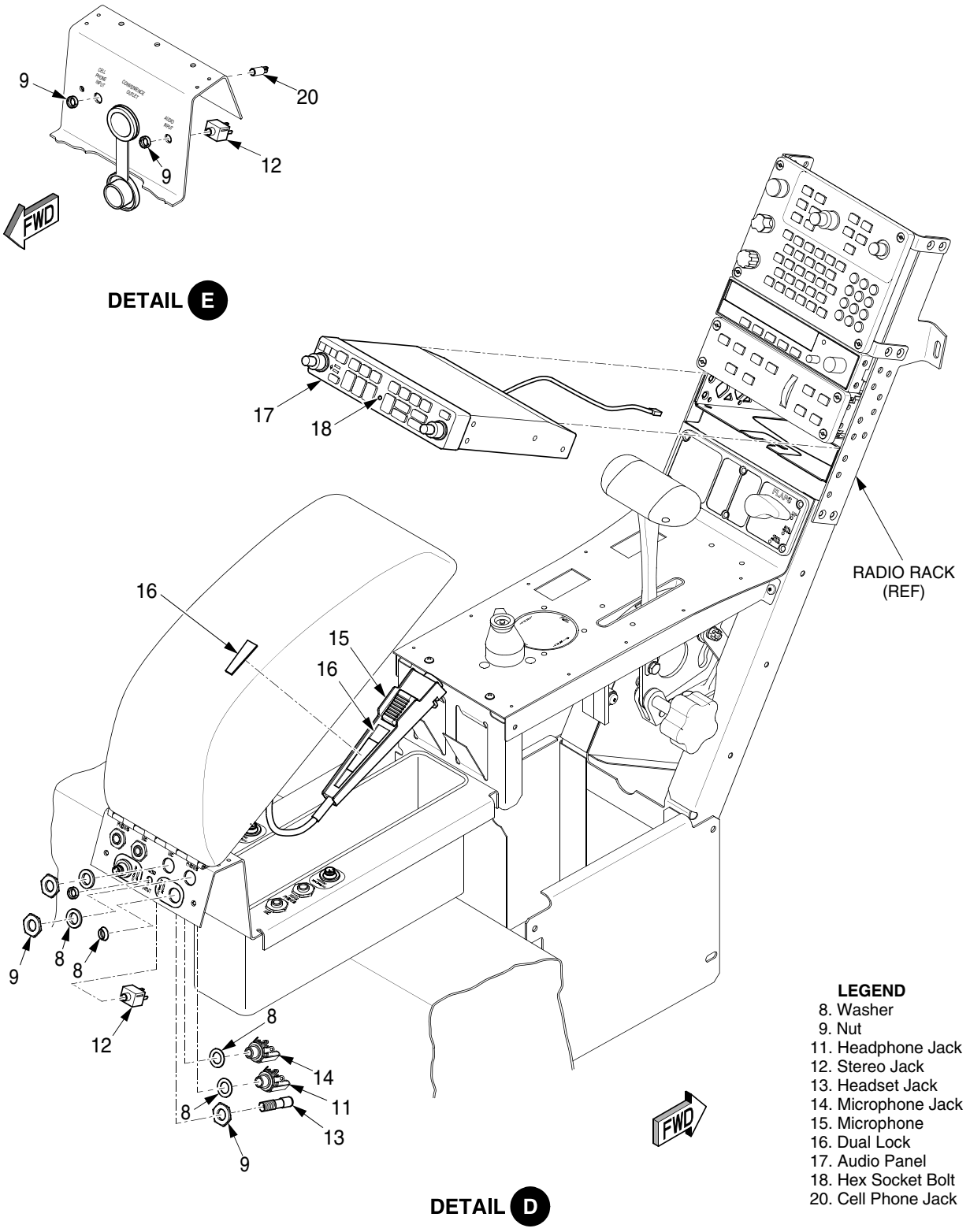


Figure 23-501
Audio Integration - Serials 1005 & subs w/o Perspective Avionics (Sheet 2 of 4)



Serials 2016 thru 2126 w/ Perspective.

SR20_MM23_3504

Figure 23-501
Audio Integration - Serials 2016 thru 2126 w/ Perspective (Sheet 3 of 4)

EFFECTIVITY:
Serials 2016 thru 2126 w/ Perspective

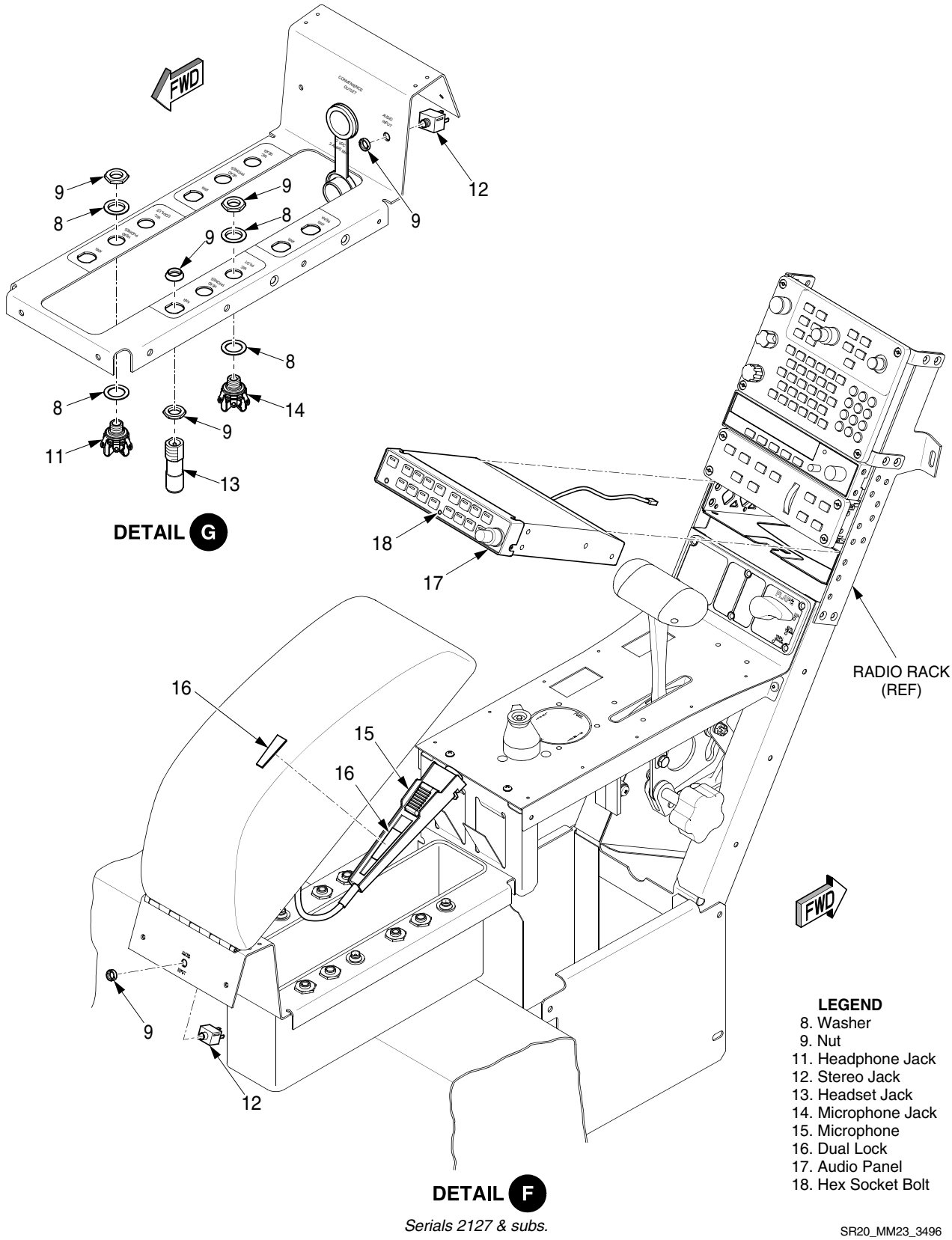


Figure 23-501
Audio Integration - Serials 2127 & subs w/ Perspective (Sheet 4 of 4)

EFFECTIVITY:
Serials 2127 & subs w/ Perspective

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STATIC DISCHARGING

1. DESCRIPTION

This section covers precipitation static wicks. Static wicks are installed on aircraft to discharge built up static electricity from the aircraft during flight.This helps reduce interference with radio systems. Micropoint static wicks are installed into static wick retainers.

A. Wing Tip Precipitation Static Wicks- ***Serials 1886 thru 2262 after SB2X-23-03, and 2263 and subs***

The wing tip precipitation static wick retainers are installed to a bracket assembly. The bracket assembly is secured to a backing plate and gasket as part of the Anti-Collision Strobe Light Assembly.

For more information on the Anti-Collision Strobe Light (Refer to 33-40).

B. Wing Tip Precipitation Static Wicks- ***Serials 1005 thru 1877, 1879 thru 1885 after SB2X-23-04***

The wing tip precipitation static wick retainers are installed along with a backing plate as part of the of the Anti-Collision Strobe Light Assembly.

For more information on the Anti-Collision Strobe Light (Refer to 33-40).

C. Aileron Precipitation Static Wicks-*1886 thru 2262 after SB2X-23-03 and 2263 and subs*

The aileron precipitation static wick retainers are attached directly to the wing between the wingtip and aileron.

D. Elevator and Rudder Precipitation Static Wicks- ***Serials 1005 thru 1885 after SB2X-23-04 and 1886 thru 2262 after SB2X-23-03 and 2263 and subs***

The elevator and rudder precipitation static wick retainers are attached directly to both elevators and the rudder.

2. MAINTENANCE PRACTICES

A. Wing Tip Precipitation Static Wicks- *Serials 1886 thru 2262 after SB2X-23-03, and 2263 and subs* *(See Figure 23-601)*

(1) Removal- Wing Tip Precipitation Static Wicks

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull NAV LIGHTS, STROBE LIGHTS, and INST LIGHTS circuit breakers.

(c) Remove static wicks from retainers.

(2) Installation- Wing Tip Precipitation Static Wicks

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.
Sealant	(Refer to 51-30)	Any Source	Seal static wicks to surface.

(b) Install static wicks onto both wing tips.

1 Screw static wicks into retainers on both wing tips.

Note: No torque stripe required.

No Loctite or locking device required.

Note: Torque static wicks to 10 - 15 in-lb (1.13 - 1.69 Nm).

Leave an area of metal base of static wick exposed for future continuity checks.

2 Fill gaps between metal base of static wicks and wing tip surfaces with sealant. (Refer to 51-30)

(c) *Serials w/ LED Strobe Light Assemblies before SB2X-33-06:* Install new gasket inboard of light assembly base plate to both LED strobe light assemblies. Ensure slit in gasket faces down.

(d) Reset circuit breakers.

(e) Perform Operational Test - Wing Tip Precipitation Static Wicks (Refer to 23-60)

(3) Operational Test - Precipitation Static Wicks

(a) Using ohmmeter, confirm resistance from metal base of each static wick to exhaust tail pipe is less than 10 ohms.

(b) Using megohmmeter, confirm resistance from metal base of each static wick to tip of static wick is 6 - 200 megohms.

EFFECTIVITY:
Serials 1886 thru 2262 after SB2X-23-03, and 2263 and subs

B. Wing Tip Precipitation Static Wicks- *Serials 1005 thru 1877, 1879 thru 1885 after SB2X-23-04*
(See Figure 23-601)

(1) Removal- Wing Tip Precipitation Static Wicks
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull NAV LIGHTS, STROBE LIGHTS, and REC/INST LTS or RECOG LIGHTS circuit breakers.
  (c) Remove static wicks from retainers.
  (d) Remove LH and RH wing tips. (Refer to 57-20)
  (e) Remove Anti-Collision Strobe Light from LH and RH wing tips. (Refer to 33-40)
    1 Remove backing plate assembly from Anti-Collision Strobe Light Assembly.
    2 Remove static wick retainer from backing plate assembly

(2) Installation- Wing Tip Precipitation Static Wicks
  (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.

  (b) Install static wick retainer to backing plate assembly with screws.
  (c) Install Anti-Collision Strobe Light assembly with backing plate assembly. (Refer to 33-40)
  (d) Install LH and RH wing tips. (Refer to 57-20)
  (e) Install static wicks onto both wing tips.
    1 Screw static wicks into retainers on both wing tips.

      Note: No torque stripe required.

      No Loctite or locking device required.

    2 Torque static wicks to 10 - 15 in-lb (1.13 - 1.69 Nm).
  (f) Reset circuit breakers.
  (g) Perform Operational Test - Precipitation Static Wicks. (Refer to 23-60)

C. Aileron Precipitation Static Wicks- ***Serials 1886 thru 2262 after SB2X-23-03 and 2263 and subs*** **(See Figure 23-601)**

(1) Removal - Aileron Precipitation Static Wicks

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull NAV LIGHTS, STROBE LIGHTS, and REC/INST LTS or RECOG LIGHTS circuit breakers.

(c) Remove static wicks from retainers.

(2) Installation - Aileron Precipitation Static Wicks

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.

(b) Install static wicks onto both ailerons.

1 Screw static wicks into retainers on both wings.

2 Torque static wicks to 10 - 15 in-lb (1.13 - 1.69 Nm)

(c) Reset circuit breakers.

(d) Perform Operational/Test - Precipitation Static Wicks. (Refer to 23-60)

D. Elevator and Rudder Precipitation Static Wicks- *Serials 1005 thru 1885 after SB2X-23-04 and 1886 thru 2262 after SB2X-23-03 and 2263 and subs* (See Figure 23-501)

(1) Removal- Elevator and Rudder Precipitation Static Wicks.

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull NAV LIGHTS, STROBE LIGHTS, and REC/INST LTS or RECOG LIGHTS circuit breakers.

(c) Remove static wicks from retainers on elevators and rudder.

(2) Installation- Elevator and Rudder Precipitation Static Wicks.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.

(b) Install static wicks onto elevators and rudder.

1 Screw static wicks into retainers on rudder and both elevators.

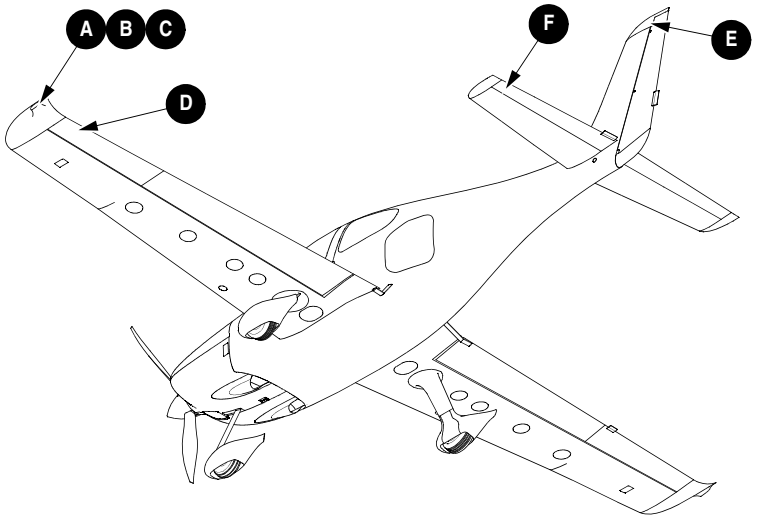
Note: No torque stripe required.

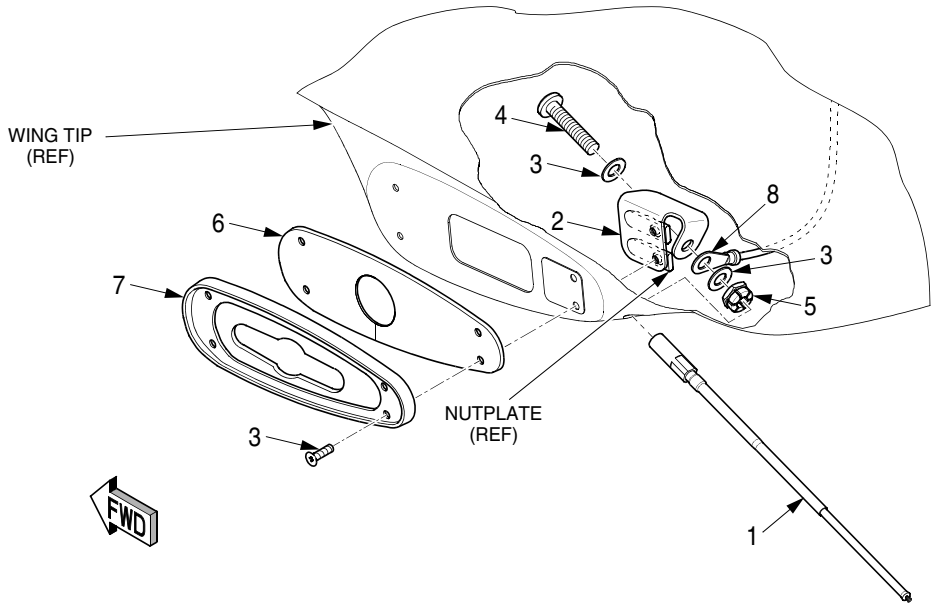
No Loctite or locking device required.

2 Torque static wicks to 10 - 15 in-lb (1.13 - 1.69 Nm).

(c) Reset circuit breakers.

(d) Perform Operational Test - Precipitation Static Wicks (Refer to 23-60)





LEGEND
1. Static Wick
2. Bracket
3. Washer
4. Screw
5. Nut
6. Gasket
7. Base Plate
8. Ground Wire

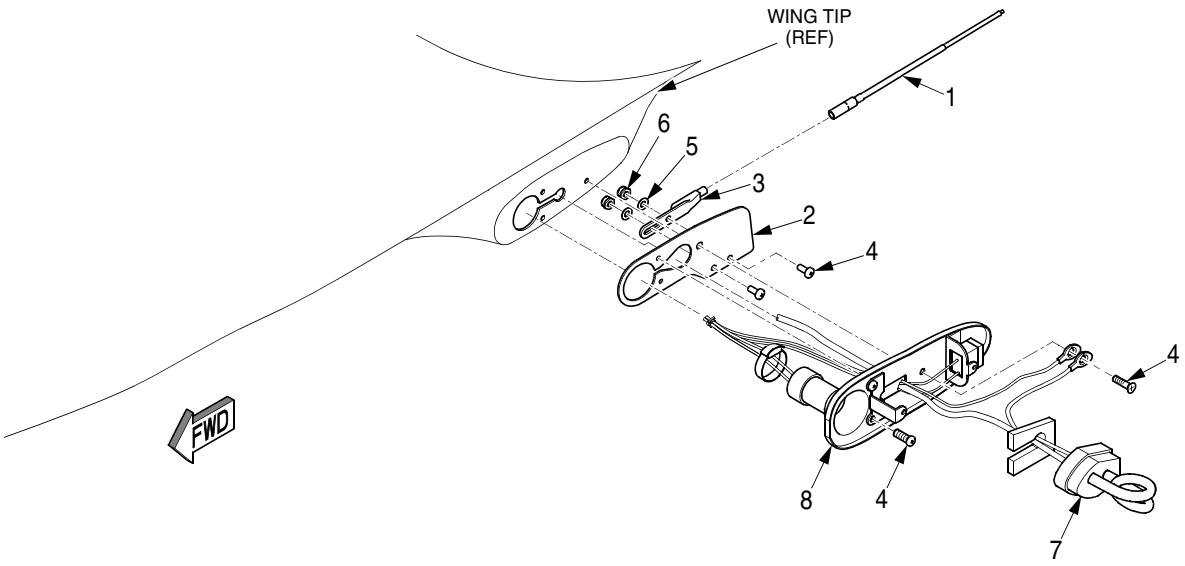
DETAIL A

Serials 1886 thru 2262 after SB2X-23-03 and 1878 & subs.

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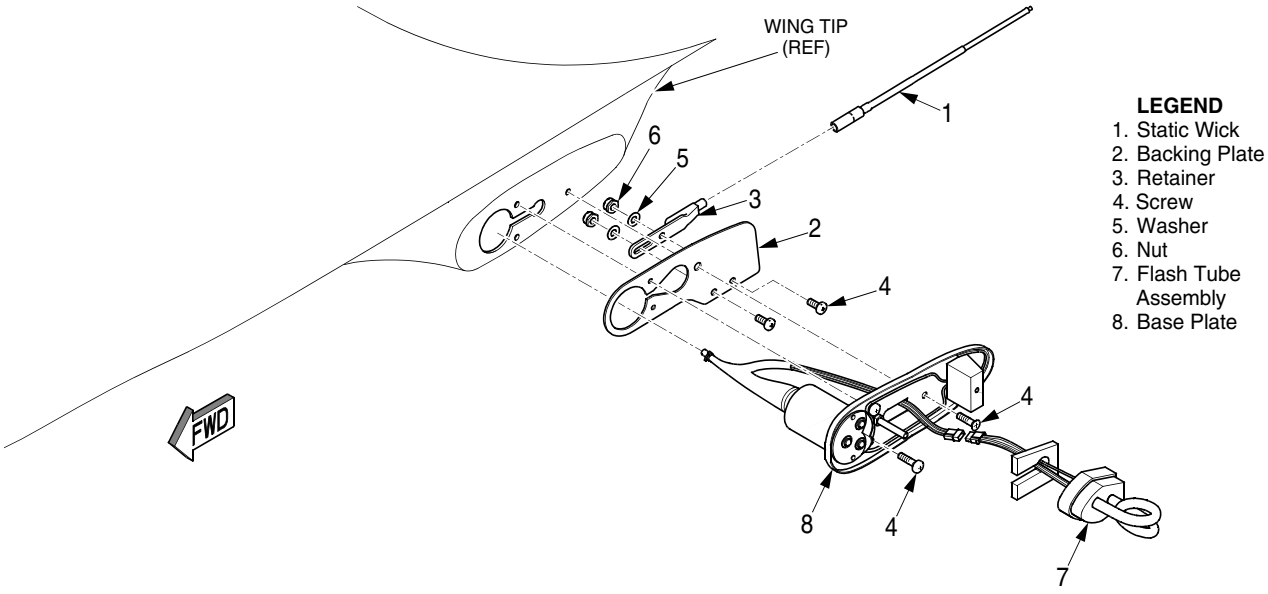
Figure 23-601
Static Wick, Wing Tip - Serials 1886-2262 after SB2X-23-03, and 2263 & subs (1 of 4)

EFFECTIVITY:
Serials 1886-2262 after SB2X-23-03, and 2263 & subs



Serials 1005 thru 1877, 1879 thru 1885
before SB2X-33-03 and after SB2X-23-04.

DETAIL B



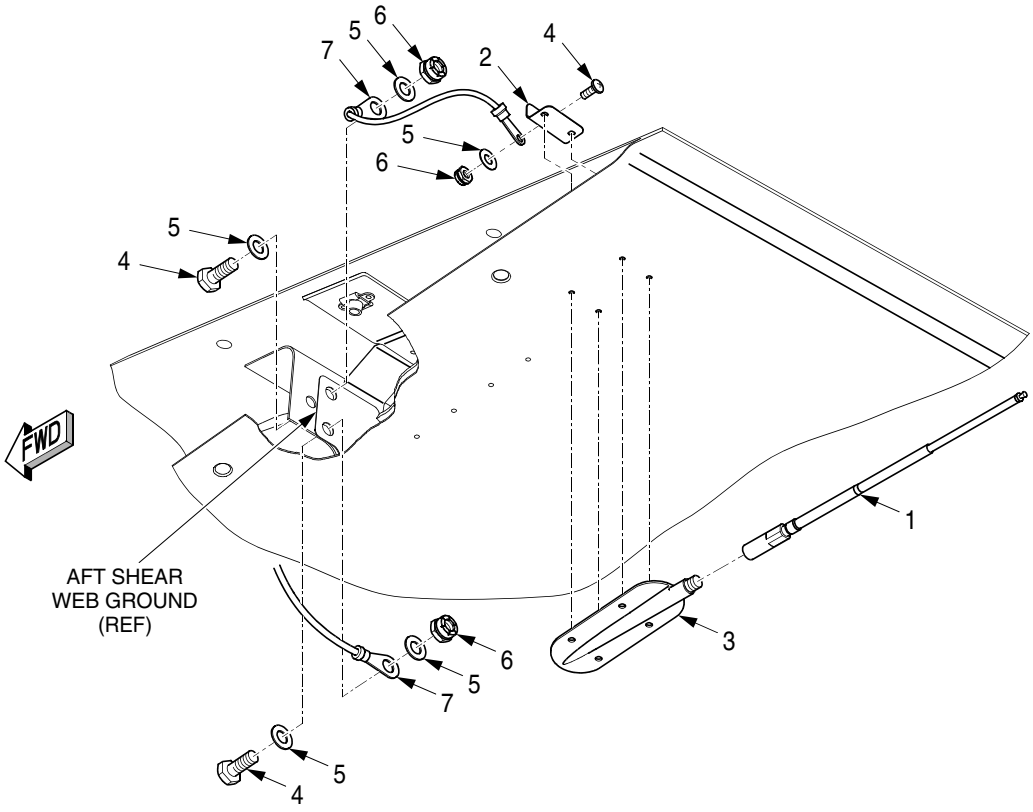
LEGEND
1. Static Wick
2. Backing Plate
3. Retainer
4. Screw
5. Washer
6. Nut
7. Flash Tube Assembly
8. Base Plate

Serials 1005 thru 1877, 1879 thru 1885
after SB2X-33-03 and SB2X-23-04.

DETAIL C

SR20_MM23_5464

Figure 23-601
Static Wick, Wing Tip - *Serials 1005-1877, 1879-1885 after SB2X-23-04* (2 of 4)



LEGEND
1. Static Wick
2. Backing Plate
3. Retainer
4. Screw
5. Washer
6. Nut
7. Ground Wire

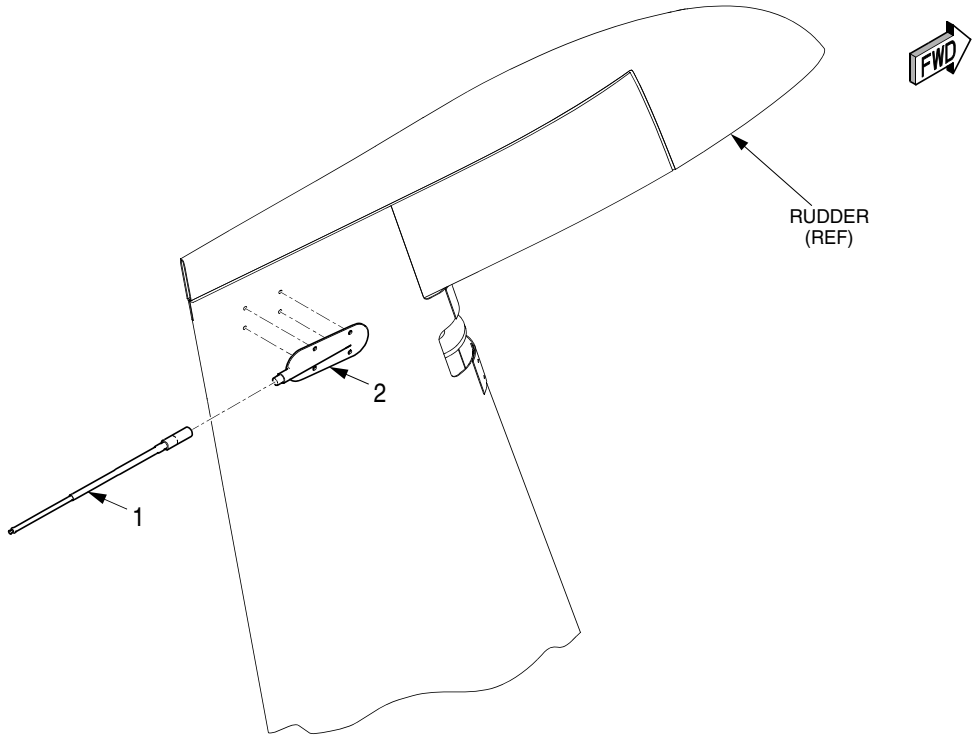
Serials 1886 thru 2262 after SB2X-23-03, 2263 & subs.

DETAIL D

SR20_MM23_5465

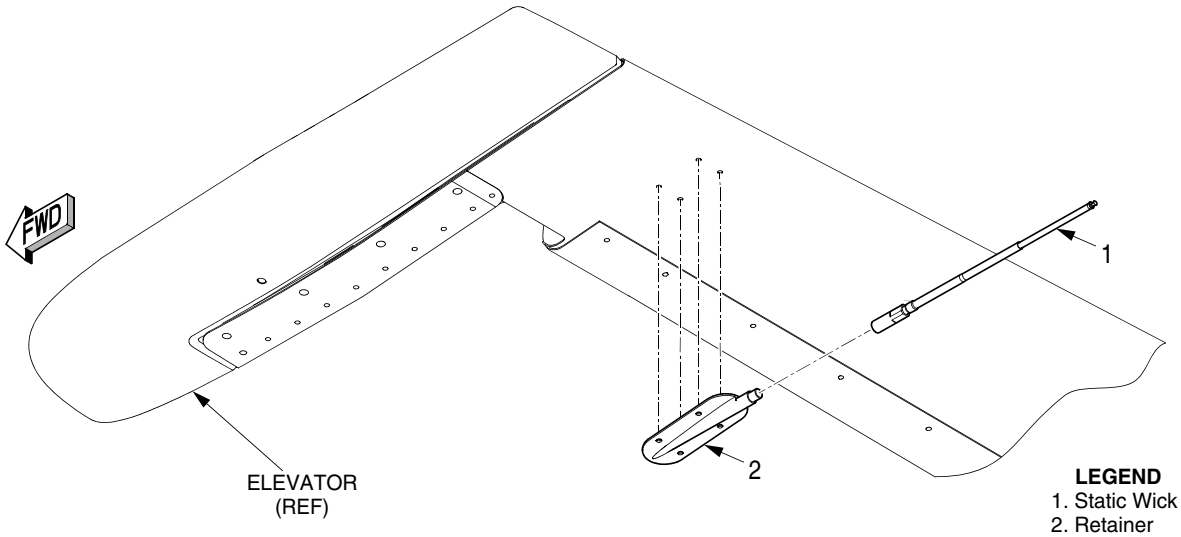
Figure 23-601
Static Wick, Aileron - *Serials 1886-2262 after SB2X-23-03, 2263 & subs* (3 of 4)

EFFECTIVITY:
Serials 1886-2262 after SB2X-23-03, 2263 & subs



Serials 1005 thru 1885 after SB2X-23-04,
1886 thru 2262 after SB2X-23-03, 2263 & subs.

DETAIL E



Serials 1005 thru 1885 after SB2X-23-04,
1886 thru 2262 after SB2X-23-03, 2263 & subs.

DETAIL F

SR20_MM23_5466

Figure 23-601

Static Wick, Elevator/Rudder - *Serials 1005-1885 after SB2X-23-04,1886-2262 after SB2X-23-03, 2263 & subs (4 of 4)*

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CHAPTER 24

ELECTRICAL POWER

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ELECTRICAL POWER

1. GENERAL

The information in this chapter covers DC Generation, External Power, and Electrical Load Distribution.

This airplane is equipped with 28-volt direct-current (VDC) electrical system designed to reduce the risk of electrical system faults. The system provides uninterrupted power for avionics, flight instrumentation, lighting, and other electrically operated and controlled systems during normal operation. The electrical system also provides for simplified load shedding in the event of an electrical system failure.

The bolster panel contains the pilot switches for operating the batteries and alternators. The switches are mounted adjoining so that a pilot can control all the switches with a single hand.

Power generated from the alternator(s) is fed into the Master Control Unit (MCU). The MCU regulates and distributes the power to the batteries and the system loads. The alternator(s) provide constant charging current for the batteries and primary power to the aircraft electrical system during normal system operation.

A. Electrical Power - *Serials 1005 thru 1267*

A single alternator system may be installed consisting of a 24-volt, 10-amp-hour battery (BAT 1), 75-amp belt-driven alternator (ALT 1), voltage regulator, and an over-voltage protection system. (See Figure 24-301)

An optional dual alternator system may be installed consisting of a 24-volt, 10-amp-hour battery (BAT 1), 75-amp belt-driven alternator (ALT 1), 40-amp gear-driven alternator (ALT 2), voltage regulator, and an over-voltage protection system. (See Figure 24-302)

B. Electrical Power - *Serials 1268 thru 2015 w/o SRV, 2016 & subs w/o SRV and w/o Perspective Avionics*

The electrical system consists of a 24-volt, 10-amp-hour battery (BAT 1), two 12-volt 7-amp-hour batteries connected in series for 24-volts (BAT 2), 75-amp belt-driven alternator (ALT 1), 20-amp engine-driven alternator (ALT 2), voltage regulator, and an over-voltage protection system. (See Figure 24-303)

C. Electrical Power - *Serials 2016 & subs w/o SRV and w/ Perspective Avionics*

The electrical system consists of a 24-volt, 10-amp-hour battery (BAT 1), two 12-volt, 18-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts (BAT 2), 75-amp belt-driven alternator (ALT 1), 40-amp gear-driven alternator (ALT 2), voltage regulator, and an over-voltage protection system. (See Figure 24-306)

D. Electrical Power - *Serials 1337 & subs w/ Single Alternator SRV*

The electrical system consists of a 24-volt, 10-amp-hour battery (BAT 1), two 12-volt 7-amp-hour batteries connected in series for 24-volts (BAT 2), 75-amp belt-driven alternator (ALT 1), voltage regulator, and an over-voltage protection system. (See Figure 24-304)

E. Electrical Power - *Serials 1337 & subs w/ Dual Alternator SRV*

The electrical system consists of a 24-volt, 10-amp-hour battery (BAT 1), two 12-volt 7-amp-hour batteries connected in series for 24-volts (BAT 2), 75-amp belt-driven alternator (ALT 1), 20-amp engine-driven alternator (ALT 2), voltage regulator, and an over-voltage protection system. (See Figure 24-305)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
No alternator output. (Voltmeter Indicates 24 VDC or less and the ammeter indicates a discharge when the corresponding BAT switch is set to ON position)	Loose alternator wire connection.	Tighten connector.
	Alternator switch off.	Turn on corresponding alternator switch.
	Defective alternator.	Replace alternator.
	Circuit breaker activated (open).	Reset circuit breaker and trouble-shoot circuit.
	Faulty voltage regulator.	Replace voltage regulator.
	Low engine RPM.	Increase engine RPM.
Alternator output is low.	Loose alternator wire connection.	Tighten corresponding connector.
	Faulty voltage regulator.	Replace voltage regulator.
	Faulty MCU.	Replace MCU.
	Faulty alternator.	Replace alternator.
	Low engine RPM.	Increase engine RPM.
No battery output.	Poor battery connections.	Clean and tighten connections.
	Faulty battery.	Replace corresponding battery.
High water usage (Battery 1).	Alternator output high, faulty voltage regulator.	Replace MCU.
	Faulty battery.	Replace battery.
Battery will not hold charge.	Flights too short to recharge sufficiently.	Remove corresponding battery and recharge when necessary.
	Loose connections, corrosion.	Tighten, clean, and neutralize connections.
	Faulty battery.	Replace corresponding battery.
	Standing too long (hot climate).	Remove corresponding battery and recharge when necessary.
Short battery life (Battery 1).	Electrolyte level below top of plates.	Keep electrolyte level above plates.
	Battery hold down loose.	Keep hold down secure at all times.
	Overcharging of battery (faulty voltage regulator).	Replace MCU.

Trouble	Probable Cause	Remedy
External power receptacle inoperable.	BAT 1 switch in OFF position.	Set BAT 1 switch to ON position.
	Faulty ground wire/connection.	Inspect and repair ground wire/connection at receptacle or firewall ground bus bar.
	Faulty ground power relay.	Replace MCU.
Low volts light illuminates.	High demand on electrical system with a low engine RPM setting.	Increase engine RPM or load shed.
	Faulty logic module or current sensor.	Replace MCU.
Alternator is noisy.	Worn alternator bearings.	Replace corresponding alternator.
	Faulty alternator diode(s).	Replace corresponding alternator.
No output from alternator 2.	Loose alternator wire connection.	Tighten connector.
	Faulty alternator drive unit.	Replace alternator drive unit.
	Faulty alternator.	Replace alternator.
Alternator 2 output is low.	Loose alternator wire connection.	Tighten connector.
	Faulty rectifier.	Replace alternator.
	Faulty MCU.	Replace MCU.
	Low RPM.	Increase RPM.
Oil leaks from alternator 2.	Faulty oil seal in alternator.	Replace alternator.

Trouble	Probable Cause	Remedy
Starter motor will not engage.	Starter Relay circuit breaker open.	Reset starter relay circuit breaker. If starter relay circuit breaker opens on second attempt, check for wiring short between circuit breaker panel and MCU.
	Loose electrical connections between MCU and starter motor.	Ensure all electrical connections to starter motor are secure.
	Damaged electrical connections between MCU and starter switch.	*MCU 14600-001, 14600-002, 16600-001:* At MCU, disconnect P108 and P109. Switch ignition switch to START. Verify resistance between pin E of P108 and pin B of P109 is zero. If infinite resistance is measured, check plugs, jacks, starter switch, and starter switch wiring for damage. *MCU 19900-001:* At MCU, disconnect P137 and P135. Set ignition switch to START. Verify resistance between pin C of P137 and pin C of P135 is zero. If infinite resistance is measured, check plugs, jacks, starter switch, and starter switch wiring for damage.
	Starter motor power relay faulty.	Remove positive cable from starter motor. Connect voltmeter to positive starter motor stud and ground. Engage BAT 1 master switch. Switch ignition switch to START. Verify volt meter indicates 24 volts. If system voltage reads zero, MCU starter relay faulty. Return MCU to approved factory service center for service. If system voltage reads 24 volts, replace positive terminal on starter motor and attempt to start airplane. If the starter motor still does not engage, replace starter motor. (Refer to 80-10)
	Starter motor faulty.	Replace starter motor. (Refer to 80-10)

Trouble	Probable Cause	Remedy
Starter motor engages when BAT 1 master switch is set to ON position.	MCU starter relay welded closed.	MCU starter relay faulty. Return MCU to approved factory service center for service.
	Starter motor faulty.	Replace starter motor. (Refer to 80-10)

Trouble	Probable Cause	Remedy
Annunciator Panel ALT 1 shows steady illumination above 2200 RPM.	ALT 1 circuit breaker open.	Reset ALT 1 circuit breaker.
	MCU 14600-001, 14600-002, 16600-001: MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages and ALT 1 remains illuminated, replace MCU logic module. (Refer to 24-30)
	MCU 14600-001, 14600-002, 16600-001: MCU current sensor faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows ALT 1 current at zero or ± 60 amps, replace ALT 1 current sensor. (Refer to 24-30)
	ALT 1 switch faulty.	*Serials 1005 thru 2077:* Test ALT 1 switch: Verify continuity between pin 5 and pin 7 of J660 when switch is engaged. *Serials 2078 & subs:* Test Alt 1 switch and relay: Measure voltage between pin K of P183 and ground. If voltage does not measure 20-24 volts, replace bolster switch panel.
	MCU 14600-001, 14600-002, 16600-001: Short circuit between annunciator panel and MCU.	At MCU, disconnect plug P111. Verify ALT 1 turns off. If ALT 1 remains illuminated, a short exists within the airplane wiring. Check plug P111 and jack J111. If no shorts are found, replace annunciator panel. (Refer to 31-50)
	MCU field control module faulty.	At alternator 1 with alternator cables attached, measure voltage between field input and ground. If voltage does not measure 20-24 volts, replace MCU field control module. (Refer to 24-30)
	Alternator 1 faulty.	At alternator 1, measure resistance between field connector and ground. If resistance shows open circuit, alternator coil is damaged. Repair or replace alternator 1. (Refer to 24-30)

Trouble	Probable Cause	Remedy
Annunciator Panel ALT 2 shows steady illumination above 2200 RPM.	ALT 2 circuit breaker open.	Reset ALT 2 circuit breaker.
	MCU 14600-001, 14600-002, 16600-001: MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages and ALT 2 remains illuminated, replace MCU logic module. (Refer to 24-30)
	MCU 14600-001, 14600-002, 16600-001: ALT 2 current sensor faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows ALT 2 current at zero or ± 60 amps, replace ALT 2 current sensor. (Refer to 24-30)
	ALT 2 switch faulty.	*Serials 1005 thru 2077:* Test ALT 2 switch: At jack J661 verify continuity between pin 5 and pin 7 when switch is engaged. *Serials 2078 & subs:* Test Alt 2 switch and relay: Measure voltage between pin K of P182 and ground. If voltage does not measure 20-24 volts, replace bolster switch panel.
	MCU 14600-001, 14600-002, 16600-001: Short circuit between annunciator panel and MCU.	At MCU, disconnect plug P111. Verify ALT 2 turns off. If ALT 2 remains illuminated, a short exists within the airplane wiring. Check plug P111 and jack J111 for damage. If no shorts are found, replace annunciator panel. (Refer to 31-50)
	ALT 2 field control module faulty.	At alternator 2, disconnect J125. Measure voltage between one pin on jack J125 and ground. If voltage does not measure 20-24 volts, replace ALT 2 field control module. (Refer to 24-30)
	Alternator 2 faulty.	At alternator 2, disconnect jack J125. Measure resistance between one pin on jack J125 and ground. If resistance shows open circuit, alternator coil is damaged. Repair or replace alternator 2. (Refer to 24-30)

Trouble	Probable Cause	Remedy
Annunciator Panel LOW VOLTS illuminated.	*MCU 14600-001, 14600-002, 16600-001:* Alternator switch faulty.	Set BAT 1 switch to OFF position. At MCU, disconnect plug P108. Connect pin D of jack J108 to ground. If LOW VOLTS illuminates, a short exists within the airplane wiring. Check plug P108 and jack J108 for damage. If no shorts are found, replace annunciator panel. (Refer to 31-50)
	MCU 14600-001, 14600-002, 16600-001: MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages and LOW VOLTS remains illuminated, replace MCU logic module. (Refer to 24-30)
	MCU field control module faulty.	At alternator 1 with alternator cables attached, measure voltage between field input and ground. If voltage does not measure 20-24 volts, replace ALT 1 field control module. (Refer to 24-30) At alternator 2, disconnect J125. Measure voltage between one pin on jack J125 and ground. If voltage does not measure 20-24 volts, replace ALT 2 field control module. (Refer to 24-30)
Annunciator Panel ALT 1 flashing.	*MCU 14600-001, 14600-002, 16600-001:* MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages, set ALT 1 switch to OFF position. If ALT 1 continues flashing or turns off, replace MCU logic module. (Refer to 24-30)
	MCU 14600-001, 14600-002, 16600-001: MCU current sensor faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows ALT 1 current at zero or ± 60 amps, replace ALT 1 current sensor. (Refer to 24-30)

Trouble	Probable Cause	Remedy
Annunciator Panel ALT 2 flashing.	*MCU 14600-001, 14600-002, 16600-001:* MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages, set ALT 2 switch to OFF position. If ALT 2 continues flashing or turns off, replace MCU logic module. (Refer to 24-30)
	MCU 14600-001, 14600-002, 16600-001: MCU current sensor faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows ALT 2 current at zero or ± 60 amps, replace MCU current sensor. (Refer to 24-30)
Annunciator Panel ALT 1 does not illuminate when ammeter shows no current.	ALT 1 circuit breaker open.	Reset ALT 1 circuit breaker.
	Loose electrical connections at MCU.	Ensure all electrical connections at MCU are secure.
	MCU 14600-001, 14600-002, 16600-001: Open circuit between MCU and annunciator panel.	Set BAT 1 switch to ON position. At MCU, disconnect P111. Connect pin F on plug P111 to ground. If ALT 1 does not illuminate, a short exists within the airplane wiring or annunciator panel is faulty. (Refer to 31-50)
	MCU 14600-001, 14600-002, 16600-001: MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages, replace MCU logic module. (Refer to 24-30)

Trouble	Probable Cause	Remedy
Annunciator Panel or ALT 2 does not illuminate when ammeter shows no current.	ALT 2 circuit breaker open.	Reset ALT 2 circuit breaker.
	Loose electrical connections at MCU.	Ensure all electrical connections at MCU are secure.
	MCU 14600-001, 14600-002, 16600-001: Open circuit between MCU and annunciator panel.	Set BAT 1 switch to ON position. At MCU, disconnect plug P111. Connect pin G on plug P111 to ground. If ALT 2 does not illuminate, a short exists within the airplane wiring or annunciator panel is faulty. (Refer to 31-50)
	MCU 14600-001, 14600-002, 16600-001: MCU logic module faulty.	Perform Operational Inspection - Master Control Unit. If MCU Operational Inspection shows normal currents and voltages, replace MCU logic module. (Refer to 24-30)
No power when BAT 1 master switch set to ON position.	BAT 1 master switch faulty.	*MCU 14600-001, 14600-002, 16600-001:* Disconnect negative cable from battery 1. At MCU, disconnect P108. Set BAT 1 switch to ON position. Measure resistance between pin D of jack J108 to ground. If resistance shows open circuit, test BAT 1 master switch and replace if necessary. *MCU 19900-001:* Disconnect negative cable from battery 1. At MCU, disconnect plug P137. Set BAT 1 switch to ON position. Measure resistance between pin K of J137 to ground. If resistance shows open circuit, test BAT 1 master switch and replace if necessary.
	MCU 14600-001, 14600-002, 16600-001: BAT Current Sensor faulty.	Disconnect negative cable from battery 1. At MCU, disconnect plug P108. Set BAT 1 switch to ON position. Measure resistance between pin D of jack J108 to ground. If resistance shows open circuit, test BAT current sensor and replace if necessary. (Refer to 24-30)

Trouble	Probable Cause	Remedy
No external power when BAT 1 master switch set to ON position.	BAT 1 master switch faulty.	*MCU 14600-001, 14600-002, 16600-001:* Disconnect negative cable from battery 1. At MCU, disconnect plug P108. Set BAT 1 switch to ON position. Measure resistance between pin D of jack J108 to ground. If resistance shows open circuit, test BAT 1 master switch and replace if necessary. (Refer to 31-10) *MCU 19900-001:* Disconnect negative cable from battery 1. At MCU, disconnect plug P137. Set BAT 1 switch to ON position. Measure resistance between pin K of J137 to ground. If resistance shows open circuit, test BAT 1 master switch and replace if necessary. (Refer to 31-10)
	MCU 14600-001, 14600-002, 16600-001: BAT current sensor faulty.	Disconnect negative cable from battery 1. At MCU, disconnect plug P108. Set BAT 1 switch to ON position. Measure resistance between pin D of jack J108 to ground. If resistance shows open circuit, test BAT current sensor and replace if necessary. (Refer to 24-30)
Ammeter pegs at ± 60 amps or indicates abnormal amperage.	ALT 1 current sensor faulty.	Replace ALT 1 current sensor. (Refer to 24-30)
ALT 1 circuit breaker opens during operation.	ALT 1 field control module faulty.	Replace ALT 1 field control module. (Refer to 24-30)
ALT 2 circuit breaker opens during operation.	ALT 2 field control module faulty.	Replace ALT 2 field control module. (Refer to 24-30)
Airplane power remains on after BAT 1 master switch set to OFF position.	BAT 1 master switch faulty.	Test BAT 1 master switch and replace if necessary.
	MCU battery 1 power relay faulty.	MCU battery 1 power relay faulty. Return MCU to approved factory service center for service.

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DC GENERATION

1. DESCRIPTION

This section covers the systems to generate, regulate, control, and indicate DC electrical power. The DC generation portion of the system includes the batteries, alternators (with internal rectifiers), and regulator.

A. DC Generation - *Serials 1005 thru 1267 w/ Single Alternator* (See Figure 24-301)

Primary power for the airplane is supplied by a 28-VDC negative-ground electrical system. The electrical power generation system consists of a 24-volt, 10-amp-hour battery, a 75-ampere alternator, a voltage regulator and an over-voltage protection system. The battery is an aviation grade, 12-cell lead-acid type with non-spill vent caps. The battery is used for engine starting and as an emergency power source in the event of alternator failure. The 75-ampere alternator provides constant charging current for the battery and primary power to the aircraft electrical system during normal system operation. The voltage regulator provides transient suppression and constant voltage regulation of the unfiltered alternator power. To protect sensitive instruments, the over-voltage protection system monitors the primary power bus and automatically limits the peak voltage to 28.5 volts.

B. DC Generation - *Serials 1005 thru 1267 w/ Dual Alternators* (See Figure 24-302)

Primary power for the airplane is supplied by a 28-VDC negative-ground electrical system. The electrical power generation system consists of a 24-volt, 10-amp-hour battery, two alternators, and a master Control Unit (MCU). The MCU contains an Alternator Control Unit (ACU) for each alternator, contactors for starter, battery, and ground power, a landing light relay, circuit protection for the circuit breaker panel buses, and modules for other protection and annunciation functions. The battery is an aviation grade, 12-cell lead-acid type with non-spill vent caps. The battery is used for engine starting and as an emergency power source in the event of alternator failure.

Two rectified alternators provide constant charging current for the battery and primary power to the aircraft electrical system during normal system operation. The forward, belt-driven alternator is designated ALT 1. The aft, engine-driven alternator is designated ALT 2. Although each alternator produces the same amount of power at a given rotational speed, ALT 1 rotates faster and is rated at 75 amperes while ALT 2 is rated at 40 amperes. Paralleling circuits in the function modules balance alternator output so that, under normal operating conditions, ALT 1 provides 60% of the electrical power and ALT 2 provides the remaining 40%.

Each alternator's ACU provides transient suppression and constant voltage regulation of the alternator output. To protect sensitive instruments, over-voltage circuits monitor each alternator's output and automatically limit peak voltage to 28.5 volts. In the event an over-voltage or an overload condition occurs, the associated ACU automatically opens the affected alternator's circuit breaker. With the alternator off line, the associated ALT FAIL light illuminates, and the other alternator will provide 100% of the electrical power requirements.

Should both alternators fail, the battery will supply system current and a discharge rate will be indicated on the ammeter. Under these conditions, depending on electrical system load, the LOW VOLTS warning light will illuminate when system voltage drops below approximately 24.5 volts.

C. DC Generation - *Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 24-303)

Primary power for the airplane is supplied by a 28-VDC, negative-ground electrical system. The electrical power generation system consists of two alternators controlled by a Master Control Unit (MCU) mounted on the left side of the firewall and two batteries for starting and electrical power storage.

Alternator 1 (ALT 1) is a belt-driven, internally rectified, 75-amp alternator mounted on the RH front of the engine. Alternator 2 (ALT 2) is a gear-driven, internally rectified, 20-amp alternator mounted on the accessory drive at the rear of the engine. ALT 1 is regulated to 28 volts and ALT 2 is regulated to 28.75 volts. The output from ALT 1 is connected to the main distribution bus in the MCU through an 80-amp fuse. The output from ALT 2 is connected to the essential distribution bus in the MCU through a 40-

amp fuse. Both alternators are self-exciting (not self-starting) and require battery voltage for field excitation in order to start up - for this reason, the batteries should not be turned off in flight.

Battery 1 (BAT 1) is an aviation grade 12-cell, lead-acid, 24-volt, 10-amp-hour battery mounted on the right firewall. BAT 1 is charged from the main distribution bus in the MCU. Battery 2 (BAT 2) is composed of two 12-volt, 7-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts. Both BAT 2 units are located in a vented, acid-resistant container mounted behind the aft cabin bulkhead (FS 222) below the parachute canister. BAT 2 is charged from the circuit breaker panel Essential bus.

The Master Control Unit (MCU) is located on the left firewall. The MCU controls ALT 1, ALT 2, starter, landing light, external power, and power generation functions. In addition to ALT 1 and ALT 2 voltage regulation, the MCU also provides external power reverse polarity protection, alternator overvoltage protection, as well as alternator fail and over-current annunciations. Power is distributed to the airplane circuit panel buses through main and essential buses in the MCU. During normal operation, the alternators feed their respective distribution bus independently (ALT 1 feeds main distribution bus and ALT 2 feeds the essential distribution bus). The distribution buses are interconnected by two 50-amp fuses and a diode. The diode prevents ALT 2 from feeding the main distribution bus. Additionally, since ALT2 / essential distribution bus voltage is slightly higher than ALT 1 / main distribution bus voltage, ALT 1 will not feed the essential distribution bus unless ALT 2 fails.

D. DC Generation - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 24-306)

During normal operation, the alternators feed their respective distribution bus independently (ALT 1 feeds Main Distribution Bus 1 and ALT 2 feeds Main Distribution Bus 2). The main distribution buses are interconnected by an 80-amp (*Serials 2016 thru 2240*) or 60-amp (*Serials 2241 & subs*) fuse and diode. The diode prevents ALT 2 from feeding Main Distribution Bus 1. Additionally, since ALT 2 voltage is slightly higher than ALT 1 voltage, bus voltage is further assured.

The alternators are three-phase AC generator type; each alternator has an internal rectifier. Each alternator uses two diodes for each phase to rectify the output. In addition, these diodes will block reverse current. If a single output diode were to fail, the winding junction will be held to the output potential, reducing the quantity of current the alternator can produce.

The alternators are regulated by the MCU and power the MCU via 6 AWG tin plated copper wires. Alternator 1 is protected by an 100-amp fuse within the MCU while alternator 2 is protected by a 80-amp fuse within the MCU. ALT 1 is connected to the Main Distribution Bus 1 and ALT 2 is connected to the Main Distribution Bus 2. Each alternator system has its own 5-amp alternator circuit breaker located in the circuit breaker panel. Each alternator is individually protected against overvoltage generation by the field control module, located within the MCU. ALT 1 is regulated to 28 volts and ALT 2 is regulated to 28.75 volts.

Voltage output of each alternator is a function of engine RPM, alternator design, and load on the alternator. During low RPM operation, the alternator will require higher engine RPM to provide the same voltage to increased electrical loads.

The drop off RPM for each alternator will change whenever the electrical system loads are altered from nominal. Any time an alternator drops off line, a Crew Alerting System (CAS) message will appear on the MFD. If an alternator drops off line due to low engine RPM, the alternator can be restarted by simply increasing engine RPM. When alternator 2 drops off line, alternator 1 will power the Essential Bus through the Main Distribution Bus 1 in the MCU. When alternator 1 drops off line, alternator 2 will power the Essential Bus through the Main Distribution Bus 2 in the MCU. For additional information concerning power distribution, see Electrical Load Distribution. (Refer to 24-50)

E. DC Generation - *Serials 1337 & subs w/ Single Alternator SRV* (See Figure 24-304)

Primary power for the airplane is supplied by a 28-VDC, negative-ground electrical system. The electrical power generation system consists of an alternator controlled by a Master Control Unit (MCU) mounted on the left side of the firewall and two batteries for starting and electrical power storage.

Alternator 1 (ALT 1) is a belt-driven, internally rectified, 75-amp alternator regulated to 28 volts, and mounted on the RH front of the engine. Alternator power is routed into the MCU, where it is distributed to the Main Distribution Bus and the Essential Distribution Bus. The alternator is regulated by a voltage regulator within the MCU, and can be disconnected from the distribution bus system by the ALT 1 switch located on the pilot's bolster switch panel. The alternator is self-exciting (not self-starting) and requires battery voltage for field excitation in order to start up - for this reason, the batteries should not be turned off in flight.

Battery 1 (BAT 1) is an aviation grade 12-cell, lead-acid, 24-volt, 10-amp-hour battery mounted on the right firewall. BAT 1 is charged from the main distribution bus in the MCU. Battery 2 (BAT 2) is composed of two 12-volt, 7-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts. Both BAT 2 units are located in a vented, acid-resistant container mounted behind the aft cabin bulkhead (FS 222) below the parachute canister. BAT 2 is charged from the circuit breaker panel Essential bus.

The Master Control Unit (MCU) is located on the left firewall. The MCU controls ALT 1, starter, landing light, external power, and power generation functions. In addition to ALT 1 voltage regulation, the MCU also provides external power reverse polarity protection, alternator overvoltage protection, as well as alternator fail and over-current annunciations. Alternator power is distributed to the airplane circuit panel buses through main and essential buses in the MCU. The distribution buses are interconnected by two 50-amp fuses and a diode. The diode prevents BAT 2 from feeding the main distribution bus.

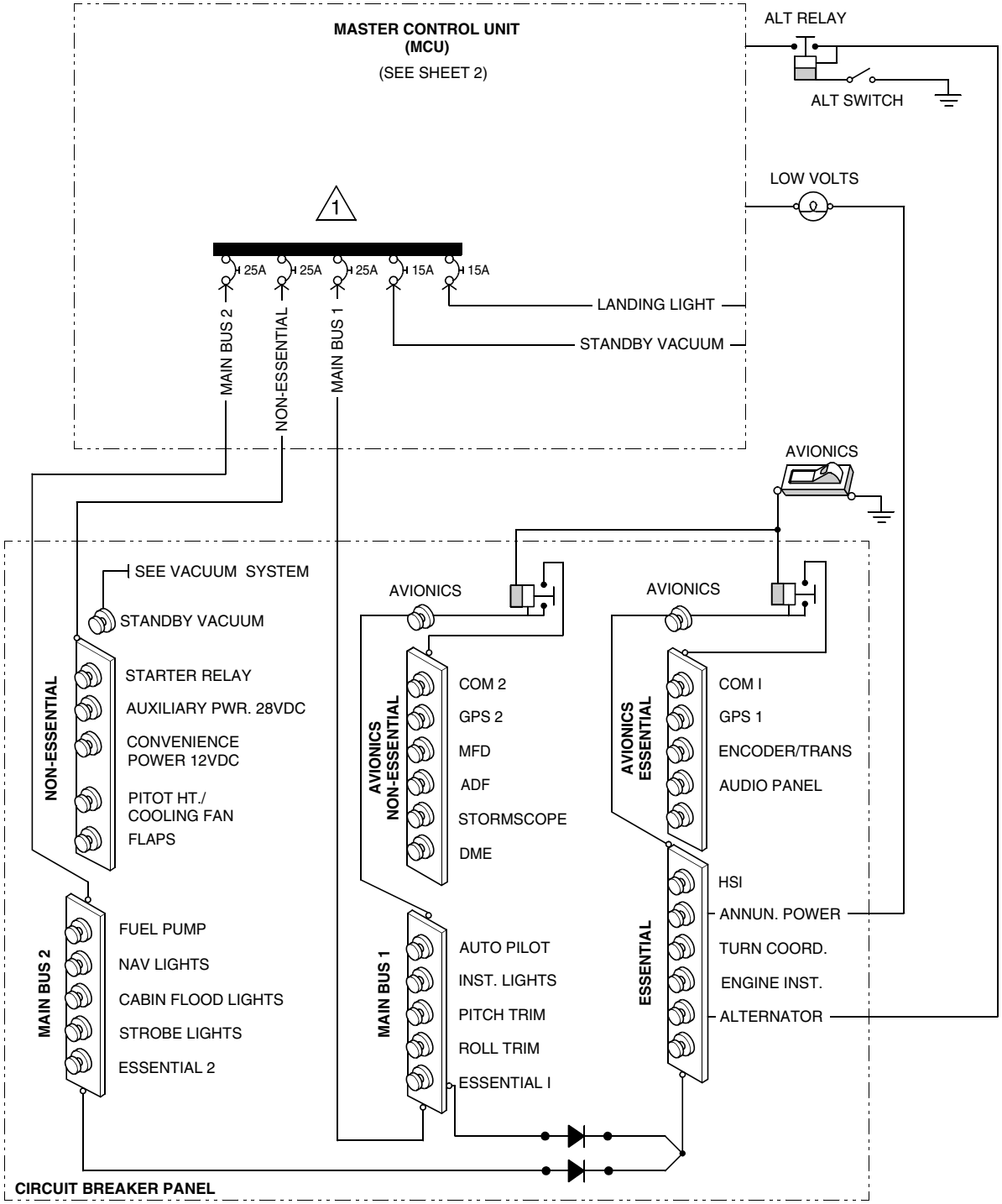
F. DC Generation - *Serials 1337 & subs w/ Dual Alternator SRV* **(See Figure 24-305)**

Primary power for the airplane is supplied by a 28-VDC, negative-ground electrical system. The electrical power generation system consists of two alternators controlled by a Master Control Unit (MCU) mounted on the left side of the firewall and two batteries for starting and electrical power storage.

Alternator 1 (ALT 1) is a belt-driven, internally rectified, 75-amp alternator mounted on the RH front of the engine. Alternator 2 (ALT 2) is a gear-driven, internally rectified, 20-amp alternator mounted on the accessory drive at the rear of the engine. ALT 1 is regulated to 28 volts and ALT 2 is regulated to 28.75 volts. The output from ALT 1 is connected to the main distribution bus in the MCU through an 80-amp fuse. The output from ALT 2 is connected to the essential distribution bus in the MCU through a 40-amp fuse. Both alternators are self-exciting (not self-starting) and require battery voltage for field excitation in order to start up - for this reason, the batteries should not be turned off in flight.

Battery 1 (BAT 1) is an aviation grade 12-cell, lead-acid, 24-volt, 10-amp-hour battery mounted on the right firewall. BAT 1 is charged from the main distribution bus in the MCU. Battery 2 (BAT 2) is composed of two 12-volt, 7-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts. Both BAT 2 units are located in a vented, acid-resistant container mounted behind the aft cabin bulkhead (FS 222) below the parachute canister. BAT 2 is charged from the circuit breaker panel Essential bus.

The Master Control Unit (MCU) is located on the left firewall. The MCU controls ALT 1, ALT 2, starter, landing light, external power, and power generation functions. In addition to ALT 1 and ALT 2 voltage regulation, the MCU also provides external power reverse polarity protection, alternator overvoltage protection, as well as alternator fail and over-current annunciations. Power is distributed to the airplane circuit panel buses through main and essential buses in the MCU. During normal operation, the alternators feed their respective distribution bus independently (ALT 1 feeds main distribution bus and ALT 2 feeds the essential distribution bus). The distribution buses are interconnected by two 50-amp fuses and a diode. The diode prevents ALT 2 from feeding the main distribution bus. Additionally, since ALT2 / essential distribution bus voltage is slightly higher than ALT 1 / main distribution bus voltage, ALT 1 will not feed the essential distribution bus unless ALT 2 fails.



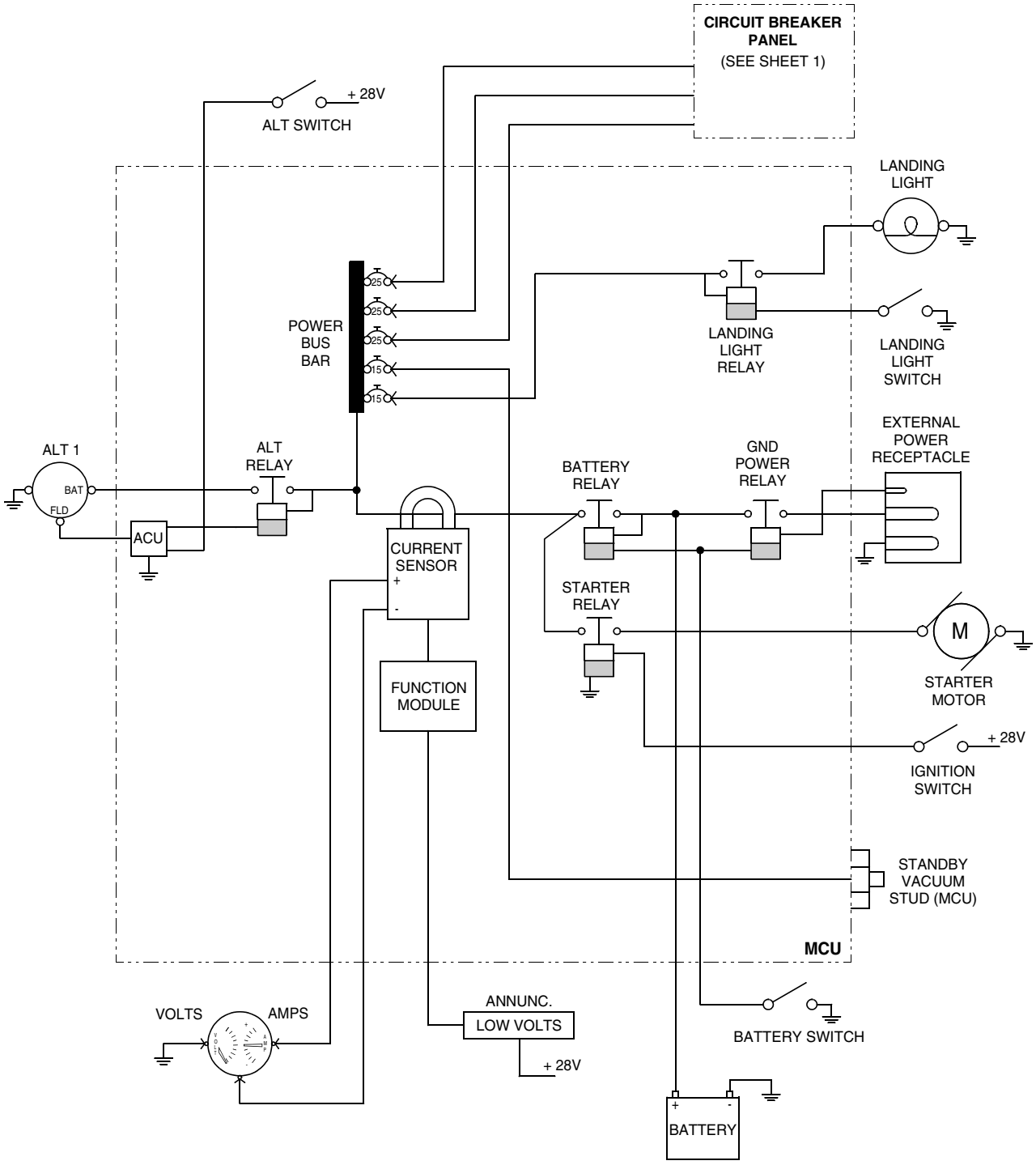
NOTE

1 Earlier serials have fuses in place of circuit breakers.

Serials 1005 thru 1267.

SR20_MM24_1316B

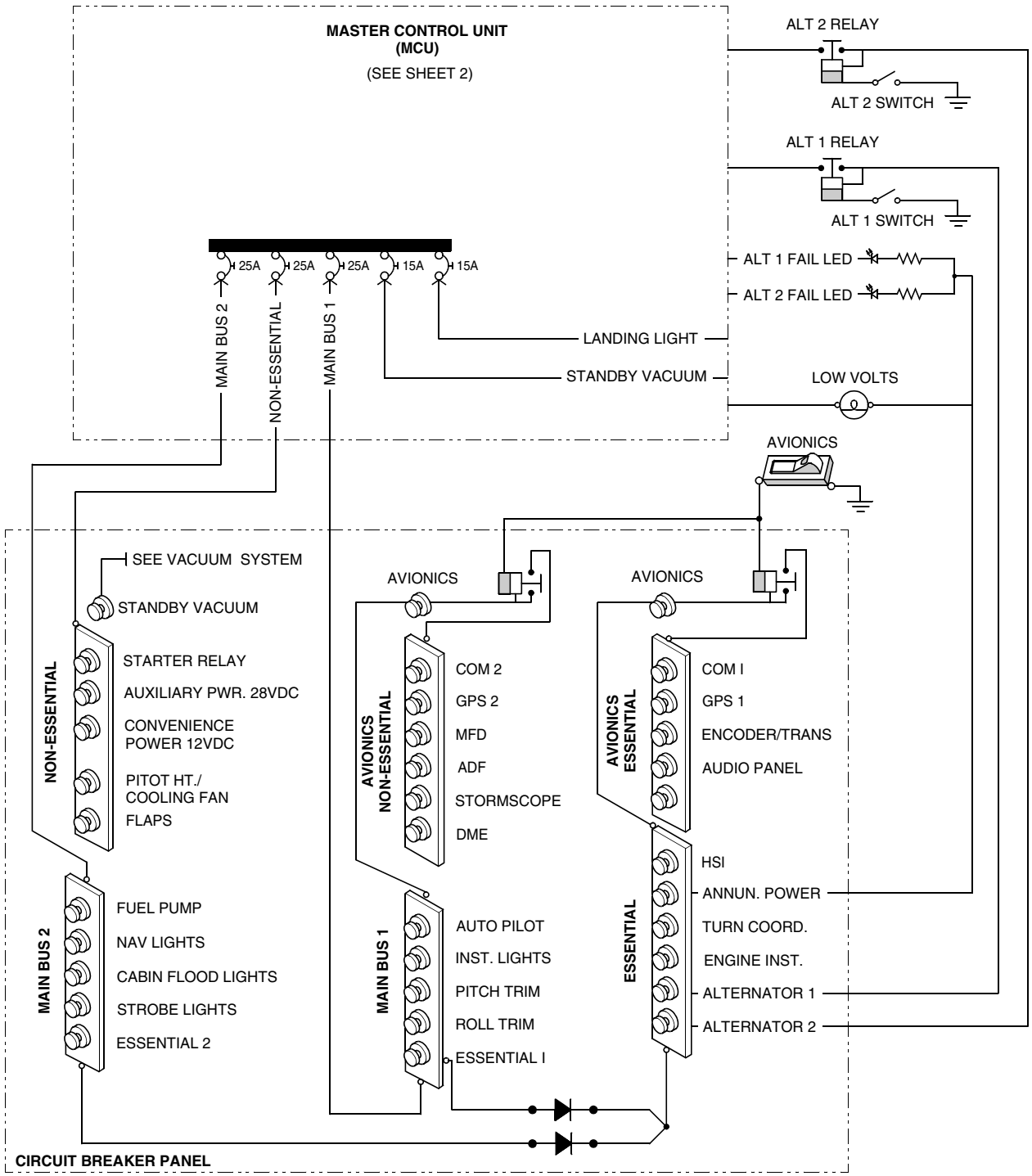
Figure 24-301
Single Alternator Electrical System Schematic - Serials 1005 thru 1267 (Sheet 1 of 2)



Serials 1005 thru 1267.

SR20_MM24_1313B

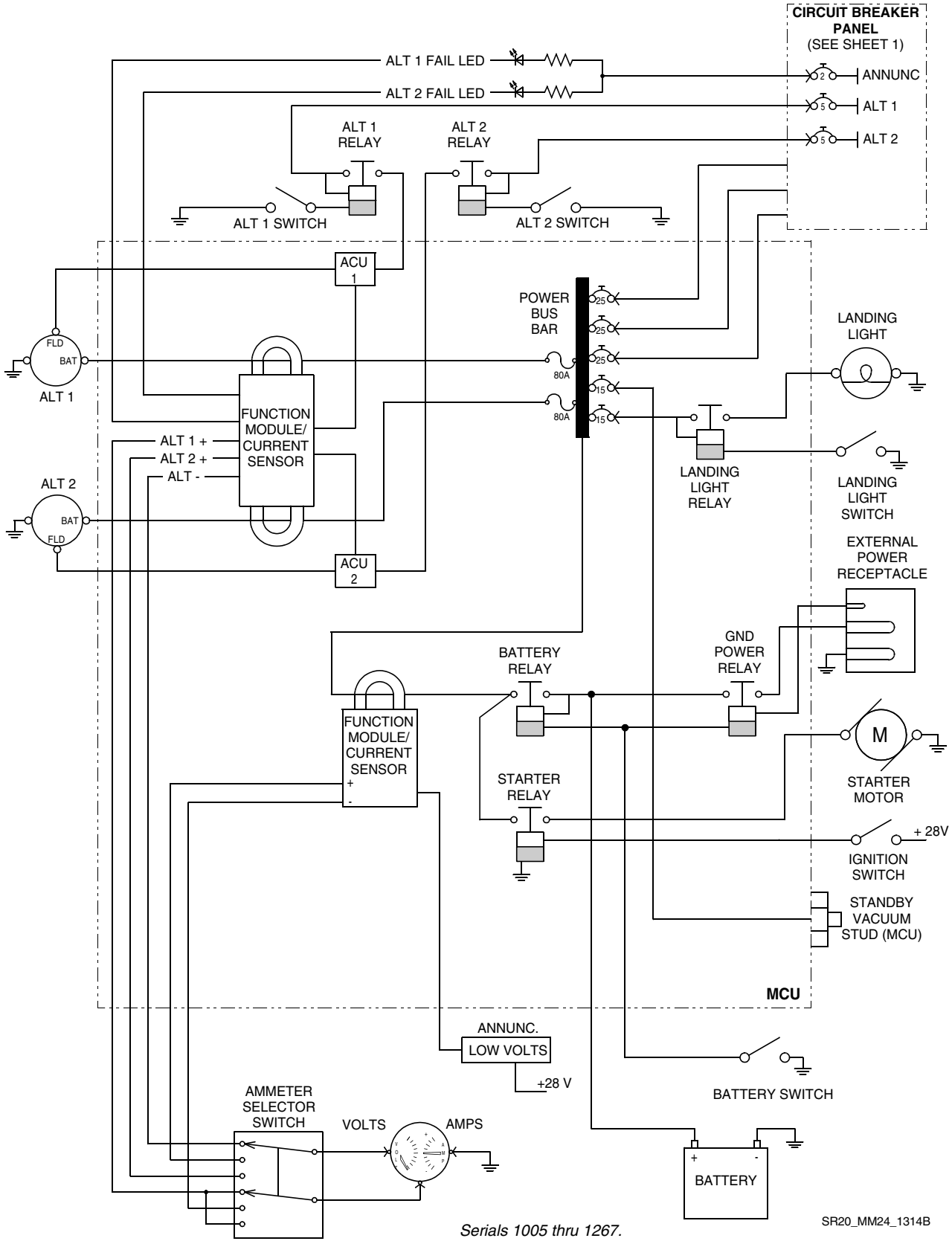
Figure 24-301
Single Alternator Electrical System Schematic - Serials 1005 thru 1267 (Sheet 2 of 2)



Serials 1005 thru 1267.

SR20_MM24_1317B

Figure 24-302
Dual Alternator Electrical System Schematic - Serials 1005 thru 1267 (Sheet 1 of 2)



Serials 1005 thru 1267.

Figure 24-302
Dual Alternator Electrical System Schematic - Serials 1005 thru 1267 (Sheet 2 of 2)

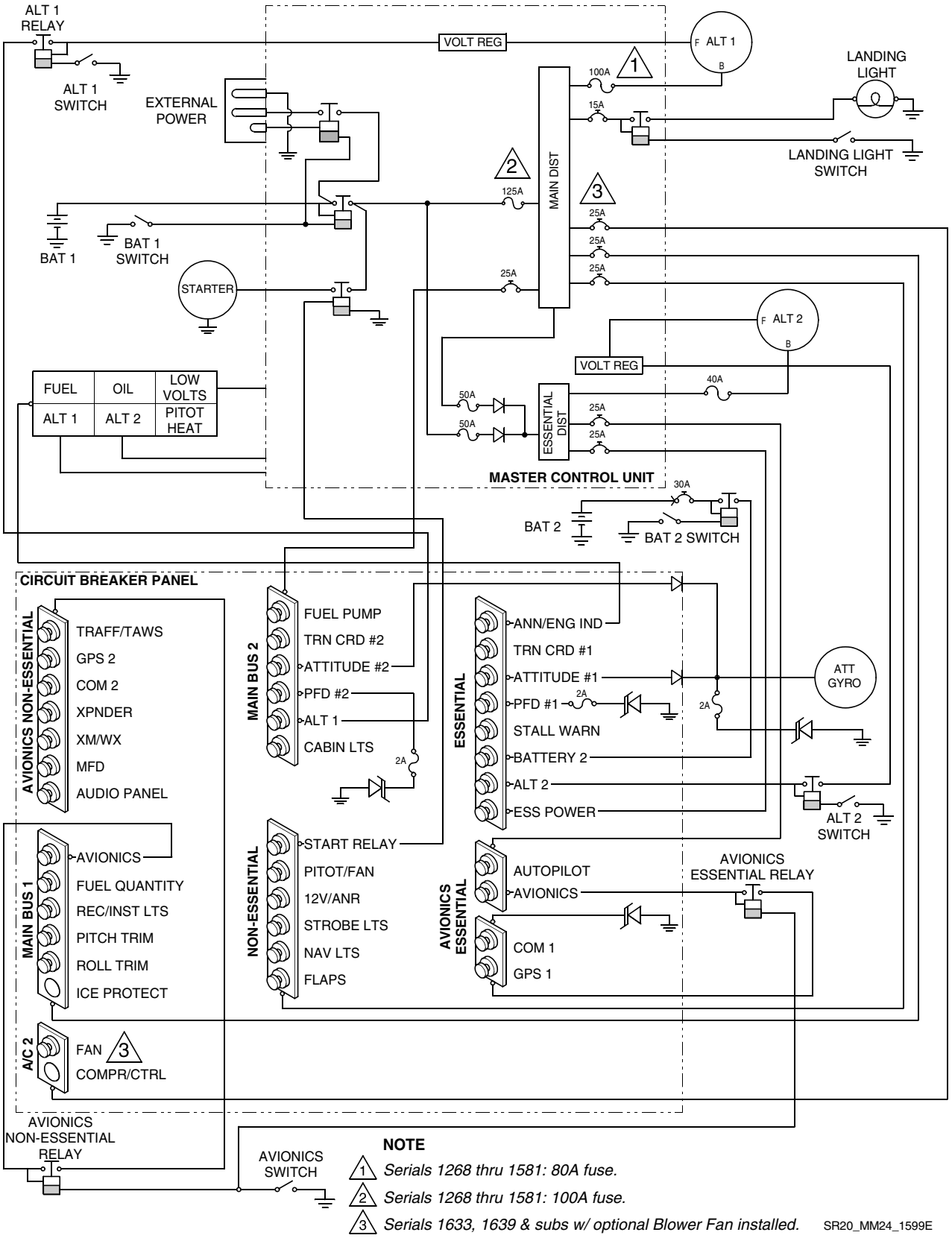


Figure 24-303
Electrical System Schematic - Serials 1268 & subs w/o SRV & w/o Perspective Avionics

EFFECTIVITY:
Serials 1268 & subs w/o SRV & w/o Perspective Avionics

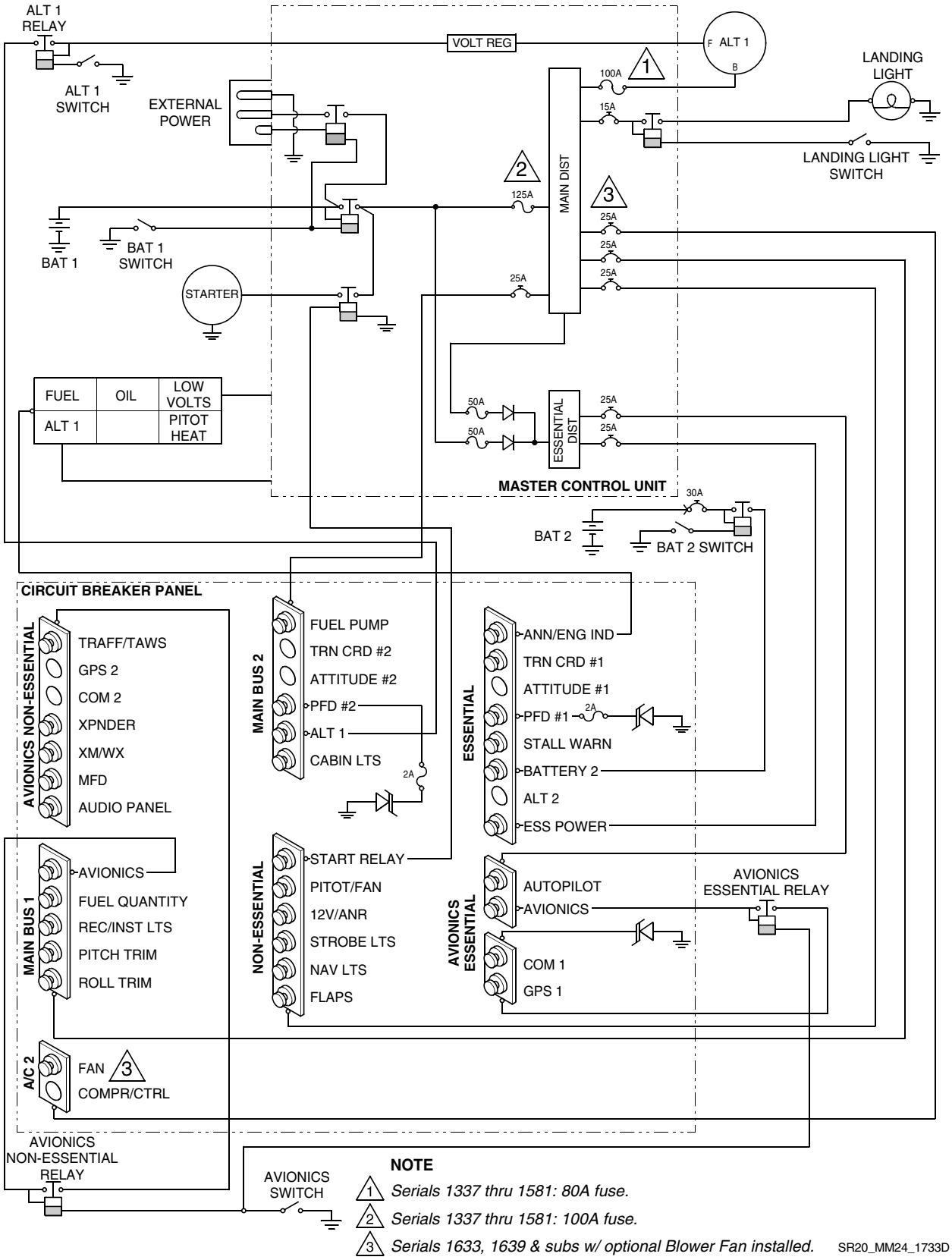


Figure 24-304
Electrical System Schematic - Serials 1337 & subs w/ Single Alternator SRV

EFFECTIVITY:
Serials 1337 & subs w/ Single Alternator SRV

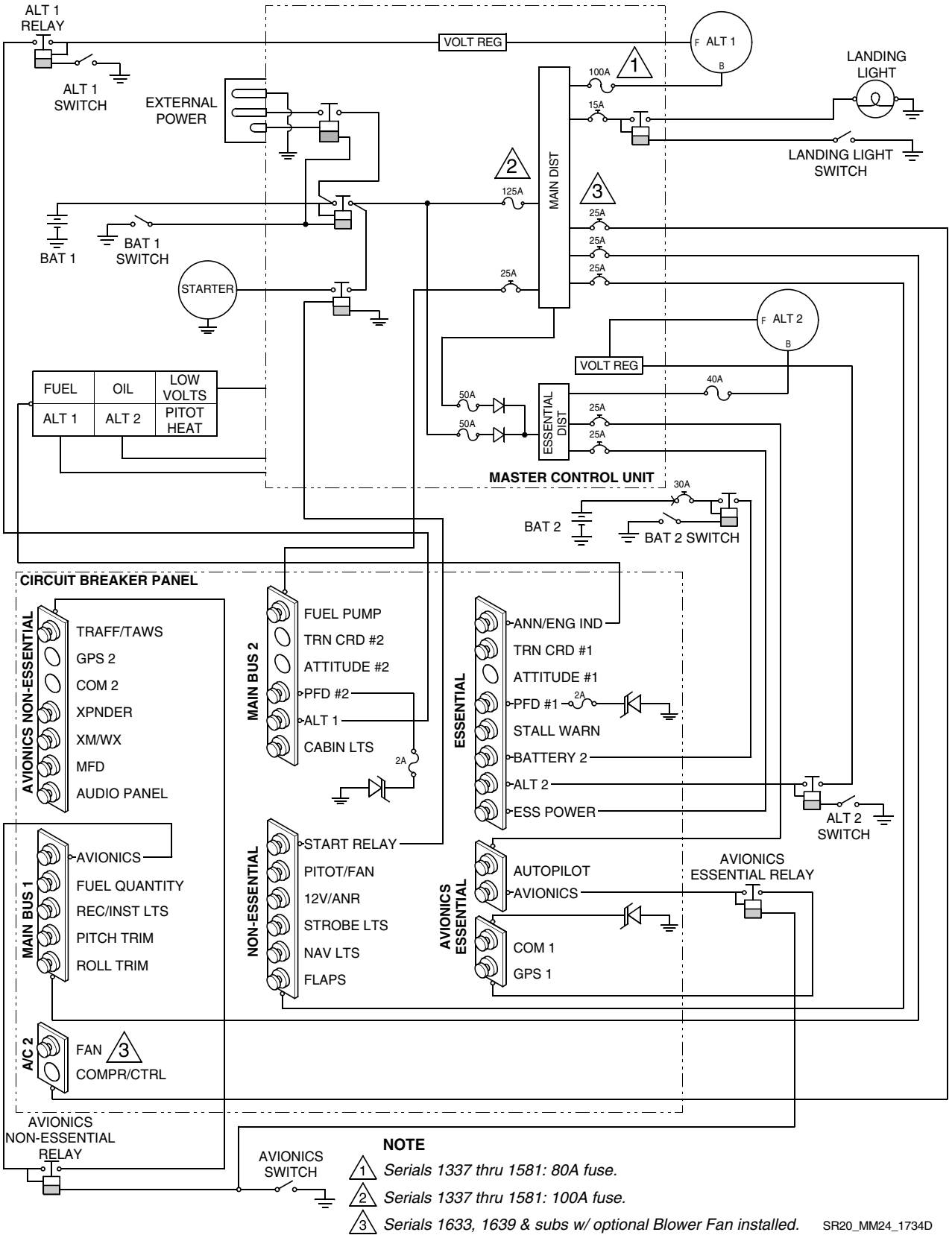
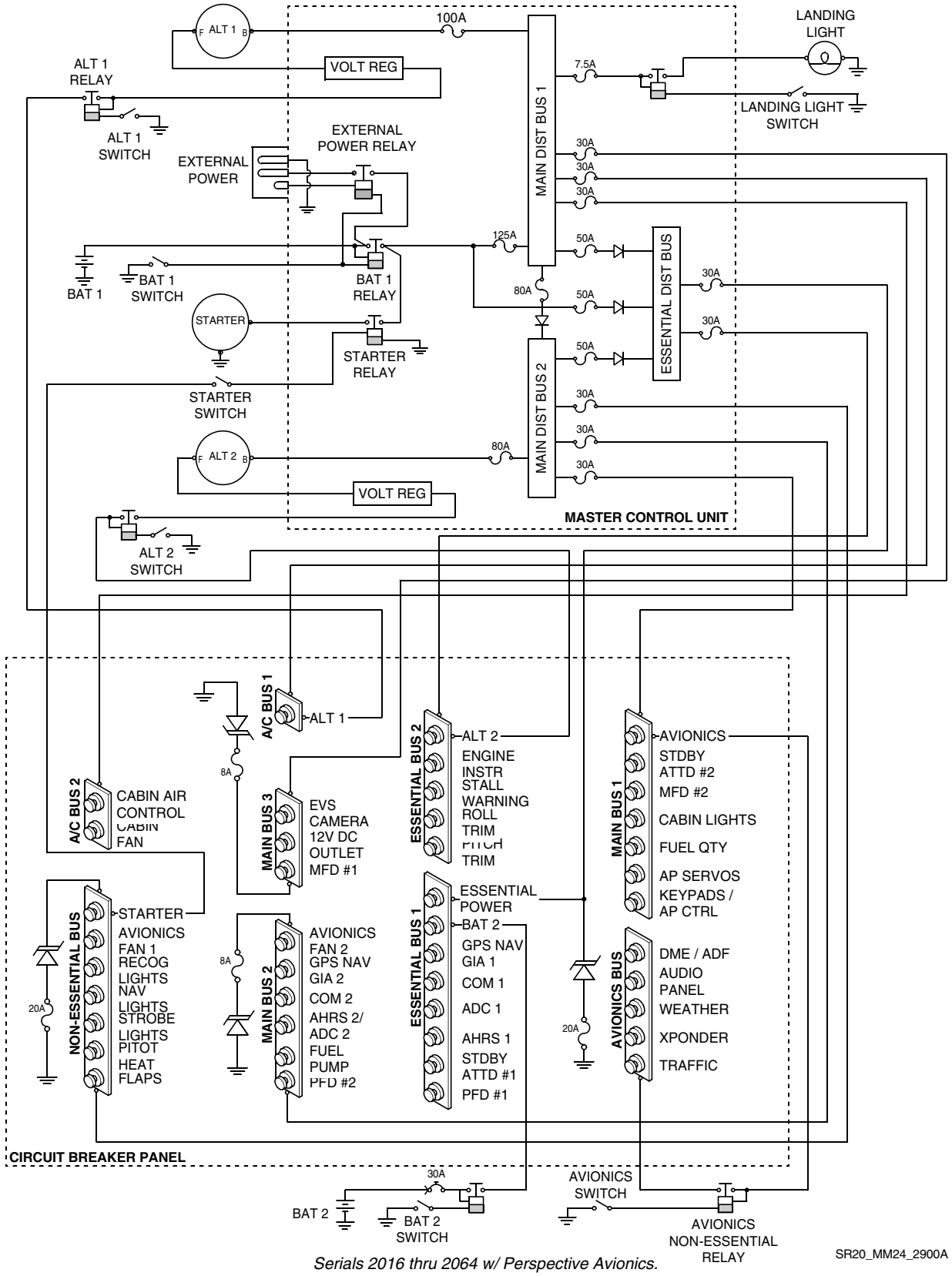


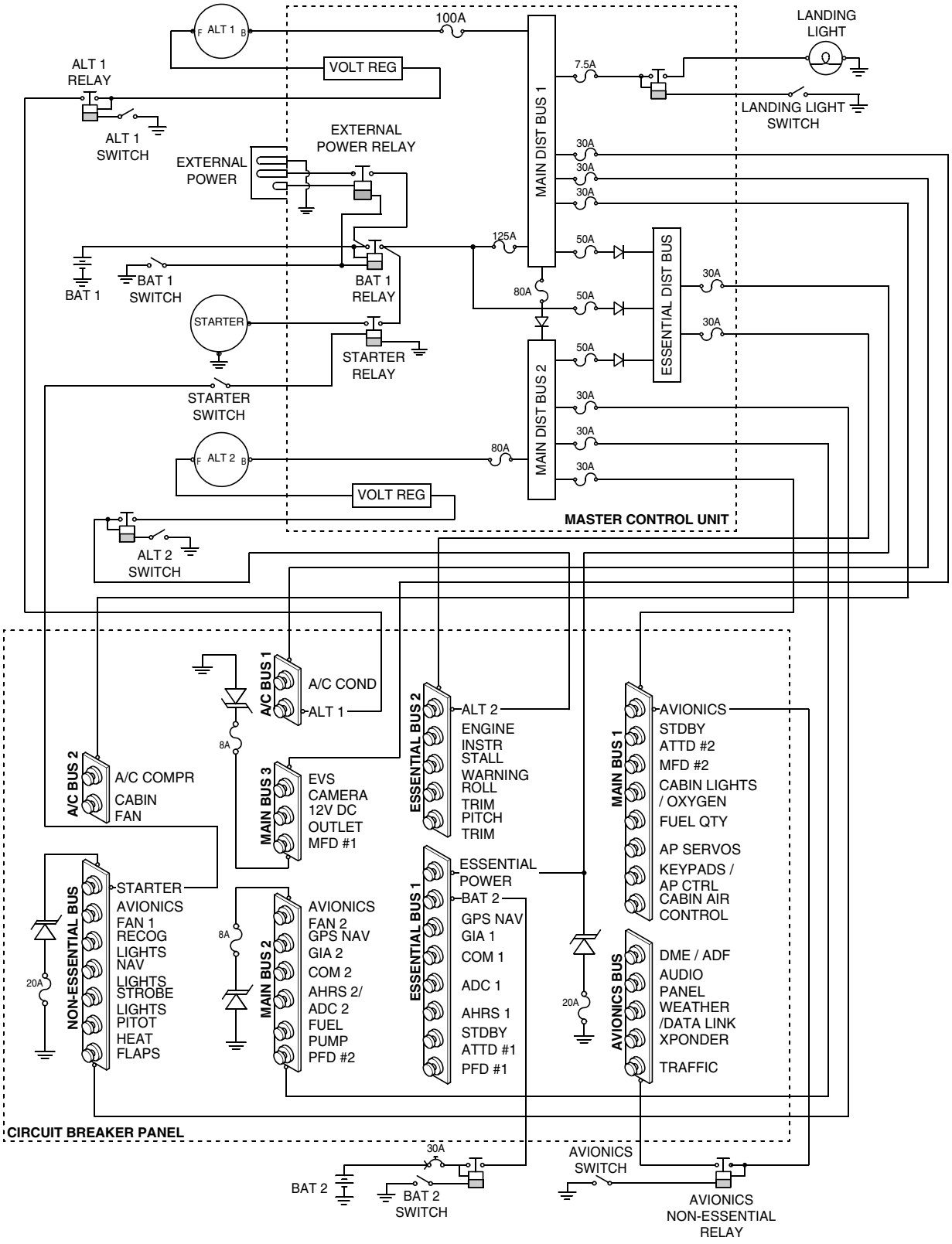
Figure 24-305
Electrical System Schematic - Serials 1337 & subs w/ Dual Alternator SRV

EFFECTIVITY:
Serials 1337 & subs w/ Dual Alternator SRV



Serials 2016 thru 2064 w/ Perspective Avionics.

Figure 24-306
Electrical System Schematic - Serials 2016 thru 2064 w/ Perspective Avionics (Sheet 1 of 3)

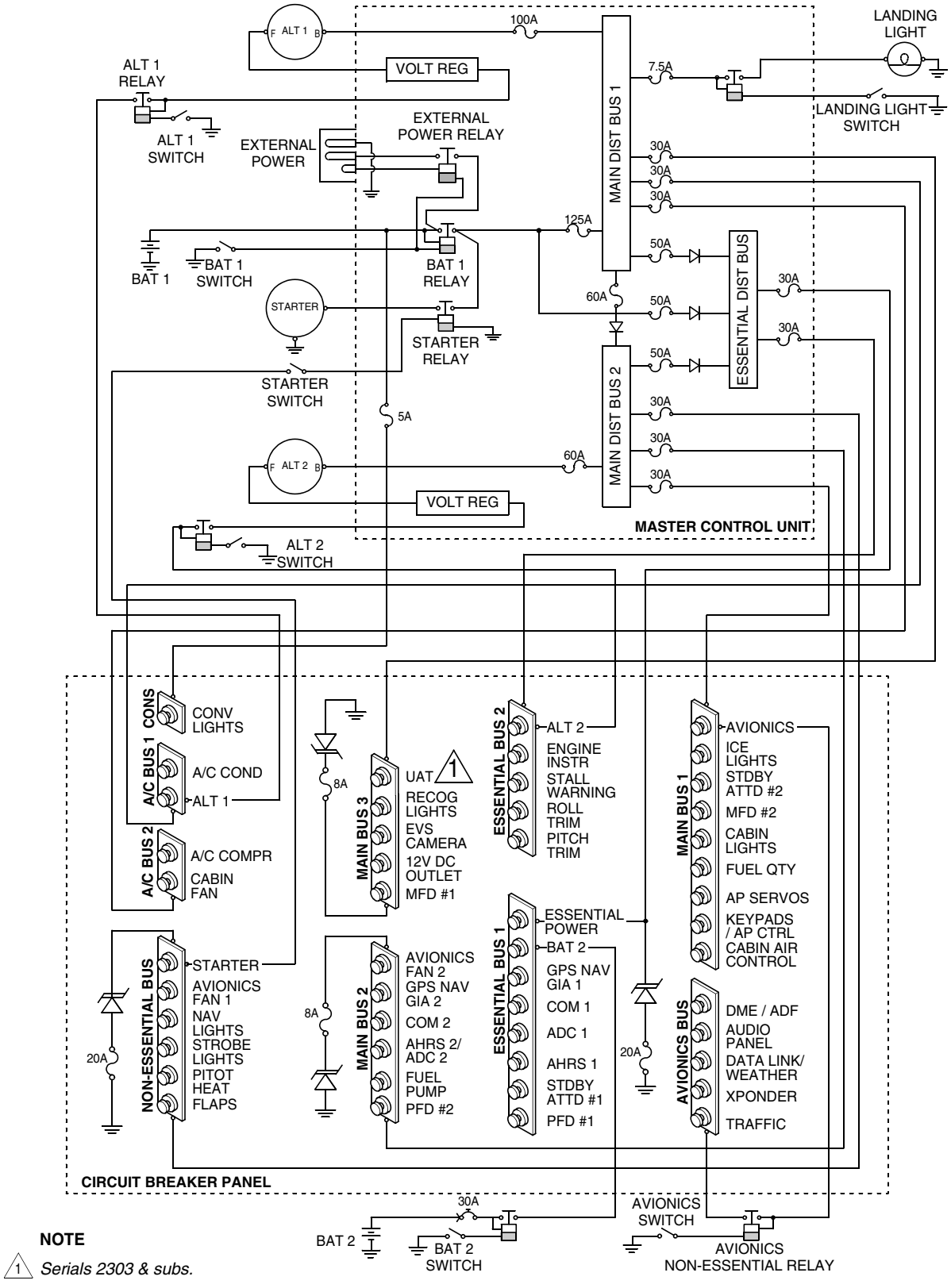


Serials 2065 thru 2240 w/ Perspective Avionics.

SR20_MM24_3359B

Figure 24-306
Electrical System Schematic - Serials 2065 thru 2240 w/ Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 2065 thru 2240 w/ Perspective Avionics



Serials 2241 & subs w/ Perspective Avionics.

SR20_MM24_3636C

Figure 24-306
Electrical System Schematic - Serials 2241 & subs w/ Perspective Avionics (Sheet 3 of 3)

G. Alternator 1 (See Figure 24-307)

Alternator 1 is mounted directly to the front, LH side of the engine and is used in all electrical configurations.

Alternator 1 is a 75-amp belt-driven alternator. Alternator 1 has sufficient capacity to power the entire aircraft electrical load and charge the battery during normal system operation. The alternator and battery are designed to function in parallel or independently and can be alternately connected to the primary bus. Alternator 1 will continue to generate electrical power in the case of battery failure or malfunction. Alternator 1 is self-exciting, not self-starting. The battery must energize Alternator 1 before it can produce electrical power.

H. Alternator 2 (See Figure 24-308)

Serials 1005 thru 1267: The optional dual alternator system adds a 40-amp engine-driven alternator 2 to the single alternator system. An alternator switch, ammeter switch, circuit breaker, function module, alternator fail lights, and alternator relay is also added in this configuration. Alternator 2 is mounted directly to the aft engine accessory pad.

On the optional dual alternator system, alternator 1 produces approximately 60% of the system voltage and alternator 2 produces approximately 40%. If alternator 1 fails during heavy loading, it may be necessary to shed electrical load to prevent over-burdening alternator 2. The alternator fail lights are located to the immediate right of the annunciator panel. The lights provide warning of a failed or inoperative alternator. If an alternator is not providing adequate proportional power, the appropriate alternator fail LED will illuminate. In addition, both lights will illuminate during a battery discharge situation (approximately a 3-amp draw).

Serials 1268 & subs w/o single alternator SRV: Alternator 2 is a 20-amp engine-driven alternator mounted directly to the aft engine accessory pad. Alternator 2 supplies electrical power to the essential bus through a 25-amp circuit breaker located in the MCU.

I. Master Control Unit (MCU) (See Figure 24-309)

The MCU is an integrated component which ensures proper electrical output over the entire temperature and RPM range of the alternator system by regulating and distributing alternator output. The MCU is mounted to the firewall, directly behind the engine.

(1) Master Control Unit - *Serials 1005 thru 1267*

The MCU used in the single alternator system contains a landing light relay, ammeter transducer, alternator control unit (ACU), three 25-amp distribution feeder fuses, buses, and contactors for the alternator, start, master battery, and ground power circuits.

The MCU used in the optional dual alternator system contains a landing light relay, 15-amp landing light circuit breaker, 15-amp auxiliary power circuit breaker, two ACUs, two function modules, three 25-amp distribution feeder circuit breakers, buses, and contactors for the start, master battery, and ground power circuits.

Note: The MCU on these airplanes is not field repairable and must be replaced if faulty.

The MCU will trip the alternator circuit breaker(s) whenever there is more than 6-10 amps reverse current. The pilot has access to the alternator circuit breaker(s), which are located in the circuit breaker panel, during flight. If the system is generating more than 31.75 ± 0.5 V, the corresponding alternator circuit breaker will open, preventing further power generation by that alternator. The other alternator will regulate at a higher rate, 29.0 +0.25, -0.5 V during the overvoltage. After the circuit breaker opens, the other alternator will provide 100% of the load at the nominal voltage.

The MCU contains a current sensor in the battery bus, this current sensor sends a signal to the ammeter (battery charge or discharge). The ammeter only indicates a discharge when the electrical draw on the system exceeds the quantity of power generated by system. In the dual alternator system, the ammeter will only indicate a discharge when the ammeter select switch is in

the BATT position and the electrical draw on the system exceeds the quantity of power generated by system. Diodes in the alternator(s) block reverse current making negative current indication unnecessary. The current value displayed by the ammeter corresponds directly to the quantity of power generated by the alternator system. When the ammeter select switch is in the ALT 1 or ALT 2 position (dual alternator system only), the ammeter drives will only allow the ammeter to display a positive current value because of the diodes within the alternator block.

The master switch arrangement, located in the pilot's bolster contains the battery, alternator 1, and alternator 2 control switches. Each switch disconnects the associated device from the primary bus. The switches are located in a side-by-side arrangement and are labeled as to their function. The BATT master switch, when closed, connects battery 1 to the primary bus. This switch activates a contactor within the MCU, providing the ability to connect and disconnect battery power from the aircraft. The battery switch controls a contactor, which isolates battery 1, while the alternator switch removes field excitation from the alternator thereby isolating the primary bus.

Six buses are powered from the MCU. These buses are designed to ensure essential flight and avionics systems remain powered during a malfunction of any one of the buses. Three bus wires run from the MCU, through the firewall, and to the circuit breaker panel. Three bus wires in the MCU are overload protected by fuses and circuit breakers. Three buses are used to power the majority of aircraft loads and supply power to the circuit breaker panel. The fourth bus is for the landing light. The fifth is the clock bus which is fused at 5 amperes and is the only bus powered directly from battery 1 and is not controlled by the master switch arrangement. The clock bus fuse is externally removable for long term storage situations to prevent battery drain. The sixth bus is for the standby vacuum pump.

Alternator power flows from the alternator into the MCU. Inside the MCU is where the ACU regulates alternator output. The ACU (voltage regulator) provides transient suppression and constant voltage regulation of unfiltered alternator power. To protect sensitive instruments, the over-voltage protection system monitors the primary power bus and automatically limits peak voltage to approximately 31.75 volts. During sustained over-voltage and under-voltage periods, the over-voltage system provides a warning to the pilot. The ACU will cause the alternator circuit breaker to open in cases of reverse current, field output overloads, and overvoltage. In the event an over-voltage condition occurs, the ACU automatically removes alternator field current to shut down the alternator. The ACU has been integrated into the MCU case, for durability and reliability.

(2) Master Control Unit 100 and 120 - *Serials 1268 thru 1581*

The MCU controls alternator 1, alternator 2 (*Serials* w/ *dual alternators*), starter, landing light, external power, and the power generation system annunciation. The MCU provides protection for external power reverse polarity and alternator overvoltage situations. The MCU also provides low voltage annunciation and an overload annunciation for ALT 1 and ALT 2 (*Serials* w/ *dual alternators*) fail annunciators in the instrument panel.

The bus structure of the MCU and the circuit breaker panel allows all power devices to feed into the Essential Bus during emergencies. This action is automatic and does not require pilot intervention. The Main and Essential Buses are separated via diodes which allow the Main Bus to feed into the Essential Bus during failures of Alternator 2 (*Serials* w/ *dual alternators*) or Battery 2. The MCU regulates Alternator 1 to 28 VDC, while Alternator 2 (*Serials* w/ *dual alternators*) is regulated to 28.75 VDC which ensures the diode separates the buses during normal operation.

The MCU used on this airplane contains a landing light relay, battery relay, ground power relay, starter relay, ammeter transducer, 15-amp landing light circuit breaker, two buses (one essential and one non-essential), two field control modules, three current sensors, and five 25-amp distribution feeder circuit breakers.

The pilot has access to the alternator circuit breaker(s), which are located in the circuit breaker panel, during flight. If the system is generating more than 31.75 ± 0.25 V, the corresponding alternator circuit breaker will open, preventing further power generation by that alternator.

The MCU contains a current sensor in the battery bus, this current sensor sends a signal to the ammeter (battery charge or discharge). The ammeter will only indicate a discharge when the ammeter select switch is in the BATT position and the electrical draw on the system exceeds the quantity of power generated by the system. Diodes in the alternators block reverse current making negative current indication unnecessary. The current value displayed by the ammeter corresponds directly to the quantity of power generated by the alternator system. When the ammeter select switch is in the ALT 1 or ALT 2 (*Serials* w/ *dual alternators*) position, the ammeter drives will only allow the ammeter to display a positive current value because of the diodes within the alternator block.

The master switch arrangement, located in the pilot's bolster contains battery 1, battery 2, alternator 1, and alternator 2 (*Serials* w/ *dual alternators*) control switches. Each switch disconnects the associated device from the corresponding bus. The switches are located in a side-by-side arrangement and are labeled as to their function. The BAT 2 switch, when closed, connects battery 2 to the Essential Bus. This switch activates a relay located next to BAT 2, providing the ability to connect and disconnect battery 2 from the aircraft.

Seven power distribution buses with associated protection devices are located in the MCU. These buses are designed to ensure essential flight and avionics systems remain powered during a malfunction of any one of the buses. Five bus wires run from the MCU, through the firewall, and to the circuit breaker panel for overload protection by fuses or circuit breakers. The five buses are used to power the majority of aircraft loads and supply power to the circuit breaker panel. Three buses are used as distribution feeders from the Main Distribution Bus. Two buses are used as distribution feeders from the Essential Distribution Bus. One bus is used to power the landing light directly from the Main Distribution Bus through a 15 amp circuit breaker. One bus is used to power the clock which is fused at 5 amperes and is the only bus powered directly from battery 1 and is not controlled by master switch arrangement. The clock bus fuse is externally removable for long term storage situations to prevent battery drain. On PFD equipped airplanes, the clock bus is not used.

Alternator power flows from alternator(s) into the MCU. Inside the MCU is where the field control module regulates alternators output. Each field control module provides transient suppression and constant voltage regulation of unfiltered alternator power. To protect sensitive instruments, the over-voltage protection system monitors the primary power bus and automatically limits peak voltage to approximately 31.75 volts. During sustained over-voltage periods, the over-voltage system provides a warning to the pilot. Each field control module will cause the corresponding alternator circuit breaker to open in cases of field output overloads, and overvoltage. In the event an over-voltage condition occurs, the corresponding field control module automatically removes alternator field current to shut down the corresponding alternator. Each field control module has been integrated into the MCU case, for durability and reliability.

(3) Master Control Unit 130 and 140 - *Serials 1582 & subs*

The MCU 130 (*Serials w/o Perspective*) and 140 (*Serials w/ Perspective*) controls alternator 1, alternator 2 (*Serials* w/ *dual alternators*), starter, landing light, and external power. The MCU provides protection for external power reverse polarity and alternator overvoltage situations. The bus structure of the MCU and the circuit breaker panel allows all power devices to feed into the Essential Bus during emergencies. This action is automatic and does not require pilot intervention.

MCU 130: The Main and Essential Buses are separated via diodes which allow the Main Bus to feed into the Essential Bus during failures of Alternator 2 (*Serials* w/ *dual alternators*) or Battery 2. The MCU used on this airplane contains a landing light relay, battery relay, ground power relay, starter relay, 15-amp landing light circuit breaker, two buses (one essential and one non-essential), two field control modules, two (*Serials* w/ *single alternator*) or three (*Serials* w/ *dual alternators*) current shunts, and seven 25-amp distribution feeder circuit breakers.

MCU 140: The Main Distribution Bus 1 and Main Distribution Bus 2 are separated via a diode which allows the Main Bus 1 to feed into Main Bus 2 during failures of Alternator 2. The MCU

used on this airplane contains a landing light relay, battery relay, ground power relay, starter relay, 7.5-amp landing light fuse, three buses (one essential and two non-essential), two field control modules, three current shunts, and eight 30-amp distribution feeder fuses.

The MCU regulates Alternator 1 to 28 VDC. while Alternator 2 (*Serials* w/ *dual alternators*) is regulated to 28.75 VDC which ensures the diode separates the buses during normal operation. The pilot has access to the alternator circuit breaker(s), which are located in the circuit breaker panel, during flight. If the system is generating more than 31.75 ± 0.25 V, the corresponding alternator circuit breaker will open, preventing further power generation by that alternator.

The MCU contains a current shunt in the battery bus. This current shunt sends a signal to the data acquisition unit (*Serials w/o Perspective*) or the GEA 71 engine airframe unit (*Serials w/ Perspective*). Diodes in the alternators block reverse current making negative current indication unnecessary. The current value displayed by the ammeter (*Serials w/o Perspective*) or MFD (*Serials w/ Perspective*) corresponds directly to the quantity of power generated by the alternator system.

The master switch arrangement, located in the pilot's bolster contains battery 1, battery 2, alternator 1, and alternator 2 (*Serials* w/ *dual alternators*) control switches. Each switch disconnects the associated device from the corresponding bus. The switches are located in a side-by-side arrangement and are labeled as to their function. The BAT 2 switch, when closed, connects battery 2 to the Essential Bus. This switch activates a relay located next to BAT 2, providing the ability to connect and disconnect battery 2 from the aircraft.

Nine (*Serials 2016 thru 2240*) or ten (*Serials 2241 & subs*) power distribution buses with associated protection devices are located in the MCU. The buses are designed to ensure essential flight and avionics systems remain powered during a malfunction of any one of the buses.

MCU 130: Seven bus wires run from the MCU, through the firewall, and to the circuit breaker panel for overload protection by fuses or circuit breakers. The seven buses are used to power the majority of aircraft loads and supply power to the circuit breaker panel. Five buses are used as distribution feeders from the Main Distribution Bus. Two buses are used as distribution feeders from the Essential Distribution Bus. One bus is used to power the landing light directly from the Main Distribution Bus through a 15 amp circuit breaker. One bus was used to power the clock which was fused at 5 amperes. On PFD equipped airplanes, the clock bus is not used.

MCU 140: Eight bus wires run from the MCU, through the firewall, and to the circuit breaker panel for overload protection by fuses or circuit breakers. The eight buses are used to power the majority of aircraft loads and supply power to the circuit breaker panel. Three buses are used as distribution feeders from the Main Distribution Bus 1. Three buses are used as distribution feeders from the Main Distribution Bus 2. Two buses are used as distribution feeders from the Essential Distribution Bus. One bus is used to power the landing light directly from the Main Distribution Bus 1 through a 7.5 amp fuse.

Serials 22-2241 & subs: One bus is used to power the constant power devices including the interface between the CAPS and the ELT system which is fused at 5 amperes and is not controlled by master switch arrangement.

Alternator power flows from alternator(s) into the MCU. Inside the MCU is where the field control module regulates alternator(s) output. Each field control module provides transient suppression and constant voltage regulation of unfiltered alternator power. To protect sensitive instruments, the over-voltage protection system monitors the primary power bus and automatically limits peak voltage to approximately 31.75 volts. Each field control module will cause the corresponding alternator circuit breaker to open in cases of field output overloads, and overvoltage. In the event an over-voltage condition occurs, the corresponding field control module automatically removes alternator field current to shut down the corresponding alternator. Each field control module has been integrated into the MCU case, for durability and reliability.

J. Low Volts Warning Light

The airplane is equipped with a red LOW VOLTS warning light in the annunciator panel, located on the left side of the instrument panel.

Serials 1005 thru 1581: If bus voltage drops to approximately 24.5 volts, the field control module in the MCU will cause the LOW VOLTS warning light will illuminate red.

Serials 1582 & subs: If Essential Bus voltage drops to approximately 24.5 volts, the data acquisition unit will cause the LOW VOLTS warning light to illuminate red.

In twin alternator configurations, resetting the ALT 1 and ALT 2 switches from off and back on again may reset the field control module. If the warning light does not illuminate again, normal alternator charging has resumed. If the light illuminates again, a malfunction has occurred. (Refer to 31-50)

Illumination of the LOW VOLTS warning light along with ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch will not need to be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

K. ALT 1 and ALT 2 Fail Lights

Serials 1005 thru 1267 w/ optional dual alternator system: In conjunction with the red LOW VOLTS warning light, the MCU will illuminate the appropriate amber alternator fail light, notifying the pilot of the system at fault. (Refer to 31-50)

Serials 1268 thru 1581 w/o single alternator SRV: Two amber colored alternator fail lights are located in the annunciator panel. The lights provide warning of a overloaded or inoperative alternator. The ALT 1 and ALT 2 fail lights are operated by circuits in the MCU and current sensors on the ALT 1 and ALT 2 output lines. If either alternator generates less than 2 amps (approximately), the corresponding annunciator light will illuminate steady.

Serials 1582 & subs w/o single alternator SRV: Two amber colored alternator fail lights are located in the annunciator panel. The lights provide warning of a overloaded or inoperative alternator. The ALT 1 and ALT 2 fail lights are operated by the data acquisition unit. The DAU monitors a voltage drop across the current shunts in the MCU on the ALT 1 and ALT 2 output lines. If either alternator generates less than 2 amps (approximately), the corresponding annunciator light will illuminate steady.

Serials 1337 thru 1581 w/ single alternator SRV: In conjunction with the red LOW VOLTS warning light, the MCU controls the illumination of the alternator fail light, notifying the pilot of the system at fault.

Serials 1582 & subs w/ single alternator SRV: In conjunction with the red LOW VOLTS warning light, the data acquisition unit controls the illumination of the alternator fail light, notifying the pilot of the system at fault.

L. Volt and Ampere Meter (See Figure 24-3011)

A combination Volt and Ampere meter is mounted on the right instrument panel immediately outboard of the oil temperature and pressure gage.

Serials 1005 thru 1382: The AMP pointer sweeps a scale from -60 to +60 amps with zero at the 9 o'clock position.

Serials 1383 thru 1581: The AMP pointer sweeps a scale from -100 to +100 amps with zero at the 9 o'clock position.

Serials 1005 thru 1267: The ammeter will indicate the current generation provided by Alternator 1, Alternator 2, and the charge or discharge status of battery 1.

The VOLT pointer sweeps a scale from 16 to 32 volts. The voltage indication is measured off the essential bus. The voltage required to operate the internal meter lighting is supplied through the 2-amp Instrument Lights circuit breaker on Main Bus 1.

Serials 1268 thru 1581 w/o single alternator SRV: The ammeter will indicate the current generation provided by Alternator 1, Alternator 2, and the charge or discharge status of battery 1.

The VOLT pointer sweeps a scale from 16 to 32 volts. The voltage indication for the Volt / Ampere Meter is measured off the annunciator circuit breaker which is on the Essential Bus. The voltage required to operate the internal meter lighting is supplied through the 2-amp instrument lights circuit breaker which is on Main Bus 1. Main Bus voltage (measured at the engine instrument circuit breaker) is displayed on the clock voltmeter for reference.

Serials 1337 thru 1581 w/ single alternator SRV: The ammeter will indicate the current generation provided by Alternator 1, and the charge or discharge status of battery 1.

The VOLT pointer sweeps a scale from 16 to 32 volts. The voltage indication for the Volt / Ampere Meter is measured off the annunciator circuit breaker which is on the Essential Bus. The voltage required to operate the internal meter lighting is supplied through the 2-amp instrument lights circuit breaker which is on Main Bus 1. Main Bus voltage (measured at the engine instrument circuit breaker) is displayed on the clock voltmeter for reference.

Serials 1582 & subs: Main and Essential Bus voltages are shown as text in the electrical data field located in the mid-right section of the MFD and are also continuously displayed in the voltage parameters field located in the upper left corner of the PFD. The MFD and PFD receive the voltage signals via the DAU as measured directly off the Main and Essential Buses.

In the event Main Bus voltage is less than 24.5v or exceeds 32.0v the MFD will display “Check Main Bus” in a yellow advisory box in the lower right corner of the MFD.

In the event Essential Bus voltage is less than 24.5v or exceeds 32.0v the MFD will display “Check Essential Bus” in a red advisory box in the lower right corner of the MFD.

Alternator 1 and Alternator 2 ampere output are shown as text in the electrical data field located in the mid-right section of the MFD. The MFD and PFD receive the amp signals via the DAU as derived from current shunts located in the MCU.

In the event Alternator 1 or Alternator 2 ampere output is less than 2 amps for 20 seconds or more, the MFD will display “Check ALT 1” or “Check ALT 2” respectively, in a yellow advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Avionics Essential Bus.

M. Ammeter Select Switch (See Figure 24-3011)

Serials 1005 thru 1267 w/ optional dual alternator system: An ammeter select switch is located in the pilot's primary view and is labeled distinctly. The ammeter select switch controls which output reading the ammeter will display, Alternator 1, Alternator 2, or the state of charge or discharge battery 1 is in. The amps indication is derived from a current transducer located in the electrical system MCU. When the engine is operating and the master switch is turned on, the ammeter indicates the charging rate applied to the battery. Due to the inability of the alternators to dissipate current, the alternator ammeter indications are positive only.

Serials 1268 thru 1581 w/o single alternator SRV: An ammeter select switch is located on the right instrument panel and is labeled distinctly. The ammeter select switch controls which output reading the ammeter will display the voltage from, ALT 1, ALT 2 or BAT 1. The amps indication is derived from a current transducer located in the electrical system MCU. When the engine is operating and the BAT 1 switch is turned on, the ammeter indicates the charging rate applied to battery 1. Due to the inability of the alternators to dissipate current, the alternator ammeter indications are positive only.

Serials 1337 thru 1581 w/ single alternator SRV: An ammeter select switch is located on the right instrument panel and is labeled distinctly. The ammeter select switch controls which output reading the ammeter will display the voltage from, ALT 1 or BAT 1. The amps indication is derived from a current transducer located in the electrical system MCU. When the engine is operating and the BAT 1 switch is

turned on, the ammeter indicates the charging rate applied to battery 1. Due to the inability of the alternators to dissipate current, the alternator ammeter indications are positive only.

Serials 1582 & subs: Main and Essential Bus voltages are displayed on the MFD and PFD, therefore, no ammeter select switch is necessary.

N. Turn Coordinator Batteries - *Serials 1005 thru 1267* (See Figure 24-3012)

Turn coordinator batteries provide emergency power to the turn coordinator in the event of essential power bus failure. Turn coordinator batteries consist of three date stamped 9-VDC Duracell MN1604 batteries connected in series to provide 27-VDC to the turn coordinator and the stall warning horn. When the turn coordinator battery switch is manually selected the turn coordinator batteries will provide at least 30 minutes of power for the turn coordinator. When replacement is required, replace all turn coordinator batteries at the same time, ensure expiration dates are the same, and expiration date is valid through the next annual inspection date.

Turn coordinator batteries are independently controlled and wired to the turn coordinator and stall warning horn power source allowing it to function properly when connected with battery 1 and the alternator. Failure of the battery 1 will not affect the ability of the turn coordinator batteries to provide necessary power. Because of diode protection, a failure or malfunction of the turn coordinator batteries will not affect Battery 1 or the alternator.

O. Battery 1 (See Figure 24-3013)

Serials w/ TCM Battery: Battery 1 is a 24-volt, 12-cell, 10-ampere hour, lead-acid aviation-grade type battery with non-spill vent caps. The battery is mounted in the engine compartment and has a top vent with an acid-resistant tube. The tube discharges out the bottom of the engine cowling, preventing the build up of dangerous or explosive gasses within the engine cowl.

Serials w/ Concorde Battery: Battery 1 is a 24-volt, valve regulated, lead-acid aviation-grade type battery. The battery is mounted in the engine compartment.

Serials 1268 & subs: Battery 1 is used for engine starting and can also be used as an emergency power source in the event Battery 2 or either alternator fails. Battery 1 provides all the electrical power for starting the aircraft. Battery 1 also supplies the electrical power to the landing light in the event Alternator 1 fails. Battery 1 is independently controlled by the BAT 1 switch, located in the pilot's bolster panel. The BAT 1 switch energizes a relay in the MCU which will connect BAT 1 to the Main Distribution Bus.

P. Battery 2 - *Serials 1268 & subs* (See Figure 24-3014)

Battery 2 is a maintenance free rechargeable sealed lead acid battery. Battery 2 consists of two 12-volt, 6-cell, 7-amp-hour batteries connected in series to provide 24-VDC to the Essential Bus. There is no need to check the specific gravity of the electrolyte or add water to these batteries during their service life.

Battery 2 is independently controlled by using the BAT 2 switch, located in the pilot's bolster panel. The BAT 2 switch energizes a relay located just aft of bulkhead 222 in the MCU which will connect BAT 2 to the Essential Bus. The electrical power from BAT 2 reaches the Essential Bus through the circuit breaker panel. Battery 2 is mounted directly behind bulkhead 222 in an acid resistant battery container.

Battery 2 is primarily used to power the Essential Bus. The Essential Bus delivers electrical power to the annunciator lights, turn coordinator, attitude indicator, horizontal situation indicator (HSI), stall warning system, and alternator 2.

Failure of the BAT 1 will not affect the ability of BAT 2 to provide necessary power to the Essential Bus. Because of diode protection, a failure or malfunction of the BAT 1 will not affect BAT 2 or either alternator output.

2. MAINTENANCE PRACTICES

A. Alternator 1 (See Figure 24-307)

(1) Removal - Alternator 1

(a) Set BATTERY and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove safety wire from alternator mounting bolt.

(e) Loosen alternator bolts and slip drive belt off alternator pulley.

(f) Identify and disconnect wires from alternator.

Note: To aid reinstallation, note position of washers on alternator mounting bolts.

(g) Remove bolts securing alternator to engine.

(2) Installation - Alternator 1

Note: Three shims must be used to align alternator. One shim must be positioned on each end of the alternator mounting boss. The remaining shim must be placed on either side of the mounting boss (as required) to obtain proper sheave alignment.

(a) Place alternator into bracket and loosely secure upper mounting bolt, washer, shims, washer, and nut. Alternator must be mounted using two shims on either side of alternator mounting boss and one on the opposite end of the mounting boss.

CAUTION: Cable shielding could be installed to the Power and/or Field wire harness. If installed, attach cable shielding wire(s) to ground terminal on alternator. Do not install cable shielding wire(s) to AUX power terminal.

(b) Install AUX terminal retainer and cap to AUX terminal.

(c) Connect wires to alternator.

(d) Loosely secure lower alternator mounting boss to bracket using bolt, small washer, and large washer.

(e) Secure alternator mounting bolts.

(f) Place a long, thin, and ridged steel ruler into the bottom of the alternator pulley and drive pulley.

(g) Verify pulleys are aligned. Pulleys are aligned if the ruler lays directly on the centerline of both pulleys.

(h) If the pulleys are not in alignment, loosen mounting bolts. Note position that shims are currently placed. Remove upper mounting bolt, nut, washer, and shims.

1 Take the shim(s) from the forward side of the alternator mounting boss and place them on the aft side of the alternator mounting boss.

2 Loosely secure upper mounting bolt, washer, shims, washer, and nut. Verify pulleys are aligned. Repeat procedure until pulleys are aligned.

(i) Install drive belt onto alternator pulley and tension belt properly. Using a torque wrench, rotate alternator pulley clockwise with 11 - 13 ft-lb (15 - 18 Nm) of force. When the belt slips in alternator pulley within the aforementioned torque range, the belt is properly tensioned.

(j) Tighten upper alternator mounting bolt to 400 - 450 in-lb (45 - 51 Nm).

(k) Tighten lower alternator mounting bolts to 200 - 275 in-lb (23 - 31 Nm).

(l) Safety wire lower alternator mounting bolt. (Refer to 20-50)

(m) Connect battery 1.(Refer to 24-30)

(n) Install engine cowling. (Refer to 71-10)

B. Alternator 1 Drive Belt (See Figure 24-307)

Alternator 1 is driven by a drive belt. The drive belt connects alternator 1 to the alternator drive sheave, which is powered by the engine's crankshaft. If the drive belt becomes insufficiently tensioned or breaks, output of alternator 1 will be reduced. The drive belt should be inspected periodically for proper tension and wear. Replace all worn drive belts.

(1) Removal - Alternator Drive Belt
- (a) Set BATTERY and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove safety wire from alternator mounting bolt.
- (e) Loosen alternator bolts and slip drive belt off alternator pulley.
- (f) Remove propeller. (Refer to 61-10)
- (g) Remove drive belt.

(2) Installation - Alternator Drive Belt
- (a) Install alternator drive belt around drive pulley.
- (b) Install propeller. (Refer to 61-10)
- (c) Install drive belt onto alternator pulley and tension belt properly. Using a torque wrench, rotate alternator pulley clockwise with 11 - 13 ft-lb (15 - 18 Nm) of force. When the belt slips in alternator pulley within the specified torque range, the belt is properly tensioned.
- (d) Tighten upper alternator mounting bolt to 400 - 450 in-lb (45 - 51 Nm).
- (e) Tighten lower alternator mounting bolt to 200 - 275 in-lb (23 - 31 Nm).
- (f) Safety wire lower alternator mounting bolt. (Refer to 20-50)
- (g) Connect battery 1. (Refer to 24-30)
- (h) Install engine cowling. (Refer to 71-10)

C. Alternator 1 Drive Sheave (See Figure 24-307)

(1) Removal - Alternator Drive Sheave

(a) Remove alternator drive belt. (Refer to 24-30)

(b) Remove bolts and washers securing alternator drive sheave and backing plates to prop flange.

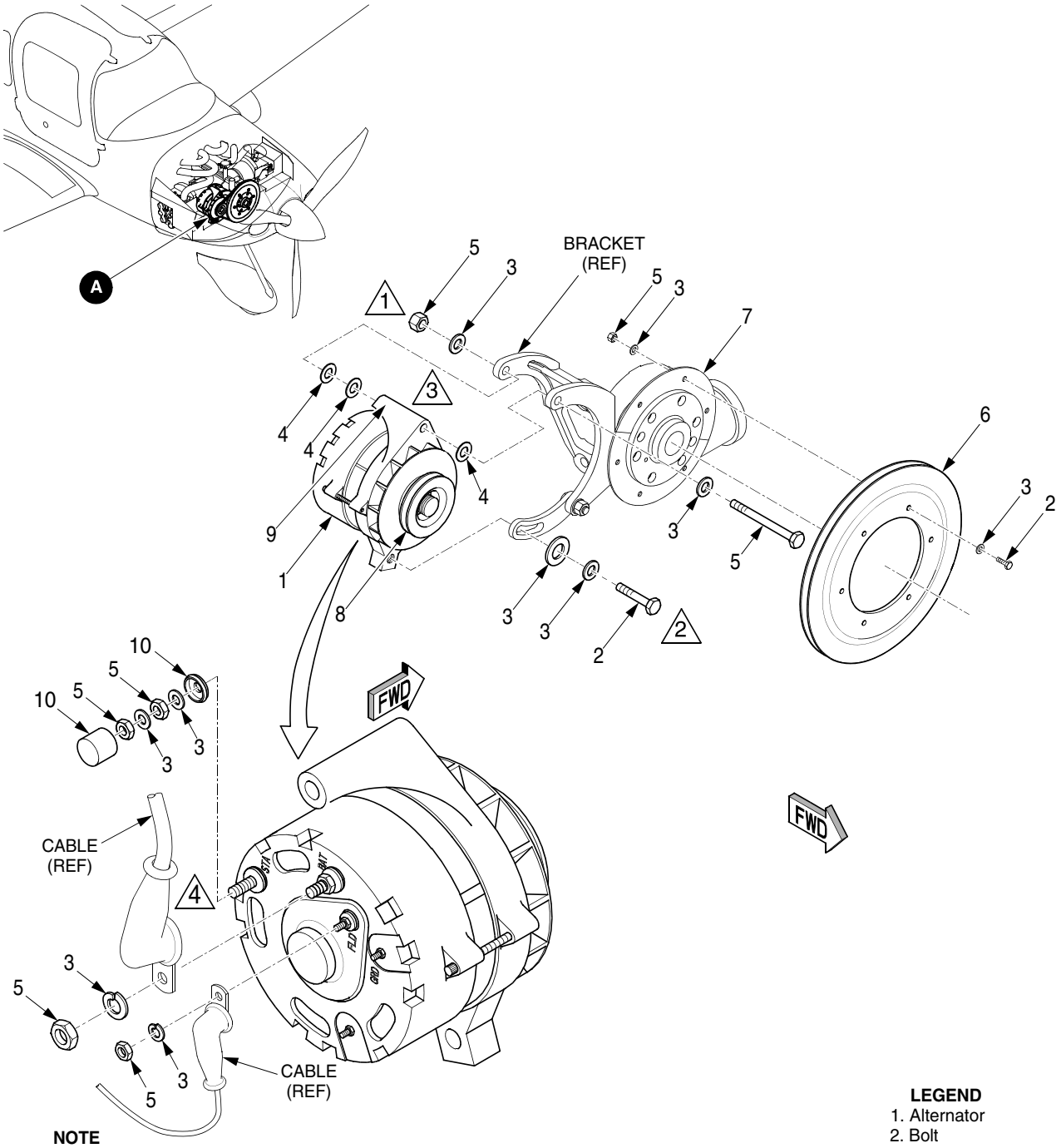
(c) Remove alternator drive sheave and backing plates.

(2) Installation - Alternator Drive Sheave

Note: Exercise caution when securing the backing plates to the prop flange. The alignment holes in the backing plates must be aligned before securing the mounting hardware.

(a) Install bolts and washers securing alternator drive sheave and backing plates to prop flange.

(b) Install alternator drive belt. (Refer to 24-30)



NOTE

1. Tighten to 400-450 inch pounds (45-51 Nm).
2. Tighten to 200-275 inch pounds (23-31 Nm) and safety wire.
3. Place one shim on each side of alternator mounting boss. Remaining shim must be used on either side of mounting boss to obtain proper sheave alignment.
4. Do not install cable shielding wire(s) to AUX power terminal.

LEGEND

1. Alternator
2. Bolt
3. Washer
4. Shim
5. Nut
6. Drive Sheave
7. Backing Plate
8. Pulley
9. Mounting Boss
10. AUX Terminal Cap

Figure 24-307
Alternator 1

EFFECTIVITY:
All

D. Alternator 2 (See Figure 24-308)

(1) Removal - Alternator 2

(a) Set BATTERY and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Identify and disconnect wires from alternator terminals.

(e) Remove nuts and washers securing alternator to engine. Remove alternator from airplane.

(f) Discard old gasket and remove residual gasket material from alternator and engine.

(2) Disassembly - Alternator 2

Note: To facilitate removal of shear coupling assembly from coupling pins on alternator, tightly grip and rock spline of shear coupling assembly back and forth until loosened.

(a) Pull shear coupling assembly from alternator.

(3) Assembly - Alternator 2

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Mallet	-	Any Source	Tap shear coupling onto shaft coupling pins.

(b) Position and align shear coupling assembly to alternator pins. Gently tap shear coupling assembly with mallet until coupling is seated onto pins.

(4) Installation - Alternator 2

(a) Place alternator and new gasket into position. Hand tighten washers and nuts in an alternating pattern securing alternator to engine.

(b) *Serials 1005 thru 1267, 2016 & subs w/ Perspective Avionics:* Torque nuts to 200 in-lb (22.6 Nm) in an alternating pattern.

(c) *Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics:* Torque nuts to 50 - 70 in-lb (5.6 - 7.9 Nm) in an alternating pattern.

CAUTION: Cable shielding could be installed to the Power and/or Field wire harness. If installed, attach cable shielding wire(s) to ground terminal on alternator. Do not install cable shielding wire(s) to AUX power terminal.

(d) Install AUX terminal retainer and cap to AUX terminal.

(e) Connect alternator wires to appropriate terminals.

(f) Connect battery 1. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

(5) Inspection/Check - Alternator 2

(a) Set BAT 1, BAT 2 and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Visually inspect rear housing cooling slots for gray dust residue which may indicate bearing failure.

(e) Verify alternator is securely mounted to engine and no oil leakage is visible around alternator base.

(f) Visually inspect alternator wiring and electrical connectors for security and condition.

(g) Visually inspect output terminal and nut for dark discoloration. If discolored or corroded, replace terminal ring on output wire.

1 Remove nut and washer securing output wire to alternator terminal.

2 Clean output terminal and nut with brass wire brush.

3 Cut old end of wire off and strip new end to obtain a clean and bright conductor.

4 Insert end of wire into terminal ring and crimp.

5 Position terminal ring on output terminal and secure with washer and nut.

(h) Clean casting webs between mounting flanges and alternator housing and visually inspect casting webs for cracks. If a crack exists in any of the four casting webs, replace alternator.

If it is difficult to distinguish casting features from cracks, refer to Advisory Circular 43.13-1B Acceptable Methods, Techniques, and Practices - Aircraft Inspection And Repair for additional non-destructive testing.

(i) Connect battery 1. (Refer to 24-30)

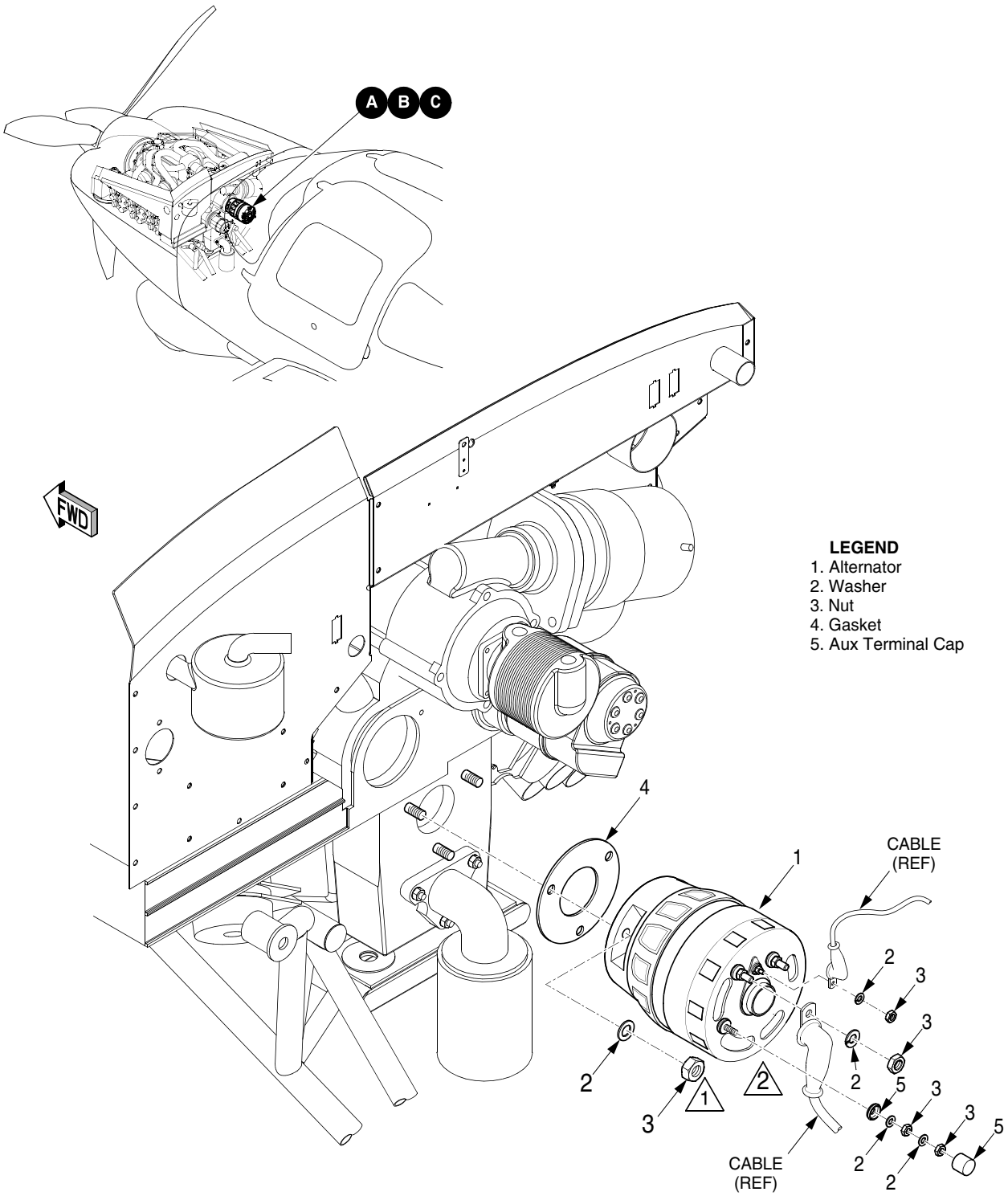
(j) Perform the Before Takeoff checklist as described in the Normal Procedures section of the Pilot's Operating Handbook.

1 Verify both ALT 1 and ALT 2 caution lights are out.

2 Verify positive amps indication for each alternator.

3 Listen for excessive noise or vibration which may indicate bearing failure.

(k) Install engine cowling. (Refer to 71-10)



NOTE

1 Torque nuts to 200 in-lb (22.6 Nm).

2 Do not install cable shielding wire(s) to AUX power terminal.

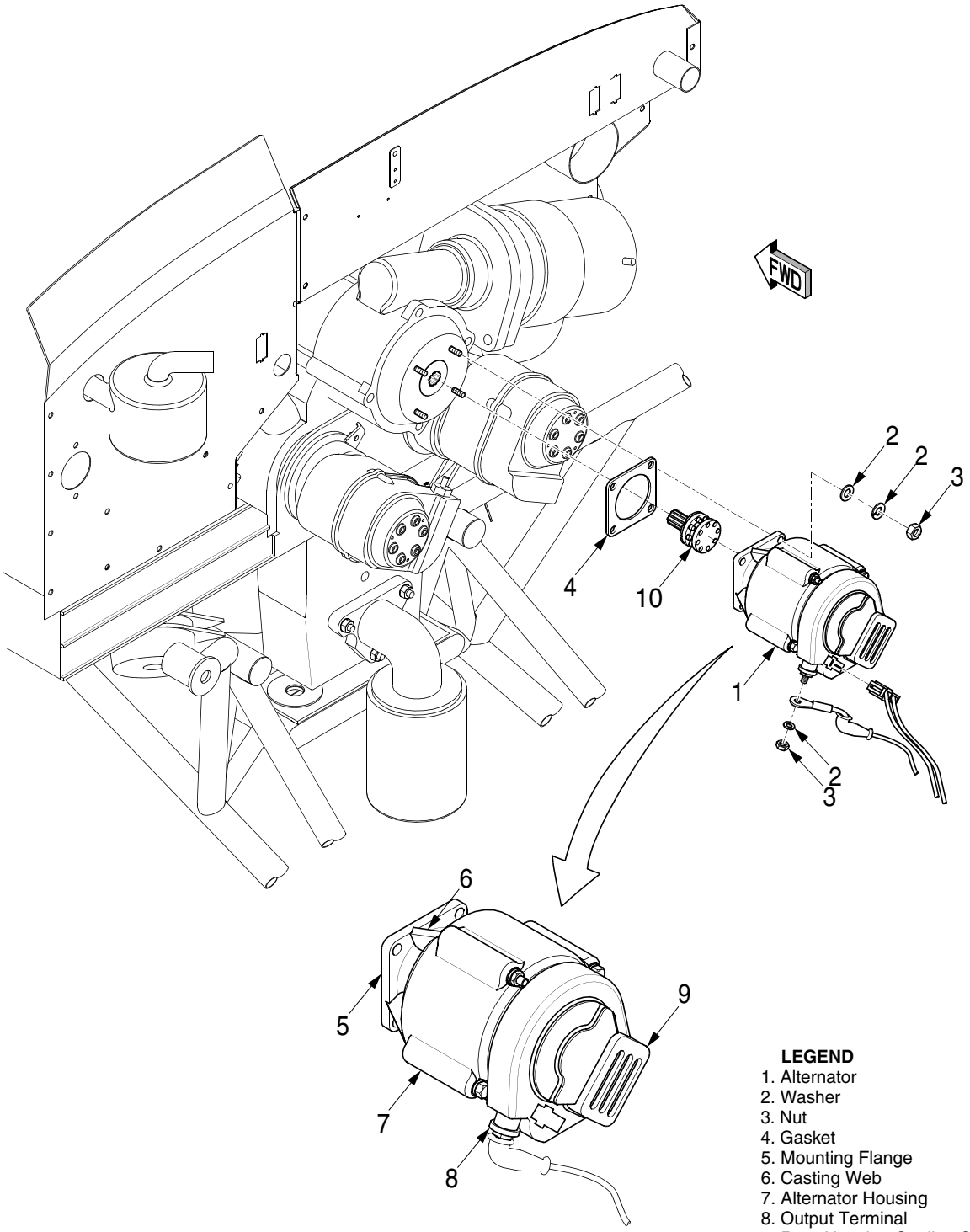
DETAIL A

Serials 1005 thru 1267.

SR20_MM24_1315E

Figure 24-308
Alternator 2 - Serials 1005 thru 1267 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1267



LEGEND
1. Alternator
2. Washer
3. Nut
4. Gasket
5. Mounting Flange
6. Casting Web
7. Alternator Housing
8. Output Terminal
9. Rear Housing Cooling Slots
10. Shear Coupling Assembly

NOTE

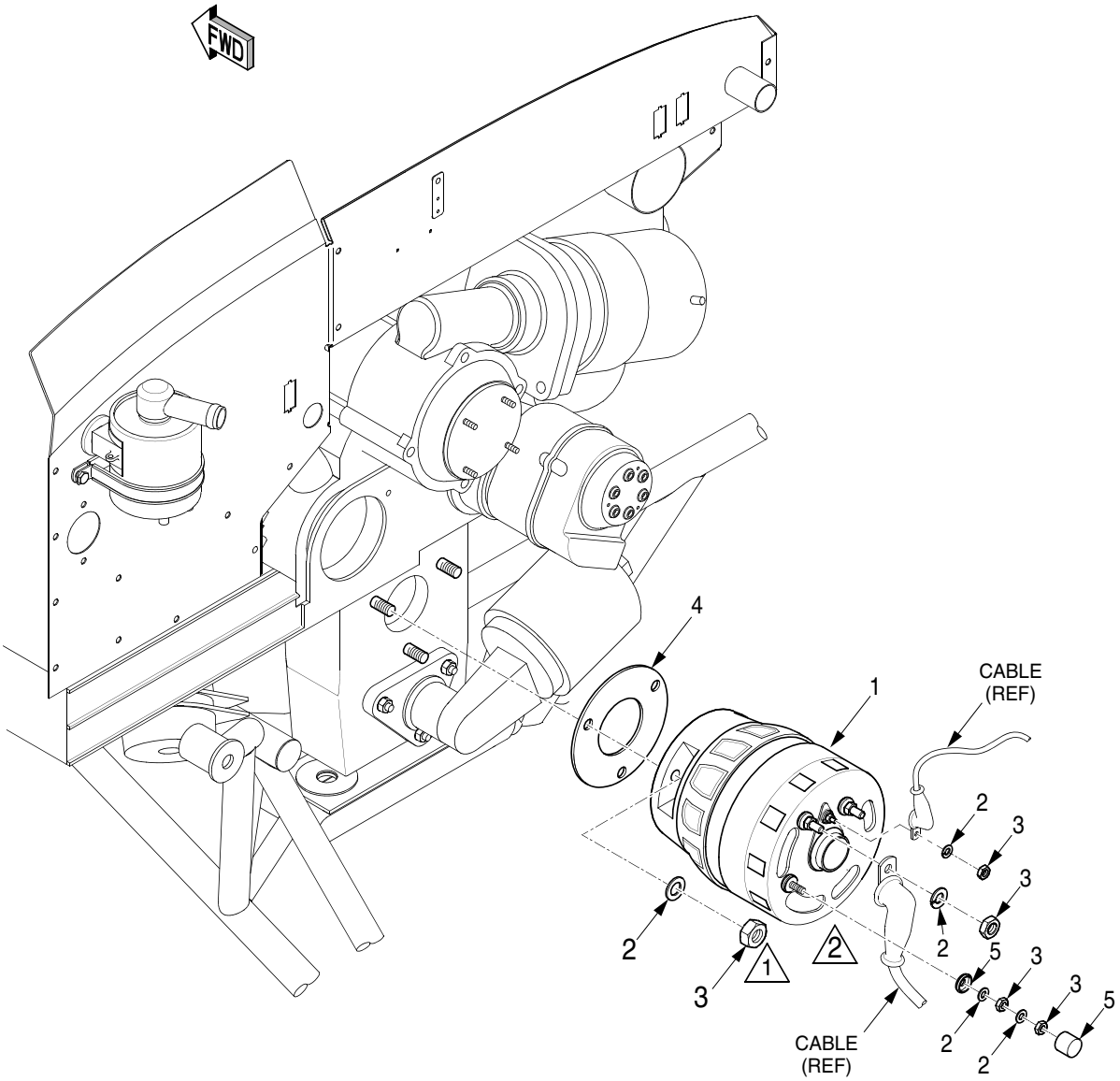
1 Torque nuts to 50 - 70 in-lb (5.6 - 7.9 Nm).

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics.

SR20_MM24_1580D

Figure 24-308
Alternator 2 - Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics



LEGEND
1. Alternator
2. Washer
3. Nut
4. Gasket
5. Aux Terminal Cap

DETAIL C

Serials 2016 & subs w/ Perspective Avionics.

NOTE

1 Torque nuts to 200 in-lb (22.6 Nm).

2 Do not install cable shielding wire(s) to AUX power terminal.

SR20_MM24_5470

Figure 24-308
Alternator 2 - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

E. Master Control Unit - *Serials 1005 thru 1267* (See Figure 24-309)

This MCU is not field repairable and must be replaced if faulty.

(1) Removal - Master Control Unit

(a) Set BATTERY and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery. (Refer to 24-30)

Note: To facilitate re-installation, label all wires prior to removal.

(d) Identify wires routed to alternator 1 and disconnect at alternator. Remove cable ties securing wires together.

(e) *Serials 1005 thru 1267 w/ dual alternator:* Identify wires routed to alternator 2 and disconnect at alternator.

(f) Identify wire routed to starter and disconnect at starter.

(g) Identify wire routed to backup vacuum pump and disconnect at MCU.

(h) Identify wire routed to ground bus bar assembly and disconnect at MCU.

(i) Identify wires routed to external power receptacle and disconnect at MCU.

(j) At MCU, identify P108 and P109 connectors and disconnect from J108 and J109 connectors.

(k) *Serials 1005 thru 1267 w/ dual alternator:* Identify P111 connector and disconnect from J111 connector on MCU.

(l) Loosen adel clamps securing MCU wires to firewall, battery bracket, engine mount, and engine baffling.

CAUTION: Remove MCU wires from engine compartment carefully to avoid damaging other components.

(m) Remove bolts and washers securing MCU to firewall and remove MCU from airplane.

(2) Installation - Master Control Unit

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.

(b) Position MCU to firewall and secure with bolts and washers.

(c) Route wires to alternator 1 and connect at alternator. Secure wires together with cable ties.

(d) *Serials 1005 thru 1267 w/ dual alternator:* Route wires to alternator 2 and connect at alternator.

(e) Route wire to starter and connect at starter.

(f) Route wire from backup vacuum pump and connect at MCU.

(g) Route wire from ground bus bar assembly and connect at MCU.

(h) Route wires from external power receptacle and connect at MCU.

(i) At MCU, connect P108 and P109 connectors to J108 and J109 connectors.

(j) *Serials 1005 thru 1267 w/ dual alternator:* At MCU, connect P111 connector to J111 connector.

(k) Verify wire routing and tighten adel clamps securing MCU wires to firewall, battery bracket, engine mount, and engine baffling.

(l) Apply firewall sealant to bolts securing MCU and adel clamps to firewall.

(m) Connect battery. (Refer to 24-30)

(n) Install engine cowling. (Refer to 71-10)

F. Master Control Unit - *Serials 1268 & subs* (See Figure 24-309)

MCU part number 14600-002, 16600-001, 19900-001, & 19800-001 are field repairable to the extent provided for in Chapter 24-00, Electrical Power Troubleshooting. (Refer to 24-00) Field repair is limited to replacing the following components: current sensors, logic module, fuses, and field control modules. The MCU part number may be determined from a placard located on the MCU chassis.

Note: Airplane serial effectivities may vary from shown if originally installed MCU has been replaced.

MCU part number 14600-002 (MCU 100) is installed on SR20 airplanes serial numbers 1268 thru 1524.

MCU part number 16600-001 (MCU 120) is installed on SR20 airplanes serial numbers 1525 thru 1581.

MCU part number 19900-001 (MCU 130) is installed on SR20 airplanes serial numbers 1582 and subsequent.

MCU part number 19800-001 (MCU 140) is installed on SR20 airplanes serial numbers 2016 & subs w/ Perspective Avionics.

(1) Removal - Master Control Unit

(a) Set BATTERY and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove nuts and washers securing grounding strap to MCU chassis.

(e) *MCU 14600-002, & 16600-001:* Identify and disconnect P108, P109, P111, and P115 connectors from J108, J109, J111, and J115 connectors.

(f) *MCU 16600-001:* Disconnect P757 connector from J757 connector, if installed.

(g) *MCU 19900-001:* Identify and disconnect P135, P136, P137, and P138 connectors from J135, J136, J137, and J138 connectors.

(h) *MCU 19800-001:* Disconnect P180, P181, P182, and P183 connectors.

(i) *MCU 19900-001:* Remove nuts, washers, and clamps securing wire harness loom to chassis.

(j) *MCU 14600-002 & 16600-001:* Remove MCU cover. (Refer to 24-30)

Note: *MCU 14600-002:* Label cable guide routing holes with cable component name to facilitate re-installation.

(k) *MCU 14600-002:* Remove screws and washers securing cable guide to MCU chassis.

(l) Remove nuts and washers securing alternator 1 cable assembly to bus bar stud.

(m) Remove nuts and washers securing alternator 2 cable assembly to bus bar stud.

(n) Remove nuts and washers securing battery 1 cable assembly to bus bar stud.

(o) Remove nuts and washers securing starter cable assembly to bus bar stud.

(p) Remove bolts and washers securing MCU to firewall. Remove MCU from airplane.

(2) Installation - Master Control Unit

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.

(b) Position MCU to firewall and secure with bolts and washers. Apply sealant over bolt heads.
(c) Install washers and nuts securing alternator 1 cable assembly to bus bar stud.
(d) Install washers and nuts securing alternator 2 cable assembly to bus bar stud.
(e) Install washers and nuts securing battery 1 cable assembly to bus bar stud.
(f) Install washers and nuts securing starter cable assembly to bus bar stud.
(g) *MCU 14600-002:* Install screws and washers securing cable guide to MCU chassis.
(h) *MCU 14600-002, & 16600-001:* Connect P108, P109, P111, and P115 connectors to J108, J109, J111, and J115 connectors.
(i) *MCU 16600-001:* Connect P757 connector to J757 connector, if installed.
(j) *MCU 19900-001:* Connect P135, P136, P137, and P138 connectors to J135, J136, J137, and J138 connectors.
(k) *MCU 19800-001:* Connect P180, P181, P182, and P183 connectors.
(l) *MCU 19900-001:* Position wire harness loom to chassis and secure with clamps, washers, and nuts.
(m) Install washers and nuts securing grounding strap to MCU chassis.
(n) *MCU 14600-002:* Install MCU cover. (Refer to 24-30)
(o) *MCU 14600-002 & 16600-001:* Apply sealant around cable guide holes where cable assemblies and connector wires exit MCU.
(p) Connect battery 1. (Refer to 24-30)
(q) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
(r) Install engine cowling. (Refer to 71-10)

(3) Operational Inspection - Master Control Unit - *Serials w/o Perspective Avionics*

WARNING: **In order to perform the following check the engine must be operating. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting this check.**

(a) Verify all circuit breakers are set.
(b) Toggle battery 2 master switch to the ON position and verify the following occurs:
1 Volt / Amp meter indicates at least 24 volts on battery 2.
2 *Serials 1268 thru 1581:* ALT 1 and ALT 2 caution lights illuminate.
3 *Serials 1582 & subs:* ALT 2 caution light illuminates.
4 Flap position light off.
5 Attitude gyro low voltage flag hidden.
6 *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD:* HSI HDG flag hidden within five minutes.
7 *Serials 1337 thru 1422 w/ PFD, 1423 & subs:* PFD powers up.
8 *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD:* Turn Coordinator low voltage flag hidden.
9 Autopilot ready indication after gyro spool up.
(c) Toggle battery 1 master switch to the ON position and verify the following occurs:
1 ALT 1 and ALT 2 fail lights are on.
2 Flap position light illuminates.
3 Engine instruments are operational and manifold pressure gage indicates approximately the altimeter setting.
4 Ammeter select switch shows slight discharge in BAT position.
(d) Start Engine and set engine speed at 1000 RPM.
(e) Verify landing light, pitot heat, avionics, strobe lights, and navigation lights are on.

(f) Switch ALT 1 ON and ALT 2 ON.

(g) Increase RPM to 1700.

(h) Check that LOW VOLT light is off and ammeter shows no current discharge in BAT position.

(i) Increase RPM to 2200.

(j) Check that LOW VOLT light is off and ammeter shows no current discharge in BAT position.

(k) Switch ALT 1 ON and ALT 2 OFF. Verify and record operating values.

Voltage Indication		Ammeter Indication			Annunciator Illumination		
Clock/Volts	Voltmeter	ALT 1	BAT	ALT 2	LOW VOLTS	ALT 1 Steady	ALT 2 Steady
27V - 28.3V	27V - 28V	Pos < 40A	0 - Pos	0A	OFF	OFF	ON

(l) Switch ALT 1 OFF and ALT 2 ON. Verify and record operating values.

Voltage Indication		Ammeter Indication			Annunciator Illumination		
Clock/Volts	Voltmeter	ALT 1	BAT	ALT 2	LOW VOLTS	ALT 1 Steady	ALT 2 Steady
20V - 24V	28V - 29V	0A	0A - Neg	2A - 20A	OFF	ON	OFF

(m) Switch ALT 1 ON and ALT 2 ON. Verify and record operating values.

Voltage Indication		Ammeter Indication			Annunciator Illumination		
Clock/Volts	Voltmeter	ALT 1	BAT	ALT 2	LOW VOLTS	ALT 1 Steady	ALT 2 Steady
27V - 28.3V	28V - 29V	Pos < 40A	0A - Pos	2A - 20A	OFF	OFF	OFF

(n) Switch ALT 1 OFF and ALT 2 OFF. Verify and record operating values.

Voltage Indication		Ammeter Indication			Annunciator Illumination		
Clock/Volts	Voltmeter	ALT 1	BAT	ALT 2	LOW VOLTS	ALT 1 Steady	ALT 2 Steady
20V - 24V	20V - 24V	0A	Neg < 40A	0A	ON	ON	ON

(o) Shut down engine.

(4) Operational Inspection - Master Control Unit - *Serials w/ Perspective Avionics*

In order to perform the following check the engine must be operating. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting this check.

(a) Verify all circuit breakers are set.

(b) Toggle battery 2 master switch to the ON position and verify the following occurs:

1 Flap position light off.

2 *Serials w/o MD302 Standby Attitude Module:* Standby attitude gyro low voltage flag hidden.

3 *Serials w/ MD302 Standby Attitude Module:* MD302 Standby Attitude Module powers up.

4 PFD powers up.

5 MFD is off.

6 Essential Bus voltage (indicated on PFD) is 22 to 26 volts.

7 ALT 1 and ALT 2 caution annunciations on PFD.

(c) Toggle battery 1 master switch to the ON position and verify the following occurs:

1 Flap position light illuminates.

2 MFD powers up.

3 Pull PFD #1 circuit breaker and verify PFD remains on.

4 Reset PFD #1 circuit breaker.

5 *Serials w/o MD302 Standby Attitude Module:* Pull STDBY ATTD #1 circuit breaker and verify standby attitude gyro voltage flag remains hidden.

6 *Serials w/ MD302 Standby Attitude Module:* Pull STDBY ATTD #1 circuit breaker and verify MD302 Standby Attitude Module remains powered up.

7 Reset STDBY ATTD #1 circuit breaker.

8 Pull MFD #2 circuit breaker and verify MFD remains on.

9 Reset MFD #2 circuit breaker.

10 Switch on Landing Light and verify Landing Light illuminates.

11 Switch off Landing Light.

12 *Serials w/ Fan or Air Conditioning:* Turn on Cabin Fan and verify fan is on.

13 *Serials w/ Fan or Air Conditioning:* Turn off Cabin Fan.

14 ALT 1 and ALT 2 caution annunciations on PFD.

15 BAT 1 current indicator shows slight discharge.

(d) Start Engine and set engine speed at 1000 RPM.

(e) Switch ALT 1 ON and ALT 2 ON.

(f) Verify landing light, pitot heat, avionics, strobe lights, and navigation lights are on.

(g) Increase RPM to 1700.

(h) Check that BAT 1, ALT 1, ALT 2, ESS BUS, M BUS 1, and M BUS 2 caution and warning annunciations are off.

(i) Increase RPM to 2200.

(j) Check that BAT 1, ALT 1, ALT 2, ESS BUS, M BUS 1, and M BUS 2 caution and warning annunciations are off.

(k) *Serials 2016 thru 2064 w/ Vent only:* Turn vent airflow off and on. Verify control of airflow into the cabin.

(l) Switch ALT 1 ON and ALT 2 OFF. Verify and record operating values from MFD.

Bus Volts (V)			Current (A)		
ESS	M1	M2	ALT 1	ALT 2	BAT 1

Bus Volts (V)			Current (A)		
= M1 - 0.7 (± 0.2)	27.0V - 28.3V	= M1 - 0.7 (± 0.2)	2A - 72A	0A	0 - Pos

(m) Switch ALT 1 OFF and ALT 2 ON. Verify and record operating values from MFD.

Bus Volts (V)			Current (A)		
ESS	M1	M2	ALT 1	ALT 2	BAT 1
= M2 - 0.7 (± 0.2)	22V - 26V	28.1V - 29.1V	0A	2A - 50A	Neg - 0

(n) Switch ALT 1 ON and ALT 2 ON. Verify and record operating values from MFD.

Bus Volts (V)			Current (A)		
ESS	M1	M2	ALT 1	ALT 2	BAT 1
= M2 - 0.7 (± 0.2)	27.0V - 28.3V	28.1V - 29.1V	Pos < 72A	2A - 50A	0 - Pos

(o) Switch ALT 1 OFF and ALT 2 OFF. Verify and record operating values from MFD.

Bus Volts (V)			Current (A)		
ESS	M1	M2	ALT 1	ALT 2	BAT 1
22V - 26V	22V - 26V	= M1 - 0.7 (± 0.2)	0A	0A	Neg - 0

(p) Shut down engine.

(5) Inspection/Check - Master Control Unit

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.
Cotton Cloth (clean and lint free)	-	Any Source	General Cleaning.
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Corrosion Inhibitor (aerosol)	MIL-C-81309 Type III	Any Source	Prevent corrosion.

(b) Set BATTERY and AVIONICS switches to OFF positions.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect battery 1. (Refer to 24-30)

(e) Remove MCU cover. (Refer to 24-30)

(f) Visually inspect inside MCU for evidence of water. If water if found, dry MCU and components with a clean cotton cloth.

Note: Evidence of surface corrosion does not require replacement of MCU components. If corrosion is found, verify MCU operation by performing Operational Inspection - Master Control Unit.

(g) Apply corrosion inhibitor as follows:

1 Cover surrounding components and structures to prevent inadvertent application of corrosion inhibitor to these areas.

2 Apply a thin coat of corrosion inhibitor to MCU circuit board, internal components, and connectors per the manufacturer's instructions.

(h) Verify security of MCU chassis to firewall.

(i) Visually inspect cable assemblies and connector wires for chafing and security.

(j) *Serials w/ MCU 100 or MCU120:* Visually inspect sealant for a tight seal around cable guide holes where cable assemblies and connector wires exit MCU.

(k) *Serials w/ MCU 100 or MCU120:* If necessary, reapply sealant to MCU as follows:

1 Solvent clean areas of MCU to be sealed. (Refer to 20-30)

2 Apply sealant around cable guide holes where cable assemblies and connector wires exit MCU.

(l) Install MCU cover. (Refer to 24-30)

(m) Connect battery 1. (Refer to 24-30)

(n) Install engine cowling. (Refer to 71-10)

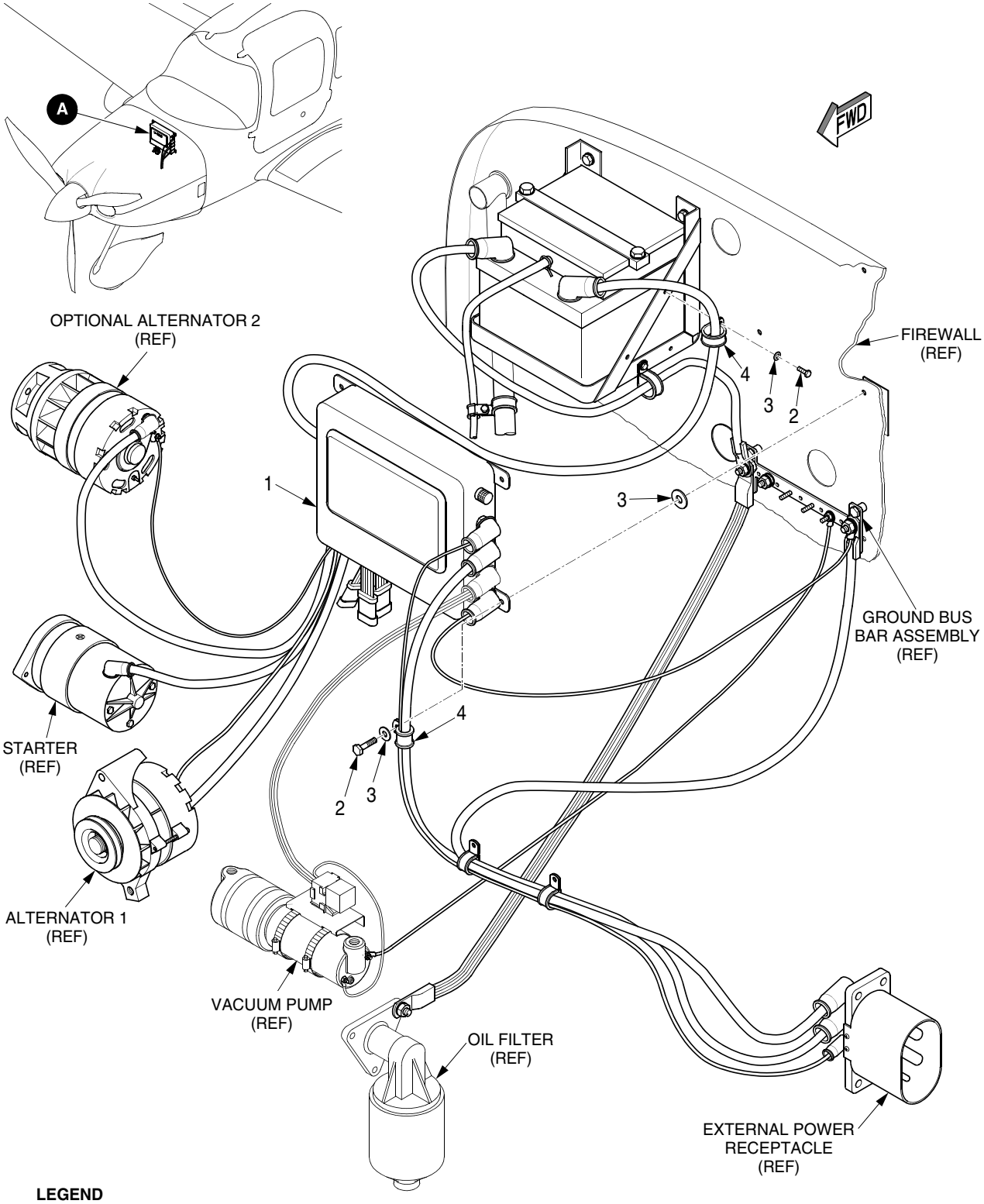
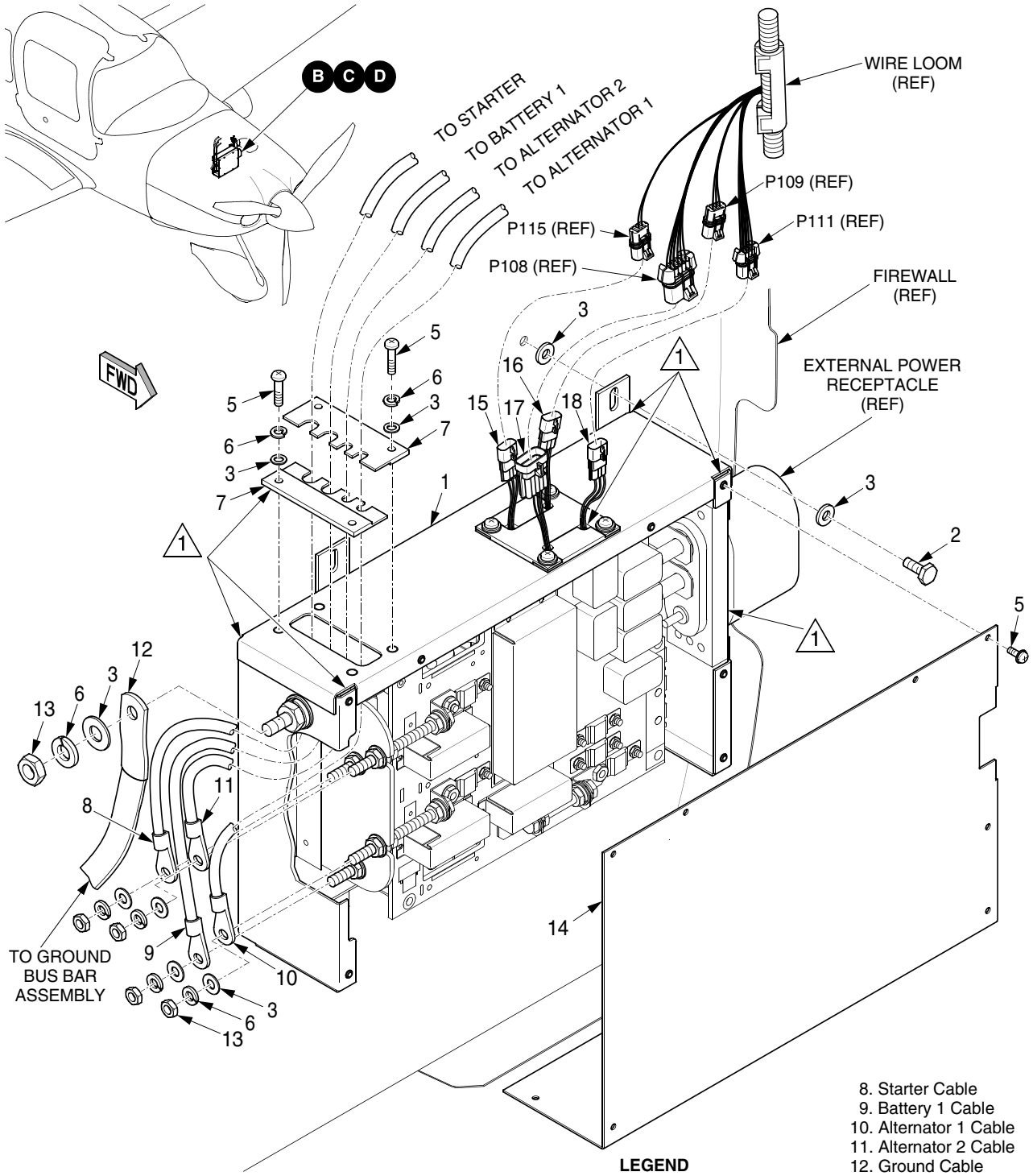


Figure 24-309
MCU Installation - Serials 1005 thru 1267 (Sheet 1 of 5)



NOTE

1 Apply sealant to top corners of MCU, cable exits, and around external power receptacle.

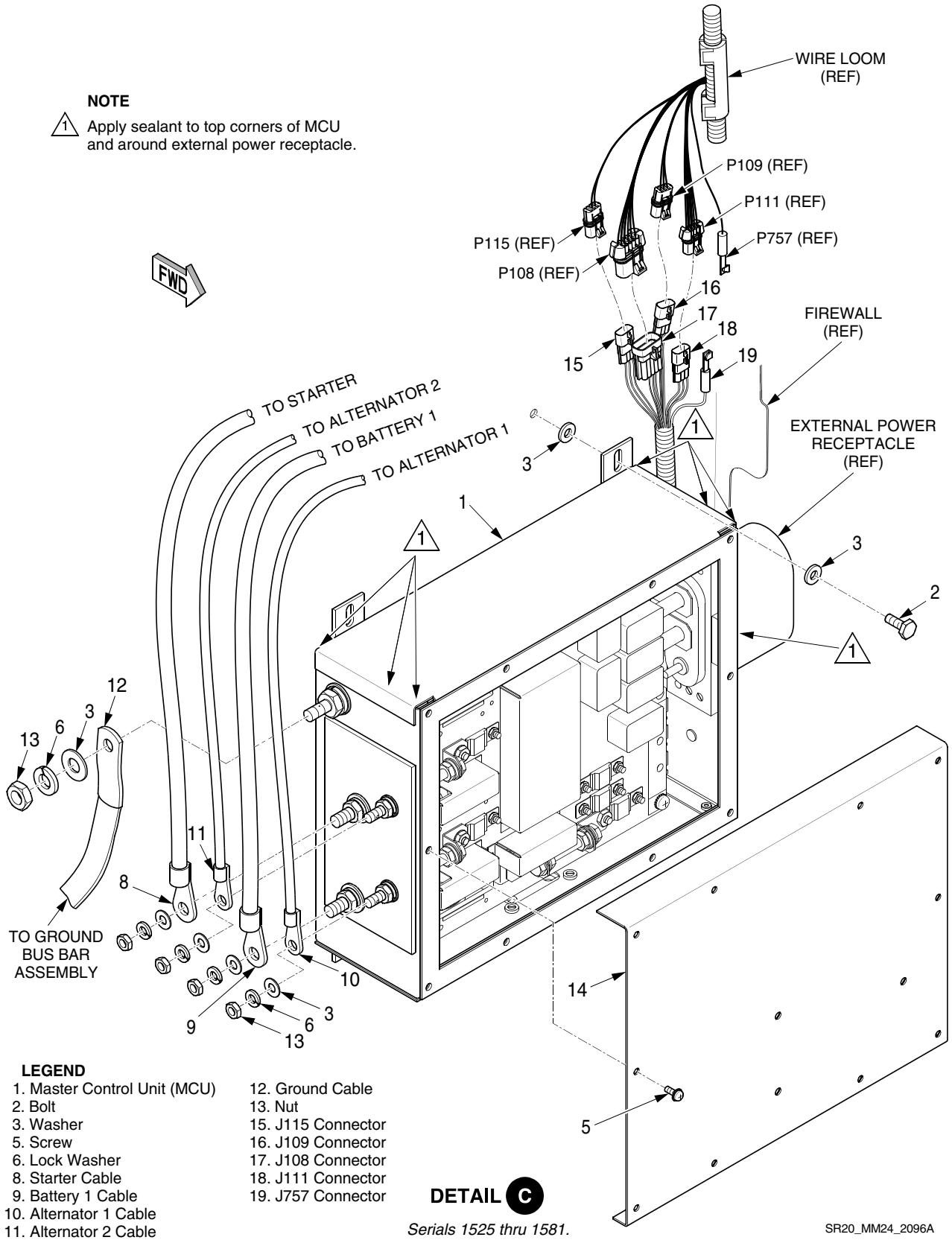
LEGEND

1. Master Control Unit (MCU)
2. Bolt
3. Washer
5. Screw
6. Lock Washer
7. Cable Guide
8. Starter Cable
9. Battery 1 Cable
10. Alternator 1 Cable
11. Alternator 2 Cable
12. Ground Cable
13. Nut
14. MCU Cover
15. J115 Connector
16. J109 Connector
17. J108 Connector
18. J111 Connector

Serials 1268 thru 1524.

SR20_MM24_1741F

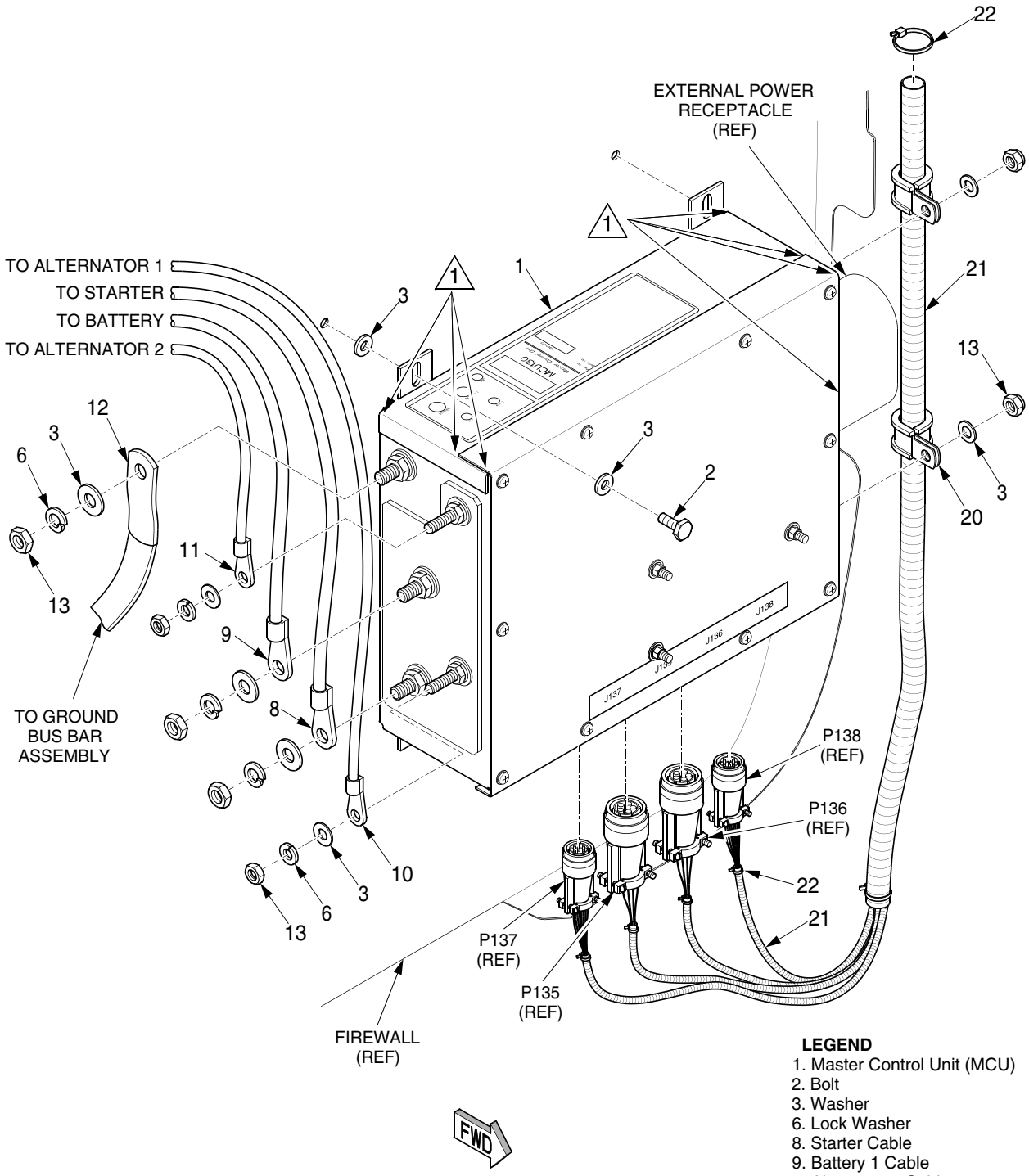
Figure 24-309
Master Control Unit Installation - Serials 1268 thru 1524 (Sheet 2 of 5)



LEGEND

1. Master Control Unit (MCU)
2. Bolt
3. Washer
5. Screw
6. Lock Washer
8. Starter Cable
9. Battery 1 Cable
10. Alternator 1 Cable
11. Alternator 2 Cable
12. Ground Cable
13. Nut
15. J115 Connector
16. J109 Connector
17. J108 Connector
18. J111 Connector
19. J757 Connector

Figure 24-309
Master Control Unit Installation - Serials 1525 thru 1581 (Sheet 3 of 5)



LEGEND

1. Master Control Unit (MCU)
2. Bolt
3. Washer
6. Lock Washer
8. Starter Cable
9. Battery 1 Cable
10. Alternator 1 Cable
11. Alternator 2 Cable
12. Ground Cable
13. Nut
20. Adel Clamp
21. Wire Loom
22. Cable Tie

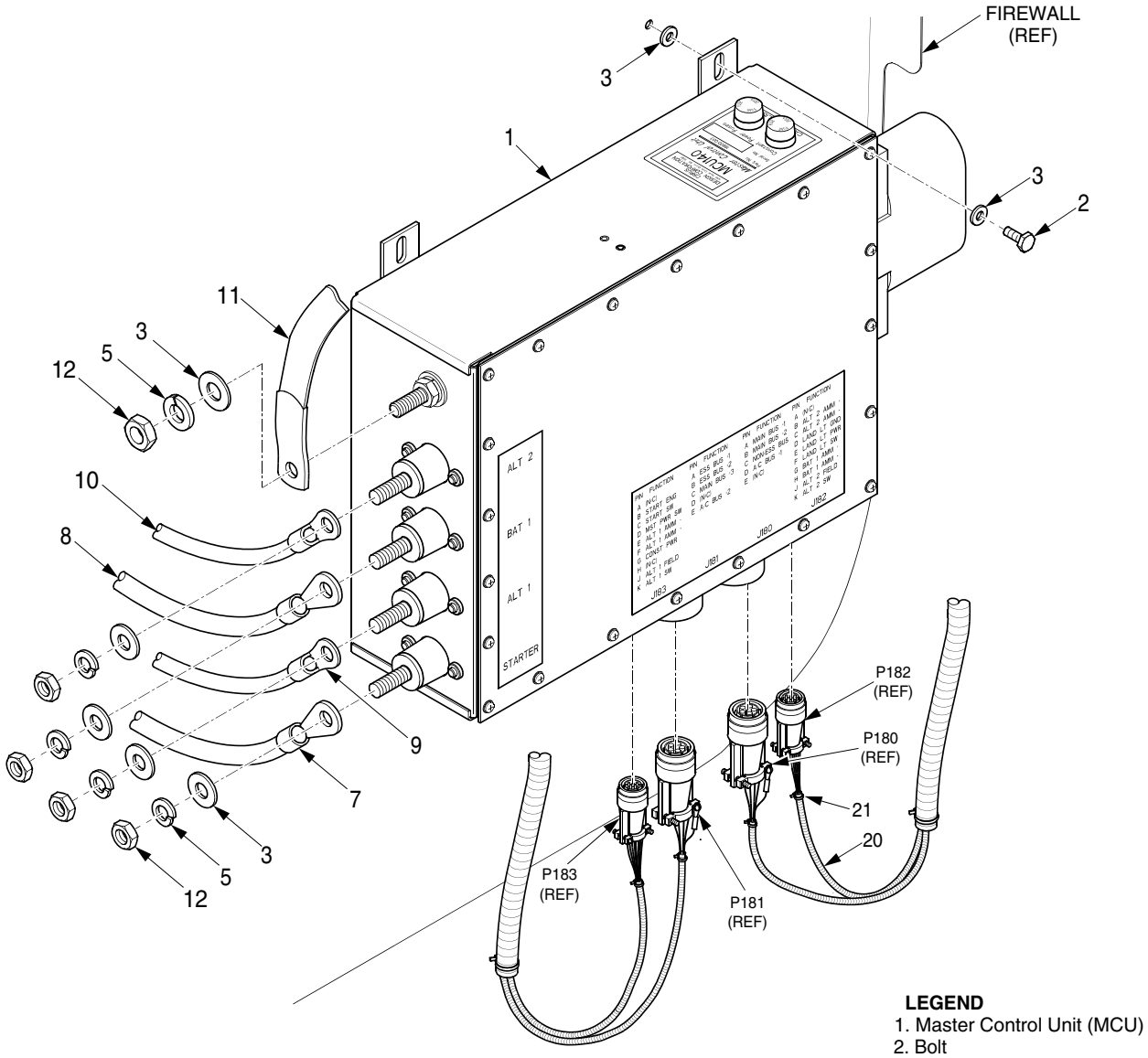
NOTE

1 Apply sealant to top corners of MCU and around external power receptacle.

DETAIL D

SR20_MM24_2191A

Figure 24-309
Master Control Unit Installation - Serials 1582 & subs w/o Perspective Avionics (Sheet 4 of 5)



LEGEND

1. Master Control Unit (MCU)
2. Bolt
3. Washer
5. Lock Washer
7. Starter Cable
8. Battery 1 Cable
9. Alternator 1 Cable
10. Alternator 2 Cable
11. Ground Cable
12. Nut
20. Wire Loom
21. Cable Tie

DETAIL D

SR20_MM24_2904A

Figure 24-309
Master Control Unit Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 5 of 5)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

G. MCU Cover - *Serials w/ MCU 14600-001, 14600-002, 16600-001, and 19900-001* (See Figure 24-3010)

(1) Removal - MCU Cover

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Using a plastic scraper, remove sealant from corners of MCU and from around external power receptacle.

(e) Remove screws securing MCU cover to chassis. Remove MCU cover.

(2) Installation - MCU Cover

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Corrosion Inhibitor (aerosol)	MIL-C-81309 Type III	Any Source	Prevent corrosion.
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.
Cotton Cloth (clean and lint free)	-	Any Source	General Cleaning.
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.

(b) Apply corrosion inhibitor as follows:

1 Cover surrounding components and structures to prevent inadvertent application of corrosion inhibitor to these areas.

2 Apply a thin coat of corrosion inhibitor to MCU circuit board, internal components, and connectors per the manufacturer's instructions.

(c) Position MCU cover to chassis and secure with screws.

(d) Solvent clean upper corners of MCU chassis, and along edge of external power receptacle. (Refer to 20-30)

(e) Apply sealant to openings at upper corners of MCU chassis, and along edge of external power receptacle.

(f) Connect battery 1. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

H. MCU Cover - *Serials w/ MCU 19800-001* (See Figure 24-3010)

(1) Removal - MCU Cover

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove screws securing MCU cover to chassis. Remove MCU cover.

(2) Installation - MCU Cover

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Corrosion Inhibitor (aerosol)	MIL-C-81309 Type III	Any Source	Prevent corrosion.

(b) Apply corrosion inhibitor as follows:

1 Cover surrounding components and structures to prevent inadvertent application of corrosion inhibitor to these areas.

2 Apply a thin coat of corrosion inhibitor to MCU circuit board, internal components, and connectors per the manufacturer's instructions.

(c) Position MCU cover to chassis and secure with screws.

(d) Connect battery 1. (Refer to 24-30)

(e) Install engine cowling. (Refer to 71-10)

I. MCU Bottom Cover - *Serials w/ MCU 16600-001 & 19900-001* **(See Figure 24-3010)**

(1) Removal - Serials w/ MCU Bottom Cover

(a) Remove MCU cover.

(b) *MCU 16600-001:* Remove nuts, washers, and clamps securing wire harness loom to chassis.

Note: *MCU 16600-001:* Label cable guide routing holes with wire harness name to facilitate re-installation.

(c) *MCU 16600-001:* Remove screws and washers securing cable guide to chassis.

(d) *MCU 19900-001:* Identify and disconnect P135, P136, P137, and P138 connectors from J135, J136, J137, and J138 connectors.

(e) *MCU 19900-001:* Remove screws securing cable plate to bottom cover.

(f) Remove screws securing MCU bottom cover to chassis.

(g) Remove MCU bottom cover from chassis.

(2) Installation - Serials w/ MCU Bottom Cover

(a) Position bottom cover to chassis and secure with screws.

(b) *MCU 16600-001:* Position cable guide around wire harness J108, J109, J111, J115, and J757, if installed.

(c) *MCU 16600-001:* Install screws and washers securing cable guide to chassis.

(d) *MCU 16600-001:* Position wire harness loom to chassis and secure with clamps, washers, and nuts.

(e) *MCU 19900-001:* Position cable plate to bottom cover and secure with screws.

(f) Install MCU cover.

(g) *MCU 19900-001:* Connect P135, P136, P137, and P138 connectors to J135, J136, J137, and J138 connectors.

J. ALT 1 Current Sensor - Serials w/ MCU *14600-002 & 16600-001* (See Figure 24-3010)

The ALT 1 current sensor, integral to the MCU, is located on the LH side of the power board assembly.

(1) Removal - ALT 1 Current Sensor

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) Disconnect ALT 1 cable assembly from ALT 1 bus bar stud.

(f) *MCU 14600-002:* Loosen nuts securing ALT 1 bus bar to terminal ring support bracket.

(g) *MCU 16600-001:* Loosen nuts securing ALT 1 bus bar to the MCU chassis.

Note: Inboard fuse stud securing ALT 1 current sensor to power board assembly is not soldered to board and may fall lose if not held in place.

(h) *MCU 14600-002:* Remove kep-nuts securing 80A fuse to power board assembly.

(i) *MCU 16600-001:* Remove kep-nuts securing 100A fuse to power board assembly.

(j) Remove screws and washers securing ALT 1 current sensor to power board assembly.

(k) Remove ALT 1 current sensor from power board assembly.

(l) Disassemble ALT 1 bus bar stud, washers, bus bar IX_a, and nuts from ALT 1 current sensor stand-off.

(2) Installation - ALT 1 Current Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Fuse installation.

(b) Assemble ALT 1 bus bar stud, washers, bus bar IX_a, and nuts to ALT 1 current sensor stand-off.

CAUTION: Before installing, examine current sensor module for bent pins. If bent pins are found, gently straighten them.

Do not force current sensor assembly into power board jack. Current sensor should install into jack with gentle pressure.

(c) *MCU 14600-002:* Align ALT 1 current sensor module pins to power board jack while simultaneously aligning bus bar IX_a on fuse stud and ALT 1 bus bar stud over terminal ring support bracket.

(d) *MCU 16600-001:* Align Alt 1 current sensor module pins to power board jack while simultaneously aligning bus bar IX_a on fuse stud and ALT 1 bus bar stud through hole in MCU chassis.

(e) Gently press ALT 1 current sensor assembly onto power board.

(f) Install screws and washers securing ALT 1 current sensor to power board assembly.

(g) Apply Loctite® to power board fuse studs.

(h) *MCU 14600-002:* Position 80A fuse to power board assembly and secure with kep-nuts.

(i) *MCU 16600-001:* Position 100A fuse to power board assembly and secure with kep-nuts.

(j) *MCU 14600-002:* Tighten nuts securing ALT 1 bus bar to terminal ring support bracket.

(k) *MCU 16600-001:* Tighten nuts securing ALT 1 bus bar to MCU chassis.

(l) Connect ALT 1 cable assembly to ALT 1 bus bar stud.
(m) Install MCU cover. (Refer to 24-30)
(n) Connect battery 1. (Refer to 24-30)
(o) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
(p) Install engine cowling. (Refer to 71-10)

K. ALT 2 Current Sensor - Serials w/ MCU *14600-002 & 16600-001* (See Figure 24-3010)

The ALT 2 current sensor, integral to the MCU, is located on the LH side of the power board assembly.

(1) Removal - ALT 2 Current Sensor

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) Disconnect ALT 2 cable assembly from ALT 2 bus bar stud.

(f) *MCU 14600-002:* Loosen nuts securing ALT 2 bus bar to terminal ring support bracket.

(g) *MCU 16600-001:* Loosen nuts securing ALT 2 bus bar to MCU chassis.

(h) Remove kep-nuts securing 40A fuse to power board assembly.

(i) Remove screws and washers securing ALT 2 current sensor to power board assembly.

(j) Remove ALT 2 current sensor from power board assembly.

(k) Disassemble ALT 2 bus bar stud, washers, bus bar IX_b, and nuts from ALT 2 current sensor stand-off.

(2) Installation - ALT 2 Current Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Fuse installation.

(b) Assemble ALT 2 bus bar stud, washers, bus bar IX_b, and nuts to ALT 2 current sensor stand-off.

CAUTION: Before installing, examine current sensor module for bent pins. If bent pins are found, gently straighten them.

Do not force current sensor assembly into power board jack. Current sensor should install into jack with gentle pressure.

(c) *MCU 14600-002:* Align ALT 2 current sensor pins to power board jack while simultaneously aligning bus bar IX_b on fuse stud and ALT 2 bus bar stud over terminal ring support bracket.

(d) *MCU 16600-001:* Align Alt 2 current sensor module pins to power board jack while simultaneously aligning bus bar IX_a on fuse stud and ALT 2 bus bar stud through hole in MCU chassis.

(e) Gently press ALT 2 current sensor assembly onto power board.

(f) Install screws and washers securing ALT 2 current sensor to power board assembly.

(g) Apply Loctite® to power board fuse studs.

(h) Position 40A fuse to power board assembly and secure with kep-nuts.

(i) *MCU 14600-002:* Tighten nuts securing ALT 2 bus bar to terminal ring support bracket.

(j) *MCU 16600-001:* Tighten nuts securing ALT 2 bus bar to MCU chassis.

(k) Connect ALT 2 cable assembly to ALT 2 bus bar stud.

(l) Install MCU cover. (Refer to 24-30)

(m) Connect battery 1. (Refer to 24-30)

(n) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(o) Install engine cowling. (Refer to 71-10)

L. BAT Current Sensor - Serials w/ MCU *14600-002 & 16600-001* (See Figure 24-3010)

The BAT current sensor, integral to the MCU, is located on the lower mid portion of the power board assembly.

(1) Removal - BAT Current Sensor

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) *MCU 14600-002:* Remove kep-nuts securing 100A fuse to power board assembly.

(f) *MCU 16600-001:* Remove kep-nuts securing 125A fuse to power board assembly.

(g) Remove screw, washers, and nut securing bus bar IX_c to power board assembly.

(h) Remove screws and washers securing BAT current sensor to power board assembly.

(i) Remove BAT current sensor from power board assembly.

(j) Disassemble BAT bus bar stud, nuts, washers, bus bar IX_c, and bus bar X, from BAT current sensor stand-off.

(2) Installation - BAT Current Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Fuse installation.

(b) Assemble BAT bus bar stud, nuts, washers, bus bar IX_c, and bus bar X, to BAT current sensor stand-off.

CAUTION: Before installing, examine current sensor module for bent pins. If bent pins are found, gently straighten them.

Do not force current sensor assembly into power board jack. Current sensor should install into jack with gentle pressure.

(c) Align BAT current sensor pins to power board jack while simultaneously aligning bus bar X on fuse stud.

(d) Gently press BAT current sensor assembly onto power board.

(e) Install screws and washers securing BAT current sensor to power board assembly.

(f) Apply Loctite® to power board fuse studs.

(g) *MCU 14600-002:* Position 100A fuse to power board assembly and secure with kep-nuts.

(h) *MCU 16600-001:* Position 125A fuse to power board assembly and secure with kep-nuts.

(i) Install screw, washers, and nut securing bus bar IX_c to power board assembly.

(j) Install MCU cover. (Refer to 24-30)

(k) Connect battery 1. (Refer to 24-30)

(l) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(m) Install engine cowling. (Refer to 71-10)

M. Logic Module - Serials w/ MCU *14600-002 & 16600-001* (See Figure 24-3010)

The logic module, integral to the MCU, is centrally located on the power board assembly.

(1) Removal - Logic Module

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) Remove screws and washers securing logic module to power board assembly.

(f) Remove logic module from power board assembly.

(2) Installation - Logic Module

CAUTION: Before installing, examine logic module for bent pins. If bent pins are found, gently straighten them.

Do not force logic module into power board jack. Logic module should install into jack with gentle pressure.

(a) Align logic module pins to power board jack and gently press logic module onto power board.

(b) Install screws and washers securing logic module to power board assembly.

(c) Install MCU cover. (Refer to 24-30)

(d) Connect battery 1. (Refer to 24-30)

(e) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(f) Install engine cowling. (Refer to 71-10)

N. Midi Fuse - Serials w/ MCU *14600-002 & 16600-001* (See Figure 24-3010)

The midi fuses, integral to the MCU, are installed in five locations on the power board assembly.

(1) Removal - Midi Fuse

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) Remove kep-nuts securing midi fuse to power board assembly.

(f) Remove midi fuse from power board assembly.

(2) Installation - Midi Fuse

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Fuse installation.

(b) Apply Loctite® to power board studs.

(c) Position midi fuse on power board studs.

(d) Install kep-nuts securing midi fuse to power board assembly.

(e) Install MCU cover. (Refer to 24-30)

(f) Connect battery 1. (Refer to 24-30)

(g) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(h) Install engine cowling. (Refer to 71-10)

O. Midi Fuse - Serials w/ MCU *19900-001* (See Figure 24-3010)

The midi fuses, integral to the MCU, are installed in five locations behind the circuit board assembly. Midi fuses are named in accordance with the attaching bus bar.

(1) Removal - Midi Fuse 28
- (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove MCU cover. (Refer to 24-30)
- (e) Remove circuit board assembly.
- (f) Remove screw and washers securing bus bar 28 to power diode.
- (g) Remove nut, washer, and spacers securing bus bar 28 to chassis.
- (h) Remove nuts, washers, and spacers securing bus bar 27 to chassis.
- (i) Remove nut, washers, and screw securing fuse to current shunt.
- (j) Remove nut, washers, and screw securing fuse to bus bar 28.
- (k) Remove fuse from MCU.

(2) Installation - Midi Fuse 28
- (a) Position fuse to bus bar 28 and secure with screw, washers, and nuts.
- (b) Position fuse to current shunt and secure with screw, washers, and nut.
- (c) Position bus bar 27 to chassis and secure with spacers, washers, and nuts.
- (d) Position bus bar 28 to chassis and secure with spacers, washer, and nut.
- (e) Position bus bar 28 to power diode and secure with screws and washers.
- (f) Install circuit board assembly.
- (g) Install MCU cover. (Refer to 24-30)
- (h) Connect battery 1. (Refer to 24-30)
- (i) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
- (j) Install engine cowling. (Refer to 71-10)

(3) Removal - Midi Fuse 18
- (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove MCU cover. (Refer to 24-30)
- (e) Remove circuit board assembly.
- (f) Remove screw, washers, and nut securing fuse to bus bar 18.
- (g) Remove screw securing fuse to power diode.
- (h) Remove fuse from MCU.

(4) Installation - Midi Fuse 18
- (a) Position fuse to power diode and secure with screw.
- (b) Position fuse to bus bar 18 and secure with screw, washers, and nut.
- (c) Install circuit board assembly.
- (d) Install MCU cover. (Refer to 24-30)
- (e) Connect battery 1. (Refer to 24-30)
- (f) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
- (g) Install engine cowling. (Refer to 71-10)

(5) Removal - Midi Fuse 10
- (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)
(e) Remove circuit board assembly.
(f) Remove screw, washers, and nut securing fuse to bus bar 10.
(g) Remove screw, washers, and nut securing fuse to current shunt.
(h) Remove fuse from MCU.

(6) Installation - Midi Fuse 10
(a) Position fuse to current shunt and secure with screw, washers, and nut.
(b) Position fuse to bus bar 10 and secure with screw, washers, and nut.
(c) Install circuit board assembly.
(d) Install MCU cover. (Refer to 24-30)
(e) Connect battery 1. (Refer to 24-30)
(f) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
(g) Install engine cowling. (Refer to 71-10)

(7) Removal - Midi Fuse 19
(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
(b) Remove engine cowling. (Refer to 71-10)
(c) Disconnect battery 1. (Refer to 24-30)
(d) Remove MCU cover. (Refer to 24-30)
(e) Remove circuit board assembly.
(f) Remove screw, washers, and nut securing fuse to current shunt.
(g) Remove screw securing fuse to power diode.
(h) Remove fuse from MCU.

(8) Installation - Midi Fuse 19
(a) Position fuse to power diode and secure with screw.
(b) Position fuse to current shunt and secure with screw, washers, and nut.
(c) Install circuit board assembly.
(d) Install MCU cover. (Refer to 24-30)
(e) Connect battery 1. (Refer to 24-30)
(f) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
(g) Install engine cowling. (Refer to 71-10)

(9) Removal - Midi Fuse 17
(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
(b) Remove engine cowling. (Refer to 71-10)
(c) Disconnect battery 1. (Refer to 24-30)
(d) Remove MCU cover. (Refer to 24-30)
(e) Remove circuit board assembly.
(f) Remove nuts securing 3 bus bar 11s to breakers.
(g) Remove screw securing midi fuse 7 to power diode.
(h) Remove screw securing midi fuse 19 to power diode.
(i) Remove nut and washers securing bus bar 19 to bus bar 16.
(j) Remove nuts and washers securing RH clamp to bus bar 14.
(k) Remove screw, washers, and nut securing fuse to busbar 14.
(l) Remove screw, washers, and nut securing fuse to busbar 17.

(10) Installation - Midi Fuse 17
(a) Position fuse to busbar 17 and secure with screw, washers, and nut.
(b) Position fuse to busbar 14 and secure with screw, washers, and nut.
(c) Position bus bar 14 into clamp and secure with washers and nuts.

(d) Position bus bar 19 to bus bar 16 and secure with washers and nuts.
(e) Position midi fuse 19 to power diode and secure with screw.
(f) Position midi fuse 7 to power diode and secure with screw.
(g) Position 3 bus bar 11s to breakers and secure with nuts.
(h) Install circuit board assembly.
(i) Install MCU cover. (Refer to 24-30)
(j) Connect battery 1. (Refer to 24-30)
(k) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
(l) Install engine cowling. (Refer to 71-10)

P. Midi Fuse - *Serials w/ MCU 19800-001* (See Figure 24-3010)

The midi fuses, integral to the MCU, are installed in two locations on the power board assembly.

(1) Removal - Midi Fuse
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Remove engine cowling. (Refer to 71-10)
  (c) Disconnect battery 1. (Refer to 24-30)
  (d) Remove MCU cover. (Refer to 24-30)
  (e) Remove screws and washers securing fuse to power board assembly.

(2) Installation - Midi Fuse
  (a) Position fuse to power board assembly and secure with screws and washers.
  (b) Install MCU cover. (Refer to 24-30)
  (c) Connect battery 1. (Refer to 24-30)
  (d) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
  (e) Install engine cowling. (Refer to 71-10)

Q. Blade Fuse (See Figure 24-3010)

MCU 14600-001, 14600-002, & 16600-001: The blade fuse, integral to the MCU, is located on the lower LH side of the power board assembly. *MCU 19900-001:* The blade fuses, integral to the MCU, are installed in seven locations on the power board assembly. *MCU 19800-001:* The blade fuses, integral to the MCU, are installed in 21 locations on the power board assembly.

(1) Removal - Blade Fuse
  (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
  (b) Remove engine cowling. (Refer to 71-10)
  (c) Disconnect battery 1. (Refer to 24-30)
  (d) Remove MCU cover. (Refer to 24-30)
  (e) Remove blade fuse from fuse holder.

(2) Installation - Blade Fuse
  (a) Insert blade fuse into fuse holder.
  (b) Install MCU cover. (Refer to 24-30)
  (c) Connect battery 1. (Refer to 24-30)
  (d) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
  (e) Install engine cowling. (Refer to 71-10)

R. External Fuse (See Figure 24-3010)

MCU 14600-001, 14600-002, 16600-001 & 19900-001: The external fuse, integral to the MCU, is located on the RH side of the MCU chassis. *MCU 19800-001:* The external fuse, integral to the MCU, is located on top of the MCU chassis.

(1) Removal - External Fuse
  (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
  (b) Remove engine cowling. (Refer to 71-10)
  (c) Remove external fuse from fuse holder assembly.

(2) Installation - External Fuse
  (a) Insert external fuse into fuse holder assembly.
  (b) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
  (c) Install engine cowling. (Refer to 71-10)

S. Field Control Module - Serials w/ MCU *14600-002, 16600-001* (See Figure 24-3010)

The ALT 1 and ALT 2 field control modules, integral to the MCU, are located on the RH side of the MCU chassis floor.

(1) Removal - Field Control Module

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) *MCU 16600-001:* Remove MCU bottom cover.

(f) Identify and disconnect wire harness from field control module.

(g) Remove lower screw and washer securing field control module to chassis floor.

(h) Ensure flange on field control module is clear of retainer bar and remove from airplane.

(2) Installation - Field Control Module

Note: Do not interchange ALT 1 and ALT 2 field control modules. Verify ALT 1 and ALT 2 field control modules are installed in correct location on chassis floor.

(a) Position field control module with flange under retaining bar, align over installation holes on chassis floor, and secure with screw and washer.

(b) Connect wire harness to field control module.

(c) *MCU 16600-001:* Install MCU bottom cover.

(d) Install MCU cover. (Refer to 24-30)

(e) Connect battery 1. (Refer to 24-30)

(f) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

T. Field Control Module - Serials w/ MCU *19900-001* (See Figure 24-3010)

The ALT 1 and ALT 2 field control modules are integral to the MCU. The ALT 1 field control module is located on the lower, RH side of chassis. The ALT 2 field control module is located on the upper, RH side of chassis floor.

(1) Removal - ALT 1 Field Control Module
- (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove MCU cover. (Refer to 24-30)
- (e) Remove MCU bottom cover. (Refer to 24-30)
- (f) Remove circuit board assembly. (Refer to 24-30)
- (g) Disconnect wire harness from field control module.
- (h) Remove screw and washer securing field control module to chassis.
- (i) Slide field control module from under retainer lip. Remove field control module from airplane.

(2) Installation - ALT 1 Field Control Module
- (a) Position field control module under retainer lip on chassis and secure with screws and washers.
- (b) Connect wire harness to field control module.
- (c) Install circuit board assembly. (Refer to 24-30)
- (d) Install MCU bottom cover. (Refer to 24-30)
- (e) Install MCU cover. (Refer to 24-30)
- (f) Connect battery 1. (Refer to 24-30)
- (g) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
- (h) Install engine cowling. (Refer to 71-10)

(3) Removal - ALT 2 Field Control Module
- (a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove MCU cover. (Refer to 24-30)
- (e) Remove circuit board assembly. (Refer to 24-30)
- (f) Remove screw securing upper RH standoff to chassis.
- (g) Disconnect wire harness from field control module.
- (h) Remove screw securing bus bar 8 and terminal ring 736 to power diode.
- (i) Remove nut and spacers securing bus bar 8 to chassis.
- (j) Remove nuts and spacers securing bus bar 9 to chassis.
- (k) Remove bolt, washers, and nuts securing ALT 2 cable and bus bar 9 to chassis.
- (l) Remove or relocate bus bar 8 and bus bar 9 assembly to allow removal of field control module.
- (m) Remove screw and washers securing field control module to chassis.
- (n) Slide field control module from under retainer lip. Remove field control module from airplane.

(4) Installation - ALT 2 Field Control Module

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Fuse installation.

(b) Position field control module under retainer lip and secure with screws and washers.

(c) Position bus bar 9 to chassis and secure with spacers, washers, and nuts.

(d) Install bolt, washers, and nuts securing alt 2 cable and bus bar 9 to chassis.

(e) Apply Loctite to upper RH standoff and secure to chassis floor with screw. Position sleeve over standoff.

(f) Position bus bar 8 to chassis and secure with spacers, washers, and nut.

(g) Position bus bar and terminal ring 736 to power diode.

(h) Position circuit board support to standoffs and secure with screws and washers.

(i) Connect wire harness to field control module.

(j) Install circuit board assembly. (Refer to 24-30)

(k) Install MCU cover. (Refer to 24-30)

(l) Connect battery 1. (Refer to 24-30)

(m) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(n) Install engine cowling. (Refer to 71-10)

U. Field Control Module - *Serials w/ MCU 19800-001* (See Figure 24-3010)

The ALT 1 and ALT 2 field control modules are integral to the MCU. The ALT 1 field control module is located on the upper chassis. The ALT 2 field control module is located on the lower, RH side of chassis.

(1) Removal - Field Control Module
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Remove engine cowling. (Refer to 71-10)
- (c) Disconnect battery 1. (Refer to 24-30)
- (d) Remove MCU cover. (Refer to 24-30)
- (e) Disconnect wire harness from field control module.
- (f) Remove nuts securing field control module to chassis. Remove field control module from airplane.

(2) Installation - Field Control Module
- (a) Position field control module to chassis and secure with nuts.
- (b) Connect wire harness to field control module.
- (c) Install MCU cover. (Refer to 24-30)
- (d) Connect battery 1. (Refer to 24-30)
- (e) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)
- (f) Install engine cowling. (Refer to 71-10)

V. Circuit Board Assembly - Serials w/ MCU *19900-001* (See Figure 24-3010)

(1) Removal - Circuit Board Assembly

(a) Set BAT1, BAT2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Remove MCU cover. (Refer to 24-30)

(e) Disconnect P134 and P126 connectors from circuit board.

(f) Remove screws securing circuit board to mount.

(g) Remove nuts and clamps securing wire harness to mount.

(h) Remove screws securing mount to chassis standoffs.

(2) Installation - Circuit Board Assembly

(a) Position mount to chassis standoffs and secure with screws.

(b) Position circuit board assembly to mount and secure with screws.

(c) Position wire harness clamps to mount and secure with nuts.

(d) Connect P134 and P126 connectors to circuit board.

(e) Install MCU cover. (Refer to 24-30)

(f) Connect battery 1. (Refer to 24-30)

(g) Perform Operational Inspection - Master Control Unit. (Refer to 24-30)

(h) Install engine cowling. (Refer to 71-10)

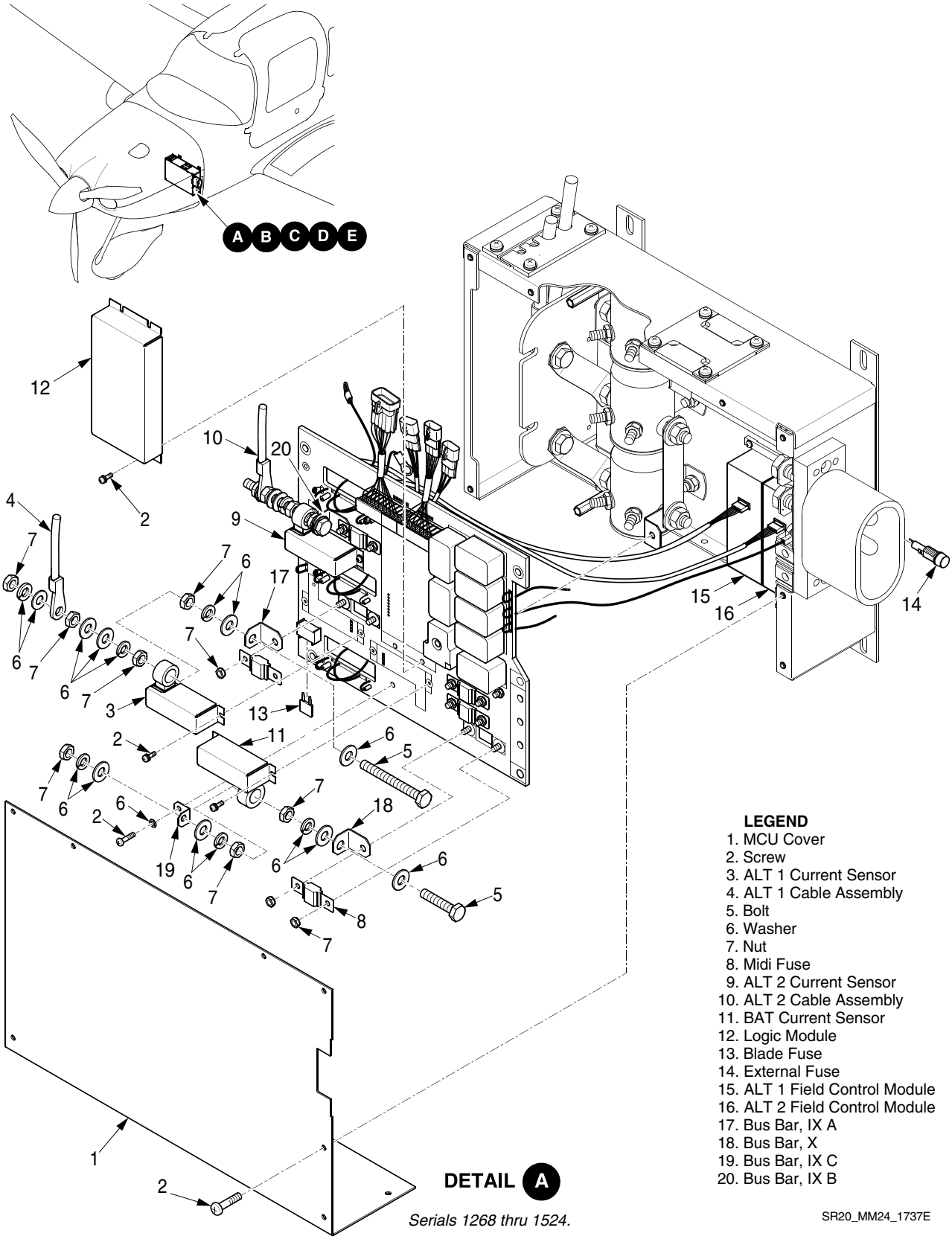
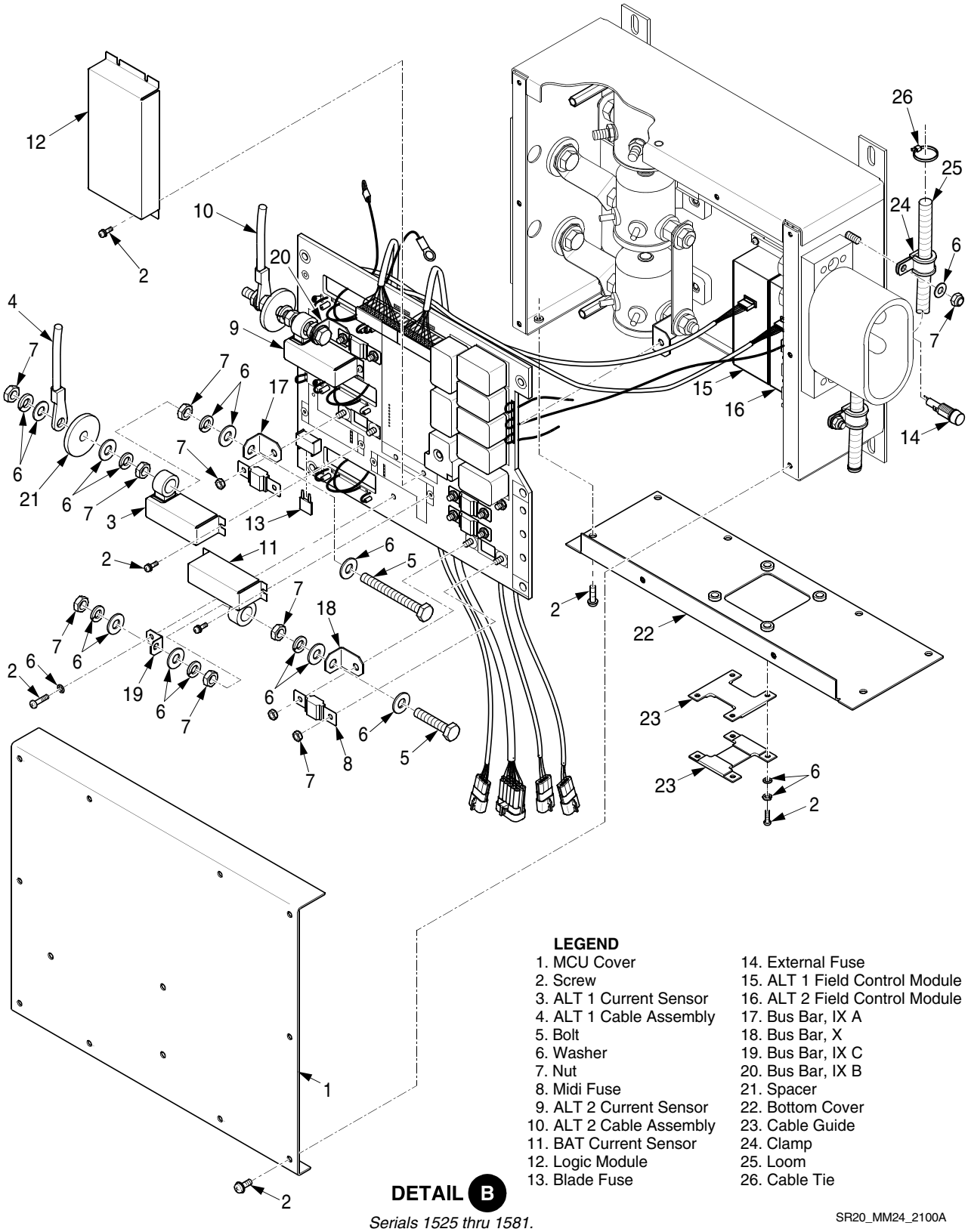


Figure 24-3010
MCU Components - Serials 1268 thru 1524 (Sheet 1 of 5)



LEGEND

1. MCU Cover	14. External Fuse
2. Screw	15. ALT 1 Field Control Module
3. ALT 1 Current Sensor	16. ALT 2 Field Control Module
4. ALT 1 Cable Assembly	17. Bus Bar, IX A
5. Bolt	18. Bus Bar, X
6. Washer	19. Bus Bar, IX C
7. Nut	20. Bus Bar, IX B
8. Midi Fuse	21. Spacer
9. ALT 2 Current Sensor	22. Bottom Cover
10. ALT 2 Cable Assembly	23. Cable Guide
11. BAT Current Sensor	24. Clamp
12. Logic Module	25. Loom
13. Blade Fuse	26. Cable Tie

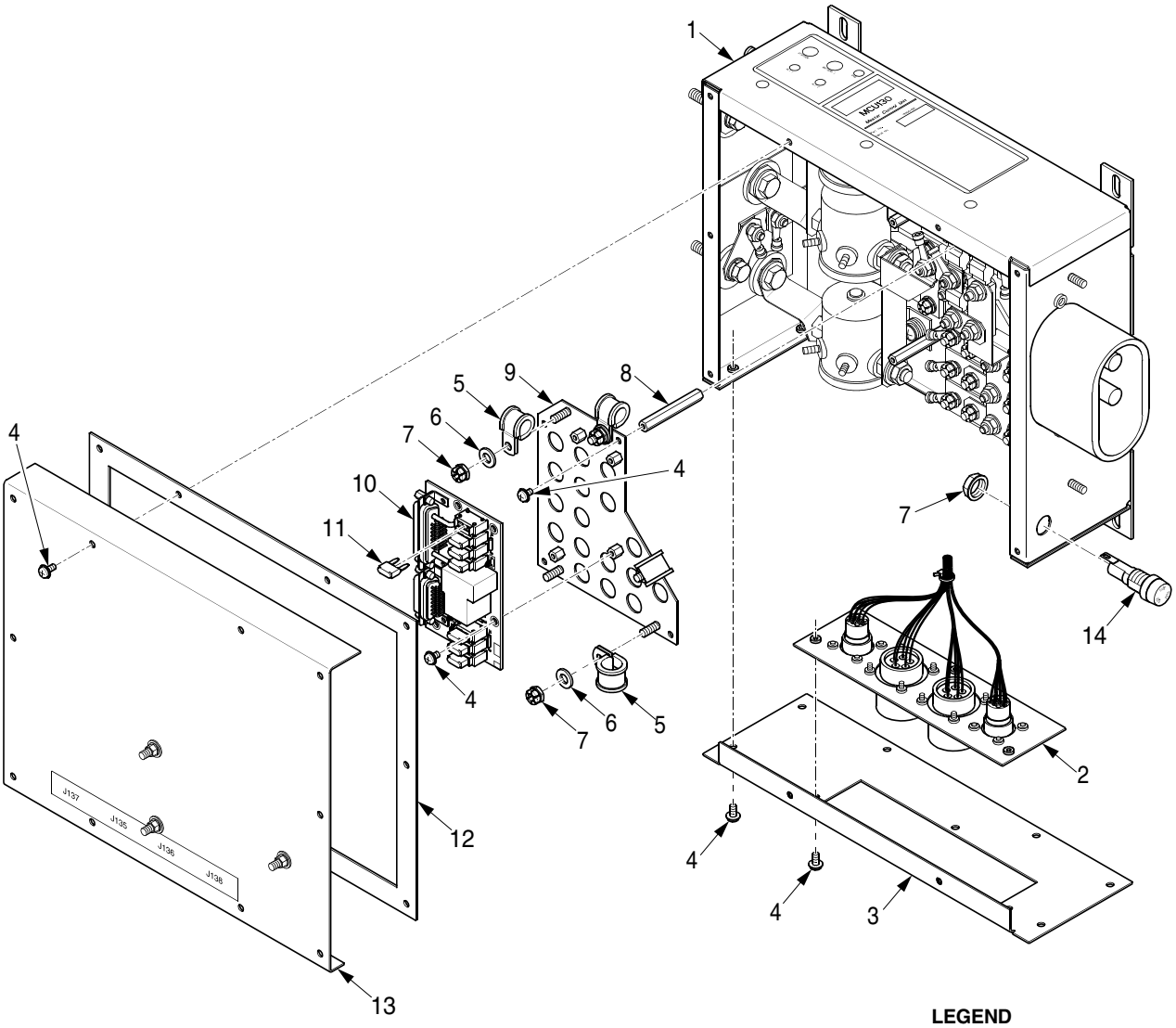
DETAIL B

Serials 1525 thru 1581.

SR20_MM24_2100A

Figure 24-3010
MCU Components - Serials 1525 thru 1581 (Sheet 2 of 5)

EFFECTIVITY:
Serials 1525 thru 1581



LEGEND

1. Master Control Unit (MCU)
2. Bottom Cable Plate
3. Bottom Cover
4. Screw
5. Clamp
6. Washer
7. Nut
8. Standoff
9. Power Board Mount
10. Power Board
11. Blade Fuse
12. Gasket
13. MCU Cover
14. External Fuse

DETAIL C

SR20_MM24_2243

Figure 24-3010
MCU Components - Serials 1582 & subs w/o Perspective Avionics (Sheet 3 of 5)

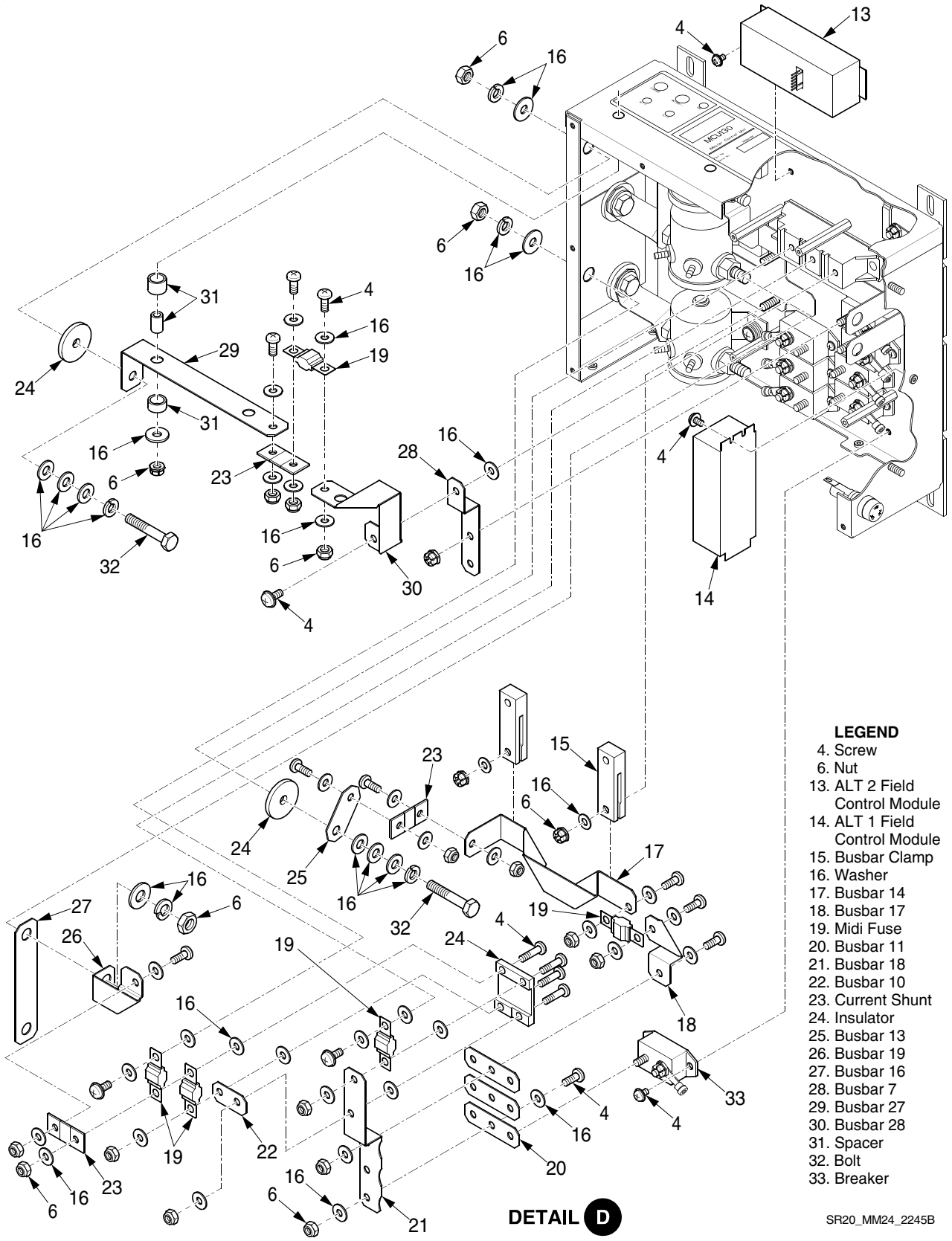


Figure 24-3010
MCU Components - Serials 1582 & subs w/o Perspective Avionics (Sheet 4 of 5)

EFFECTIVITY:
Serials 1582 & subs w/o Perspective Avionics

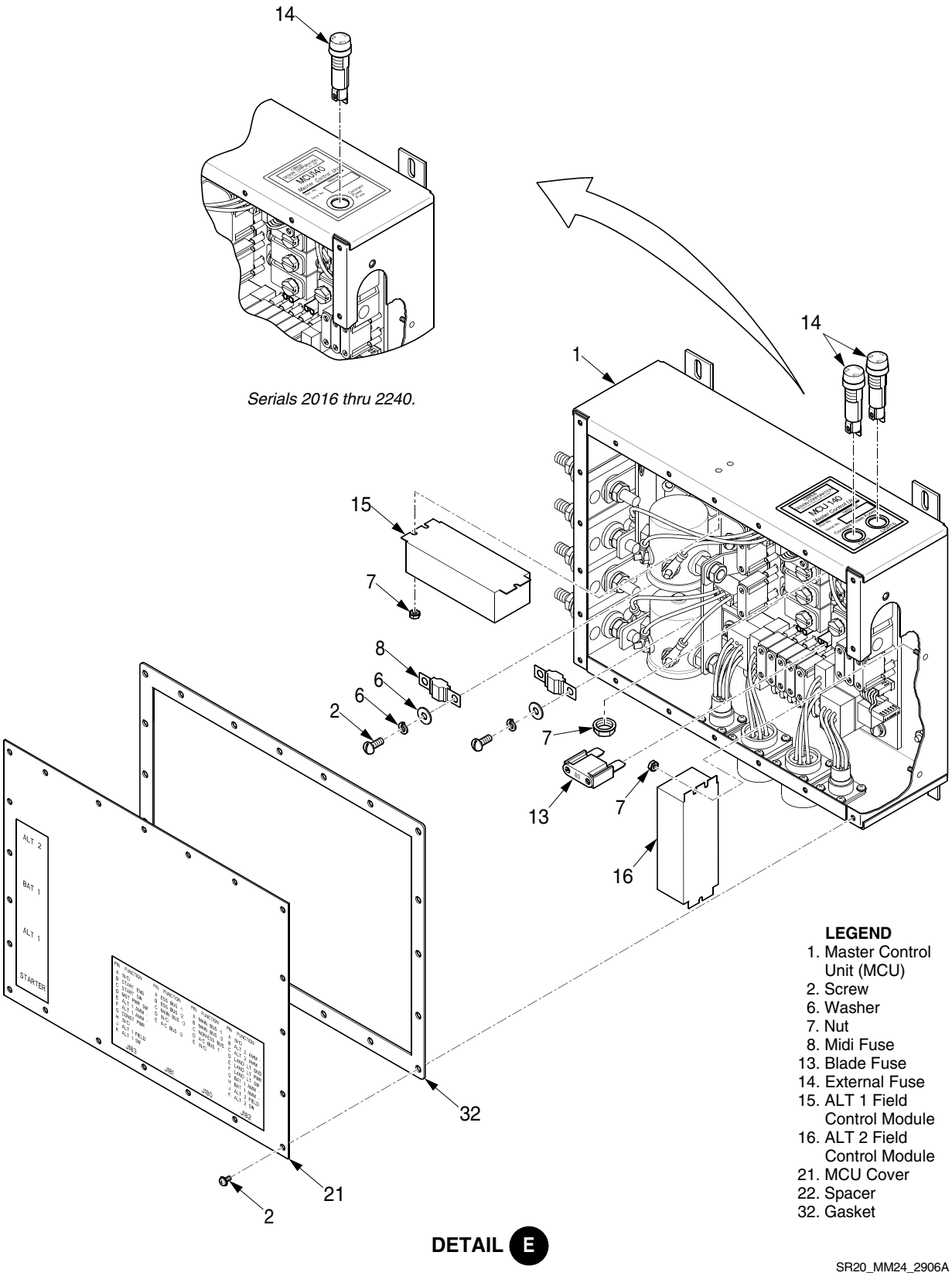


Figure 24-3010
MCU Components - Serials 2016 & subs w/ Perspective Avionics (Sheet 5 of 5)

W. Low-Volts Warning Light (Annunciator Panel) (Refer to 31-50)

X. ALT 1 and ALT 2 Fail Lights (Refer to 31-50)

Y. Volt / Amp Meter - *Serials 1005 thru 1581* (See Figure 24-3011)

(1) Removal - Volt / Amp Meter

(a) Set BATTERY and AVIONICS switches to OFF positions.

(b) *Serials 1268 thru 1581:* Pull BAT 2 circuit breaker to the OFF position.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect battery 1. (Refer to 24-30)

(e) Remove MFD. (Refer to 31-60)

(f) Remove screws and washers securing volt / amp meter to instrument panel.

(g) Identify and disconnect wire harness connector from volt / amp meter.

(h) *Serials 1005 thru 1502 w/ 100A amp meter after SB 2X-24-04:* Disconnect amp meter adaptor from wire harness connector.

(i) Remove volt / amp meter from airplane.

(2) Installation - Volt / Amp Meter

Note: Volt/amp meter P/N 11240-001 requires adaptor installation between amp meter and wire harness connector.

(a) Identify and connect wire harness connector to volt / amp meter.

(b) Position volt/amp meter to instrument panel and secure with screws and washers.

(c) Install MFD. (Refer to 31-60)

(d) Connect battery 1. (Refer to 24-30)

(e) Install engine cowling. (Refer to 71-10)

(f) *Serials 1268 thru 1581:* Reset BAT 2 circuit breaker.

(g) Perform Operational Test - Volt / Amp Meter. (Refer to 24-30)

(3) Operational Test - Volt / Amp Meter

(a) Set BAT 1 switch to ON position.

(b) Verify needle indicates 26 ±2 VDC.

(c) Set BAT 1 switch to OFF position.

Z. Volt / Amp Meter - *Serials 1582 & subs* **(See Figure 24-3011)**

Note: Voltage and amperage are displayed on the screens of the MFD and PFD.

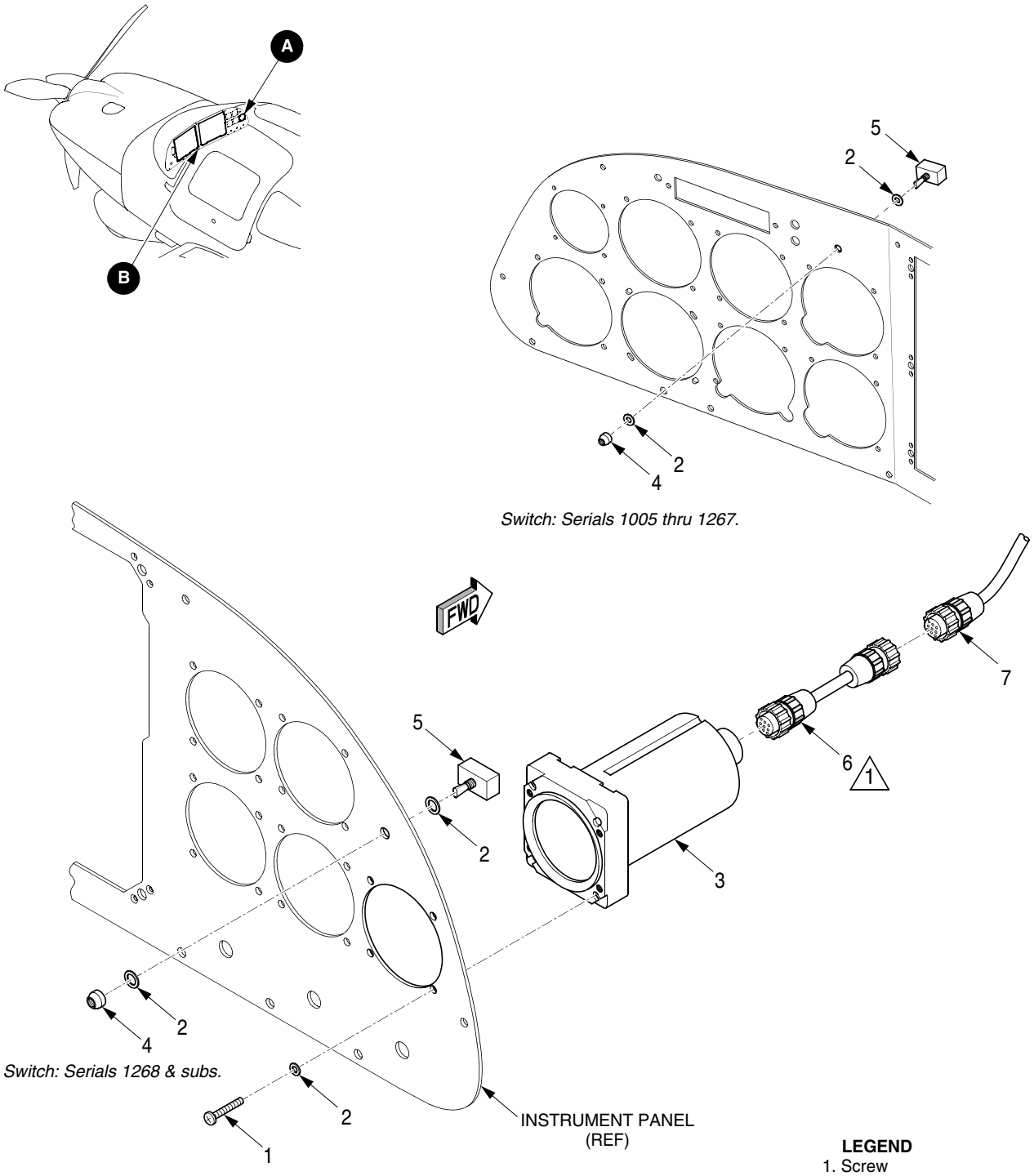
(1) Operational Test - Volt / Amp Meter
- (a) Set BAT1 and AVIONICS switches to ON positions.
- (b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
- (c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
- (d) Rotate left knob to select Engine page.
- (e) Verify main bus voltage indicates 26 ±2 VDC.
- (f) Verify essential bus voltage indicates no more than 1 vdc less than the main bus voltage.
- (g) Verify ALT1 indicates zero amps.
- (h) Verify ALT2 indicates zero amps.
- (i) Verify BATT indicates Dschg 0 - 10 amps.
- (j) Turn on large electrical loads (landing light, nav lights, pitot heat, etc.) to ensure more amps are drawn when larger electrical loads are introduced.
- (k) Verify ammeter indicates an increase in amperage.
- (l) Set BAT1 and AVIONICS switches to OFF positions.

AA. Ammeter Select Switch - *Serials 1005 thru 1581* (See Figure 24-3011)

(1) Removal - Ammeter Select Switch
- (a) Ensure BATTERY and AVIONICS master switches are in the OFF position.
- (b) *Serials 1268 thru 1581:* Pull BAT 2 circuit breaker to the OFF position.
- (c) Remove engine cowling. (Refer to 71-10)
- (d) Disconnect battery 1. (Refer to 24-30)
- (e) Remove MFD. (Refer to 31-60)
- (f) Remove screws and washers securing low-volts annunciator to instrument panel.
- (g) Identify and disconnect all wires from low-volts annunciator and select switch.
- (h) Remove nut and washer securing ammeter select switch to instrument panel. Remove Low-Volts annunciator and Ammeter Select Switch from instrument panel.
- (i) To disconnect switch, use a solder gun and remove solder from each terminal.

(2) Installation - Ammeter Select Switch
- (a) Identify the corresponding wires and place heat shrink tubing into position. Solder all wires to the corresponding terminal on the switch.
- (b) Install screws and washers securing low-volts annunciator to instrument panel.
- (c) Place ammeter select switch into position and secure with washer and nut.
- (d) Install MFD. (Refer to 31-60)
- (e) Connect battery 1. (Refer to 24-30)
- (f) Install engine cowling.
- (g) *Serials 1268 thru 1581:* Reset BAT 2 circuit breaker.
- (h) Perform Operational Test - Ammeter Select Switch. (Refer to 24-30)

(3) Operational Test - Ammeter Select Switch
- (a) Set ammeter switch to "BATT".
- (b) Ammeter should read 0 to -10 amps.
- (c) Turn on large electrical loads (landing light, nav lights, pitot heat, etc.) to ensure more amps are drawn when larger electrical loads are introduced.
- (d) Verify ammeter indicates an increased discharge.
- (e) Set ammeter switch to "ALT1" and "ALT2".
- (f) Ammeter should read “0” in both positions.



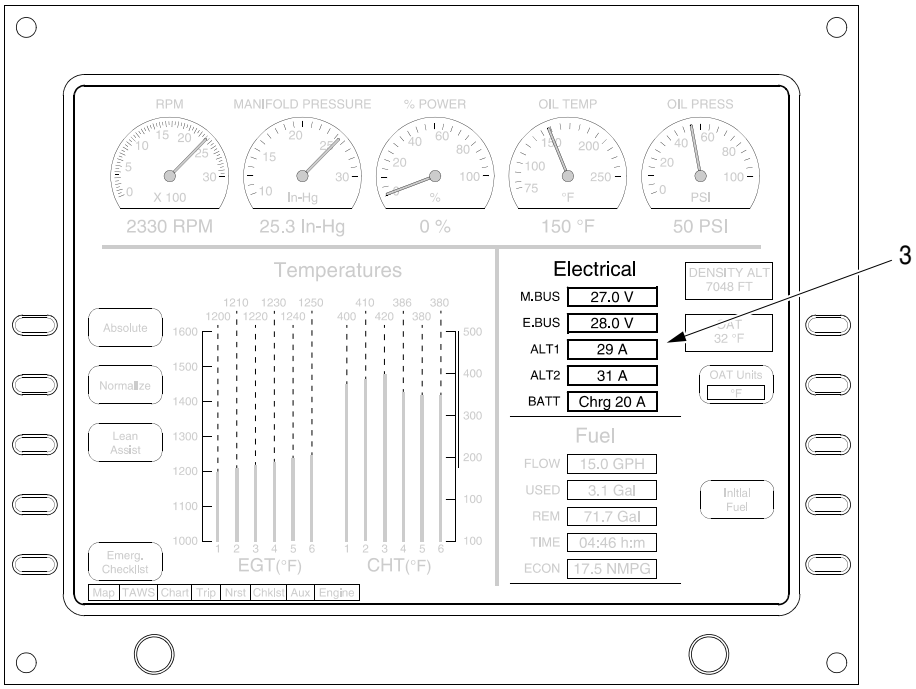
LEGEND

1. Screw
2. Washer
3. Amp Meter
4. Nut
5. Ammeter Select Switch
6. Adaptor
7. Connector

NOTE

1 *Serials 1005 thru 1502 w/ 100A amp meter after SB 2X-24-04.*

Figure 24-3011
Amp Meter Installation - Serials 1005 thru 1581 (Sheet 1 of 3)



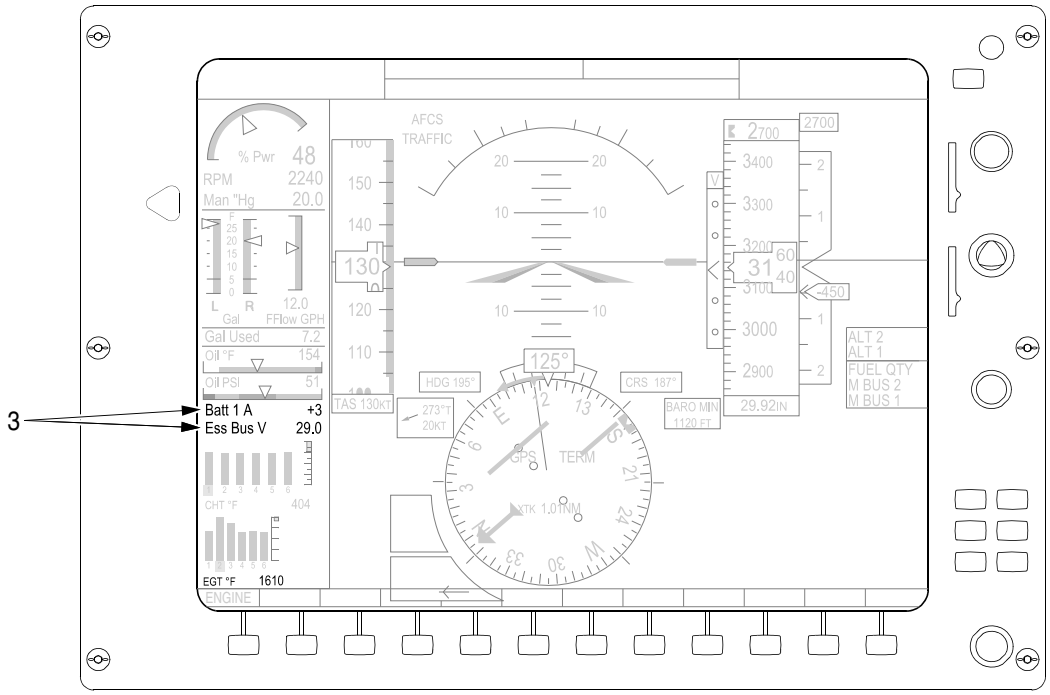
LEGEND
3. Amp Meter

DETAIL B

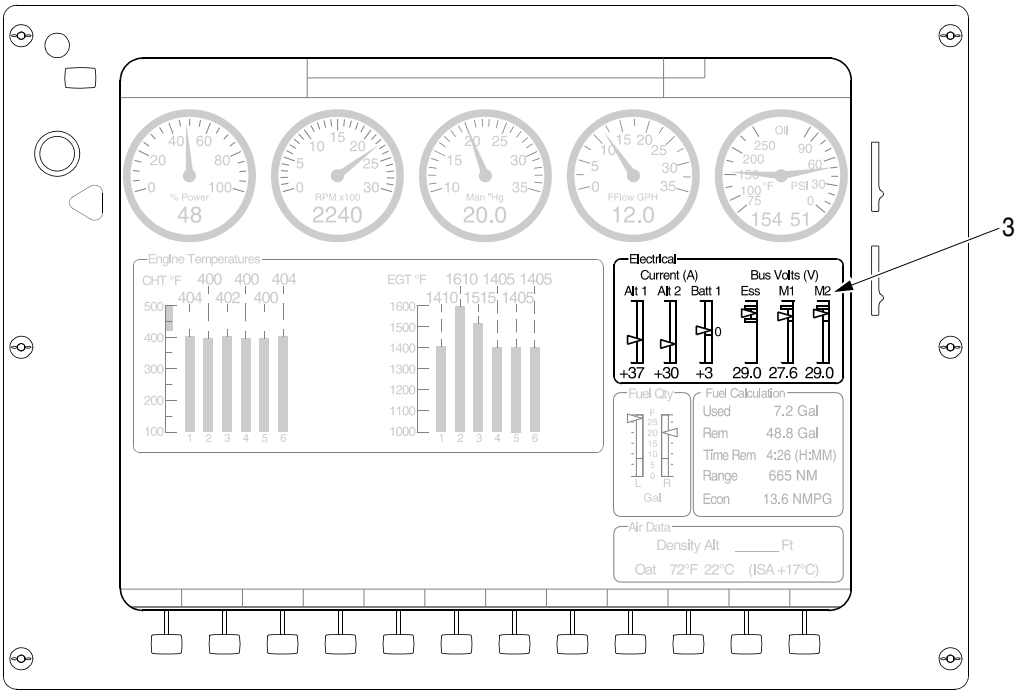
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Figure 24-3011
Amp Meter Installation - Serials 1582 & subs w/o Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 1582 & subs w/o Perspective Avionics



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

DETAIL C

LEGEND
3. Amp Meter

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM24_2892A

Figure 24-3011
Amp Meter Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

AB. Turn Coordinator Batteries - *Serials 1005 thru 1267* (See Figure 24-3012)

All turn coordinator batteries must be inspected every year for the current expiration date stamp. All turn coordinator batteries must be replaced prior to the date stamped on the batteries or whenever turn coordinator power is used. Replace all turn coordinator batteries at the same time and with same expiration date stamp.

(1) Removal - Turn Coordinator Batteries

WARNING: **Turn coordinator batteries cannot be recharged, only replaced.**

CAUTION: Ensure electrical power to airplane is off prior to performing maintenance. Do not use abrasive cleaners or materials to clean battery contacts.

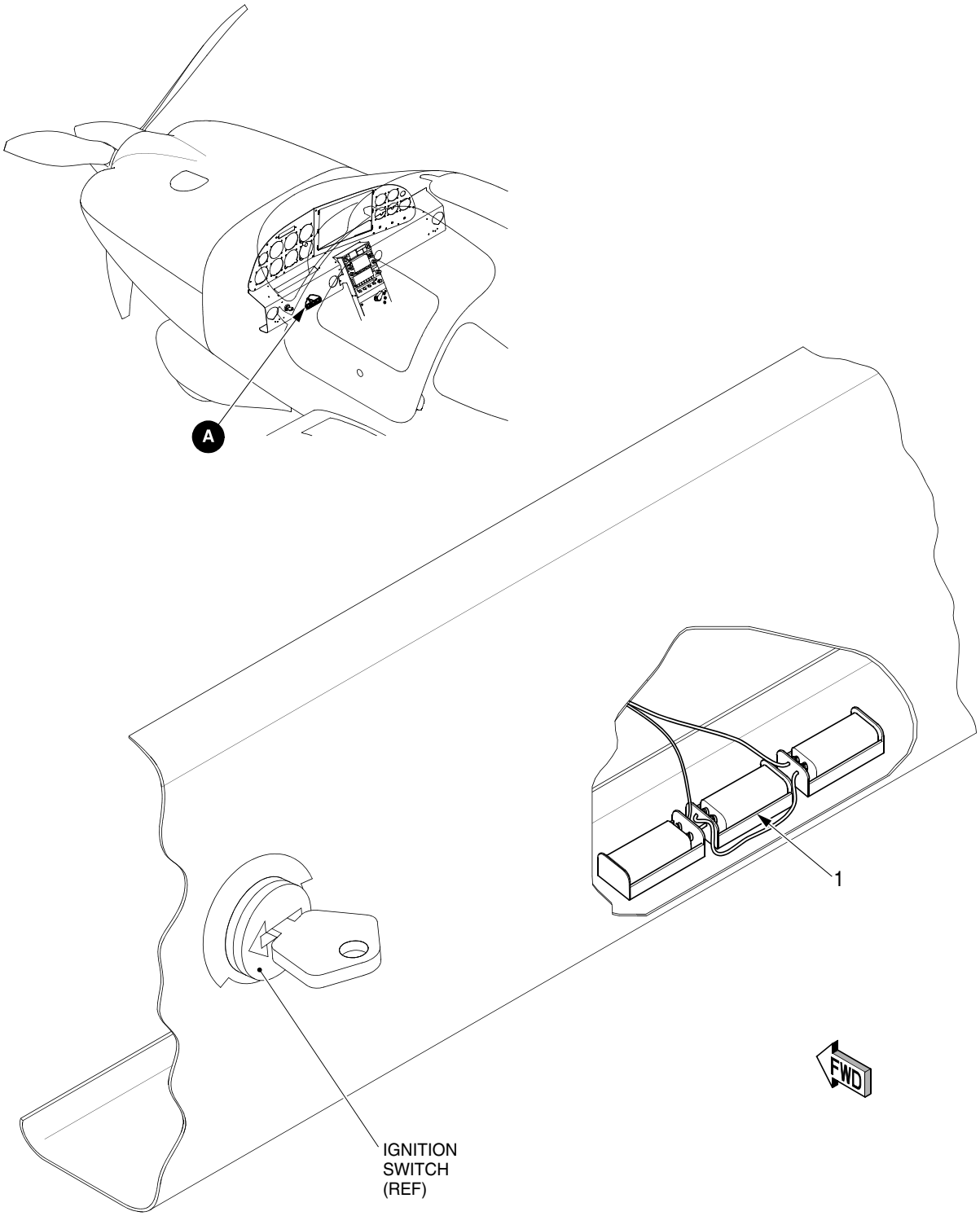
(a) Remove LH kick plate. (Refer to 25-10)
(b) Locate battery tray fastened to under-side flange of bolster panel.
(c) Pry battery tray from lock strip.
(d) Remove batteries from battery tray.
(e) Examine battery contacts for dirt or corrosion, clean or replace contacts as necessary.
(f) Record battery replacement date of new cells in Airplane Log Book.

(2) Installation - Turn Coordinator Batteries

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Batteries (9 volt)	MN1604	Duracell	Provide emergency power to turn coordinator.

(b) Install batteries as indicated by battery orientation illustration affixed to inside of battery case.
(c) Verify correct battery voltage and terminal location to ensure batteries have correct voltage and that they have been installed correctly.



LEGEND
1. Turn Coordinator Battery

DETAIL A

Serials 1005 thru 1267.

SR20_MM24_1149B

Figure 24-3012
Turn Coordinator Batteries - Serials 1005 thru 1267

AC. Battery 1 (See Figure 24-3013)

(1) Removal - Battery 1

WARNING: **All electrical circuits must be off, prior to disconnecting battery cables. Always remove the negative battery cable first, then the positive cable. Insulate cable ends and battery terminals to prevent accidental re-connection.**

Remove all jewelry before servicing the battery. Metal objects may fuse to electrical connections and cause severe burns. Wear face shield and protective clothing when servicing battery and/or handling electrolyte. Neutralize electrolyte spills with a solution of baking soda and water, then rinse with clean water.

Note: The battery box should be washed out thoroughly and dried each time the battery is removed. Use a non-metallic bristle brush to clean the battery. The battery vent hose should be inspected periodically for obstructions.

(a) To disconnect battery 1:

1 Verify ignition switch is in OFF position and remove the key.

2 Set BATTERY and AVIONICS switches to OFF positions.

3 *Serials 1268 & subs:* Pull BAT 2 circuit breaker.

4 Remove upper engine cowling. (Refer to 71-10).

CAUTION: After battery disconnection, insulate cable ends and battery terminals to prevent accidental connection.

5 Remove negative battery cable from battery terminal.

6 Remove positive battery cable from battery terminal.

7 Insulate cable ends and battery terminals. (Refer to 24-30)

(b) To remove battery 1:

1 *Serials w/ TCM battery:* Remove clamp securing vent hose to battery.

2 *Serials 1005 thru 1267:* Remove bolts, washers, and cotter pins securing hold-down bracket to battery mounting tray.

3 *Serials 1268 & subs:* Remove bolts and washers securing hold-down bracket to battery mounting tray.

4 Remove battery hold-down bracket and battery from airplane.

(2) Installation - Battery 1

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Bicarbonate of Soda (baking soda)	-	Any Source	Neutralize electrolyte.
Contact Cleaner	-	Any Source	Clean terminals.
Acid Resistant Bristle Brush (non-metallic)	-	Any Source	Clean terminals.
Petroleum Jelly	VV-P-236	Any Source	Prevent corrosion.

(b) To install battery 1:

1 Rinse battery with fresh water and wipe clean with a dry cloth.

2 Visually inspect battery box for corrosion and spilled electrolyte.

CAUTION: Do not allow bicarbonate of soda to enter battery cells or permanent battery damage will result.

3 If necessary, clean battery with a solution of bicarbonate of soda and clean water.

4 Using contact cleaner and bristle brush, remove dirt and corrosion from battery terminals.

CAUTION: Ensure hold-down bracket is installed to prevent damage to battery.

5 Install battery into battery mounting tray, and position battery hold-down bracket to top of battery.

6 *Serials 1005 thru 1267:* Install bolts, washers, and cotter pins securing battery hold-down bracket to battery mounting tray.

7 *Serials 1268 & subs:* Install bolts and washers securing battery hold-down bracket to battery mounting tray. Torque bolts to 10 in-lb (1.1 Nm) greater than accepted nut drag. Maximum torque not to exceed 45 in-lb (5.1 Nm).

8 *Serials w/ TCM battery:* Inspect battery vent hose for damage, kinks, or obstructions.

9 *Serials w/ TCM battery:* Position battery vent hose to battery and secure with clamp.

(c) To connect battery 1:

CAUTION: Connecting cables in reverse (positive to negative and negative to positive) can cause serious damage to the electrical system. Connect the negative cable last.

1 Connect positive battery cable to positive terminal.

2 Connect negative battery cable to negative terminal.

3 To prevent corrosion, apply petroleum jelly to battery terminals.

4 Install engine cowling. (Refer to 71-10)

5 *Serials 1268 & subs:* Reset BAT 2 circuit breaker.

6 Verify operation of electrical system.

(3) Inspection/Check - Battery 1 Capacity

Note: *Serials w/ TCM Battery:* A fully charged battery is considered serviceable if it meets 80% of the 30 minute emergency capacity rating.

Serials w/ Concorde Battery: A fully charged battery is considered serviceable if it meets 85% of the nominal rated capacity (C1) shown on the label.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
24-Volt Battery Capacity Tester	-	Any Source	Test battery condition.

(b) Verify ignition switch is in OFF position and remove the key.

(c) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(d) Pull BAT 2 circuit breaker.
(e) Remove battery 1. (Refer to 24-30)
(f) Perform capacity test as instructed by the manufacturer.(Refer to 05-10)
(g) If battery fails capacity test, replace battery.
(h) Install battery 1. (Refer to 24-30)
(i) Reset BAT 2 circuit breaker.

(4) Inspection/Check - Battery 1 Charging - *Serials 1005 & subs w/ TCM Battery*

If the airplane is parked for long periods of time, the battery may become discharged. The battery may be recharged using a constant-voltage charger.

WARNING: **Do not charge battery in airplane or within 10 feet of a fuel servicing area. The battery cell caps must be installed during charging.**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Battery Charger (constant-current)	24 Volt	Any Source	Charge battery.

(b) Verify ignition switch is in OFF position and remove the key.
(c) Set BATTERY and AVIONICS switches to OFF positions.
(d) Remove battery 1. (Refer to 24-30)
(e) Perform Battery 1 Electrolyte Specific Gravity Check. (Refer to 12-10)
(f) Ensure battery cell caps are installed and battery charger is turned off.
(g) Connect battery charger positive lead to positive terminal.
(h) Connect battery charger negative lead to negative terminal.
(i) Set battery charger switch to ON position.
(j) Charge battery at 3-amp rate until cells are gassing. Once cells start gassing, reduce rate of charge to 1.5 amps.

Note: Allow 18 to 24 hours to fully charge battery. During charging, maintain electrolyte temperature between 60 - 110°F.

(k) Charge battery until voltage and specific gravity readings are constant over three readings taken at 1/2-hour intervals.
(l) Set battery charger switch to OFF position. Unplug battery charger.
(m) Disconnect battery charger negative lead.
(n) Disconnect battery charger positive lead.
(o) Install battery 1. (Refer to 24-30)

(5) Inspection/Check - Battery 1 Charging - *Serials 2016 & subs w/ Concorde Battery*

If the airplane is parked for long periods of time, the battery may become discharged. The battery may be recharged using a constant potential charger.

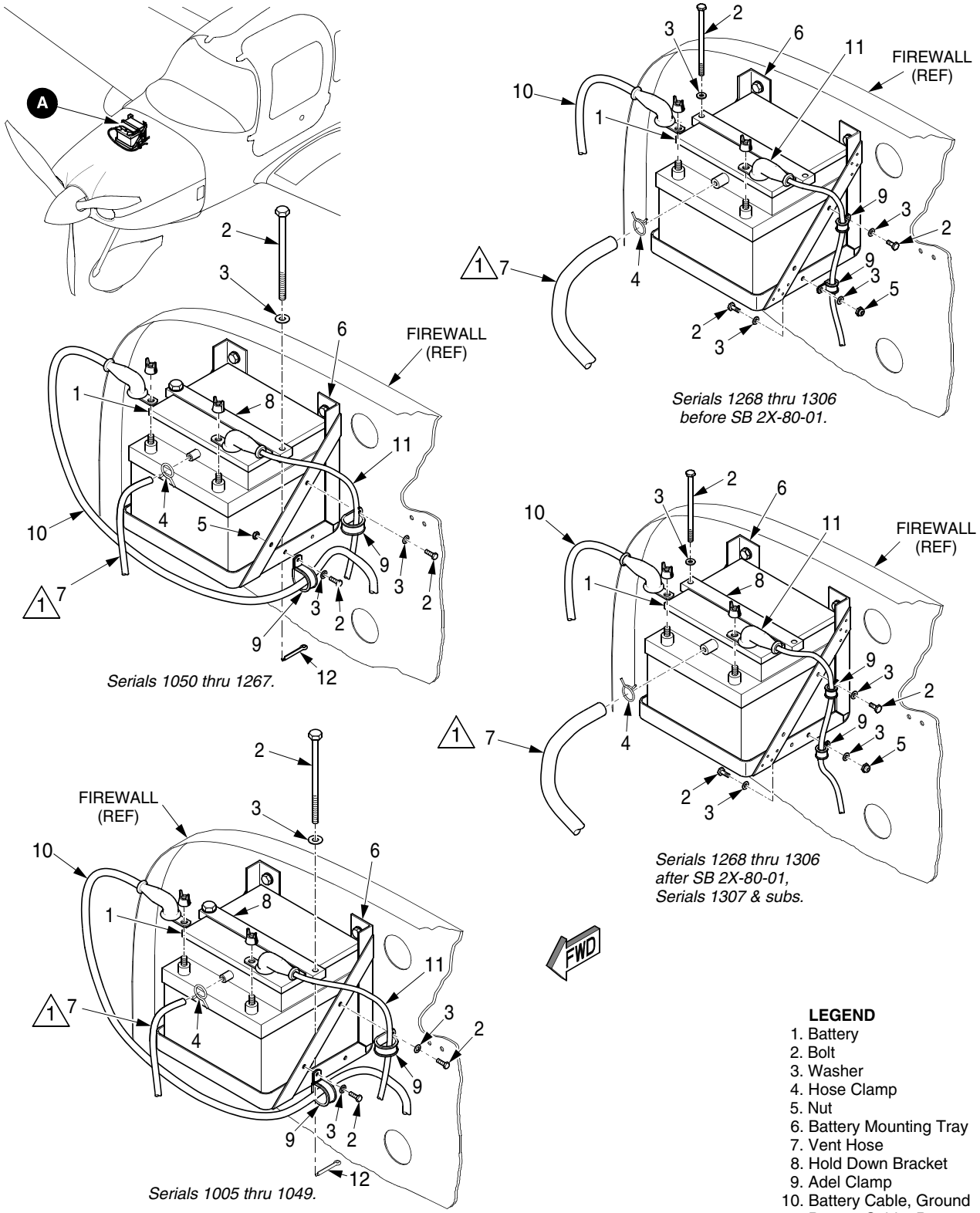
WARNING: **Do not charge battery in airplane or within 10 feet of a fuel servicing area.**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Battery Charger (constant potential)	4142	Advanced Power Products Azusa, CA 91702 626-969-7227	Charge Battery 1.

CAUTION: Some battery chargers will destroy the battery. Contact manufacturer for determination of equivalent equipment.

(b) Verify ignition switch is in OFF position and remove the key.
(c) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(d) Remove battery 1. (Refer to 24-30)
(e) Ensure battery charger is turned off.
(f) Connect battery charger positive lead to positive terminal.
(g) Connect battery charger negative lead to negative terminal.
(h) Set battery charger switch to ON position.
(i) Charge battery at 28.2 volts constant potential until charge current stabilizes for 1 hour.
(j) Set battery charger switch to OFF position. Unplug battery charger.
(k) Disconnect battery charger negative lead.
(l) Disconnect battery charger positive lead.
(m) Install battery 1. (Refer to 24-30)



LEGEND

1. Battery
2. Bolt
3. Washer
4. Hose Clamp
5. Nut
6. Battery Mounting Tray
7. Vent Hose
8. Hold Down Bracket
9. Adel Clamp
10. Battery Cable, Ground
11. Battery Cable, Power
12. Cotter Pin

NOTE

1 Battery drain hose only installed on airplanes with TCM battery.

SR20_MM24_2061B

Figure 24-3013
Battery 1 Installation

AD. Battery 2 (See Figure 24-3014) - *Serials 1268 & subs*

(1) Removal - Battery 2

WARNING: **All electrical circuits must be off, prior to disconnecting battery cables. If battery 2 becomes damaged and electrolyte is spilled, neutralize the spill immediately with a solution of baking soda and water, then rinse with clean water.**

(a) Verify ignition switch is in OFF position and remove the key.
(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) *Serials 1005 thru 1422:* Remove access panel CB6. (Refer to 06-00)
(d) *Serials 1423 & subs:* Remove access panel RE3. (Refer to 06-00)
(e) Disconnect vent hose from battery enclosure.
(f) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Disconnect electrical connector from battery enclosure.
(g) *Serials 2016 & subs w/ Perspective Avionics:* Remove cable ties securing wire harness service loop to empennage.
(h) *Serials 1005 thru 1422:* Remove screws and washers securing battery enclosure to mounting tray standoffs.
(i) *Serials 1423 & subs:* Remove screws, washers, and spacers securing battery enclosure to mounting tray.
(j) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Remove battery enclosure from airplane.
(k) *Serials 2016 & subs w/ Perspective Avionics:* Position battery enclosure near access panel opening.
(l) Remove screws, washers, and nuts securing upper battery enclosure to lower battery enclosure.
(m) Disconnect negative battery cables from battery terminals.
(n) Disconnect positive battery cables from battery terminals.
(o) Remove batteries from lower enclosure.

CAUTION: Do not use abrasive cleaners or materials to clean battery terminals.

(p) Visually inspect battery terminals for dirt or corrosion. Clean or replace terminals as necessary.

(2) Installation - Battery 2

(a) Position batteries to lower battery enclosure.
(b) Connect positive battery cables to battery terminals.
(c) Connect negative battery cables to battery terminals.
(d) Position upper battery enclosure to lower battery enclosure and secure with screws, washers, and nuts.
(e) *Serials 1005 thru 1422:* Position battery enclosure to mounting tray standoffs and secure with screws and washers.
(f) *Serials 1423 & subs:* Position battery enclosure to mounting tray and secure with screws, washers, and spacers.
(g) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Connect electrical connector to battery enclosure.
(h) *Serials 2016 & subs w/ Perspective Avionics:* Position wire harness service loop to fuselage and secure with cable ties.
(i) Connect vent hose to battery enclosure.

(j) *Serials 1005 thru 1422:* Install access panel CB6. (Refer to 06-00)

(k) *Serials 1423 & subs:* Install access panel RE3. (Refer to 06-00)

(3) Inspection/Check - Battery 2 Top-Charging

The battery will discharge at approximately 3% per month when storage temperature is maintained at 68° F (20° C). Self-discharge rate will vary with storage temperature and the remaining capacity. If the battery is going to be stored for extended periods of time, the battery should be top-charged periodically with a constant-voltage charger.

WARNING: Do not charge batteries in airplane or within 10 feet of a fuel servicing area.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Battery Charger (constant-voltage)	24 Volt	Any Source	Charge Battery 2.

(b) Verify ignition switch is in OFF position and remove key.

(c) Set BAT 1, BAT 2, and master switches to OFF positions.

(d) Remove battery 2. (Refer to 24-30)

(e) Ensure battery charger is turned off.

(f) Connect battery charger positive lead to positive terminal.

(g) Connect battery charger negative lead to negative terminal.

(h) Set battery charger switch to ON position.

CAUTION: In higher temperature areas, the battery should be charged at the lower voltage of 2.35 volts per cell.

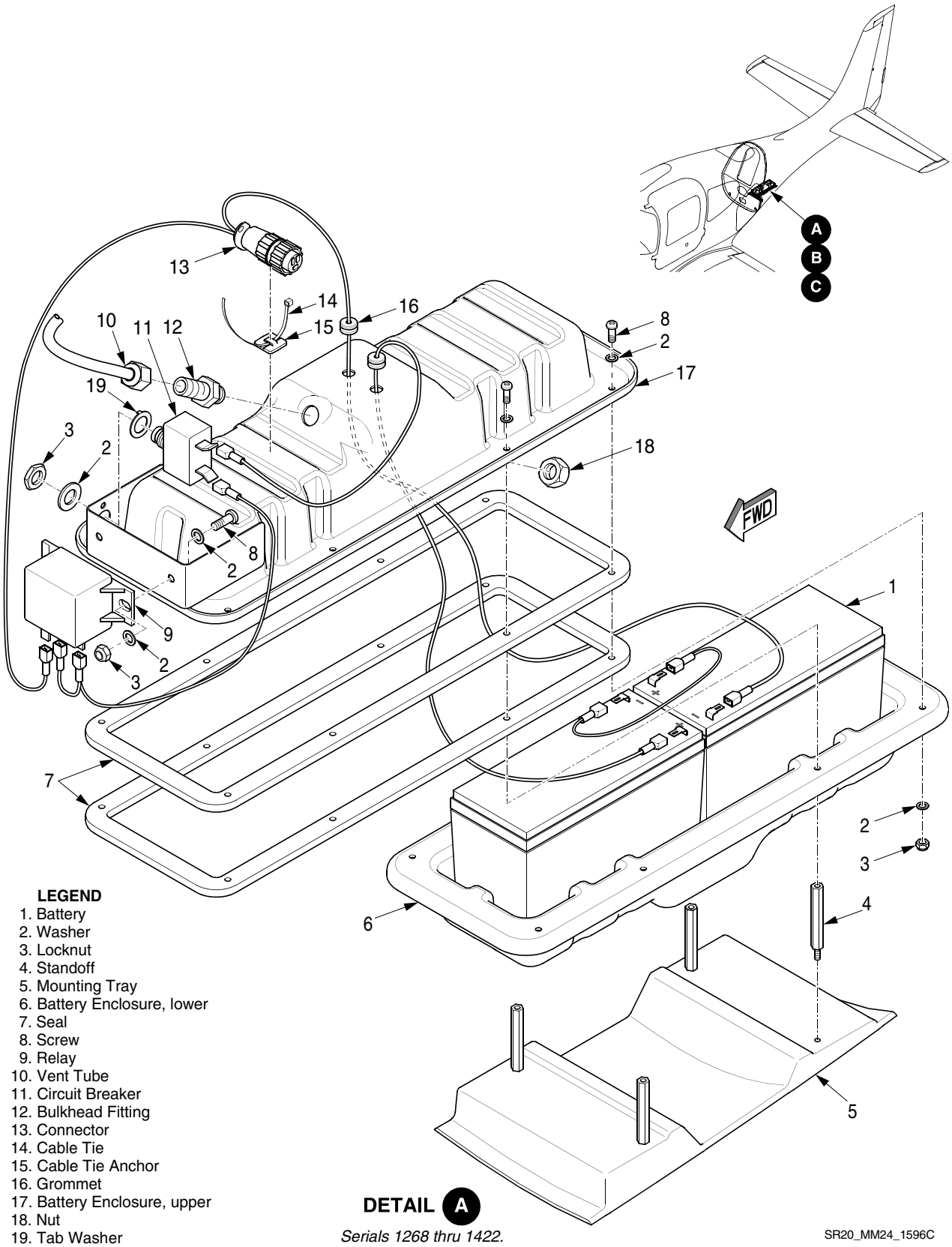
(i) Charge battery at a rate of 2.35 to 2.47 volts per cell (each battery has 6-cells).

(j) Set battery charger switch to OFF position. Unplug battery charger.

(k) Disconnect battery charger negative lead.

(l) Disconnect battery charger positive lead.

(m) Install battery 2. (Refer to 24-30)

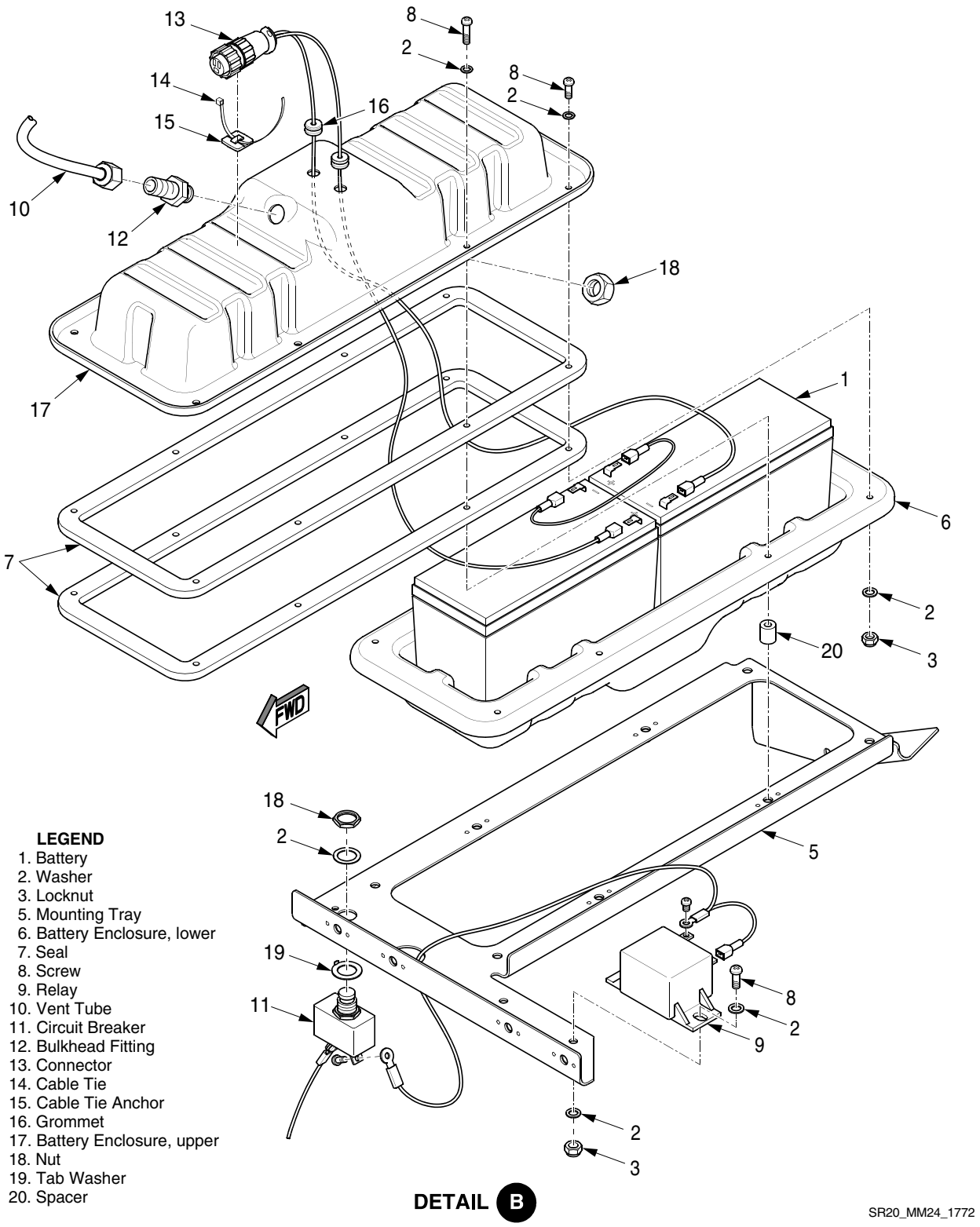


LEGEND

1. Battery
2. Washer
3. Locknut
4. Standoff
5. Mounting Tray
6. Battery Enclosure, lower
7. Seal
8. Screw
9. Relay
10. Vent Tube
11. Circuit Breaker
12. Bulkhead Fitting
13. Connector
14. Cable Tie
15. Cable Tie Anchor
16. Grommet
17. Battery Enclosure, upper
18. Nut
19. Tab Washer

Serials 1268 thru 1422.

Figure 24-3014
Battery 2 - Serials 1268 thru 1422 (Sheet 1 of 3)



LEGEND

1. Battery
2. Washer
3. Locknut
5. Mounting Tray
6. Battery Enclosure, lower
7. Seal
8. Screw
9. Relay
10. Vent Tube
11. Circuit Breaker
12. Bulkhead Fitting
13. Connector
14. Cable Tie
15. Cable Tie Anchor
16. Grommet
17. Battery Enclosure, upper
18. Nut
19. Tab Washer
20. Spacer

Figure 24-3014
Battery 2 - Serials 1423 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 1423 thru 2015, 2016 & subs w/o Perspective Avionics

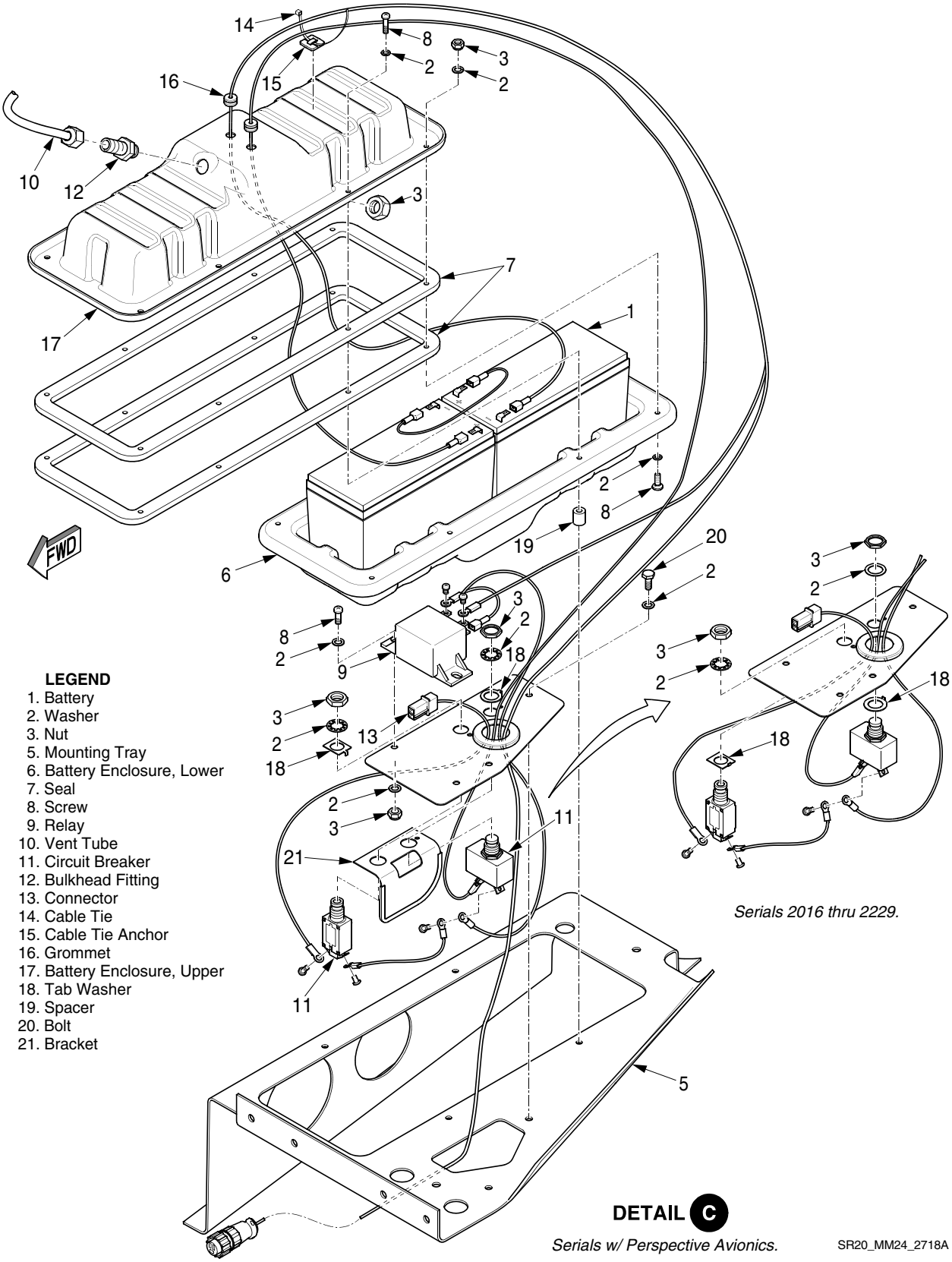


Figure 24-3014
Battery 2 - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

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EXTERNAL POWER

1. DESCRIPTION

The external power receptacle is mounted on the left side of the fuselage just forward of the firewall. Two types of external power receptacles are used on this airplane.

Serials 1005 thru 1267: The external power receptacle is a separate component from the Master Control Unit (MCU). The external power receptacle is connected to the MCU via heavy gauge wires.

Serials 1268 & subs: The external power receptacle is integrated into the MCU. (Refer to 24-30)

The receptacle is comprised of a three-contact connector. The two longer contacts transfer power. The shorter contact engages the external power relay in the MCU, connecting the external power source to the Main Distribution Bus (*Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*) or Main Distribution Bus 1 (*Serials 2016 & subs w/ Perspective Avionics*). By making this contact shorter, power will not be transferred until a reliable connection is made between the jack and plug, thereby reducing the chance of arcing or sparking. In addition, the signal power to the relay contains an isolation diode to prevent reverse polarity. If reverse polarity is applied to the external power receptacle, the relay will not engage, preventing connection of the external power source to the Distribution bus.

The external power receptacle is installed to permit the use of an external power source for cold weather starting and maintenance procedures requiring reliable power for an extended period. The external power source must be regulated to 28 VDC. The external power control contactor is wired through the BAT 1 switch so that the BAT 1 switch must be on to apply external power.

2. MAINTENANCE PRACTICES

A. External Power Receptacle - *Serials 1005 thru 1267* (See Figure 24-401)

(1) Removal - External Power Receptacle

(a) Ensure BATTERY and AVIONICS master switches are in off position.

(b) Verify the ignition switch is in the off position and remove the key.

(c) Remove the engine cowling. (Refer to 71-10)

(d) Disconnect the battery. (Refer to 24-30)

(e) Identify and disconnect all wires at the receptacle.

(f) Remove the bolts securing the receptacle to the firewall.

(2) Installation - External Power Receptacle

(a) Install and secure the receptacle to the firewall.

(b) Identify and connect all wires to the receptacle.

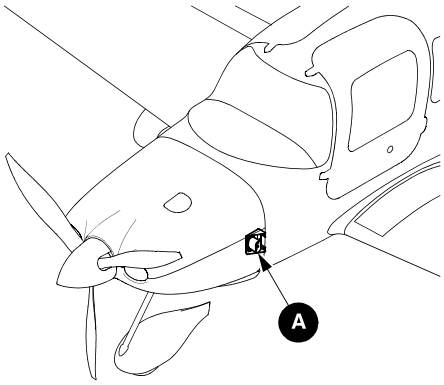
(c) Secure the receptacle to the firewall.

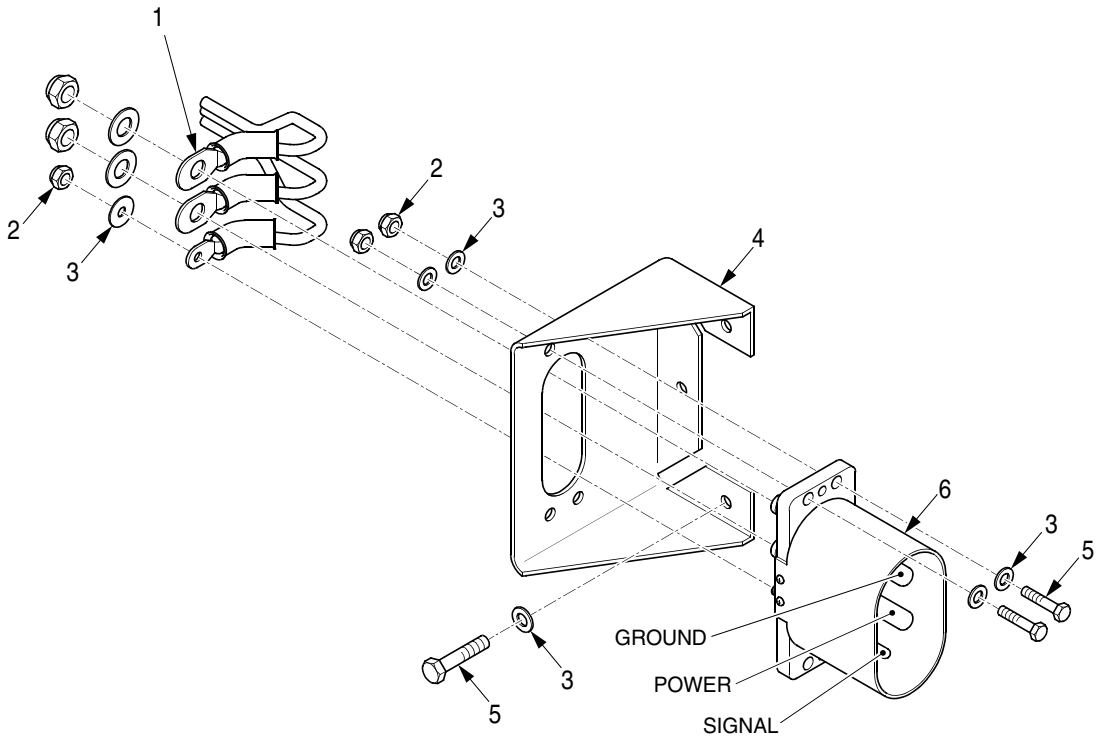
(d) Connect the battery. (Refer to 24-30)

(e) Install the engine cowling. (Refer to 71-10)

B. External Power Receptacle - *Serials 1268 & subs*

The external power receptacle is integral to the Master Control Unit (MCU). For maintenance practices pertinent to the MCU, see DC Generation. (Refer to 24-30)





LEGEND
1. Cable Ends
2. Nut
3. Washer
4. Bracket
5. Bolt
6. Receptacle

DETAIL A

Serials 1005 thru 1267.

SR20_MM24_1150A

Figure 24-401
External Power Receptacle - Serials 1005 thru 1267

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ELECTRICAL LOAD DISTRIBUTION

1. DESCRIPTION

A. Power Distribution - *Serials 1005 thru 1267*

The power distribution system consists of the main electrical power bus, the essential and non-essential power buses, and the associated fuses, circuit breakers and switches. The main power bus receives power from the power generation system through a series of bus fuses (single alternator system) or circuit breakers (dual alternator system). The main power bus provides power to the essential and nonessential power buses through a network of bus fuses or bus circuit breakers.

During normal operation, the essential and non-essential buses operate in parallel, but during power system failures, the non-essential bus can be disconnected to provide load shedding of non-essential equipment loads. This load shedding is designed to increase emergency operating power capacity and to decrease pilot work-load during emergency situations by providing the capability to remove all non-essential loads in a single action. Essential aircraft loads can be powered with a failure of either the alternator or battery. Either power source can be disconnected from the primary bus in the event of a failure. In addition, the secondary batteries (three 9-volt batteries) can be manually selected to power the turn coordinator in the event of primary electrical power failure. The secondary batteries are mounted to the inner side of the bolster switch panel (just above the pilot's kneecaps).

The airplane has a specially designed bus architecture that allows power to be routed to the essential circuitry if any one of the main power wires fails. Each bus and circuit are labeled on the circuit breaker panel. The clock bus is fused within the MCU and is the only bus not connected to the master switch arrangement. The clock is continuously powered through a 5-amp fuse connected to the primary bus in the MCU.

Individual circuit load charts and bus schematics showing system current flow during normal and failure modes are provided in the Wiring Manual.

B. Power Distribution - *Serials 1268 thru 2015 w/o single alternator SRV, 2016 & subs w/o single alternator SRV and w/o Perspective Avionics*

The power distribution system consists of the main distribution bus and the essential distribution bus in the MCU along with the associated buses in the circuit breaker panel and their associated circuit breakers and switches. Each bus and circuit are labeled on the circuit breaker panel. The clock bus is fused within the MCU and is the only bus not connected to the master switch arrangement. The clock, if installed, is continuously powered through a 5-amp fuse connected to the primary bus in the MCU.

This airplane has four ways of obtaining electrical power for the essential bus. The essential bus can obtain electrical power from BAT 1, BAT 2, ALT 1, or ALT 2. In an emergency, as long as one of the four power sources remain functional, the essential bus will continue to supply electrical power to all of the flight critical instruments. The essential power bus normally receives electrical power from the ALT 2 and BAT 2 electrical systems.

The main power bus receives power from the BAT 1 system (ALT 1 and/or BAT 1). The main power bus provides power to the essential and nonessential power buses through a network of bus fuses or bus circuit breakers.

For normal operation, the Essential Buses in the circuit breaker panel are powered from the essential distribution bus in the MCU through 25-amp circuit breakers. BAT 2 is connected directly to the Essential Bus in the circuit breaker panel and will power the bus should the voltage coming from the MCU distribution buses drop below the battery voltage. Additionally, in the event of an ALT 2 failure, the circuit breaker panel Essential Bus will be powered from ALT 1 through the main distribution and essential distribution buses in the MCU. Main Bus 1, Main Bus 2, and the equipment Non-Essential Bus in the circuit breaker panel are powered from ALT 1 through the main distribution bus in the MCU. The Avionics Non-Essential Bus in the circuit breaker panel is powered from circuit breaker panel Main Bus 1.

Individual circuit load charts and bus schematics showing system current flow during normal and failure modes are provided in the Wiring Manual.

C. Power Distribution - *Serials 2016 & subs w/ Perspective Avionics*

The power distribution system for this airplane consists of the Main Distribution Bus 1, Main Distribution Bus 2, and the Essential Distribution Bus in the MCU along with the associated buses in the circuit breaker panel. The circuit breaker panel is located on the left side of the console next to the pilots right knee. Each bus and circuit is labeled on the circuit breaker panel.

The Essential Distribution Bus receives electrical power from both Main Distribution Bus 1 and Main Distribution Bus 2 in the MCU through two 50-amp fuses. The Essential Power Bus powers circuit breaker buses ESS BUS 1 and ESS BUS 2 through 30-amp fuses located in the MCU.

The Main Power Bus 1 receives power from ALT 1 through a 100-amp fuse. The Main Power Bus 1 provides directly powers the landing light through a 7.5-amp fuse, and circuit breaker buses A/C BUS 1, A/C BUS 2, and MAIN BUS 3 through 30-amp fuses located in the MCU.

The Main Power Bus 2 receives power from ALT 2 through a 80-amp fuse. The Main Power Bus 1 powers circuit breaker buses NON ESS BUS, MAIN BUS 1, and MAIN BUS 2 through 30-amp fuses located in the MCU.

The airplane can obtain electrical power for the Essential Bus from BAT 1, BAT 2, ALT 1, or ALT 2. In an emergency, as long as one of the four power sources remain functional, the Essential Bus will continue to supply electrical power to all of the flight critical instruments.

(1) Essential Buses

The circuit breaker panel ESS BUS 1 is powered by ALT 1 and ALT 2 from the MCU Essential Distribution Bus through the 20-amp ESSENTIAL POWER circuit breaker and from BAT 2 through the 20-amp BAT 2 circuit breaker.

The circuit breaker panel ESS BUS 2 is powered directly from the MCU Essential Distribution Bus through the 30-amp fuse inside the MCU. Power from the 10-amp AVIONICS circuit breaker is controlled through the AVIONICS master switch on the bolster switch panel.

In the event of ALT 1 or ALT 2 failure, the Essential Buses in the circuit breaker panel will be powered by the remaining alternator through the Main Distribution Bus 1 or Main Distribution Bus 2 in the MCU. In the case of both alternators failing, BAT 1 is connected directly to the Essential Distribution Bus in the MCU and will power ESS BUS 1 and ESS BUS 2. In the event of both alternators and BAT 1 failing, BAT 2 is connected directly to ESS BUS 1.

(2) Main Buses

The circuit breaker panel MAIN BUS 1 and MAIN BUS 2 are powered by ALT 2 from the MCU Main Distribution Bus 2 and - in the event of ALT 2 failure - by ALT 1 and BAT 1 from the Main Distribution Bus 2 via the diode interconnecting the MCU distribution buses through 30-amp fuses inside the MCU. The 10-amp AVIONICS circuit breaker on MAIN BUS 1 powers all loads on the AVIONICS BUS.

The circuit breaker panel MAIN BUS 3 is powered by ALT 1 and BAT 1 from the MCU Main Distribution Bus 1 through a 30-amp fuse inside the MCU. In the event of ALT 1 failure, BAT 1 will power MAIN BUS 3. ALT 2 is prevented from powering MAIN BUS 3 by the isolation diode interconnecting the MCU Distribution Buses 1 and 2.

(3) Non-Essential Buses

The circuit breaker panel NON ESS BUS is powered by ALT 2 from the MCU Main Distribution Bus 2 and - in the event of ALT 2 failure - by ALT 1 and BAT 1 from the Main Distribution Bus 2 via the diode interconnecting the MCU distribution buses through 30-amp fuses inside the MCU. The Avionics Non-Essential Bus is powered through the 10-amp AVIONICS circuit breaker on MAIN BUS 1.

The circuit breaker panel A/C BUS 1 and A/C BUS 2, is powered by ALT 1 and BAT 1 from the MCU Main Distribution Bus 1 through a 30-amp fuse inside the MCU. In the event of ALT 1 failure, BAT 1 will power A/C BUS 1 and A/C BUS 2. ALT 2 is prevented from powering A/C BUS 1 and A/C BUS 2 by the isolation diode interconnecting the MCU Distribution Buses 1 and 2.

Individual circuit load charts and bus schematics showing system current flow during normal and failure modes are provided in the Wiring Manual.

D. Power Distribution - *Serials 1337 & subs w/ single alternator SRV*

The power distribution system consists of the main distribution bus and the essential distribution bus in the MCU along with the associated buses in the circuit breaker panel and their associated circuit breakers and switches. Each bus and circuit are labeled on the circuit breaker panel. The clock bus is fused within the MCU and is the only bus not connected to the master switch arrangement.

This airplane has three ways of obtaining electrical power for the essential bus. The essential bus can obtain electrical power from BAT 1, BAT 2, or ALT 1. In an emergency, as long as one of the three power sources remain functional, the essential bus will continue to supply electrical power to all of the flight critical instruments.

The main power bus receives power from the BAT 1 system (ALT 1 and/or BAT 1). The main power bus provides power to the essential and nonessential power buses through a network of bus fuses or bus circuit breakers.

For normal operation, the Essential Buses in the circuit breaker panel are powered from the essential distribution bus in the MCU through 25-amp circuit breakers. BAT 2 is connected directly to the Essential Bus in the circuit breaker panel and will power the bus should the voltage coming from the MCU distribution buses drop below the battery voltage. Main Bus 1, Main Bus 2, and the equipment Non-Essential Bus in the circuit breaker panel are powered from ALT 1 through the main distribution bus in the MCU. The Avionics Non-Essential Bus in the circuit breaker panel is powered from circuit breaker panel Main Bus 1.

Individual circuit load charts and bus schematics showing system current flow during normal and failure modes are provided in the Wiring Manual.

E. Circuit Protection Devices (See Figure 24-501)

(1) Circuit Breakers

The electrical system in this airplane is protected by using circuit breakers and fuses. A circuit breaker panel is located near the pilot's right leg, and is labeled as to each circuit's identity. The circuit breaker panel contains all circuit protection devices re-settable in flight. The circuit breakers have their rated values identified on the top of the shaft. The circuit breakers only have two positions, open and closed. In the open position the circuit is disconnected and in the closed position the circuit breaker will automatically open the circuit if an overload or circuit fault occurs. Each circuit breaker requires a manual reset by the operator.

Serials 1005 thru 1267: The airplane Essential bus is supplied from the Main Buses through the 20-amp ESSENTIAL 1 and ESSENTIAL 2 circuit breakers. Avionics loads on the Non-essential Avionics Bus and Essential Avionics Bus are protected by 15-amp AVIONICS circuit breakers connected to the respective bus through relays energized by the AVIONICS switch.

In addition to the individual circuit breakers, 25-amp fuses located on the primary bus in the Master Control Unit (MCU) protect the Main Bus 1, Main Bus 2, and the Non-Essential Bus in the single alternator system. Additionally, the single alternator system uses 15-amp fuses located in the MCU to protect the landing light and standby vacuum pump circuits. The dual alternator system uses circuit breakers instead of fuses for the aforementioned circuits.

Serials 1268 thru 2015, 2016 & subs w/o Perspective: Avionics loads on the NON-ESSENTIAL Avionics Bus and ESSENTIAL Avionics Bus are protected by 15-amp AVIONICS circuit breakers connected to the respective bus through relays energized by the AVIONICS switch.

In addition to the individual circuit breakers, 25-amp circuit breakers located in the Master Control Unit (MCU) protect the Main Distribution Bus and the Essential Distribution Bus. Additionally a 15-amp circuit breaker is located in the MCU to protect the landing light circuit.

Serials 2016 & subs w/ Perspective Avionics: Avionics loads on the Avionics Bus are protected by a 10-amp AVIONICS circuit breaker connected to the Main Bus 1 through relays energized by the AVIONICS switch.

In addition to the individual circuit breakers, 30-amp circuit breakers located in the Master Control Unit (MCU) protect the Main Distribution Bus 1, Main Distribution Bus 2, and the Essential Distribution Bus. Additionally a 7.5-amp circuit breaker is located in the MCU to protect the landing light circuit.

(2) Transient Voltage Suppressors (TVS)

Transient Voltage Suppressors (TVS) are installed in key areas of the electrical system to protect the system from lightning strikes. During lightning strikes, enormous energy spikes can be induced within the aircraft electrical system. In the absence of any transient protection, this unwanted energy would typically be dissipated in the form of high-voltage discharge across the avionics and electrical systems of the aircraft. By adding a high power TVS at key power entry points on the electrical busses, unwanted energy from electrical transients is allowed to dissipate through a semi-conducting pathway to ground.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: One TVS is installed on the circuit breaker panel and one TVS is installed on the wire loom behind the attitude indicator.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: Three TVS are installed on the circuit breaker panel and one is installed on the wire loom behind the attitude indicator.

Serials 2016 & subs w/ Perspective Avionics: Two TVS are installed on the RH side of the center console. Eight TVS are integral to wire harnesses and located at the following locations: AHRS 1 connector, air data computer connector, GIA 63W integrated avionics unit 1 connector, attitude indicator connector, two on the PFD connector, and two near the circuit breaker panel.

F. Switches (See Figure 24-504)

Serials 1005 thru 1267: The Battery (BAT) and Alternator (ALT) master switches are side by side and directly in front of the pilot on the bolster panel. The battery switch disconnects the battery from the primary bus, and the alternator switch disconnects the alternator from the primary bus, thereby disconnecting the aircraft from the power sources. If both switches are turned on (BAT and ALT), the hour meter becomes activated.

Serials 1268 & subs w/o single alternator SRV: BAT 1, BAT 2, ALT 1, and ALT 2 master switches are side by side and directly in front of the pilot on the bolster panel. The BAT 1 switch disconnects battery 1 from the main bus in the MCU. The alternator 1 switch disconnects the forward alternator (ALT 1) from the main bus. If BAT 1 and ALT 1 switches are in the off position the flight critical instruments will remain powered from ALT 2 or BAT 2. If BAT 1 and either ALT 1 or ALT 2 switches are turned on, the hour meter becomes activated.

Serials 1337 & subs w/ single alternator SRV: BAT 1, BAT 2, and ALT 1 master switches are side by side and directly in front of the pilot on the bolster panel. The BAT 1 switch disconnects battery 1 from the main bus in the MCU. The alternator 1 switch disconnects the alternator (ALT 1) from the main bus. If BAT 1 and ALT 1 switches are in the off position the flight critical instruments will remain powered from BAT 2. If BAT 1 and ALT 1 switches are turned on, the hour meter becomes activated.

(1) BAT & ALT Master Switches

Serials 1005 thru 1267: The rocker type electrical system MASTER switches are ON in the up position and off in the down position. The right switch, labeled BAT, controls all electrical power to the airplane. The left switch, labeled ALT, controls the alternator.

Normally, both master switches will be on. However, the BAT switch can be turned on separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, the avionics power switch must also be turned on. Positioning the ALT switch to the off position isolates the alternator from the electrical system and the entire electrical load is placed on the battery.

Note: Continued operation with the alternator switch off will reduce battery power low enough to open the battery relay, remove power from the alternator field, and prevent alternator restart.

Serials 1268 & subs w/o single alternator SRV: The rocker type electrical system MASTER switches are ON in the up position and off in the down position. The left battery switches, labeled BAT 1 and BAT 2, control all electrical power to the airplane. The right switches, labeled ALT 1 and ALT 2, control the corresponding alternator.

Note: Prior to engine start-up, the pilot must activate only the BAT 2 switch to verify that BAT 2 properly energizes the electrical loads powered by the ESSENTIAL Bus and that BAT 2 has proper voltage. The voltage reading must be taken from the combination Volt and Ampere meter mounted on the right instrument panel.

Serials 1268 thru 1581: The voltage is displayed by the combination Volt / Amp meter mounted on the RH instrument panel.

Serials 1582 & subs: The voltage is displayed by the MFD and PFD.

Use BAT 1 for suppling electrical power to the avionics system when performing general servicing tests.

Normally, all master switches will be on. However, the BAT 1 switch can be turned on separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, the avionics power switch must also be turned on. Positioning the ALT 1 and ALT 2 switch to the off position isolates the alternators from the electrical system and the entire electrical load is placed on the batteries.

Note: Continued operation with the alternator switch off will reduce battery power low enough to open the battery relay, remove power from the alternator field control, and prevent alternator restart.

Serials 1337 & subs w/ single alternator SRV: The rocker type electrical system MASTER switches are ON in the up position and off in the down position. The left battery switches, labeled BAT 1 and BAT 2, control all electrical power to the airplane. The right switch, labeled ALT 1, controls the alternator.

Note: Prior to engine start-up, the pilot must activate only the BAT 2 switch to verify that BAT 2 properly energizes the electrical loads powered by the ESSENTIAL Bus and that BAT 2 has proper voltage. The voltage reading must be taken from the combination Volt and Ampere meter mounted on the right instrument panel.

Serials 1337 thru 1581: The voltage is displayed by the combination Volt / Amp meter mounted on the RH instrument panel.

Serials 1582 & subs: The voltage is displayed by the MFD and PFD.

Use BAT 1 for suppling electrical power to the avionics system when performing general servicing tests.

Normally, all master switches will be on. However, the BAT 1 switch can be turned on separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, the avionics power switch must also be turned on. Positioning the ALT 1 switch to the off position isolates the alternator from the electrical system and the entire electrical load is placed on the batteries.

Note: Continued operation with the alternator switch off will reduce battery power low enough to open the battery relay, remove power from the alternator field control, and prevent alternator restart.

(2) Avionics Power Switch

Serials 1005 thru 1267: A rocker switch, labeled AVIONICS POWER, controls electrical power from the airplane primary bus to the avionics bus. The switch is located next to the ALT and BAT Master switches and is ON in the up position and off in the down position. Typically, the switch is used to energize or de-energize all avionics on the Avionics Non-essential and Avionics Essential buses simultaneously. With the switch in the off position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The AVIONICS POWER switch should be placed in the off position prior to turning the master switch ON or off, starting the engine, or applying an external power source.

The airplane has two different types of circuit protection devices. Each circuit has an electrical protective device, with the exception of the starter motor. Fuses are located in the MCU and the push-pull type circuit breakers are all located in the cabin area. The fuses are not replaceable during flight.

Serials 1268 & subs w/o single alternator SRV: A rocker switch, labeled AVIONICS, controls electrical power from the airplane primary bus to the avionics bus. The switch is located next to the ALT 1, ALT 2, BAT 1, and BAT 2 Master switches and is ON in the up position and OFF in the down position. Typically, the Avionics Power Switch is used to energize or de-energize all avionics on the Avionics Non-essential and Avionics Essential buses simultaneously. With the switch in the OFF position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The AVIONICS switch should be placed in the OFF position prior to turning the master switch ON or OFF, starting the engine, or applying an external power source.

The airplane has two different types of circuit protection devices. Each circuit has an electrical protective device, with the exception of the starter motor. A 5-amp clock fuse is located in the MCU and the push-pull type circuit breakers are all located in the cabin area. The fuses are not replaceable during flight.

Serials 1337 & subs w/ single alternator SRV: A rocker switch, labeled AVIONICS, controls electrical power from the airplane primary bus to the avionics bus. The switch is located next to the ALT 1, BAT 1, and BAT 2 Master switches and is ON in the up position and OFF in the down position. Typically, the Avionics Power Switch is used to energize or de-energize all avionics on the Avionics Non-essential and Avionics Essential buses simultaneously. With the switch in the OFF position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The AVIONICS switch should be placed in the OFF position prior to turning the master switch ON or OFF, starting the engine, or applying an external power source.

The airplane has two different types of circuit protection devices. Each circuit has an electrical protective device, with the exception of the starter motor. A 5-amp clock fuse is located in the MCU and the push-pull type circuit breakers are all located in the cabin area. The fuses are not replaceable during flight.

G. Transmission Wire

Power is routed throughout most of the aircraft with MIL-W-22759/16 teflon coated wires. These wires have a 150° C rating. Joints made in wires are covered with polyolefin heat shrink material, or are joined using a solder sleeve. In the engine compartment, all power wire terminal ring ends are covered with a silicon boot. Rubber, nylon, or teflon grommets protect the wires from chafing where the wires pass through materials that could cause wear.

H. Transmission Wire

Power is routed throughout most of the aircraft with MIL-W-22759/16 teflon coated wires. These wires have a 150° C rating. Joints made in wires are covered with polyolefin heat shrink material, or are

I. Convenience Power

The aircraft contains a 12 VDC convenience power outlet to power auxiliary equipment. The convenience outlet is located in the center console arm rest. Regulated 12 VDC power is supplied to the outlet through the convenience power circuit card.

Power for Active Noise Reduction (ANR) headsets is also provided through the convenience power circuit card. The ANR power can be set to 9 VDC, 17 VDC, or 28 VDC through a switch on the assembly. (Refer to 23-50)

Serials 2273 & subs: The aircraft contains two dual-port USB power outlets to power auxiliary equipment. One outlet is located near the convenience outlet for use by the pilot and forward passenger, and the other is located on the aft portion of the center console for the rear passengers. 28 VDC for the USB power outlets is supplied through the 5-amp 12V DC OUTLET circuit breaker on MAIN BUS 3.

Serials 1005 thru 1267: 28 VDC for the convenience power circuit card is supplied through the 5-amp CONVENIENCE POWER 12VDC circuit breaker on NON-ESSENTIAL.

Serials 1268 & subs w/o Perspective: 28 VDC for the convenience power circuit card is supplied through the 3-amp 12V/ANR circuit breaker on NON-ESSENTIAL.

Serials w/ Perspective: 28 VDC for the convenience power circuit card is supplied through the 5-amp 12V DC OUTLET circuit breaker on MAIN BUS 3.

J. Level Sensor Power Circuit Card - *Serials 2156 thru 2292*

The aircraft is equipped with a digital fuel quantity system. The fuel quantity level sensors operate on 12 VDC which is provided through the Level Sensor Power Circuit Card. 28 VDC for the Level Sensor Power Circuit Card is provided through the 3-amp FUEL QTY circuit breaker on MAIN BUS 1. The Level Sensor Power Circuit Card provides two regulated 12 VDC outputs for the right wing fuel and left wing fuel quantity systems. Resistors located within the wire harness set the output voltage to 12 VDC.

For information pertaining to the fuel quantity sensors, see Chapter 28, Section 40 - Indicating. (Refer to 28-40)

K. Convenience System Controller - *Serials 2303 & subs w/ Convenience Lighting*

The aircraft is equipped with a convenience system controller providing the means to power on ground lights for several minutes of convenience illumination when aircraft power is off. LED lights controlled by the convenience system controller include the cabin dome light, flight compartment interior footwell lights, passenger compartment interior footwell lights, entry step lights, and baggage lights. The convenience system controller is installed on the fuselage skin below the RH passenger seat. Power is activated via wireless keyfob or cabin light switch located on the cabin headliner.

28 VDC for the convenience system controller is supplied through the 3-amp CONV LIGHTS circuit breaker on CONS bus.

For information regarding convenience lighting, see Lights. (Refer to 33-00)

2. MAINTENANCE PRACTICES

A. Circuit Breakers (See Figure 24-501)

(1) Removal - Circuit Breakers

(a) Verify ignition switch is in OFF position and remove the key.

(b) Disconnect battery 1. (Refer to 24-30)

(c) Disconnect battery 2. (Refer to 24-30)

(d) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Remove aft screws securing circuit breaker panel to center console. Swing circuit breaker panel open.

(e) *Serials 2016 & subs w/ Perspective Avionics:* Rotate turn studs securing circuit breaker panel to center console. Swing circuit breaker panel open.

(f) Identify and disconnect all wires to circuit breaker and/or bus.

Note: It may be necessary to loosen more than one circuit breaker and/or bus bar to remove the selected breaker and/or bus bar.

(g) Remove nut, washer, and tab washer securing circuit breaker to panel. Remove circuit breaker from airplane.

(2) Installation - Circuit Breakers

(a) Position tab washer on circuit breaker stud.

(b) Position circuit breaker to panel, ensuring washer tab inserts into small hole on panel.

(c) Install washer and nut securing circuit breaker to panel.

(d) Identify and connect all wires to circuit breaker.

(e) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Position circuit breaker panel to center console and secure with screws.

(f) *Serials 2016 & subs w/ Perspective Avionics:* Position circuit breaker panel to center console and secure with turn studs.

(g) Connect battery 2. (Refer to 24-30)

(h) Connect battery 1. (Refer to 24-30)

(3) Functional Check - Redundant Circuit Breakers - *Serials 1005 thru 1267*

28 VDC for the essential bus is supplied through redundant circuit breakers on the main bus 1 and main bus 2. The following functional check ensures both circuit breakers are operating properly with no disturbance of power to the essential bus.

(a) Set BAT 1 switch to ON position.

(b) Pull ESSENTIAL 1 circuit breaker.

(c) Verify no disruption of power to essential bus by confirming annunciator OIL light is illuminated.

(d) Reset ESSENTIAL 1 circuit breaker.

(e) Pull ESSENTIAL 2 circuit breaker.

(f) Verify no disruption of power to essential bus by confirming annunciator OIL light is illuminated.

(g) Reset ESSENTIAL 2 circuit breaker.

(h) Set BAT 1 switch to OFF position.

(4) Functional Check - Redundant Circuit Breakers - *Serials 1268 & subs w/o SRV*

28 VDC for the HSI or PFD, turn coordinator, and attitude indicator is supplied through redundant circuit breakers on the Essential Bus and Main Bus 2. The following functional check ensures both circuit breakers are operating properly with no disturbance of power to the equipment.

(a) Set BAT 1 switch to ON position.

(b) *Serials 1005 thru 1885:* Test HSI/PFD circuit breakers.

1 Pull HSI/PFD #1 circuit breaker.
2 Verify no disruption of power to HSI or PFD.
3 Reset HSI/PFD #1 circuit breaker.
4 Pull HSI/PFD #2 circuit breaker.
5 Verify no disruption of power to HSI or PFD.
6 Reset HSI/PFD #2 circuit breaker.

(c) *Serials 1886 & subs:* Test PFD circuit breakers.
1 Pull PFD #1 circuit breaker.
2 Verify no disruption of power to PFD.
3 Reset PFD #1 circuit breaker.
4 Pull PFD #2 circuit breaker.
5 Verify no disruption of power to PFD.
6 Reset PFD #2 circuit breaker.

(d) *Serials 1005 thru 1885:* Test TURN COORD circuit breakers.
1 Pull TURN COORD #1 circuit breaker.
2 Verify no disruption of power to turn coordinator.
3 Reset TURN COORD #1 circuit breaker.
4 Pull TURN COORD #2 circuit breaker.
5 Verify no disruption of power to turn coordinator.
6 Reset TURN COORD #2 circuit breaker.

(e) *Serials 1886 & subs w/ System 55X Autopilot:* Test TRN CRD circuit breakers.
1 Pull TRN CRD #1 circuit breaker.
2 Verify no disruption of power to turn coordinator.
3 Reset TRN CRD #1 circuit breaker.
4 Pull TRN CRD #2 circuit breaker.
5 Verify no disruption of power to turn coordinator.
6 Reset TRN CRD #2 circuit breaker.

(f) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Test ATTITUDE circuit breakers.
1 Pull ATTITUDE #1 circuit breaker.
2 Verify no disruption of power to attitude indicator.
3 Reset ATTITUDE #1 circuit breaker.
4 Pull ATTITUDE #2 circuit breaker.
5 Verify no disruption of power to attitude indicator.
6 Reset ATTITUDE #2 circuit breaker.

(g) *Serials 2016 & subs w/ Perspective Avionics:* Test ATTITUDE circuit breakers.
1 Pull STDBY ATTD #1 circuit breaker.
2 Verify no disruption of power to attitude indicator.
3 Reset STDBY ATTD #1 circuit breaker.
4 Pull STDBY ATTD #2 circuit breaker.
5 Verify no disruption of power to attitude indicator.
6 Reset STDBY ATTD #2 circuit breaker.

(h) *Serials 2016 & subs w/ Perspective Avionics:* Test MFD circuit breakers.
1 Pull MFD #1 circuit breaker.
2 Verify no disruption of power to MFD.
3 Reset MFD #1 circuit breaker.
4 Pull MFD #2 circuit breaker.

5 Verify no disruption of power to MFD.

6 Reset MFD #2 circuit breaker.

(i) Set BAT 1 switch to OFF position.

(5) Functional Check - Redundant Circuit Breakers - *Serials 1337 & subs w/ SRV*

28 VDC for the PFD and turn coordinator is supplied through redundant circuit breakers on the essential bus and main bus 2. The following functional check ensures both circuit breakers are operating properly with no disturbance of power to the equipment.

(a) Set BAT 1 switch to ON position.

(b) Test PFD circuit breakers.

1 Pull PFD #1 circuit breaker.

2 Verify no disruption of power to PFD.

3 Reset PFD #1 circuit breaker.

4 Pull PFD #2 circuit breaker.

5 Verify no disruption of power to PFD.

6 Reset PFD #2 circuit breaker.

(c) *Serials 1005 thru 1885:* Test TURN COORD circuit breakers.

1 Pull TURN COORD #1 circuit breaker.

2 Verify no disruption of power to turn coordinator.

3 Reset TURN COORD #1 circuit breaker.

4 Pull TURN COORD #2 circuit breaker.

5 Verify no disruption of power to turn coordinator.

6 Reset TURN COORD #2 circuit breaker.

(d) *Serials 1886 & subs:* Test TRN CRD circuit breakers.

1 Pull TRN CRD #1 circuit breaker.

2 Verify no disruption of power to turn coordinator.

3 Reset TRN CRD #1 circuit breaker.

4 Pull TRN CRD #2 circuit breaker.

5 Verify no disruption of power to turn coordinator.

6 Reset TRN CRD #2 circuit breaker.

(e) Set BAT 1 switch to OFF position.

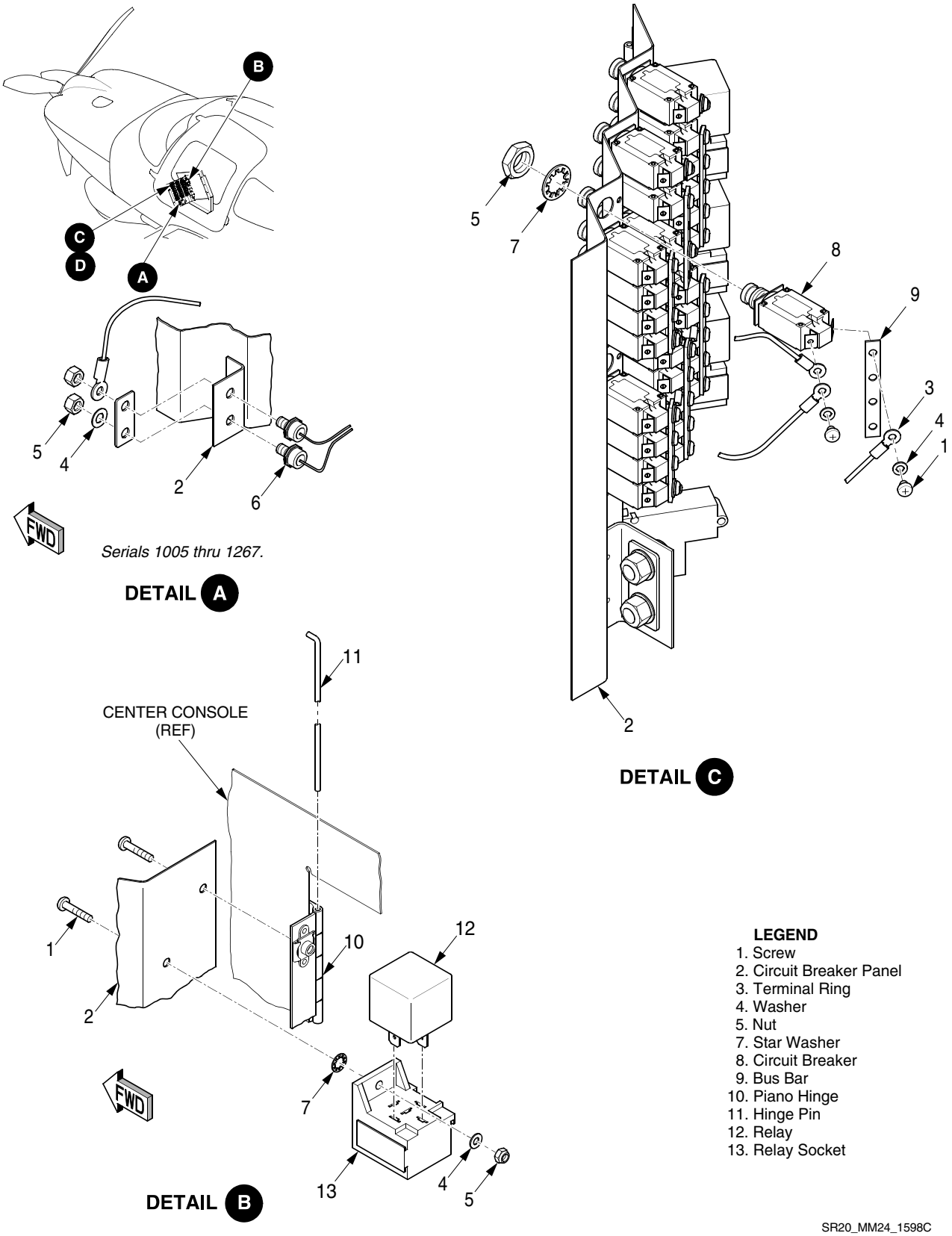


Figure 24-501
Circuit Breaker Panel - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 2)

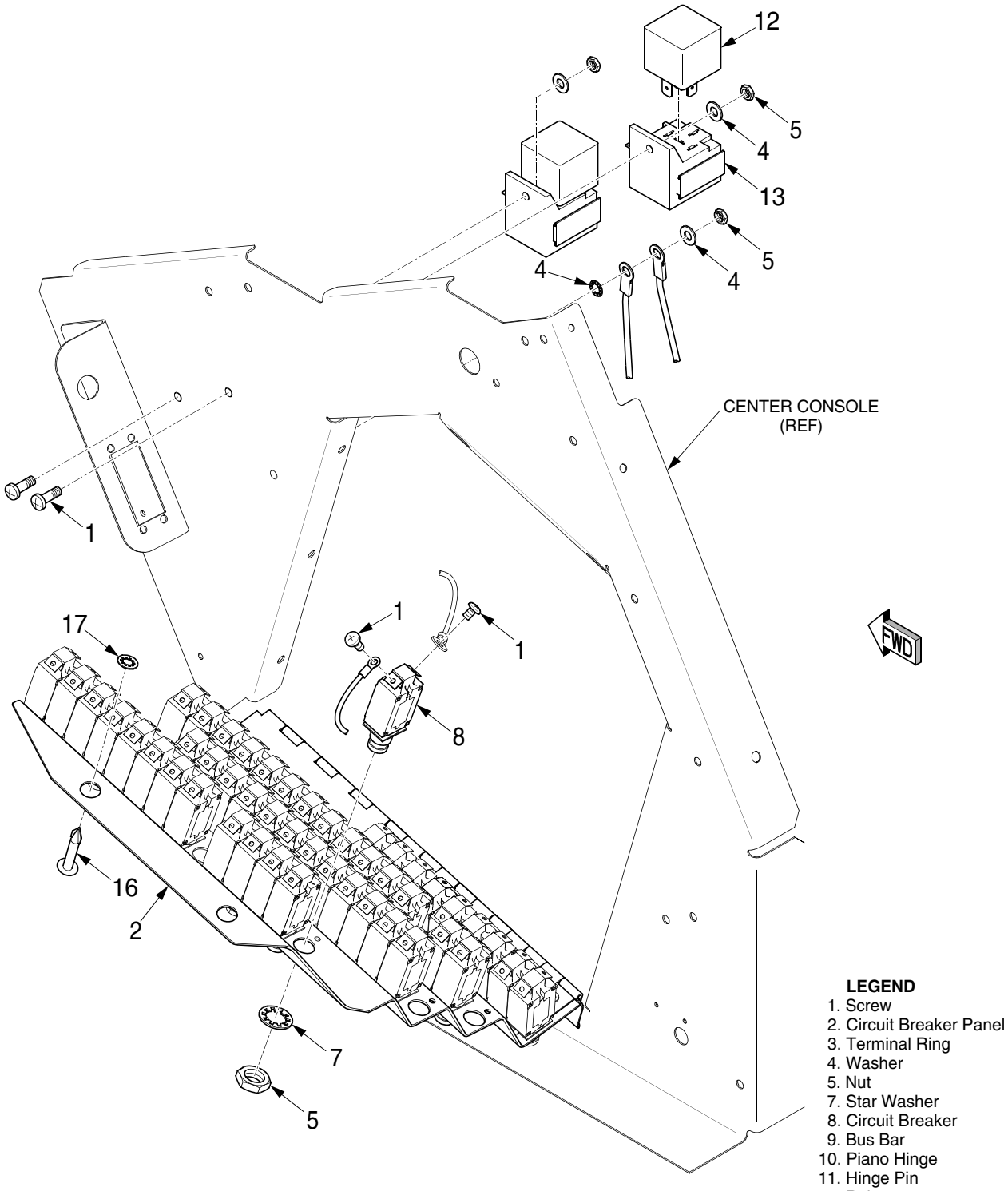


Figure 24-501
Circuit Breaker Panel - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

B. Transient Voltage Suppressor (TVS) - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 24-502)

(1) Removal - Transient Voltage Suppressor

(a) Verify ignition switch is in OFF position and remove the key.

(b) Disconnect battery 1. (Refer to 24-30)

(c) Disconnect battery 2. (Refer to 24-30)

(d) Remove TVS located on circuit breaker panel.

1 Remove aft screws securing circuit breaker panel to center console. Swing circuit breaker panel open.

2 Remove screws and washers securing TVS terminal rings to COM 1, PFD #1, and PFD #2 circuit breakers.

3 Remove screws, washers, and nuts securing TVS and terminal rings to circuit breaker panel.

(e) Remove TVS located on attitude indicator wire harness.

1 Remove LH kick Plate. (Refer to 25-10)

2 Remove screw and washer securing TVS terminal ring to console.

3 Remove cable tie securing TVS and fuse to attitude indicator wire harness.

4 Cut wire between attitude indicator and TVS fuse holder.

(2) Installation - Transient Voltage Suppressor

(a) Install TVS located on circuit breaker panel.

CAUTION: Verify TVS polarity prior to installation.

1 Position TVS and terminal rings to circuit breaker panel and secure with screws, washers, and nuts.

2 Position TVS terminal rings to COM 1, PFD #1, and PFD #2 circuit breakers and secure with screws and washers.

3 Position circuit breaker panel to center console and secure with screws.

(b) Install TVS located on attitude indicator wire harness.

CAUTION: Verify TVS polarity prior to installation.

1 Splice new TVS and fuse holder to wire from attitude indicator.

2 Position TVS terminal ring to console and secure with screw and washer.

3 Position TVS and fuse to wire harness and secure with cable tie.

4 Install LH kick plate. (Refer to 25-10)

(c) Connect battery 2. (Refer to 24-30)

(d) Connect battery 1. (Refer to 24-30)

(3) Inspection/Check - Transient Voltage Suppressor

(a) Verify ignition switch is in OFF position and remove the key.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Remove LH kick Plate. (Refer to 25-10)

(d) Remove aft screws securing circuit breaker panel to center console. Swing circuit breaker panel open.

Note: If a circuit breaker repeatedly opens and cannot be reset, the power TVS may be damaged.

(e) Reset circuit breakers.

(f) Visually inspect power TVS for charring, cracking, pieces broken off or missing, or other signs of physical damage. If necessary, replace power TVS. (Refer to 24-50)

(g) *Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics*: Visually inspect fuse between attitude indicator and TVS. If fuse is blown, replace fuse and corresponding TVS. (Refer to 24-50)

(h) *Serials 1268 thru 1422 w/o PFD:* Visually inspect fuse between TVS and COM 1 circuit breaker. If fuse is blown, replace fuse and TVS. (Refer to 24-50)

(i) *Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics*: Visually inspect fuses between TVS and PFD #1 and PFD #2 circuit breakers. If fuse is blown, replace fuse and corresponding TVS. (Refer to 24-50)

(j) Position circuit breaker panel to center console and secure with screws.

(k) Install LH kick plate. (Refer to 25-10)

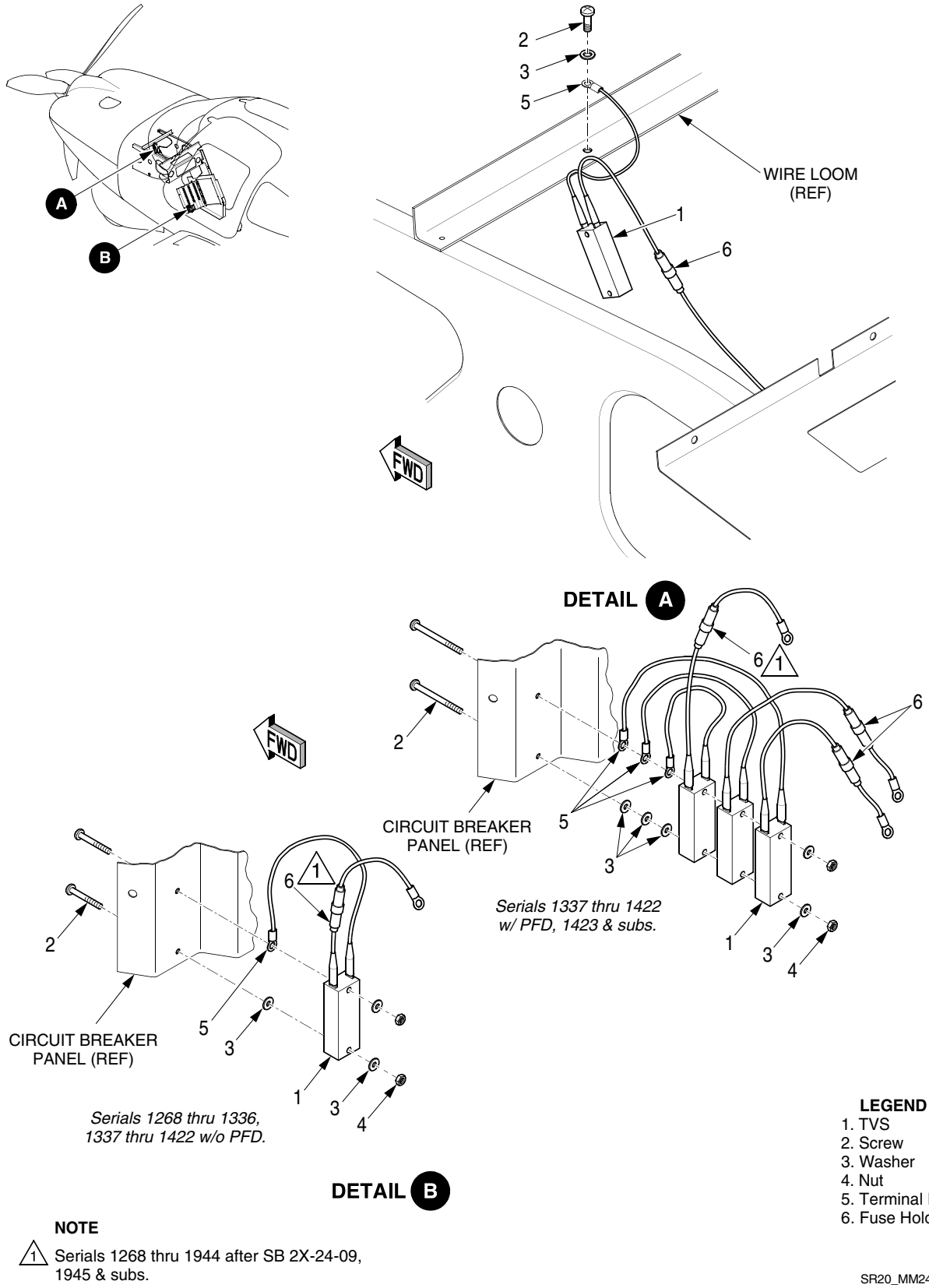


Figure 24-502
Transient Voltage Suppressor Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

C. Transient Voltage Suppressor (TVS) - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 24-502)

(1) Removal - Transient Voltage Suppressor
- (a) Verify ignition switch is in OFF position and remove the key.
- (b) Disconnect battery 1. (Refer to 24-30)
- (c) Disconnect battery 2. (Refer to 24-30)
- (d) Remove right mid console trim. (Refer to 25-10)
- (e) Remove screw, washer, and nut securing ground wire to console.
- (f) Remove screw securing terminal rings to positive terminal of TVS.
- (g) Remove washers and nuts securing TVS to console. Remove TVS from airplane.

(2) Installation - Transient Voltage Suppressor
- (a) Position TVS to console and secure with washers and nuts.
- (b) Position ground wire to console and secure with screw, washer, and nut.
- (c) Position terminal rings to positive terminal of TVS and secure with screw.
- (d) Install right mid console trim. (Refer to 25-10)
- (e) Connect battery 2. (Refer to 24-30)
- (f) Connect battery 1. (Refer to 24-30)

(3) Inspection/Check - Transient Voltage Suppressor
- (a) Verify ignition switch is in OFF position and remove the key.
- (b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

Note: There are ten TVS with associated fuses in the Perspective Avionics system. Eight of the TVS are integral to wire harnesses and covered by heat shrink. It is not necessary to remove the heat shrink for the visual inspection.

- (c) Visually inspect attitude indicator TVS.
  1. Remove LH kick plate. (Refer to 25-10)
  2. Visually inspect TVS for signs of overheating or damage.
  3. Visually inspect fuse between attitude indicator and TVS. If fuse is blown, replace fuse and corresponding TVS. (Refer to 24-50)
  4. Install LH kick plate. (Refer to 25-10)
- (d) Visually inspect center console and circuit breaker panel TVS.
  1. Remove turn studs securing circuit breaker panel to center console. Swing circuit breaker panel open.
  2. On RH side of center console, visually inspect TVS for charring, cracking, pieces broken off or missing, or other signs of physical damage. If necessary, replace TVS. (Refer to 24-50)
  3. On circuit breaker panel, visually inspect TVS for signs of overheating or damage.
  4. Visually inspect each TVS fuse. If fuse is blown, replace fuse and corresponding TVS. (Refer to 24-50)
  5. Close circuit breaker panel and secure with turn studs.
- (e) Visually inspect TVS on the following connectors: PFD, AHRS 1, air data computer, and integrated avionics unit 1.
  1. Remove PFD. (Refer to 31-60)
  2. Remove MFD. (Refer to 31-60)
  3. Remove glareshield. (Refer to 25-10)
  4. Remove EMI shielding. (Refer to 25-10)
  5. Remove AHRS 1. (Refer to 34-20)

6 Visually inspect TVS for signs of overheating or damage.

7 Visually inspect each TVS fuse. If fuse is blown, replace fuse and corresponding TVS. (Refer to 24-50)

8 Install AHRS 1. (Refer to 34-20)

9 Install EMI shielding. (Refer to 25-10)

10 Install glareshield. (Refer to 25-10)

11 Install MFD. (Refer to 31-60)

12 Install PFD. (Refer to 31-60)

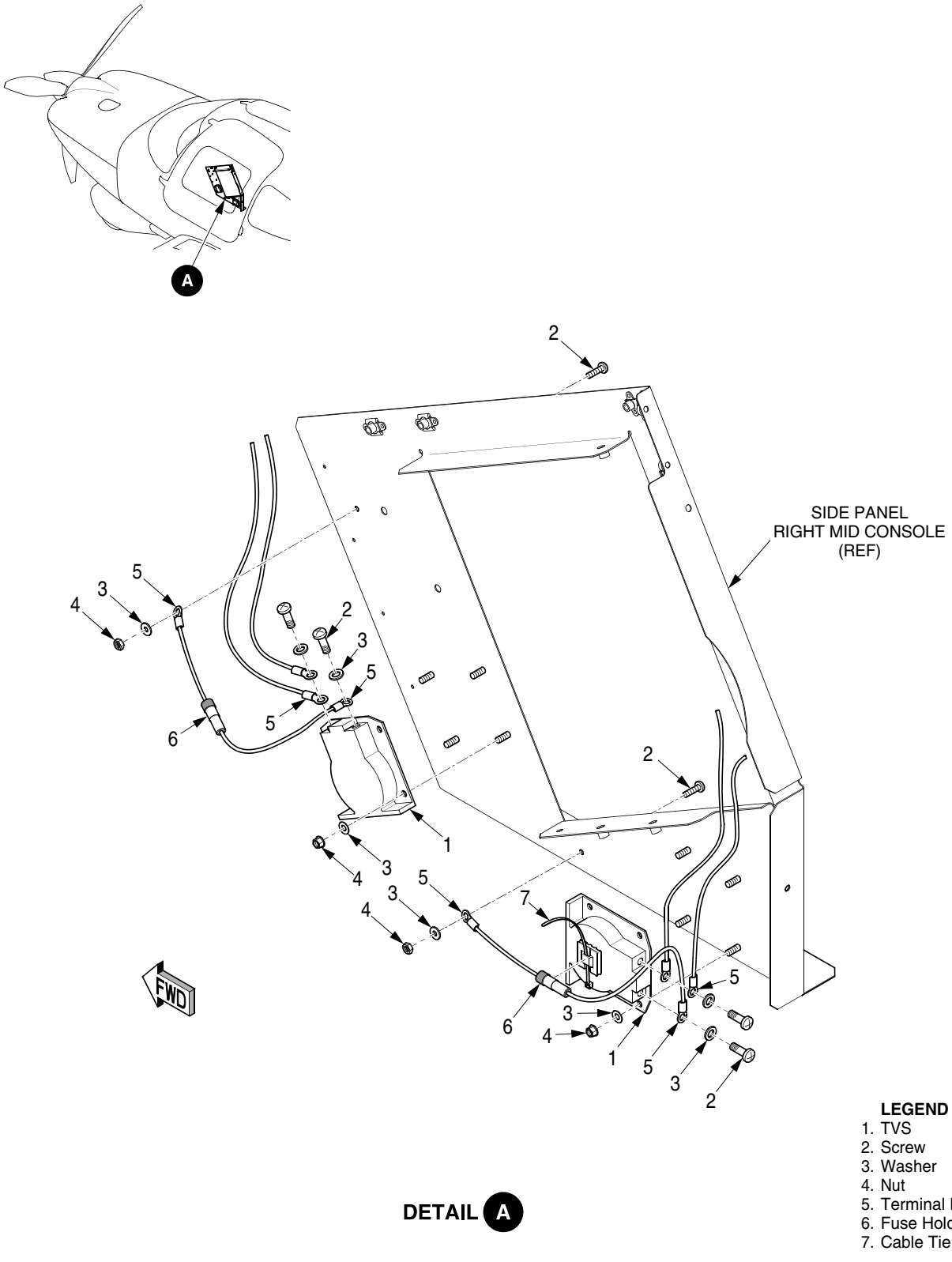


Figure 24-503
Transient Voltage Suppressor Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

D. Bolster Panel Switches - *Serials 1005 thru 1183* (See Figure 24-504)

(1) Removal - Bolster Panel Switches

(a) Verify ignition switch is in OFF position and remove key.

(b) Disconnect batteries. (Refer to 24-30)

(c) Remove kick plate. (Refer to 25-10)

(d) Remove screws and washers securing bolster panel to console.

(e) Identify and disconnect all wires to the selected switch.

(f) Compress retainers on selected switch and push up to remove.

(2) Installation - Bolster Panel Switches

(a) Compress retainers on selected switch and push down into position.

(b) Identify and connect all wires to selected switch.

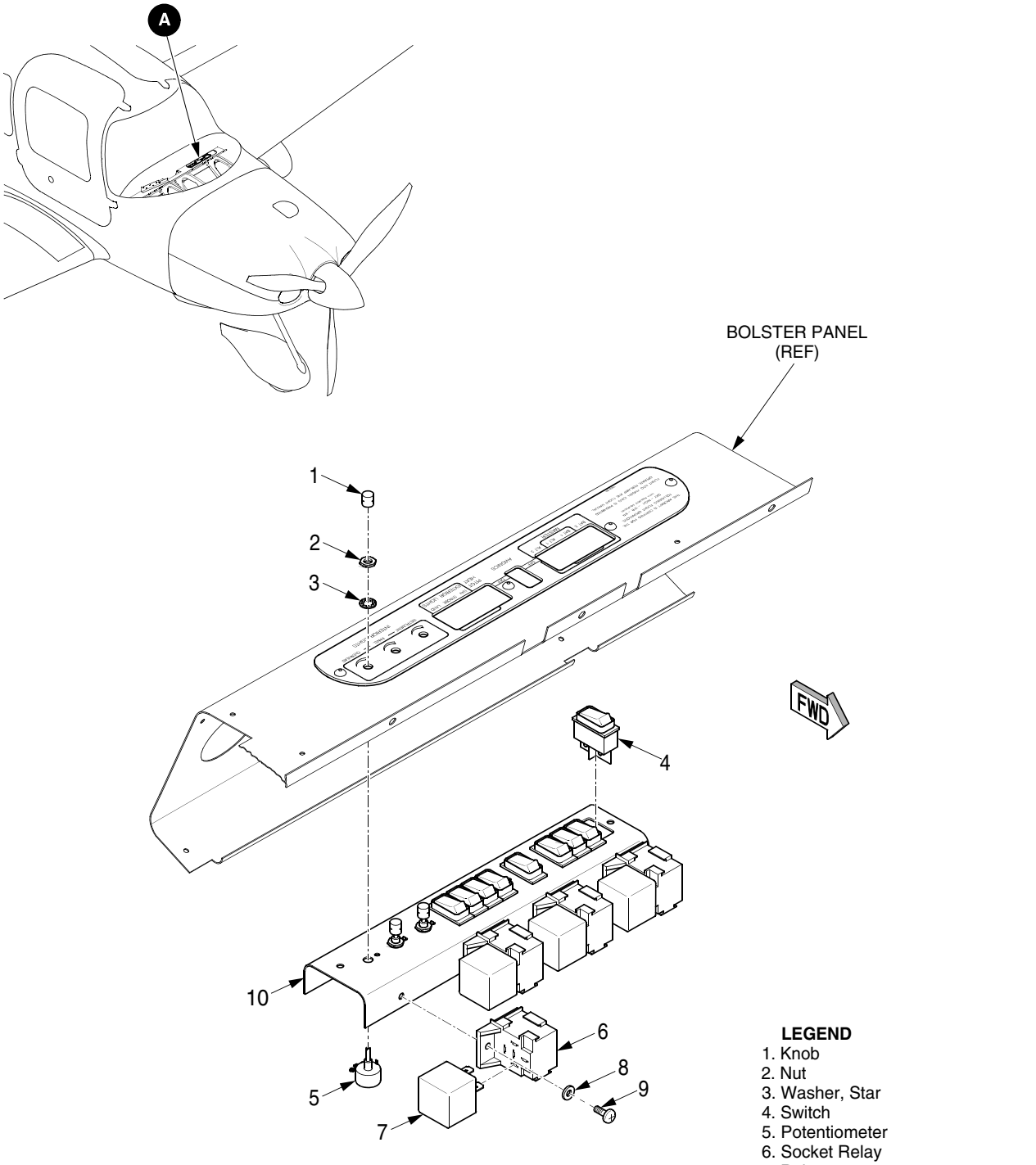
(c) Secure bolster panel to console with screws and washers.

(d) Install kick plate. (Refer to 25-10)

(e) Connect batteries. (Refer to 24-30)

E. Bolster Panel Switches - *Serials 1184 & subs*

The bolster panel switches are integral to the bolster panel. For maintenance practices pertinent to the bolster panel, see Instrument and Control Panels. (Refer to 31-10)



LEGEND

1. Knob
2. Nut
3. Washer, Star
4. Switch
5. Potentiometer
6. Socket Relay
7. Relay
8. Washer
9. Screw
10. Switch Panel, Forward Console

DETAIL A

Serials 1005 thru 1183.

SR20_MM24_1572B

Figure 24-504
Bolster Panel Switch Installation - Serials 1005 thru 1183

EFFECTIVITY:
Serials 1005 thru 1183

F. Convenience Power Circuit Card (See Figure 24-505)

(1) Removal - Convenience Power Circuit Card
- (a) Remove pilot's seat. (Refer to 25-10)
- (b) Remove left aft console trim. (Refer to 25-10)
- (c) Disconnect wiring harnesses from connectors on convenience power circuit card.
- (d) Remove screws and washers securing convenience power circuit card to bracket.

(2) Installation - Convenience Power Circuit Card
- (a) Install screws and washers securing convenience power circuit card to bracket.
- (b) Connect wiring harnesses to connectors on convenience power circuit card.
- (c) Perform Functional Test - Convenience Power Circuit Card. (Refer to 24-50)
- (d) Install left aft console trim. (Refer to 25-10)
- (e) Install pilot's seat. (Refer to 25-10)

(3) Functional Test - Convenience Power Circuit Card
- (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Voltmeter	-	Any Source	Measure voltage.

- (b) Ensure flap switch is set in current flap position.
- (c) Ensure that all flight controls and propeller area are clear.
- (d) Pull Starter Relay and Fuel Pump Relay circuit breakers.
- (e) Connect 28 ±1 VDC external power to external power receptacle.
- (f) Set BAT 2 switch to ON position.
- (g) Use voltmeter to ensure voltage measures 22-26 VDC.
- (h) Ensure Flap circuit breaker is in.
- (i) Ensure Flap Position lights are not on.
- (j) Set BAT 1 switch to ON position.
- (k) Set BAT 2 switch to OFF position.
- (l) Ensure OIL, ALT1, and ALT2 annunciator lights indicate power.
- (m) Use voltmeter to ensure voltage at convenience power outlet measures 13 ±1 VDC with positive pin (+) to center contact and negative pin (-) to outside of jack.
- (n) On convenience power circuit card, set headset power switch S520 to 9 VDC.
- (o) Ensure voltage at all four ANR jacks measures 9 ±1 VDC with positive (+) to center contact and negative (-) to ground.
- (p) On convenience power circuit card, set headset power switch S520 to 17 VDC.
- (q) Ensure voltage at all four ANR jacks measures 17 ±1 VDC with positive (+) to center contact and negative (-) to ground.
- (r) On convenience power circuit card, set headset power switch S520 to 28 VDC.
- (s) Ensure voltage at all four ANR jacks measures 1 VDC with positive (+) to center contact and negative (-) to ground.
- (t) Leave power switch set at 28 VDC.

G. Voltage Converter - *Serials w/ GNC 250 XL* (See Figure 24-505)

(1) Removal - Voltage Converter

(a) Remove pilot's seat. (Refer to 25-10)

(b) Remove left aft console trim. (Refer to 25-10)

(c) Open circuit breaker panel to gain access to voltage converter.

(d) Disconnect wiring harnesses from connectors on voltage converter.

(e) Remove screws, washers, and nuts securing voltage converter to center console.

(2) Installation - Voltage Converter

(a) Install screws, washers, and nuts securing voltage converter to center console.

(b) Connect wiring harnesses to connectors on voltage converter.

(c) Close and secure circuit breaker panel.

(d) Install left aft console trim. (Refer to 25-10)

(e) Install pilot's seat. (Refer to 25-10)

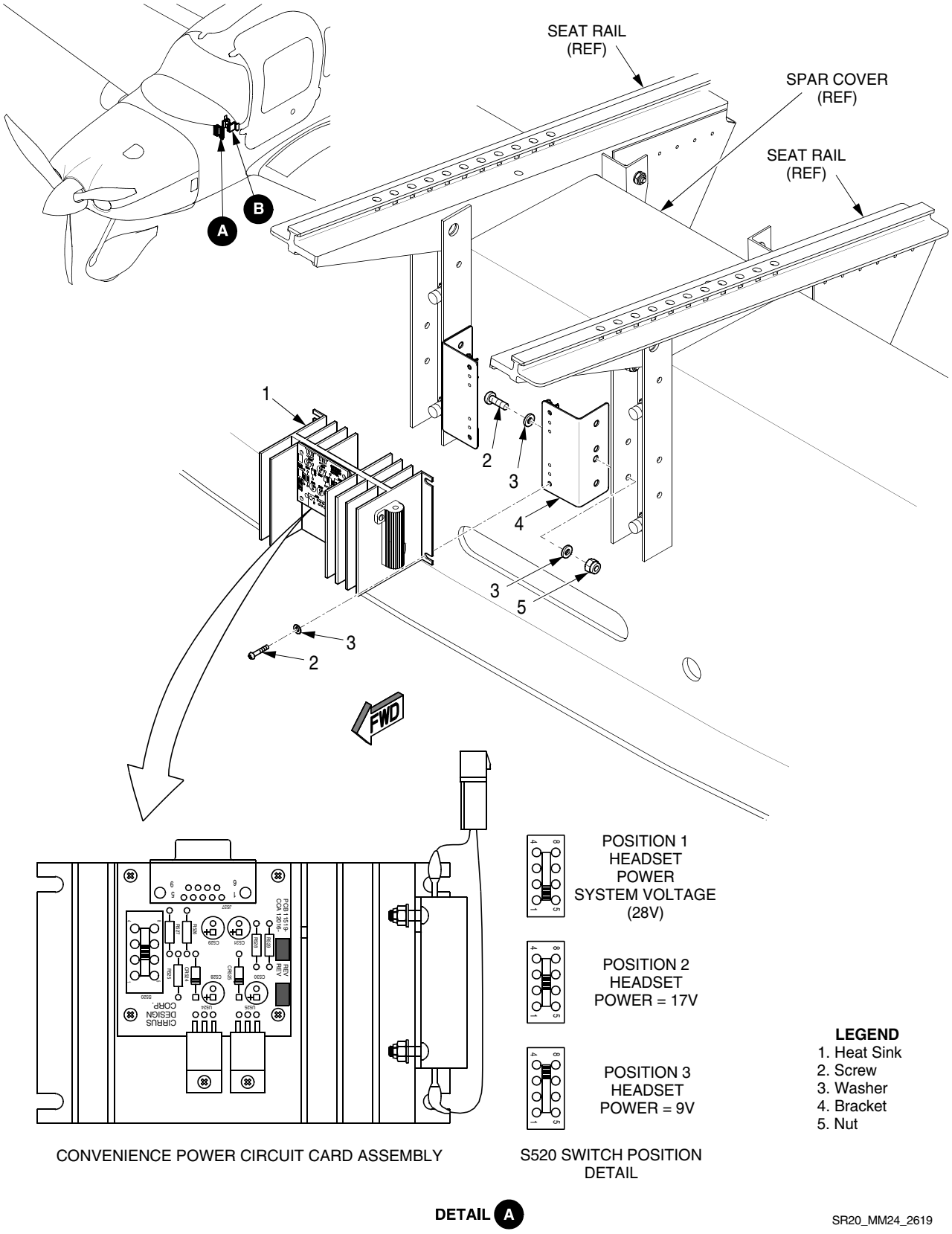
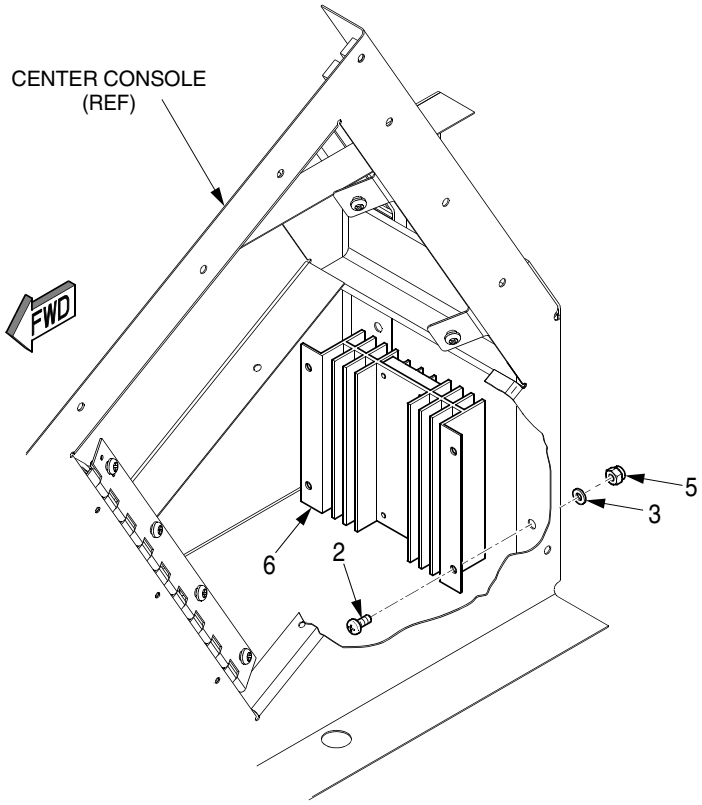


Figure 24-505
Convenience Power Circuit Card Installation (Sheet 1 of 2)



DETAIL B

Serials w/ GNC 250 XL.

LEGEND
2. Screw
3. Washer
5. Nut
6. Voltage Converter

SR20_PC24_2620

Figure 24-505
Convenience Power Circuit Card Installation (Sheet 2 of 2)

EFFECTIVITY:
All

H. Level Sensor Power Circuit Card - *Serials 2156 thru 2292* **(See Figure 24-506)**

(1) Removal - Level Sensor Power Circuit Card

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL QTY circuit breaker.

(c) Remove RH crew seat. (Refer to 25-10)

(d) Remove RH kick plate. (Refer to 25-10)

(e) Disconnect wiring harness from Level Sensor Power Circuit Card.

(f) Remove screws securing Level Sensor Power Circuit Card to console rib. Remove Level Sensor Power Circuit Card from airplane.

(2) Installation - Level Sensor Power Circuit Card

(a) Position Level Sensor Power Circuit Card to console rib and secure with screws.

(b) Connect wiring harness to Level Sensor Power Circuit Card.

(c) Install RH kick plate. (Refer to 25-10)

(d) Install RH crew seat. (Refer to 25-10)

(e) Reset FUEL QTY circuit breaker.

(f) Perform Functional Test - Level Sensor Power Circuit Card. (Refer to 24-50)

(3) Functional Test - Level Sensor Power Circuit Card

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Voltmeter	-	Any Source	Measure voltage.

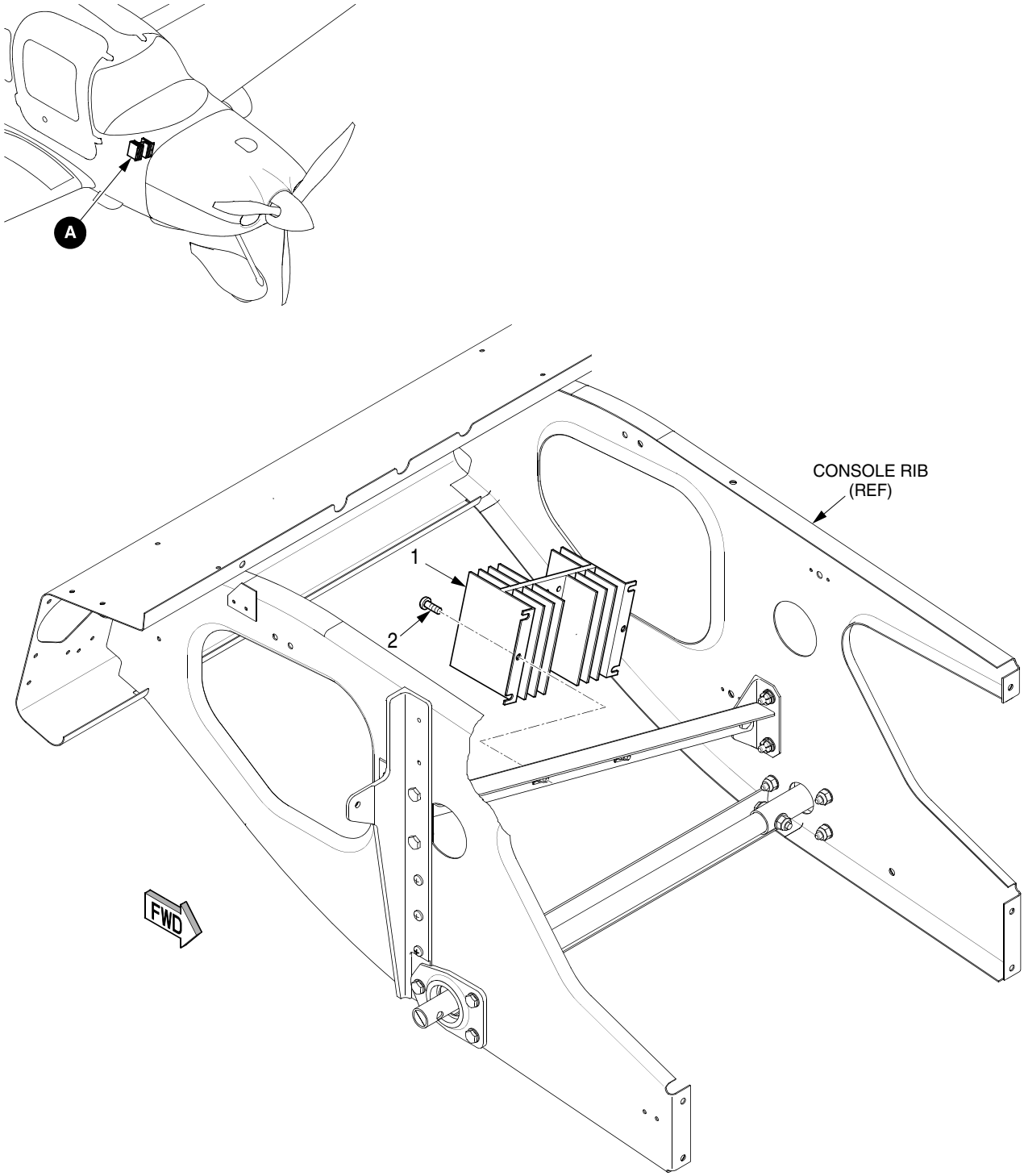
(b) Remove wing access panels LW5 and RW5. (Refer to 06-00)

(c) Disconnect sensor connectors P350 and P450 from LH and RH inboard fuel level sensors.

(d) Ensure voltage at connectors P350 and P450 measures 12 ±1 VDC with positive (+) to socket 1 and negative (-) to socket 3. (Refer to 28-40)

(e) Connect sensor connectors P350 and P450 to sensors.

(f) Install wing access panels LW5 and RW5. (Refer to 06-00)



DETAIL A

Serials 2156 thru 2292.

LEGEND
1. Level Sensor Power Circuit Card
2. Screw

SR20_MM24_3528

Figure 24-506
Level Sensor Power Circuit Card - Serials 2156 thru 2292

EFFECTIVITY:
Serials 2156 thru 2292

I. Convenience Power Outlet (See Figure 24-507)

(1) Removal - Convenience Power Outlet

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull 12V DC OUTLET circuit breaker.

(c) Open center console armrest and remove glove box. (Refer to 25-10)

(d) Remove aft console rear cover. (Refer to 25-10)

(e) Disconnect electrical terminals.

(f) Loosen outlet housing from outlet.

(g) Remove outlet and outlet housing from airplane.

(2) Installation - Convenience Power Outlet

(a) Install retaining ring of outlet cover to outlet.

(b) Position outlet through hole in center console with threaded end pointing aft.

Note: *Serials 1005 thru 2272:* Ensure terminals and outlet cover cap point down when outlet is snug against center console.

Serials 2273 & subs: Ensure terminals point down and outlet cover cap is positioned horizontally as shown when outlet is snug against center console.

(c) Install outlet housing to outlet and tighten until snug against center console.

(d) Connect electrical terminals.

(e) Install aft console rear cover. (Refer to 25-10)

(f) Insert glove box. (Refer to 25-10)

(g) Reset 12V DC OUTLET circuit breaker.

J. USB Power Outlets - *Serials 2273 & subs* **(See Figure 24-507)**

(1) Removal - USB Power Outlet

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Utility Knife	-	Any Source	Cut template.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Pull 12V DC OUTLET circuit breaker.
(d) Open center console armrest and remove glove box. (Refer to 25-10)
(e) Remove aft console rear cover. (Refer to 25-10)
(f) *For Cockpit USB Power Outlet:* Disconnect connector P1520.
(g) *For Passenger USB Power Outlet:* Disconnect connector P1521.
(h) Using template, remove audio panel overlay covering existing countersunk screws.

Note: Verify template is printed to scale.

1 Using utility knife, cut out template on dashed line.
2 Using utility knife, cut out shaded area within template, making sure to stay inside of dark line.
3 Align template over USB outlet.
4 Using cross-hatches on template, locate center of screws.

Note: Remove smallest area of overlay as possible to expose entire diameter of screw heads.

5 Using utility knife, remove audio panel overlay to expose screw heads.

(i) Remove screws securing outlet to center console. Discard screws.
(j) Remove outlet from airplane.

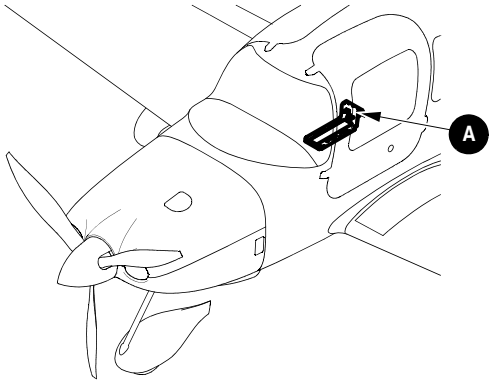
(2) Installation - USB Power Outlet

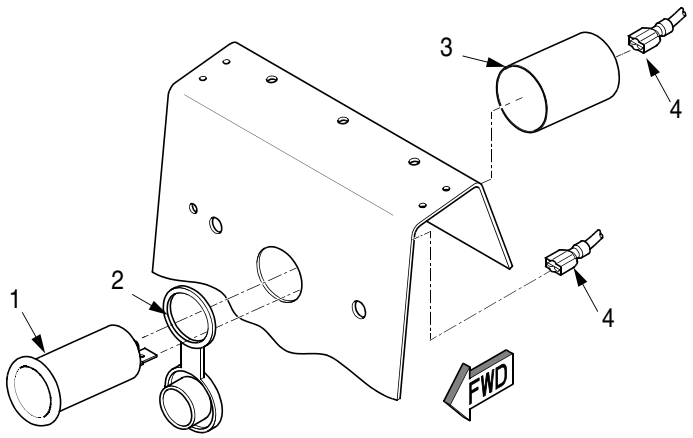
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Screw, #4-40 x .3125”, Qty. 2	24676	Fastenal Winona, MN 55987 507-454-5374	Secure outlet.
Flat Washer, Nylon, .115” ID, .032” Thk, Qty. 2	11513272	Fastenal Winona, MN 55987 507-454-5374	Secure outlet.

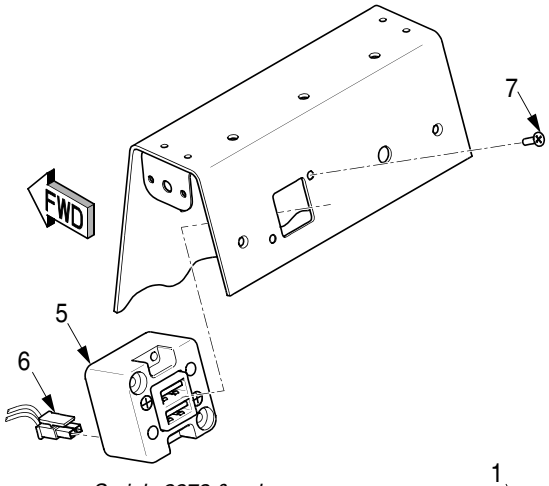
(b) Position outlet to center console and secure with washers and screws.
(c) *For Cockpit USB Power Outlet:* Connect connector P1520.
(d) *For Passenger USB Power Outlet:* Connect connector P1521
(e) Install aft console rear cover. (Refer to 25-10)
(f) Insert glove box. (Refer to 25-10)
(g) Reset 12V DC OUTLET circuit breaker.

EFFECTIVITY:
Serials 2273 & subs



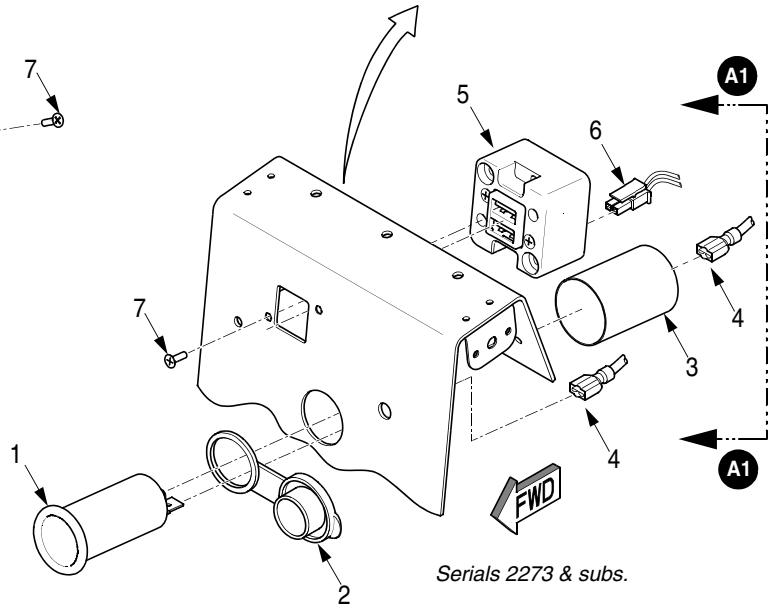


Serials 1005 thru 2272.



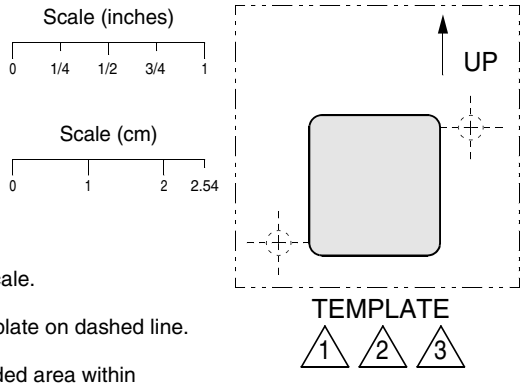
Serials 2273 & subs.

VIEW A1



Serials 2273 & subs.

DETAIL A



NOTE

1. Verify template is printed to scale.
2. Using utility knife, cut out template on dashed line.
3. Using utility knife, cut out shaded area within template, making sure to stay inside of dark line.

LEGEND

1. Convenience Power Outlet
2. Outlet Cover
3. Outlet Housing
4. Electrical Terminal
5. USB Power Outlet
6. Connector
7. Screw

SR20_MM24_3687

Figure 24-507
Convenience Power Outlet and USB Power Outlet Installation

K. Convenience System Controller - *Serials 2303 & subs w/ Convenience Lighting* (See Figure 24-508)

(1) Removal - Convenience System Controller

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Remove access panel CF4R.

(d) Disconnect wire harness connector from convenience system controller.

(e) Remove washers and screws securing convenience system controller to standoffs and remove from airplane.

(2) Installation - Convenience System Controller

(a) Position convenience system controller to standoffs with connector facing forward. Secure with screws and washers.

(b) Connect wire harness connector to convenience system controller.

(c) Install access panel CF4R.

(d) Reset CONV LIGHTS circuit breaker.

(e) Perform Operational Test - Convenience System Controller. (Refer to 24-50)

(3) Operational Test - Convenience System Controller

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Press unlock button on wireless keyfob.

(c) Verify doors unlock and step lights illuminate.

(d) Set cabin light switch to ON position.

(e) Verify interior footwell lights illuminate.

(f) Set cabin light switch to OFF position.

(g) Verify interior footwell lights turn off.

(h) Set cabin light switch to AUTO position.

(i) Open baggage door.

(j) Verify baggage lights illuminate.

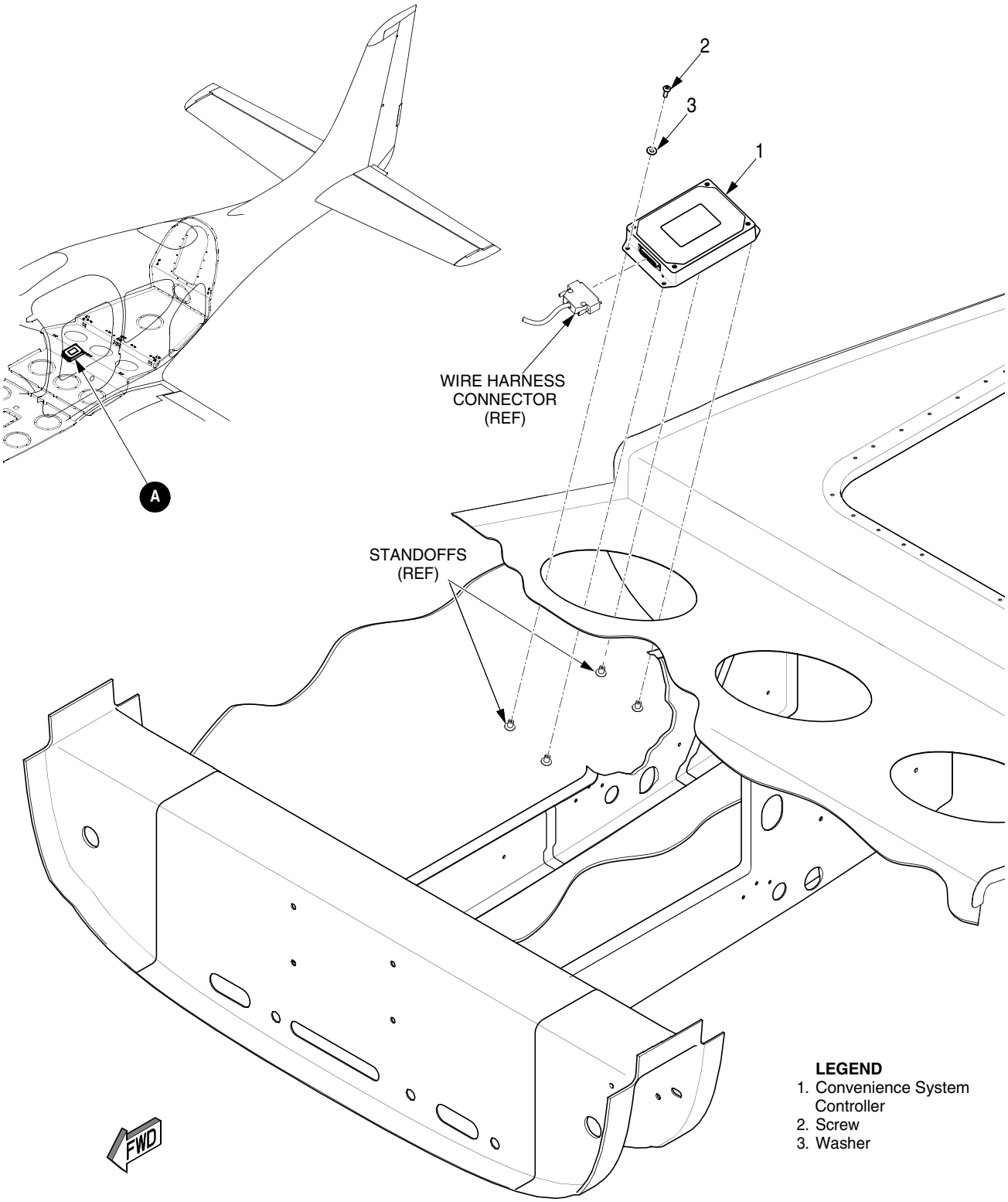


Figure 24-508
Convenience System Controller Installation - Serials 2303 & subs w/ Convenience Lighting

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EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

CHAPTER 25

EQUIPMENT AND FURNISHINGS

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EQUIPMENT AND FURNISHINGS

1. GENERAL

This chapter describes interior equipment and furnishings contained in the flight and passenger compartments on the airplane. Included are crew and passenger seats, four-point seat harnesses with inertia-reel retractors, console trim, mid and aft trim, headliner trim, carpeting, sunvisors, grab handles, headset hooks, coat hooks, drink holders, storage pockets, glove box, and radio rack module.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Seat is difficult to adjust or does not move freely between forward/aft or recline lock positions.	Seat track is mis-aligned with seat.	Perform Adjustment/Test - Crew Seat Longitudinal Alignment. (Refer to 25-10)
	Seat and/or seat track is damaged.	Contact Cirrus Design for disposition.
Seat lock pins do not engage simultaneously.	Seat track is mis-aligned with seat.	Perform Adjustment/Test - Crew Seat Longitudinal Alignment. (Refer to 25-10)
Seat back mechanism in the aft and mid seat back positions does not function correctly.	Break-over pins are misaligned.	Perform Adjustment/Test - Break-Over Pin Alignment. (Refer to 25-10)

CABIN

1. DESCRIPTION

This section covers cabin compartment seats, seat harnesses, trim, cabin headliner, floor covering, sunvisors, grab handles, headset hooks, coat hooks, drink holders, storage pockets, and radio module assembly.

A. Cabin Seats

This airplane has two individual front crew seats. The seat's forward and aft travel path is adjusted through seat position control located below the center of the seat cushion. The lower seat cushion is supported by an energy absorption module that reduces impact stroke in the event of a crash. Recline position is controlled through levers located on either side of seat back. Rotating the lever to the recline position when there is no pressure on the seat back will return the seat back to the full up position.

Serials 1005 thru 1472 before SB 2X-25-07 or SB 2X-25-14: Each front crew seat has a four-point restraint, with a single inertia-reel retractor on the shoulder belt.

Serials 1005 thru 1472 after SB 2X-25-07, 1473 thru 1540 before SB 2X-25-14: Each front crew seat has a four-point restraint, with a dual inertia-reel retractor on the shoulder belt.

Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs: Each crew seat has an inflatable, four-point restraint, with a dual inertia-reel retractor on the shoulder belt. An electronic module assembly, mounted below the cabin floor, contains a crash sensor, battery, and related circuitry to monitor the deceleration rate of the airplane. In the event of a crash, the electronic module assembly sends a signal to an inflator assembly mounted to the aft seat frame. The inflator assembly inflates an air bag integral to the shoulder belts that reduces impact trauma to the passenger.

Serials 1005 & subs w/o 2+1 Rear Seat: The rear split passenger seat bench has a fixed seat bottom and features backrests that fold forward independently for each side. The lower seat cushion is supported by an energy absorption module that reduces impact stroke in the event of a crash. Seat backs can be folded forward, with detent pins removed, to provide a semi-flat surface for bulky cargo extending forward from the baggage compartment. The detent pins are located at the base of the backrest.

Serials 2127 & subs w/ 2+1 Rear Seat: The rear seats employ a one-piece bench seat and two seat backs configured in 60/40 split. This "2+1" seating configuration provides for a center seat/restraint area for a third passenger on the pilot-side (LH) seat. Each seat back reclines independently of each other and can be folded forward to provide a semi-flat surface for cargo extending forward from the baggage compartment. Recline position is controlled through a lever located on either side of the seat. The lower seat cushion is supported by an energy absorption module that reduces impact stroke in the event of a crash. Shoulder belt options include two-harness (standard) and three-harness (optional). Additionally, a cargo net between the seat backs and bulkhead 222 secures cargo in the baggage compartment. The aircraft is equipped with provisions for installing two LATCH compliant child seats in the outboard rear seat positions, OR one non-LATCH compliant seat in the center rear seat position. Lower anchors for the LATCH compliant seats are located in the outboard seat positions. The non-LATCH compliant seat must be installed using the center seat belt. Three top tether anchors for the child seats are located on the rear bulkhead. For installation of child seat attach fittings, refer to Chapter 53, Attach Fittings. (Refer to 53-40)

B. Radio Module Assembly

Serials w/o Perspective Avionics: The radio module assembly, mounted to the bolster panel and center console, contains the audio panel, GPS/COM/NAV receivers, transponder, and autopilot. A rear-mounted cooling fan and series of cooling ducts prevent the avionics from overheating.

Serials w/ Perspective Avionics: The radio module assembly, mounted to the bolster panel and center console, contains the FMS keyboard, autopilot, audio panel, and optional ADF receiver. A rear-mounted cooling fan and series of cooling ducts prevent the avionics from overheating.

C. Troubleshooting - *Serials 2127 & subs w/ 2+1 Rear Seat*

Trouble - Rear Seats	Probable Cause	Remedy
Seat recline position does automatically spring forward when levers are rotated.	Weight and/or object on seat preventing seat break-over position.	Remove weight and/or object.
	Seat recline pins are not disengaging from lock hole.	Perform Adjustment/Test - Passenger Seat Back Recline Pin Engagement. (Refer to 25-10)
	Low tension in clock spring.	Ensure clock spring is installed correctly per passenger seat back installation. (Refer to 25-10)
	Parts damaged.	Replace damaged parts.
Seat recline position does not lock into one or more locations.	Seat recline pins are not engaging into lock hole.	Perform Adjustment/Test - Passenger Seat Back Recline Pin Engagement. (Refer to 25-10)
	Parts damaged.	Replace damaged parts.
Grinding noise and/or resistance during seat reclination.	Washer not installled between clock spring and seat flange.	Install washer per passenger seat back installation. (Refer to 25-10)

2. MAINTENANCE PRACTICES

A. Crew Seats (See Figure 25-101)

CAUTION: Avoid kneeling or stepping on seats so as to not crush the energy absorption modules.

(1) Removal - Crew Seats
  (a) *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Disconnect inflatable restraint interface cable from inflator cable.
  (b) Remove seat stop bolts and washers from seat rails.
  (c) Lift up on seat latch and slide seat forward off seat tracks.

(2) Disassembly - Crew Seats
  (a) Recline handle
    1 At side of crew seat back, loosen set screws securing crew seat recline handle to shaft, and slide handle off shaft. Repeat on opposite side of crew seat.
  (b) Seat back top
    1 Disassemble crew seat recline handle. (Refer to 25-10)

    CAUTION: Use care to avoid damaging upholstery on recline handle shafts.

    2 At lower, aft crew seat back, release reclosable fasteners and slide upholstery upward to expose seat back frame.
    3 Disassemble crew seat harness lap belt attach clip. (Refer to 25-10)
    4 Remove seat belt straps from upholstery, then slide upholstery upward and off seat back.
    5 Slide head rest upward and off top of seat back.
    6 *Serials 1423 thru 1540 before SB 2X-25-14, and Serials 1005 thru 1422:* Remove screws, washers, spacers, fairlead plates, and rub strips securing upholstery angle to seat back top.
    7 *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Remove bolts, washers, spacers, fairlead plates, shoulder belt guides, and rub strips securing upholstery angle to seat back top.
  (c) Seat adjustment handle
    1 Remove crew seat. (Refer to 25-10)
    2 Remove screw, washers, and nut securing handle and seat pins to lower seat frame. Repeat on opposite side of seat frame.
    3 Remove handle and spring-loaded seat pins from seat frame.
  (d) Seat recline locks
    1 Fold crew seats to break-over positions.
    2 At lower, aft crew seats, release reclosable fasteners to expose lower seat frame.
    3 Remove bolts, washers, and nuts securing aft lateral tube and recline locks to lower, aft sides of seat frame.

(3) Assembly - Crew Seats
  (a) Recline handle
    1 At side of crew seat back, position recline handle onto shaft so that handle is pointing in a downward direction, slide reclining handle on shaft, then tighten set screws securing crew seat reclining handle to shaft. Repeat on opposite side of crew seat.
  (b) Seat back top

    CAUTION: When routing seat belt straps, ensure belts do not become twisted.

1 Route seat belt straps from inertia reel up seat back until straps rest over top of seat back.

2 *Serials 1423 thru 1540 before SB 2X-25-14, and Serials 1005 thru 1422:* Position rub strips between each seat belt strap and top of seat back. Secure upholstery angle to seat back with screws, washers, spacers, fairlead plates, and rub strips.

3 *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Position rub strips and shoulder belt guides between each seat belt strap and top of seat back. Secure upholstery angle to seat back with bolts, washers, spacers, fairlead plates, shoulder belt guides, and rub strips.

4 Install head rest on top of seat back.

5 Slide seat back upholstery over the seat back far enough to pass the seat belt straps through the pass-through hole in the upholstery.

6 Assemble crew seat lap belt attach clip. (Refer to 25-10)

7 Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

8 Assemble crew seat recline handle. (Refer to 25-10)

(c) Seat adjustment handle

1 At bottom of seat, install spring-loaded seat pins into seat frame pin holes.

2 Position handle to attachment points on seat frame.

3 Install screw, washers, and nut securing seat pin and handle to lower seat frame. Repeat on opposite side of seat frame.

4 Install crew seat. (Refer to 25-10)

(d) Seat recline locks

1 Position aft lateral tube and recline locks to seat frame and install bolts, washers, and nuts securing recline locks to seat frame. Torque to 30 - 40 in-lb (3.3 - 4.5 Nm).

2 Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

(4) Installation - Crew Seats

CAUTION: *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Interface and inflator cable connections requires that LH and RH crew seats are installed at their designated locations.

(a) Position seat channel onto forward edge of seat tracks.

(b) Lift up on seat latch and slide seat rearward onto tracks. Slide seat back to the neutral position.

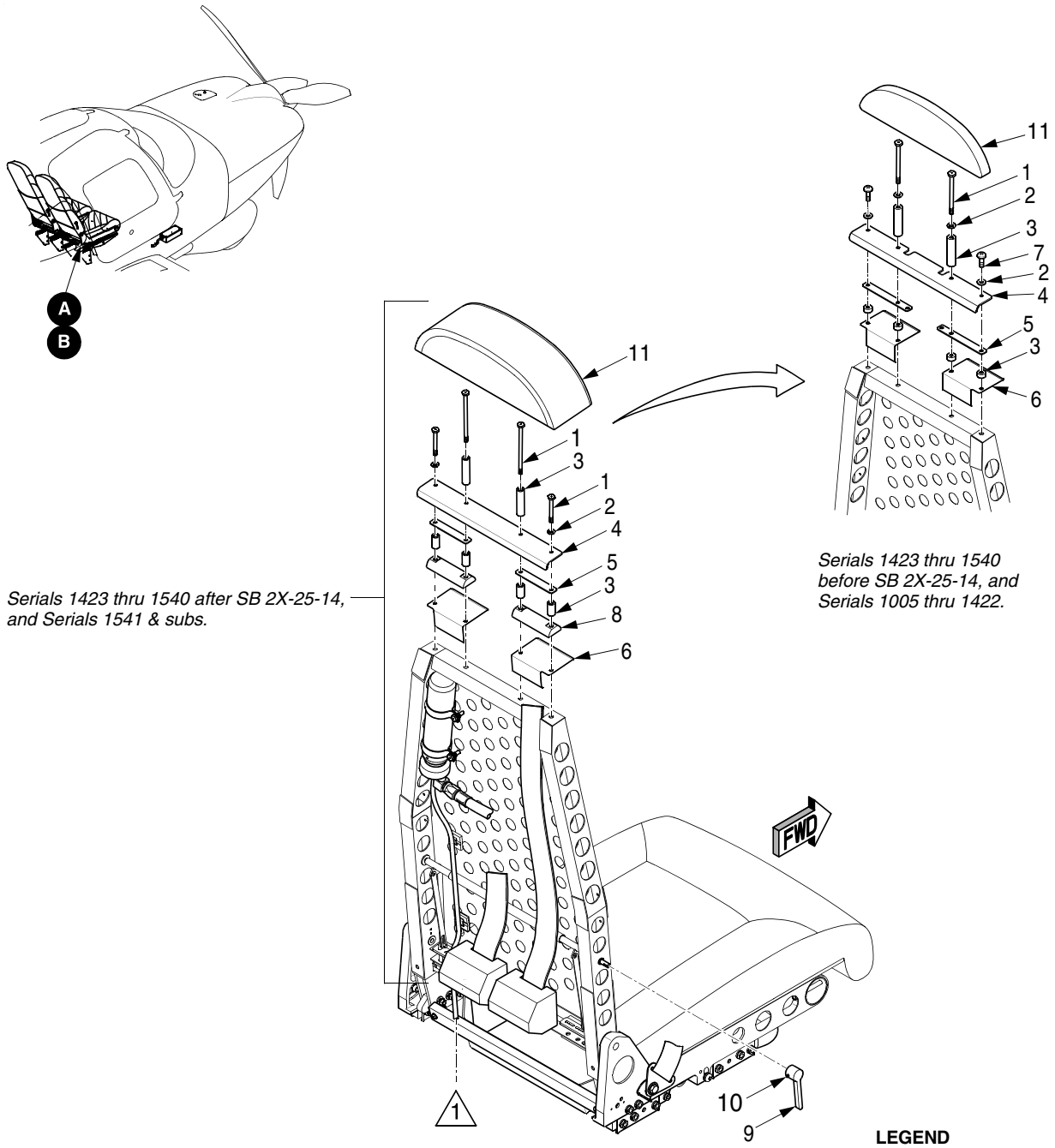
CAUTION: Ensure seat stop screw is installed on LH track of pilot's and co-pilot's seat track.

(c) Torque each seat stop screw assembly to 25.0 in-lb (2.8 Nm).

(d) *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Connect inflatable restraint interface cable to inflator cable.

(e) Perform Inspection/Check - Crew Seats. (Refer to 25-10)

(f) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)



NOTE

1 Refer to sheet 2 of 2 for continuation.

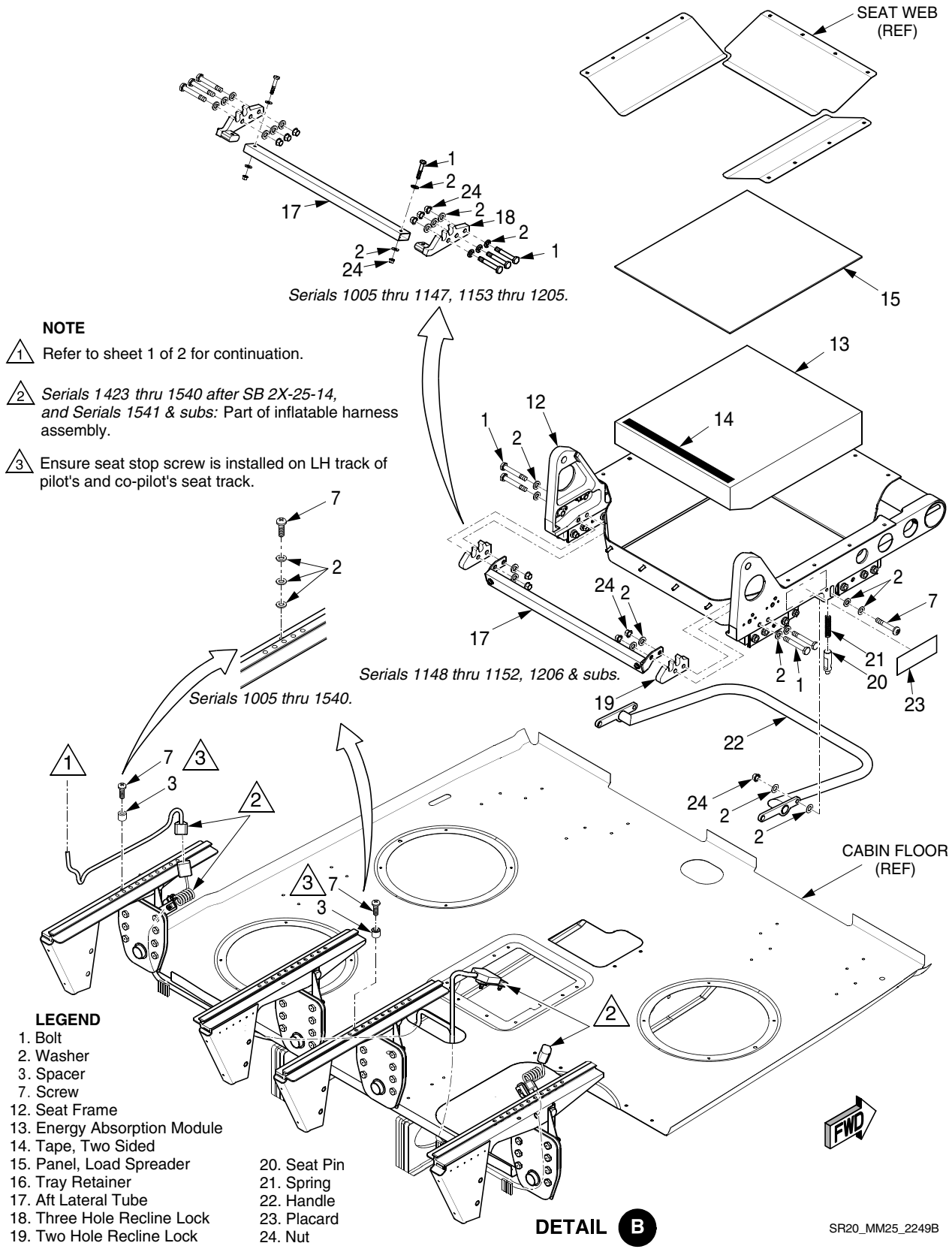
LEGEND

1. Bolt
2. Washer
3. Spacer
4. Upholstery Angle
5. Fairlead Plate
6. Rub Strip
7. Screw
8. Shoulder Belt Guide
9. Recline Handle
10. Set Screw
11. Head Rest Assembly

DETAIL A

SR20_MM25_2138B

Figure 25-101
Crew Seat Installation (Sheet 1 of 2)



NOTE

1. Refer to sheet 1 of 2 for continuation.
2. *Serials 1423 thru 1540 after SB 2X-25-14, and Serials 1541 & subs:* Part of inflatable harness assembly.
3. Ensure seat stop screw is installed on LH track of pilot's and co-pilot's seat track.

LEGEND

1. Bolt
2. Washer
3. Spacer
7. Screw
12. Seat Frame
13. Energy Absorption Module
14. Tape, Two Sided
15. Panel, Load Spreader
16. Tray Retainer
17. Aft Lateral Tube
18. Three Hole Recline Lock
19. Two Hole Recline Lock
20. Seat Pin
21. Spring
22. Handle
23. Placard
24. Nut

Figure 25-101
Crew Seat Installation (Sheet 2 of 2)

(5) Inspection/Check - Crew Seats.

(a) Verify security of attach brackets and seat stop screw.

CAUTION: If seat is misaligned and cannot be corrected by Adjustment/Test - Crew Seat Longitudinal Alignment, contact Cirrus Design for disposition.

(b) Verify seat forward/aft position adjustment catches both seat pins in all locking positions. To determine if both seat pins are engaged, skew seat forward-and-aft, and note whether second seat pin engages after the first seat pin.

1 If seat position adjusts smoothly and seat pins engage simultaneously, seat track is aligned with seat.

2 If seat position is difficult to adjust and/or seat pins require that seat is skewed before seat pins are aligned with seat track holes, perform Adjustment/Test - Crew Seat Longitudinal Alignment. (Refer to 25-10)

(c) Verify seat recline lock functions in all recline positions.

(d) Visually inspect harness webbing for cut or worn edges, damaged stitching, broken fabric threads, tears, excessive chafe marks, excessive wear, and excessive fraying.

Note: A limited amount of “frayed” webbing will retain sufficient strength necessary to meet the strength requirements of the webbing. Frayed webbing is defined as broken filaments from either the longitudinal or transverse yarns.

1 Verify that broken or fraying webbing filaments are not numerous enough to obscure the identity of any yarn when viewed from a distance of about 8.0 inches (20.3 cm).

2 Verify amount of fray comprises less than 10% of webbing width and does not exceed 8 inches (20.3 cm) in length.

3 Ensure edge of webbing is free from cuts or tears.

4 At non-edge locations, verify number of broken yarns does not exceed 15.

5 Ensure number of torn stitches in a stitch pattern does not exceed 15.

6 Verify frayed or distorted webbing does not interfere with proper operation of the restraint system.

(e) Ensure harness is clean and does not contain dirt, oil, grease, or other unwanted particles or substances. If necessary, clean harness. (Refer to 12-20)

(f) Inspect break-over pin alignment.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vernier Caliper	-	Any Source	Measure

2 Fold crew seats to break-over positions.

3 At lower, aft crew seats, release reclosable fasteners to expose lower seat frame.

4 Using caliper, verify clearance between center of break-over pin and seat back frame at bottom of upper break-over guide is equal to 0.580 ±0.023 inch (1.473 ±0.058 cm). (See Figure 25-103)

5 Verify clearance between center of break-over pin and seat back frame at tangent of lower break-over pin is equal to 0.580 ±0.023 inch (1.473 ±0.058 cm).

6 If measurement *is not equal* to that specified, perform Adjustment/Test - Break-Over Pin Alignment. (Refer to 25-10)

7 Repeat break-over pin alignment inspection for opposite seat.

(6) Adjustment/Test - Crew Seat Longitudinal Alignment (See Figure 25-102)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Seat Track Longitudinal Alignment Tool	15936-001	Cirrus Design	Measure
Caliper	-	Any Source	Measure
Lithium Marine Grease	50665-001	Cirrus Design	Lubricate
Permanent Marker	-	Any Source	Mark

(b) Remove crew seat. (Refer to 25-10)

(c) Verify seat track longitudinal alignment tool slots are free of debris, pins are secure, sliding pin moves freely forward and aft, and calibration label is identified.

(d) Align seat track longitudinal alignment tool to seat tracks with sliding mechanism positioned at the upper RH corner.

(e) Install slots of tool onto seat tracks. Press sliding and stationary pins on tool into corresponding seat track holes.

Note: There is about 0.5 inch (1.27 cm) of movement forward to aft when the tool is properly seated on the seat tracks.

(f) Move RH side of tool forward and aft to ensure proper movement of the tool.

CAUTION: Using 7.0 to 10.0 lbs (3.2 to 4.5 kg) of force, push tool until binding occurs between the tool and seat tracks. Excessive force will produce inaccurate measurements.

(g) Push RH side of tool aft to furthermost orientation.

(h) Measure distance between top edge of the tool and top edge of the sliding pin with a caliper. Record measurement as the aft value.

CAUTION: Using 7.0 to 10.0 lbs (3.2 to 4.5 kg) of force, push tool until binding occurs between the tool and seat tracks. Excessive force will produce inaccurate measurements.

(i) Push RH side of tool forward to furthermost orientation.

(j) Measure distance between top edge of the tool and top edge of the sliding pin with a caliper and record measurement as the forward value. Remove tool from seat tracks.

(k) Determine if forward value is within acceptable tolerance.

For example: If aft value is 0.2 inch (0.508 cm) and forward value is -0.245 inch (0.622 cm), use the following formula:

Acceptable Forward Value Range = - (Aft Value) ±0.025
Acceptable Forward Value Range = - (0.2) ±0.025 = -0.2 ±0.025

(l) If forward value is within acceptable tolerance, offset pins are not required:

1 Install crew seat. (Refer to 25-10)

(m) If forward value is not within acceptable tolerance, offset pins are required.

1 Determine offset required to correct mismatch.

Mismatch Range (in inches)	Greater Than Maximum		Less Than Minimum	
	LH Side	RH Side	RH Side	LH Side
0.011 to 0.030	-	Red (+0.020)	Black (-0.020)	-
0.031 to 0.050	-	Orange (+0.040)	White (-0.040)	-
0.051 to 0.070	-	Yellow (+0.060)	Purple (-0.060)	-
0.071 to 0.090	-	Green (+0.080)	Blue (-0.080)	-
0.091 to 0.110	Black (-0.020)	Green (+0.080)	Blue (-0.080)	Red (0.020)
0.111 to 0.130	White (-0.040)	Green (+0.080)	Blue (-0.080)	Orange (0.040)
0.131 to 0.150	Purple (-0.060)	Green (+0.080)	Blue (-0.080)	Yellow (0.060)
0.151 to 0.160[a]	Blue (-0.080)	Green (+0.080)	Blue (-0.080)	Green (0.080)

a. Maximum of 0.160 inch (4.06 mm) mismatch may be accommodated, If mismatch is greater than 0.160 inch (4.06 mm), contact Cirrus Design for disposition.

For example, if aft value is 0.2 inch (0.508 cm) and forward value is -0.245 inch (0.622 cm), the forward value is out of tolerance below the minimum acceptable value of -0.225 inch (-0.572 cm). To correct this mismatch, use the following formula:

Mismatch = (Measured Aft Value + Measured Forward Value) / 2
Mismatch = (0.2 + (-0.245)) / 2 = -0.023

Note: Mismatch is corrected by replacing aft pin with offset pin where sum of offset and mismatch is closest to the nominal value of zero.

2 Order placard and the appropriate offset pin to correct mismatch.

Description	P/N or Spec.	Supplier	Purpose
Placard	Refer to IPC, Interior Placards and Overlays for approved placards	Cirrus Design	Label
Seat Pin, Red (0.020 inch)	Refer to IPC, Forward Seat Installation for approved seat pins	Cirrus Design	Offset Pin
Seat Pin, Black (-0.020 inch)			
Seat Pin, Orange (0.040 inch)			
Seat Pin, White (-0.040 inch)			
Seat Pin, Yellow (0.060 inch)			
Seat Pin, Purple (-0.060 inch)			
Seat Pin, Green (0.080 inch)			
Seat Pin, Blue (-0.080 inch)			

For example, if mismatch is -0.023 inch (-0.058 cm), use pin required to offset as close to zero as possible.

Offset = - (Mismatch)
Offset = - (-0.023) = 0.023

A pin with offset of 0.020 inch (Red) will bring Longitudinal mismatch within tolerance.

Note: It may be necessary to use opposite displacement seat pins on each side of seat to compensate for misalignment.

For example, if mismatch is -0.091 inch (-0.231 cm), use combination of pins required to offset as close to zero as possible.

Offset = - (Mismatch)
Offset = - (-0.091) = 0.091

A pin with offset of 0.080 inch (Green) installed at RH side and a pin with offset of 0.020 inch (Black) installed at LH side will bring Longitudinal mismatch within tolerance.

3 Disassemble crew seat adjustment handle. (Refer to 25-10)

Note: Mismatch measured using the Seat Track Longitudinal Alignment Tool is only nominal track alignment. Other factors such as seat shape may also influence pin engagement function. Any selection of offset pins may be used such that best engagement function is achieved.

4 Replace the existing pin(s) with the offset pin(s). Discard the existing pin(s).

5 Assemble crew seat adjustment handle. (Refer to 25-10)

6 Lubricate seat pins with lithium marine grease.

7 Verify screws are loose enough to permit smooth, unrestricted forward and aft travel of seat.

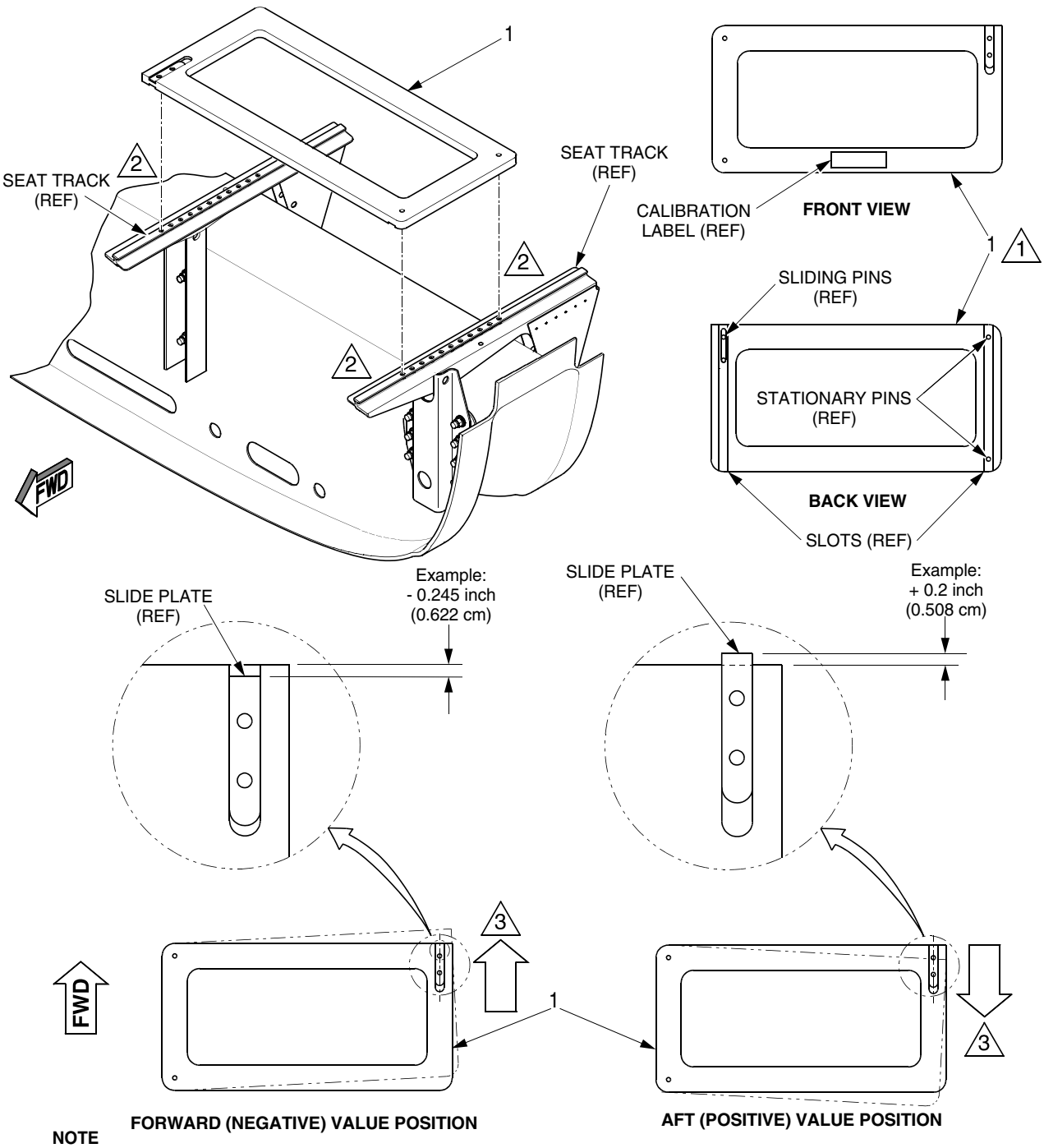
CAUTION: Once seat is modified using offset seat pins, it may only be installed in seat location affected by longitudinal mismatch.

8 Install crew seat. (Refer to 25-10)

9 Verify seat forward and aft position adjusts to all locking positions with relative ease.

10 Using marker on placard, indicate pins utilized, location of each pin, and seat location (pilot or co-pilot).

11 Attach placard to visible location on lower seat frame.



NOTE

1. Verify seat track longitudinal alignment tool slots are free of debris, pins are secure, sliding pin moves freely forward and aft, and calibration label is identified.

2. Install slots of tool onto the seat tracks. Press sliding and stationary pins into corresponding seat track holes.

3. Using 7.0 to 10.0 lbs (3.2 to 4.5 kg) of force, push tool until binding occurs between the tool and seat tracks. Excessive force will produce inaccurate measurements.

LEGEND

1. Seat Track Longitudinal Alignment Tool

SR20_MM25_2247

Figure 25-102
Seat Track Longitudinal Adjustment

(7) Adjustment/Test - Break-Over Pin Alignment (See Figure 25-103)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caliper	-	Any Source	Measure

(b) Free break-over pin by slightly loosening four sets of attaching hardware securing break-over guides to seat frame.

(c) Press break-over pin and guides inboard or outboard as required until break-over pin is positioned within tolerance.

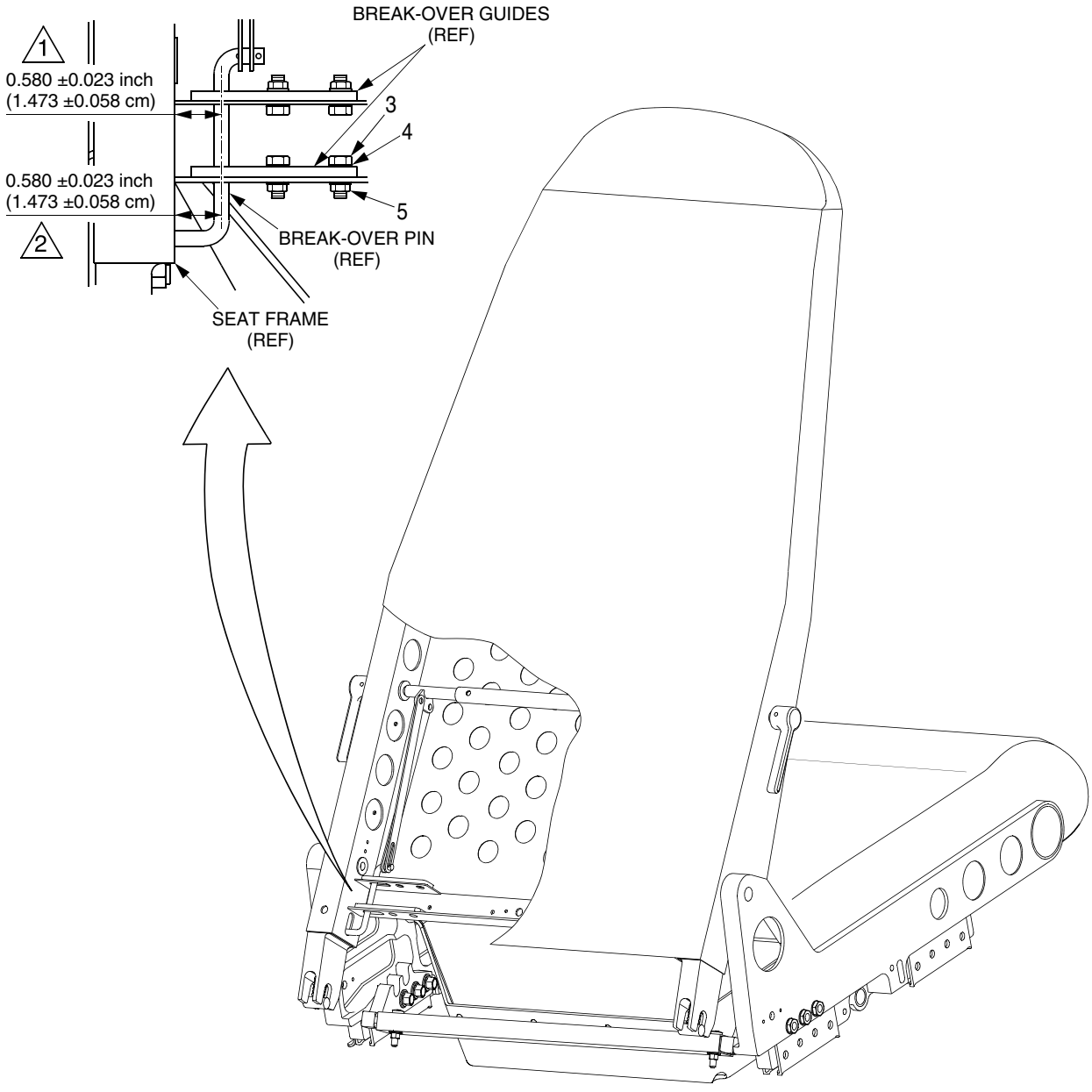
(d) Using a caliper, verify clearance between center of break-over pin and seat back frame at bottom of upper break-over guide is equal to 0.580 ±0.023 inch (1.473 ±0.058 cm).

(e) Verify clearance between center of break-over pin and seat back frame at tangent of lower break-over pin is equal to 0.580 ±0.023 inch (1.473 ±0.058 cm).

(f) Tighten four sets of attaching hardware securing break-over guides to seat frame.

(8) Cleaning - Crew Seats

Periodically vacuum and clean crew seats with approved cleaning solutions to ensure surface dirt and dust removal. (Refer to 12-20)



NOTE

1. Measure distance between center of break-over pin and seat frame at bottom of upper break-over guide.
2. Measure distance between center of break-over pin and seat frame at tangent of lower break-over pin.

LEGEND

1. Bolt
2. Washer
3. Nut

SR20_MM25_2253

Figure 25-103
Break-Over Pin Alignment

B. Crew Seat Harness (See Figure 25-104)

(1) Removal - Crew Seat Harness

(a) Remove crew seat. (Refer to 25-10)

(b) Disassemble crew seat back top. (Refer to 25-10)

(c) *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Disconnect harness inflator hose from inflator assembly.

(d) *Serials 1005 thru 1472 before SB 2X-25-07:* Remove inertia reel cover from inertia reel.

(e) *Serials 1005 thru 1472 before SB 2X-25-07:* Remove bolts and washers securing single inertia reel to crossover bar on back of crew seat.

(f) *Serials 1005 thru 1472 after SB 2X-25-07:* Remove bolts, washers, and nuts securing dual inertia reel to crossover bar on back of crew seat.

(g) *Serials 1473 & subs:* Remove bolts and washers securing dual inertia reel to crossover bar on back of crew seat.

(2) Disassembly - Crew Seat Harness Lap Belt Attach Clip

(a) Disassemble crew seat recline handle. (Refer to 25-10)

CAUTION: Use care to avoid damaging upholstery on recline handle shafts.

(b) At lower, aft crew seat back, release reclosable fasteners and slide upholstery upward to expose seat back frame.

(c) *Serials 1005 thru 1455 before SB 2X-25-09:* Remove bolt, washers, and spacer securing lap belt attach clip to side of lower crew seat frame. Repeat on opposite side of crew seat.

(d) *Serials 1005 thru 1455 after SB 2X-25-09, 1456 & subs:* Remove bolt, washer, spacer, and anti-rotation tab securing lap belt attach clip to side of lower crew seat frame. Repeat on opposite side of crew seat.

(3) Assembly - Crew Seat Harness Lap Belt Attach Clip

(a) *Serials 1005 thru 1455 before SB 2X-25-09:* At forward lap belt installation hole, secure lap belt attach clip to lower seat assembly with spacer, washers, and bolt. Torque bolt to 55 in-lb (6.2 Nm). Verify lap belt attach clip rotates freely. Repeat on opposite side of seat.

(b) *Serials 1005 thru 1455 after SB 2X-25-09, 1456 & subs:* At forward lap belt installation hole, secure lap belt attach clip to lower seat assembly with anti-rotation tab, spacer, washer, and bolt. Torque bolt to 55 in-lb (6.2 Nm). Verify lap belt attach clip rotates freely from stop to stop. Repeat on opposite side of crew seat.

(c) Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

(d) Assemble crew seat recline handle. (Refer to 25-10)

(4) Installation - Crew Seat Harness

(a) *Serials 1005 thru 1472 before SB 2X-25-07:* Position single inertia reel to crossover bar with reel positioned upward and secure to seat back with bolts and washers.

(b) *Serials 1005 thru 1472 after SB 2X-25-07:* Position dual inertia reel to crossover bar with reels positioned upward and secure to seat back with bolts, washers, and nuts.

(c) *Serials 1473 & subs:* Position dual inertia reel to crossover bar with reels positioned upward and secure to seat back with bolts and washers.

(d) *Serials 1005 thru 1472 before SB 2X-25-07:* Press inertia reel cover to inertia reel.

(e) *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs:* Connect inflator hose to inflator assembly.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	Inflator hose installation.

2 Route inflator hose from seat belt assembly between seat belt webbing and seat back web, ensuring twists and bends are minimized.

3 Apply Loctite® to threads of harness inflator hose fitting.

4 Connect harness inflator hose to inflator assembly. Torque hose fitting to 110 - 130 in-lb (12.4 - 14.7 Nm).

(f) Assemble crew seat back top. (Refer to 25-10)

(g) Install crew seat. (Refer to 25-10)

(h) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

(5) Inspection/Check - Crew Seat Harness - *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs*

(a) *Serials 1423 thru 1632, 1634 thru 1636:* Remove RH crew seat. (Refer to 25-10)

(b) *Serials 1633, 1637 & subs:* Remove LH crew seat. (Refer to 25-10)

(c) *Serials 1423 thru 1632, 1634 thru 1636:* Remove cabin floor access panel CF2R. (Refer to 06-00)

(d) *Serials 1633, 1637 & subs:* Remove cabin floor access panel CF2L. (Refer to 06-00)

(e) Verify security of electronic module assembly mounting hardware.

(f) Verify security of connection between electronic module assembly and cable interface assembly.

(g) Disassemble crew seat recline handle. (Refer to 25-10)

CAUTION: Use care to avoid damaging upholstery on recline handle shafts.

(h) At lower, aft crew seat back, release reclosable fasteners and slide upholstery upward to expose seat back frame.

(i) Verify security of inflator assembly mounting hardware.

(j) Verify security of connection between harness inflator hose and inflator assembly. If loose, torque hose fitting to 110 - 130 in-lb (12.4 - 14.7 Nm).

(k) *Serials w/ inflator part number 20902-005:* Verify security of connection between inflator assembly fitting and inflator assembly. If loose, torque fitting to 50 - 70 in-lb (5.6 - 7.9 Nm).

(l) Verify security of connection between inflator cable assembly and inflator assembly.

(m) Visually inspect exposed hoses and cables for tears, fraying, and excessive wear.

(n) *Serials 1423 thru 1632, 1634 thru 1636:* Install cabin floor access panel CF2R. (Refer to 06-00)

(o) *Serials 1633, 1637 & subs:* Install cabin floor access panel CF2L. (Refer to 06-00)

(p) Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

(q) Position recline handle onto shaft so that handle is pointing in a downward direction and secure with set screws. Repeat for opposite side of seat.

(r) Assemble crew seat recline handle. (Refer to 25-10)

(s) *Serials 1423 thru 1632, 1634 thru 1636:* Install RH crew seat. (Refer to 25-10)

(t) *Serials 1633, 1637 & subs:* Install LH crew seat. (Refer to 25-10)

(u) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

(6) Adjustment/Test - Crew Seat Harness - *Serials 1423 thru 1540 after SB 2X-25-14, 1541 & subs*

The system diagnostic tool (SDT) is a electronic, hand-held testing device used to verify inflatable restraint system functionality and facilitate component troubleshooting. The SDT connects directly to the diagnostic connector on the inflatable restraint cable interface assembly. LEDs for battery, sensor, and inflator indicate green for pass and red for fail. A three-position switch enables testing of multiple seats.

WARNING: Electronic module assembly must be securely installed in airplane prior to testing or inadvertent system deployment may occur.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
System Diagnostic Tool	508987-401	AmSafe Aviation Phoenix, Arizona 85043 800-228-1567	Test inflatable restraint system.

(b) Set SDT power switch to ON position.

(c) Verify SDT battery indicator illuminates green. If SDT battery indicator illuminates red, replace SDT battery.

(d) Set SDT toggle switch to number of seats connected to electronic module assembly.

(e) Remove right mid console trim. (Refer to 25-10)

(f) Disconnect diagnostic connector from center console by sliding plug off rail from connector plug.

CAUTION: Disconnect SDT from diagnostic connector once test is completed. If SDT remains connected to diagnostic connector for an extended period of time, power is drained from electronic module assembly.

(g) Connect SDT connector to diagnostic connector on interface cable.

(h) Verify LEDs on SDT indicate green.

(i) If one or more of the LEDs indicate red, perform the following steps:

1 Check all cable assembly connectors and retest.

2 If battery and/or sensor LED indicates red, replace the electronic module assembly and retest. (Refer to 25-10)

3 If inflator LED indicates red, replace the inflator cable assembly and retest. (Refer to 25-10)

4 If inflator LED still indicates red, replace the inflator assembly and retest. (Refer to 25-10)

5 If any fail condition exists after replacing electronic module assembly, inflator cable, and inflator assembly, replace the interface cable and retest. (Refer to 25-10)

(j) Set SDT power switch to OFF position.

(k) Disconnect SDT connector from diagnostic connector on interface cable.

(l) Install diagnostic connector to RH center console flange by sliding plug forward onto rail until connector locks into place with connector plug.

(m) Install right mid console trim. (Refer to 25-10)

C. Inflatable Restraint System, Inflator Assembly - *Serials 1541 & subs, Serials 1423 thru 1540 after SB 2X-25-14* (See Figure 25-104)

WARNING: **The inflator assembly is a stored, gas/energetic material device. Severe personal injury or bodily harm may be caused by misuse and/or tampering. Do not tamper with or mishandle the product in any way. Never attempt to open the inflator to service the inflator system. Never apply electrical current to the electronics connection.**

(1) Removal - Inflator Assembly

(a) Remove crew seat. (Refer to 25-10)

(b) Disassemble crew seat recline handle. (Refer to 25-10)

CAUTION: Use care to avoid damaging upholstery on recline handle shafts.

(c) At lower, aft crew seat back, release reclosable fasteners and slide upholstery upward to expose seat back frame.

(d) Disconnect inflator cable assembly from inflator assembly.

(e) Disconnect harness inflator hose from inflator assembly.

(f) Loosen bolts, washers, spacers, and nuts securing inflator assembly clamps.

(g) Remove inflator assembly from seat back.

(h) *Serials w/ inflator part number 20902-005:* To remove inflator assembly fitting, disconnect fitting from inflator assembly.

(2) Installation - Inflator Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	Seal threads.

(b) *Serials w/ inflator part number 20902-005:* To install inflator assembly fitting:

1 Apply Loctite® to threads of inflator assembly fitting.

2 Connect fitting to inflator assembly. Torque fitting to 50 - 70 in-lb (5.6 - 7.9 Nm).

(c) Position inflator assembly into clamps and secure to seat with bolts, washers, spacers, and nuts.

(d) Apply Loctite® to threads of harness inflator hose fitting.

(e) Connect harness inflator hose to inflator assembly. Torque hose fitting to 110 - 130 in-lb (12.4 - 14.7 Nm).

Note: *Serials w/ inflator part number 20902-002:* Inflator cable connection is adjacent to hose fitting.

Serials w/ inflator part number 20902-005: Inflator cable connection is on upper end of inflator assembly.

(f) Connect inflator cable assembly to inflator assembly.

(g) Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

(h) Assemble crew seat recline handle. (Refer to 25-10)

(i) Install crew seat. (Refer to 25-10)

(j) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

D. Inflatable Restraint System, Electronic Module Assembly - *Serials 1541 & subs, Serials 1423 thru 1540 after SB 2X-25-14* (See Figure 25-104)

WARNING: Avoid magnetic fields near the electronic module assembly as inadvertent system deployment may occur.

Secure electronic module assembly to fuselage floor before connecting wire harness. An unsecured, electrically connected electronic module assembly may result in inadvertent system deployment.

Do not drop the electronic module assembly as damage to the electronics, battery, or sensor may occur.

(1) Removal - Electronic Module Assembly

(a) *Serials 1423 thru 1632, 1634 thru 1636:* Remove RH crew seat. (Refer to 25-10)

(b) *Serials 1633, 1637 & subs:* Remove LH crew seat. (Refer to 25-10)

(c) *Serials 1423 thru 1632, 1634 thru 1636:* Remove cabin floor access panel CF2R. (Refer to 06-00)

(d) *Serials 1633, 1637 & subs:* Remove cabin floor access panel CF2L. (Refer to 06-00)

(e) Disconnect cable interface assembly from electronic module assembly.

(f) Remove screws and nut plate securing electronic module assembly to fuselage floor.

(g) Remove electronic module assembly from airplane.

(2) Installation - Electronic Module Assembly

(a) Position electronic module assembly to fuselage floor with directional arrow facing forward and secure with screws and nut plate assemblies.

(b) Torque screws to 6.0 ±2.0 in-lb (0.68 ±0.23 Nm). Torque stripe not required.

(c) Connect interface cable to electronic module assembly.

(d) *Serials 1423 thru 1632, 1634 thru 1636:* Install cabin floor access panel CF2R. (Refer to 06-00)

(e) *Serials 1633, 1637 & subs:* Install cabin floor access panel CF2L. (Refer to 06-00)

(f) *Serials 1423 thru 1632, 1634 thru 1636:* Install RH crew seat. (Refer to 25-10)

(g) *Serials 1633, 1637 & subs:* Install LH crew seat. (Refer to 25-10)

(h) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

E. Inflatable Restraint System, Interface Cable - *Serials 1541 & subs, Serials 1423 thru 1540 after SB 2X-25-14* (See Figure 25-104)

(1) Removal - Interface Cable

(a) Remove crew seats. (Refer to 25-10)

(b) *Serials 1423 thru 1632, 1634 thru 1636:* Remove cabin floor access panels CF1R, CF2R, and CF2L. (Refer to 06-00)

(c) *Serials 1633, 1637 & subs:* Remove cabin floor access panels CF1R, CF1L, and CF2L. (Refer to 06-00)

(d) Remove right mid console trim. (Refer to 25-10)

(e) At RH center console flange, disconnect diagnostic connector assembly from center console by sliding connector assembly forward and off mounting rail.

(f) Remove screw, washer, and clamp securing interface cable to bracket mounted on seat attach bracket. Repeat for opposite side of airplane.

(g) Remove cable ties securing interface cable to cable tiedowns on spar tunnel.

(h) Disconnect interface cable from electronic module assembly.

(i) *Serials 1423 thru 1632, 1634 thru 1636:* Route interface cables.

1 At RH aft corner of fuselage floor, route RH branch of interface cable from electronic module assembly aft along floor, and down through fuselage floor. Route interface cable along forward surface of spar tunnel, RH forward longeron, and up through RH pass-through hole.

2 At LH aft corner of fuselage floor, route LH branch of interface cable down through fuselage floor, along forward surface of spar tunnel, LH forward longeron, and up through LH pass-through hole.

(j) *Serials 1633, 1637 & subs:* Route interface cables.

1 At LH aft corner of fuselage floor, route LH branch of interface cable from electronic module assembly aft along floor, and down through fuselage floor. Route interface cable along forward surface of spar tunnel, LH forward longeron, and up through LH pass-through hole.

2 At RH aft corner of fuselage floor, route RH branch of interface cable down through fuselage floor, along forward surface of spar tunnel, RH forward longeron, and up through RH pass-through hole.

(k) At center console, locate diagnostic connector assembly of interface cable extending from two pass-through holes in fuselage floor just aft of the forward pulley gang. Retrieve remaining interface cable from pass-through holes and remove interface cable from airplane.

(2) Disassembly - Interface Cable

To disassemble diagnostic connector mounting rail, perform the following steps:

(a) Remove right mid console trim. (Refer to 25-10)

(b) At RH center console flange, disconnect diagnostic connector assembly from center console by sliding connector assembly forward and off mounting rail.

(c) Remove screws securing mounting rail to RH center console flange.

(3) Assembly - Interface Cable

To assemble diagnostic connector mounting rail, perform the following steps:

(a) Install screws securing mounting rail to RH center console flange.

(b) Install connector assembly to RH center console flange by sliding plug aft on mounting rail until connector assembly locks into place.

(c) Install right mid console trim. (Refer to 25-10)

(4) Installation - Interface Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	-	Any Source	Secure cable.

(b) At center console, locate pass-through holes in fuselage floor aft of forward pulley gang.

(c) *Serials 1423 thru 1632, 1634 thru 1636:* Route interface cables.

1 Route LH branch of interface cable through LH pass-through hole, LH forward longeron, along forward surface of spar tunnel, and up through LH aft corner of fuselage floor.

2 Route RH branch of interface cable through RH pass-through hole, RH forward longeron, and along forward surface of spar tunnel. At RH aft corner of fuselage floor, route RH branch of wire harness up through fuselage floor, and electronic module assembly branch of wire harness forward along floor.

(d) *Serials 1633, 1637 & subs:* Route interface cables.

1 Route RH branch of interface cable through RH pass-through hole, RH forward longeron, along forward surface of spar tunnel, and up through RH aft corner of fuselage floor.

2 Route LH branch of interface cable through LH pass-through hole, LH forward longeron, and along forward surface of spar tunnel. At LH aft corner of fuselage floor, route LH branch of wire harness up through fuselage floor, and electronic module assembly branch of wire harness forward along floor.

(e) Connect interface cable to electronic module assembly.

(f) Position interface cable to cable tiedowns on spar tunnel and secure with cable ties.

(g) Position interface cable to bracket mounted on seat attach bracket and secure with screw, washer, and clamp. Repeat for opposite side of airplane.

(h) Install connector assembly to RH center console flange by sliding plug aft on mounting rail until connector assembly locks into place.

(i) Install right mid console trim. (Refer to 25-10)

(j) *Serials 1423 thru 1632, 1634 thru 1636:* Install cabin floor access panels CF1R, CF2R, and CF2L. (Refer to 06-00)

(k) *Serials 1633, 1637 & subs:* Install cabin floor access panels CF1R, CF1L, and CF2L. (Refer to 06-00)

(l) Install crew seats. (Refer to 25-10)

(m) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

F. Inflatable Restraint System, Inflator Cable - *Serials 1541 & subs, Serials 1423 thru 1540 after SB 2X-25-14* (See Figure 25-104)

(1) Removal - Inflator Cable

(a) Disassemble crew seat recline handle. (Refer to 25-10)

CAUTION: Use care to avoid damaging upholstery on recline handle shafts.

(b) At lower, aft crew seat back, release reclosable fasteners and slide upholstery upward to expose seat back frame.

(c) Remove cable ties securing inflator cable to cable tiedowns on seat back.

(d) Remove cable ties securing inflator cable to cable tiedowns on spar tunnel.

(e) Disconnect inflator cable from inflator assembly.

(f) Disconnect inflator cable from interface cable. Remove inflator cable from airplane.

(2) Installation - Inflator Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Ties	-	Any Source	Secure cable.

(b) Connect inflator cable to interface cable.

Note: *Serials w/ inflator part number 20902-002:* Inflator cable connection is adjacent to hose fitting. Route inflator cable to lower end of inflator assembly. (See Figure 25-104)

Serials w/ inflator part number 20902-005: Inflator cable connection is on upper end of inflator assembly. Route cable through crew seat tube to upper end of inflator assembly. (See Figure 25-104)

(c) Connect inflator cable to inflator assembly.

Note: If replacing inflator part number 20902-002 with 20902-005, an additional cable tiedown must be installed on seat back. (See Figure 25-104)

(d) Position inflator cable to cable tiedowns on seat back and secure with cable ties.

(e) Place seat back upholstery into position and press firmly on reclosable fasteners to secure upholstery to seat back.

(f) Assemble crew seat recline handle. (Refer to 25-10)

(g) Perform Adjustment/Test - Crew Seat Harness. (Refer to 25-10)

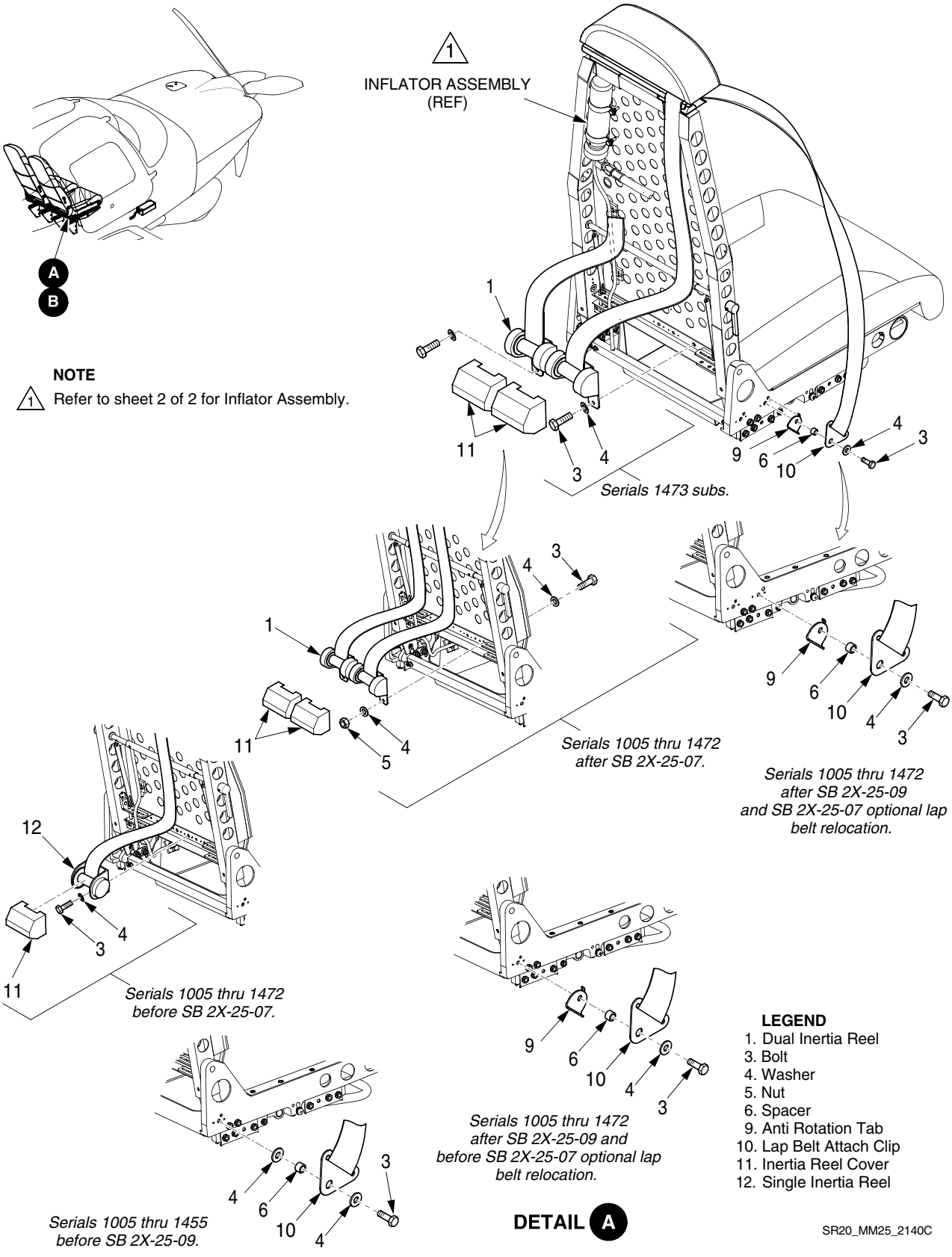
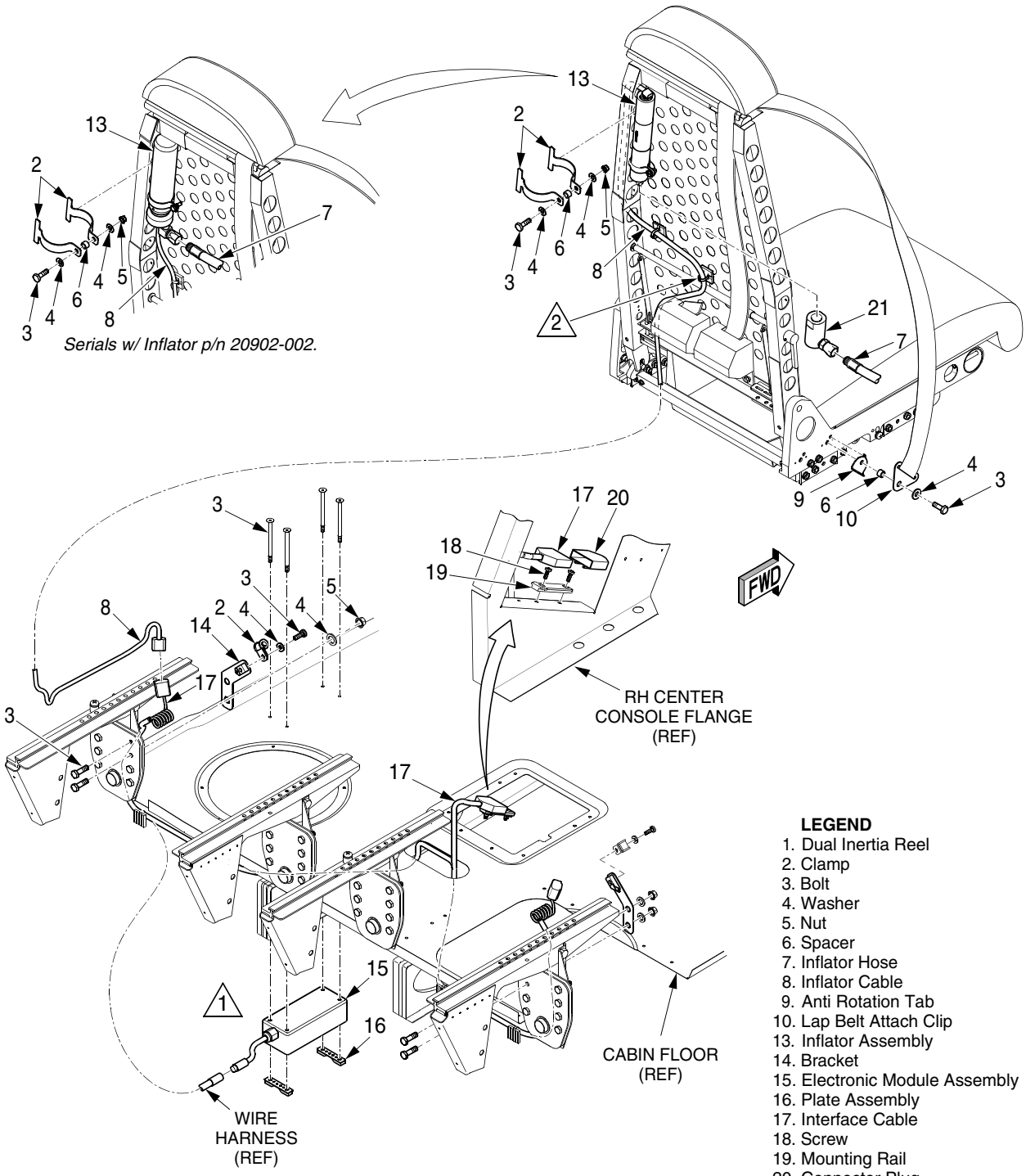


Figure 25-104
Crew Seat Harness and Inflatable Restraint System Installation (Sheet 1 of 2)



LEGEND

1. Dual Inertia Reel
2. Clamp
3. Bolt
4. Washer
5. Nut
6. Spacer
7. Inflator Hose
8. Inflator Cable
9. Anti Rotation Tab
10. Lap Belt Attach Clip
13. Inflator Assembly
14. Bracket
15. Electronic Module Assembly
16. Plate Assembly
17. Interface Cable
18. Screw
19. Mounting Rail
20. Connector Plug
21. Fitting

NOTE

1. *Serials 1423 thru 1632, 1634 thru 1638:* Installed on RH side of cabin floor.
2. If replacing inflator part number 20902-002 with 20902-005, an additional cable tiedown must be installed on seat back.

Figure 25-104
Crew Seat Harness and Inflatable Restraint System Installation (Sheet 2 of 2)

G. Passenger Seats - *Serials 1005 & subs w/o 2+1 Rear Seat* **(See Figure 25-105)**

CAUTION: Detent pins must be installed when occupants are seated in the passenger seats.

Avoid kneeling or stepping on seats so as to not crush energy absorption modules.

(1) Removal - Passenger Seats
  (a) Remove seat cushion.
  (b) Remove cotter pins used to secure the seat assembly to floor.

Note: Access to detent pins is best achieved through the baggage door.

  (c) Remove the detent pins from the seat back.
  (d) Lift forward edge of seat assembly up, pull seat assembly forward, and remove seats.

(2) Installation - Passenger Seats
  (a) Install seats on aft floor and insert the rear studs into the attach fittings.
  (b) Secure forward seat brackets with cotter pins.
  (c) Place the detent pins into position.
  (d) Secure seat cushion.

(3) Cleaning - Passenger Seats

Periodically vacuum and clean crew seats with approved cleaning solutions to ensure surface dirt and dust removal. (Refer to 12-20)

EFFECTIVITY:
Serials 1005 & subs w/o 2+1 Rear Seat

H. Passenger Seats - *Serials 2127 & subs w/ 2+1 Rear Seat* (See Figure 25-105), (See Figure 25-106)

CAUTION: Avoid kneeling or stepping on seats so as to not crush energy absorption modules.

Remove seat base assembly secured with reclosable fasteners carefully so as to not damage fasteners.

(1) Removal - Passenger Seat Base
  (a) Remove cotter pins used to secure the seat base assembly to floor.
  (b) Lift forward edge of seat base assembly up, pull seat base assembly forward to release reclosable fasteners, and remove seat base assembly.

(2) Installation - Passenger Seat Base
  (a) Install seat base assembly on aft floor and press rear seat base assembly firmly onto reclosable fasteners.

Note: If seat base wobbles, one to three washers may be installed at each pin below the seat or cotter pin to eliminate excess pin engagement.

  (b) Secure forward seat brackets with cotter pins.

(3) Removal - Passenger Seat Back
  (a) At outboard seat, slip harness strap free of seat belt guide and stow harness aft of seat.
  (b) *Serials w/ three-harness installation:* If removing LH seat, disengage LH center harness latch securing seat harness to LH center harness mount. Unbuckle seat harness, and route harness aft through seat pass-through hole.
  (c) With no pressure on seat back, rotate lever to recline position and fold seat back forward.
  (d) Remove bolts, washers, clock spring, housing, and nuts securing seat back to floor brackets, and remove seat back assembly.

(4) Disassembly - Passenger Seat Back
  (a) Recline handle
    1 At outboard seat, loosen set screws securing crew seat recline handle to shaft, and slide handle off shaft.
  (b) Seat belt guide
    1 At aft seat, remove screws securing seat belt guide to seat.
  (c) Baggage strap anchor plates
    1 At aft seat, remove screws securing anchor plates to seat.
  (d) Actuator assembly
    1 At outboard seat, loosen jam nut at base of recline pin housing.
    2 Depress pin shoulder flush with recline pin housing while loosening barrel nut until pin slot can be detached from cable ball.
    3 Remove spring from recline pin housing.
    4 Remove recline handle. (Refer to 25-10)
    5 Remove retaining ring securing actuator shaft to seat.
    6 Slide actuator shaft inboard at flanged bushing and disengage from cable S-hook.
    7 Remove flanged bushing from seat.
    8 Remove screws and washers securing recline pin housing to seat.
    9 Release cable clip and remove cable from pass-through hole.
    10 Remove grommet from pass-through hole.
  (e) Seat hinge plates
    1 At inboard/outboard seat, remove screws, washers, and nuts securing seat hinge plates to seat.

(5) Assembly - Passenger Seat Back

(a) Recline handle

1 Position recline handle onto shaft so that handle is pointing in a downward direction, slide reclining handle on shaft, then tighten set screws securing crew seat reclining handle to shaft.

(b) Seat belt guide

1 At aft seat, position seat belt guide to aft seat and install screws securing seat belt guide to seat.

(c) Baggage strap anchor plates

1 At aft seat, install screws securing anchor plates to seat.

(d) Actuator assembly

1 At outboard seat, install grommet at pass-through hole.

2 Route cable in pass-through hole and secure to cable clip.

3 Install screws and washers securing recline pin housing to seat.

4 Install flanged bushing into seat.

5 Engage actuator shaft onto cable S-hook and slide actuator shaft outboard through seat at flanged bushing.

6 Install retaining ring securing actuator shaft to seat.

7 Install recline handle. (Refer to 25-10)

8 Install spring into recline pin housing.

9 Route cable through recline pin housing and position cable ball in pin slot.

10 Depress pin shoulder flush with recline pin housing while tightening barrel nut until spring compression is maintained by pin tension.

11 Tighten jam nut at base of recline pin housing.

(e) Seat hinge plates

1 At inboard/outboard seat, install screws, washers, and nuts securing seat hinge plates to seat.

(6) Installation - Passenger Seat Back

(a) Position clock spring to outboard floor bracket so that outer clock spring tab is facing aft, and inner clock spring tab is captured by slot in outboard floor bracket.

(b) Position seat back to floor brackets so that lower edge of aft outboard seat flange contacts outer clock spring tab. Secure seat to floor brackets with bolts, washers, clock spring, housing, and nuts.

(c) Fold passenger seat to upright position.

CAUTION: When routing seat belt straps, ensure belts do not become twisted.

(d) At outboard seat, slip outboard harness into seat belt guide and route harness forward.

(e) *Serials w/ three-harness installation:* If installing LH seat, route center harness forward through seat pass-through hole and engage LH center harness latch to LH center harness mount. Buckle seat harness.

(f) If actuator assembly was removed, perform Adjustment/Test - Passenger Seat Back Recline Pin Engagement. (Refer to 25-10)

(7) Adjustment/Test - Passenger Seat Back Recline Pin Engagement **(See Figure 25-105)**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vernier Caliper	-	Any Source	Measure

EFFECTIVITY:
Serials 2127 & subs w/ 2+1 Rear Seat

(b) Loosen jam nut at base of recline pin housing.
(c) Tighten or loosen barrel nut as required to adjust pin spring compression.
(d) Using caliper, verify measurement between flat surfaces of housing and pin shoulder is approximately 0.10 inch (2.54 mm).
(e) Once measurement is obtained, hold recline handle while slowly loosening barrel nut. Stop loosening barrel nut when reduction in tension can be felt in recline handle.
(f) Tighten jam nut at base of recline pin housing.
(g) Rotate lever and fold passenger seat to available recline positions.
(h) Verify pin engages lock hole when recline handle is not actuated.
(i) Verify pin fully dis-engages lock hole when recline handle is actuated.
(j) Repeat pin spring compression adjustment as necessary.

(8) Cleaning - Passenger Seats (Refer to 12-20)

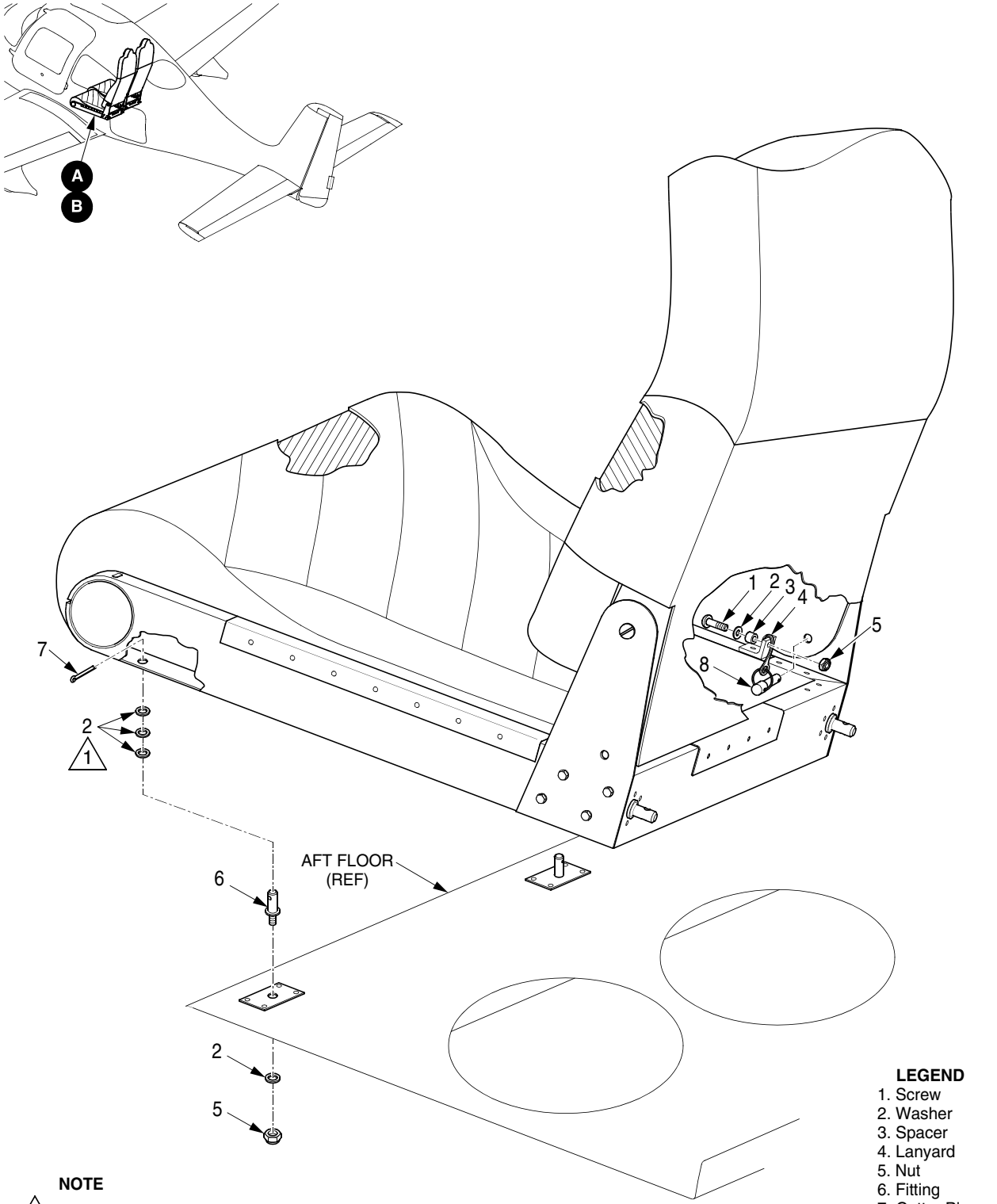


Figure 25-105
Passenger Seat Installation - Serials 1005 & subs w/o 2+1 Rear Seat (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 & subs w/o 2+1 Rear Seat

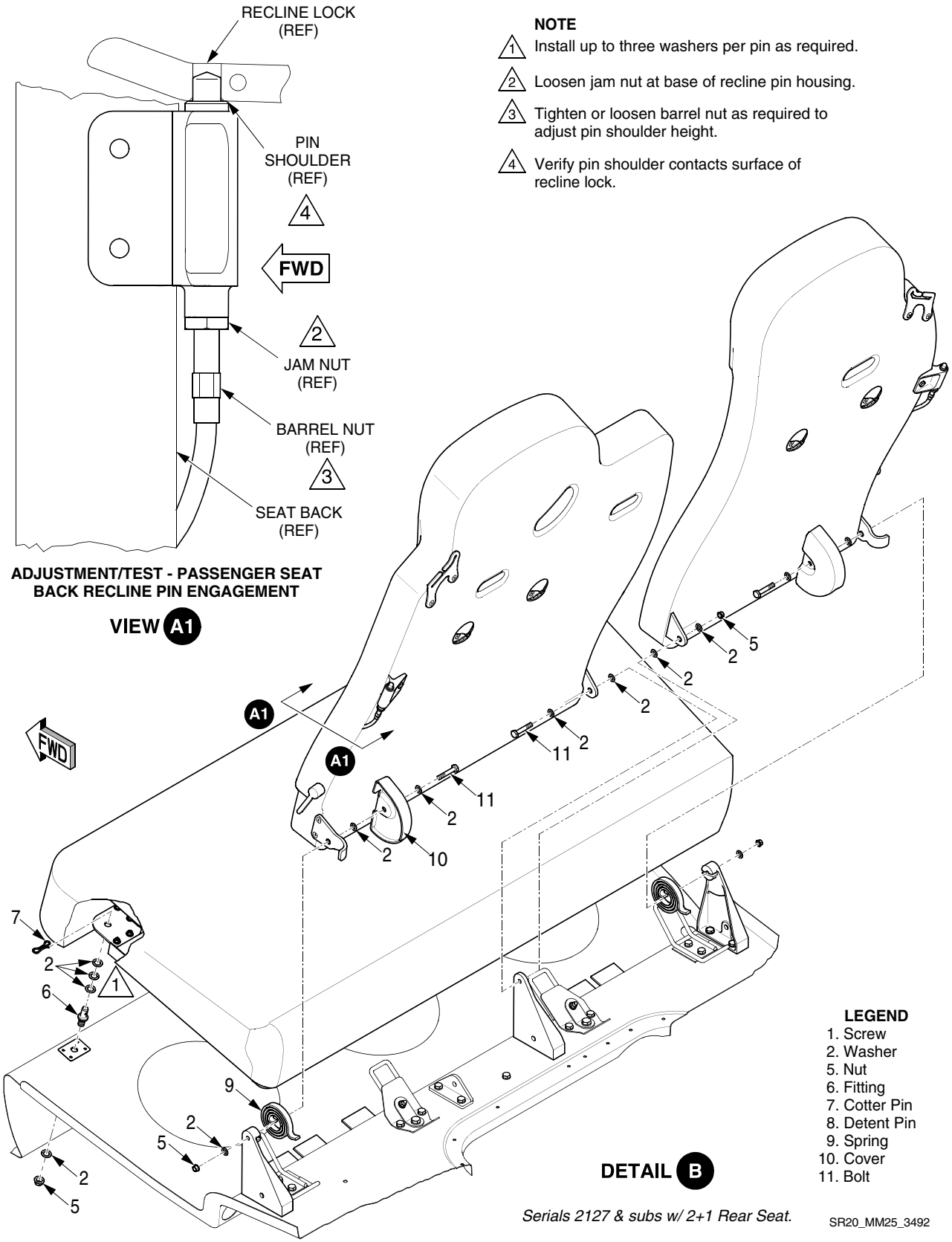
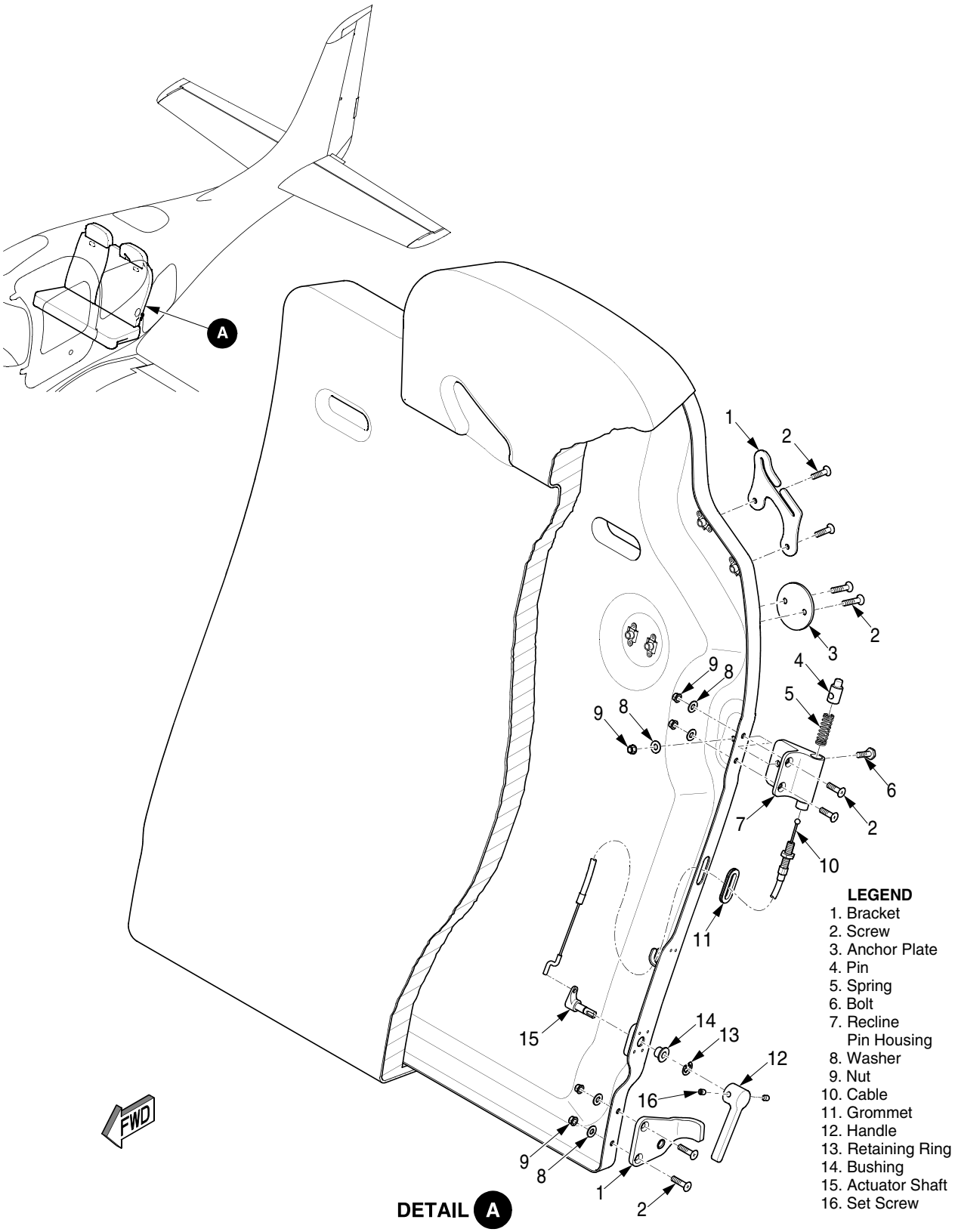


Figure 25-105
Passenger Seat Installation - Serials 2127 & subs w/ 2+1 Rear Seat (Sheet 2 of 2)



Serials 2127 & subs w/ 2+1 Rear Seat.

Figure 25-106
Passenger Seat Back Assembly - Serials 2127 & subs w/ 2+1 Rear Seat

EFFECTIVITY:
Serials 2127 & subs w/ 2+1 Rear Seat

I. Passenger Seat Harness - *Serials 1005 & subs w/o 2+1 Rear Seat* **(See Figure 25-107)**

(1) Removal - Passenger Seat Harness

(a) Remove the bolt, washer, bushing, washer, and nylon self-locking nut from lower outboard harness mount.

(b) Remove the bolt, washer, bushing, washer, and self-locking nut from lower central harness mount.

(c) Remove the aft bulkhead trim panel and the rear headliner. (Refer to 25-10)

(d) Remove the bolts, washers, and self-locking nuts from upper seat harness mount.

(2) Installation - Passenger Seat Harness

(a) Install the two lower central lap harnesses into the lower central harness mount.

(b) Insert the bushing, bolt, and washer through the harness mount and both harnesses.

(c) Install flat washer and self-locking nut. Tighten self-locking nut.

WARNING: **Inertia reel must be installed with harness coming off the top side of inertia reel. The inertia reel plate must be installed on the underside of mount.**

(d) Install inertia reel plate on the underside of mount and secure with three bolts, washers, and self-locking nuts.

(e) Secure aft bulkhead trim panel. (Refer to 25-10)

(f) Install the lower outboard harness mount, and secure with bolt, washer, bushing, washer, and nylon self-locking nut.

(g) Perform Inspection/Check - Passenger Seat Harness. (Refer to 25-10)

J. Passenger Seat Harness - *Serials 2127 & subs w/ 2+1 Rear Seat* **(See Figure 25-107)**

(1) Removal - Passenger Seat Harness

(a) Remove aft bulkhead trim panel and rear headliner. (Refer to 25-10)

(b) LH or RH Harness

1 Remove bolt, washers, bushing, and nut securing seat harness to lower outboard harness mount.

2 Remove bolt, washers, bushing, and nut securing seat harness to lower inboard harness mount.

3 At outboard seat, slip outboard harness strap free of seat belt guide.

4 Remove bolts, washers, and nuts securing inertia reel to upper outboard seat harness mount. Remove harness from airplane.

(c) *Serials w/ three-harness installation:* Center Harness

1 Disengage LH center latch securing seat harness to LH center harness mount.

2 Disengage RH center latch securing seat harness to RH center harness mount, and route harness aft through seat pass-through hole.

3 Remove bolts, washers, and nuts securing inertia reel to upper center seat harness mount. Remove harness from airplane.

(2) Installation - Passenger Seat Harness

WARNING: Inertia reel must be installed with harness coming off the top side of inertia reel. The inertia reel plate must be installed on the underside of mount.

(a) LH or RH Harness

1 Install inertia reel plate on underside of upper outboard seat harness mount and secure with bolts, washers, and nuts.

2 At outboard seat, slip outboard harness strap into seat belt guide.

3 Install bolt, washers, bushing, and nut securing seat harness to lower inboard harness mount.

4 Install bolt, washers, bushing, and nut securing seat harness to lower outboard harness mount.

(b) *Serials w/ three-harness installation:* Center Harness

1 Install inertia reel plate on underside of upper center seat harness mount and secure with bolts, washers, and nuts.

2 Route center harness forward through seat pass-through hole.

3 Engage LH center latch securing seat harness to LH center harness mount.

4 Engage RH center latch securing seat harness to RH center harness mount.

(c) Secure aft bulkhead trim panel. (Refer to 25-10)

(d) Perform Inspection/Check - Passenger Seat Harness. (Refer to 25-10)

K. Inspection/Check - Passenger Seat Harness

(a) Examine harness webbing for cut or worn edges, damaged stitching, broken fabric threads, tears, excessive chafe marks, excessive wear, excessive fusing.

Note: A limited amount of “frayed” webbing will retain sufficient strength necessary to meet the strength requirements of the webbing. Frayed webbing is defined as broken filaments from either the longitudinal or transverse yarns.

(b) Verify that broken or fraying webbing filaments are not numerous enough to obscure the identity of any yarn when viewed from a distance of about 8.0 inches (20.3 cm).

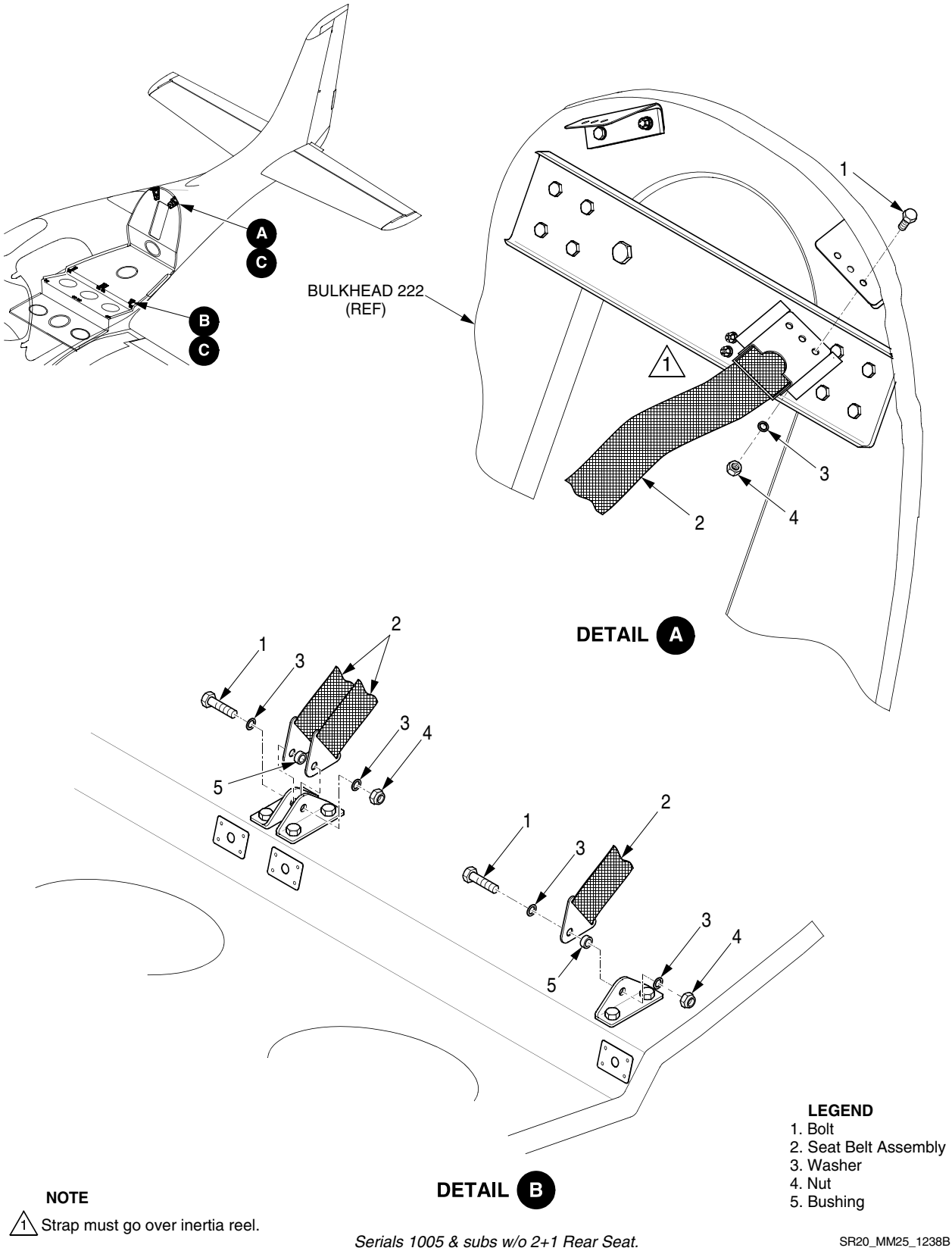
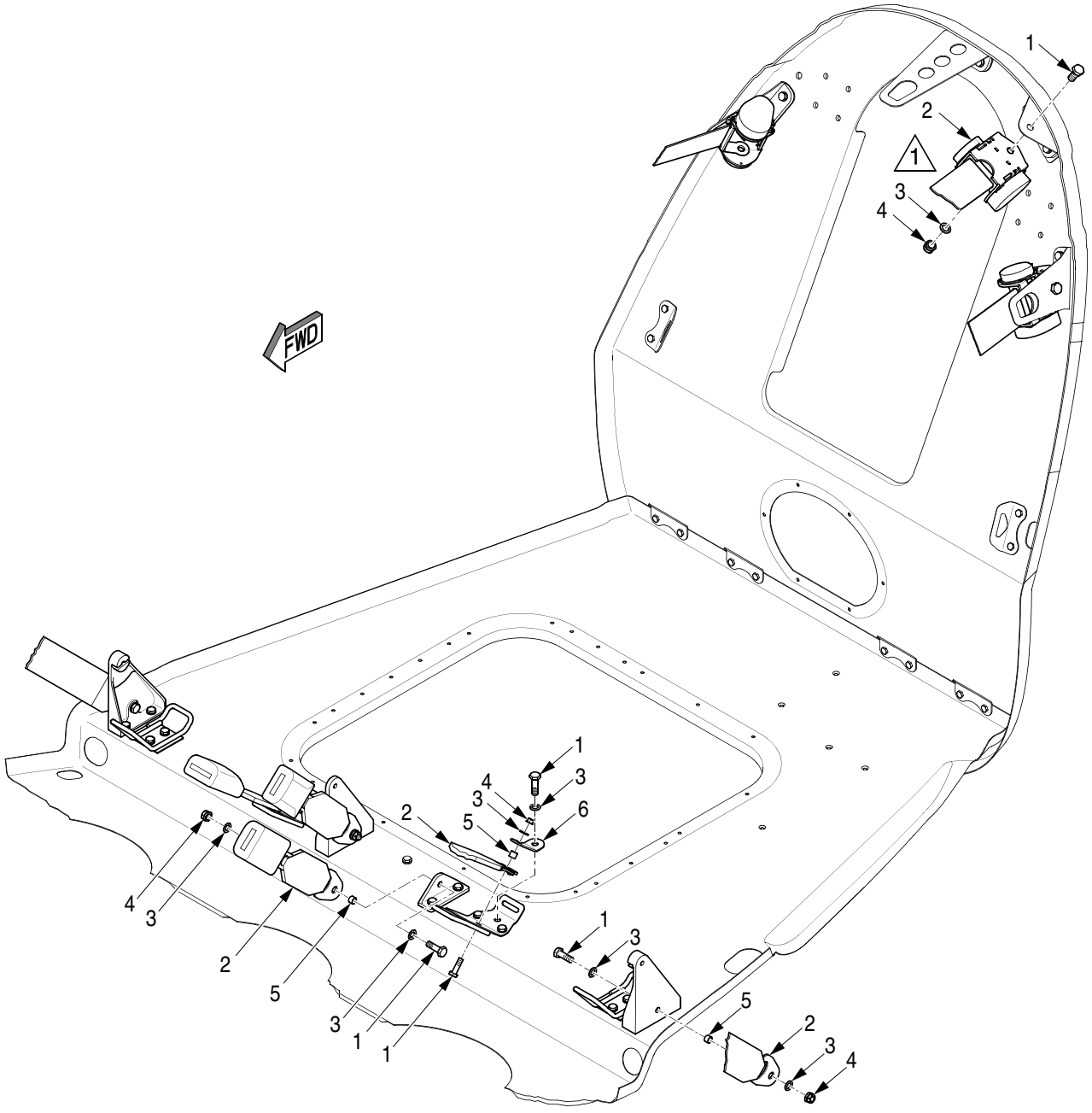


Figure 25-107
Passenger Seat Harness - Serials 1005 & subs w/o 2+1 Rear Seat (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 & subs w/o 2+1 Rear Seat



LEGEND
1. Bolt
2. Seat Belt Assembly
3. Washer
4. Nut
5. Bushing
6. Fitting

NOTE

1 Strap must go over inertia reel.

DETAIL C

Serials 2127 & subs w/ 2+1 Rear Seat.

SR20_MM25_3488

Figure 25-107
Passenger Seat Harness - Serials 2127 & subs w/ 2+1 Rear Seat (Sheet 2 of 2)

L. Cargo Net - *Serials 2127 & subs w/ 2+1 Rear Seat* **(See Figure 25-108)**

(1) Removal - Cargo Net

(a) At passenger seat backs, depress and hold latch pins to disengage latches securing cargo net straps to anchor plates.

(b) Slide latches off anchor plates.

(c) Remove bolts, washers, and nuts securing inertia reels to cargo net mounts. Remove cargo net from airplane.

(2) Installation - Cargo Net

WARNING: **Inertia reel must be installed with harness coming off the bottom side of inertia reel. The inertia reel plate must be installed on the upper-side of mount.**

(a) Install inertia reel plate on upperside of cargo net mounts and secure with bolts, washers, and nuts.

(b) Position cargo net straps to passenger seat backs and engage latches to anchor plates.

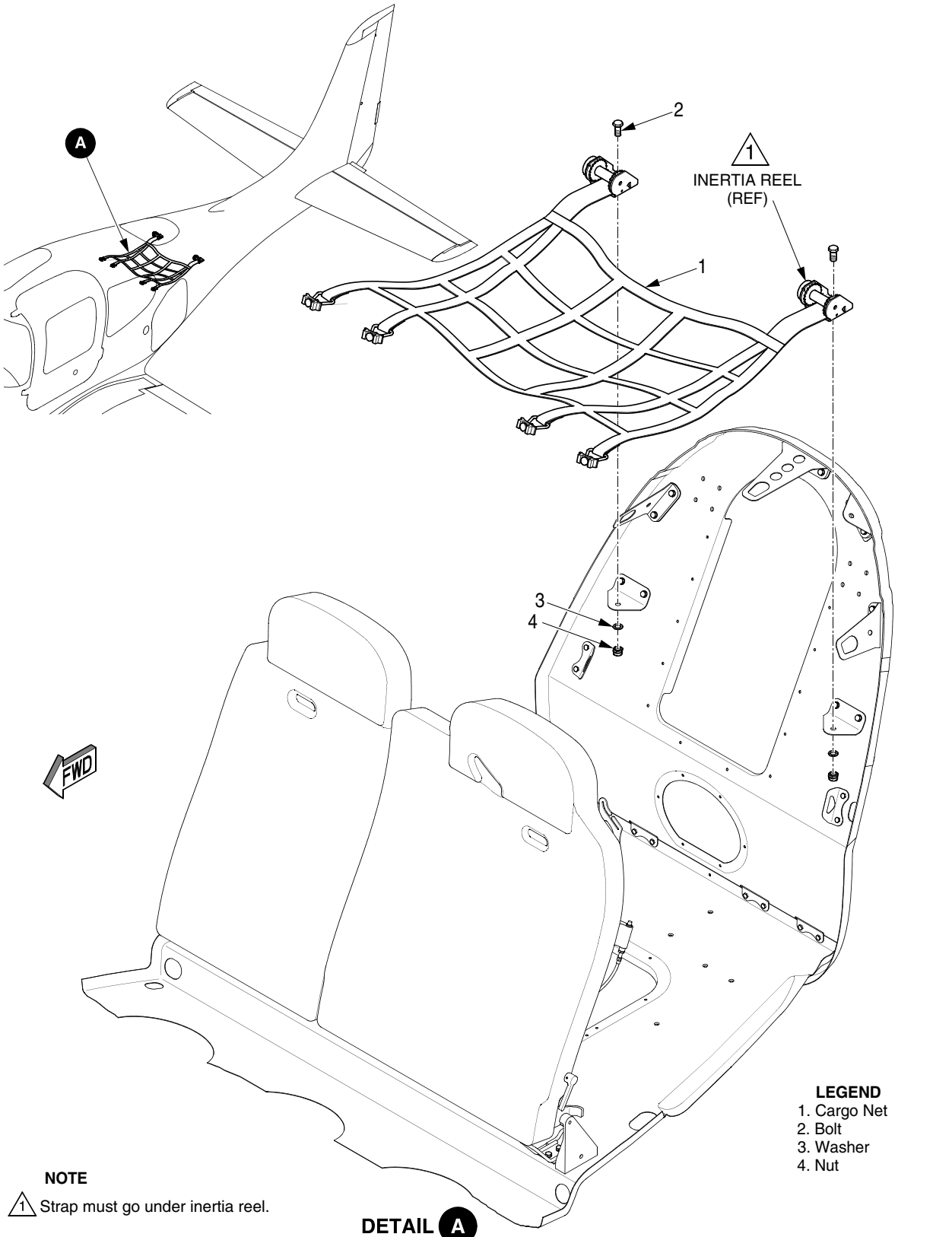
(c) Perform Inspection/Check - Cargo Net. (Refer to 25-10)

(3) Inspection/Check - Cargo Net

(a) Examine harness webbing for cut or worn edges, damaged stitching, broken fabric threads, tears, excessive chafe marks, excessive wear, excessive fusing.

Note: A limited amount of “frayed” webbing will retain sufficient strength necessary to meet the strength requirements of the webbing. Frayed webbing is defined as broken filaments from either the longitudinal or transverse yarns.

(b) Verify that broken or fraying webbing filaments are not numerous enough to obscure the identity of any yarn when viewed from a distance of about 8.0 inches (20.3 cm).



Serials 2127 & subs w/ 2+1 Rear Seat.

Figure 25-108
Cargo Net - Serials 2127 & subs w/ 2+1 Rear Seat

M. Console Trim (See Figure 25-109)

CAUTION: Remove trim secured with reclosable fasteners carefully so as to not damage fasteners or trim.

Remove any sharp objects from pockets or clothing to avoid damaging interior panels or upholstery.

When installed, verify interior panels are secure to side walls and do not interfere with rudder pedal movement throughout the rudder pedal's full range of movement.

Note: It is useful in most instances to remove crew and/or passenger seats to improve access to interior trim panels during removal or installation procedures.

(1) Removal - Glareshield Assembly
- (a) *Serials 1005 thru 1422*: Remove the instrument panel-glareshield mounting screw that is located at the upper left-hand edge of the instrument panel.
- (b) Remove glareshield mounting screws from LH and RH edges of windshield trim.
- (c) *Serials 1005 thru 1053*: Remove center bolster trim. (Refer to 25-10)
- (d) Remove MFD. (Refer to 31-60)
- (e) Disconnect GPS antenna lead(s) located underneath the glareshield.
- (f) Disconnect the glareshield light wire harness.
- (g) *Serials 1005 thru 1422*: Remove the glareshield mounting screws located just inside of the MFD opening, underneath the glareshield.
- (h) Lift edge of glareshield to release the reclosable fasteners. Remove glareshield.

(2) Installation - Glareshield Assembly
- (a) Place glareshield into position and secure. Press firmly on trim in areas of reclosable fasteners.
- (b) *Serials 1005 thru 1422*: Install the glareshield mounting screws located just inside of the MFD opening, underneath the glareshield.
- (c) Connect the glareshield light wire harness.
- (d) Connect GPS antenna lead(s) located underneath the glareshield.
- (e) Install MFD. (Refer to 31-60)
- (f) *Serials 1005 thru 1053*: Install center bolster trim. (Refer to 25-10)
- (g) Install glareshield mounting screws to LH and RH edges of windshield trim.
- (h) *Serials 1005 thru 1422*: Tighten the instrument panel-glareshield mounting screw that is located at the upper left-hand edge of the instrument panel.

(3) Removal - Lower Windshield Trim - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*
- (a) Remove both door seals. (Refer to 52-10)
- (b) Remove A-pillar trim. (Refer to 25-10)
- (c) Remove glareshield. (Refer to 25-10)
- (d) *Serials 1005 thru 1422*: Remove two outside edge screws securing lower windshield trim to instrument panel.
- (e) *Serials 1423 & subs*: Disengage quarter-turn studs securing brackets to lower windshield trim.
- (f) Lift edge of lower windshield trim to release reclosable fasteners. Remove windshield trim.

(4) Installation - Lower Windshield Trim - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*
- (a) Place windshield trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

(b) *Serials 1423 & subs*: Position brackets to lower windshield trim assembly. Engage quarter-turn studs securing brackets to lower windshield trim.
(c) *Serials 1005 thru 1422*: Install two outside edge screws securing lower windshield trim to instrument panel.
(d) Install glareshield. (Refer to 25-10)
(e) Install A-pillar trim. (Refer to 25-10)
(f) Install both door seals. (Refer to 52-10)

(5) Removal - Right Bolster Trim
(a) Remove right door seal. (Refer to 52-10)
(b) Remove right A-pillar trim. (Refer to 25-10)
(c) *Serials 1005 thru 1885:* Loosen screws securing lower RH instrument panel.
(d) *Serials 1005 thru 1053*: Remove yoke trim. (Refer to 25-10)
(e) *Serials 1005 thru 1053*: Remove center bolster trim. (Refer to 25-10)
(f) Lift edge of lower windshield trim to release reclosable fasteners.
(g) Lift edge of right bolster trim and release reclosable fasteners. Remove trim.

(6) Installation - Right Bolster Trim
(a) Place right bolster trim into position and secure. Firmly push on trim in areas of reclosable fasteners.
(b) Secure lower windshield trim. Press firmly on trim in areas of reclosable fasteners.
(c) *Serials 1005 thru 1053*: Install center bolster trim. (Refer to 25-10)
(d) *Serials 1005 thru 1053*: Install yoke trim. (Refer to 25-10)
(e) *Serials 1005 thru 1885:* Tighten screws securing lower RH instrument panel.
(f) Install right A-pillar trim. (Refer to 25-10)
(g) Install right door seal. (Refer to 52-10)

(7) Removal - Left Bolster Trim
(a) Verify ignition switch is in the OFF position and remove key.
(b) Remove battery. (Refer to 24-30)
(c) Remove left door seal. (Refer to 52-10)
(d) Remove left A-pillar trim. (Refer to 25-10)
(e) *Serials 1005 thru 1885:* Loosen screws securing lower LH instrument panel.
(f) *Serials 1005 thru 1053*: Remove yoke trim. (Refer to 25-10)
(g) Remove screws securing the three interior light knobs.
(h) Remove screws securing bolster switch panel. Remove panel.
(i) *Serials 1005 thru 1053*: Remove center bolster trim. (Refer to 25-10)
(j) Remove nut securing ignition switch. (Refer to 74-30)
(k) Lift edge of lower windshield trim to release reclosable fasteners.
(l) Lift edge of left bolster trim and release reclosable fasteners. Remove trim.

(8) Installation - Left Bolster Trim
(a) Place left bolster trim into position and secure. Press firmly on trim in areas of reclosable fasteners.
(b) Tighten ignition switch nut finger tight until snug. (Refer to 74-30)
(c) *Serials 1005 thru 1053*: Secure center bolster trim. (Refer to 25-10)
(d) Secure bolster switch panel with screws.
(e) Secure the three interior light knobs with screws.
(f) *Serials 1005 thru 1053*: Install yoke trim. (Refer to 25-10)
(g) *Serials 1005 thru 1885:* Tighten screws securing lower LH instrument panel.
(h) Install left A-pillar trim. (Refer to 25-10)
(i) Install left door seal. (Refer to 52-10)

(j) Connect battery. (Refer to 24-30)

(9) Removal - Center Bolster Trim

(a) *Serials 1005 thru 1885:* Remove trim.

1 Remove screws securing center bolster trim to left bolster trim.

2 Remove screws securing center bolster trim to right bolster trim.

3 Lift edge of center bolster trim and release reclosable fasteners. Remove trim.

(b) *Serials 1886 & subs:* Remove trim.

1 Remove glove box or MFD to access trim mounting screw. (Refer to 25-10) (Refer to 31-60)

2 Remove screws securing bolster switch panel. Remove panel.

3 Remove screws securing center bolster trim to center console.

4 Loosen screws securing lower instrument panel.

5 Lift edge of center bolster trim and release reclosable fasteners. Remove trim.

(10) Installation - Center Bolster Trim

(a) *Serials 1005 thru 1885:* Install trim.

1 Place center bolster trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

2 Secure center bolster trim to right bolster trim with screws.

3 Secure center bolster trim to left bolster trim with screws.

(b) *Serials 1886 & subs:* Install trim.

1 Place center bolster trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

2 Tighten screws securing lower instrument panel.

3 Install screws securing center bolster trim to center console.

4 Secure bolster switch panel with screws.

5 Install glove box or MFD. (Refer to 25-10) (Refer to 31-60)

(11) Removal - Right Aft Console Trim

(a) Remove co-pilot seat. (Refer to 25-10)

(b) Remove control-quadrant friction knob and washer. (Refer to 76-10)

(c) Remove right mid console trim. (Refer to 25-10)

(d) Remove right aft console trim screws and remove trim.

(12) Installation - Right Aft Console Trim

(a) Secure right aft console trim with screws.

(b) Install right mid console trim. (Refer to 25-10)

(c) Install control-quadrant friction knob and washer. (Refer to 76-10)

(d) Install co-pilot seat. (Refer to 25-10)

(13) Removal - Left Aft Console Trim

(a) Remove pilot seat. (Refer to 25-10)

(b) Remove left mid console circuit breaker trim. (Refer to 25-10)

(c) Remove left aft console trim screws and remove trim.

(14) Installation - Left Aft Console Trim

(a) Secure left aft console trim with screws.

(b) Install left mid console circuit breaker trim. (Refer to 25-10)

(c) Install pilot seat. (Refer to 25-10)

(15) Removal - Left Mid Console Circuit Breaker Trim

(a) *Serials 1005 thru 1705:* Lift forward edge of alternate static source cover plate and release reclosable fasteners. Remove cover plate.

(b) Lift forward edge of left mid console circuit breaker trim and release reclosable fasteners. Remove trim.

(16) Installation - Left Mid Console Circuit Breaker Trim

(a) Place left mid console circuit breaker trim into position and press firmly on trim in areas of reclosable fasteners.

(b) *Serials 1005 thru 1705:* Place alternate static source cover plate into position and press firmly on trim in areas of reclosable fasteners.

(17) Removal - Right Mid Console Trim

(a) Remove right mid console trim screws.

(b) Lift forward edge of trim and release reclosable fasteners. Remove trim.

(18) Installation - Right Mid Console Trim

(a) Place trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

(b) Install screws securing right mid console trim.

(19) Removal - Right Aft Console Lower Panel Trim

(a) Remove co-pilot seat. (Refer to 25-10)

(b) Remove screws securing right aft console lower panel trim.

(c) Lift forward edge of trim and release reclosable fasteners. Remove trim.

(20) Installation - Right Aft Console Lower Panel Trim

(a) Place trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

(b) Install screws securing right aft console lower panel trim.

(c) Install co-pilot seat. (Refer to 25-10)

(21) Removal - Left Aft Console Lower Panel Trim

(a) Remove pilot seat. (Refer to 25-10)

(b) Remove fire extinguisher. (Refer to 26-20)

(c) Remove screws securing left aft console lower panel trim.

(d) Lift forward edge of trim and release reclosable fasteners. Remove trim.

(22) Installation - Left Aft Console Lower Panel Trim

(a) Place trim into position and secure. Press firmly on trim in areas of reclosable fasteners.

(b) Install screws securing left aft console lower panel trim.

(c) Install fire extinguisher. (Refer to 26-20)

(d) Install pilot seat. (Refer to 25-10)

(23) Removal - Center Armrest Console

(a) *Serials 1005 thru 1705:* Open center armrest console and remove screw, washer, lanyard, and spacer from armrest.

(b) Remove armrest mounting screws and remove armrest.

(24) Installation - Center Armrest Console

(a) Place center armrest console into position and secure with screws.

(b) *Serials 1005 thru 1705:* Secure armrest lanyard with screw, washer, and spacer.

(25) Removal - Aft Console Rear Cover

(a) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect connector from aft console rear cover LED assembly. (Refer to 33-20)

(b) Remove screws securing aft console rear cover to center console.

(26) Installation - Aft Console Rear Cover

(a) Place cover into position and secure with screws.

(b) *Serials 2303 & subs w/ Convenience Lighting:* Connect connector to aft console rear cover LED assembly. (Refer to 33-20)

(27) Removal - Yoke Trim - *Serials 1005 thru 1053*

(a) Remove screw securing yoke trim to bolster trim.

(b) Gently slide trim off of yoke.

(28) Installation - Yoke Trim - *Serials 1005 thru 1053*

(a) Slide trim over yoke and into position.

(b) Secure trim with screw.

(29) Removal - Kick Plate

(a) Remove mid console trim. (Refer to 25-10)

(b) Remove screws securing kick plate to lower console rib.

(c) Remove cable tie from air duct and remove duct.

(d) *Serials 1441 & subs w/ TAWS:* For LH kick plate, disconnect connectors from TAWS processor. (Refer to 34-40)

(e) *Serials 1005 thru 1581 w/ Engine Monitoring:* For RH kick plate, disconnect connectors from Sensor Interface Unit. (Refer to 77-40)

(f) *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics:* For RH kick plate, disconnect connectors from Data Acquisition Unit. (Refer to 77-40)

(g) *Serials 2303 & subs:* Disconnect connector from kick plate LED assembly. (Refer to 33-10)

CAUTION: Ensure that kick plate edges do not contact any adjacent trim during removal procedures to avoid damage to trim.

(h) Remove kick plate.

(30) Installation - Kick Plate

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cable Tie	8 inch	Any Source	Secure duct.

CAUTION: Ensure that kick plate edges do not contact any adjacent trim during installation procedures to avoid damage to trim.

(b) Place kick plate into position at lower console rib.

(c) *Serials 1441 & subs w/ TAWS:* For LH kick plate, connect connectors to TAWS processor. (Refer to 34-40)

(d) *Serials 1005 thru 1581 w/ Engine Monitoring:* For RH kick plate, connect connectors to Sensor Interface Unit. (Refer to 77-40)

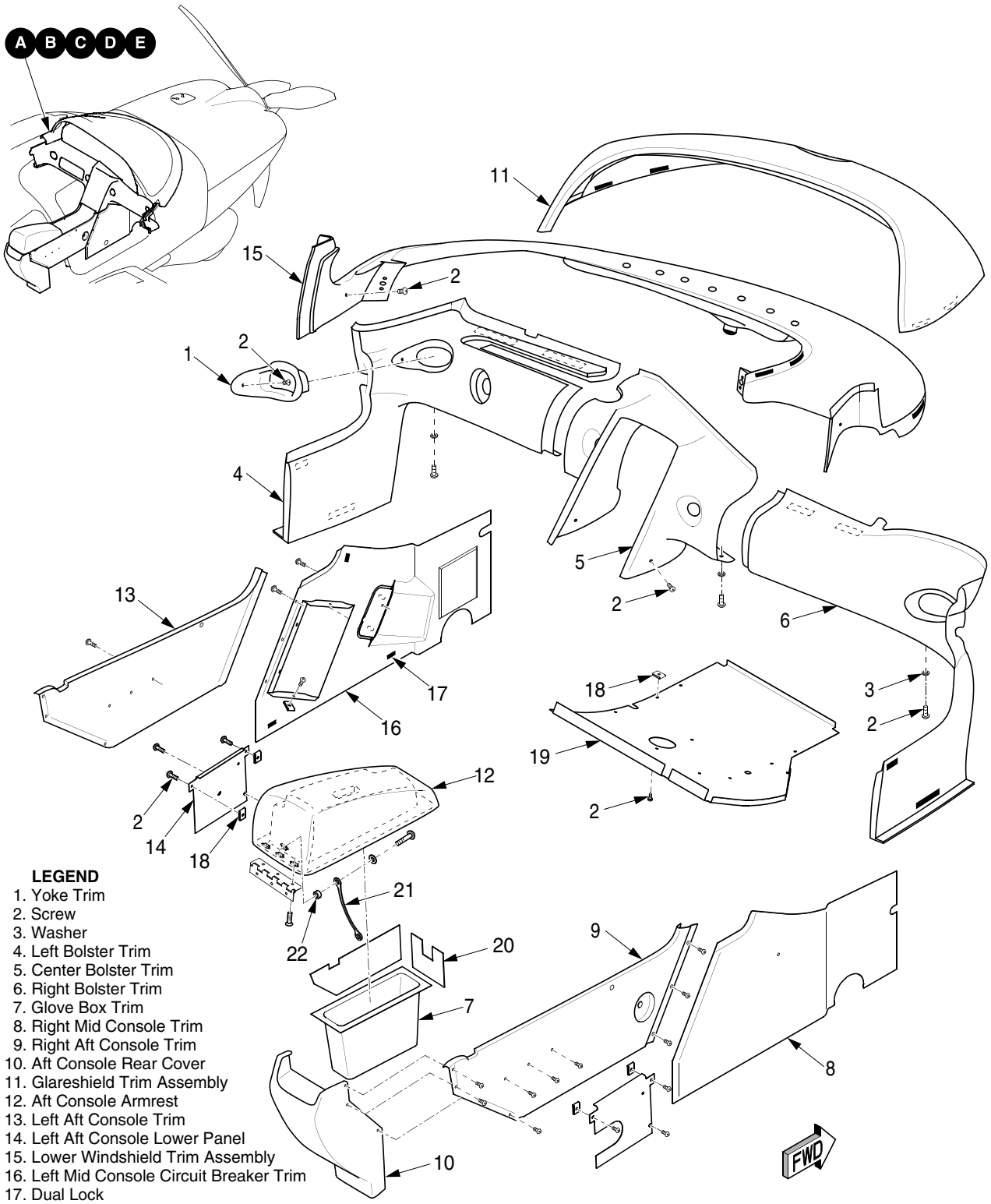
(e) *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics:* For RH kick plate, connect connectors to Data Acquisition Unit. (Refer to 77-40)

(f) *Serials 2303 & subs:* Connect connector to kick plate LED assembly. (Refer to 33-10)

(g) Secure air duct to vent with cable tie.

(h) Secure kick plate to lower console rib with screws.

(i) Install mid console trim. (Refer to 25-10)



LEGEND

1. Yoke Trim
2. Screw
3. Washer
4. Left Bolster Trim
5. Center Bolster Trim
6. Right Bolster Trim
7. Glove Box Trim
8. Right Mid Console Trim
9. Right Aft Console Trim
10. Aft Console Rear Cover
11. Glareshield Trim Assembly
12. Aft Console Armrest
13. Left Aft Console Trim
14. Left Aft Console Lower Panel
15. Lower Windshield Trim Assembly
16. Left Mid Console Circuit Breaker Trim
17. Dual Lock
18. Nut
19. Kick Plate
20. Liner
21. Lanyard
22. Spacer

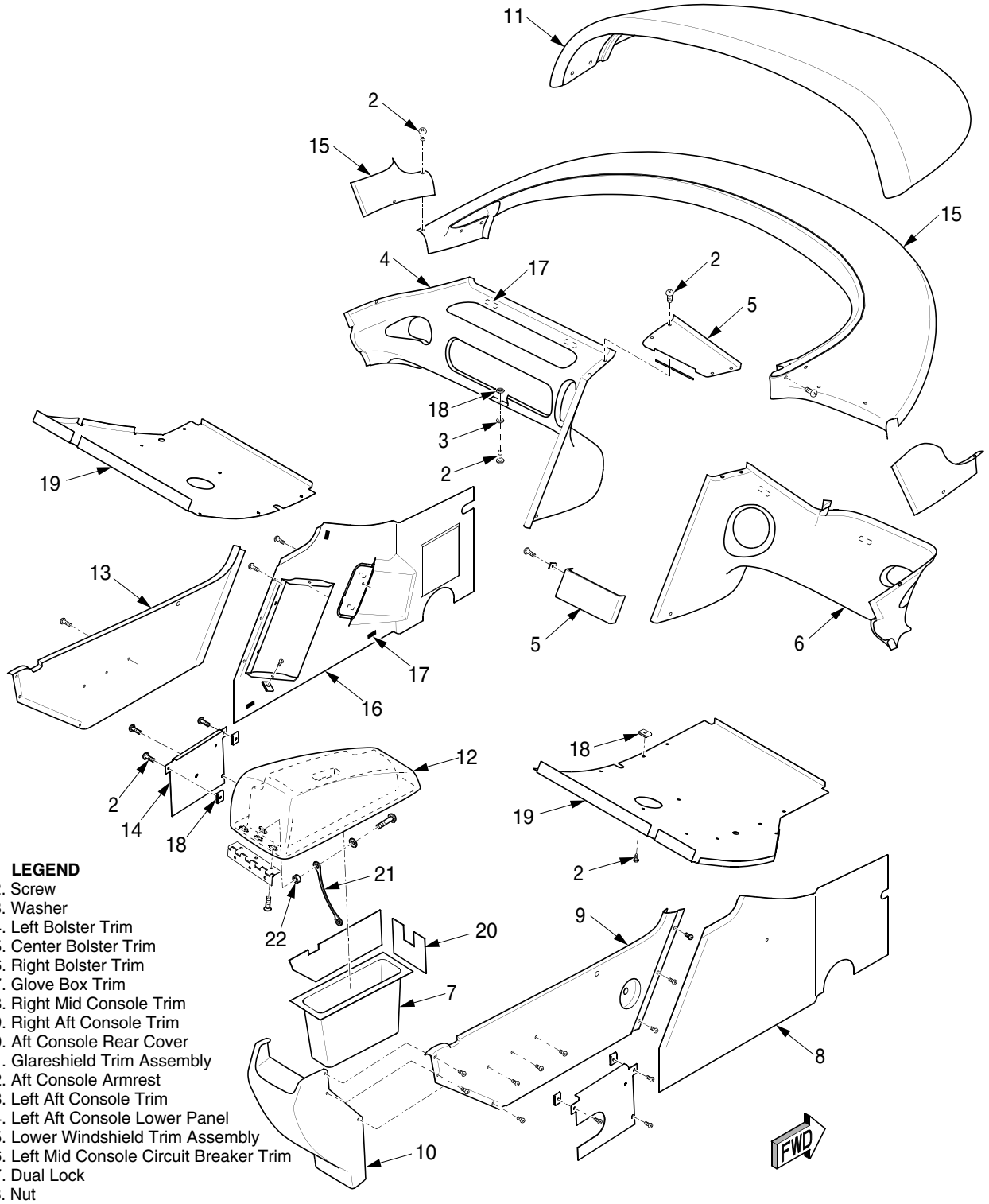
DETAIL A

Serials 1005 thru 1053.

SR20_MM25_1235E

Figure 25-109
Console Trim - Serials 1005 thru 1053 (Sheet 1 of 5)

EFFECTIVITY:
Serials 1005 thru 1053



LEGEND

2. Screw
3. Washer
4. Left Bolster Trim
5. Center Bolster Trim
6. Right Bolster Trim
7. Glove Box Trim
8. Right Mid Console Trim
9. Right Aft Console Trim
10. Aft Console Rear Cover
11. Glareshield Trim Assembly
12. Aft Console Armrest
13. Left Aft Console Trim
14. Left Aft Console Lower Panel
15. Lower Windshield Trim Assembly
16. Left Mid Console Circuit Breaker Trim
17. Dual Lock
18. Nut
19. Kick Plate
20. Liner
21. Lanyard
22. Spacer

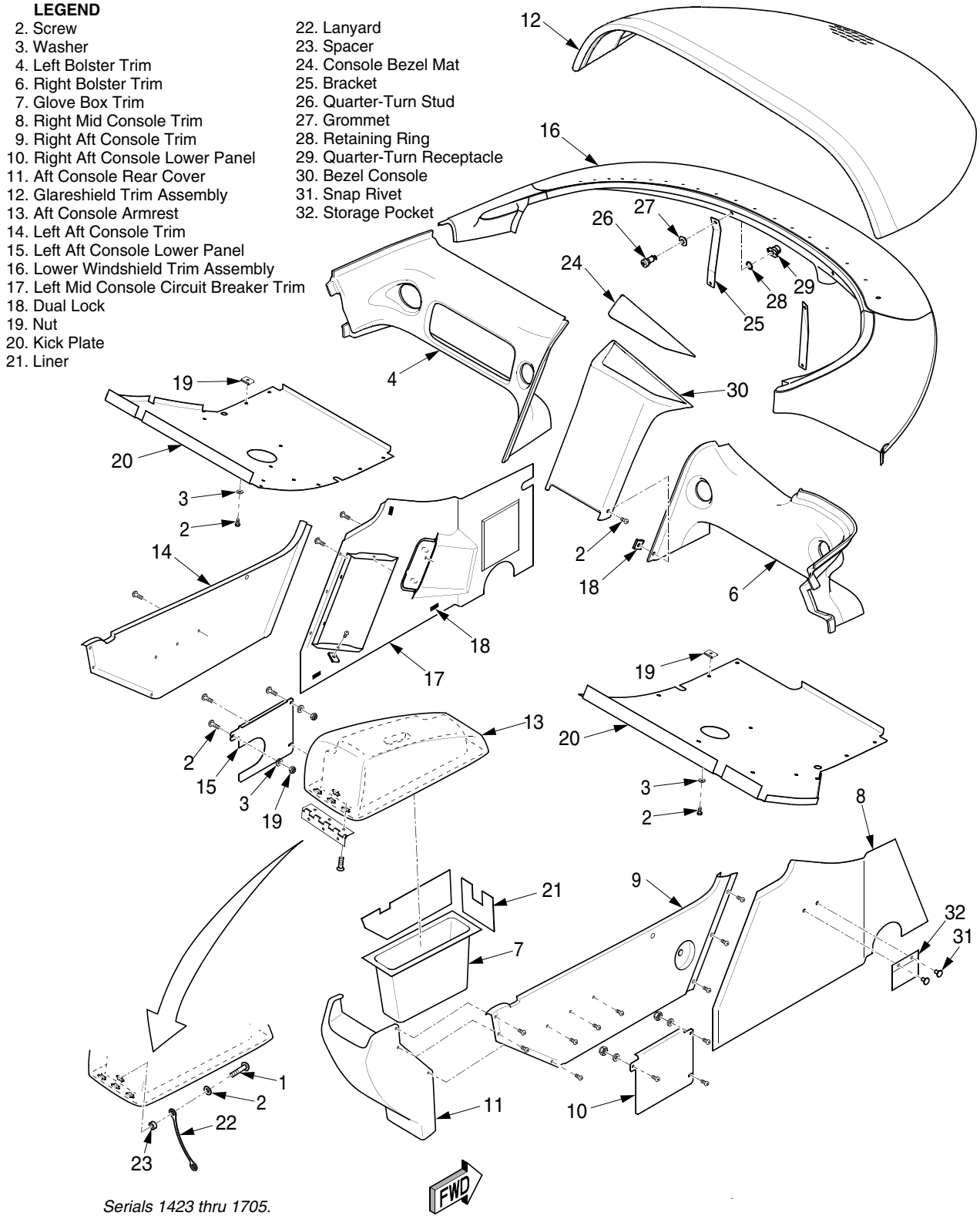
DETAIL B

Serials 1054 thru 1422.

SR20_MM25_1705B

Figure 25-109
Console Trim - Serials 1054 thru 1422 (Sheet 2 of 5)

EFFECTIVITY:
Serials 1054 thru 1422



Serials 1423 thru 1705.

DETAIL C

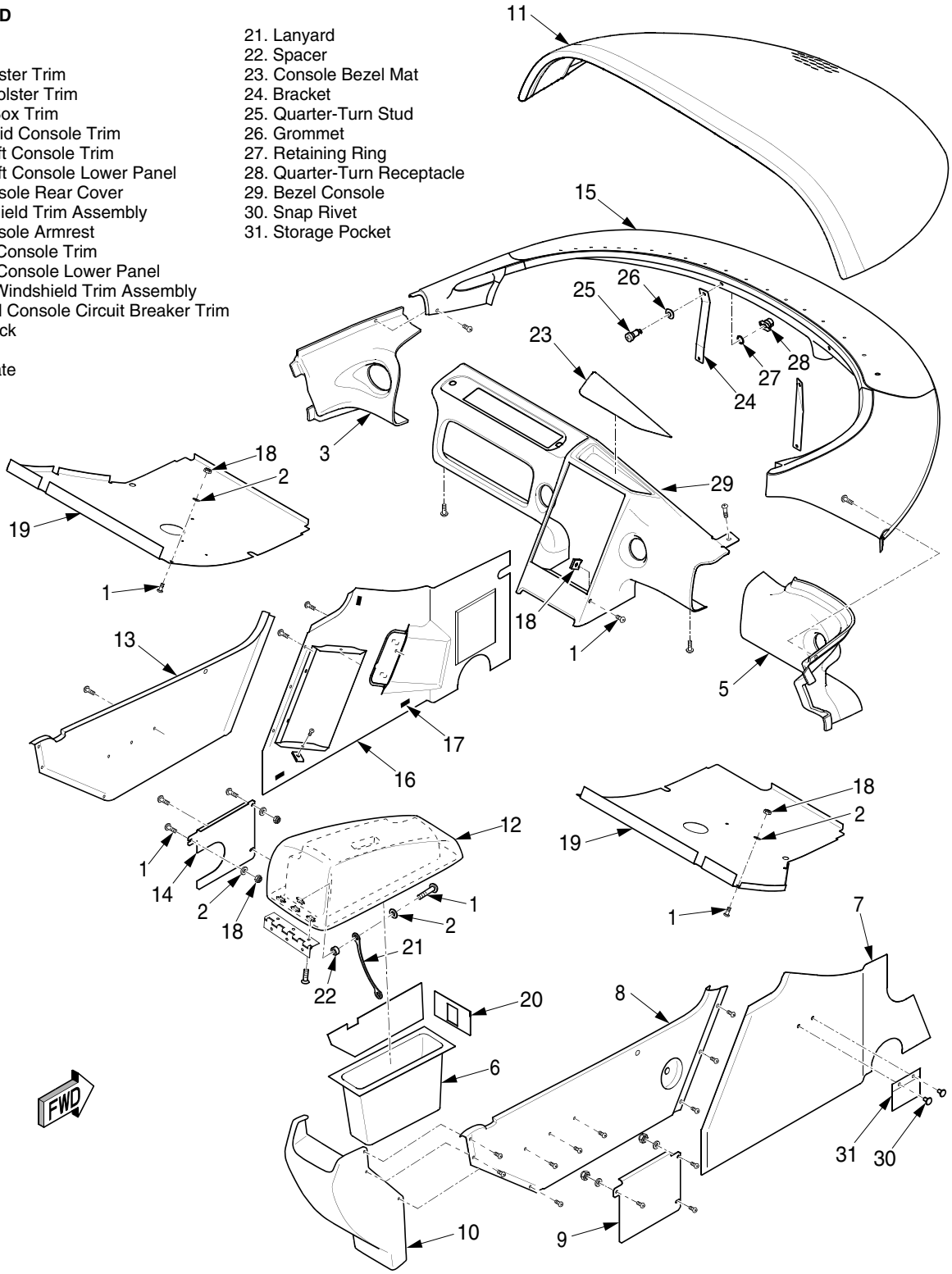
Serials 1423 thru 1877, 1879 thru 1885.

SR20_MM25_1890E

Figure 25-109
Console Trim - Serials 1423 thru 1885 (Sheet 3 of 5)

LEGEND

1. Screw
2. Washer
3. Left Bolster Trim
5. Right Bolster Trim
6. Glove Box Trim
7. Right Mid Console Trim
8. Right Aft Console Trim
9. Right Aft Console Lower Panel
10. Aft Console Rear Cover
11. Glareshield Trim Assembly
12. Aft Console Armrest
13 Left Aft Console Trim
14 Left Aft Console Lower Panel
15. Lower Windshield Trim Assembly
16. Left Mid Console Circuit Breaker Trim
17. Dual Lock
18. Nut
19. Kick Plate
20. Liner
21. Lanyard
22. Spacer
23. Console Bezel Mat
24. Bracket
25. Quarter-Turn Stud
26. Grommet
27. Retaining Ring
28. Quarter-Turn Receptacle
29. Bezel Console
30. Snap Rivet
31. Storage Pocket



DETAIL D

Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics.

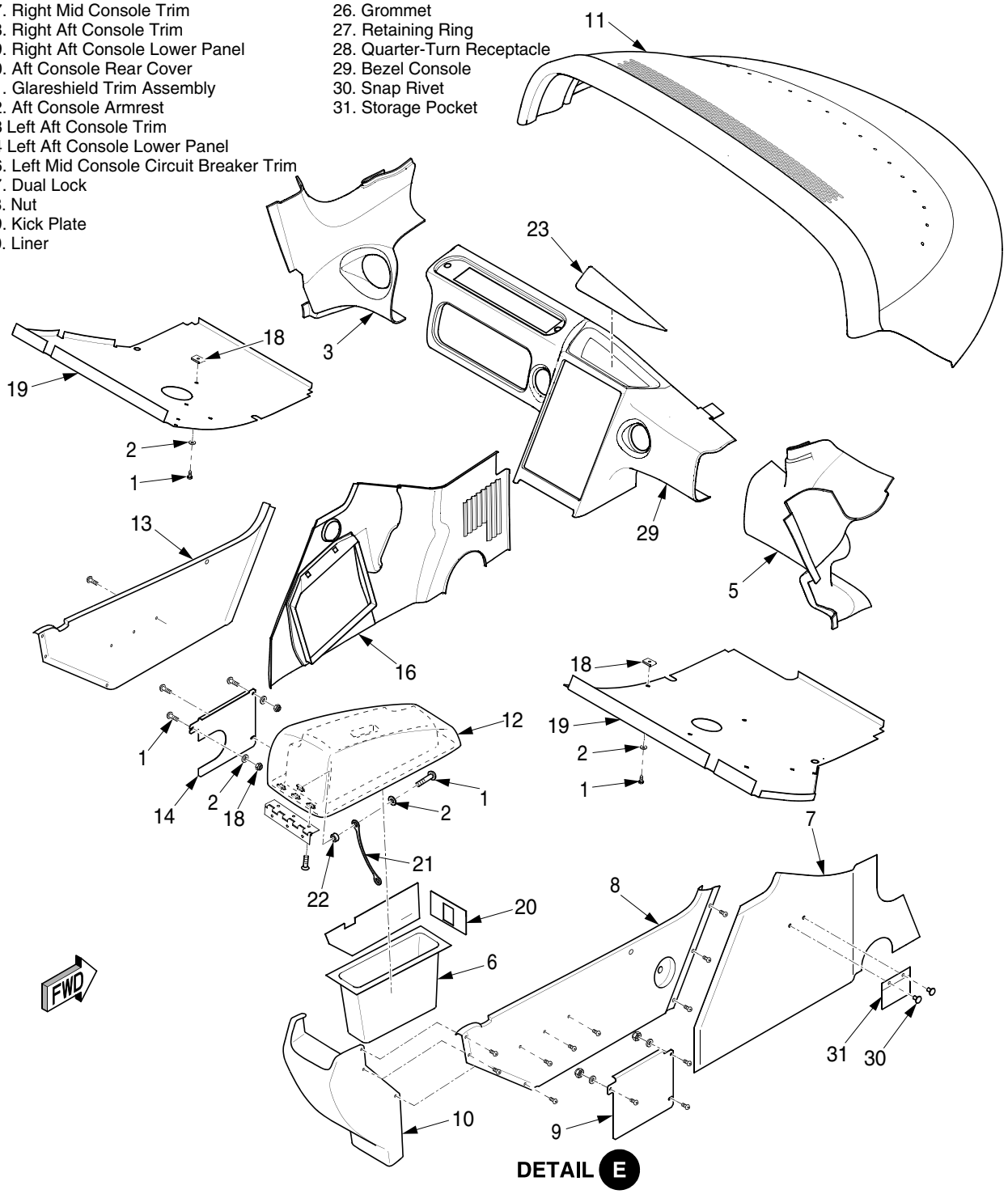
SR20_MM25_2751B

Figure 25-109
Console Trim - Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 4 of 5)

EFFECTIVITY:
Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics

LEGEND

1. Screw
2. Washer
3. Left Bolster Trim
5. Right Bolster Trim
6. Glove Box Trim
7. Right Mid Console Trim
8. Right Aft Console Trim
9. Right Aft Console Lower Panel
10. Aft Console Rear Cover
11. Glareshield Trim Assembly
12. Aft Console Armrest
13 Left Aft Console Trim
14 Left Aft Console Lower Panel
16. Left Mid Console Circuit Breaker Trim
17. Dual Lock
18. Nut
19. Kick Plate
20. Liner
21. Lanyard
22. Spacer
23. Console Bezel Mat
24. Bracket
25. Quarter-Turn Stud
26. Grommet
27. Retaining Ring
28. Quarter-Turn Receptacle
29. Bezel Console
30. Snap Rivet
31. Storage Pocket



Serials 2016 & subs w/ Perspective Avionics.

SR20_MM25_2884

Figure 25-109
Console Trim - Serials 2016 & subs w/ Perspective Avionics (Sheet 5 of 5)

N. Mid and Aft Trim (See Figure 25-1010)

(1) Removal - Door Handle - *Serials 1423 & subs*

CAUTION: Door handle screws cannot be re-used. If removed, screws must be discarded and replaced with new screws.

(a) On door interior, remove screws securing door handle to door. Remove door handle.

(2) Installation - Door Handle - *Serials 1423 & subs*

(a) On door interior, position door handle to door.

(b) Secure door handle to door with screws.

(3) Removal - Interior Door Trim

(a) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect door lock harness.

1 Pull CONV LIGHTS circuit breaker.

2 Remove kick plate. (Refer to 25-10)

3 Remove mid console trim. (Refer to 25-10)

4 Remove washer and bolt securing terminal ring to inboard gas strut attach bracket.

5 Remove cable tie securing door lock harness to fuselage.

6 Identify and disconnect electrical connector from wire harness.

(b) Ensure cabin door is in fully open position.

WARNING: Ensure gas strut rod is not fully compressed during removal. Sudden extension of partially removed gas strut rod could result in damage to airplane or injury to aircraft technician.

(c) Remove locking cap from gas strut inboard rod end.

(d) Position flat wrench around neck of ball stud between attach bracket and gas strut inboard rod end.

CAUTION: The ball stud snaps into four locking tabs integral to the gas strut rod end. Use caution during gas strut removal to avoid damaging locking tabs. If any one of the locking tabs cracks or breaks loose, the rod end must be replaced.

(e) Gently pry gas strut inboard rod end off of ball stud.

(f) *Serials 1423 & subs:* Remove handle lever. (Refer to 52-10)

(g) Remove armrest interior trim. (Refer to 25-10)

(h) Remove screws securing trim to door.

(i) Gently lift corner of door trim and release reclosable fasteners. Remove door trim.

(4) Installation - Interior Door Trim

(a) Place trim into position and press firmly on trim in areas of reclosable fasteners.

(b) Secure trim with screws.

(c) Install armrest interior trim. (Refer to 25-10)

(d) *Serials 1423 & subs:* Install handle lever. (Refer to 52-10)

(e) Ensure cabin door is in fully open position.

WARNING: Ensure gas strut rod is not fully compressed during installation. Sudden extension of partially installed gas strut rod could result in damage to airplane or injury to aircraft technician.

(f) Visually inspect gas strut rod ends and locking caps for cracked or missing tabs, security, and general condition.

CAUTION: The ball stud snaps into four locking tabs integral to the gas strut rod end. Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

(g) Position gas strut rod end to ball stud and press firmly to secure.

(h) Install locking cap to gas strut rod end.

(i) *Serials 2303 & subs w/ Convenience Lighting:* Connect door lock harness.

1 Install bolt and washer securing terminal ring to inboard gas strut attach bracket.

Note: Secure wire so that harness can flex when door is opened.

2 Secure door lock harness to fuselage with cable tie.

3 Connect electrical connector to wire harness.

4 Install mid console trim. (Refer to 25-10)

5 Install kick plate. (Refer to 25-10)

6 Reset CONV LIGHTS circuit breaker.

(5) Removal - Sidewall Air Duct Trim

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Cut tape bond.
Plastic Scraper	-	Any Source	Remove tape residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Remove door seal. (Refer to 52-10)

CAUTION: When cutting foam tape, ensure knife blade does not penetrate too far and damage trim or fuselage skin.

(c) *Serials 1005 thru 1422:* Remove screws securing rear section of sidewall air duct trim to forward section of rear cabin side trim.

(d) Lift forward edge of trim and slowly pull trim away from fuselage while cutting exposed foam tape with knife. Remove sidewall air duct trim.

(e) Remove residue from installation areas using knife and isopropyl alcohol. (Refer to 20-30)

(6) Installation - Sidewall Air Duct Trim

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Foam Tape, 0.062 inch thick × 0.50 inch wide (1.575 mm thick × 12.70 mm wide)	-	Any Source	Secure trim.

(b) Apply 2-sided tape to sidewall air duct trim at locations in contact with installation areas.

(c) Place trim into position and press firmly on trim in areas of foam tape.

(d) *Serials 1005 thru 1422:* Install screws securing rear section of sidewall air duct trim to forward section of rear cabin side trim.

(e) Install door seal. (Refer to 52-10)

(7) Removal - Rear Cabin Side Trim
- (a) Remove screws securing upper section of rear cabin side trim to B-pillar trim.
- (b) *Serials 1005 thru 1422:* Remove screws securing forward section of rear cabin side trim to sidewall air duct trim.
- (c) Lift forward edge of trim and release reclosable fasteners.
- (d) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect connector from rear cabin side trim LED assembly. (Refer to 33-20)
- (e) Remove rear cabin side trim.

(8) Installation - Rear Cabin Side Trim
- (a) *Serials 2303 & subs w/ Convenience Lighting:* Connect connector to rear cabin side trim LED assembly. (Refer to 33-20)
- (b) Place trim into position and press firmly on trim in areas of reclosable fasteners.
- (c) *Serials 1005 thru 1422:* Secure forward section of rear cabin side trim to sidewall air duct trim with screws.
- (d) Secure upper section of rear cabin side trim to B-pillar trim with screws.

(9) Removal - Armrest Interior Trim - *Serials 1005 & subs w/o 2+1 Rear Seat*
- (a) Lift one corner of armrest interior trim, and release reclosable fasteners. Remove armrest interior trim.

(10) Installation - Armrest Interior Trim - *Serials 1005 & subs w/o 2+1 Rear Seat*
- (a) Place trim into position and press firmly on trim in areas of reclosable fasteners.

(11) Removal - Bulkhead 222 Trim
- (a) Remove screws securing side sections of bulkhead 222 trim to fuselage.
- (b) Remove screws securing upper section of bulkhead 222 trim to cabin headliner.
- (c) Lift one corner of trim, and release reclosable fasteners. Remove trim.

(12) Installation - Bulkhead 222 Trim
- (a) Place trim into position and press firmly on trim in areas of reclosable fasteners.
- (b) Secure upper section of bulkhead 222 trim to cabin headliner with screws.
- (c) Secure side sections of bulkhead 222 trim to fuselage with screws.

(13) Removal - Drink Holder
- (a) *Serials 1005 thru 1422:* For forward drink holder, remove screws and nuts securing drink holder to attaching bracket. Remove drink holder.
- (b) *Serials 1423 & subs:* For forward drink holder, remove snap rivets securing drink holder to sidewall air duct trim. Remove drink holder.
- (c) For aft drink holder, remove retainers securing drink holder to attaching bracket. Remove drink holder.

(14) Installation - Drink Holder
- (a) *Serials 1005 thru 1422:* For forward drink holder, secure drink holder to attaching bracket with screws and nuts.
- (b) *Serials 1423 & subs:* For forward drink holder, secure drink holder to sidewall air duct trim with snap rivets.
- (c) For aft drink holder, secure drink holder to attaching bracket with retainers.

(15) Removal - Aft Storage Pocket
- (a) Remove screws, washers, brackets, and wellnuts securing side sections of storage pocket to attaching brackets.
- (b) Lift one corner of storage pocket, and release reclosable fasteners. Remove storage pocket.

(16) Installation - Aft Storage Pocket
- (a) Place storage pocket into position and press firmly on storage pocket in areas of reclosable fasteners.
- (b) Secure side sections of storage pocket to attaching brackets with screws, washers, brackets, and wellnuts.

(17) Removal - Forward Storage Pocket

(a) *Serials 1005 thru 1422:* Remove drink holder from sidewall air duct trim. (Refer to 25-10)

(b) *Serials 1005 thru 1422:* Remove screws, washers, and wellnuts securing storage pocket to attaching brackets.

(c) *Serials 1005 thru 1422:* Lift one corner of storage pocket, and release reclosable fasteners. Remove storage pocket.

(d) *Serials 1423 & subs:* Remove snap rivets securing storage pocket to sidewall air duct trim. Remove storage pocket.

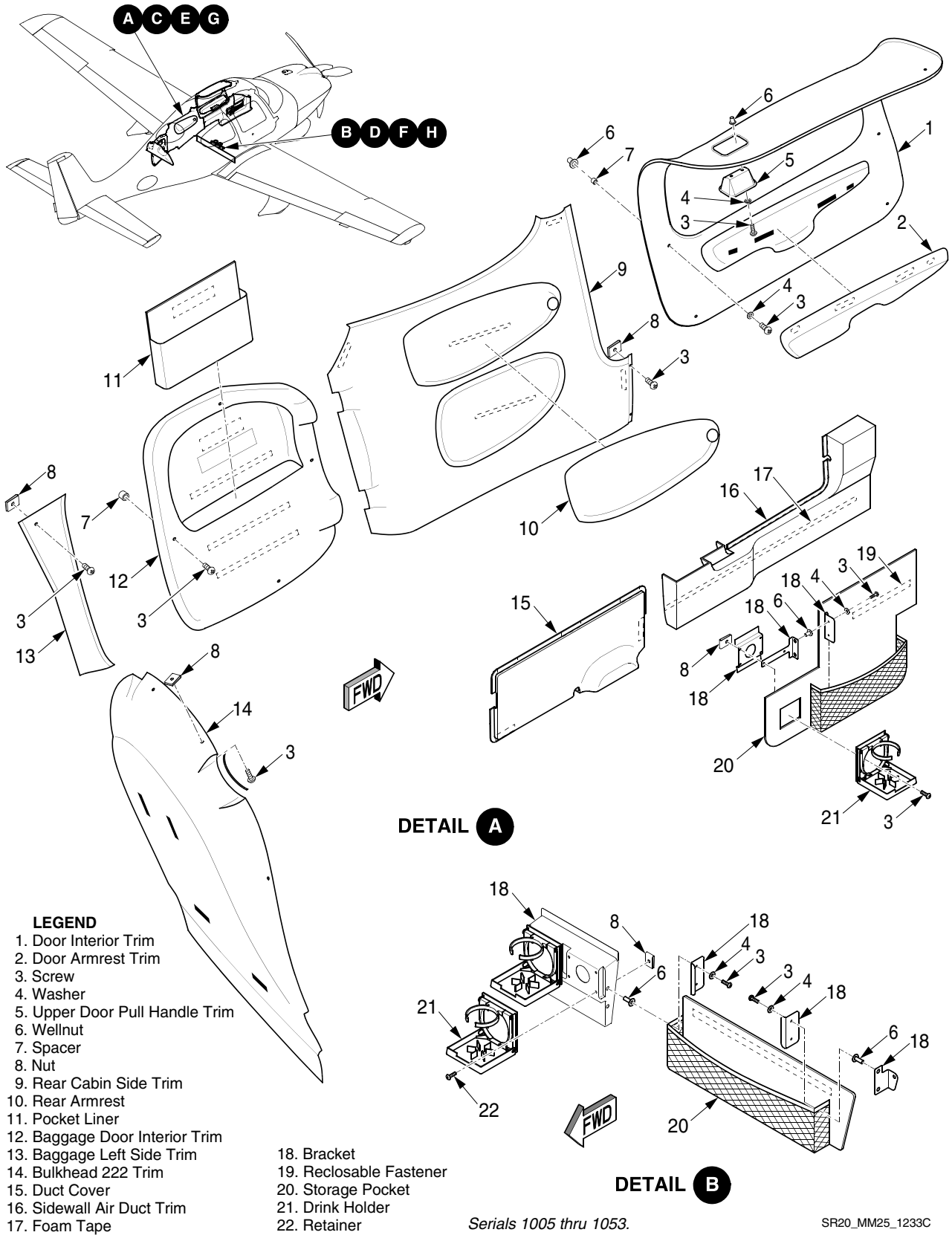
(18) Installation - Forward Storage Pocket

(a) *Serials 1005 thru 1422:* Place storage pocket into position and press firmly on storage pocket in areas of reclosable fasteners.

(b) *Serials 1005 thru 1422:* Secure storage pocket to attaching brackets with screws, washers, and wellnuts.

(c) *Serials 1005 thru 1422:* Install drink holder to sidewall air duct trim. (Refer to 25-10)

(d) *Serials 1423 & subs:* Install snap rivets securing storage pocket to sidewall air duct trim.



LEGEND

1. Door Interior Trim
2. Door Armrest Trim
3. Screw
4. Washer
5. Upper Door Pull Handle Trim
6. Wellnut
7. Spacer
8. Nut
9. Rear Cabin Side Trim
10. Rear Armrest
11. Pocket Liner
12. Baggage Door Interior Trim
13. Baggage Left Side Trim
14. Bulkhead 222 Trim
15. Duct Cover
16. Sidewall Air Duct Trim
17. Foam Tape
18. Bracket
19. Reclosable Fastener
20. Storage Pocket
21. Drink Holder
22. Retainer

Serials 1005 thru 1053.

Figure 25-1010
Mid and Aft Trim - Serials 1005 thru 1053 (Sheet 1 of 4)

EFFECTIVITY:
Serials 1005 thru 1053

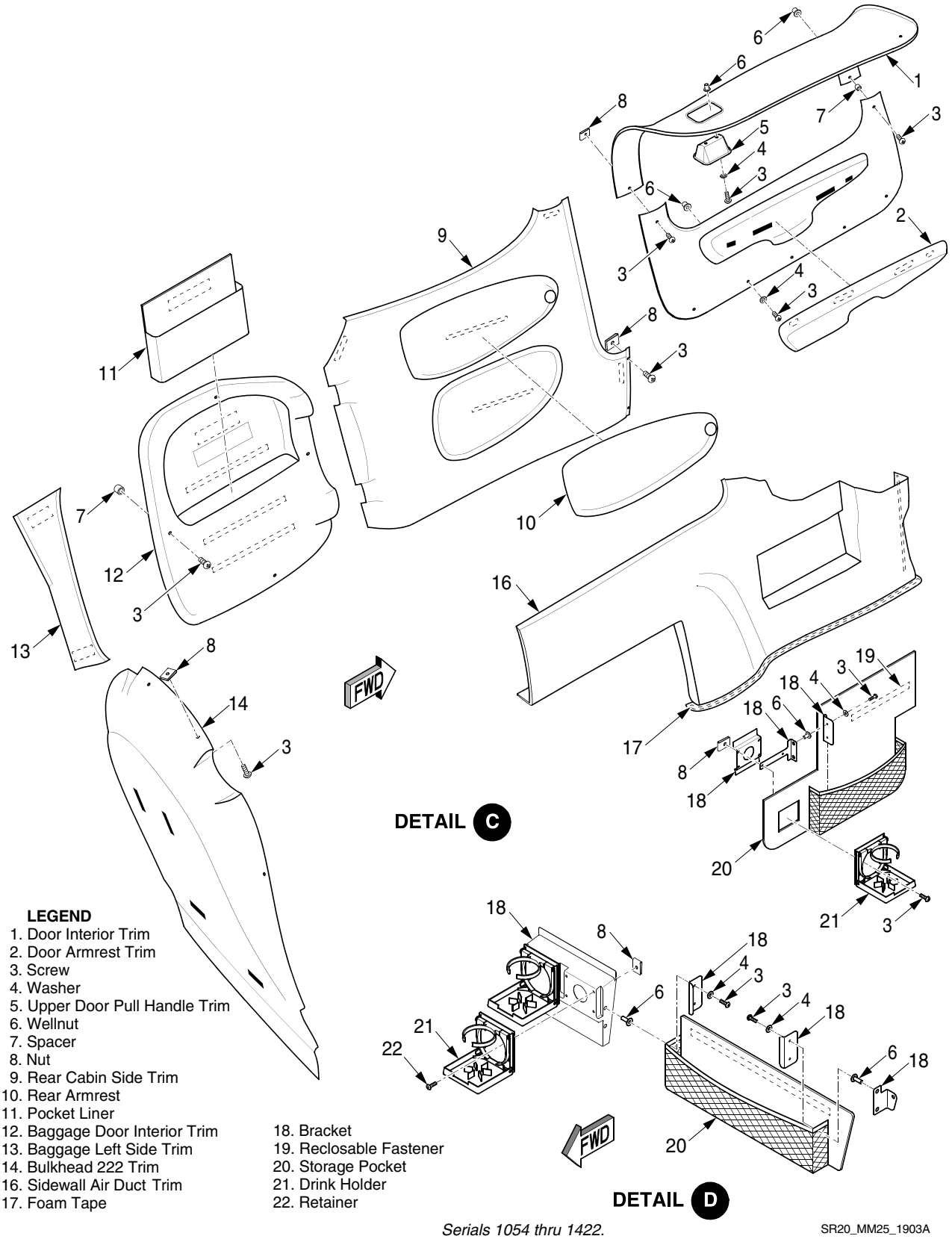
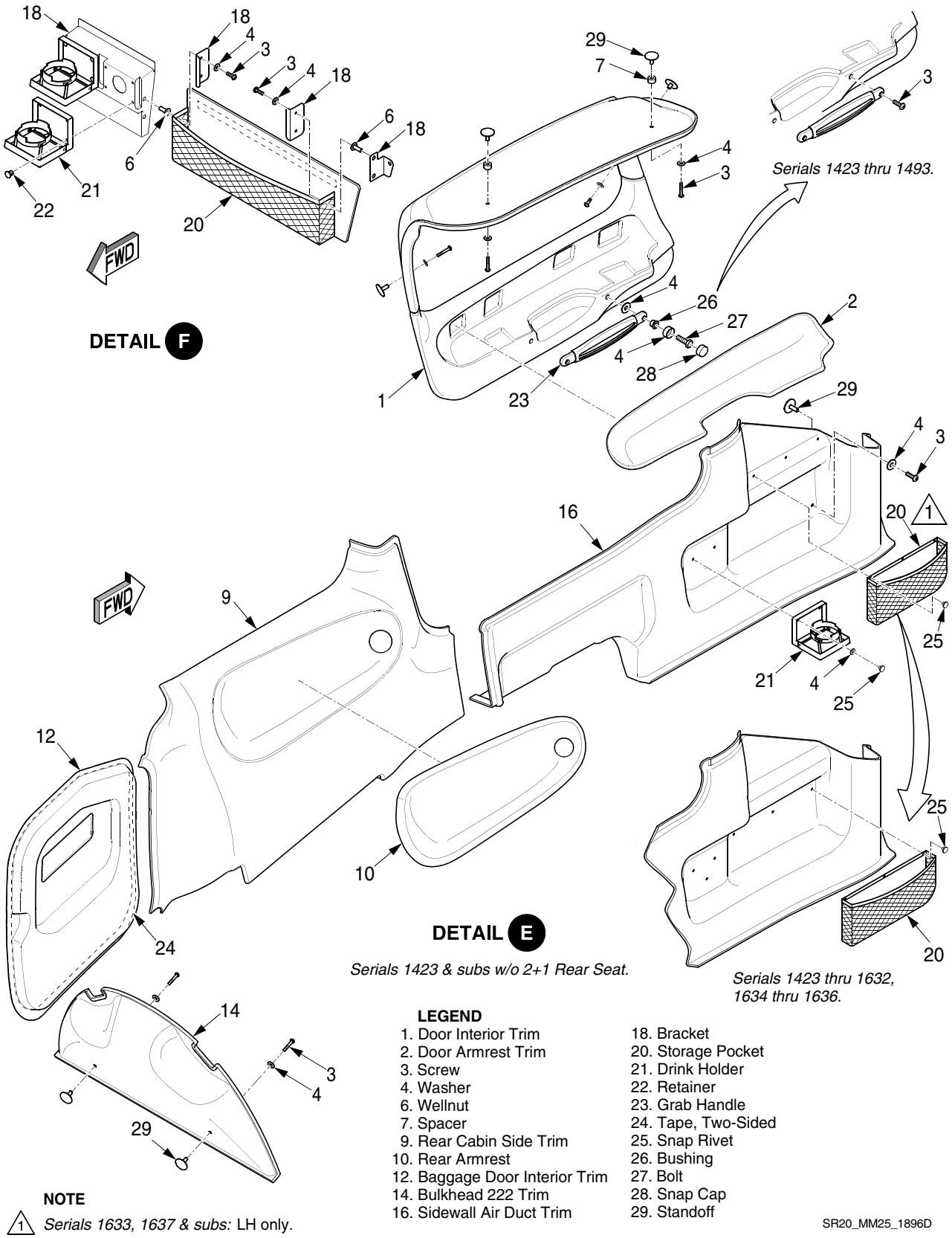


Figure 25-1010
Mid and Aft Trim - Serials 1054 thru 1422 (Sheet 2 of 4)

EFFECTIVITY:
Serials 1054 thru 1422



LEGEND

1. Door Interior Trim
2. Door Armrest Trim
3. Screw
4. Washer
6. Wellnut
7. Spacer
9. Rear Cabin Side Trim
10. Rear Armrest
12. Baggage Door Interior Trim
14. Bulkhead 222 Trim
16. Sidewall Air Duct Trim
18. Bracket
20. Storage Pocket
21. Drink Holder
22. Retainer
23. Grab Handle
24. Tape, Two-Sided
25. Snap Rivet
26. Bushing
27. Bolt
28. Snap Cap
29. Standoff

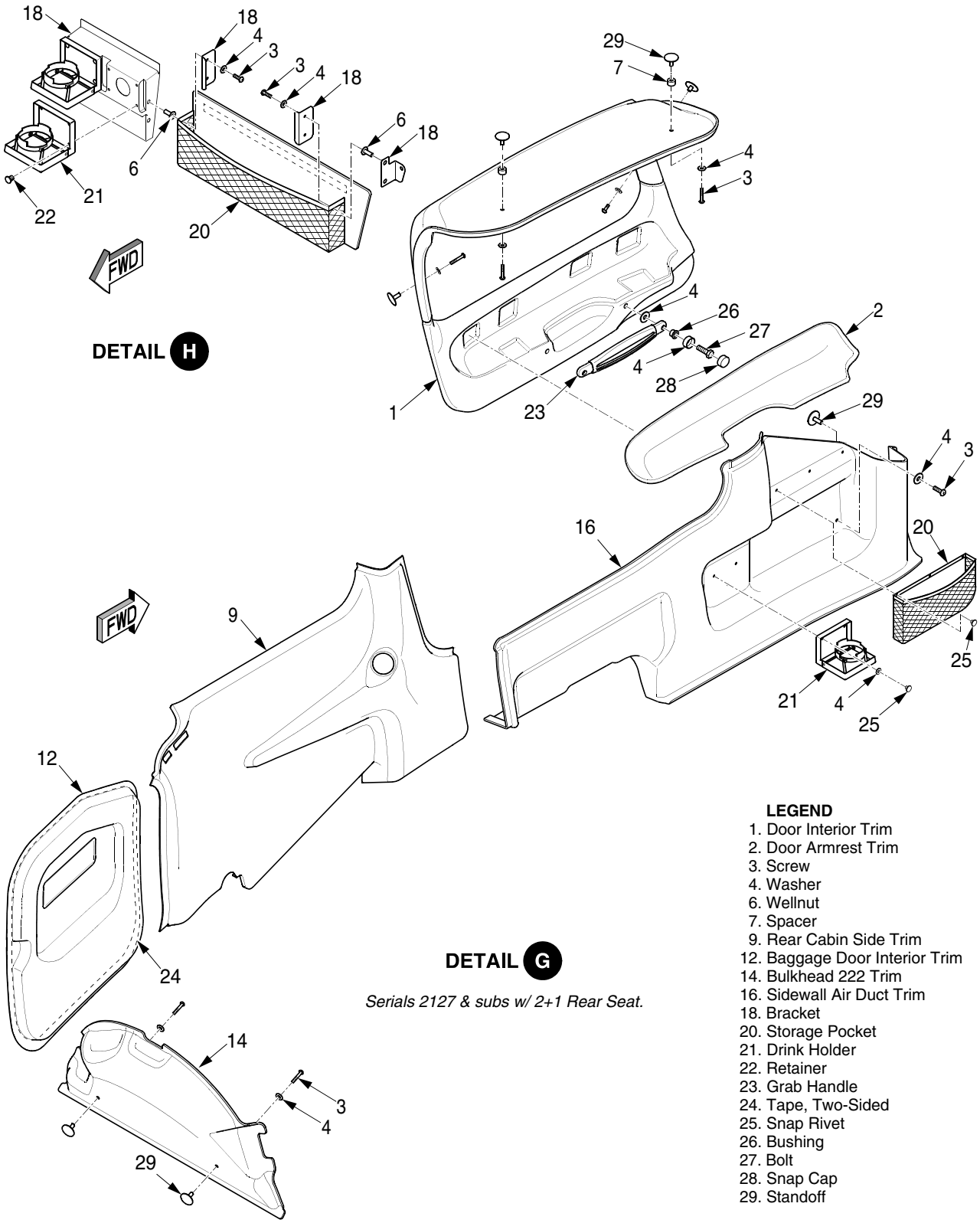
NOTE

1 *Serials 1633, 1637 & subs:* LH only.

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Figure 25-1010
Mid and Aft Trim - Serials 1423 & subs w/o 2+1 Rear Seat (Sheet 3 of 4)

EFFECTIVITY:
Serials 1423 & subs w/o 2+1 Rear Seat



LEGEND

1. Door Interior Trim
2. Door Armrest Trim
3. Screw
4. Washer
6. Wellnut
7. Spacer
9. Rear Cabin Side Trim
12. Baggage Door Interior Trim
14. Bulkhead 222 Trim
16. Sidewall Air Duct Trim
18. Bracket
20. Storage Pocket
21. Drink Holder
22. Retainer
23. Grab Handle
24. Tape, Two-Sided
25. Snap Rivet
26. Bushing
27. Bolt
28. Snap Cap
29. Standoff

SR20_MM25_3506

Figure 25-1010
Mid and Aft Trim - Serials 2127 & subs w/ 2+1 Rear Seat (Sheet 4 of 4)

EFFECTIVITY:
Serials 2127 & subs w/ 2+1 Rear Seat

O. Headliner Trim (See Figure 25-1011)

(1) Removal - Cabin Headliner
- (a) Remove door seal. (Refer to 52-10)
- (b) Remove A-pillar trim. (Refer to 25-10)
- (c) Remove B-pillar trim. (Refer to 25-10)
- (d) Remove grab handle screws and loosen sunvisor screws. (Refer to 25-10)
- (e) Remove grill from speaker.
- (f) Remove screws securing speaker to headliner and disconnect speaker wires.
- (g) Remove compass. (Refer to 34-20)
- (h) Remove rear passenger light access panel and disconnect wires to switch and light.
- (i) Remove upper windshield interior trim. (Refer to 25-10)
- (j) Remove bulkhead 222 trim. (Refer to 25-10)
- (k) Remove rear headliner trim. (Refer to 25-10)
- (l) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect baggage lights from wire harness. (Refer to 33-30)
- (m) Lift corners of cabin headliner and release reclosable fasteners. Remove headliner.

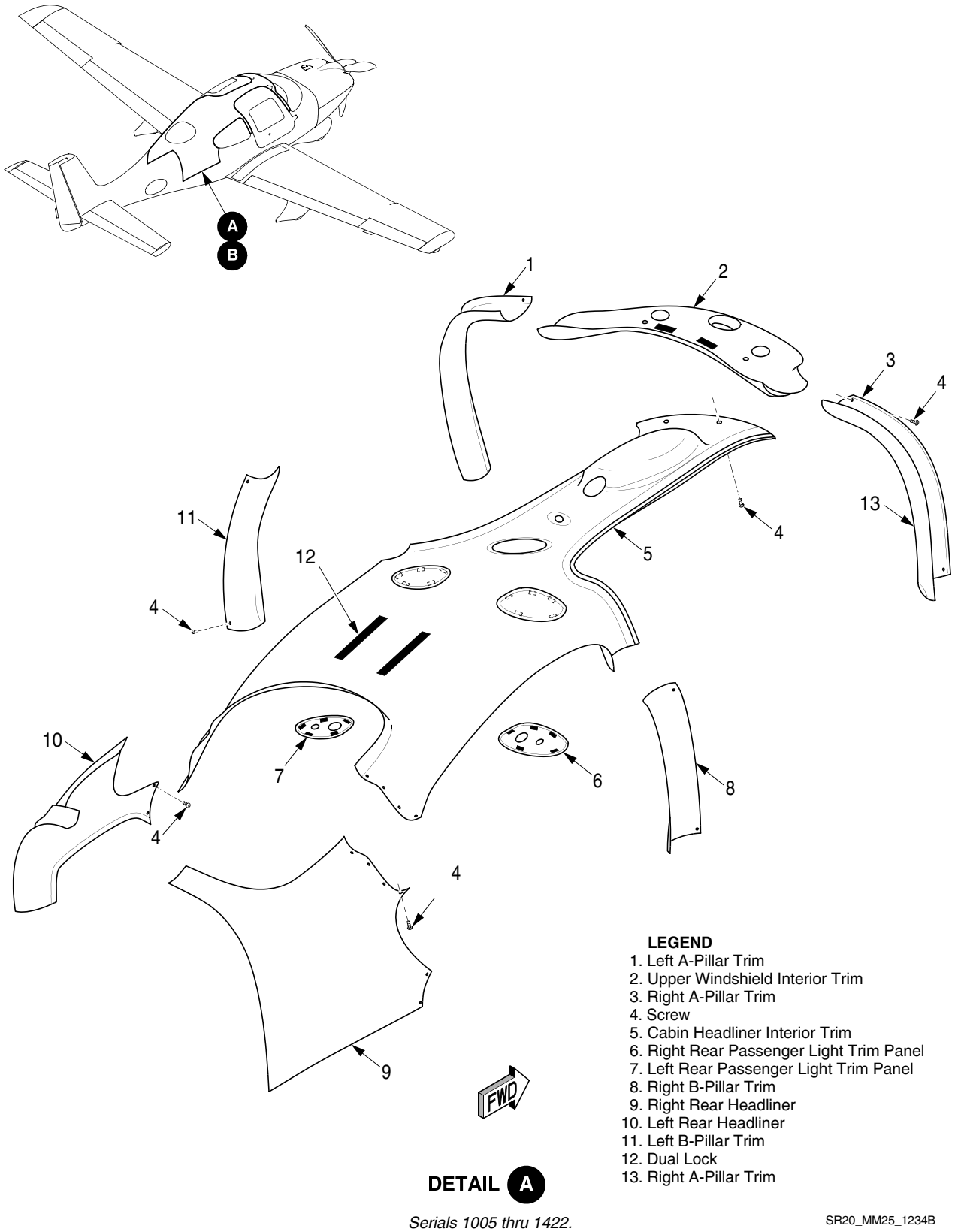
(2) Installation - Cabin Headliner
- (a) Place cabin headliner into position and secure. Press firmly on trim in areas of reclosable fasteners.
- (b) *Serials 2303 & subs w/ Convenience Lighting:* Connect baggage lights to wire harness. (Refer to 33-30)
- (c) Install rear headliner trim. (Refer to 25-10)
- (d) Install bulkhead 222 trim. (Refer to 25-10)
- (e) Install upper windshield interior trim. (Refer to 25-10)
- (f) Connect wires to rear passenger light access panel switch and light. Secure rear passenger light access panel.
- (g) Install compass. (Refer to 34-20)
- (h) Connect speaker wires and secure with screws.
- (i) Install and secure speaker grill.
- (j) Secure grab handles with screws and tighten sunvisor screws. (Refer to 25-10)
- (k) Install B-pillar trim. (Refer to 25-10)
- (l) Install A-pillar trim. (Refer to 25-10)
- (m) Install door seal. (Refer to 52-10)

(3) Removal - Rear Headliner Trim
- (a) Remove screws securing upper section of rear headliner trim to cabin headliner trim.
- (b) Remove screws securing lower section of rear headliner trim to rear cabin side trim.
- (c) Lift corners of rear headliner trim and release reclosable fasteners. Remove rear headliner trim.

(4) Installation - Rear Headliner Trim
- (a) Place rear headliner trim into position and secure upper section of trim with screws to cabin headliner trim.
- (b) Secure lower section of trim with screws to rear cabin side trim.
- (c) Press firmly on trim in areas of reclosable fasteners.

(5) Removal - Upper Windshield Trim
- (a) Remove compass. (Refer to 34-20)
- (b) Remove A-pillar trim. (Refer to 25-10)
- (c) Lift corners of upper windshield trim and release reclosable fasteners.
- (d) Disconnect wires to switches and lights. Remove upper windshield trim.

(6) Installation - Upper Windshield Trim
  (a) Connect wires to switches, compass, and lights in upper windshield trim.
  (b) Place upper windshield trim into position and secure. Press firmly on trim in areas of reclosable fasteners.
  (c) Install A-pillar trim. (Refer to 25-10)
  (d) Install compass. (Refer to 34-20)
(7) Removal - A-Pillar Trim
  (a) Remove sunvisor blade. (Refer to 25-10)
  (b) Remove screws securing A-pillar trim to upper windshield trim and lower windshield trim.
  (c) Lift corners of trim and release reclosable fasteners. Remove trim.
(8) Installation - A-Pillar Trim
  (a) Place A-pillar trim into position and press firmly on trim in areas of reclosable fasteners.
  (b) Secure upper section of A-pillar trim with screws to upper windshield trim.
  (c) Secure lower section of A-pillar trim with screws to lower windshield trim.
  (d) Install sunvisor blade. (Refer to 25-10)
(9) Removal - B-Pillar Trim
  (a) Remove screws securing B-pillar trim to cabin headliner and rear cabin side trim.
  (b) Lift corners of trim and release reclosable fasteners. Remove trim.
(10) Installation - B-pillar Trim
  (a) Place B-pillar trim into position and press firmly on trim in areas of reclosable fasteners.
  (b) Secure upper section of B-pillar trim with screws to cabin headliner.
  (c) Secure lower section of B-pillar trim with screws to rear cabin side trim.
  (d) Press firmly on trim in areas of reclosable fasteners.
(11) Removal - Rear Passenger Light Trim Panel - *Serials 1005 thru 1422*
  (a) Lift corner of panel and release reclosable fasteners. Remove panel.
(12) Installation - Rear Passenger Light Trim Panel - *Serials 1005 thru 1422*
  (a) Place panel into position and press firmly on trim in areas of reclosable fasteners.
(13) Removal - Coat Hook - *Serials 1541 & subs*
  (a) Remove screw securing coat hook to cabin headliner trim.
(14) Installation - Coat Hook - *Serials 1541 & subs*
  (a) Position coat hook to cabin headliner trim and secure with screw.
(15) Removal - Garment Bracket
  (a) Remove screws and washers securing garment bracket to cabin headliner trim.
(16) Installation - Garment Bracket
  (a) Position garment bracket to cabin headliner trim and secure with screws and washers.



LEGEND

1. Left A-Pillar Trim
2. Upper Windshield Interior Trim
3. Right A-Pillar Trim
4. Screw
5. Cabin Headliner Interior Trim
6. Right Rear Passenger Light Trim Panel
7. Left Rear Passenger Light Trim Panel
8. Right B-Pillar Trim
9. Right Rear Headliner
10. Left Rear Headliner
11. Left B-Pillar Trim
12. Dual Lock
13. Right A-Pillar Trim

Figure 25-1011
Headliner Trim - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422

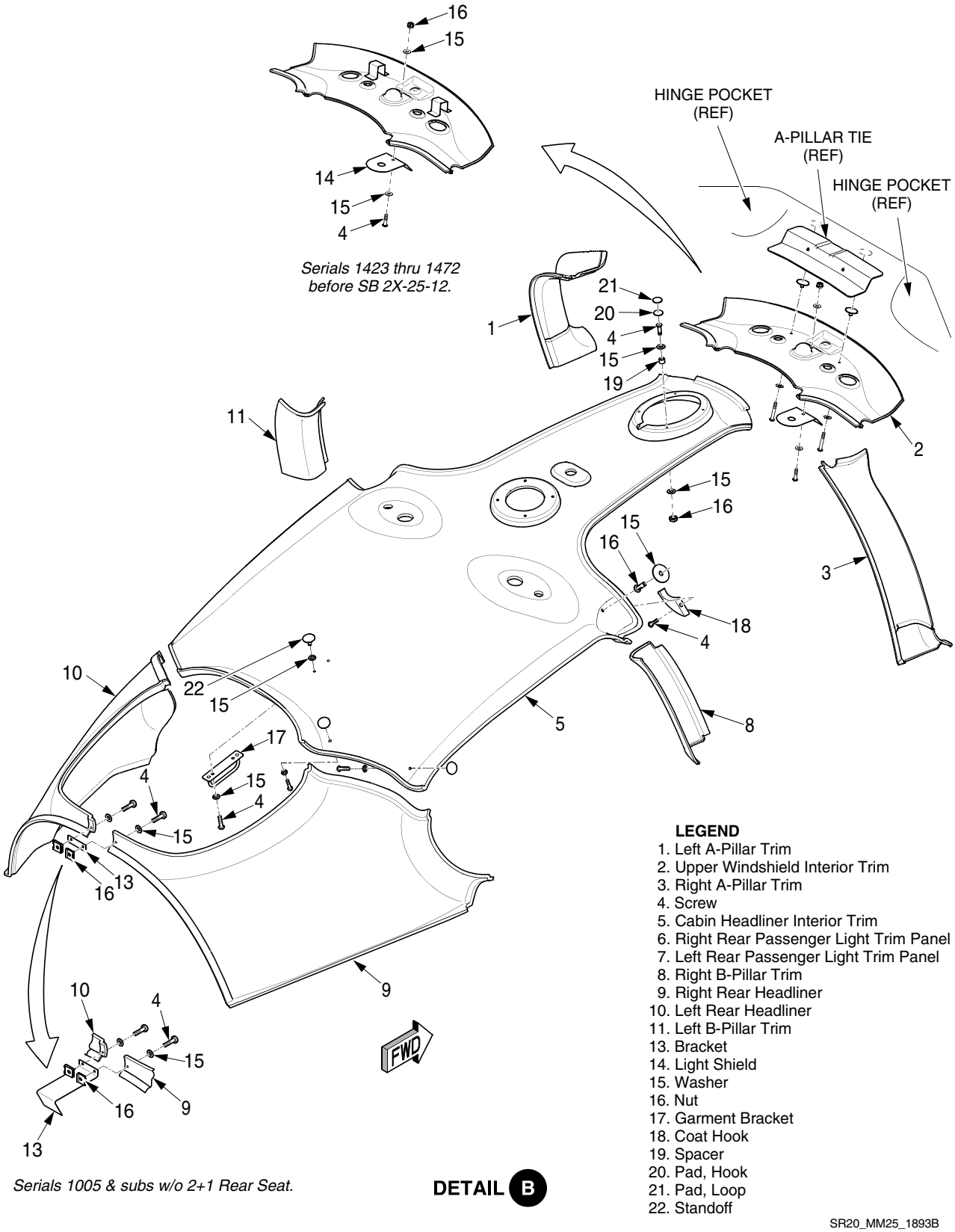


Figure 25-1011
Headliner Trim - Serials 1423 & subs (Sheet 2 of 2)

P. Floor Covering (See Figure 25-1012)

(1) Removal - Floor Covering

(a) Lift corner of carpet and pull carpet from floor to release reclosable fasteners.

(2) Installation - Floor Covering

(a) Clean floor surface and reclosable fasteners using a whisk broom and a vacuum cleaner.

(b) Place carpet into position and press firmly on carpet in areas of reclosable fasteners.

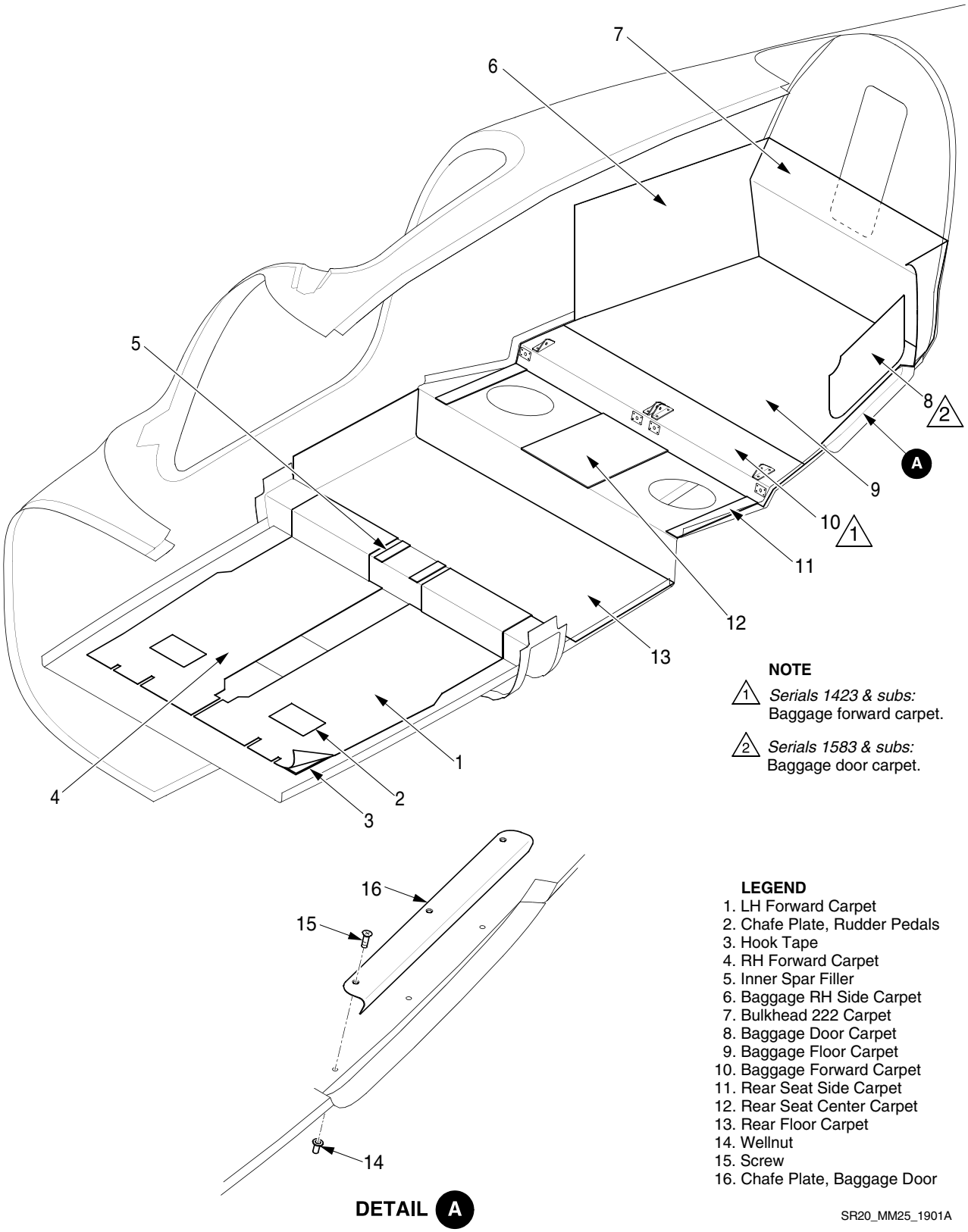


Figure 25-1012
Floor Covering

Q. Sunvisor Blade (See Figure 25-1013)

(1) Removal - Sunvisor Blade

(a) *Serials 1005 thru 1188*: To avoid damaging the blade, do not slide the sunvisor blade off the sunvisor arm. Blade, mounting clamp, and arm must be removed as assembly. Perform Removal - Sunvisor Mounting Clamp and Arm. (Refer to 25-10)

(b) *Serials 1189 & subs*: Remove sunvisor blade by rotating blade and pulling away from sunvisor arm.

(2) Installation - Sunvisor Blade

(a) *Serials 1005 thru 1188*: To avoid damaging the blade, do not slide the sunvisor blade on the sunvisor arm. Blade, mounting clamp, and arm must be installed as assembly. Perform Installation - Sunvisor Mounting Clamp and Arm. (Refer to 25-10)

(b) *Serials 1189 & subs*: Slide sunvisor blade clamp onto sunvisor arm.

R. Sunvisor Mounting Clamp and Arm (See Figure 25-1013)

(1) Removal - Sunvisor Mounting Clamp and Arm

(a) Remove screws, spacer, felt isolators, washers, and nuts securing sunvisor to clamp.

(b) Remove A-pillar trim. (Refer to 25-10)

(c) Remove screws securing sunvisor arm to fuselage.

(2) Installation - Sunvisor Mounting Clamp and Arm

(a) Secure sunvisor arm to fuselage with screws.

(b) Install A-pillar trim. (Refer to 25-10)

(c) Position clamp on sunvisor arm.

(d) Position sunvisor to clamp and secure to clamp with screws, spacer, felt isolators, washers, and nuts.

S. Grab Handle (See Figure 25-1013)

(1) Removal - Grab Handle

(a) Remove A-pillar trim. (Refer to 25-10)

(b) *Serials 1005 thru 1422:* Remove screws and spacers securing grab handle to fuselage.

(c) Serials 1423 & 1424:

1 Remove screws and spacers securing outboard end of grab handle to fuselage.

2 Remove screws securing inboard end of grab handle to fuselage.

(d) *Serials 1425 thru 1540, 1541 & subs w/o optional headset hook:* Remove screws securing grab handle to fuselage.

(e) Serials 1541 & subs w/ optional headset hook:

1 Remove headset hook. (Refer to 25-10)

2 Remove screw securing inboard end of grab handle to fuselage.

3 Remove screws securing outboard end of grab handle to fuselage.

(2) Installation - Grab Handle

(a) *Serials 1005 thru 1422:* Position grab handle to fuselage and secure with screws and spacers.

(b) Serials 1423 & 1424:

1 Position outboard end of grab handle to fuselage and secure with screws and spacers.

2 Position inboard end of grab handle to fuselage and secure with screws.

(c) *Serials 1425 thru 1540, 1541 & subs w/o optional headset hook:* Position grab handle to fuselage and secure with screws.

(d) Serials 1541 & subs w/ optional headset hook:

1 Position outboard end of grab handle to fuselage and secure with screws.

2 Position inboard end of grab handle to fuselage and secure with screw.

3 Install headset hook. (Refer to 25-10)

(e) Install A-pillar trim. (Refer to 25-10)

T. Headset Hook - *Serials 1541 & subs* **(See Figure 25-1013)**

(1) Removal - Headset Hook

(a) Remove screw securing headset hook to grab handle.

(2) Installation - Headset Hook

(a) Position headset hook to grab handle and secure with screw.

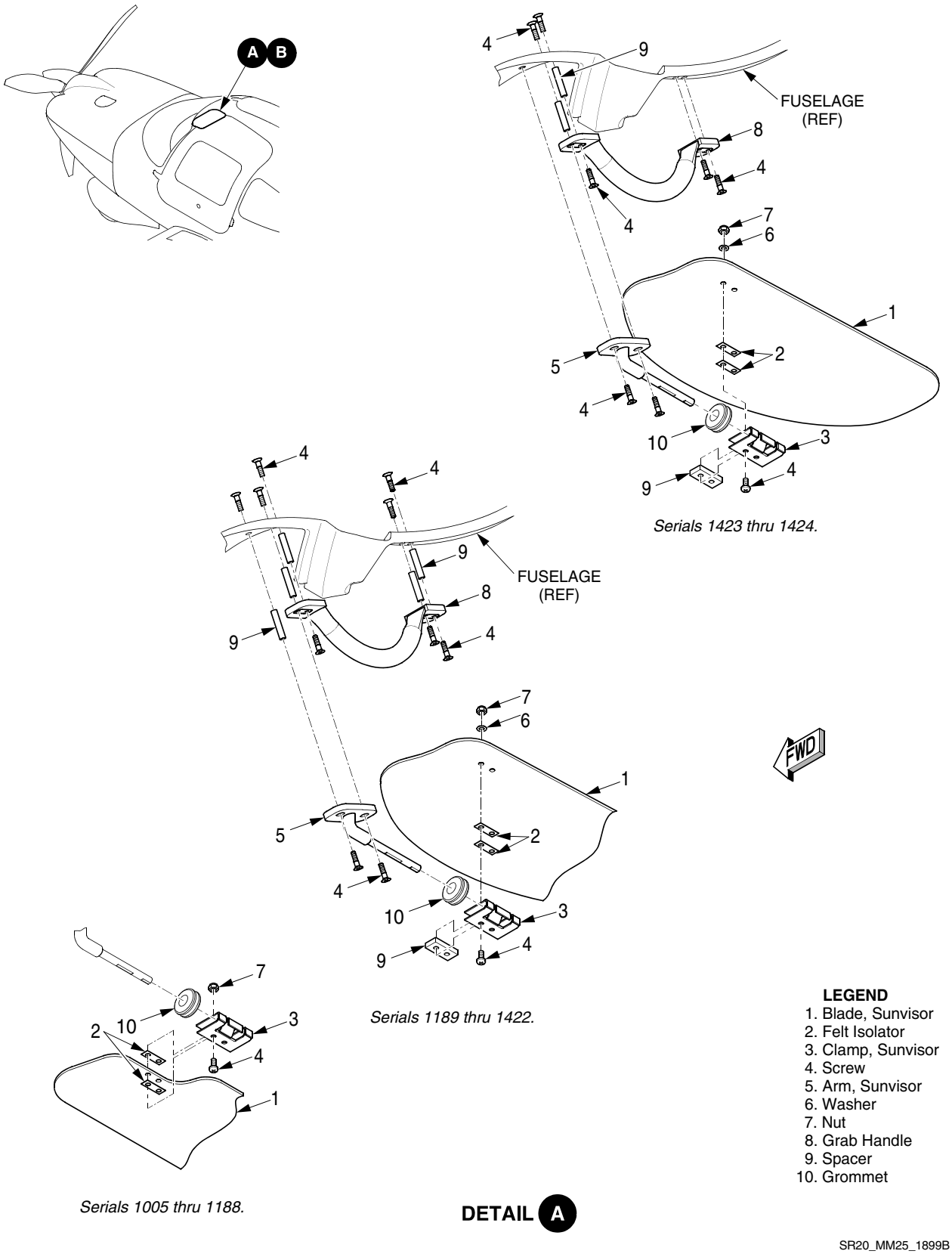
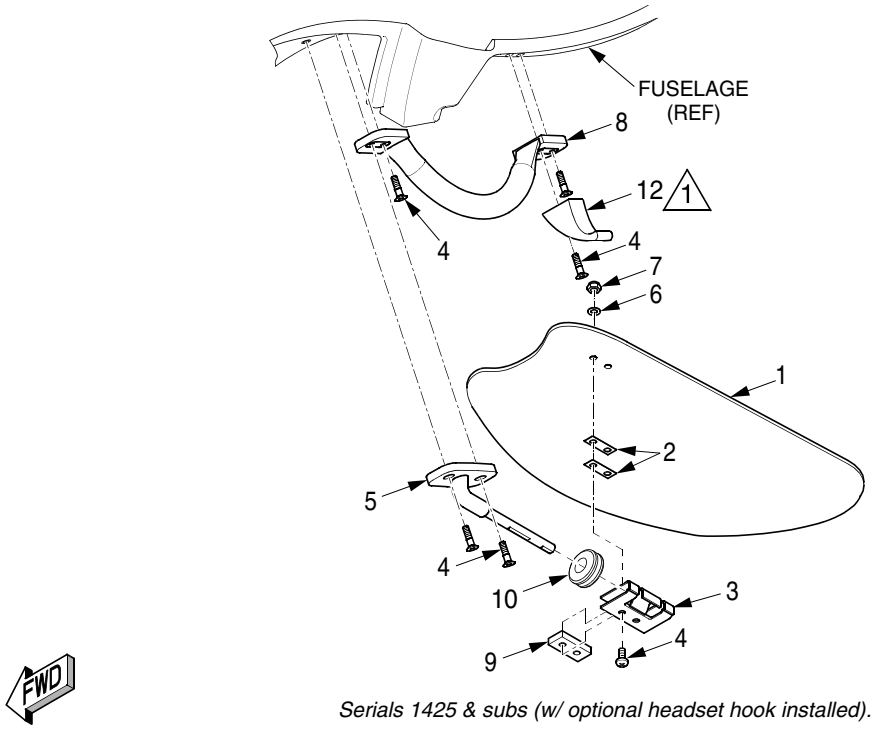
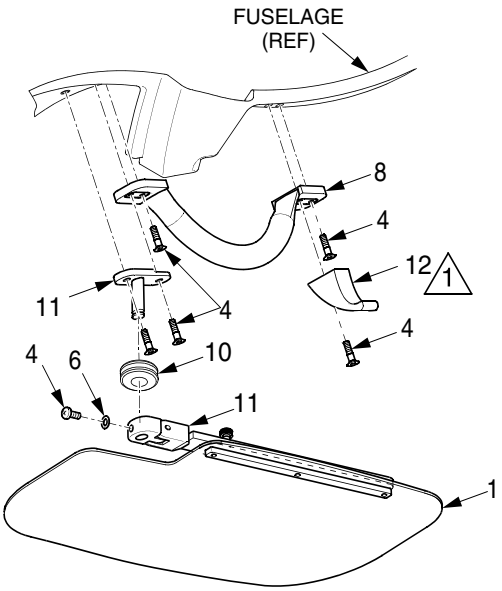


Figure 25-1013
Sunvisor and Grab Handle Assembly - Serials 1005 thru 1424 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1424



Serials 1425 & subs (w/ optional headset hook installed).



Serials 1473 & subs (w/ optional headset hook installed).

LEGEND

1. Blade, Sunvisor
2. Felt Isolator
3. Clamp, Sunvisor
4. Screw
5. Arm, Sunvisor
6. Washer
7. Nut
8. Grab Handle
9. Spacer
10. Grommet
11. Mount
12. Headset Hook

NOTE

1 *Serials 1541 thru 2011 only.*

DETAIL B

SR20_MM25_2956

Figure 25-1013
Sunvisor and Grab Handle Assembly - Serials 1425 & subs (Sheet 2 of 2)

U. Glove Box - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 25-1014)**

(1) Removal - Glove Box

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Remove screws and washers securing glove box to instrument panel.

(2) Installation - Glove Box

(a) Position glove box to instrument panel and secure with screws and washers.

(b) Install glareshield. (Refer to 25-10)

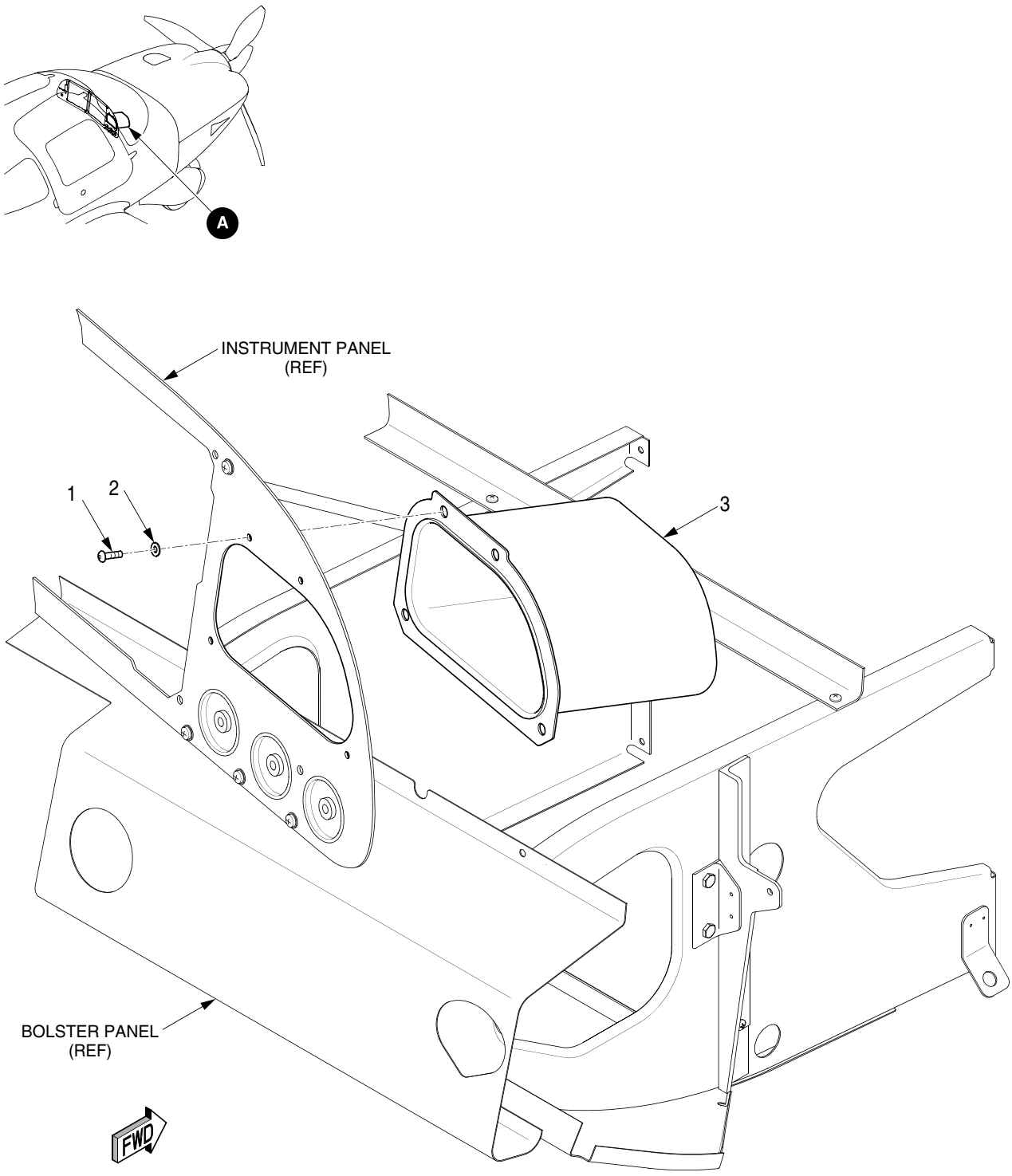


Figure 25-1014
Glove Box Installation - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics

V. Radio Module Assembly - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 25-1015)

(1) Removal - Radio Module Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull STARTER RELAY, FUEL PUMP RELAY, ESSENTIAL, and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove LH, RH, and center bolster trim. (Refer to 25-10)

(d) Loosen screws securing bolster plate to LH bolster panel. (Refer to 31-10)

(e) Remove LH mid-console circuit breaker trim. (Refer to 25-10)

(f) Remove RH mid-console trim. (Refer to 25-10)

(g) Remove cabin floor access panel CF8. (Refer to 06-00)

(h) Remove glareshield. (Refer to 25-10)

(i) Remove MFD. (Refer to 31-60)

Note: Label avionics and communication units to ensure proper reinstallation. Failure to install avionics and communication units as originally configured will require calibration and setup procedures to be performed.

(j) Remove GPS 1. (Refer to 34-50)

(k) Remove GPS 2, if installed. (Refer to 34-50)

(l) Remove GTX Transponder. (Refer to 34-50)

(m) Remove System 55 Autopilot, if installed. (Refer to 22-12)

(n) Remove audio panel. (Refer to 23-50)

(o) Disconnect J521 connector from audio wire harness.

(p) Disconnect P566 connector from Flight Director wire harness, if installed.

(q) Disconnect J550 connector from autopilot wire harness, if installed.

(r) Disconnect P517 connector from NAV/PFD wire harness.

(s) Disconnect P518 connector from NAV/PFD wire harness.

(t) Remove screws securing TR522, TR523, TR524, TR525, and TR526 terminal rings from radio module assembly.

(u) Disconnect J546 connector from Sandel HSI, if installed.

(v) Disconnect P554 connector from autopilot wire harness, if installed.

(w) Disconnect J556 connector from SKYWATCH wire harness, if installed.

(x) Disconnect GPS 1 antenna cable from radio module assembly.

(y) Disconnect COM 1 antenna cable from radio module assembly.

(z) *Serials 1005 thru 1263:* Disconnect transponder antenna cable.

1 At access panel CF8, reach through forward longeron and disconnect J509 connector from transponder antenna.

2 Cut cable ties securing transponder antenna cable to other cables.

CAUTION: Use caution while removing transponder antenna cable to prevent damaging other wire harnesses and cables.

3 Pull cable through forward longeron, access panel CF8, and over wire loom.

(aa) *Serials 1264 & subs:* Disconnect transponder antenna cable J506 connector from transponder.

(ab) Disconnect J520 connector from radio module assembly.

(ac) Remove screws and washers securing front of radio module assembly to bolster panel.

(ad) Remove screws and washers securing sides of radio module assembly to center console.

CAUTION: Use caution while pulling radio module assembly out to prevent damaging wire harnesses and electrical connectors.

(ae) Carefully slide radio module assembly out of center console.
(af) Disconnect P508 connector from altitude encoder.
(ag) Disconnect P533 connector from marker beacon antenna cable.
(ah) Disconnect GPS 2 antenna cable from radio module assembly, if installed.
(ai) Disconnect COM 2 antenna cable from radio module assembly, if installed.
(aj) Disconnect VOR/LOC cable from antenna diplexer.
(ak) Remove radio module assembly from airplane.

(2) Installation - Radio Module Assembly

Note: To facilitate installation of VOR/LOC cable it may be necessary to loosen the diplexer.

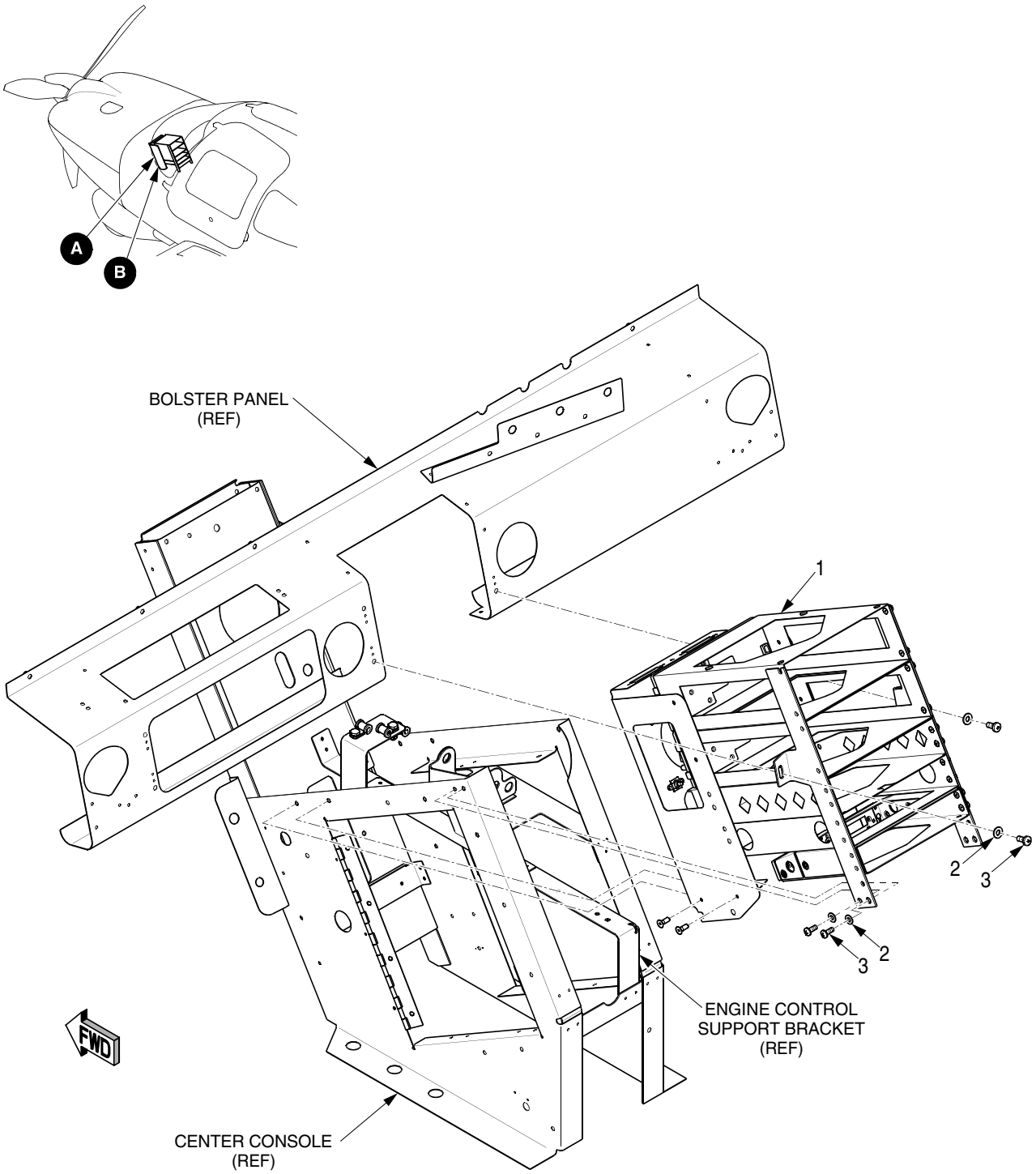
(a) Connect VOR/LOC cable to diplexer.
(b) Connect GPS 2 antenna cable to radio module assembly, if installed.
(c) Connect COM 2 antenna cable to radio module assembly, if installed.
(d) Connect P533 connector to marker beacon antenna cable.
(e) Connect P508 connector to altitude encoder.
(f) Carefully slide radio module assembly into center console.
(g) Connect J520 connector to radio module assembly.
(h) *Serials 1005 thru 1263:* Connect transponder antenna cable.

WARNING: Verify transponder antenna cable does not interfere with any flight controls or lines.

1 Route transponder antenna cable over wire loom, through access panel CF8, and through forward longeron.
2 Connect J509 connector to transponder antenna.
3 Install cable ties securing transponder antenna cable to adjacent wire harnesses and cables.

(i) *Serials 1264 & subs:* Connect transponder antenna cable J506 connector to transponder.
(j) Connect GPS 1 antenna cable to radio module assembly.
(k) Connect COM 1 antenna cable to radio module assembly.
(l) Install screws securing TR522, TR523, TR524, TR525, and TR526 terminal rings to radio module assembly.
(m) Connect P518 connector to NAV/PFD wire harness.
(n) Connect P517 connector to NAV/PFD wire harness.
(o) Connect J550 connector to autopilot wire harness.
(p) Connect P566 connector to Flight Director wire harness, if installed.
(q) Connect J521 connector to audio wire harness.
(r) Connect J546 connector to Sandel HSI, if installed.
(s) Connect P554 connector to autopilot wire harness, if installed.
(t) Connect J556 connector to SKYWATCH wire harness, if installed.
(u) Install screws and washers securing sides of radio module assembly to center console.
(v) Install screws and washers securing front of radio module assembly to bolster panel.
(w) Install GPS 1. (Refer to 34-50)
(x) Install GPS 2, if installed. (Refer to 34-50)

(y) Install GTX Transponder. (Refer to 34-50)
(z) Install System 55 Autopilot. (Refer to 22-12)
(aa) Install audio panel. (Refer to 23-50)
(ab) Install MFD. (Refer to 31-60)
(ac) Install glareshield. (Refer to 25-10)
(ad) Install cabin floor access panel CF8. (Refer to 06-00)
(ae) Tighten screws securing bolster plate to LH bolster panel. (Refer to 31-10)
(af) Install RH mid-console trim. (Refer to 25-10)
(ag) Install LH mid-console circuit breaker trim. (Refer to 25-10)
(ah) Install LH, RH, and center bolster trim. (Refer to 25-10)
(ai) Reset STARTER RELAY, FUEL PUMP RELAY, ESSENTIAL, and NON-ESSENTIAL AVIONICS circuit breakers.

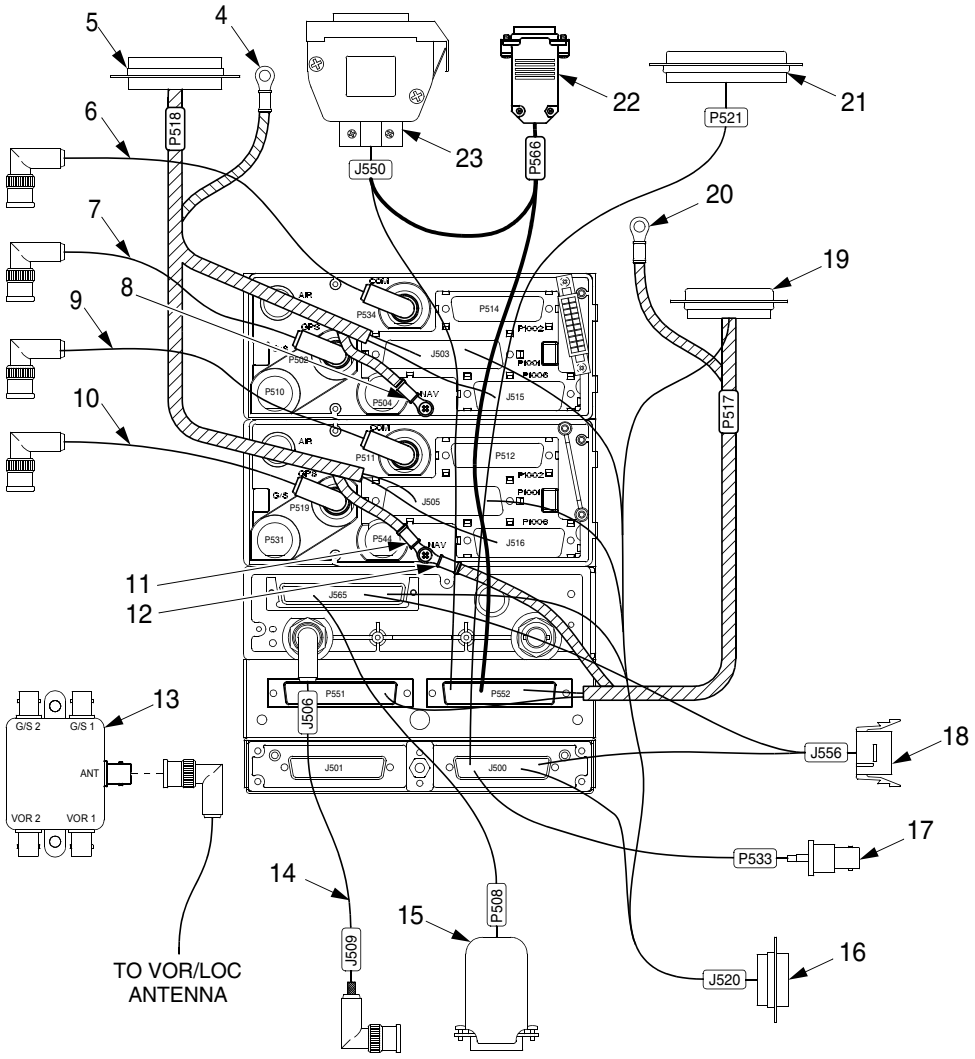


LEGEND
1. Radio Module Assembly
2. Screw
3. Washer

DETAIL A

SR20_MM25_2067

Figure 25-1015
Radio Module Assembly Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 2)



DETAIL B

LEGEND

4. TR522
5. P518, NAV/PFD
6. COM 1 Antenna Cable
7. GPS 1 Antenna Cable
8. TR526
9. COM 2 Antenna Cable
10. GPS 2 Antenna Cable
11. TR525
12. TR524
13. Antenna Diplexer
14. Transponder Antenna Cable
15. P508, Altitude Encoder
16. J520, Radio Module Assembly
17. P533, Marker Beacon Antenna Cable
18. J556, Skywatch
19. P517, NAV/PFD
20. TR523
21. P521, Audio
22. P566, Flight Director
23. J550, Autopilot

SR20_MM25_2068

Figure 25-1015
Radio Module Assembly Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 2)

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

W. Radio Module Assembly - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 25-1016)

(1) Removal - Radio Module Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull STARTER RELAY, FUEL PUMP RELAY, ESSENTIAL, and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove LH, RH, and center bolster trim. (Refer to 25-10)

(d) Loosen screws securing bolster plate to LH bolster panel. (Refer to 31-10)

(e) Remove LH mid-console circuit breaker trim. (Refer to 25-10)

(f) Remove RH mid-console trim. (Refer to 25-10)

(g) Remove cabin floor access panel CF8. (Refer to 06-00)

(h) Remove glareshield. (Refer to 25-10)

(i) Remove MFD. (Refer to 31-60)

Note: Label avionics and communication units to ensure proper reinstallation. Failure to install avionics and communication units as originally configured will require calibration and setup procedures to be performed.

(j) Remove ADF receiver. (Refer to 34-50)

(k) Remove GMC 705 mode controller. (Refer to 22-13)

(l) Remove audio panel. (Refer to 23-50)

(m) Remove screws and washers securing front of radio module assembly to bolster panel.

(n) Remove screws and washers securing sides of radio module assembly to center console.

CAUTION: Use caution while pulling radio module assembly out to prevent damaging wire harnesses and electrical connectors.

(o) Carefully slide radio module assembly out of center console.

(p) Remove radio module assembly from airplane.

(2) Installation - Radio Module Assembly

(a) Carefully slide radio module assembly into center console.

(b) Install screws and washers securing sides of radio module assembly to center console.

(c) Install screws and washers securing front of radio module assembly to bolster panel.

(d) Install audio panel. (Refer to 23-50)

(e) Install GMC 705 mode controller. (Refer to 22-13)

(f) Install ADF receiver. (Refer to 34-50)

(g) Install MFD. (Refer to 31-60)

(h) Install glareshield. (Refer to 25-10)

(i) Install cabin floor access panel CF8. (Refer to 06-00)

(j) Tighten screws securing bolster plate to LH bolster panel. (Refer to 31-10)

(k) Install RH mid-console trim. (Refer to 25-10)

(l) Install LH mid-console circuit breaker trim. (Refer to 25-10)

(m) Install LH, RH, and center bolster trim. (Refer to 25-10)

(n) Reset STARTER RELAY, FUEL PUMP RELAY, ESSENTIAL, and NON-ESSENTIAL AVIONICS circuit breakers.

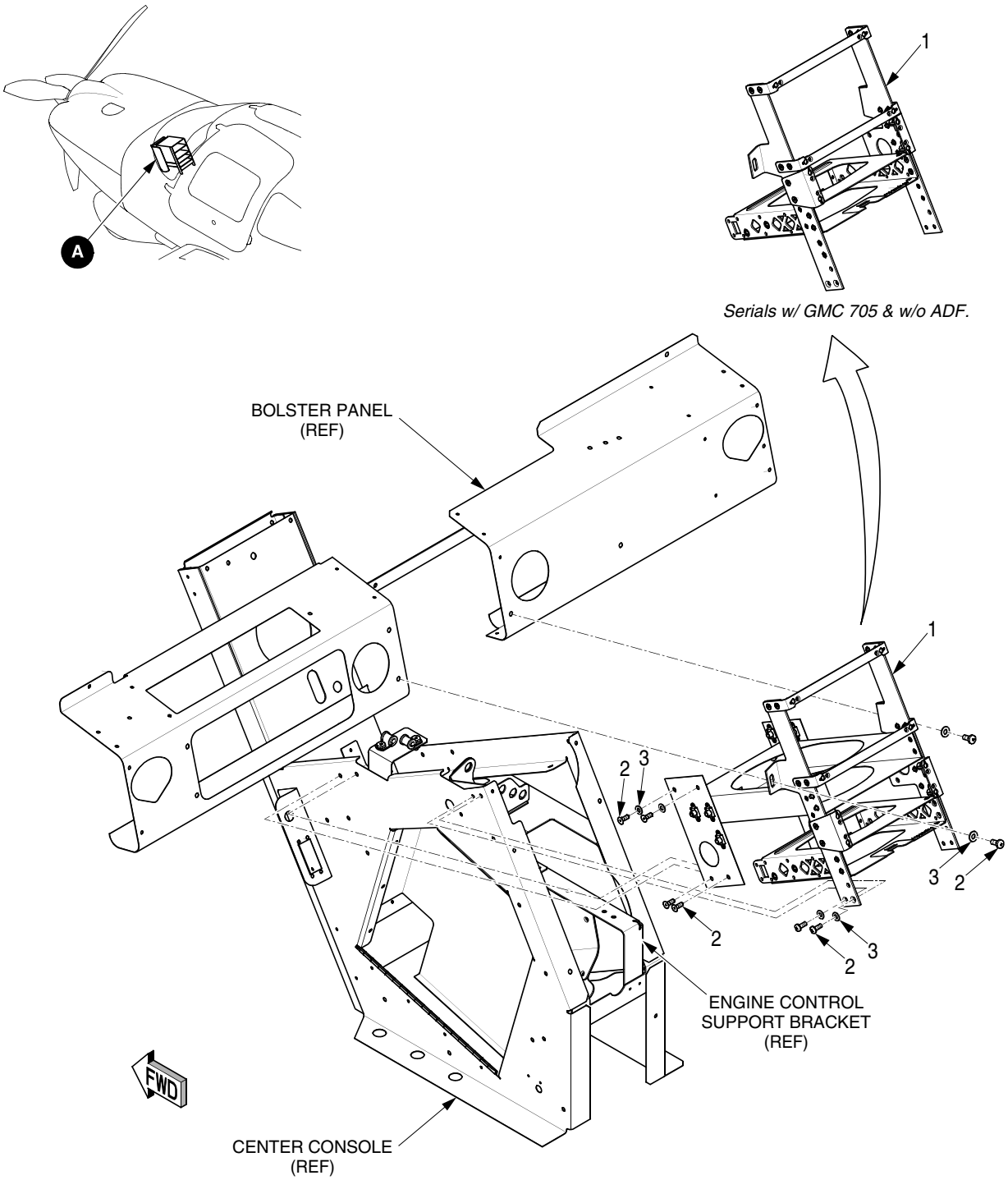


Figure 25-1016
Radio Module Assembly Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

X. EMI Shielding - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 25-1017)

(1) Removal - EMI Shielding

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Remove screws and washers securing EMI shield to instrument panel. Remove EMI shield from airplane.

(2) Installation - EMI Shielding

(a) Slide forward edge of EMI shield under mounting clips.

(b) Position EMI shield to instrument panel and secure with screws and washers.

(c) Install glareshield. (Refer to 25-10)

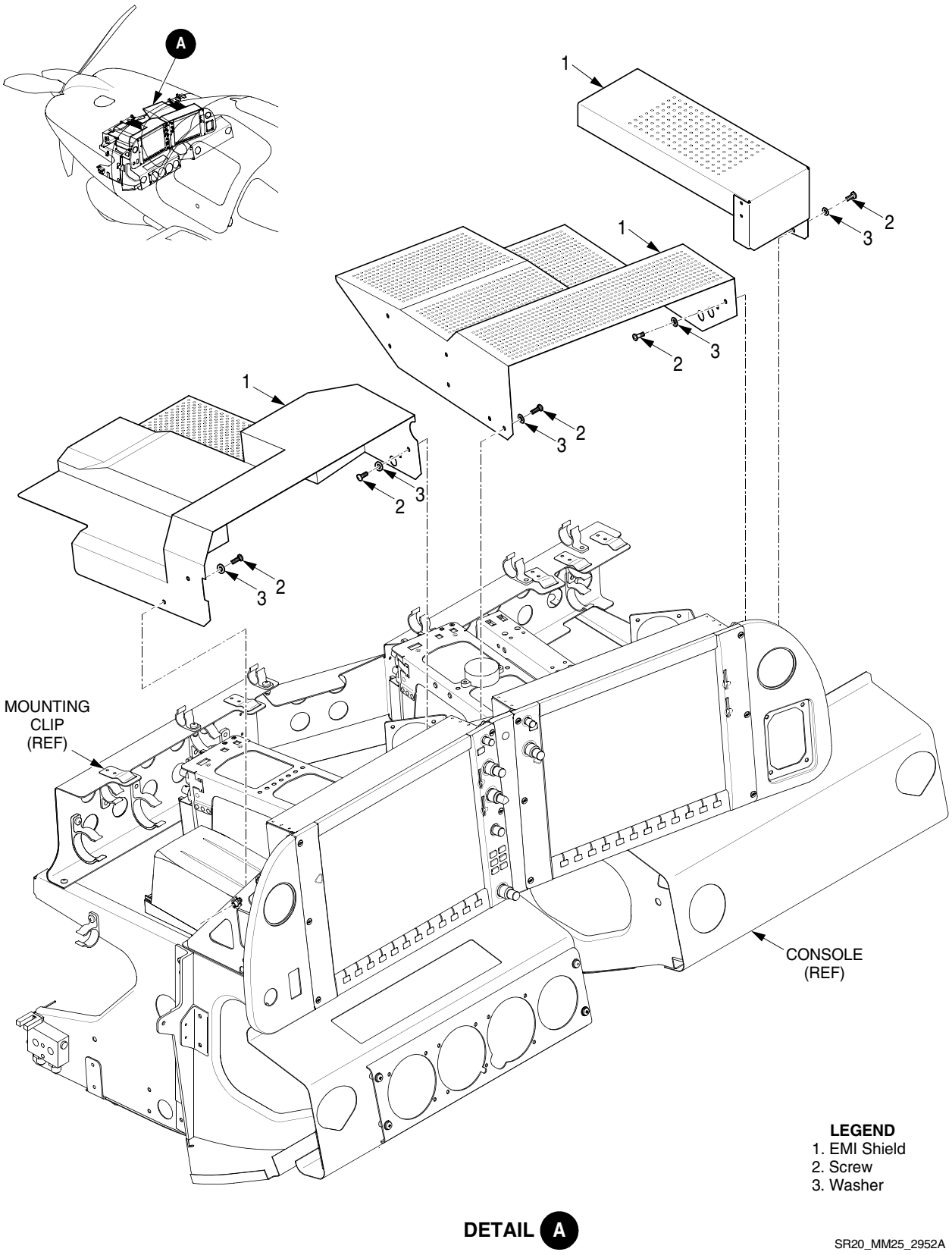


Figure 25-1017
EMI Shields Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

EMERGENCY

1. DESCRIPTION

A. Emergency Locator Transmitter (ELT)

This airplane is equipped with a self-contained ELT. The ELT transmitter is installed immediately behind the aft cabin bulkhead. The ELT is mounted slightly to the right of the airplane centerline. The transmitter and antenna are accessible through an access panel at the base of the baggage compartment bulkhead. ELT models available on the airplane include the ACK E-01 ELT, the Artex ME406 ELT, and the Artex ELT 1000.

Serials 1005 thru 2126 w/ ACK E-01 ELT: The transmitter unit is mounted longitudinally in the airplane. If rapid deceleration is detected, the transmitter will repeatedly transmit VHF band audio sweeps at 121.5 Mhz and 243.0 Mhz approximately 0.5 seconds apart. The transmitter can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident.

The main transmitter control switch is labeled ON-OFF-ARMED. The transmitter is in the armed position for normal operations. Eight dated “D” cell alkaline batteries contained within the transmitter unit provide power to the transmitter. Replace all ELT batteries at the same time and with the same expiration date stamp. The expiration date of the batteries must be indicated on the outside of the ELT battery case and recorded in the aircraft logs.

The ELT Remote Switch and Control Panel Indicator (RCPI) are located below the circuit breakers on the circuit breaker panel. The RCPI provides test and monitoring functions for the transmitter. The panel contains a button labeled ON, a button labeled RESET, and a red LED indicator light. The ON button is used to test the unit in accordance with the manufacturer’s approved Instructions For Continued Airworthiness. The RESET button can be used to cancel an inadvertent transmission. The red light flashes when the ELT is transmitting. A Duracell PX28L or Kodak K28L 6-volt lithium battery mounted in the panel powers the LED.

WARNING: **The ACK E-01 ELT is designed to use only Duracell MN1300 or PC 1300 alkaline batteries which are dated by the manufacturer. This ELT does not meet the requirements of TSO-91a or 14 CFR 91.207 if used with any other type of battery. ELT and RCPI batteries must be inspected in accordance with the requirements of the replacement schedule in Chapter 5. The ELT and RCPI batteries must be replaced upon reaching the date stamped on the batteries or whenever the batteries have been in use for one cumulative hour.**

For additional information on the ACK ELT, refer to the Model E-01 ELT Installation and Operation Manual. (Refer to 05-10)

Serials 1639 thru 2272 w/ Artex ME406 ELT: The transmitter unit is mounted longitudinally in the airplane in order to detect deceleration greater than 2.3 g. If rapid deceleration is detected, the transmitter will repeatedly transmit VHF band audio sweeps at 121.5 Mhz until battery power is gone. In addition, for the first 24 hours of operation, a 406 MHz signal is transmitted at 50-second intervals. This transmission lasts 440 ms and contains identification data programmed into the beacon and is received by Cospas-Sarsat satellites. The transmitted data is referenced in a database (maintained by the national authority responsible for ELT registration) and used to identify the beacon and owner. The transmitter can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident.

The main transmitter control switch is labeled ON-ARM. The transmitter is in the armed position for normal operations. A red LED indicator light flashes when the ELT is transmitting. A battery pack consisting of two “D” cell lithium batteries mounts to a cover assembly within the transmitter to provide power to the transmitter. The expiration date of the batteries must be indicated on the outside of the ELT battery case and recorded in the aircraft logs.

Serials w/o Perspective Avionics: The ELT Remote Switch and Control Panel Indicator (RCPI) are located below the circuit breakers on the circuit breaker panel.

Serials w/ Perspective Avionics: The ELT Remote Switch and Control Panel Indicator (RCPI) are located forward of the circuit breakers on the LH side of the center console.

The RCPI provides test and monitoring functions for the transmitter. The panel contains a switch labeled ON-ARM and a red LED indicator light. The ON button is used to test the unit in accordance with the manufacturer's approved service instructions. The red LED indicator light flashes when the ELT is transmitting. Power to the LED is supplied by the clock bus on the MCU (*Serials 1639 thru 1705*) or by a 6V lithium battery in the RCPI (*Serials 1706 thru 2272*).

A warning buzzer is mounted to the ELT shelf. When the ELT is activated, the buzzer “beeps” periodically. This buzzer operates in tandem with the ELT panel indicator and would serve as a redundant indicator. Power to the buzzer is supplied by the ELT batteries.

After setting transmitter switch to ARM position, the ELT automatically enters a self-test mode. The self-test transmits a 406 MHz test coded pulse that monitors certain system functions before shutting off. The test pulse is ignored by any satellite that receives the signal, but the ELT uses this pulse to check output power and frequency. Other parameters of the ELT are checked and a set of error codes is generated if a problem is found. The error codes are indicated by a series of pulses on the transmitter LED, remote control panel indicator LED, and alert buzzer. One pulse indicates that the system is operational and no error conditions were found. For a list of error codes, refer to the Installation and Maintenance Manual for the ME406 ELT. (Refer to 05-10)

WARNING: **ELT batteries must be inspected in accordance with the requirements of the replacement schedule in Chapter 5. The ELT batteries must be replaced upon reaching the date stamped on the batteries, after an inadvertent activation of unknown duration, or whenever the batteries have been in use for one cumulative hour.**

For additional information on the Artex ME406 ELT, refer to the Installation and Maintenance Manual for the ME406 ELT. (Refer to 05-10)

Serials 2273 & subs w/ Artex ELT 1000: The transmitter unit is mounted longitudinally in the airplane in order to detect deceleration greater than 2.3 g. The transmitter unit is automatically activated upon sensing a change of velocity along its longitudinal axis exceeding 4 to 5 feet per second, or upon sensing deployment of the Cirrus Airframe Parachute System (CAPS). Once activated, the ELT transmits VHF band audio sweeps at 121.5 MHz until battery power is gone. In addition, for the first 24 hours of operation, a 406 MHz signal is transmitted at 50-second intervals. This transmission lasts 440 milliseconds and contains aircraft-specific information and GPS position data provided by the Garmin avionics. The transmitted data is referenced in a database maintained by the national authority responsible for ELT registration to identify the beacon and owner. The transmitter can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident.

The main transmitter control switch is labeled ON-ARM/OFF-TEST. The transmitter is in the ARM/OFF position for normal operations. A red LED indicator light flashes when the ELT is transmitting. A battery pack consisting of two "D" cell lithium batteries mounts to a cover assembly within the transmitter to provide power to the transmitter. The expiration date of the batteries must be indicated on the outside of the ELT battery case and recorded in the aircraft logs.

The ELT Remote Switch and Control Panel Indicator (RCPI) are located forward of the circuit breakers on the LH side of the center console.

The RCPI provides test and monitoring functions for the transmitter. The panel contains a switch labeled ON-ARM/OFF-TEST and a red LED indicator light. The TEST button is used to test the unit in accordance with the manufacturer's approved service instructions. The red LED indicator light flashes when the ELT is transmitting.

A warning buzzer is mounted to the ELT shelf. When the ELT is activated, the buzzer "beeps" periodically. This buzzer operates in tandem with the ELT panel indicator and would serve as a redundant indicator. Power to the buzzer is supplied by the ELT batteries.

After pressing and releasing TEST on the RCPI switch, the ELT automatically enters a self-test mode. The self-test transmits a 406 MHz test coded pulse that monitors certain system functions before shutting off. The test pulse is ignored by any satellite that receives the signal, but the ELT uses this pulse to check output power and frequency. Other parameters of the ELT are checked and a set of error codes is generated if a problem is found. The error codes are indicated by a series of pulses on the transmitter LED, remote control panel indicator LED, and alert buzzer. One pulse indicates that the system is operational and no error conditions were found. For a list of error codes, refer to the Installation and Maintenance Manual for the Artex ELT 1000. (Refer to 05-10)

WARNING: **ELT batteries must be inspected in accordance with the requirements of the replacement schedule in Chapter 5. The ELT batteries must be replaced upon reaching the date stamped on the batteries, after an inadvertent activation of unknown duration, or whenever the batteries have been in use for one cumulative hour.**

For additional information on the Artex ELT 1000, refer to the Installation and Maintenance Manual for the Artex ELT 1000. (Refer to 05-10)

2. MAINTENANCE PRACTICES

A. Emergency Locator Transmitter - *Serials 1005 thru 2126 w/ ACK E-01 ELT* (See Figure 25-601)

(1) Removal - ELT

(a) Remove access panel CB06. (Refer to 06-00)

(b) Set transmitter control switch to OFF position.

(c) Disconnect remote control panel indicator cable from transmitter.

(d) Disconnect antenna cable from transmitter.

(e) Remove portable antenna from transmitter.

(f) Open quick release straps securing transmitter to mounting tray. Remove transmitter from airplane.

(2) Installation - ELT

WARNING: **ELT must be installed with printed arrow on battery case pointing in the direction of flight.**

(a) Position transmitter to mounting tray with printed arrow on battery case pointing in direction of flight.

Note: The quick release straps which secure the transmitter to the mounting tray are slightly different sizes. The strap which fits around front of transmitter is marked FRONT. The strap which fits around battery end of transmitter is marked BATTERY.

(b) Close quick release straps securing transmitter to mounting tray.

(c) Position portable antenna to transmitter and secure.

(d) Connect antenna cable to transmitter.

(e) Connect remote control panel indicator cable to transmitter.

(f) Perform Operational Test - ELT. (Refer to 25-60)

(g) Install access panel CB06. (Refer to 06-00)

(3) Operational Test - ELT

Note: Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 3 audio sweeps (1.5 seconds). If you are at a location where there is an FAA control tower or other monitoring facility, notify the facility before beginning the tests. Never activate the ELT while airborne for any reason.

A low quality AM broadcast receiver should be used to determine if energy is being transmitted from the antenna. When the antenna of the radio (tuning dial on any setting) is held about 6 inches from the activated ELT antenna, the ELT aural tone will be heard on the AM broadcast receiver. This is not a measured check, but it does provide confidence that the antenna is radiating sufficient power to aid search and rescue. The aircraft's VHF receiver, tuned to 121.5 MHz, may also be used. This receiver, however, is more sensitive and could pick up a weak signal even if the radiating ELT's antenna is disconnected. Thus it does not check the integrity of the ELT system or provide the same level of confidence as does an AM radio.

(a) Remove access panel CB06. (Refer to 06-00)

(b) Monitor 121.5 Mhz using aircraft COM receiver or portable hand-held receiver.

(c) Turn receiver squelch control all the way down or to OFF position.

EFFECTIVITY:
Serials 1005 thru 2126 w/ ACK E-01 ELT

(d) Set transmitter control switch to ON position.
(e) Verify audio sweep tone can be heard on COM receiver.
(f) Set transmitter control switch to ARMED position.
(g) Press ON button on remote control panel indicator.
(h) Verify LED flashes and is readily visible from pilots operating position.
(i) Verify audio sweep tone can be heard on COM receiver.
(j) Push RESET button on remote control panel indicator.
(k) Verify LED stops flashing and audio sweep tone stops transmitting.
(l) Install access panel CB06. (Refer to 06-00)

(4) Inspection/Check - ELT

Note: Perform Inspection/Check in accordance with 14 CFR 91.207.

(a) Remove ELT. (Refer to 25-60)
(b) Visually inspect mounting tray, fasteners, and mechanical assemblies for security.
(c) Visually inspect antenna cable and RCPI cable for cuts, abrasions, or signs of wear.
(d) Visually inspect all cable connectors and mating plugs for signs of corrosion.

Note: Pay special attention to antenna cable center conductor pins which are prone to retracting into connector housing.

(e) Visually inspect and confirm proper seating of all connector pins.
(f) Check transmitter batteries for expiration date and corrosion. Replace if necessary. (Refer to 25-60)
(g) Check RCPI battery for expiration date and corrosion. Replace if necessary. (Refer to 25-60)
(h) Verify operation of G-switch.

Note: Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 3 audio sweeps (1.5 seconds). If you are at a location where there is an FAA control tower or other monitoring facility, notify the facility before beginning the tests.

1 Set transmitter control switch to ARMED position.
2 Hold transmitter with printed arrow on battery case pointing forward.
3 Activate ELT with a rapid forward throwing motion coupled by a rapid reversing motion.
4 Verify transmitter activation by monitoring 121.5 Mhz with aircraft COM receiver or portable hand-held receiver.
5 Set transmitter control switch to OFF position.

(i) Install ELT. (Refer to 25-60)

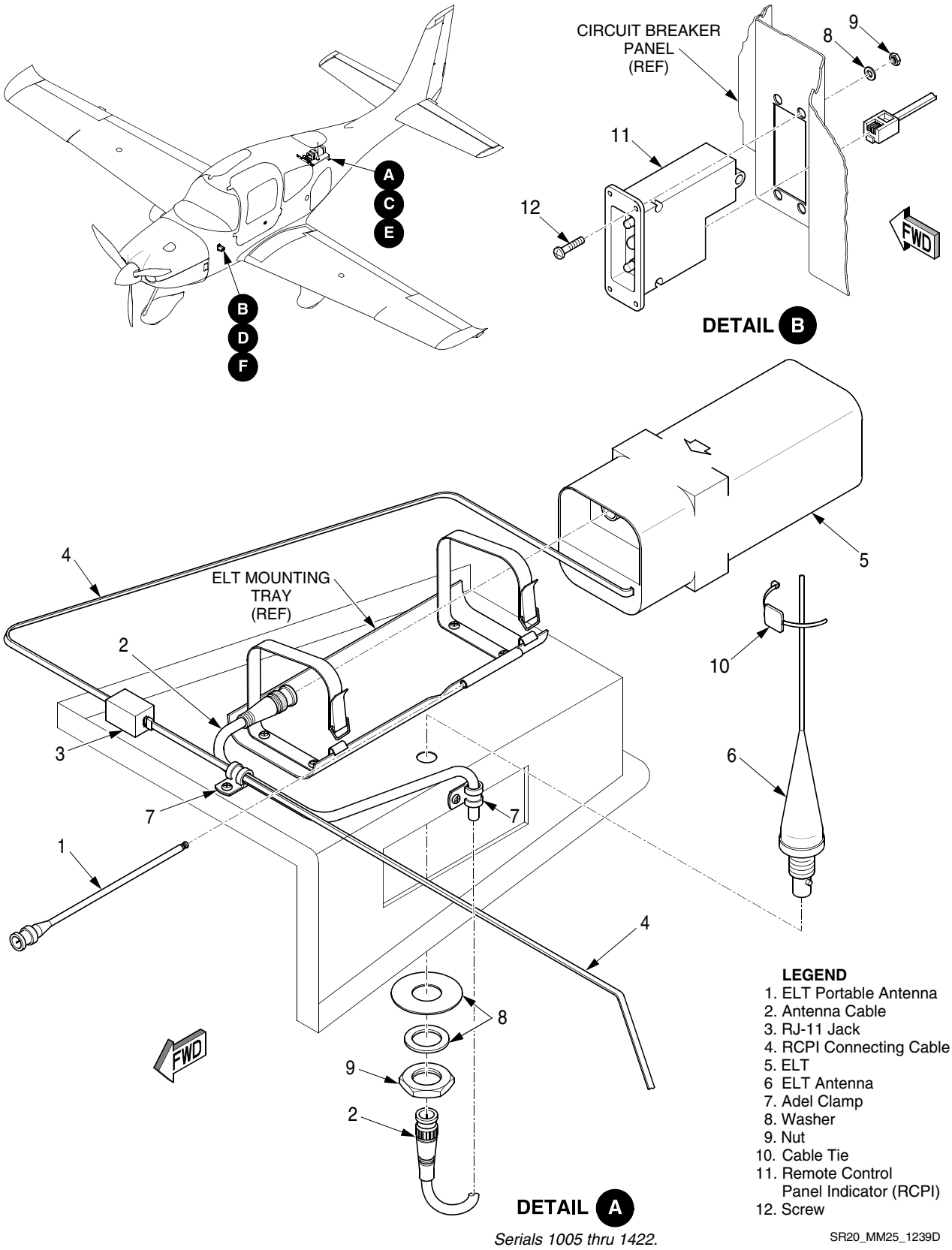


Figure 25-601
ACK E-01 ELT Installation - Serials 0002 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 0002 thru 1422

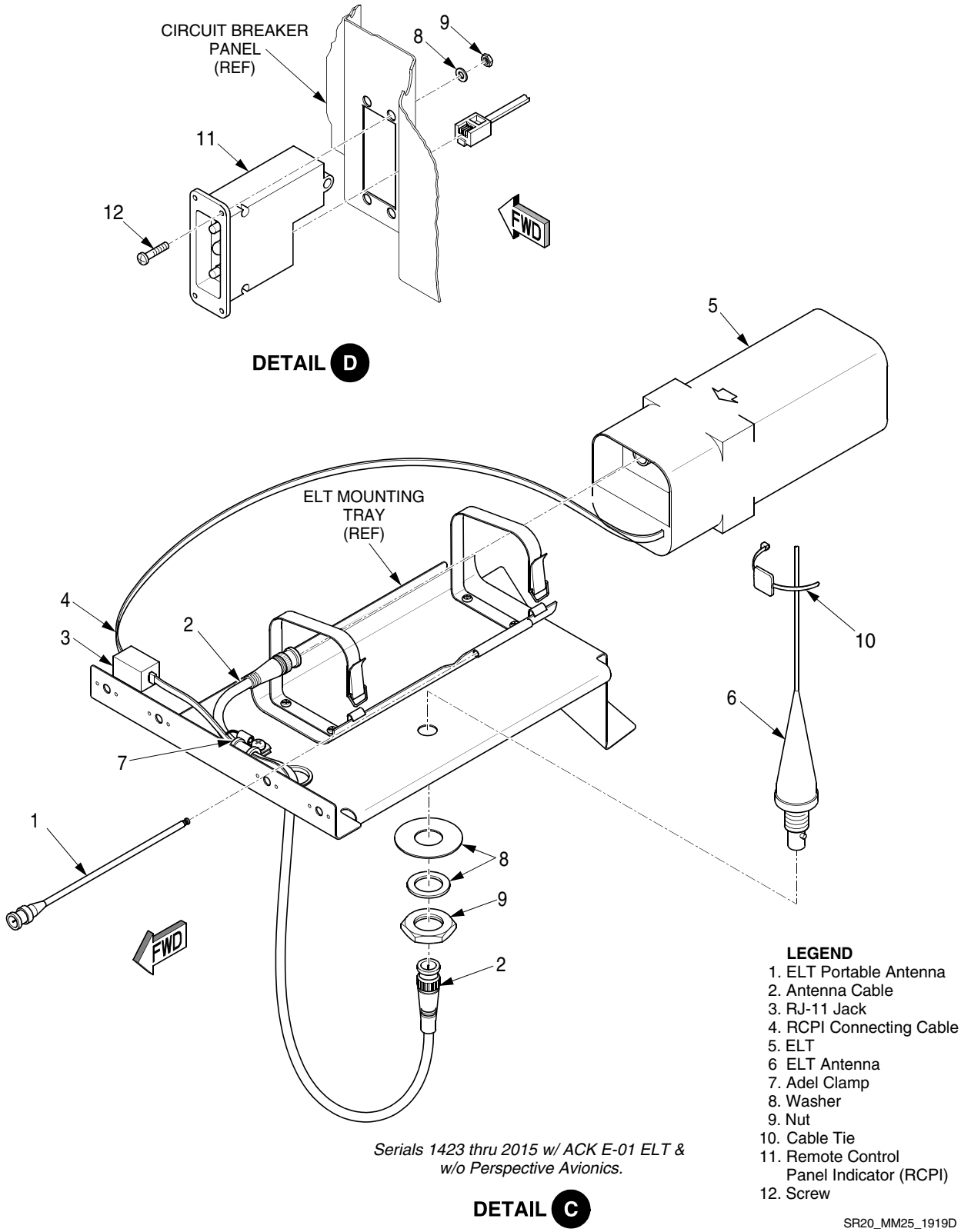
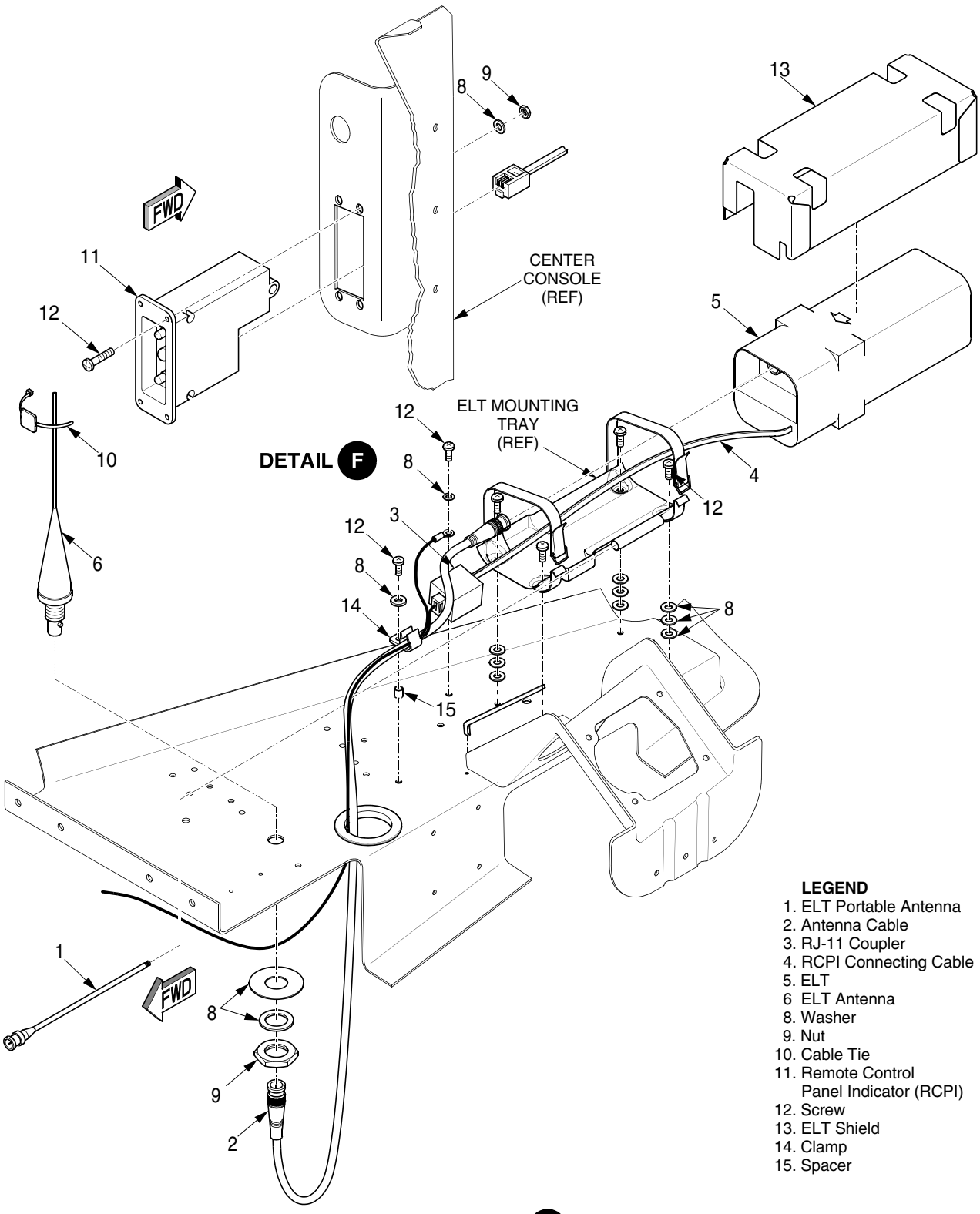


Figure 25-601
ACK E-01 ELT Installation - Serials 1423 thru 2015 w/o Perspective Avionics (Sheet 2 of 3)



Serials 2016 thru 2126 w/ ACK E-01 ELT & w/ Perspective Avionics.

SR20_MM25_2882B

Figure 25-601
ACK E-01 ELT Installation - Serials 2016 thru 2126 w/ Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 thru 2126 w/ Perspective Avionics

B. Emergency Locator Transmitter - *Serials 1639 thru 2272 w/ Artex ME406 ELT, Serials 2273 & subs w/ Artex ELT 1000* (See Figure 25-602)

(1) Removal - ELT

(a) Remove access panel CB06. (Refer to 06-00)

(b) Disconnect antenna cable from transmitter.

(c) Disconnect remote control panel indicator cable from transmitter.

(d) Loosen strap securing transmitter to mounting tray. Remove transmitter from airplane.

(2) Installation - ELT

(a) Position transmitter to mounting tray and secure with strap.

(b) Connect remote control panel indicator cable to transmitter.

(c) Connect antenna cable to transmitter.

(d) *Serials w/ Artex ME406 ELT:* Perform Operational Test - ELT. (Refer to 25-60)

(e) *Serials w/ Artex ELT 1000:* Perform Operational Test - ELT. (Refer to 25-60)

(f) Install access panel CB06. (Refer to 06-00)

(3) Operational Test - ELT - *Serials 1639 thru 2272 w/ Artex ME406 ELT*

Note: Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 5 seconds. If you are at a location where there is an FAA control tower or other monitoring facility, notify the facility before beginning the tests. Never activate the ELT while airborne for any reason.

(a) Remove access panel CB06. (Refer to 06-00)

(b) Monitor 121.5 Mhz using aircraft COM receiver or portable hand-held receiver.

(c) Turn receiver squelch control all the way down or to OFF position.

(d) Set remote control panel indicator switch to ON position.

(e) Verify three audio sweep tones can be heard on COM receiver or portable hand-held receiver.

(f) Verify audio tone can be heard from buzzer.

(g) Verify LED flashes and is readily visible from pilot's operating position.

(h) Set remote control panel indicator switch to ARM position.

(i) Verify LED stays on for approximately 1 second, then turns off.

(j) If LED displays an error code, refer to Installation and Maintenance Manual for the Artex ELT 1000. (Refer to 05-10)

Note: A low quality AM broadcast receiver should be used to determine if energy is being transmitted from the antenna.The aircraft transceiver is not recommended for the following steps because it is too sensitive to verify the integrity of the antenna system and it may pick up a weak signal even if the antenna is disconnected from the ELT. Thus it does not check the integrity of the ELT system or provide the same level of confidence as does an AM radio.

This is not a measured check, but it does provide confidence that the antenna is radiating sufficient power to aid search and rescue.

(k) Locate radio approximately six inches from antenna.

(l) Set remote control panel indicator switch to ON position.

(m) Verify three audio sweep tones can be heard on portable hand-held receiver.

(n) Set remote control panel indicator switch to ARM position.

(o) Verify LED stays on for approximately 1 second, then turns off.

(p) If LED displays an error code, refer to Installation and Maintenance Manual for the Artex ELT 1000. (Refer to 05-10)

(q) Install access panel CB06. (Refer to 06-00)

(4) Operational Test - ELT - *Serials 2273 & subs w/ Artex ELT 1000*

Note: Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 5 seconds. If you are at a location where there is an FAA control tower or other monitoring facility, notify the facility before beginning the tests. Never activate the ELT while airborne for any reason.

(a) Remove access panel CB06. (Refer to 06-00)

Note: If using portable AM receiver, locate radio approximately 20 to 30 feet from antenna.

(b) Monitor 121.5 Mhz using aircraft COM receiver or portable hand-held receiver.

(c) Turn receiver squelch control all the way down or to OFF position.

(d) On remote control panel indicator switch, press TEST for 1 second, then release. LED will begin flashing continuously.

(e) Verify three audio sweep tones can be heard on COM receiver or portable hand-held receiver.

(f) Verify audio tone can be heard from buzzer.

(g) Verify LED stays on for approximately 1 second, then turns off, and is readily visible from pilot's operating position.

(h) If LED displays an error code, refer to Installation and Maintenance Manual for the Artex ELT 1000. (Refer to 05-10)

Note: A low quality AM broadcast receiver should be used to determine if energy is being transmitted from the antenna.The aircraft transceiver is not recommended for the following steps because it is too sensitive to verify the integrity of the antenna system and it may pick up a weak signal even if the antenna is disconnected from the ELT. Thus it does not check the integrity of the ELT system or provide the same level of confidence as does an AM radio.

This is not a measured check, but it does provide confidence that the antenna is radiating sufficient power to aid search and rescue.

(i) Locate radio approximately 6 inches from antenna.

(j) Set remote control panel indicator switch to ON position.

(k) Verify three audio sweep tones can be heard on receiver.

(l) Set remote control panel indicator switch to ARM/OFF position.

(m) Install access panel CB06. (Refer to 06-00)

(5) Inspection/Check - ELT

Note: Perform Inspection/Check in accordance with 14 CFR 91.207.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shorting Plug Connector	500-0079	Artex Aircraft Supplies Canby, Oregon 97013 800-547-8901	Enables G-switch activation.
ELT Test Set	453-1000	Artex Aircraft Supplies Canby, Oregon 97013 800-547-8901	Test 406 MHz digital message.

(b) Remove ELT. (Refer to 25-60)

(c) Visually inspect mounting tray, fasteners, and hardware for cracks and security.

(d) Visually inspect antenna cable and RCPI cable for cuts, abrasions, or signs of wear.

(e) Visually inspect all cable connectors and mating plugs for signs of corrosion.

Note: Pay special attention to antenna cable center conductor pins which are prone to retracting into connector housing.

(f) Visually inspect and confirm proper seating of all connector pins.

(g) Check transmitter batteries for expiration date, corrosion and damage to wiring and housing. Replace if necessary. (Refer to 25-60)

(h) Verify operation of G-switch.

Note: Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 5 seconds. If you are at a location where there is an FAA control tower or other monitoring facility, notify the facility before beginning the tests.

G-switch activation requires pins 5 and 12 of the D-sub connector to be connected (shorted) together. A shorting plug connector must be used to verify operation of G-switch.

1 Connect shorting plug connector to transmitter.

2 Set transmitter control switch to ARM position.

3 Hold transmitter with printed arrow on battery case pointing forward.

4 Activate ELT with a rapid forward throwing motion coupled by a rapid reversing motion.

5 Verify ELT activation by observing transmitter LED and by monitoring 121.5 Mhz with aircraft COM receiver or portable hand-held receiver.

6 Reset ELT by setting transmitter control switch to ON position, then to ARM position.

(i) Install ELT. (Refer to 25-60)

Note: Digital message verification is not mandatory per 14 CFR 91.207 but is highly recommended.

(j) Verify 406 MHz digital message.

1 Disconnect antenna cable from transmitter.

2 Connect ELT test set to transmitter.

3 Power up test set per manufacturer's operating instructions.

4 Set transmitter control switch to ON position, then to ARM position.

5 After test set receives digital message from transmitter, verify information is correct for country code, aircraft Identification, etc.

6 Verify 15 digit transmitter identification number matches number shown on transmitter product label.

7 Power down test set per manufacturer's operating instructions.

8 Disconnect test set from transmitter.

9 Connect antenna cable to transmitter.

C. ELT Battery

For additional information on the ELT battery, refer to the Model E-01 ELT Installation and Operation Manual, the Installation and Maintenance Manual for the ME406 ELT, or the Installation and Maintenance Manual for the Artext ELT 1000. (Refer to 05-10)

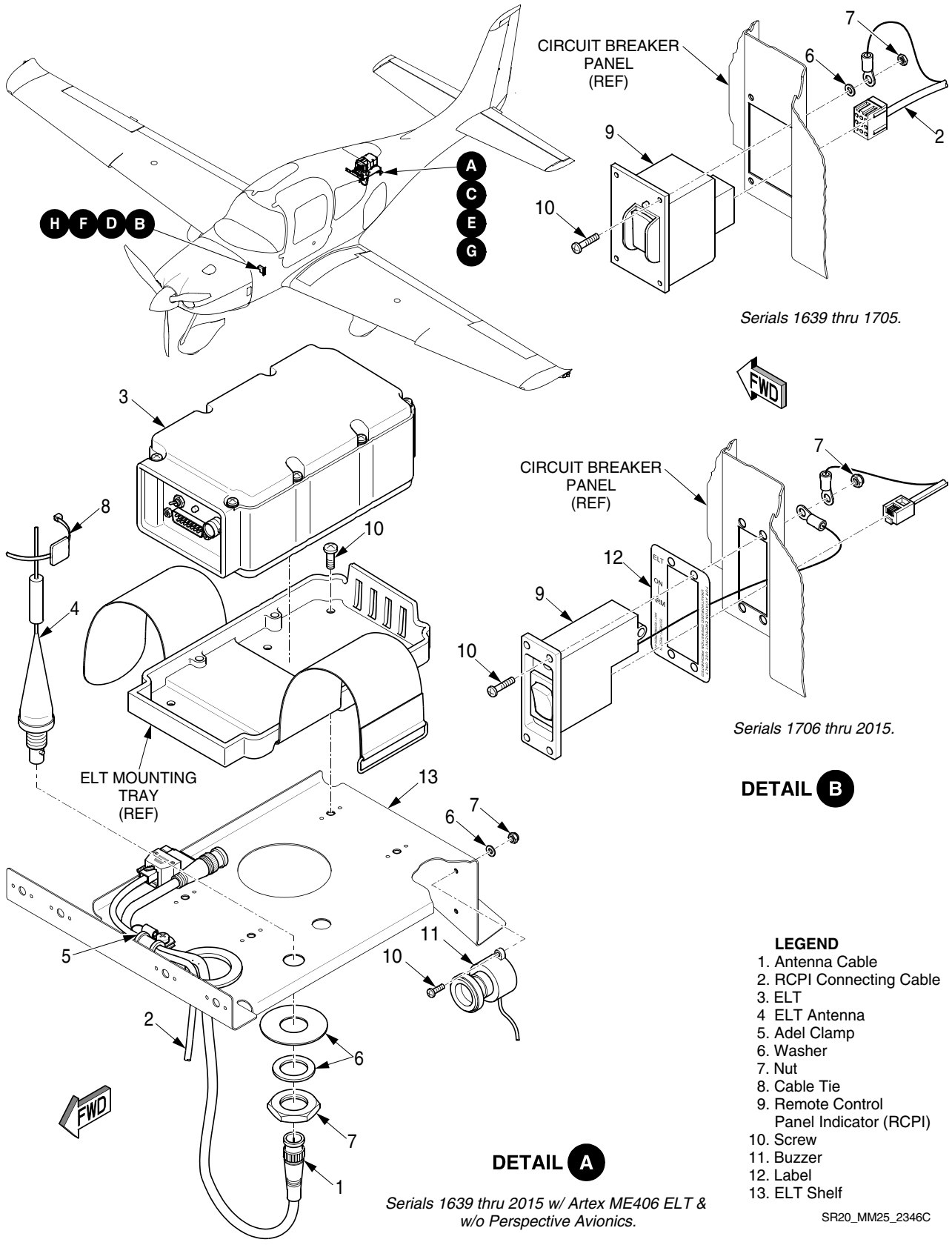
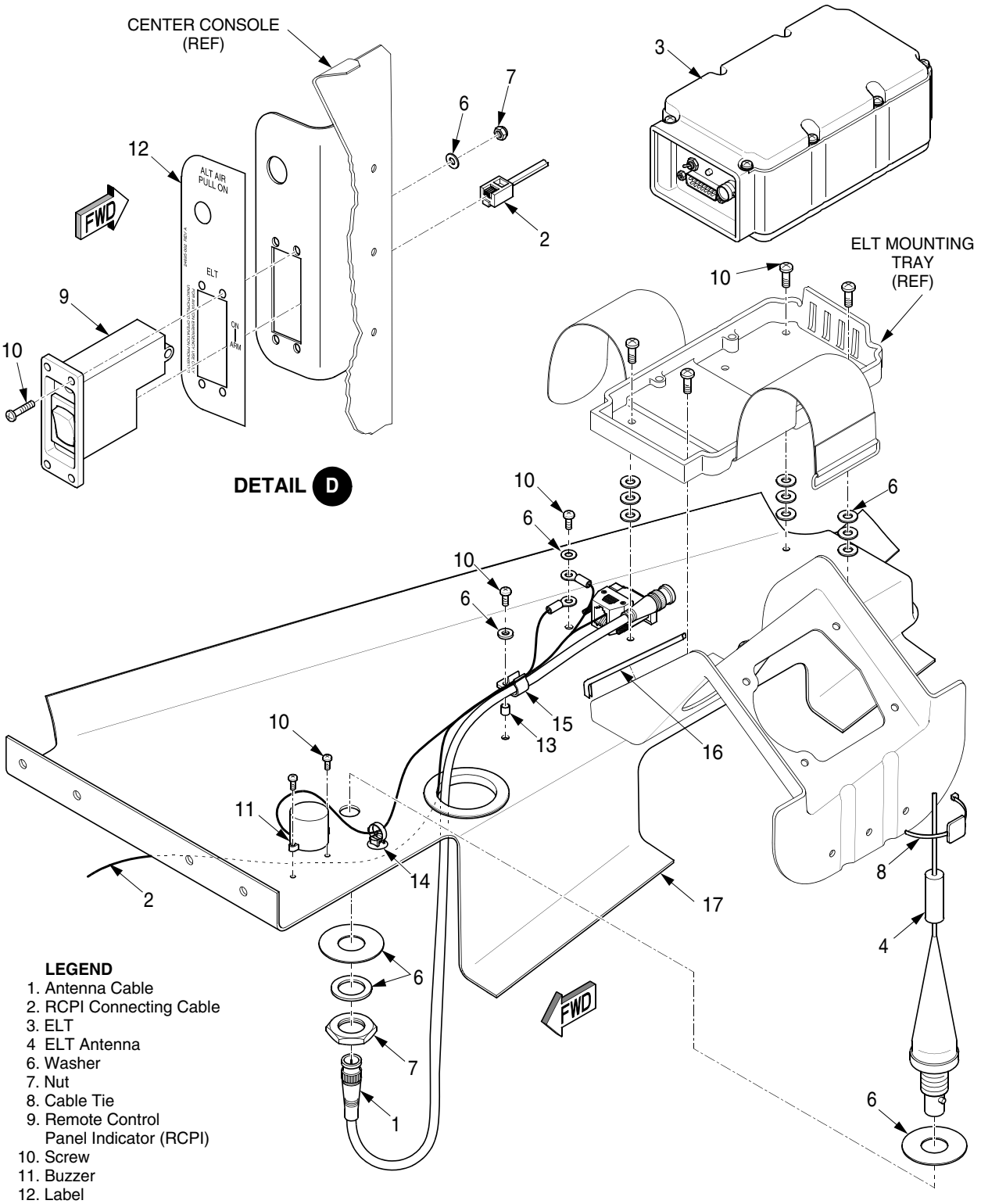
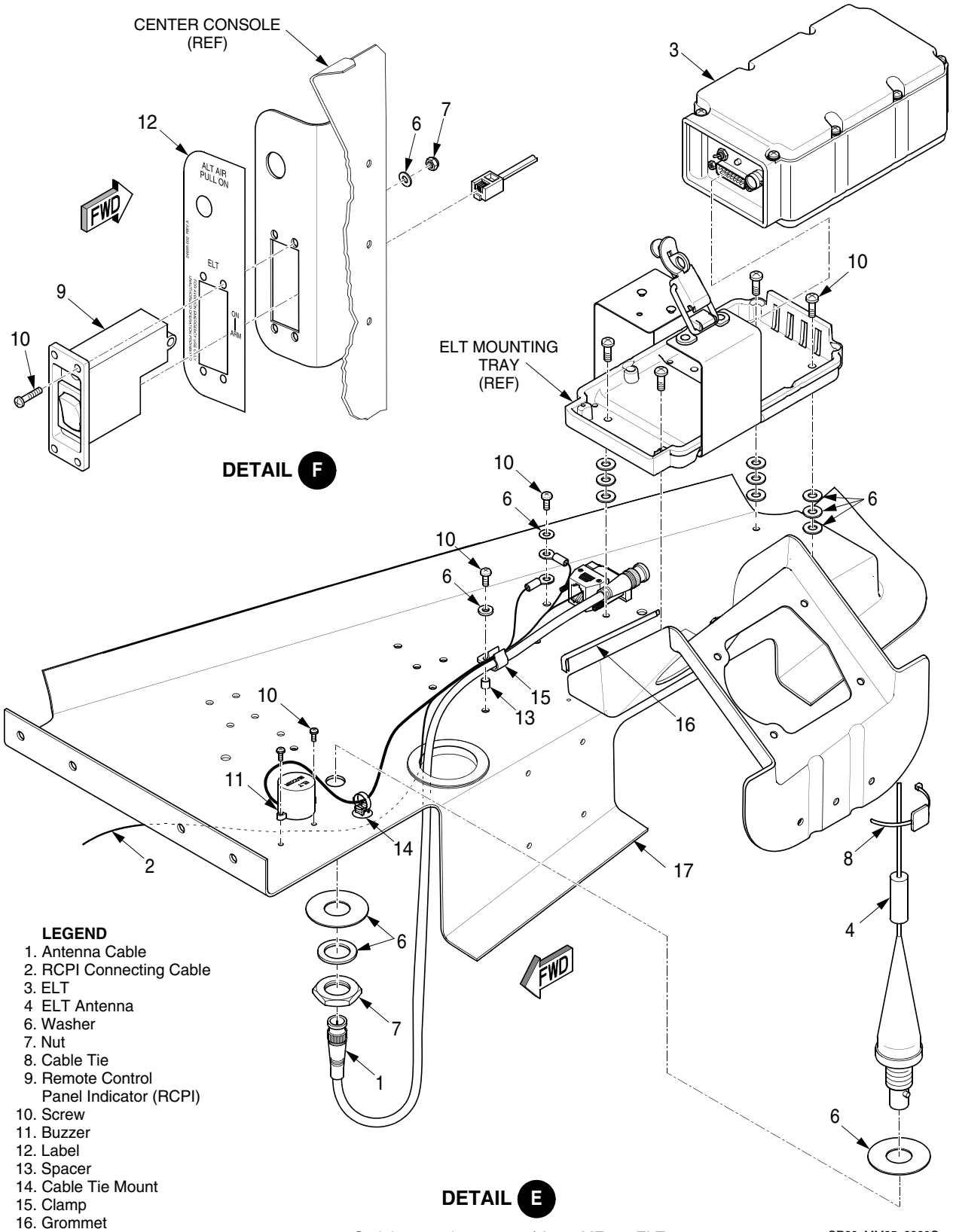


Figure 25-602
Artex ME406 ELT Installation - Serials 1639 thru 2015 w/o Perspective Avionics (Sheet 1 of 2)



Serials 2016 thru 2240 w/ Artex ME406 ELT & w/ Perspective Avionics. SR20_MM25_3667

Figure 25-602
Artex ME406 ELT Installation - Serials 2016 thru 2240 (Sheet 2 of 3)



LEGEND

1. Antenna Cable
2. RCPI Connecting Cable
3. ELT
4. ELT Antenna
6. Washer
7. Nut
8. Cable Tie
9. Remote Control Panel Indicator (RCPI)
10. Screw
11. Buzzer
12. Label
13. Spacer
14. Cable Tie Mount
15. Clamp
16. Grommet
17. ELT Shelf

Serials 2240 thru 2272 w/ Artex ME406 ELT.

SR20_MM25_2880C

Figure 25-602
Artex ME406 ELT Installation - Serials 2240 thru 2272 (Sheet 3 of 3)

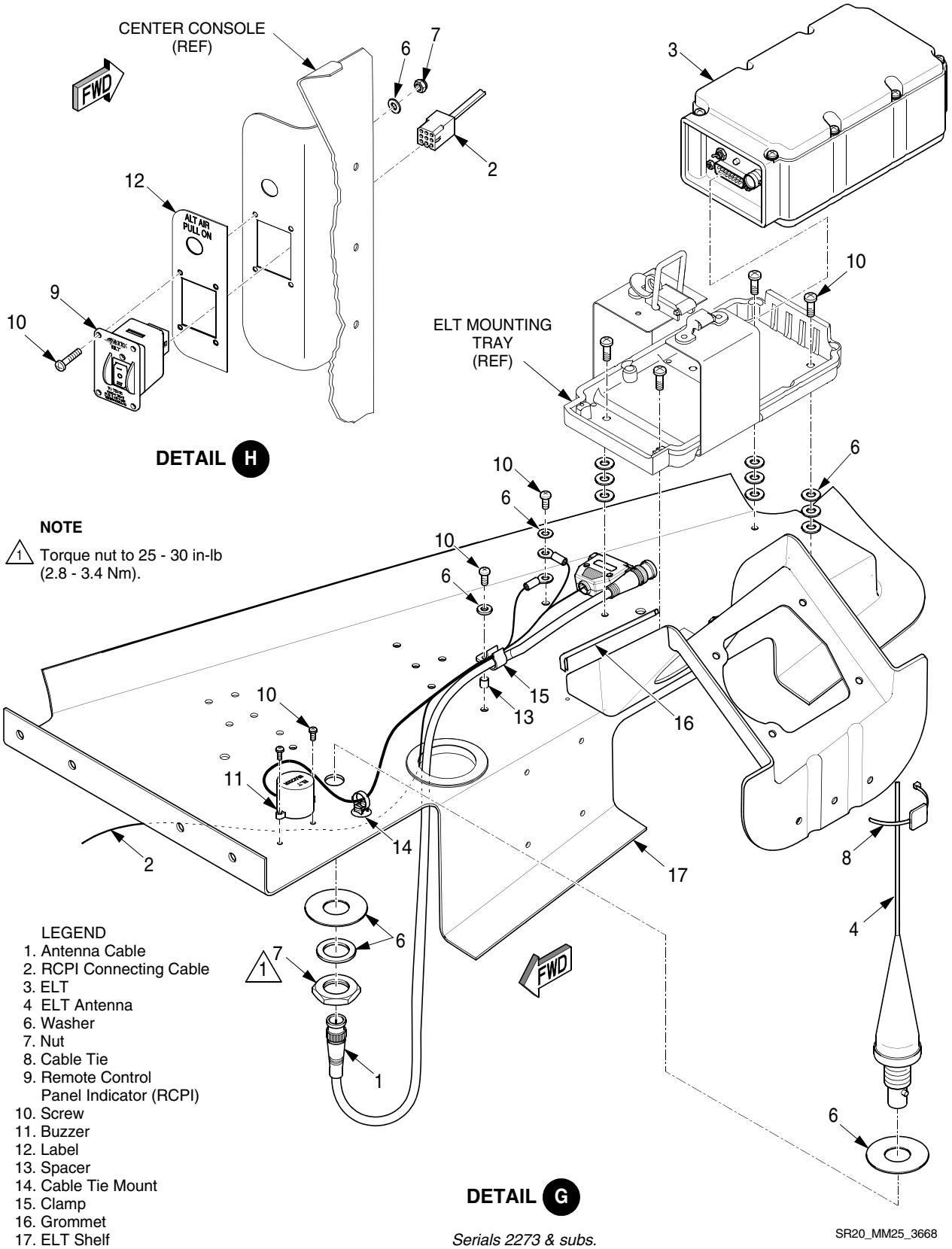


Figure 25-603
Artex ELT 1000 Installation - Serials 2273 & subs

D. Remote Control Panel Indicator (RCPI) - *Serials 1005 thru 2126 w/ ACK E-01 ELT* (See Figure 25-601)

(1) Removal - Remote Control Panel Indicator

(a) Remove aft screws securing circuit breaker panel to console. Open circuit breaker panel.

(b) Disconnect transmitter cable from RCPI.

(c) Remove screws, washers, and nuts securing RCPI to circuit breaker panel. Remove RCPI from airplane.

(2) Installation - Remote Control Panel Indicator

(a) Position RCPI to circuit breaker panel and secure with screws, washers, and nuts.

(b) Connect transmitter cable to RCPI.

(c) Perform Operational Test - ELT. (Refer to 25-60)

(d) Position circuit breaker panel to console and secure with screws.

E. Remote Control Panel Indicator (RCPI) - *Serials 1639 thru 2272 w/ Artex ME406 ELT, Serials 2273 & subs w/ Artex ELT 1000* (See Figure 25-602)

(1) Removal - Remote Control Panel Indicator

(a) *Serials w/o Perspective Avionics:* Remove aft screws securing circuit breaker panel to console. Open circuit breaker panel.

(b) *Serials w/o Perspective Avionics*: Remove cable tie securing RCPI ground wire to RCPI connecting cable.

(c) Disconnect transmitter cable from RCPI.

(d) *Serials w/o Perspective Avionics:* Remove screws, washers, and nuts securing RCPI to circuit breaker panel. Remove RCPI from airplane.

(e) *Serials w/ Perspective Avionics:* Remove screws, washers, and nuts securing RCPI to center console. Remove RCPI from airplane.

(2) Installation - Remote Control Panel Indicator

(a) *Serials w/o Perspective Avionics:* Position RCPI to circuit breaker panel and secure with screws, washers, and nuts.

(b) *Serials w/ Perspective Avionics:* Position RCPI to center console and secure with screws, washers, and nuts.

(c) Connect transmitter cable to RCPI.

(d) *Serials w/o Perspective Avionics*: Install cable tie securing RCPI ground wire to RCPI connecting cable.

(e) *Serials 1639 thru 2272 w/ Artex ME406 ELT:* Perform Operational Test - ELT. (Refer to 25-60)

(f) *Serials 2273 & subs w/ Artex ELT 1000:* Perform Operational Test - ELT. (Refer to 25-60)

(g) *Serials w/o Perspective Avionics:* Position circuit breaker panel to console and secure with screws.

F. Remote Control Panel Indicator (RCPI) Battery - *Serials 1005 thru 2126 w/ ACK E-01 ELT*

(1) Removal - Remote Control Panel Indicator Battery

(a) Remove RCPI. (Refer to 25-60)

(b) Remove screws securing upper and lower half of RCPI.

(c) Loosen nuts securing switches to RCPI.

(d) Remove top half of RCPI to access battery compartment.

(e) Remove battery from RCPI.

(2) Installation - Remote Control Panel Indicator Battery

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
6-Volt Battery	Duracell PX28L or Kodak K28L	Any Source	Provide power to RCPI.

(b) Visually inspect battery contacts for dirt or corrosion. If necessary, clean contacts with nonabrasive electrical contact cleaner and a stiff brush.

(c) Insert battery with polarity as shown on bottom of battery compartment.

(d) Position top half of RCPI to bottom half and secure with screws.

(e) Tighten nuts securing switches to RCPI.

(f) Record next battery replacement date on one of the adhesive labels supplied with the ELT. Affix label to ELT in a readily visible location when installed. Record battery replacement date in logbook.

(g) Install RCPI. (Refer to 25-60)

G. Remote Control Panel Indicator (RCPI) Battery - *Serials 1706 thru 2272 w/ Artex ME406 ELT*

(1) Removal - Remote Control Panel Indicator Battery

(a) Remove RCPI. (Refer to 25-60)

(b) Remove screws securing upper and lower half of RCPI.

(c) Loosen nuts securing switch to RCPI.

(d) Remove top half of RCPI to access battery compartment.

(e) Remove battery from RCPI.

(2) Installation - Remote Control Panel Indicator Battery

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
6-Volt Battery	131-0001	Artex Aircraft Supplies Canby, Oregon 97013 800-547-8901	Provide power to RCPI.

(b) Visually inspect battery contacts for dirt or corrosion. If necessary, clean contacts with nonabrasive electrical contact cleaner and a stiff brush.

(c) Insert battery with polarity as shown on bottom of battery compartment.

(d) Position top half of RCPI to bottom half and secure with screws.

(e) Tighten nuts securing switches to RCPI.

(f) Record next battery replacement date on one of the adhesive labels supplied with the ELT. Affix label to ELT in a readily visible location when installed. Record battery replacement date in logbook.

(g) Install RCPI. (Refer to 25-60)

H. ELT Antenna (See Figure 25-601)(See Figure 25-602)

(1) Removal - ELT Antenna

(a) Remove access panel CB06. (Refer to 06-00)

(b) Disconnect antenna cable from antenna.

(c) Remove cable tie securing antenna tip to fuselage.

(d) Remove nut and washers securing antenna base to ELT shelf. Remove antenna from airplane.

(2) Installation - ELT Antenna

(a) Position antenna base to ELT shelf and secure with washers and nut.

(b) *Serials 2273 & subs w/ Artex ELT 1000:* Torque nut to 25 - 30 in-lb (2.8 - 3.4 Nm).

(c) Position antenna tip to fuselage and secure with cable tie.

(d) Connect antenna cable to antenna.

(e) *Serials 1005 thru 2126 w/ ACK E-01 ELT:* Perform Operational Test - ELT. (Refer to 25-60)

(f) *Serials 1639 thru 2272 w/ Artex ME406 ELT:* Perform Operational Test - ELT. (Refer to 25-60)

(g) *Serials 2273 & subs w/ Artex ELT 1000:* Perform Operational Test - ELT. (Refer to 25-60)

(h) Install access panel CB06. (Refer to 06-00)

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CHAPTER

26

FIRE PROTECTION

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CHAPTER 26 - FIRE PROTECTION
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26-00	2	15 JUN 2010
26-20	1	01 JAN 2016
26-20	2	01 JAN 2016
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CHAPTER 26 - FIRE PROTECTION

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Inspection/Check - Fire Extinguisher - Serials w/o Gaged Fire Extinguisher		2
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FIRE PROTECTION

1. GENERAL

This chapter describes that portion of the airplane system which is used to extinguish fire.

Serials 1005 thru 1632, 1634 thru 1638: Fire protection is provided by a portable Halon 1211/1301 (*Serials w/o gaged fire extinguisher*) or Halon 1211 (*Serials w/ gaged fire extinguisher*) fire extinguisher, mounted to the LH aft console trim panel adjacent to the pilot's seat base.

Serials 1633, 1639 & subs: Fire protection is provided by a portable Halon 1211/1301 (*Serials w/o gaged fire extinguisher*) or Halon 1211 (*Serials w/ gaged fire extinguisher*) fire extinguisher, mounted to the LH sidewall air duct trim panel just forward of the pilot's drink holder.

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EXTINGUISHING

1. DESCRIPTION

The airplane is equipped with a liquefied-gas type fire extinguisher mounted within a quick-release bracket assembly. The extinguishing agent is Halon 1211/1301 blend (*Serials w/o gaged fire extinguisher*) or Halon 1211 (*Serials w/ gaged fire extinguisher*) and is approved for use on class B (liquid, grease) and class C (electrical equipment) fires.

Serials w/o gaged fire extinguisher: The fire extinguisher must be replaced after each use.

Serials w/ gaged fire extinguisher: The fire extinguisher must be recharged or replaced after each use.

Serials 1005 thru 1632, 1634 thru 1638: The fire extinguisher is mounted to the LH aft console trim panel adjacent to the pilot's seat base.

Serials 1633, 1639 & subs: The fire extinguisher is mounted to the LH sidewall air duct trim panel just forward of the pilot's drink holder.

2. MAINTENANCE PRACTICES

A. Fire Extinguisher (See Figure 26-201)

(1) Removal - Fire Extinguisher
  (a) Release quick-release clamp.
  (b) Remove fire extinguisher from bracket assembly.

(2) Installation - Fire Extinguisher
  (a) Position fire extinguisher to bracket assembly.
  (b) Secure with quick-release clamp.

(3) Operation - Fire Extinguisher
  (a) Point fire extinguisher nozzle directly at target.
  (b) Pull ring to remove safety pin.
  (c) Depress discharge lever.
  (d) Direct discharge at base of flame with side to side motion (range for a fully charged extinguisher is 6 to 8 feet (1.8 to 2.4 meters) with a duration of 10 to 12 seconds.

(4) Inspection/Check - Fire Extinguisher - *Serials w/o Gaged Fire Extinguisher*
  (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale	-	Any Source	Weighing

  (b) Visually inspect fire extinguisher for signs of leakage, corrosion, or other damage.
  (c) At annual inspection, weigh fire extinguisher.
    1 *Serials 1005 thru 1422:* Ensure gross weight is above 24.2 oz. (686 g). If extinguisher weighs less than specified, replace immediately.
    2 *Serials 1423 & subs:* Ensure gross weight is above 17.6 oz. (500 g). If extinguisher weighs less than specified, replace immediately.
  (d) Once a month (or more frequently when circumstances require), perform the following:
    1 *Serials 1005 thru 1422:* Weigh or “heft” fire extinguisher to ensure gross weight is above 24.2 oz. (686 g).
    2 *Serials 1423 & subs:* Weigh or “heft” fire extinguisher to ensure gross weight is above 17.6 oz. (500 g).
    3 Ensure nozzle is unobstructed, and safety seal is intact.

(5) Inspection/Check - Fire Extinguisher - *Serials w/ Gaged Fire Extinguisher*

Note: Perform the following once a month (or more frequently as circumstances require).

  (a) Weigh or “heft” fire extinguisher to ensure gross weight is approximately 40 oz. (1134 g).
  (b) Visually inspect fire extinguisher for signs of leakage, corrosion, or other damage.
  (c) Ensure nozzle is unobstructed and safety seal is intact.
  (d) Ensure gauge pressure is in operable (green) range.
  (e) Ensure there is no obstruction to access or visibility of fire extinguisher.
  (f) Ensure operating instructions are clearly visible.

B. Fire Extinguisher Bracket Assembly (See Figure 26-201)

(1) Removal - Fire Extinguisher Bracket Assembly

(a) Remove fire extinguisher. (Refer to 26-20)

(b) *Serials 1005 thru 1213, 1473 & subs:* Remove screws securing bracket assembly to trim.

(c) *Serials 1214 thru 1472:* Remove aft console lower trim. (Refer to 25-10)

(d) *Serials 1214 thru 1472:* Remove screws, washers, and nuts securing bracket assembly to trim.

(2) Installation - Fire Extinguisher Bracket Assembly

(a) *Serials 1005 thru 1213, 1473 & subs:* Position bracket assembly to trim and secure with screws.

(b) *Serials 1214 thru 1472:* Position bracket assembly to trim and secure with screws, washers, and nuts.

(c) *Serials 1214 thru 1472:* Install aft console lower trim. (Refer to 25-10)

(d) Install fire extinguisher. (Refer to 26-20)

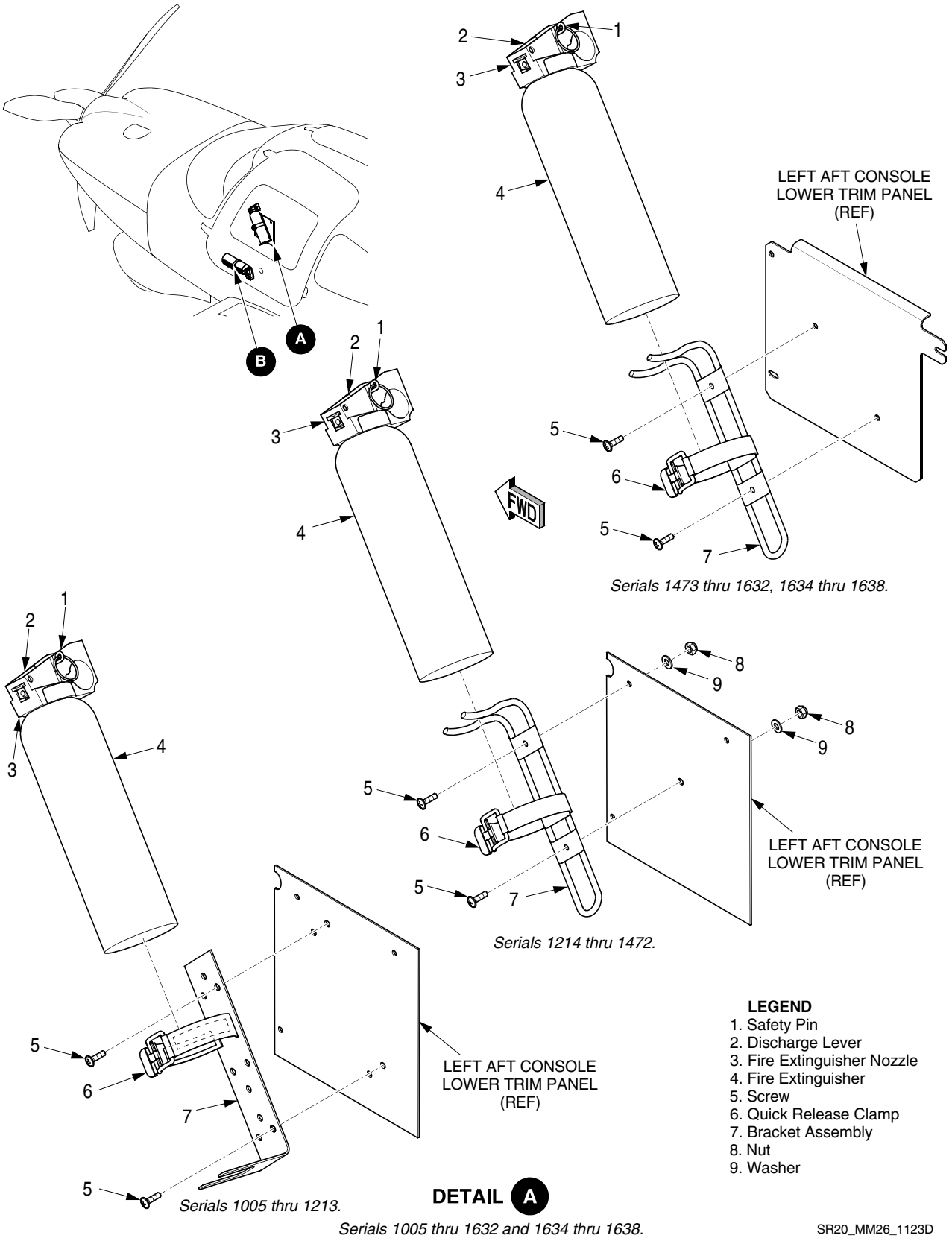
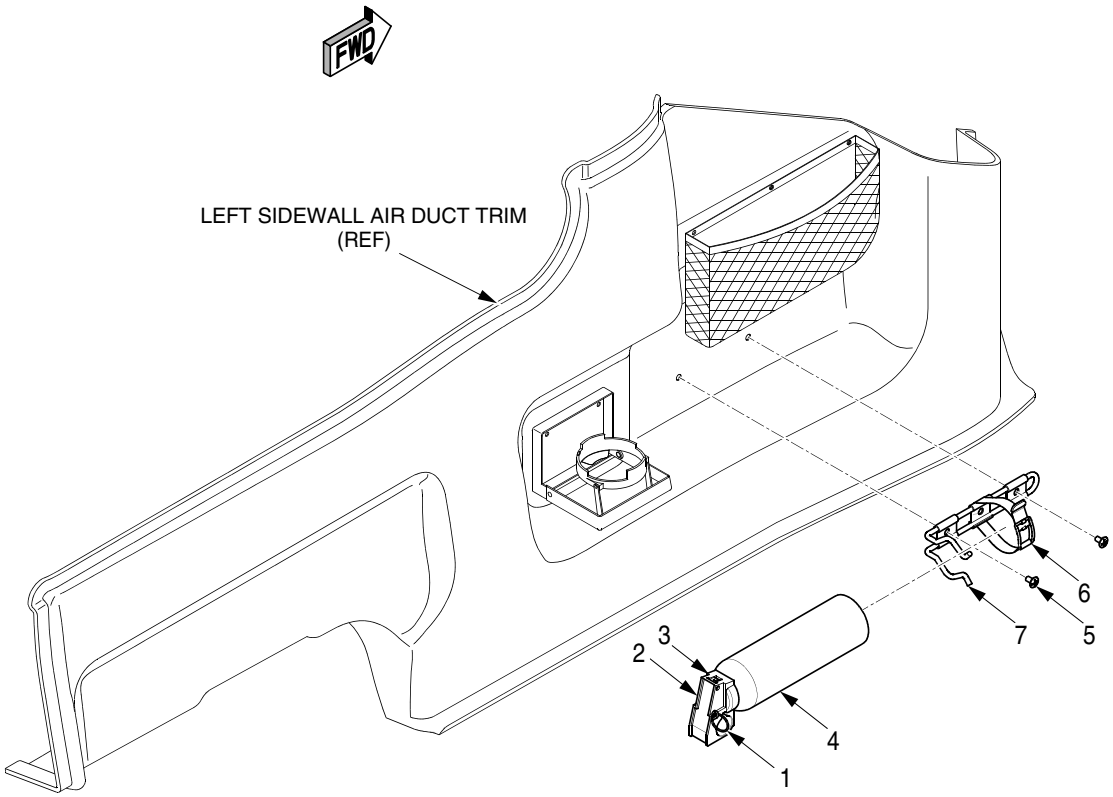


Figure 26-201
Fire Extinguisher Installation - Serials 1005 thru 1632 and 1634 thru 1638 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1632 and 1634 thru 1638



Serials 1633, 1639 & subs.

DETAIL B

LEGEND
1. Safety Pin
2. Discharge Lever
3. Fire Extinguisher Nozzle
4. Fire Extinguisher
5. Screw
6. Quick Release Clamp
7. Bracket Assembly

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Figure 26-201
Fire Extinguisher Installation - Serials 1633 and 1639 and subs (Sheet 2 of 2)

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CHAPTER

27

FLIGHT CONTROLS

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CHAPTER 27 - FLIGHT CONTROLS
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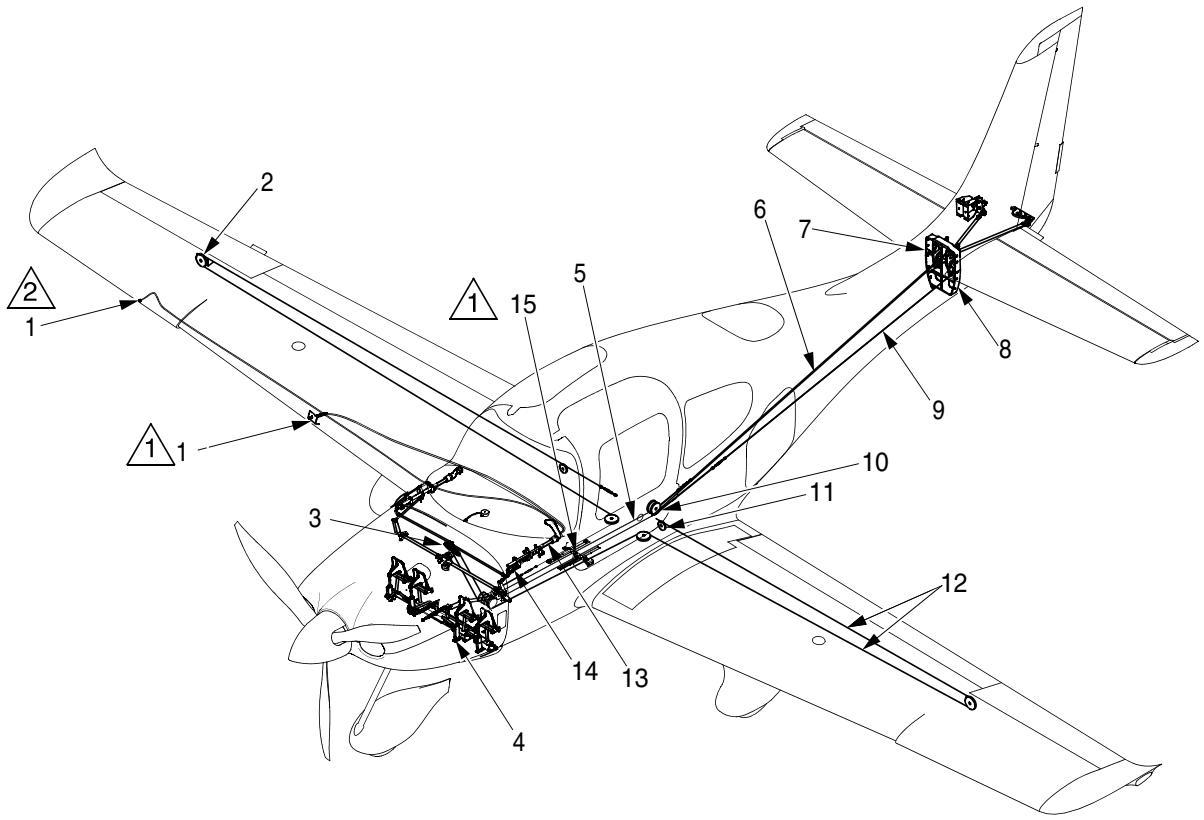
FLIGHT CONTROLS

1. GENERAL

This chapter describes those units and components which furnish a means of manually controlling the flight attitude characteristics of the airplane. The flight controls for the airplane consist of ailerons, roll trim cartridges, rudder, elevator, pitch trim cartridges, and flap system.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Roll trim oscillation.	Aileron trim tab misadjusted.	Perform Adjustment/Test - Aileron Trim Tab. (Refer to 57-50)
	Aileron cable misaligned on system pulley.	Inspect aileron pulleys for abnormal wear on pulley flange. Verify cable installation and perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)
	Stiff system pulleys restrict aileron movement.	Inspect aileron system pulleys for freedom of movement and replace if necessary.
	Stiff hinge bearings restrict aileron and elevator movement.	Inspect hinge bearings for freedom of movement and replace if necessary.
	Aileron system rigged incorrectly.	Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)
Pitch trim oscillation.	Elevator cable misaligned on system pulley.	Inspect elevator pulleys for abnormal wear on pulley flange. Verify correct cable installation and perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)
	Stiff system pulleys restrict elevator movement.	Inspect elevator system pulleys for freedom of movement and replace if necessary.
	Stiff hinge bearings restrict elevator movement.	Inspect hinge bearings for freedom of movement and replace if necessary.
	Elevator system rigged incorrectly.	Perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)
Excessive freeplay at elevator trailing edge.	Loose actuation arm on pitch trim motor assembly.	Remove pitch trim motor assembly. Disassemble actuation arm. Correctly position actuation arm to shaft of motor and reassemble. Install pitch trim motor assembly. (Refer to 27-30)
	Pitch trim cartridge misadjusted.	Perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)
Push-to-talk switch functions intermittently.	Dirty or corroded switch.	Perform Servicing - Push-to-Talk Switch. (Refer to 27-10)



LEGEND

1. Stall Warning System (27-31)
2. Roll Trim System (27-10)
3. Elevator System Cables (27-30)
4. Rudder Pedal Assembly (27-20)
5. Flap System (27-50)
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15. Rudder/Aileron Interconnect System (27-20)

NOTE

1 *Serials 1005 thru 1877, 1879 thru 1885.*

2 *Serials 1878, 1886 & subs.*

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Figure 27-001
Flight Controls

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AILERON AND ROLL TRIM SYSTEM

1. DESCRIPTION

This section describes that portion of the flight control system which controls the position and movement of the ailerons. Included are; aileron system rigging, control grip assembly, control yoke assembly, V-grooved guide wheel, pulleys and cables, roll trim cartridge, and 4-way trim/autopilot disconnect switch, and roll relays.

Aileron control motion is transferred by the control yoke through a linkage to a pulley mounted on the console structure. From the pulley, control motion is passed to a single cable system and is routed through the forward pulley gang at the bottom of the center console, under the cabin floor to the rudder-aileron interconnect (*Serials 1005 thru 1885*), and along the fuselage longerons to kick-out pulleys which direct the cables to the wing area between the aft spar and flap cove. The cables pass through fairleads at each flap hinge location where they attach to the aileron actuation pulley. As the aileron actuation pulley rotates, the control surface is deflected via a right-angle drive arm. A cross-over cable returns to the other wing, interconnecting the left and right ailerons. Cable retainers on each set of pulleys prevent fouling. Adjustable control stops on each aileron actuation pulley limit control surface travel.

The roll trim system acts as autopilot servo through the use of a captured compression spring cartridge integrated into the control system and activated by an electric motor. The spring cartridge, bolted directly to the LH aileron actuation pulley, and the electric trim motor, provide a centering force regardless of the direction of control surface deflection. When activated, the trim motor moves the spring cartridge causing the aileron actuation pulley to move the aileron to a new trimmed position. A 4-way switch, mounted on both yoke grips, controls the roll trim system.

2. MAINTENANCE PRACTICES

WARNING: **A system rigging Inspection/Check must be performed after loosening any flight control cable to assure proper control surface operation. Refer to the appropriate control system's rigging procedures for the Inspection/Check maintenance practices.**

A. Aileron System Cables (See Figure 27-101)

(1) Removal - Aileron System Cables

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
String	-	Any Source	Cable routing.

(b) Remove kick plate. (Refer to 25-10)

(c) Remove MFD. (Refer to 31-60)

(d) Remove passenger seats. (Refer to 25-10)

(e) Remove carpet and access panels CF1L, CF1R, CF3C, CF4C, CF4R, and CF4L. (Refer to 06-00)

Note: *Serials 2016 & subs w/ Perspective Avionics:* Note location of roll servo bridle cable clamps on aileron cable to facilitate reinstallation.

(f) *Serials 2016 & subs w/ Perspective Avionics:* Remove bolts, nuts, and clamps securing roll servo bridle cable to aileron cable. (See Figure 22-135)

(g) Remove LH and RH ailerons. (Refer to 57-50).

(h) At access holes CF3C and CF4C, remove turnbuckles from LH, RH, and forward aileron cables.

(i) *Serials 1005 thru 1885:* Disconnect rudder/aileron interconnect bungee from RH aileron cable. (Refer to 27-20)

(j) Remove cotter pins, washers and cable retaining clevis pins from kick-out and cross-over pulley brackets.

(k) Remove safety wire securing aileron cable to LH aileron actuation pulley and remove bolt and washer securing cable guard to pulley bracket. Repeat procedure on RH side.

(l) Remove cotter pins and washers securing pulley guard pins to forward pulley gang bracket and remove pins.

(m) Remove safety wire securing aileron cable to console actuation pulley.

(n) Loosen bolts and washers securing pulley keepers to center console.

Note: Attach string to end of cable prior to removing from airplane to facilitate cable routing during installation.

(o) Attach string to end of forward aileron cable below access hole CF3C and pull cable through. Remove cable from airplane.

(p) Attach string to end of LH aileron cable below access hole CF4C and pull cable through. Remove cable from airplane. Repeat procedure for RH aileron cable.

(2) Installation - Aileron System Cables

(a) At access hole CF3C, route forward aileron cable to forward pulley gang, up to console actuation pulley and back to access hole CF3C.

(b) At access hole CF4C, route LH aileron cable to kick-out pulley, aileron actuation pulley, cross-over pulley and back to center of fuselage floor. Repeat procedure for RH aileron cable.

(c) Secure forward aileron cable to console actuation pulley with safety wire.

(d) Tighten bolts and washers securing pulley keepers to center console.

(e) At forward pulley gang bracket, verify cable routing, insert pulley guard pins, and install washers and cotter pins.

(f) For LH aileron cable, verify cable routing through flap-hinge fairleads, kick-out, and cross-over pulleys, install cable retaining clevis pins, washers, and cotter pins. Repeat procedure for RH aileron cable.

(g) At LH aileron actuation pulley, verify cable routing, position cable guard to pulley bracket, and install washer and bolt. Safety wire aileron cable to pulley. Repeat procedure at RH aileron actuation pulley.

WARNING: **Position turnbuckle so that at aileron neutral position, turnbuckle is centered between LH and RH longerons and at full left and full right aileron deflection swaged cable end does not contact either longeron.**

(h) Install turnbuckles on LH, RH, and forward aileron cables.

(i) *Serials 1005 thru 1885:* Install rudder/aileron interconnect to RH aileron cable. (Refer to 27-20)

(j) Install ailerons. (Refer to 57-50)

(k) Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

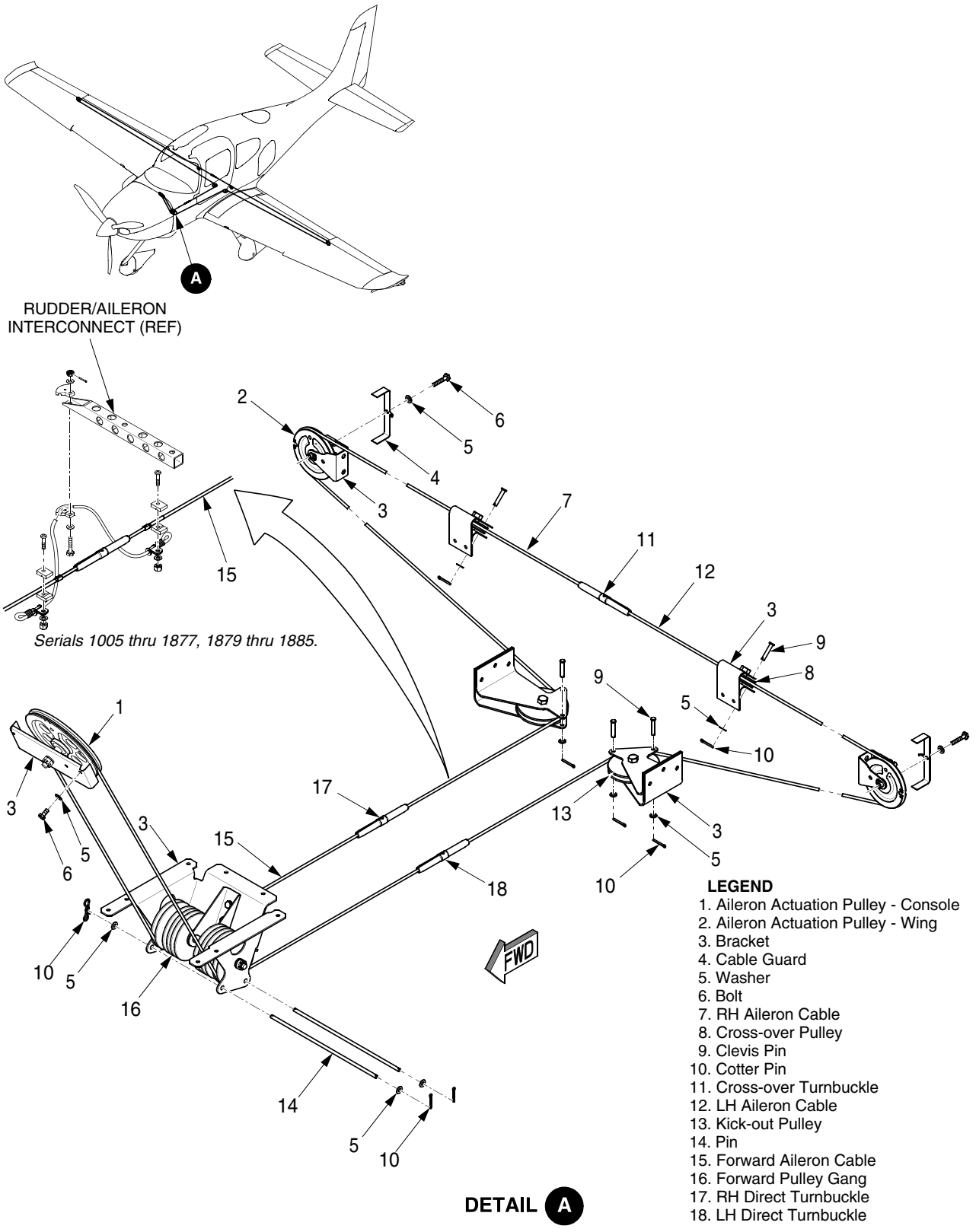


Figure 27-101
Aileron System Cables

(3) Adjustment/Test - Aileron System Rigging (See Figure 27-102)

CAUTION: Allow temperature to stabilize for a period of four hours before setting cable tensions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
3/16" Lockout Pin (quantity of 3)	-	Any Source	Aileron rigging.
WS 144 Rigging Template	13057-109	Cirrus Design Duluth, MN 55811 218-727-2737	Aileron rigging.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension determination.

(b) Remove kick plate. (Refer to 25-10)

(c) Remove MFD. (Refer to 31-60)

(d) Remove passenger seats. (Refer to 25-10)

(e) Remove carpet and access panels CF3C and CF4C. (Refer to 06-00)

Note: *Serials 2016 & subs w/ Perspective Avionics:* Note location of roll servo bridle cable clamps on aileron cable to facilitate reinstallation.

(f) *Serials 2016 & subs w/ Perspective Avionics:* Remove bolts, nuts, and clamps securing roll servo bridle cable to aileron cable. (See Figure 22-135)

(g) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to aileron actuation pulley.

(h) Insert lockout pins at aileron actuation pulleys in LH and RH wing.

(i) Insert lockout pin at aileron actuation pulley in center console.

(j) Set LH yoke grip to 45° by adjusting LH aileron push/pull rod at aileron actuation bracket so trim indicator is aligned with 0° on roll trim decal. Repeat procedure on RH side. (See Figure 27-102)

(k) Tighten turnbuckles to adjust aileron control cable tension according to ambient temperature. (See Figure 06-001)

Note: Control cable tension should be within approved range and equal between each set of locked-out pulleys.

1 At access hole CF4R, measure tension of RH aileron cable between crossover pulley and crossover turnbuckle.

2 At access hole CF4L, measure tension of LH aileron cable between crossover pulley and crossover turnbuckle.

3 At access hole CF4R, measure tension of RH aileron cable between RH kick-out pulley and RH wing aileron actuation pulley.

4 At access hole CF4L, measure tension of LH aileron cable between LH kick-out pulley and LH wing aileron actuation pulley.

(l) Ensure aileron cables at kick-out and cross-over pulleys do not rub against pulley flange.

(m) Remove lockout pins from LH and RH aileron actuation pulleys.

(n) Set ailerons to neutral position using WS 144 rigging template.

Note: To keep the opposite aileron in approximate neutral position, as the cross-over turnbuckle is tightened, the same-side direct-cable turnbuckle must be loosened (or vice-versa).

1 Align aileron trailing edges to wing chord line. To lower trailing edge, tighten cross-over cable turnbuckle and loosen direct-cable turnbuckle for appropriate aileron side.

2 After both ailerons are adjusted to neutral, recheck position of aileron rigged first to verify position did not shift during cable adjustment.

(o) Fasten inclinometer to LH aileron and set at 0°

(p) Remove lockout pin in center console aileron actuation pulley.

(q) Verify aileron neutral position remains at 0 ±0.5° with control yoke in neutral position.

(r) Verify neutral position between LH and RH ailerons is not greater than 0.5°.

WARNING: Turning control yoke counterclockwise should put left aileron trailing edge in raised position. If this is not true, system is improperly rigged. The system MUST BE RIGGED CORRECTLY. Check for crossed or wrapped cables.

(s) Verify turning control yoke counterclockwise places LH aileron in raised position.

Note: Verify aileron up and down travel with inclinometer. If travel requirements are not met, remove aileron and adjust stop screws as necessary.

(t) Adjust stop screws at LH aileron actuation pulley to allow 12.5 ±1° up and down aileron travel. In addition, adjust stops screws at LH aileron actuation pulley so that for full left roll input; (See Figure 27-102)

1 the LH lower aileron stop contacts first with 12.5 ±1° aileron up travel,

2 the RH upper aileron stop shows a 0.035 ±0.020 inch (0.89 ±0.51 mm) gap between stop and pulley bearing,

3 the secondary stop mounted on the co-pilot control yoke assembly shows a 0.070 ±0.020 inch (1.8 ±0.51 mm) gap between stop and center console.

(u) Fasten inclinometer to RH aileron and set at 0°.

(v) Adjust stop screws at RH aileron actuation pulley to allow 12.5 ±1° up and down aileron travel. In addition, adjust stops screws at RH aileron actuation pulley so that for full right roll input; (See Figure 27-102)

1 the RH lower aileron stop contacts first with 12.5 ±1° aileron up travel,

2 the LH upper aileron stop shows a 0.035 ±0.020 inch (0.89 ±0.51 mm) gap between stop and pulley bearing,

3 the secondary stop mounted on pilot control yoke assembly shows a 0.070 ±0.020 inch (1.8 ±0.51 mm) gap between stop and center console.

(w) Install bolt, washers, nut, and cotter pin securing trim cartridge push/pull rod to aileron actuation pulley.

(x) Perform Inspection/Check - Roll Trim Cartridge. (Refer to 27-10)

(y) *Serials 2016 & subs w/ Perspective Avionics:* Perform Adjustment/Test - GSM 85A/86 Roll Servo Mount Bridle Cable Tension. (Refer to 22-13)

(z) Install access panels and carpet. (Refer to 06-00)

(aa) Install passenger seats. (Refer to 25-10)

(ab) Install MFD. (Refer to 31-60)

(ac) Install kick plate. (Refer to 25-10)

(4) Inspection/Check - Aileron System Rigging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale 6.0 inches (15.24 cm)	-	Any Source	Aileron rigging.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension.

(b) Perform Inspection/Check - Aileron Gap and Overlap. (Refer to 57-50)

(c) Remove passenger seats. (Refer to 25-10)

(d) Remove carpet and access panels CF3C and CF4C. (Refer to 06-00)

(e) Verify aileron control cable tension. (Refer to 27-10)

(f) Verify aileron cable at kick-out pulleys do not rub against pulley flange. (Refer to 27-10)

(g) Verify 0.1 inch (2.54 mm) minimum clearance between aileron control cables and composite structure where aileron control cables pass through step closeout, aft longeron, and fuselage skin.

(h) Verify aileron neutral position remains at 0 ±0.5° with control yoke in neutral position.

(i) Verify neutral position between LH and RH ailerons is not greater than 0.5°.

(j) Verify 12.5 ±1° aileron up and down travel. (Refer to 27-10)

(k) Verify that under full left roll input, the LH lower aileron stop contacts first with 12.5 ±1° aileron up travel.

(l) Verify that under full right roll input, the RH lower aileron stop contacts first with 12.5 ±1° aileron up travel.

(m) Verify upper aileron stops show a 0.035 ±0.020 inch (0.89 ±0.51 mm) gap between stops and pulley bearings at aileron actuation pulleys under full left or right roll input. (Refer to 27-10)

(n) Verify secondary stop mounted on control yoke assembly shows a 0.070 ±0.020 inch (1.8 ±0.51 mm) gap between stop and center console under full left or right roll input. (Refer to 27-10)

(o) Verify 6 ±1° aileron trim deflection. (Refer to 27-10)

(p) *Serials 1005 thru 1885:* Perform Inspection/Check - Rudder-Aileron Interconnect. (Refer to 27-20)

(q) *Serials 2016 & subs w/ Perspective Avionics:* Verify roll servo mount bridle cable tension inboard of bridle cable clamps is 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg). (Refer to 22-13)

(r) Verify minimum rod end thread engagement of 0.313 inch (0.80 cm).

(s) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts throughout entire aileron control system.

(t) Install access panels and carpet. (Refer to 06-00)

(u) Install passenger seats. (Refer to 25-10)

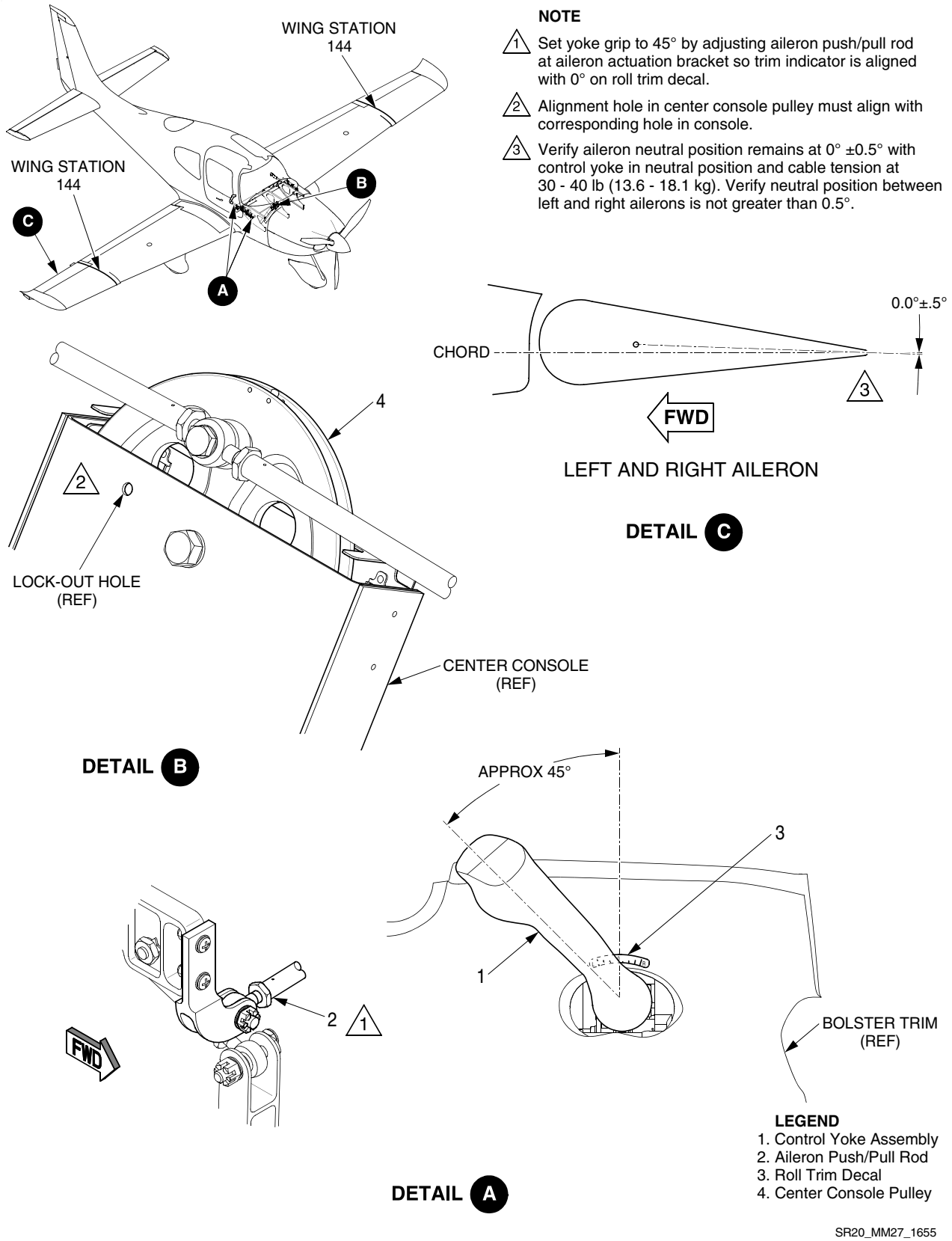


Figure 27-102
Aileron System Rigging (Sheet 1 of 2)

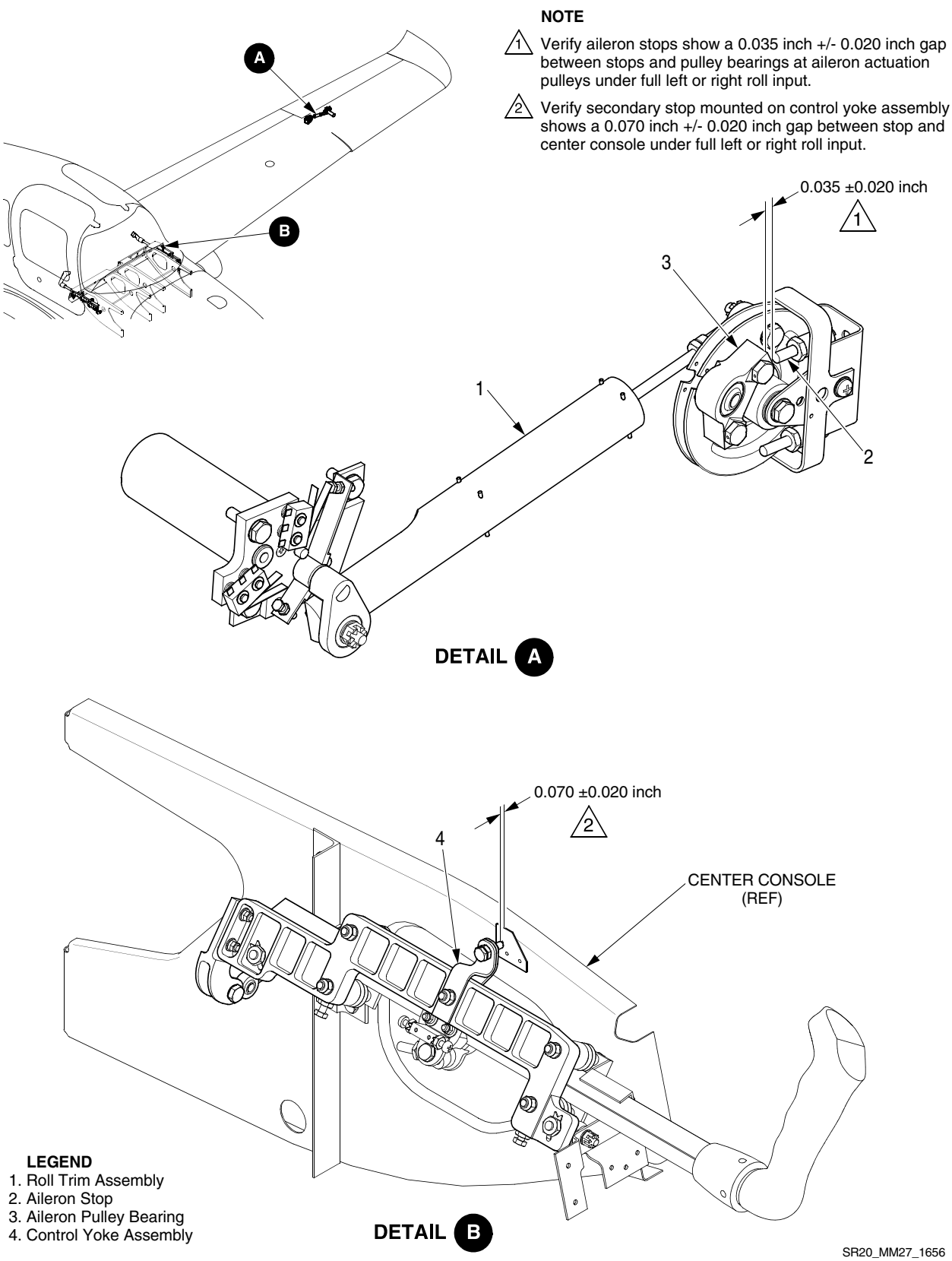


Figure 27-102
Aileron System Rigging (Sheet 2 of 2)

B. Control Grip Assembly (See Figure 27-103)

(1) Removal - Control Grip Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Pin Extractor	305183	AMP/Tyco Electronics Harrisburg, PA 17105-3608 800-522-6752	Removal of connector pins.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF position.

(c) Pull AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

(d) Remove crew seat. (Refer to 25-10)

(e) Remove kick plate. (Refer to 25-10)

(f) Disconnect electrical connector at forward end of yoke tube.

(g) Remove control yoke assembly. (Refer to 27-10)

(h) Use pin extractor to remove individual pins on electrical connector.

(i) Remove screws securing control grip to yoke tube.

(j) Remove yoke tube cover.

Note: To facilitate removal of harness, carefully remove any method used to bundle wires.

(k) Carefully pull wires through yoke tube and remove grip assembly.

(2) Installation - Control Grip Assembly

(a) Route control yoke wires through yoke tube.

Note: Ensure retaining barbs are sufficiently bent away from electrical pins to prevent pins from dislodging from connector body.

Reinstall any existing method used to bundle wires.

(b) Install yoke tube cover.

(c) Install screws securing control grip to yoke tube.

(d) Install pins into electrical connector.

(e) Install control yoke assembly. (Refer to 27-10)

(f) Connect electrical connector.

(g) *Serials 1005 thru 1885:* Perform Servicing - Push-to-Talk (PTT) Switch. (Refer to 27-10)

(h) Install kick plate. (Refer to 25-10)

(i) Install crew seat. (Refer to 25-10)

(j) Reset AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

C. 4-Way Trim / 4-Way Trim and Autopilot Disconnect Switch (See Figure 27-103)

(1) Removal - 4-Way Trim / 4-Way Trim and Autopilot Disconnect Switch

(a) Set BATTERY and AVIONICS switches to OFF position.

(b) Pull AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

(c) Remove screws securing switch plate assembly to top of control grip.

(d) De-solder electrical leads from switch terminals.

(e) Remove jam nut and washer securing switch to switch plate. Remove switch from airplane.

(2) Installation - 4-Way Trim / 4-Way Trim and Autopilot Disconnect Switch

(a) Solder electrical leads to switch terminals.

(b) Install jam nut and washer securing switch to switch plate.

(c) Install screws securing switch plate assembly to top of control grip.

(d) Reset AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

D. Autopilot Disconnect Switch - *Serials 1706 & subs* **(See Figure 27-103)**

(1) Removal - Autopilot Disconnect Switch

(a) Set BATTERY and AVIONICS switches to OFF position.

(b) Pull AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

(c) Remove screws securing switch plate assembly to top of control grip.

(d) De-solder electrical leads from switch terminals.

(e) Remove nut securing switch to switch plate and remove switch from airplane.

(2) Installation - Autopilot Disconnect Switch

(a) Solder electrical leads to switch terminals.

(b) Install nut securing switch to switch plate.

(c) Install screws securing switch plate assembly to top of control grip.

(d) Reset AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

E. A/P Altitude Hold Switch - *Serials 1005 thru 1705* **(See Figure 27-103)**

(1) Removal - A/P Altitude Hold Switch

(a) Set BATTERY and AVIONICS switches to OFF position.

(b) Pull AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

(c) Remove screws securing switch plate assembly to top of control grip.

(d) De-solder electrical leads from switch terminals.

(e) Remove nut and bezel securing switch to switch plate and remove switch from airplane.

(2) Installation - A/P Altitude Hold Switch

(a) Solder electrical leads to switch terminals.

(b) Install nut and bezel securing switch to switch plate.

(c) Install screws securing switch plate assembly to top of control grip.

(d) Reset AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

F. Push-to-Talk (PTT) Switch (See Figure 27-103)

(1) Servicing - Push-to-Talk (PTT) Switch

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Electrical Contact Cleaner	-	Any Source	Clean switch.

CAUTION: Electrical contact cleaner may cause leather discoloration. Use care when applying electrical contact cleaner to avoid damaging control grip leather.

(b) Cover control grip leather with shop towel.

(c) Depress switch and apply electrical contact cleaner to space between switch and housing.

(d) Release switch and apply electrical contact cleaner to space between switch and housing.

(e) Engage switch several times to ensure distribution of electrical contact cleaner.

(f) Remove shop towel from control grip leather.

(2) Removal - Push-to-Talk (PTT) Switch

(a) Set BATTERY and AVIONICS switches to OFF position.

(b) Pull AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

(c) Remove screws securing switch plate assembly to top of control grip.

CAUTION: Identify and mark electrical leads prior to cutting to facilitate reinstallation.

(d) Cut electrical leads from switch as close to switch base as possible.

(e) *Serials 1005 thru 1705:* Remove bezel and unscrew switch from control grip.

(f) *Serials 1706 & subs:* Unscrew switch from control grip.

(3) Installation - Push-to-Talk (PTT) Switch

(a) Solder new electrical leads to switch.

(b) *Serials 1005 thru 1705:* Route electrical leads through mounting hole, screw switch into control grip, and install bezel.

(c) *Serials 1706 & subs:* Route electrical leads through mounting hole, and screw switch into control grip.

(d) Splice switch leads to harness leads.

(e) Install screws securing switch plate assembly to top of control grip.

(f) Reset AUTOPILOT, PITCH TRIM, and ROLL TRIM circuit breakers.

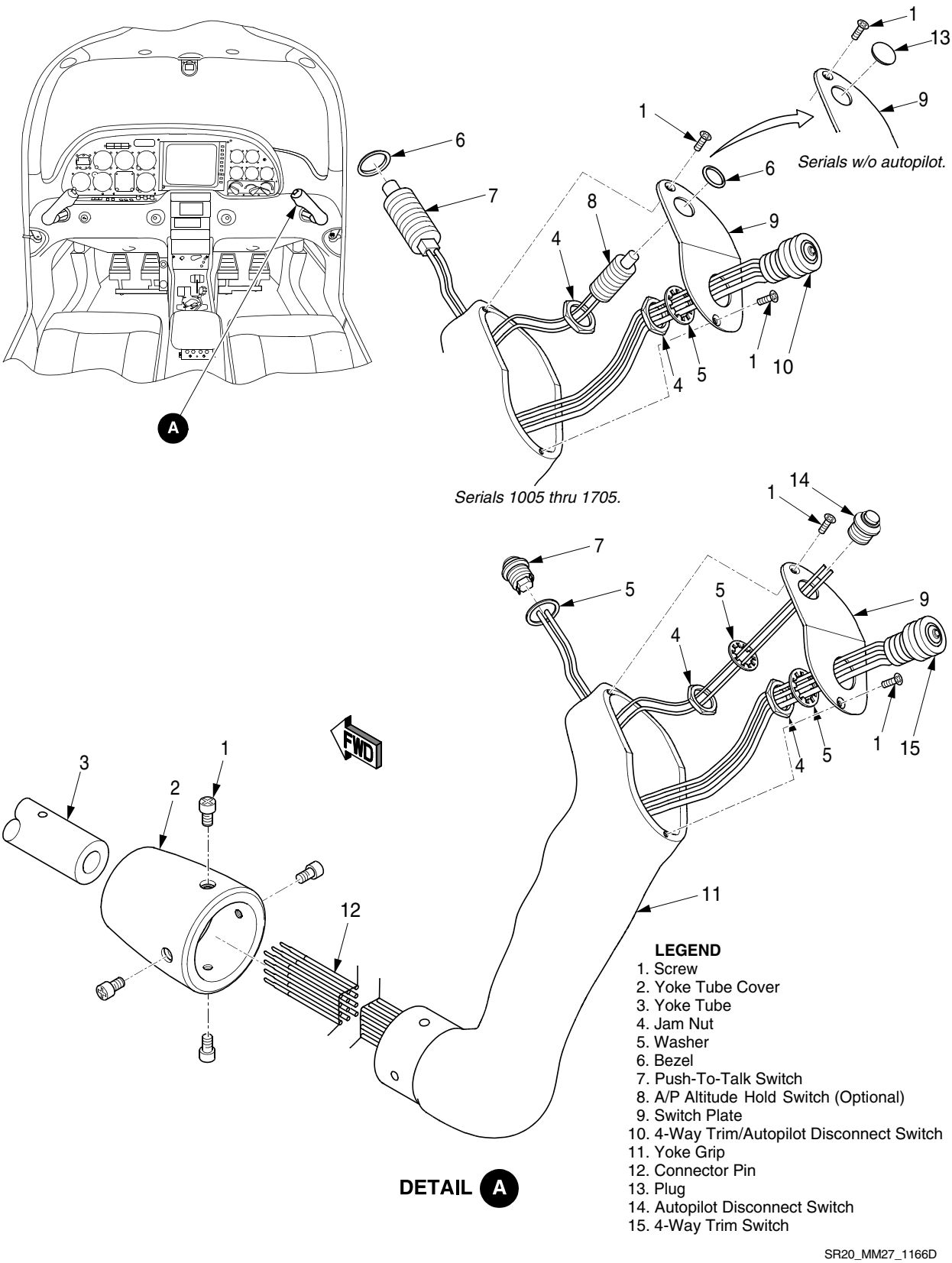


Figure 27-103
Control Grip Assembly Installation

G. Control Yoke Assembly (See Figure 27-104), (See Figure 27-105)

(1) Removal - Control Yoke Assembly

(a) Remove control grip assembly. (Refer to 27-10)

(b) Remove seat. (Refer to 25-10)

(c) Remove kick plate. (Refer to 25-10)

(d) Remove bolster panel trim. (Refer to 25-10)

(e) Remove cotter pin, nut, washers, and bolt securing aileron push/pull rod to control yoke aileron actuation bracket.

(f) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod to control yoke elevator stop.

Note: For the following step, note washer stackup to aid in reinstallation.

(g) Remove cotter pins, nuts, washers, and bolts securing control yoke assembly rod ends to console assembly.

(h) Remove control yoke assembly from airplane.

(2) Installation - Control Yoke Assembly

(a) Position control yoke assembly on center console and install bolts, washers, nuts, and cotter pins securing control yoke assembly rod ends to console assembly.

(b) Install bolt, washers, nut, and cotter pin securing elevator push/pull rod to control yoke elevator stop.

(c) Position aileron push/pull rod to control yoke aileron actuation bracket and install bolt, washers, nut, and cotter pin.

(d) Perform Inspection/Check - Control Yoke Assembly. (Refer to 27-10)

(e) Install bolster panel trim. (Refer to 25-10)

(f) Install kick plate. (Refer to 25-10)

(g) Install seat. (Refer to 25-10)

(h) Install control grip assembly. (Refer to 27-10)

(3) Inspection/Check - Control Yoke Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Corrosion Inhibitor (aerosol)	MIL-C-81309 Type II or III	Any Source	Prevent corrosion.

(b) Remove seat. (Refer to 25-10)

(c) Remove kick plate. (Refer to 25-10)

(d) Verify zero vertical play exists between yoke tube and V-grooved guide wheels.

(e) Verify V-grooved guide wheel bolts are torqued to 50 - 55 in-lb (5.6 - 6.2 Nm).

(f) Verify positive clearance and proper operation of control yoke assembly through full range of motion.

(g) Verify yoke movement is free of resistance.

(h) Remove control grip assembly. (Refer to 27-10)

(i) Apply corrosion inhibitor.

1 Cover surrounding components, furnishings, and structures to prevent inadvertent application of corrosion inhibitor to these areas.

2 Cover or plug opposite end of control yoke tube during application of corrosion inhibitor.

3 Apply a thin coat of corrosion inhibitor to inside of control yoke tubes per the manufacturer's instructions.

(j) Verify yoke tubes and V-grooved guide wheels are free of grit build-up.

(k) Verify engagement of jam nuts on control yoke assembly rod ends.

(l) Verify proper installation of safety wires and cotter pins on all fasteners.

(m) Install control grip assembly. (Refer to 27-10)

(n) Install kick plate. (Refer to 25-10)

(o) Install seat. (Refer to 25-10)

H. Aileron Push/Pull Rods (See Figure 27-104), (See Figure 27-105)

(1) Removal - Aileron Push/Pull Rods

(a) Remove kick plate. (Refer to 25-10)

(b) Remove MFD. (Refer to 31-60)

(c) Remove cotter pin, nut, washers, and bolt securing aileron push/pull rod to aileron actuation pulley.

(d) Remove cotter pin, nut, washers, and bolt securing aileron push/pull rod to control yoke aileron actuation bracket and remove push/pull rod from airplane.

(2) Installation - Aileron Push/Pull Rods

(a) Position aileron push/pull rod to control yoke aileron actuation bracket and install bolt, washers, nut, and cotter pin.

(b) Install bolt, washers, nut, and cotter pin securing aileron push/pull rod to aileron actuation pulley.

(c) Install MFD. (Refer to 31-60)

(d) Install kick plate. (Refer to 25-10)

I. V-Grooved Guide Wheel (See Figure 27-104), (See Figure 27-105)

(1) Removal - V-Grooved Guide Wheel

(a) Remove control yoke assembly. (Refer to 27-10)

(b) Remove bolt, washers, bearing tie plate, spacers, and nut securing V-grooved guide wheel to control yoke assembly.

(2) Installation - V-Grooved Guide Wheel

(a) Position washers, spacers, V-grooved guide wheel, bearing tie plate, and yoke tube to bearing mount and loosely secure with bolts and nuts.

(b) Perform Adjustment/Test - V-Grooved Guide Wheel. (Refer to 27-10)

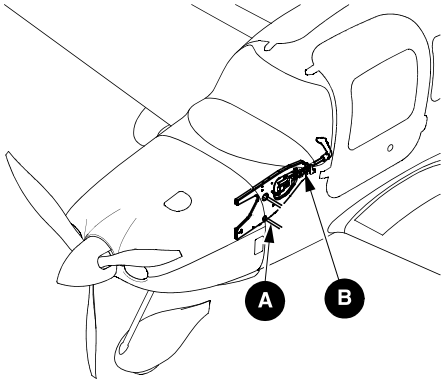
(c) Install control yoke assembly. (Refer to 27-10)

(3) Adjustment/Test - V-Grooved Guide Wheel

(a) On bottom, aft side of bearing mount, loosen jam nut and adjust hex screw so zero vertical play exists between yoke tube and V-grooved guide wheel.

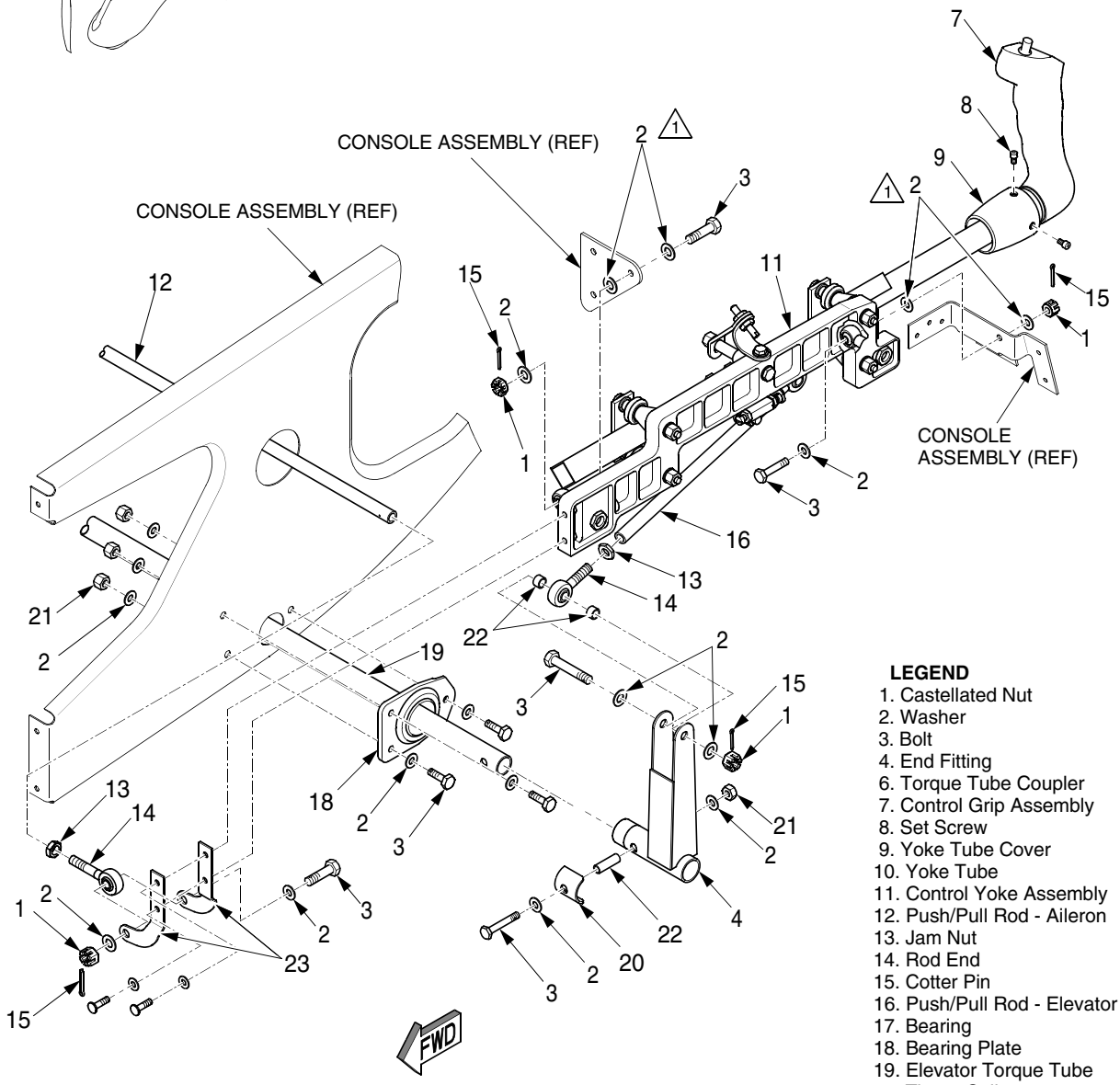
(b) On bottom, forward side of bearing mount, loosen jam nut and adjust hex screw so zero vertical play exists between yoke tube and V-grooved guide wheel.

(c) When no vertical play exists between yoke tube and V-grooved guide wheels, torque bearing nuts to 50 - 55 in-lb (5.5 - 6.1 Nm). After torquing bearing nuts to proper spec, check for vertical play between yoke tube and V-grooved guide wheels. If play exists, loosen bearing nuts and repeat Adjustment/Test - V-Grooved Guide Wheel.



NOTE

1. To reduce rotating friction of yoke assembly, any combination of washers .016" & .032" thickness may be added between control yoke assembly & console assembly. Min. total .016", max. total .064".



LEGEND

1. Castellated Nut
2. Washer
3. Bolt
4. End Fitting
6. Torque Tube Coupler
7. Control Grip Assembly
8. Set Screw
9. Yoke Tube Cover
10. Yoke Tube
11. Control Yoke Assembly
12. Push/Pull Rod - Aileron
13. Jam Nut
14. Rod End
15. Cotter Pin
16. Push/Pull Rod - Elevator
17. Bearing
18. Bearing Plate
19. Elevator Torque Tube
20. Thrust Collar
21. Nut
22. Spacer
23. Aileron Actuation Bracket

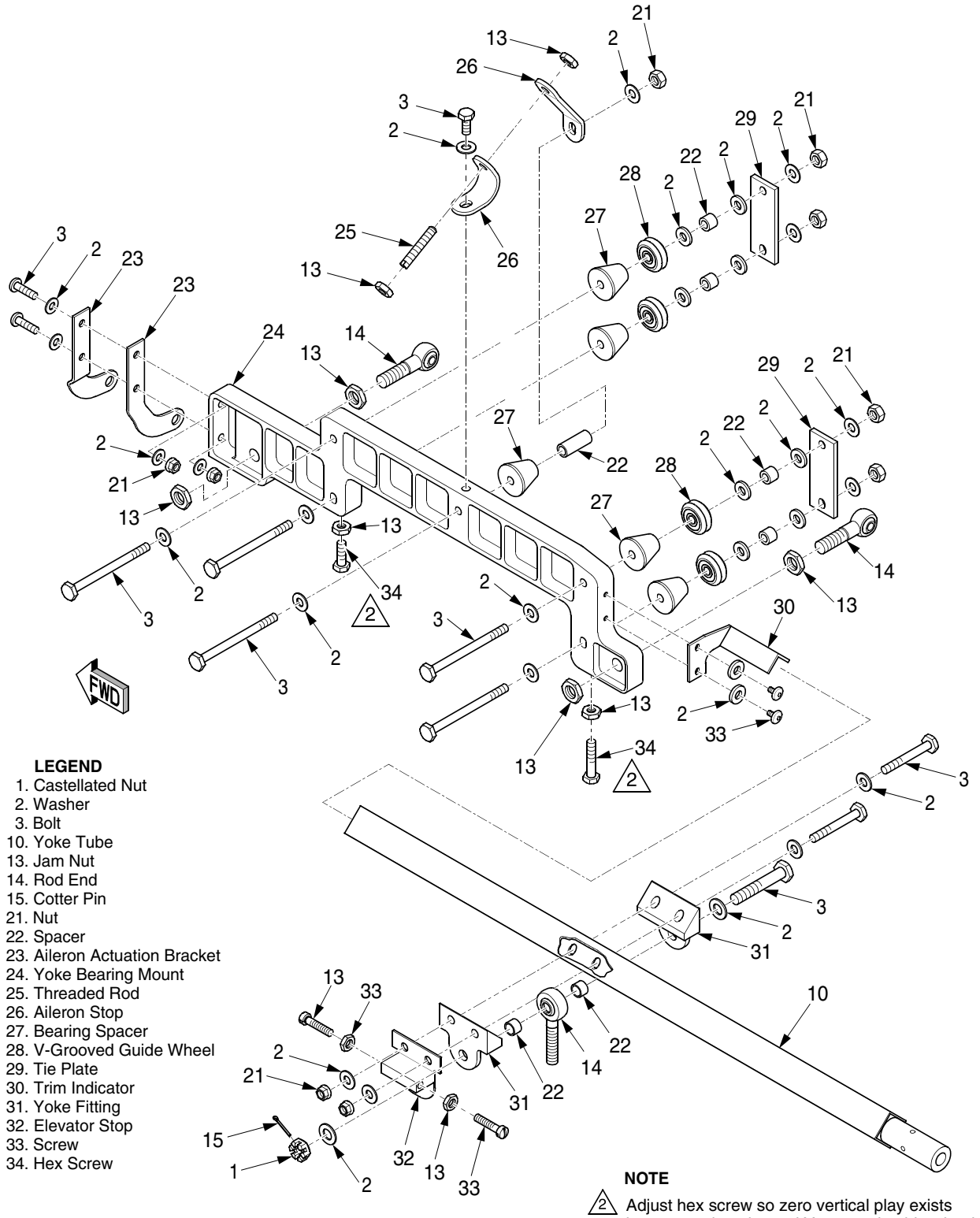
DETAIL A

Serials 1005 thru 1300, 1302 thru 1306.

SR20_MM27_1161C

Figure 27-104
Control Yoke Assembly - Serials 1005 thru 1306 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1306



DETAIL B

Serials 1005 thru 1300, 1302 thru 1306.

SR20_MM27_1162B

Figure 27-104
Control Yoke Assembly - Serials 1005 thru 1306 (Sheet 2 of 2)

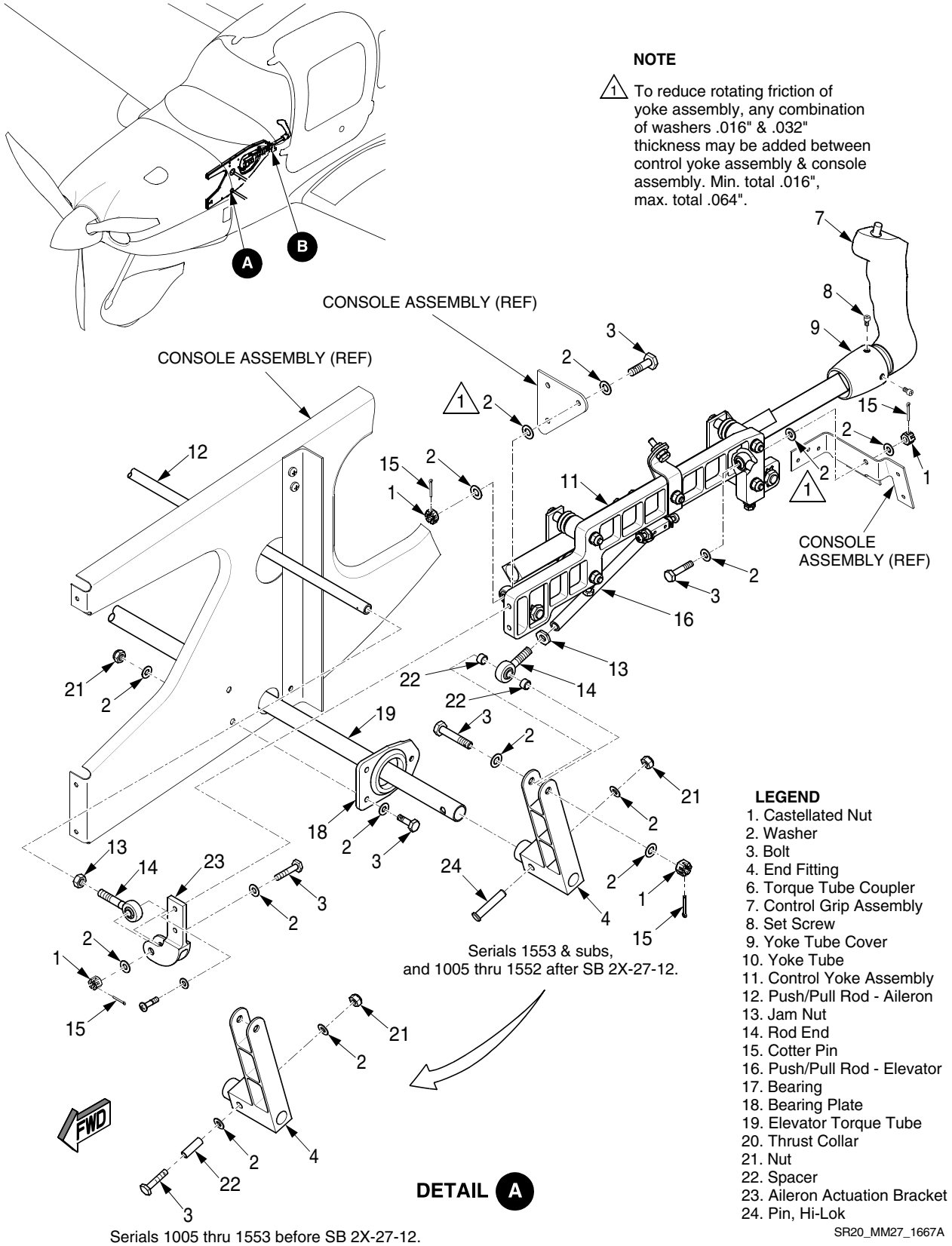
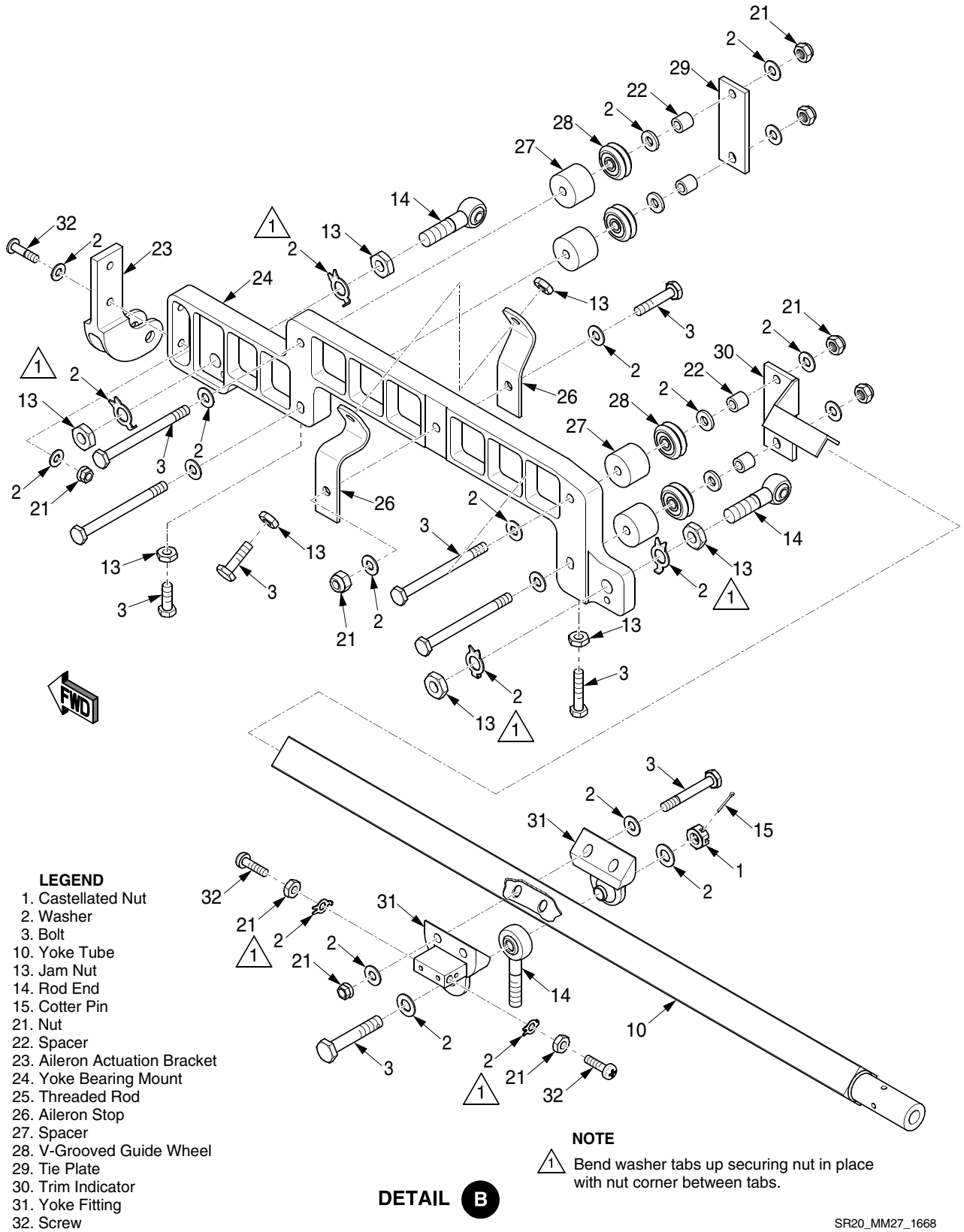


Figure 27-105
Control Yoke Assembly - Serials 1307 & subs (Sheet 1 of 2)

EFFECTIVITY:
Serials 1307 & subs



LEGEND

1. Castellated Nut
2. Washer
3. Bolt
10. Yoke Tube
13. Jam Nut
14. Rod End
15. Cotter Pin
21. Nut
22. Spacer
23. Aileron Actuation Bracket
24. Yoke Bearing Mount
25. Threaded Rod
26. Aileron Stop
27. Spacer
28. V-Grooved Guide Wheel
29. Tie Plate
30. Trim Indicator
31. Yoke Fitting
32. Screw

NOTE

1 Bend washer tabs up securing nut in place with nut corner between tabs.

Figure 27-105
Control Yoke Assembly - Serials 1307 & subs (Sheet 2 of 2)

J. Aileron Actuation Pulley - Console (See Figure 27-106) (See Figure 27-107)

(1) Removal - Aileron Actuation Pulley - Console

(a) Remove carpet and access panel CF3C from passenger compartment floor. (Refer to 06-00)

(b) Identify and loosen aileron cable tension via turnbuckle.

(c) Remove MFD. (Refer to 31-60)

(d) Remove cotter pin, nut, washers, and bolt securing aileron push/pull rods to aileron actuation pulley.

(e) Cut safety wire securing cable to aileron actuation pulley.

(f) Remove cotter pin, nut, washers, spacer, and bolt securing aileron actuation pulley to console assembly and remove from airplane.

(2) Installation - Aileron Actuation Pulley - Console

(a) Position aileron actuation pulley over console assembly ensuring lockout holes line up, and install bolt, spacer, washers, nut.

(b) Install bolt, washers, nut, and cotter pin securing aileron push/pull rods to aileron actuation pulley.

(c) Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(d) Install access panel CF3C and carpet. (Refer to 06-00)

(e) Install MFD. (Refer to 31-60)

K. Forward Pulley Gang (See Figure 27-106), (See Figure 27-107)

(1) Removal - Forward Pulley Gang

The forward pulley gang is used to route the aileron, rudder, and elevator system control cables.

(a) Remove carpet and access panel CF3C from passenger compartment floor. (Refer to 06-00)

(b) Identify and loosen aileron cable tension via turnbuckle.

(c) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

(d) Identify and loosen rudder and elevator cable tension via turnbuckle.

(e) Remove pilot and co-pilot seats.(Refer to 25-10)

(f) Remove carpet and access panel CF2L and CF2R from cockpit floor. (Refer to 06-00)

(g) Remove cotter pin, nut, washers, spacers, and bolt securing pulleys to console assembly and remove pulleys from airplane.

(2) Installation - Forward Pulley Gang

(a) Position and install bolt, spacers, washers, nut, and cotter pin securing pulleys to console assembly.

(b) Rig aileron system and perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(c) Rig rudder system and perform Adjustment/Test - Rudder System Rigging. (Refer to 27-20), (Refer to 27-20)

(d) Rig elevator system and perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30), (Refer to 27-30)

(e) Install access panels CF3C, CF5, CF2L, and CF2R. (Refer to 06-00)

(f) Install carpet. (Refer to 25-10)

L. Kick-Out Pulley (See Figure 27-108)

(1) Removal - Kick-Out Pulley

(a) Remove passenger compartment seats. (Refer to 25-10)

(b) Remove carpet and access panel CF4C from passenger compartment floor. (Refer to 06-00)

(c) Identify and loosen aileron cable tension via turnbuckle.

(d) Remove cotter pins, washers, and cable retaining clevis pins from pulley assembly and remove cable from pulley.

(e) Remove cotter pin, nut, washers, and bolt securing kick-out pulley to pulley brackets and remove from airplane.

(2) Installation - Kick-Out Pulley

(a) Install pulley, bolt, washers, nut, and cotter pin securing kick-out pulley to brackets.

(b) Position cable on pulley and install cable retainer clevis pins, washers, and cotter pins.

(c) Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(d) Install access panel CF4C. (Refer to 06-00)

(e) Install carpet. (Refer to 25-10)

M. Cross-Over Pulley (See Figure 27-108)

(1) Removal - Cross-Over Pulley

(a) Remove passenger compartment seats. (Refer to 25-10)

(b) Remove carpet and access panels CF4L and CF4R from aft floor. (Refer to 06-00)

(c) Identify and loosen aileron cable tension via turnbuckle.

(d) Remove cotter pin, washer, and cable retainer clevis pin from pulley assembly and remove cable from pulley.

(e) Remove cotter pin, nut, washers, and bolt securing cross-over pulley to pulley brackets and remove from airplane.

(2) Installation - Cross-Over Pulley

(a) Install pulley, washers, bolt, and cotter pin securing cross-over pulley to bracket assembly.

(b) Position cable on pulley and install cable retainer clevis pin, washer, and cotter pin.

(c) Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(d) Install access panels CF4L and CF4R. (Refer to 06-00)

(e) Install carpet. (Refer to 25-10)

(f) Install passenger compartment seats. (Refer to 25-10)

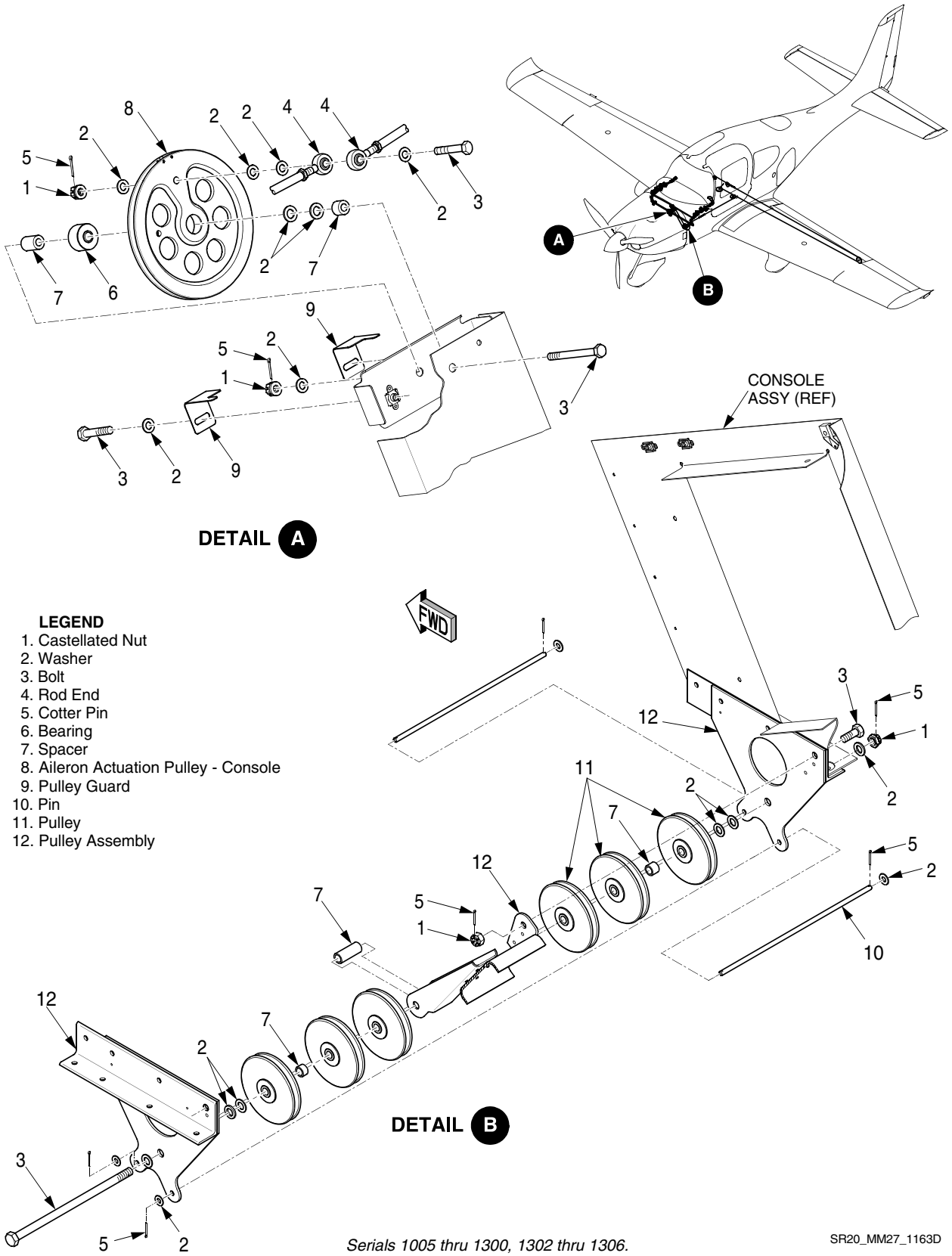
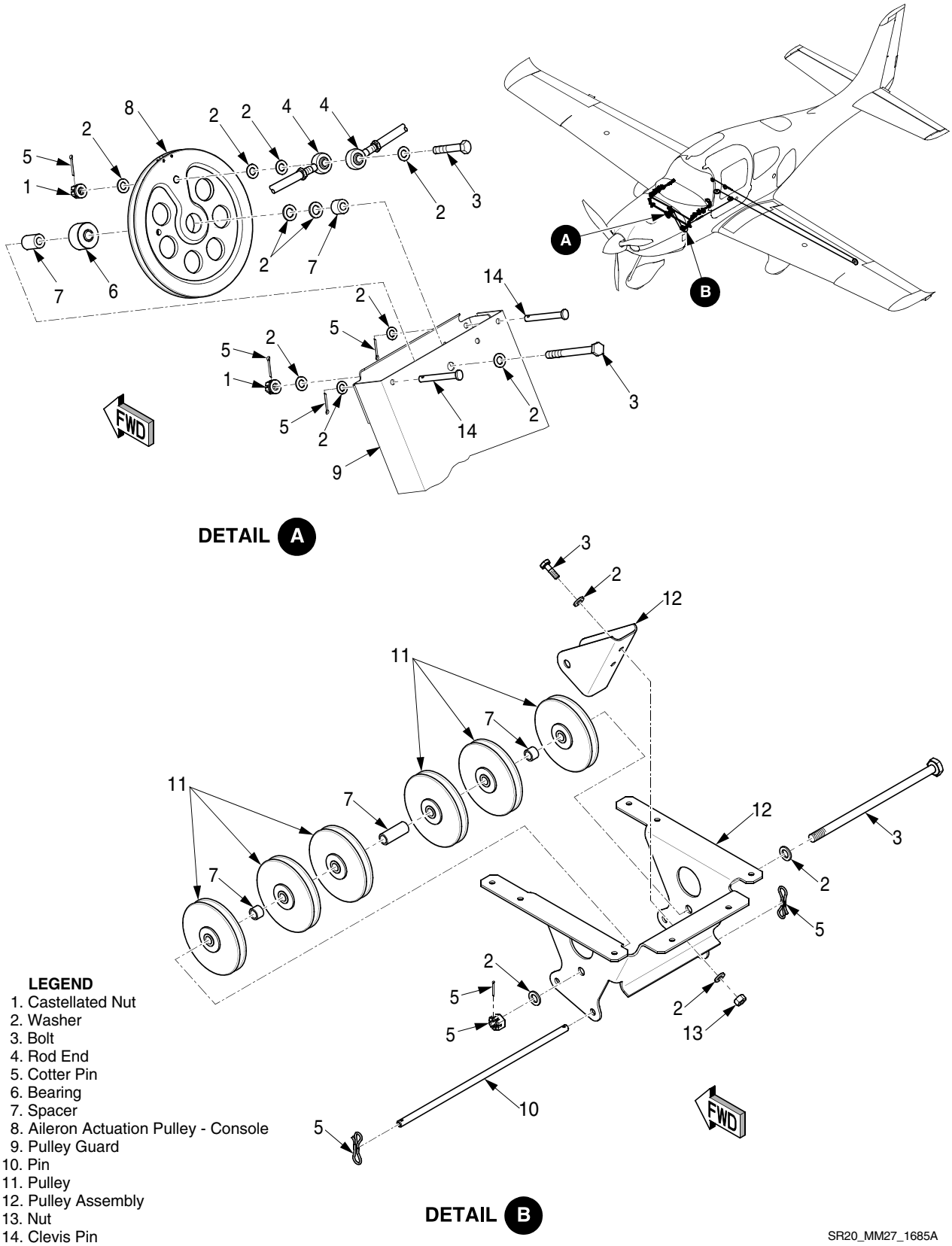


Figure 27-106
Forward Pulley Gang - Serials 1005 thru 1306

EFFECTIVITY:
Serials 1005 thru 1306



LEGEND

1. Castellated Nut
2. Washer
3. Bolt
4. Rod End
5. Cotter Pin
6. Bearing
7. Spacer
8. Aileron Actuation Pulley - Console
9. Pulley Guard
10. Pin
11. Pulley
12. Pulley Assembly
13. Nut
14. Clevis Pin

Figure 27-107
Forward Pulley Gang - Serials 1307 & subs

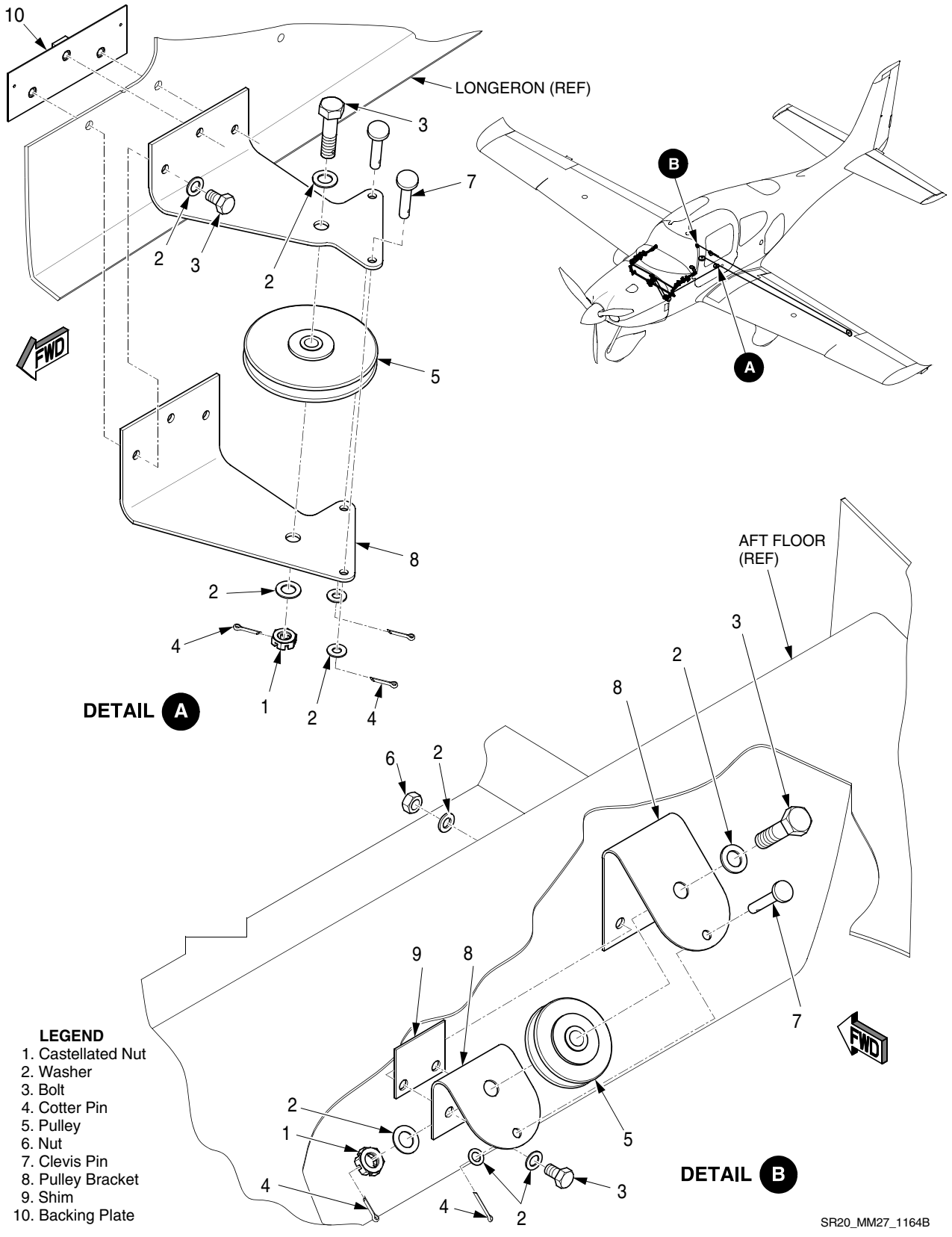


Figure 27-108
Aileron Kick-Out and Cross-Over Pulleys

N. Roll Trim System (See Figure 27-109)

(1) Removal - Aileron Actuation Pulley - Wing

(a) Remove passenger compartment seats. (Refer to 25-10)

(b) Remove carpet and access panels CF3C and CF4C from passenger compartment. (Refer to 06-00)

(c) Identify and loosen aileron cable tension via turnbuckles.

(d) Remove ailerons. (Refer to 57-50)

(e) *Serials 1005 thru 1885:* Remove wing access panel LW7. (Refer to 06-00)

(f) *Serials 1886 & subs:* Remove wing access panel LW11. (Refer to 06-00)

(g) Cut safety wire securing cable to aileron actuation pulley.

(h) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to aileron actuation pulley. (LH side only.)

(i) Cut safety wire, remove bolt and washer securing aileron actuation pulley to pulley bracket, and remove pulley from airplane.

(2) Disassembly - Aileron Actuation Pulley - Wing

(a) *Serials 1005 thru 1195:* Remove bolts securing bearing block and spacers to aileron actuation pulley.

(b) *Serials 1196 & subs*: Remove bolts securing bearing block to aileron actuation pulley.

(3) Reassembly - Aileron Actuation Pulley - Wing

(a) *Serials 1005 thru 1195:* Install bolts securing bearing block and spacers to aileron actuation pulley.

(b) *Serials 1196 & subs*: Install bolts securing bearing block to aileron actuation pulley.

(4) Installation - Aileron Actuation Pulley - Wing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire	-	Any Source	Safetying.

(b) Position aileron actuation pulley to pulley bracket and install bolt and washer. Torque bolt 10 - 15 in-lb (1.1 - 1.6 Nm) and safety wire.

(c) Install bolt, washers, nut, and cotter pin securing trim cartridge push/pull rod to aileron actuation pulley. (LH side only.)

(d) *Serials 1005 thru 1885:* Install wing access panel LW7. (Refer to 06-00)

(e) *Serials 1886 & subs:* Install wing access panel LW11. (Refer to 06-00)

(f) Install ailerons. (Refer to 57-50)

(g) Rig and perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

(h) Install carpet and access panels CF3C and CF4C. (Refer to 06-00)

(i) Install passenger compartment seats. (Refer to 25-10)

(5) Removal - Roll Trim Cartridge

WARNING: A maintenance check flight must be performed after the installation of a replacement (new or different) trim cartridge.

(a) Remove LH aileron. (Refer to 57-50)

(b) *Serials 1005 thru 1885:* Remove wing access panel LW7. (Refer to 06-00)

(c) *Serials 1886 & subs:* Remove wing access panel LW11. (Refer to 06-00)

(d) Slightly loosen trim motor assembly to facilitate trim cartridge removal. (Refer to 27-10)

(e) Remove cotter pin, nut, washers, spacer, and bolt securing trim cartridge to trim motor offset arm.

(f) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to aileron actuation pulley and remove roll trim cartridge from airplane.

(6) Installation - Roll Trim Cartridge

(a) Align trim cartridge push/pull rod with mounting hole on aileron actuation pulley and install bolt, washers, nut, and cotter pin.

(b) Align trim cartridge with trim motor offset arm and install bolt, washers, nut, and cotter pin.

(c) Tighten trim motor assembly. (Refer to 27-10)

(d) Perform Adjustment/Test - Roll Trim Cartridge. (Refer to 27-10)

(e) *Serials 1005 thru 1885:* Install wing access panel LW7. (Refer to 06-00)

(f) *Serials 1886 & subs:* Install wing access panel LW11. (Refer to 06-00)

(g) Install LH aileron. (Refer to 57-50)

(h) If replacement (new or different) trim cartridge installed, perform maintenance check flight. If airplane can not be trimmed properly during maintenance check flight, perform Adjustment/Test - Aileron Trim Tab. (Refer to 57-50)

(7) Adjustment/Test - Roll Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
3/16” Lockout Pin	-	Any Source	Lockout ailerons.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Remove MFD. (Refer to 31-60)

(c) Insert lockout pin at aileron actuation pulley in center console.

(d) Remove LH aileron. (Refer to 57-50)

CAUTION: To prevent damage to trim motor, set adjustment screws on limit switch stops all the way in to limit travel of motor to minimal rotation.

(e) Fasten inclinometer to RH aileron and set at 0°.

(f) Remove lockout pin.

(g) Adjust trim cartridge length to allow 6 ±1° aileron trim deflection:

1 If required, adjust initial length of trim cartridge to 9.4 inches (24.1 cm).

2 To increase RH aileron trailing edge up movement (LH aileron trailing edge down), lengthen trim cartridge by loosening jam nut and turning rod counterclockwise.

3 Shorten cartridge for opposite results.

4 If additional travel is required, adjust trim motor adjustment screws.

(h) Verify trim cartridge minimum rod end thread engagement of 0.313 inch (0.792 cm). Tighten jam nuts.

(i) Perform Inspection/Check - Roll Trim Cartridge. (Refer to 27-10)

(j) Install LH aileron. (Refer to 57-50)

(k) Install MFD. (Refer to 31-60)

(8) Inspection/Check - Roll Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

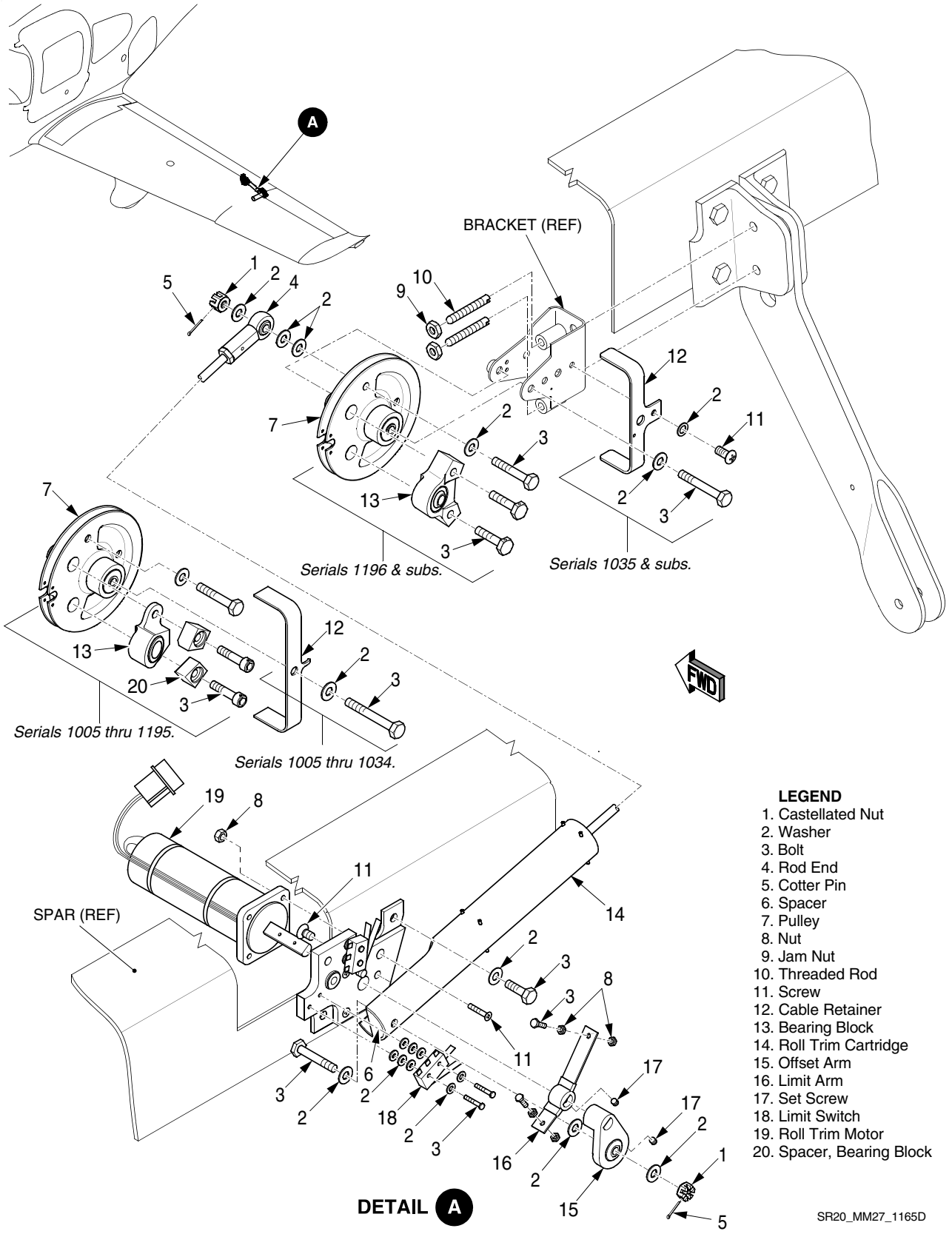
(b) Verify correct aileron system rigging. (Refer to 27-10)
(c) Fasten inclinometer to left aileron and set at 0°
(d) Verify roll trim cartridge is adjusted to hold ailerons in neutral position ±1°.
(e) Run trim motor to full right and full left bank trim positions and verify 6 ±1° aileron trim deflection. If roll trim is out of adjustment, perform Adjustment/Test - Roll Trim Cartridge. (Refer to 27-10)
(f) *Serials 1005 thru 1885:* Verify that at full aileron trim travel (±6°), the aileron-rudder interconnect bungee does not get tensioned.
(g) Remove inclinometer.
(h) Verify positive clearance between trim cartridge and actuation pulley under full range of trim motor positions.
(i) Verify minimum rod end thread engagement of 0.313 inch (0.79 cm).
(j) Verify proper installation of safety wires and cotter pins on all fasteners.

(9) Removal - Roll Trim Motor Assembly
(a) Set BATTERY and AVIONICS switches to OFF position.
(b) Pull ROLL TRIM circuit breaker.
(c) Remove LH aileron. (Refer to 57-50)
(d) *Serials 1005 thru 1885:* Remove wing access panel LW7. (Refer to 06-00)
(e) *Serials 1886 & subs:* Remove wing access panel LW11. (Refer to 06-00)
(f) Slightly loosen trim motor assembly to facilitate trim cartridge removal. (Refer to 27-10)
(g) Remove cotter pin, nut, washers, spacer, and bolt securing trim cartridge assembly to trim motor offset arm.
(h) Remove bolts and washers securing ground lead and trim motor assembly to spar.
(i) Disconnect electrical connector and remove trim motor assembly from wing

(10) Installation - Roll Trim Motor Assembly
(a) Connect electrical connector and insert trim motor assembly into spar.
(b) Align mounting bracket with bolt holes and install bolts and washers securing ground lead and trim motor assembly to spar. Leave assembly slightly loose to facilitate trim cartridge installation.
(c) Install bolt, washers, spacer, nut, and cotter pin securing trim cartridge assembly to trim motor actuation arm. Bend cotter pin prongs around nut rather than over
(d) Tighten bolts securing trim motor assembly to spar.
(e) Perform Adjustment/Test - Roll Trim Cartridge. (Refer to 27-10)
(f) *Serials 1005 thru 1885:* Install wing access panel LW7. (Refer to 06-00)
(g) *Serials 1886 & subs:* Install wing access panel LW11. (Refer to 06-00)
(h) Install LH aileron. (Refer to 57-50)
(i) Reset ROLL TRIM circuit breaker.

O. Aileron Trim Tab

Roll trim adjustment is ground adjustable only and is achieved by changing the deflection angle of the aileron trim tab. For maintenance practices pertinent to the aileron trim tab, see Flight Surfaces. (Refer to 57-50)



LEGEND

1. Castellated Nut
2. Washer
3. Bolt
4. Rod End
5. Cotter Pin
6. Spacer
7. Pulley
8. Nut
9. Jam Nut
10. Threaded Rod
11. Screw
12. Cable Retainer
13. Bearing Block
14. Roll Trim Cartridge
15. Offset Arm
16. Limit Arm
17. Set Screw
18. Limit Switch
19. Roll Trim Motor
20. Spacer, Bearing Block

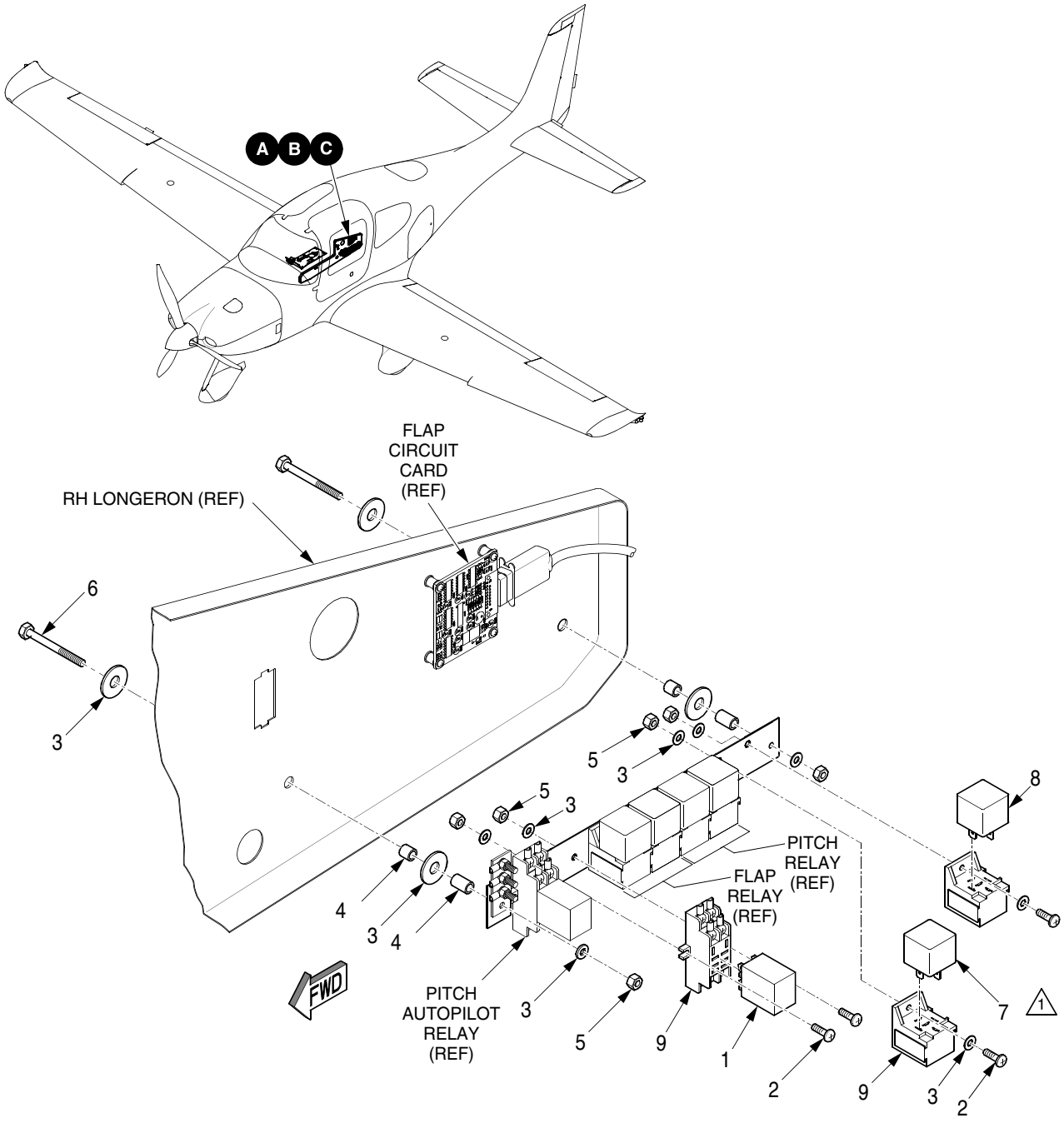
Figure 27-109
Roll Trim System Installation

P. Relays (See Figure 27-1010) (See Figure 27-1011)

CAUTION: Failure of either roll relay is cause for replacement of both relays. Replace both relays upon failure of one.

(1) Removal - Roll Relay
  (a) Pull ROLL TRIM circuit breaker.
  (b) *Serials 1005 thru 1422:* Remove rear passenger seats. (Refer to 25-10)
  (c) *Serials 1005 thru 1422:* Remove access panel CF4C. (Refer to 06-00)
  (d) *Serials 1423 & subs:* Remove access panel CF3R. (Refer to 06-00)
  (e) Remove relay from socket.

(2) Installation - Roll Relay
  (a) Position relay to socket and push firmly to install.
  (b) *Serials 1005 thru 1422:* Install access panel CF4C. (Refer to 06-00)
  (c) *Serials 1423 & subs:* Install access panel CF3R. (Refer to 06-00)
  (d) *Serials 1005 thru 1422:* Install rear passenger seats. (Refer to 25-10)
  (e) Reset ROLL TRIM circuit breaker.



DETAIL A

Serials 1005 thru 1422.

LEGEND

1. Roll Autopilot Relay
2. Screw
3. Washer
4. Spacer
5. Nut
6. Bolt
7. Roll Relay-Left
8. Roll Relay-Right
9. Relay Socket
10. Mounting Plate

CAUTION

1 Failure of either relay is cause for replacing both relays.

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Figure 27-1010
Roll Relay Assembly - Serials 1005 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1422

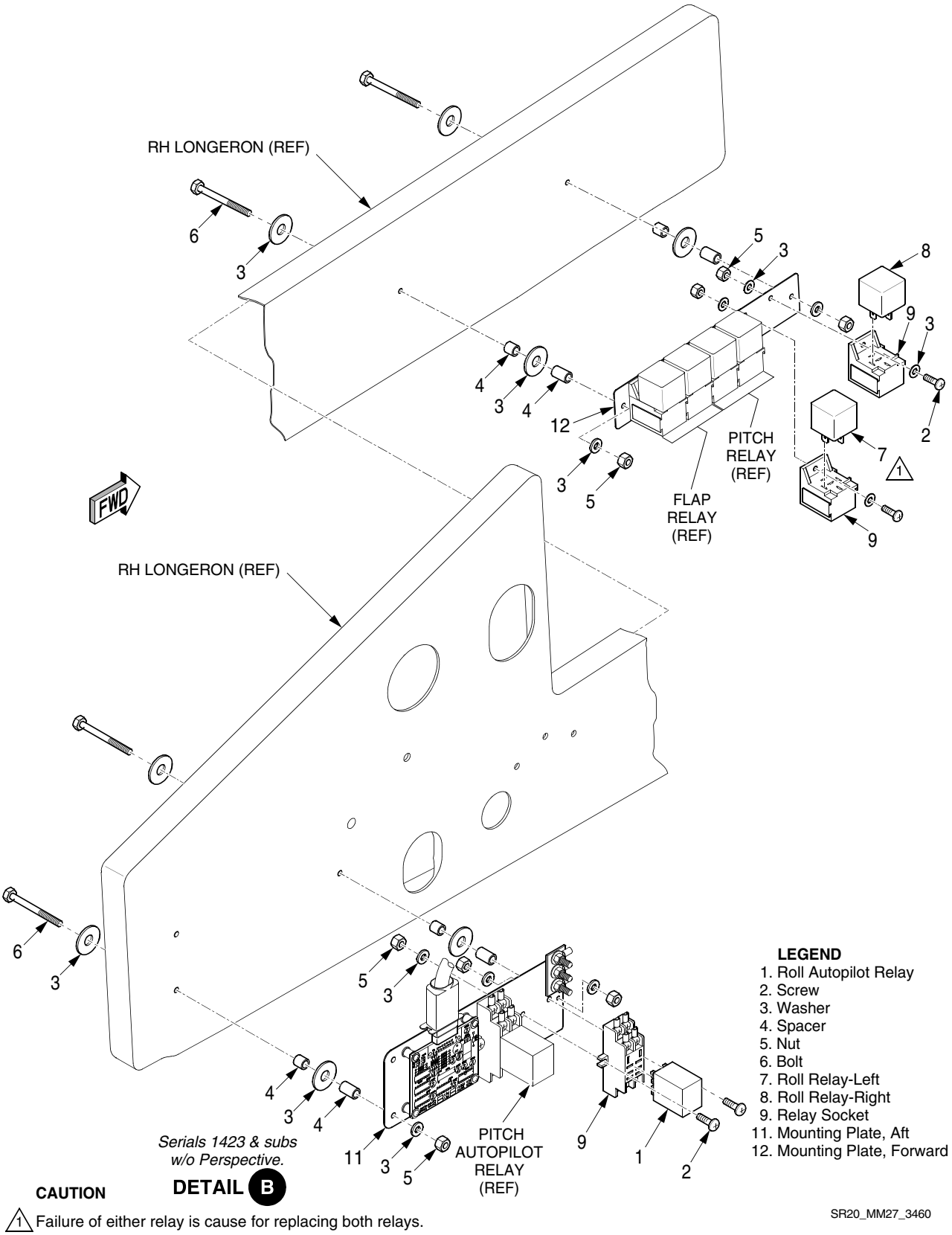
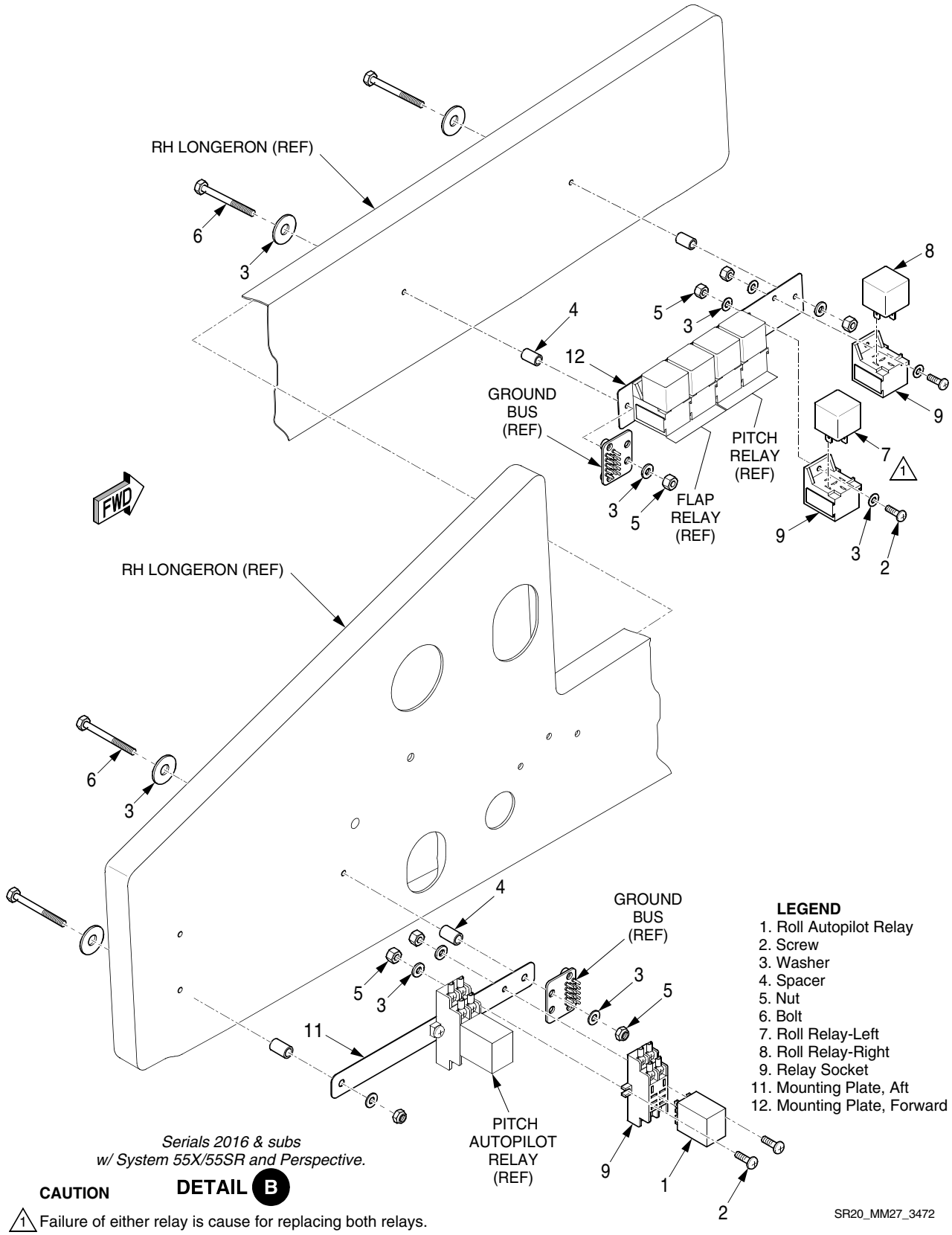


Figure 27-1010
Roll Relay Assembly - Serials 1423 & subs w/o Perspective Avionics (Sheet 2 of 3)

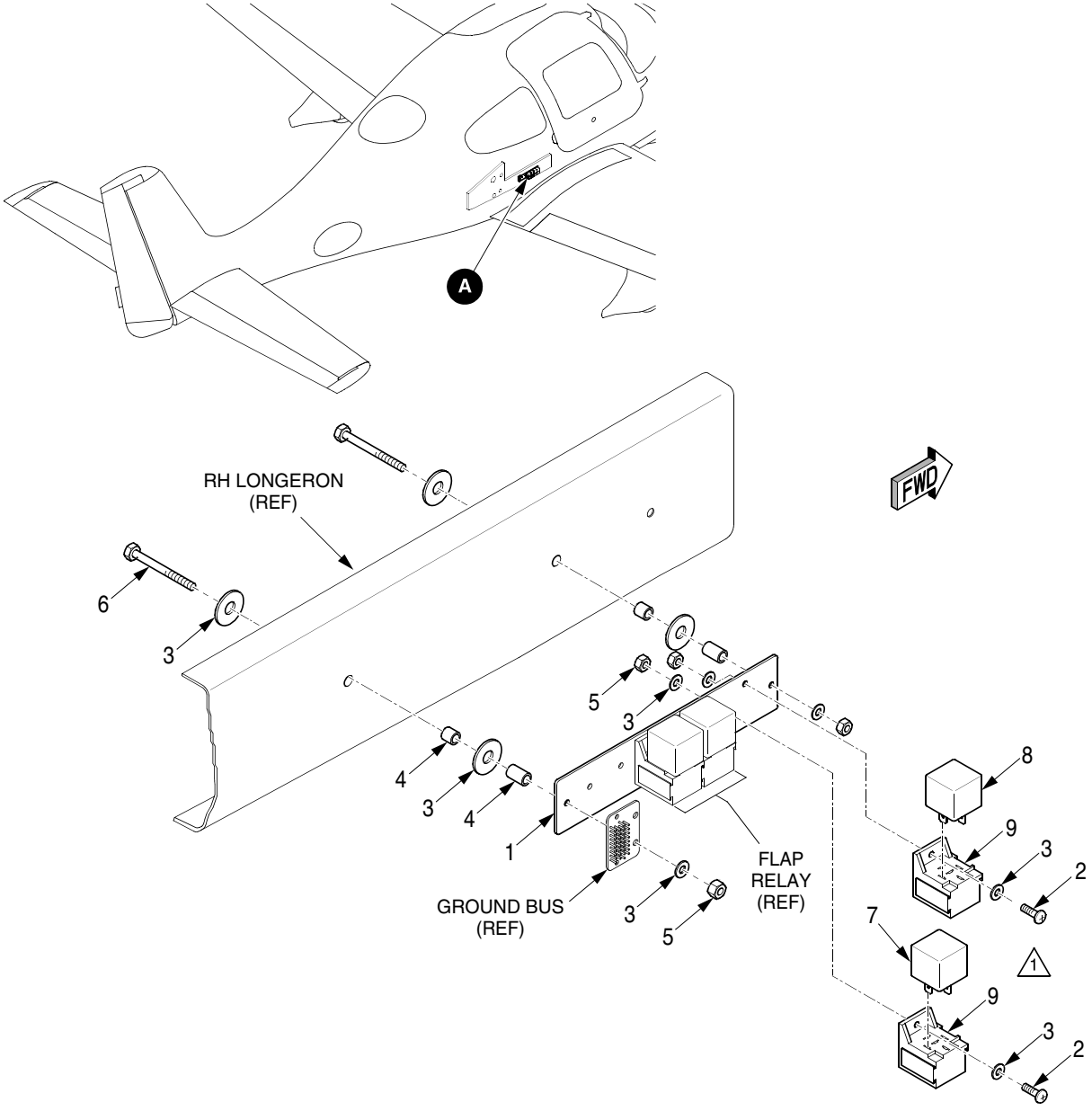


CAUTION

1 Failure of either relay is cause for replacing both relays.

Figure 27-1010
Roll Relay Assembly - Serials 2016 & subs w/ System 55X/55SR and Perspective (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ System 55X/55SR and Perspective



LEGEND
1. Mounting Plate, Forward
2. Screw
3. Washer
4. Spacer
5. Nut
6. Bolt
7. Roll Relay-Left
8. Roll Relay-Right
9. Relay Socket

DETAIL A

CAUTION

1 Failure of either relay is cause for replacing both relays.

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Figure 27-1011
Roll Relay Installation - Serials w/ Perspective Avionics

EFFECTIVITY:
Serials w/ Perspective Avionics

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RUDDER AND YAW TRIM SYSTEM

1. DESCRIPTION

This section describes that portion of the flight control system which controls the position and movement of the rudder. Included are; rudder system rigging, rudder pedal assembly, cables, pulleys and bellcranks, rudder-aileron interconnect, and yaw trim system.

Serials 1005 thru 1300, 1302 thru 1306: Rudder control motion is transferred by the rudder pedals to the forward pulley gang at the bottom of the center console. From the pulley gang, control motion is passed to a single cable system which is routed under the cabin floor to the rudder-aileron interconnect, through to the rudder/elevator pulley gang under the baggage floor, and finally to the rudder actuation pulley. The rudder actuation pulley drives a push/pull rod attached to the rudder bellcrank which is bolted directly to the rudder. The rudder and elevator control system utilize separate actuation pulleys which mount to a shared pulley-gang bracket mounted inside the empennage. Each set of pulleys has a cable retainer to prevent fouling. Adjustable control stops at the rudder actuation pulley limit control surface travel. Two springs attached to the rudder pedal assembly and firewall provide rudder system interconnection and determine system cable tension.

Serials 1301, 1307 & subs: Rudder control motion is transferred by the rudder pedals to the forward pulley gang at the bottom of the center console. From the pulley gang, control motion is transferred to a single cable system which is routed under the cabin floor to the rudder-aileron interconnect *(Serials 1005 thru 1885)*, through to the rudder/elevator pulley gang under the baggage floor, and finally to the rudder empennage bellcrank. The rudder empennage bellcrank drives a push/pull rod attached to the aft rudder bellcrank which is bolted directly to the rudder. The rudder and elevator control system utilize separate bellcranks connected by a shared shaft mounted directly to the FS 306 bulkhead. Fixed control stops at the rudder empennage bellcrank limit control surface travel. Two springs attached to the rudder assembly and firewall provide rudder system interconnection and determine system cable tension.

The yaw trim system employs a ground-adjustable trim tab. Neutral rudder position is held by a ground-adjustable spring cartridge which bolts to the left rudder pedal torque tube and center console assembly. The cartridge is a captured compression spring that provides a centering force regardless of the direction of control surface deflection. Yaw trim adjustment is ground adjustable only and is achieved by changing the deflection angle of the trim tab.

2. MAINTENANCE PRACTICES

WARNING: **A system rigging Inspection/Check must be performed after loosening any flight control cable to assure proper control surface operation. Refer to the appropriate control system's rigging procedures for the Inspection/Check maintenance practices.**

A. Rudder System Cables - *Serials 1005 thru 1306* (See Figure 27-201)

(1) Removal - Rudder System Cables

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
String	-	Any Source	Cable routing.

(b) Remove RH mid console trim panel. (Refer to 25-10)

(c) Remove passenger seats. (Refer to 25-10)

(d) Remove carpet and access panels CF3C, CF4C, and CF5. (Refer to 06-00)

(e) Remove nut, washers, clamps, bushings, spacer, and bolt securing right rudder cable to interconnect arm. (Refer to 27-20)

(f) Remove empennage pulley gang. (Refer to 27-20)

(g) Remove cotter pin and washer securing pulley guard pin to rudder/elevator pulley gang bracket and remove pin.

(h) Remove cotter pins and washers securing pulley guard pins to forward pulley gang bracket and remove pins.

Note: To facilitate cable routing during installation, attach string to end of cables prior to removing from airplane.

(i) Remove cotter pins, nuts, washers, and bolts securing rudder cables to rudder pedal torque tubes. Attach string to ends of forward rudder cables.

(j) At access hole CF5 pull forward rudder cables through and remove cables from airplane.

(2) Installation - Rudder System Cables

(a) Install empennage pulley gang. (Refer to 27-20)

(b) At access hole CF5, install turnbuckles on forward and aft rudder cables.

(c) At rudder pedal torque tubes, route forward rudder cable through mid and forward pulleys gangs.

(d) Install bolts, washers, nuts, and cotter pins securing rudder cables to rudder pedal torque tubes.

(e) At forward pulley gang, verify cable routing, insert pulley guard pins, and install washers and cotter pins.

(f) At rudder/elevator pulley gang, verify cable routing, insert pulley guard pin, and install washer and cotter pin.

(g) At empennage pulley gang, verify cable routing.

(h) Install bolt, washers, clamps, bushings, spacer, and nut securing right rudder cable to interconnect arm. (Refer to 27-20)

(i) Perform Adjustment/Test - Rudder System Rigging. (Refer to 27-20)

(j) Perform Adjustment/Test - Rudder-Aileron Interconnect. (Refer to 27-20)

(k) Perform Inspection/Check - Empennage Pulley Gang. (Refer to 27-20)

(l) Install carpet and access panels CF3C, CF4C, and CF5. (Refer to 06-00)

(m) Install RH mid console trim panel. (Refer to 25-10)

(n) Install passenger seats. (Refer to 25-10)

(3) Adjustment/Test - Rudder System Rigging (See Figure 27-204)

Note: Allow temperature to stabilize for a period of four hours before setting cable tensions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
3/16” Lockout Pin	-	Any Source	Rudder rigging.
Spacer Block 7 3/8” x 2” (18.73 x 5.08 cm)	-	Any Source	Spacer for holding neutral rudder position.
Scale 12.0 inch (30.48 cm)	-	Any Source	Rudder rigging.

(b) Remove left mid console circuit breaker trim. (Refer to 25-10)

(c) Remove access panel CF5. (Refer to 06-00)

(d) Remove access panels LE1, LE2, and RE2. (Refer to 06-00)

(e) Remove cotter pin, nut, washers, and bolt securing yaw trim cartridge to rudder pedal actuation arm. (See Figure 27-205)

(f) Set rudder pedal neutral position and cable tension.

1 Position spacer block between LH outboard rudder pedal tube and firewall to support spring tension.

2 Position spacer block between RH outboard rudder pedal tube and firewall to support spring tension.

3 Loosen rudder system turnbuckles so all cable tension is removed.

4 Insert lockout pin at rudder actuation pulley in empennage.

5 Position rudder pedal pivot tubes so both left and right pedals are centered directly over gap between forward and aft torque tubes within 0.10 inch (2.54 mm). (See Figure 27-204)

6 Tighten LH cable turnbuckle until spacer block falls away from pedal, indicating LH rudder pedals are in neutral position. Remove spacer block from airplane.

7 Tighten RH cable turnbuckle until spacer block falls away from pedal, indicating RH rudder pedals are in neutral position. Remove spacer block from airplane.

(g) Adjust rudder-to-vertical stabilizer alignment such that the rudder horn aligns with the vertical stabilizer with no more than 0.1 inch (0.25 cm) misalignment:

1 To move rudder trailing edge right, lengthen push/pull rod by removing bolt securing rod end to aft rudder bellcrank, loosening jam nut, and turning rod end counterclockwise.

2 Shorten push/pull rod for opposite results.

(h) Remove lockout pin from rudder actuation pulley in empennage.

(i) Position yaw trim cartridge to rudder pedal actuation arm and secure with bolt, washers, nut, and cotter pin. (See Figure 27-205)

WARNING: Applying right rudder should deflect rudder trailing edge to the right. If this is not true, system is improperly rigged. The system MUST BE RIGGED CORRECTLY. Check for crossed or wrapped cables.

(j) Verify application of right rudder deflects rudder trailing edge to the right.

(k) Determine rudder travel.

Note: Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.6 - 6.0 inches (14.2 - 15.2 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

1 With full left rudder applied, verify rudder deflection angle is equal to 20° ±1°. Adjust stop screws at empennage rudder actuation pulley if necessary.

2 Repeat procedure for right rudder travel.

3 Ensure that rudder actuation pulley stops limit rudder travel and not yaw trim cartridge.

(l) Verify trim cartridge minimum rod end thread engagement of 0.312 inch (0.79 cm). Tighten jam nuts.

(m) Perform Inspection/Check - Yaw Trim Cartridge. (Refer to 27-20)

(n) Install left mid console circuit breaker trim. (Refer to 25-10)

(o) Install access panel CF5. (Refer to 06-00)

(p) Install access panels LE1, LE2, and RE2. (Refer to 06-00)

(4) Inspection/Check - Rudder System Rigging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale 6.0 inches (15.24 cm)	-	Any Source	Rudder rigging.

(b) Perform Inspection/Check - Rudder Gap and Overlap. (Refer to 55-40)

(c) Verify rudder neutral position remains at 0 ±1° with rudder pedals in neutral position.

Note: Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.6 - 6.0 inches (14.2 - 15.2 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

(d) Verify 20° ±1° rudder deflection angle. (Refer to 27-20)

(e) Perform Inspection/Check - Rudder-Aileron Interconnect. (Refer to 27-20)

(f) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(g) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts throughout entire rudder control system.

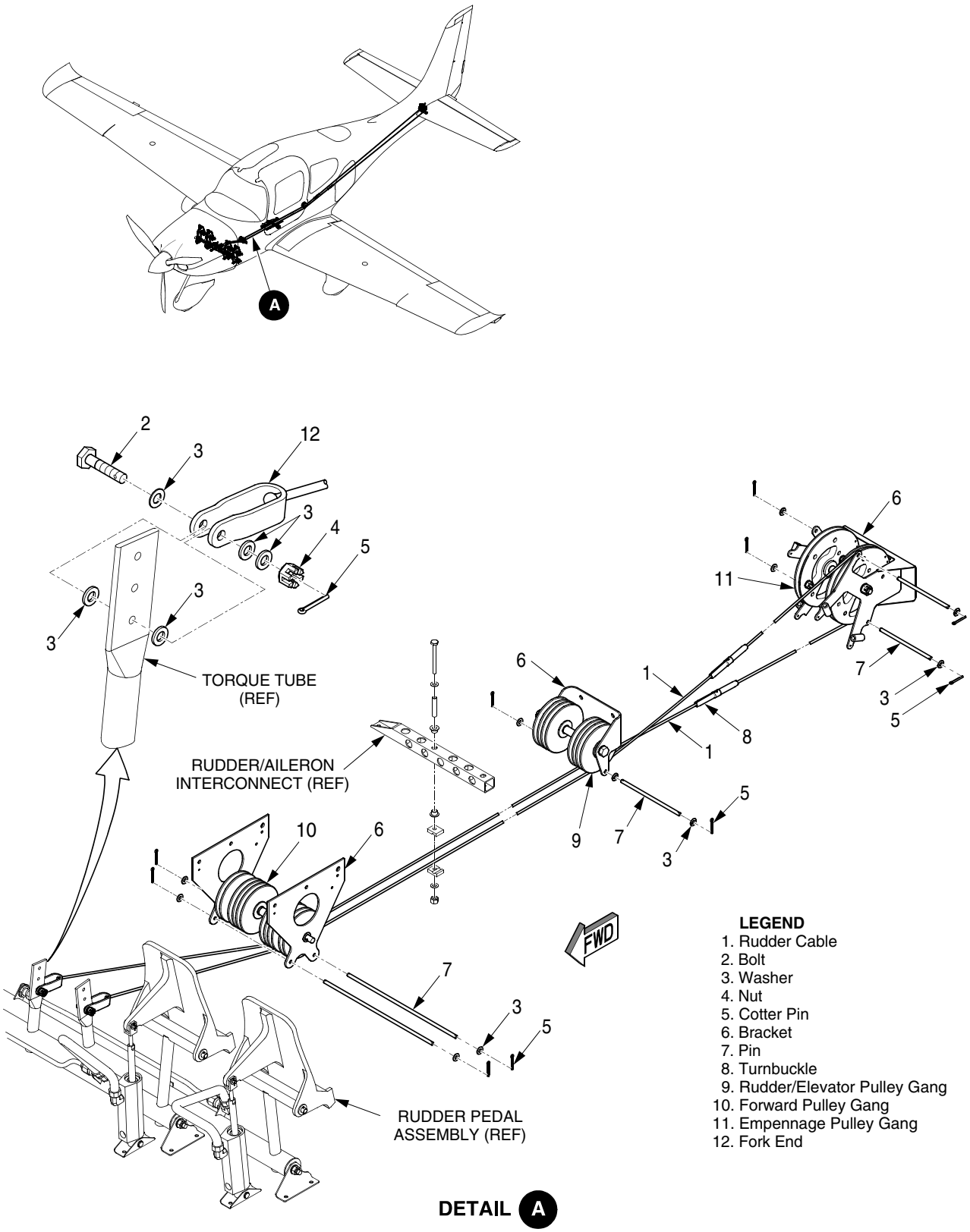


Figure 27-201
Rudder System Cables - Serials 1005 thru 1306

B. Rudder System Cables - *Serials 1307 & subs* (See Figure 27-202)

The rudder system bellcrank, cable clevises, and cable turnbuckle ends are marked with blue and yellow paint to allow visual verification of proper cable assembly and installation. (See Figure 27-203)

Description	Color Identification
Top Rudder Empennage Bellcrank Left Rudder Pedal Torque Tube Arm Cable Clevises and Turnbuckle Ends	Primary Blue
Bottom Rudder Empennage Bellcrank Right Rudder Pedal Torque Tube Arm Cable Clevises and Turnbuckle Ends	Primary Yellow

(1) Removal - Rudder System Cables

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spacer Block 7 3/8” x 2” (18.73 x 5.08 cm)	-	Any Source	Spacer for holding neutral rudder position.
String	-	Any Source	Cable routing.

(b) Remove RH mid console trim panel. (Refer to 25-10)

(c) Remove passenger seats. (Refer to 25-10)

(d) Remove carpet and access panels CF3C, CF4C, and CF5. (Refer to 06-00)

(e) Remove access panels LE1, LE2, and RE2. (Refer to 06-00)

(f) *Serials 1307 thru 1885:* Remove nut, washers, clamps, bushings, spacer, and bolt securing right rudder cable to interconnect arm. (Refer to 27-20)

Note: Prior to removing turnbuckles, position spacer block between rudder pedals and firewall to support spring tension.

(g) At access panel CF5, remove turnbuckles from rudder cables.

(h) Remove cotter pins, nuts, washers, and bolts securing rudder cable rod ends to rudder empennage bellcrank.

(i) At access hole CF5, pull aft rudder cables through and remove cables from airplane.

(j) Remove cotter pin and washer securing pulley guard pin to rudder/elevator pulley gang bracket and remove pin.

(k) Remove cotter pins and washers securing pulley guard pins to forward pulley gang bracket and remove pins.

Note: To facilitate cable routing during installation, attach string to end of cables prior to removing from airplane.

(l) Remove cotter pins, nuts, washers, and bolts securing rudder cables to rudder pedal torque tubes. Attach string to ends of forward rudder cables.

(m) At access hole CF5, pull forward rudder cables through and remove cables from airplane.

(2) Installation - Rudder System Cables

(a) If installing new cable, paint turnbuckle ends appropriate color. (Refer to 20-90)

(b) At rudder pedal torque tubes, route forward rudder cable through mid and forward pulley gangs.

(c) Install bolts, washers, nuts and cotter pins securing rudder cables to rudder pedal torque tubes.

(d) At forward pulley gang, verify cable routing, insert pulley guard pins, and install washers and cotter pins.

(e) At rudder/elevator pulley gang, verify cable routing, insert pulley guard pin, and install washer and cotter pin.

(f) Route aft rudder cable from access hole CF5 to rudder empennage bellcrank. Install bolts, washers, nuts, and cotter pins securing rudder cable rod end to rudder empennage bellcrank.

(g) At access hole CF5, install turnbuckles on forward and aft rudder cables.

(h) *Serials 1307 thru 1885:* Install bolt, washers, clamps, bushings, spacer, and nut securing right rudder cable to interconnect arm. (Refer to 27-20)

(i) Perform Adjustment/Test - Rudder System Rigging. (Refer to 27-20)

(j) *Serials 1307 thru 1885:* Perform Adjustment/Test - Rudder-Aileron Interconnect. (Refer to 27-20)

(k) Perform Inspection/Check - Empennage Bellcranks. (Refer to 27-20)

(l) Install access panels LE1, LE2, and RE2. (Refer to 06-00)

(m) Install carpet and access panels CF3C, CF4C, and CF5. (Refer to 06-00)

(n) Install RH mid console trim panel. (Refer to 25-10)

(o) Install passenger seats. (Refer to 25-10)

(3) Adjustment/Test - Rudder System Rigging (See Figure 27-204)

Note: Allow temperature to stabilize for a period of four hours before setting cable tensions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spacer Block 7 3/8” x 2” (18.73 x 5.08 cm)	-	Any Source	Spacer for holding neutral rudder position.
Rigging Lockout Tool	14905-001	Cirrus Design	Lockout empennage bellcranks.
3/16” Lockout Pin	-	Any Source	Lockout empennage bellcranks.
Scale 12.0 inch (30.48 cm)	-	Any Source	Rudder rigging.

(b) Remove access panel CF5. (Refer to 06-00)

(c) Remove access panels LE1, LE2, and RE2. (Refer to 06-00)

Note: Prior to removing turnbuckles, position spacer block between rudder pedals and firewall to support spring tension.

(d) Loosen rudder system turnbuckles so all cable tension is removed.

(e) Set Rudder Deflection.

Note: *Serials 1307 thru 1422:* Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.6 - 6.0 inches (14.2 - 15.2 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

Serials 1423 & subs: Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.8 - 6.2 inches (14.7 - 15.8 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

1 With full left rudder applied, verify rudder deflection angle is equal to 20° ±1°.

Note: Adjusting push/pull rod length affects the center location of the rudder deflection. The limits of deflection are not adjustable. It may be necessary to set each side off of nominal to meet tolerance on both sides.

2 To increase deflection angle, lengthen push/pull rod by removing bolt securing rod end to aft rudder bellcrank, loosening jam nut, and turning rod end counterclockwise.

3 Shorten push/pull rod for opposite results.

4 Repeat procedure for right rudder travel.

(f) Using rigging lockout tool and pin, lockout rudder empennage bellcrank.

(g) Set Rudder Pedal Neutral Position.

1 *Serials 1307 thru 1422:* Position rudder pedal pivot tubes so both left and right pedals are centered directly over gap between forward and aft torque tubes within 0.10 inch (2.54 mm). (See Figure 27-204)

2 *Serials 1423 & subs:* Position rudder pedal pivot tubes so both left and right pedals are 0.5 ±0.1 inch (12.7 ±2.54 mm) aft of gap between forward and aft torque tubes. (See Figure 27-204)

3 At LH outboard rudder pedal, wedge spacer block between rudder pedal tube and firewall.

4 Tighten LH cable turnbuckle until spacer block falls away from pedal, indicating LH rudder pedals are in neutral position. Remove spacer block from airplane.

5 Repeat procedure on RH side.

(h) Remove rigging lockout tool and pin from rudder empennage bellcrank.

WARNING: Applying right rudder should deflect rudder trailing edge to the right. If this is not true, system is improperly rigged. The system MUST BE RIGGED CORRECTLY. Check for crossed or wrapped cables and verify color identification is correct.

(i) Verify application of right rudder deflects rudder trailing edge to the right.

(j) Verify trim cartridge minimum rod end thread engagement of 0.313 inch (0.79 cm). Tighten jam nuts.

(k) Perform Inspection/Check - Yaw Trim Cartridge.(Refer to 27-20)

(l) Install access panels LE1, LE2, and RE2. (Refer to 06-00)

(m) Install access panel CF5. (Refer to 06-00)

(4) Inspection/Check - Rudder System Rigging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale 6.0 inches (15.24 cm)	-	Any Source	Rudder rigging.

(b) Perform Inspection/Check - Rudder Gap and Overlap. (Refer to 55-40)

(c) Verify rudder neutral position remains at 0 ±1° with rudder pedals in neutral position.

Note: *Serials 1307 thru 1422:* Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.6 - 6.0 inches (14.2 - 15.2 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

Serials 1423 & subs: Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.8 - 6.2 inches (14.7 - 15.8 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn. (See Figure 27-204)

(d) Verify 20° ±1° rudder deflection angle. (Refer to 27-20)

(e) *Serials 1307 thru 1885:* Perform Inspection/Check - Rudder-Aileron Interconnect. (Refer to 27-20)

(f) Verify minimum rod end thread engagement of 0.313 inch (0.79 cm).

(g) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts throughout entire rudder control system.

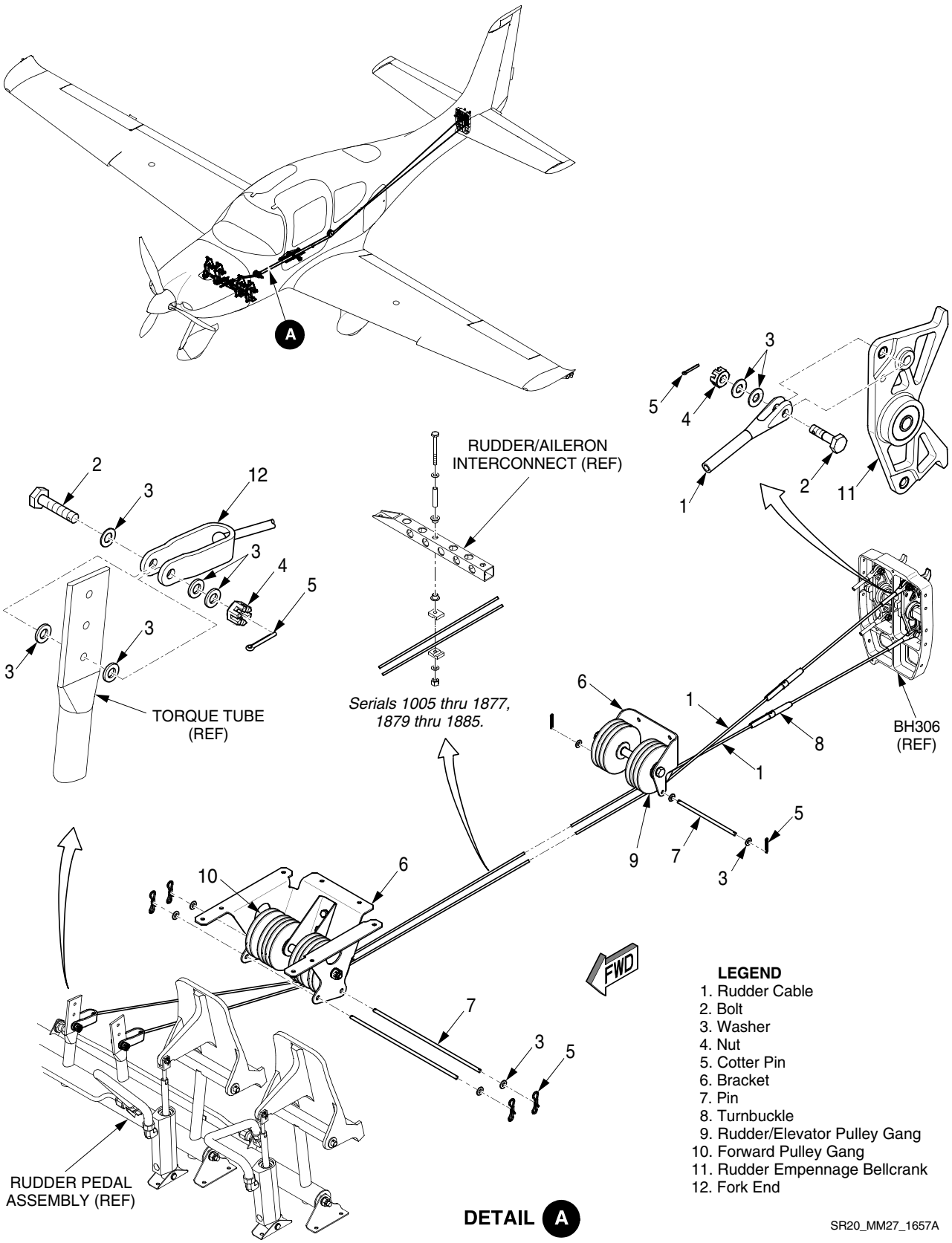


Figure 27-202
Rudder System Cables - Serials 1307 & subs

EFFECTIVITY:
Serials 1307 & subs

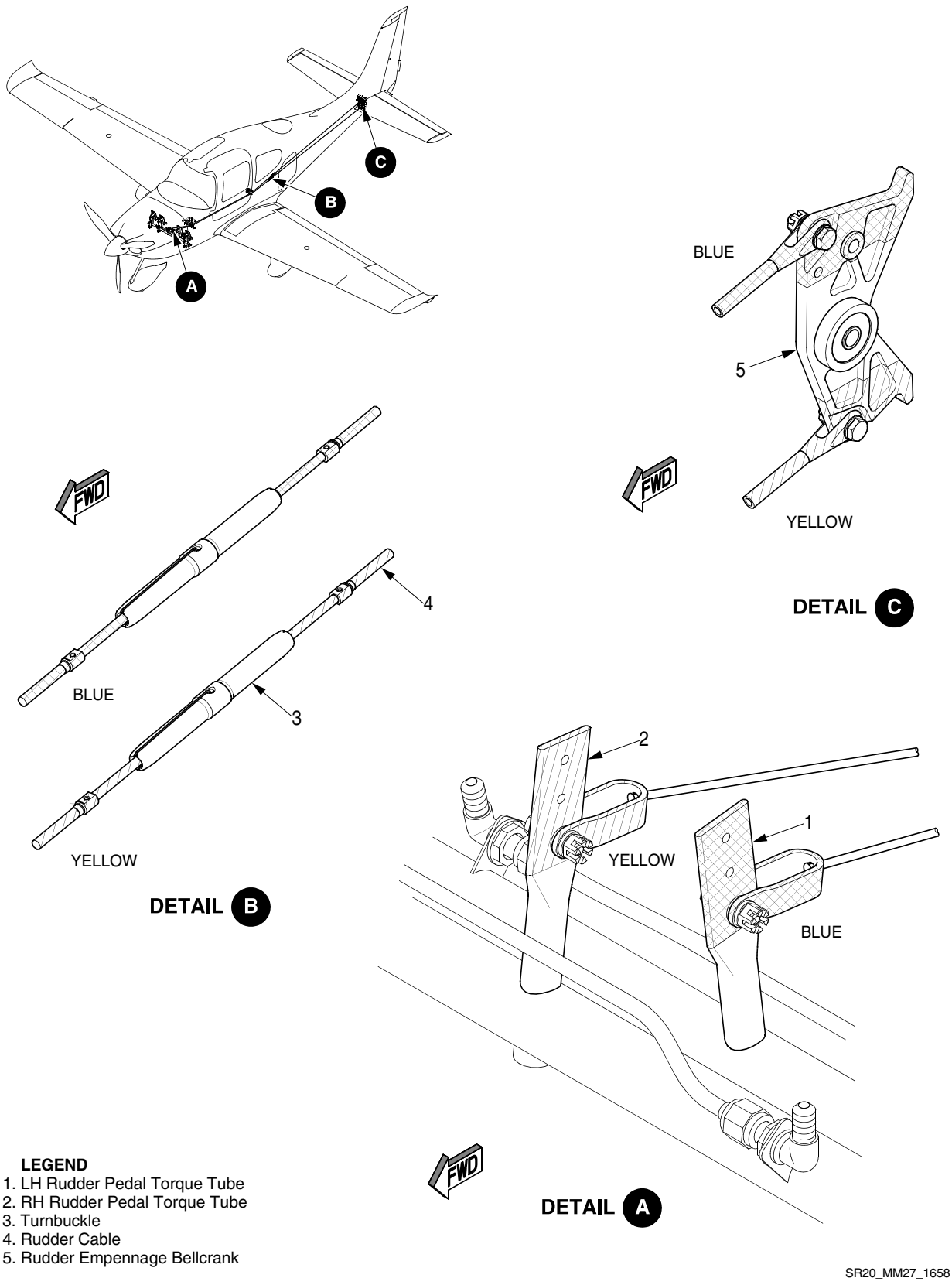
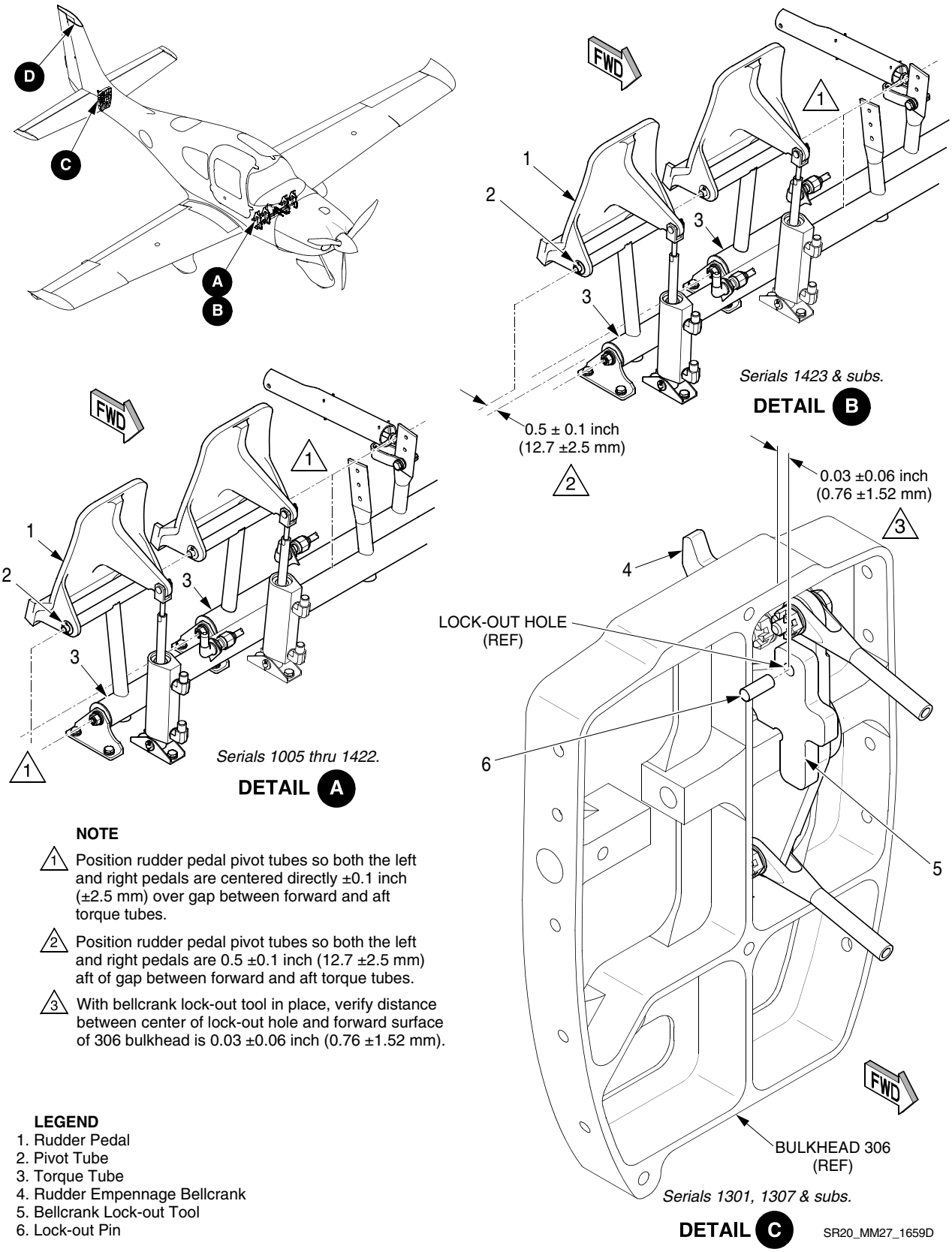


Figure 27-203
Color Identification - Serials 1307 & subs



NOTE

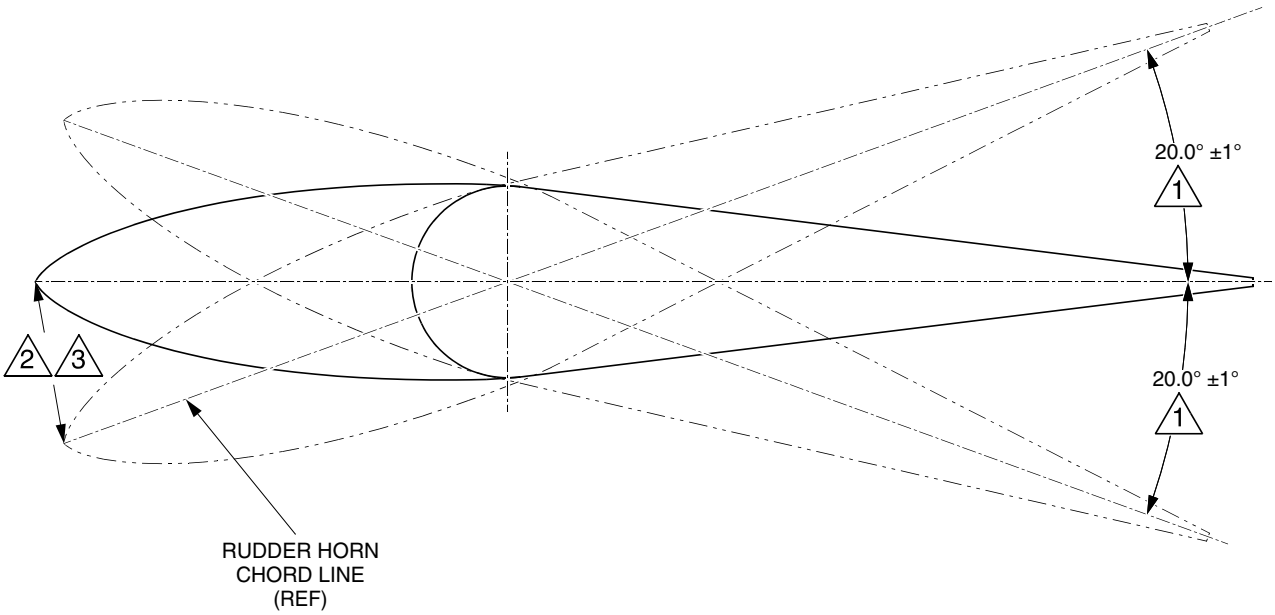
1. Position rudder pedal pivot tubes so both the left and right pedals are centered directly ±0.1 inch (±2.5 mm) over gap between forward and aft torque tubes.
2. Position rudder pedal pivot tubes so both the left and right pedals are 0.5 ±0.1 inch (12.7 ±2.5 mm) aft of gap between forward and aft torque tubes.
3. With bellcrank lock-out tool in place, verify distance between center of lock-out hole and forward surface of 306 bulkhead is 0.03 ±0.06 inch (0.76 ±1.52 mm).

LEGEND

1. Rudder Pedal
2. Pivot Tube
3. Torque Tube
4. Rudder Empennage Bellcrank
5. Bellcrank Lock-out Tool
6. Lock-out Pin

Figure 27-204
Rudder Rigging (Sheet 1 of 2)

EFFECTIVITY:
All



DETAIL D

NOTE

1. With full left/right rudder applied, verify rudder deflection angle is equal to 20° ±1°.

2. *Serials 1005 thru 1422:* Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.6 - 6.0 inches (14.2 - 15.2 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn.

3. *Serials 1423 & subs:* Typically, the correct rudder deflection (20° ±1°) is obtained by measuring 5.8 - 6.2 inches (14.7 - 15.8 cm) between chord line at upper leading edge of vertical stabilizer and chord line at lower leading edge of deflected rudder horn.

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Figure 27-204
Rudder Rigging (Sheet 2 of 2)

C. Rudder Pedal Assembly (See Figure 27-205)

(1) Removal - Rudder Pedal Assembly

(a) Remove pilot and co-pilot seats. (Refer to 25-10)

(b) Remove left mid console circuit breaker trim panel. (Refer to 25-10)

(c) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

(d) Identify and loosen rudder cable tension via turnbuckle.

(e) Remove yaw trim cartridge. (Refer to 27-20)

(f) Remove cotter pin, nut, washers, and bolt securing cable fork ends to torque tube actuation arm.

(g) Disconnect springs from firewall and torque tube actuation arms.

(h) Remove cotter pins, washers, and clevis pins from upper connection at rudder pedals of each master cylinder.

(i) Remove cotter pin and washers from rudder pedal pivot tube.

(j) Slide rudder pedal pivot tube from bearing.

(k) Detach rudder pedal from torque tube weldment.

(l) Disconnect brake lines at torque tube fittings. Cap brake lines and fittings.

(m) Remove carpet and forward access panels CF1R and CF1L to gain access to torque tube mounting nuts. (Refer to 06-00)

(n) Remove cotter pin, nut, washers, and bolt securing rudder pedal assembly and bracket to floor.

(o) Remove torque tube assembly from airplane.

(2) Installation - Rudder Pedal Assembly

(a) Align torque tube assembly and bracket over mounting holes on airplane floor and install bolts, washers, nuts, and cotter pins securing torque tube assembly to airplane floor.

(b) Perform Inspection/Check - Torque Tube Gap Tolerance. (Refer to 27-20)

(c) Install forward access panels CF1R and CF1L. (Refer to 06-00)

(d) Install carpet. (Refer to 25-10)

(e) Connect brake lines at torque tube fittings. (Refer to 32-42)

(f) Align rudder pedal on torque tube weldment, insert rudder pedal pivot tube, and install washer and cotter pin.

(g) Install clevis pin, washers, and cotter pin securing rudder pedal to upper connection on master cylinder.

(h) Connect springs to firewall and torque tube actuation arms

(i) Install bolt, washers, nut and cotter pin securing cable fork ends to torque tube actuation arms.

(j) Install yaw trim cartridge. (Refer to 27-20)

(k) Perform Inspection/Check - Rudder Pedal Assembly. (Refer to 27-20)

(l) Install carpet and access panel CF5. (Refer to 06-00)

(m) Install left mid console circuit breaker trim panel. (Refer to 25-10)

(n) Install pilot and co-pilot seats. (Refer to 25-10)

(o) Bleed brake system. (Refer to 32-42)

(3) Inspection/Check - Torque Tube Gap Tolerance

Note: Gap between flange on bushing and rudder pedal torque tube must not exceed 0.06 inch (1.5 mm). Prior to measuring gap, push torque tube assembly to opposing side.

(a) Push torque tube assembly to opposite side of where measurement is being made and place feeler gauge between bushing and torque tube to verify gap is within tolerance throughout full range of pedal motion.

(b) If necessary, adjust Torque Tube Gap Tolerance:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Washer	NAS1149F0463P	Any Source	Obtain gap tolerance.

Note: To maintain correct rudder system cable tension remove one rudder pedal bracket at a time, always leaving one end of torque tube attached to cabin floor.

2 Remove nuts, washers, and bolts securing bracket to floor.

3 Remove bracket and bushing from end of torque tube.

4 Remove nut, washer, and bolt securing bushing to bracket.

Note: Up to two additional washers may be added on one end of torque tube to obtain gap tolerance.

5 Add washer(s) between bracket and bushing as required to obtain gap tolerance.

6 Install bolt, washer, and nut securing bushing to bracket. Verify bolt clamps bushing tight against bracket.

7 Coat bushing with oil and insert bushing assembly into torque tube.

8 Install bolts, washers, and nuts securing bracket to airplane floor.

9 Verify gap between bushing and torque tube does not exceed 0.06 inch (1.5 mm). If necessary, re-adjust Torque Tube Gap Tolerance.

(4) Inspection/Check - Rudder Pedal Assembly

(a) Verify torque tube bushing attach bolt torque is 50 - 70 in-lb (5.6 - 7.9 Nm)

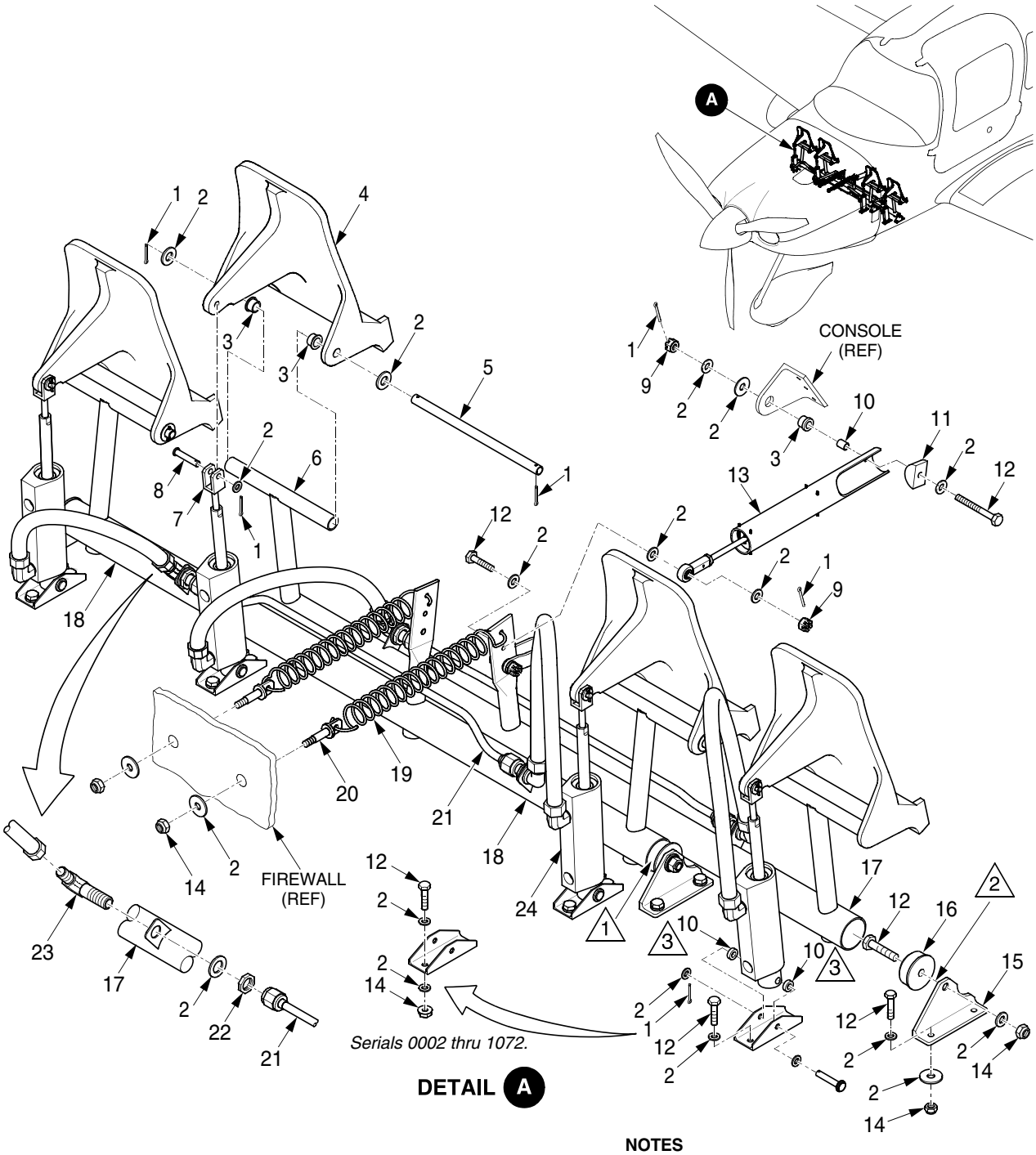
(b) Verify positive rudder pedal clearance through full range of pedal motion from brake lines and any other console structure or systems.

D. Rudder Pedal Bracket (See Figure 27-205)

During the removal and installation of the rudder pedal brackets, it is important to maintain the correct rudder system cable tension. Remove one bracket at a time, always leaving one end of torque tube firmly attached to cabin floor.

(1) Removal - Rudder Pedal Bracket
- (a) Remove pilot and co-pilot seats. (Refer to 25-10)
- (b) Remove carpet and forward access panels CF1R and CF1L to gain access to rudder pedal bracket mounting nuts. (Refer to 06-00)
- (c) Remove nuts, washers, and bolts securing bracket to floor.
- (d) Remove bracket and bushing from end of torque tube.
- (e) Remove nut, washer, and bolt securing bushing to bracket.

(2) Installation - Rudder Pedal Bracket
- (a) Install nut, washer, and bolt securing bushing to bracket. Verify bolt clamps bushing tight against bracket.
- (b) Coat bushing with oil and insert bushing assembly into torque tube.
- (c) Install bolts, washers, and nuts securing bracket to airplane floor
- (d) Perform Inspection/Check - Torque Tube Gap Tolerance. (Refer to 27-20)
- (e) Install forward access panels CF1R and CF1L and carpet. (Refer to 06-00)
- (f) Install pilot and co-pilot seats. (Refer to 25-10)



LEGEND

1. Cotter Pin
2. Washer
3. Bushing
4. Rudder Pedal
5. Rudder Pedal Pin
6. Weldment Tube
7. Clevis
8. Clevis Pin
9. Castellated Nut
10. Spacer
11. Cartridge Spacer
12. Bolt
13. Yaw Trim Cartridge
14. Nut
15. Torque Tube Bracket
16. Torque Tube Bushing
17. Left Torque Tube
18. Right Torque Tube
19. Spring
20. Eye Bolt
21. Brake Line
22. Jam Nut
23. Fitting
24. Master Cylinder

NOTES

1. Measure gap between flange on bushing and end of Rudder Pedal Torque Tube Bracket. Maximum gap tolerance is 0.06 inch (1.5 mm).
2. Up to two additional washers may be installed on one end of torque tube to obtain gap tolerance.
3. Serials 1601 & subs,
   Serials 1005 thru 1600 after SB 2X-32-13.

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Figure 27-205
Rudder Pedal Installation

E. Forward Pulley Gang (See Figure 27-106), (See Figure 27-107)

The forward pulley gang is used to route the aileron, rudder, and elevator system control cables. Maintenance practices pertinent to the forward pulley gang are covered under the Aileron and Roll Trim System. (Refer to 27-10)

F. Rudder/Elevator Pulley Gang (See Figure 27-206)

(1) Removal - Rudder/Elevator Pulley Gang

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spacer Block 7 3/8” x 2” (18.73 x 5.08 cm)	-	Any Source	Spacer for holding neutral rudder position.

(b) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

Note: Prior to removing turnbuckles, position spacer block between rudder pedals and firewall to support spring tension.

(c) Identify and loosen rudder and elevator cable tension via turnbuckle.

(d) Remove cotter pin, nut, washers, spacers, and bolt securing pulleys to rudder/elevator pulley gang bracket and remove components from airplane.

(2) Installation - Rudder/Elevator Pulley Gang

(a) Position and install bolt, spacers, washers, nut, and cotter pin securing pulleys to rudder/elevator pulley gang bracket.

(b) Rig rudder system and perform Adjustment/Test - Rudder System Rigging. (Refer to 27-20) (Refer to 27-20)

(c) Rig elevator system and perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30) (Refer to 27-30)

(d) Install fuselage floor access panel CF5 and carpet. (Refer to 06-00)

G. Empennage Pulley Gang - *Serials 1005 thru 1306* **(See Figure 27-207)**

(1) Removal - Empennage Pulley Gang

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spacer Block 7 3/8” x 2” (18.73 x 5.08 cm)	-	Any Source	Spacer for holding neutral rudder position.

(b) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

Note: Prior to removing turnbuckles, position spacer block between rudder pedals and firewall to support spring tension.

(c) At access panel CF5, remove turnbuckles from rudder and elevator cables.

(d) Remove fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(e) Loosen jam nuts securing rudder and elevator push/pull rods to rudder and elevator actuation pulleys.

(f) Remove cotter pin, nut, washer, spacer, and bolt securing rudder push/pull rod to rudder bellcrank.

(g) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod to elevator bellcrank.

(h) Unscrew rudder push/pull rod from rod end attached to rudder actuation pulley and remove from airplane.

(i) Unscrew elevator push/pull rod from rod end attached to elevator actuation pulley and remove from airplane.

(j) Remove nut, washer, and screw securing support brace to empennage, loosen jam nut securing support brace to pulley gang, and remove support brace from airplane.

(k) Gain access to pulley gang mounting bracket through access hole in FS 306 bulkhead and remove bolts securing pulley gang to bulkhead. Remove gang assembly from airplane.

(l) Remove cotter pins and washers securing pulley guard pins to empennage pulley gang bracket and remove pins.

(m) Cut safety wire securing cables to actuation pulleys.

(n) At access hole CF5, pull rudder and elevator cables through. Remove cables from airplane.

(2) Installation - Empennage Pulley Gang

(a) Prior to empennage pulley gang installation, secure rudder and elevator cables to actuation pulleys with safety wire and insert pulley guard pins, install washers and cotter pins

(b) Route rudder and elevator cables through access hole RE1 forward to access hole CF5.

(c) Insert pulley gang into empennage and position gang assembly over holes in FS 306 bulkhead. Install bolts securing pulley gang to bulkhead.

(d) Screw rudder push/pull rod onto rod end attached to rudder actuation pulley and tighten jam nut.

(e) Screw elevator push/pull rod onto rod end attached to elevator actuation pulley and tighten jam nut.

(f) Install bolt, spacer, washer, nut, and cotter pin securing rudder push/pull rod to rudder bellcrank.

(g) Install bolt, washers, nut, and cotter pin securing elevator push/pull rod to elevator bellcrank.

(h) Install screw, washer, and nut securing pulley gang support brace to empennage.

(i) Install rudder and elevator cables. (Refer to 27-20) (Refer to 27-20)

(j) Install access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(k) Install carpet and access panel CF5. (Refer to 06-00)

(3) Inspection/Check - Empennage Pulley Gang

(a) Remove fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(b) Verify positive clearance of pulleys through full range of rudder and elevator movement.

(c) Verify positive clearance between pitch trim cartridge and FS 306 bulkhead through full range of elevator and trim motor operation.

(d) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(e) Verify proper safety wire and cotter pin installation on all fasteners.

(f) Install fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

H. Empennage Bellcranks - *Serials 1307 & subs* (See Figure 27-208)

(1) Removal - Empennage Bellcranks

(a) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

Note: Prior to removing turnbuckles, position spacer block between rudder pedals and firewall to support spring tension.

(b) At access panel CF5, remove turnbuckles from rudder and elevator cables.

(c) Remove fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(d) Loosen jam nuts securing rudder and elevator push/pull rods to rudder and elevator empennage bellcranks.

(e) Remove cotter pin, nut, washers, and bolt securing rudder push/pull rod to rudder bellcrank.

(f) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod to elevator bellcrank.

(g) Unscrew rudder push/pull rod from rod end attached to rudder empennage bellcrank and remove from airplane.

(h) Unscrew elevator push/pull rod from rod end attached to elevator empennage bellcrank and remove from airplane.

(i) Remove plug covering end of bulkhead shaft.

(j) Remove bolt and washer securing bulkhead shaft to bulkhead.

(k) Remove bulkhead shaft and bellcranks from airplane.

(l) At access hole CF5, pull rudder and elevator cables through. Remove cables airplane.

(2) Installation - Empennage Bellcranks

(a) Route rudder and elevator cables through access hole RE1 forward to access hole CF5.

(b) Insert bellcranks into empennage and position bulkhead shaft through bulkhead and bellcranks.

Note: Ensure bolt engages threaded insert to within 0.063 inch (1.6 mm) of flush with bulkhead surface or protrudes past bulkhead surface.

(c) Install bolt and washer securing bulkhead shaft to bulkhead.

(d) Install plug covering end of bulkhead shaft.

(e) Screw rudder push/pull rod onto rod end attached to rudder empennage bellcrank and tighten jam nut.

(f) Screw elevator push/pull rod onto rod end attached to elevator empennage bellcrank and tighten jam nut.

(g) Install bolt, spacer, washer, nut, and cotter pin securing rudder push/pull rod to rudder bellcrank.

(h) Install bolt, washers, nut, and cotter pin securing elevator push/pull rod to elevator bellcrank.

(i) Install rudder and elevator cables. (Refer to 27-20), (Refer to 27-20)

(j) Install access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(k) Install carpet and access panel CF5. (Refer to 06-00)

(3) Inspection/Check - Empennage Bellcranks

(a) Remove fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

(b) Verify positive clearance of bellcranks through full range of rudder and elevator movement.

(c) Verify positive clearance between pitch trim cartridge and vertical stabilizer bulkhead through full range of elevator and trim motor operation.

(d) Verify minimum rod end thread engagement of 0.313 inch (0.79 cm).

(e) Verify proper safety wire and cotter pin installation on all fasteners.

(f) Install fuselage access panels RE1, RE2, LE1, and LE2. (Refer to 06-00)

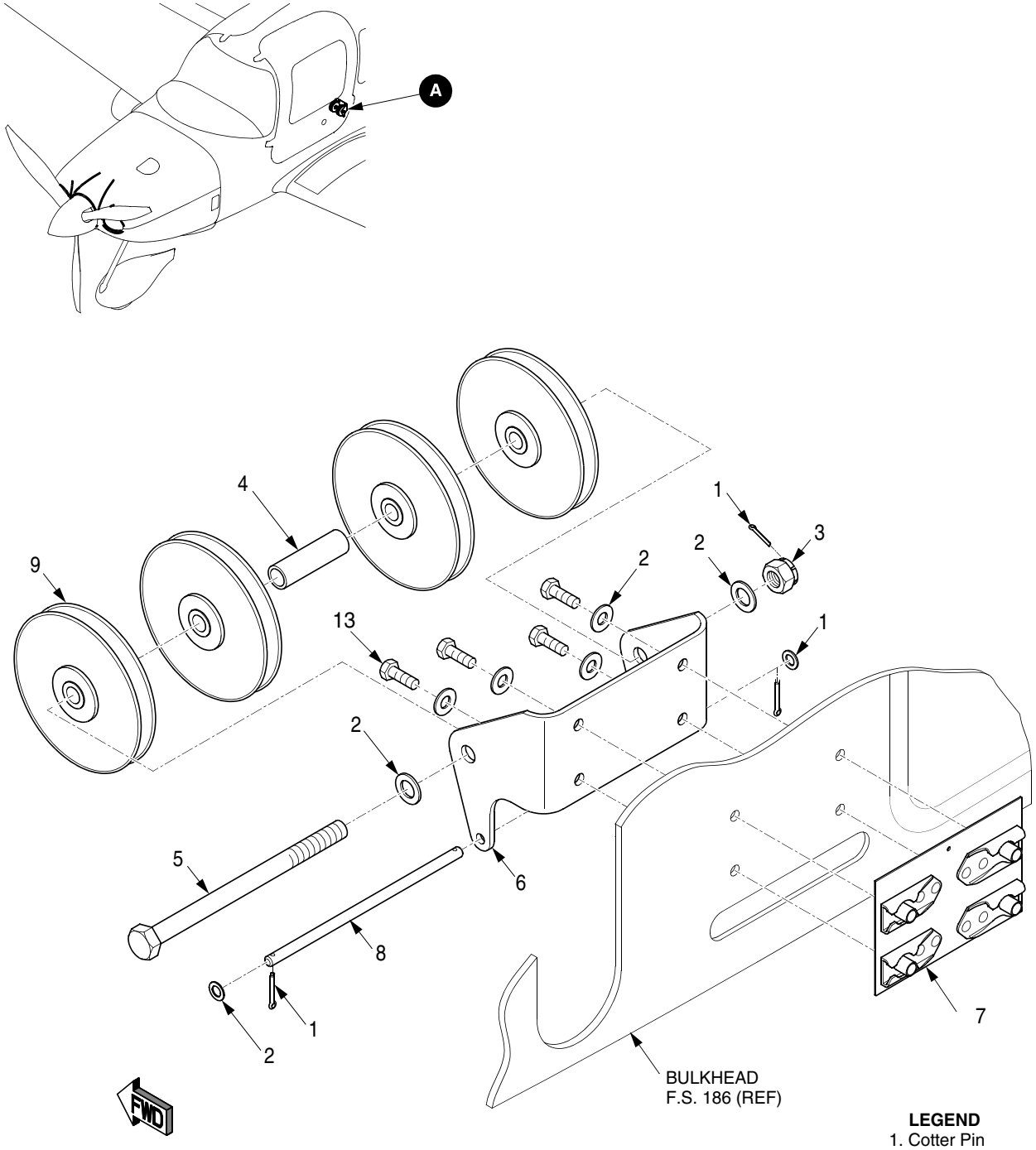
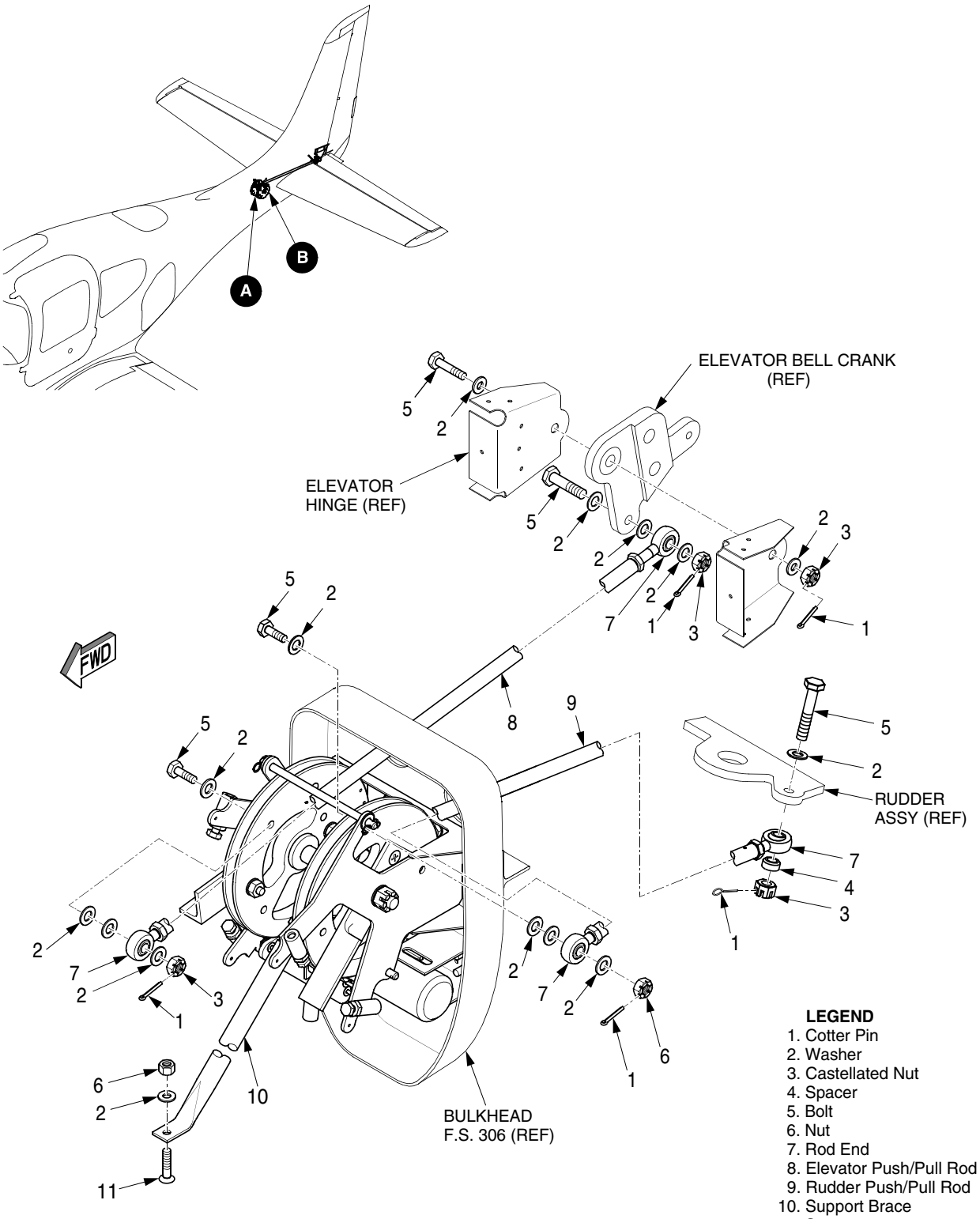


Figure 27-206
Rudder/Elevator Pulley Gang



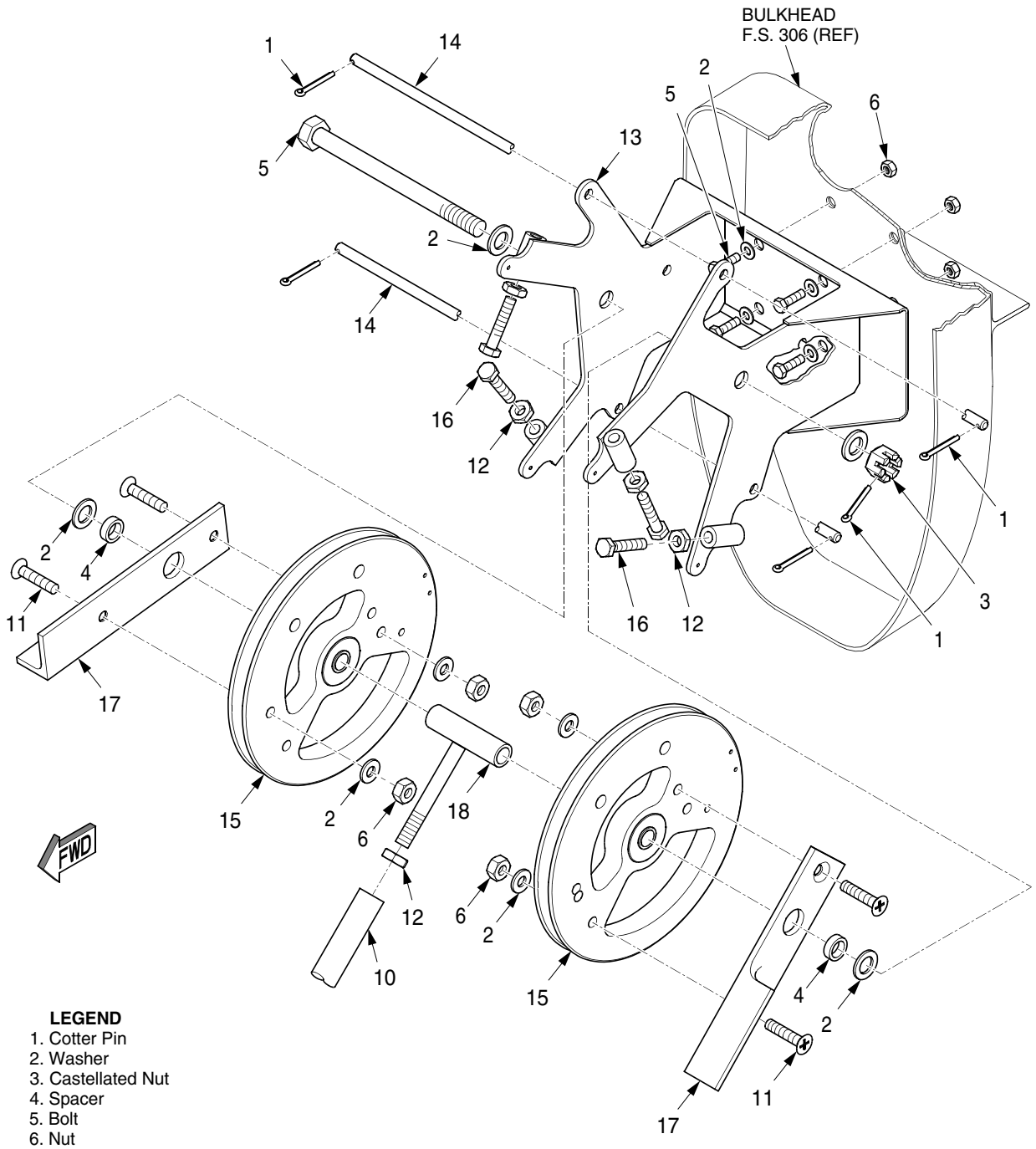
DETAIL A

Serials 1005 thru 1300, 1302 thru 1306.

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Figure 27-207
Empennage Pulley Gang - Serials 1005 thru 1306 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1306



LEGEND

1. Cotter Pin
2. Washer
3. Castellated Nut
4. Spacer
5. Bolt
6. Nut
10. Support Brace
11. Screw
12. Jam Nut
13. Pulley Bracket
14. Pin
15. Pulley
16. Stop Bolt
17. Pulley Stop
18. Support Rod Weldment

DETAIL B

Serials 1005 thru 1300, 1302 thru 1306.

SR20_MM27_1179C

Figure 27-207
Empennage Pulley Gang - Serials 1005 thru 1306 (Sheet 2 of 2)

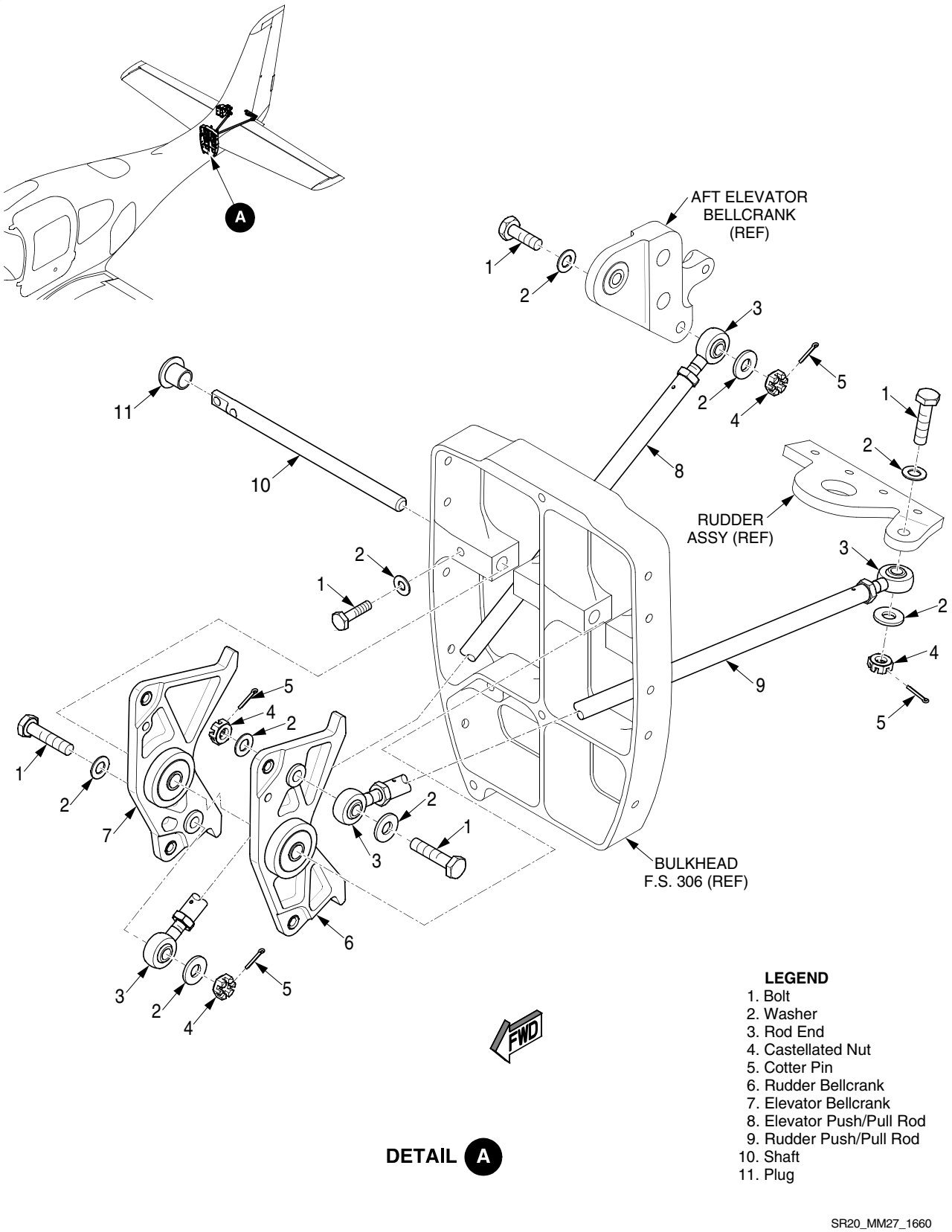


Figure 27-208
Empennage Bellcranks - Serials 1307 & subs

EFFECTIVITY:
Serials 1307 & subs

I. Yaw Trim Cartridge (See Figure 27-205)

(1) Removal - Yaw Trim Cartridge

(a) Remove left mid console circuit breaker trim. (Refer to 25-10)

(b) Remove cotter pin, nut, washers, bushing, spacers, and bolt securing trim cartridge to console bracket.

(c) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to left torque tube actuation arm and remove from airplane.

(2) Installation - Yaw Trim Cartridge

(a) Install bolt, washers, nut, and cotter pin securing trim cartridge push/pull rod to left torque tube actuation arm.

(b) Install bolt, washers, bushing, spacers, nut, and cotter pin securing trim cartridge to console bracket.

(c) Perform Inspection/Check - Yaw Trim Cartridge. (Refer to 27-20)

(d) Install left mid console circuit breaker trim. (Refer to 25-10)

(3) Inspection/Check - Yaw Trim Cartridge

(a) Verify correct rudder system rigging. (Refer to 27-20) (Refer to 27-20)

(b) Verify yaw trim cartridge is adjusted to hold rudder in neutral position ±1°.

(c) Verify positive clearance between trim cartridge and actuation pulley under full range of trim motor positions.

(d) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(e) Verify proper installation of safety wires and cotter pins on all fasteners.

J. Rudder Trim Tab

Yaw trim adjustment is ground adjustable only and is achieved by changing the deflection angle of the rudder trim tab. For maintenance practices pertinent to the rudder trim tab, see Rudder. (Refer to 55-40)

K. Rudder-Aileron Interconnect - *Serials 1005 thru 1885* **(See Figure 27-209)**

(1) Removal - Rudder-Aileron Interconnect

(a) Remove rear passenger compartment carpet. (Refer to 25-10)

(b) Remove cabin floor access panel 3C. (Refer to 06-00)

(c) Remove passenger seats. (Refer to 25-10)

(d) Remove nuts, washers, cable clamps, and screws securing bungee cord to RH aileron cable.

(e) Remove nut, washers, spacer, cable clamps, and bolt securing RH rudder cable to rudder-aileron interconnect arm.

(f) Remove washers, bolts, and shim securing interconnect bracket to LH longeron and remove rudder-aileron interconnect arm from airplane.

(2) Disassembly - Rudder-Aileron Interconnect

(a) Remove nut, washers, bungee clamp, and bolt securing bungee cord to rudder-aileron interconnect arm.

(3) Assembly - Rudder-Aileron Interconnect

Note: Verify bungee cord fits to contour of channel between clamps.

(a) Position upper and lower bungee clamps over center of bungee cord.

(b) Position bungee clamps to end of rudder-aileron interconnect arm so that arm is located between upper and lower bungee clamps.

Note: If required, add an additional washer to ensure correct thread engagement.

(c) Install bolt, washers, bungee clamps, nut, and cotter pin securing bungee cord to rudder-aileron interconnect arm. Torque bolt to 45 ±2 in-lb (5.1 ±0.2 Nm).

(4) Installation - Rudder-Aileron Interconnect

(a) Install shim, bolts, and washers securing interconnect bracket to LH longeron.

CAUTION: To prevent interference with adjacent control cables, forward edge of rudder-aileron interconnect arm must be oriented 90° +5°/-0° to the control cables.

(b) Verify forward edge of rudder-aileron interconnect arm is positioned at 90° +5°/-0° perpendicular to the control cables.

Note: To increase clearance between LH and RH rudder cables, install rudder cable clamps so that RH rudder cable is inboard of cable clamp attach bolt.

(c) Install bolt, cable clamps, spacer, washers, and nut securing RH rudder cable to rudder-aileron interconnect arm.

CAUTION: If not oriented properly, the cable clamps may interfere with attaching hardware at the bungee clamps. Verify cable clamps are positioned so that screws are oriented vertically.

(d) Install screws, cable clamps, washers, and nuts securing bungee cord adel clamps to RH aileron cable. Torque nuts between 45 - 50 in-lb (5.1 - 5.6 Nm).

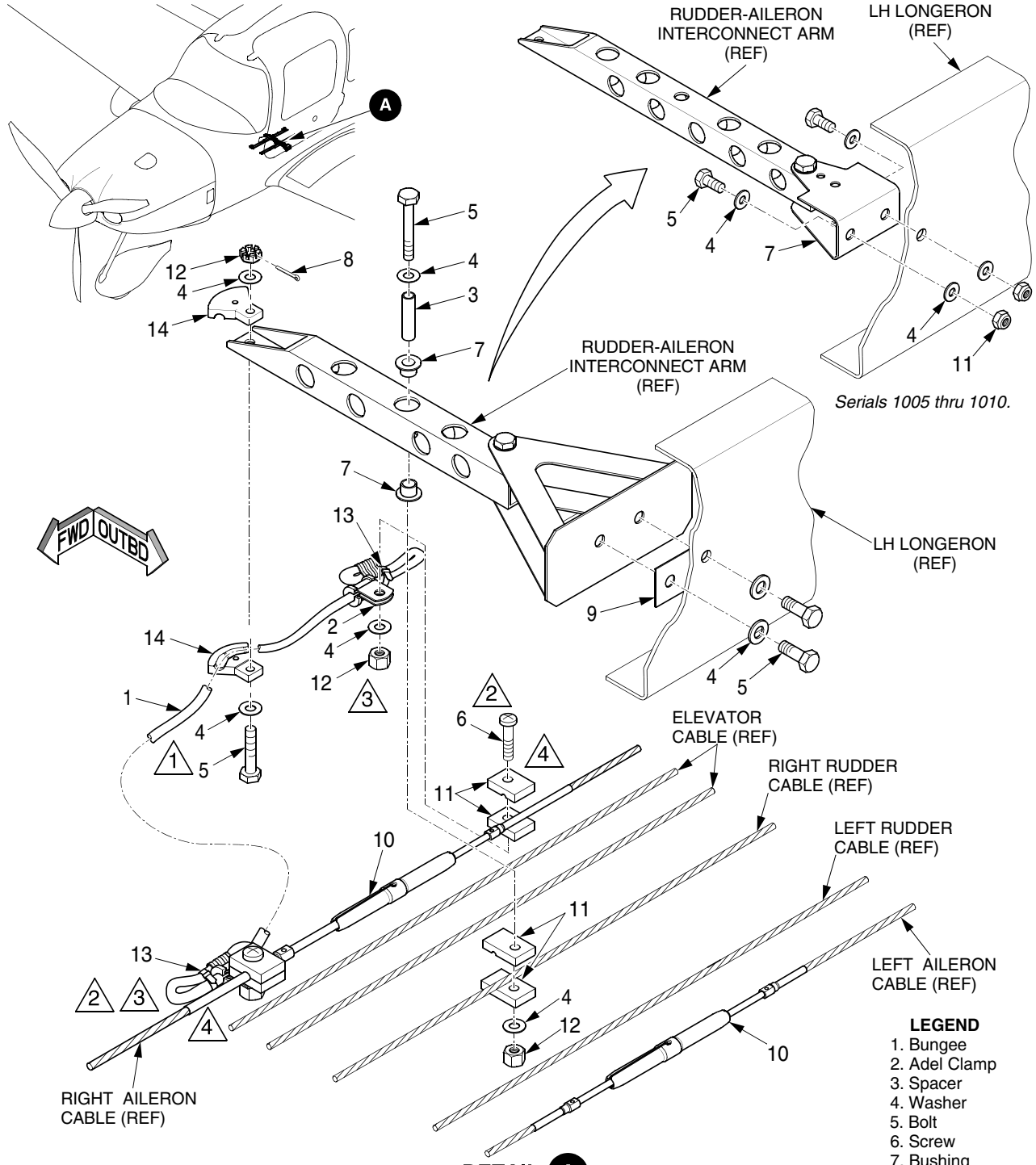
(e) Perform Adjustment/Test - Rudder-Aileron Interconnect. (Refer to 27-20)

(f) Perform Inspection/Check - Rudder-Aileron Interconnect. (Refer to 27-20)

(g) Install passenger seats. (Refer to 25-10)

(h) Install cabin floor access panel 3C. (Refer to 06-00)

(i) Install rear passenger compartment carpet. (Refer to 25-10)



LEGEND

1. Bungee
2. Adel Clamp
3. Spacer
4. Washer
5. Bolt
6. Screw
7. Bushing
8. Cotter Pin
9. Shim
10. Turnbuckle
11. Cable Clamp
12. Nut
13. Cable Tie
14. Bungee Clamp

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NOTE

1. It is allowable to add an additional washer to ensure correct thread engagement.
2. If not oriented properly, the cable clamps may interfere with attaching hardware at the bungee clamp. Verify cable clamps are positioned so that screws are oriented vertically.
3. Torque nut between 45 - 50 in-lb (5.1 - 5.6 Nm).
4. Do not install washer below head of screw. Only one washer is required at nut.

Figure 27-209
Rudder-Aileron Interconnect Installation - Serials 1005 thru 1885

(5) Adjustment/Test - Rudder-Aileron Interconnect **(See Figure 27-2010)**

Note: Improper rudder-aileron interconnect adjustment may effect autopilot roll trim and roll performance.

Verify that ailerons and rudder are properly rigged in accordance with 27-10 and 27-20 to ensure proper flight control surface operation prior to modification of rudder-aileron interconnect system. (Refer to 27-10) (Refer to 27-20)

The interconnect must be adjusted so that full rudder application will meet the requirements of 14 CFR 23.177 or optionally:

full LH rudder deflection causes 5° minimum, 8° maximum RH aileron trailing edge down;

full RH rudder deflection causes 5° minimum, 8° maximum LH aileron trailing edge down.

To adjust the interconnect, perform the following procedure:

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
WS 144 Rigging Template	13057-109	Cirrus Design Duluth, MN 55811 218-727-2737	Aileron rigging.

(b) Remove rear passenger compartment carpet. (Refer to 25-10)

(c) Remove cabin floor access panel 3C. (Refer to 06-00)

(d) Verify rudder and aileron are in the neutral position.

(e) Verify rudder-aileron interconnect arm is perpendicular to the control cables.

(f) Verify the forward aileron bungee clamp is positioned aft, against the swage end of the cable terminal.

(g) Verify the aft aileron bungee clamp is positioned forward, against the swage end of the cable terminal.

(h) Position WS 144 rigging template on wing.

(i) Verify full LH rudder deflection causes 5° - 8° RH aileron trailing edge down.

(j) Verify full RH rudder deflection causes 5° - 8° LH aileron trailing edge down.

(k) If downward motion is less than 5°, too much slack exists. Reduce slack by pulling bungee cord from forward and aft aileron cable clamps away from interconnect arm.

(l) If downward motion is greater than 8°, too much tension exists. Reduce tension by pulling bungee cord from forward and aft aileron cable clamps toward interconnect arm.

(m) If excess bungee cord exists at ends:

1 Fold bungee cord end towards the cable clamps and install cable tie securing bungee cord end to itself.

2 Position excess bungee cord below cable clamps to eliminate any interference with bottom of interconnect arm.

3 Ensure cable tie is tightly secured and snug against the clamps.

4 Repeat with opposite end of bungee cord.

(n) With rudder and aileron neutral, verify that at full aileron trim travel, the bungee cord does not interfere with trim travels or cause rudder movement.

1 To ensure bungee cord is not interfering with full RH trim travels, trim roll trim to full right. Verify rudder does not move.

2 To ensure bungee cord is not interfering with full LH trim travels, trim roll trim to full left. Verify rudder does not move.

(o) Verify that steady rudder application will move the ailerons the required travel.

(p) Cycle RH aileron cable forward and aft several times. Verify cable clamps remain positioned so that screws are oriented vertically. If clamp orientation is altered due to cable rotation, loosen screw, correct clamp orientation, and re-torque nut.

(q) Install cabin floor access panel 3C. (Refer to 06-00)

(r) Install rear passenger compartment carpet. (Refer to 25-10)

(6) Inspection/Check - Rudder-Aileron Interconnect

(a) Verify interconnect adjustment will meet the requirements of 14 CFR 23.177 or optionally:

1 full LH rudder deflection causes 5° minimum, 8° maximum RH aileron trailing edge down.

2 full RH rudder deflection causes 5° minimum, 8° maximum LH aileron trailing edge down.

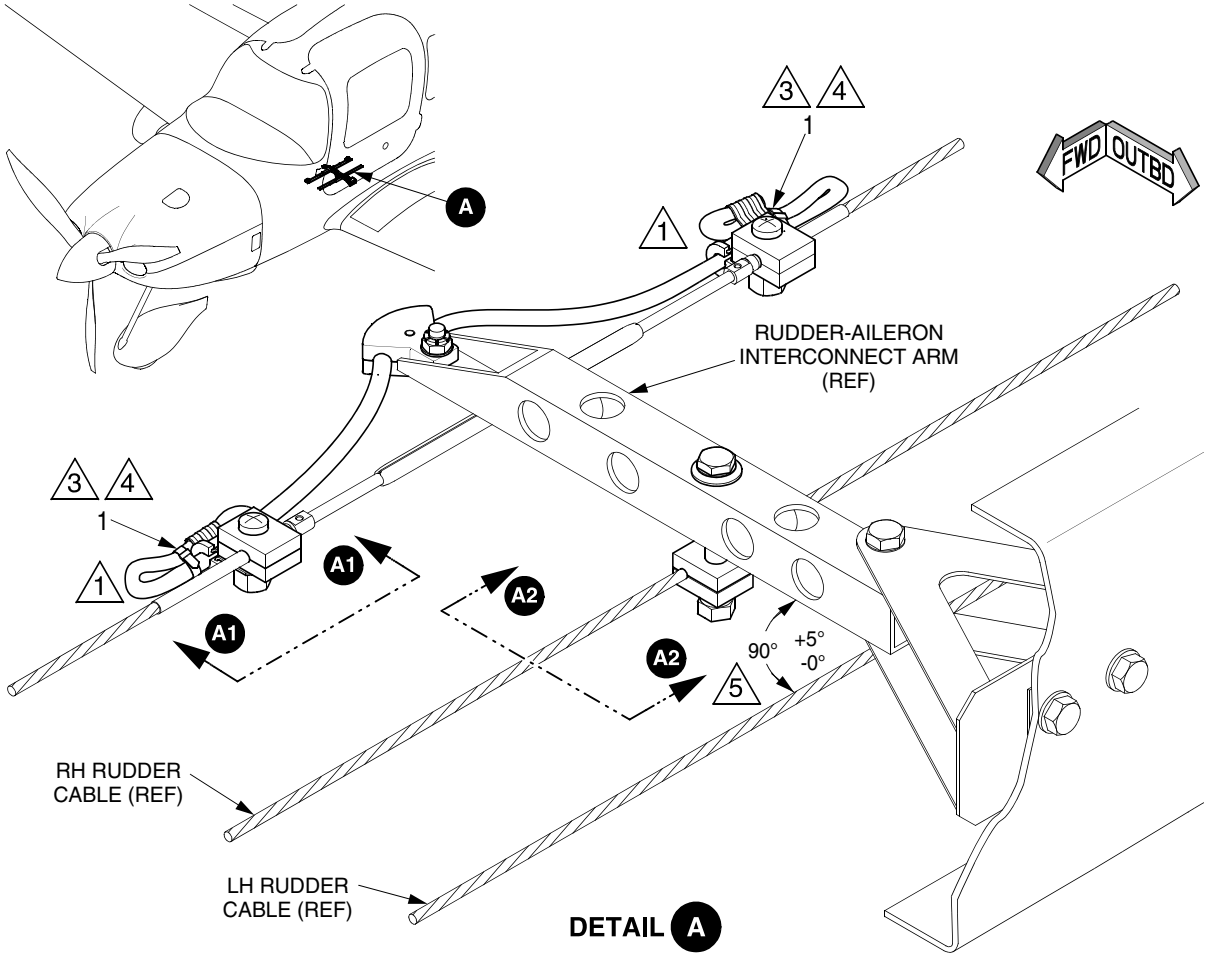
(b) Verify bungee cord ends are folded back upon themselves and secured with cable ties.

(c) Verify cable ties are tightly secured and do not slide on bungee cords.

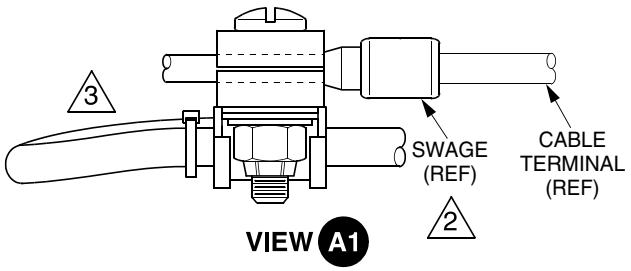
(d) Verify positive bungee cord clearance under slack and full cross control movement.

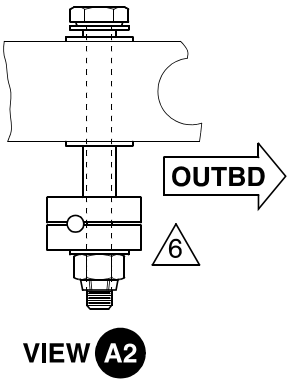
(e) With full LH rudder and full RH aileron applied, verify that in crossed controls condition that attaching hardware at bungee clamp does not interfere with attaching hardware at aileron cable clamps.

(f) With full RH rudder and full LH aileron applied, verify that in crossed controls condition that attaching hardware at bungee clamp does not interfere with attaching hardware at aileron cable clamps.



Serials 1005 thru 1877, 1879 thru 1885.





NOTE

1. Verify adel clamps are parallel to cable clamps.
2. Install cable clamp against the swage end of the cable terminal. Ensure cable clamps are not installed over tapered end of swage.
3. Fold bungee cord end towards the clamp and install cable tie securing bungee cord end to itself. Position excess bungee cord below cable clamps to eliminate any interference with bottom of interconnect arm.
4. Ensure cable tie is tightly secured and snug against the clamps.
5. To prevent interference with adjacent control cables, forward edge of rudder-aileron interconnect arm must be oriented 90° +5°/-0° to the control cables.
6. RH rudder cable only: To facilitate increased clearance between LH and RH rudder cables, install rudder cable clamps so that RH rudder cable is inboard of cable clamp attach bolt.

LEGEND
1. Cable Tie

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Figure 27-2010
Rudder-Aileron Interconnect Adjustment/Test - Serials 1005 thru 1885

ELEVATOR AND PITCH TRIM SYSTEM

1. DESCRIPTION

This section describes that portion of the flight control system which controls the position and movement of the elevator. Included are; elevator system torque tube, rigging, push/pull rods, pulleys, and pitch trim cartridge, and pitch relays.

Serials 1005 thru 1300, 1302 thru 1306: Elevator control motion is transferred by the control yoke through a linkage to a pulley sector mounted on the elevator torque tube. From the pulley sector, control motion is passed to a single cable system which is routed through the forward pulley gang at the bottom of the center console, through to the rudder/elevator pulley gang under the baggage floor, and finally to the elevator actuation pulley. The elevator actuation pulley drives a push/pull rod attached to the elevator bellcrank which is bolted directly to the elevators. Each set of pulleys has a cable retainer to prevent fouling. Adjustable control stops at the elevator actuation pulley limit control surface travel.

Serials 1301, 1307, & subs: Elevator control motion is transferred by the control yoke through a linkage to a bellcrank weldment on the elevator torque tube. From the bellcrank, control motion is transferred to a single cable system which is routed to the forward pulley gang at the bottom of the center console, through to the rudder/elevator pulley gang under the baggage floor, and finally to the elevator empennage bellcrank. The elevator empennage bellcrank drives a push/pull rod attached to the aft elevator bellcrank which is bolted directly to the elevators. Each set of pulleys has a cable retainer to prevent fouling. Fixed control stops at the elevator empennage bellcrank limit control surface travel.

The pitch trim system employs a ground adjustable trim tab and a spring cartridge activated by an electric motor. The spring cartridge, directly connected to the elevator bellcrank and the electric trim motor, provides a centering force regardless of the direction of control surface deflection. When activated, the trim motor moves the spring cartridge causing the elevator bellcrank to move the elevator to a new trimmed position. A 4-way switch, mounted on both yoke grips, controls the pitch trim system.

WARNING: A system rigging Inspection/Check must be performed after loosening any flight control cable to assure proper control surface operation. Refer to the appropriate control system's rigging procedures for the Inspection/Check maintenance practices.

2. MAINTENANCE PRACTICES

A. Elevator System Cables - *Serials 1005 thru 1300, 1302 thru 1306* (See Figure 27-301)

(1) Removal - Elevator System Cables

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
String	-	Any Source	Cable routing.

(b) Remove RH mid console trim panel. (Refer to 25-10)

(c) Remove LH mid console circuit breaker trim panel. (Refer to 25-10)

(d) Remove passenger seats. (Refer to 25-10)

(e) Remove carpet and access panels CF5. (Refer to 06-00)

(f) Remove empennage pulley gang. (Refer to 27-20)

(g) Remove cotter pin and washer securing pulley guard pin to rudder-elevator pulley gang bracket and remove pin.

(h) Remove cotter pins and washers securing pulley guard pins to forward pulley gang bracket and remove pins.

Note: To facilitate cable routing during installation, attach string to end of cables prior to removing from airplane.

(i) Remove nuts, washers, and screws securing elevator cables to elevator pulley sector. Attach strings to ends of forward elevator cable.

(j) At elevator pulley sector, pull forward cables through and remove from airplane.

(2) Installation - Elevator System Cables

(a) Install empennage pulley gang. (Refer to 27-20)

(b) At access hole CF5, install turnbuckles on forward and aft elevator cables.

(c) At access hole CF5, route forward elevator cable through mid and forward pulley gangs.

(d) Install screws, washers, and nuts securing elevator cables to elevator pulley sector.

(e) At forward pulley gang, verify cable routing, insert pulley guard pins, and install washers and cotter pins.

(f) At rudder-elevator pulley gang, verify cable routing, insert pulley guard pin, and install washer and cotter pin.

(g) At empennage pulley gang, verify cable routing.

(h) Perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)

(i) Perform Inspection/Check - Empennage Pulley Gang. (Refer to 27-20)

(j) Install carpet and access panels CF5. (Refer to 06-00)

(k) Install RH mid console trim panel. (Refer to 25-10)

(l) Install LH mid console circuit breaker trim panel. (Refer to 25-10)

(m) Install passenger seats. (Refer to 25-10)

(3) Adjustment/Test - Elevator System Rigging

CAUTION: Allow temperature to stabilize for a period of four hours before setting cable tensions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
3/16” Lockout Pin	-	Any Source	Elevator rigging.
BL 60 Template	13057-115	Cirrus Design Duluth, MN 55811 218-727-2737	Elevator rigging.
BL 12 Template	13057-111	Cirrus Design Duluth, MN 55811 218-727-2737	Elevator rigging.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension determination.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.
Hose Clamp	#10	Any Source	Neutral pitch determination.

(b) Remove baggage compartment carpet and access panel CF5. (Refer to 06-00)

(c) Remove access panels RE1 and RE2. (Refer to 06-00)

(d) Remove kick plate. (Refer to 25-10)

(e) Set control yoke to neutral pitch position. (See Figure 27-302)

CAUTION: Use caution to avoid damaging yoke position placard, trim indicator, or yoke tube with hose clamp.

1 Position hose clamp around trim indicator and yoke tube.

2 Position control yoke so distance from center of push/pull rod end to front inside face of yoke carriage is 3.81 inches (9.68 cm).

3 Tighten clamp to secure control yoke firmly in place.

4 Adjust forward elevator push/pull rod so distance from center of aft rod end to center of forward rod end is 9.9 ±0.1 inches (25.15 ±0.25 cm).

(f) Insert lockout pin at elevator actuation pulley in empennage.

(g) Set elevators to neutral position using BL 12 and BL 60 templates.

1 Align elevator trailing edges to horizontal stabilizer chord line. To move elevator trailing edge up, lengthen push/pull rod by loosening jam nut and turning rod counterclockwise. Shorten push/pull rod for opposite results.

(h) Tighten turnbuckles to adjust elevator control cable tension according to ambient temperature. (See Figure 06-001)

(i) Remove lockout pin.

(j) Fasten inclinometer to elevator and set at 0°.

(k) Verify elevator neutral position remains at 0 ±1° with control yoke in neutral position.

(l) Remove hose clamp holding control yoke to neutral pitch position.

WARNING: **Pulling back on pilot control yoke should deflect elevator trailing edge up. If this is not true, system is improperly rigged. The system MUST BE RIGGED CORRECTLY. Check for crossed or wrapped cables.**

(m) Verify pulling back on pilot control yoke deflects elevator trailing edge up.

(n) Verify that at full forward or full aft yoke movement the elevator cables on the pulley sector do not pull away or bend around sector. Elevator cables should stay in sector track through full forward or full aft yoke travel.

(o) Streamline elevator.

(p) Adjust stop screws at empennage elevator actuation pulley to allow 15 ±1° down and 25 +0/- 1.0° up elevator travel. In addition, adjust stop screws at empennage elevator actuation pulley so that for full forward or full aft yoke movement;

1 the empennage elevator actuation pulley stops contact before secondary stops,

2 secondary stops mounted on either control yoke assemblies show a 0.035 inch ±0.020 (0.89 mm ±0.51 mm) gap between stop and yoke bearing mount.

(q) Verify trim cartridge minimum rod end thread engagement of 0.312 inch (0.79 cm). Tighten jam nuts.

(r) Perform Inspection/Check - Pitch Trim Cartridge. (Refer to 27-30)

(s) Remove inclinometer.

(t) Install kick plate. (Refer to 25-10)

(u) Install access panels RE1 and RE2.(Refer to 06-00)

(v) Install baggage compartment carpet and access panel CF5. (Refer to 06-00)

(4) Inspection/Check - Elevator System Rigging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale 6.0 inches (15.24 cm)	-	Any Source	Elevator rigging.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension determination.

(b) Remove baggage compartment carpet and access panel CF5. (Refer to 06-00)

(c) Remove access panels RE1 and RE2. (Refer to 06-00)

(d) Perform Inspection/Check - Elevator Gap and Overlap. (Refer to 55-20)

(e) Verify elevator control cable tension. (Refer to 27-30)

(f) Verify elevator neutral position remains at 0 ±1° with control yoke in neutral position

(g) Verify 15 ±1° down and 25 +0/-1.0° up elevator travel. (Refer to 27-30)

(h) For full forward or full aft yoke movement, verify empennage elevator actuation pulley primary stops contact before secondary stops.

(i) Inspect elevator pitch trim motor for security and condition.

(j) For full forward or full aft yoke movement, verify secondary stops mounted on either control yoke assemblies show a 0.035 inch ±0.020 (0.89 mm ±0.51 mm) gap between stop and yoke bearing mount.

(k) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(l) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts throughout entire elevator control system.

(m) Install access panels RE1 and RE2. (Refer to 06-00)

(n) Install baggage compartment carpet and access panel CF5. (Refer to 06-00)

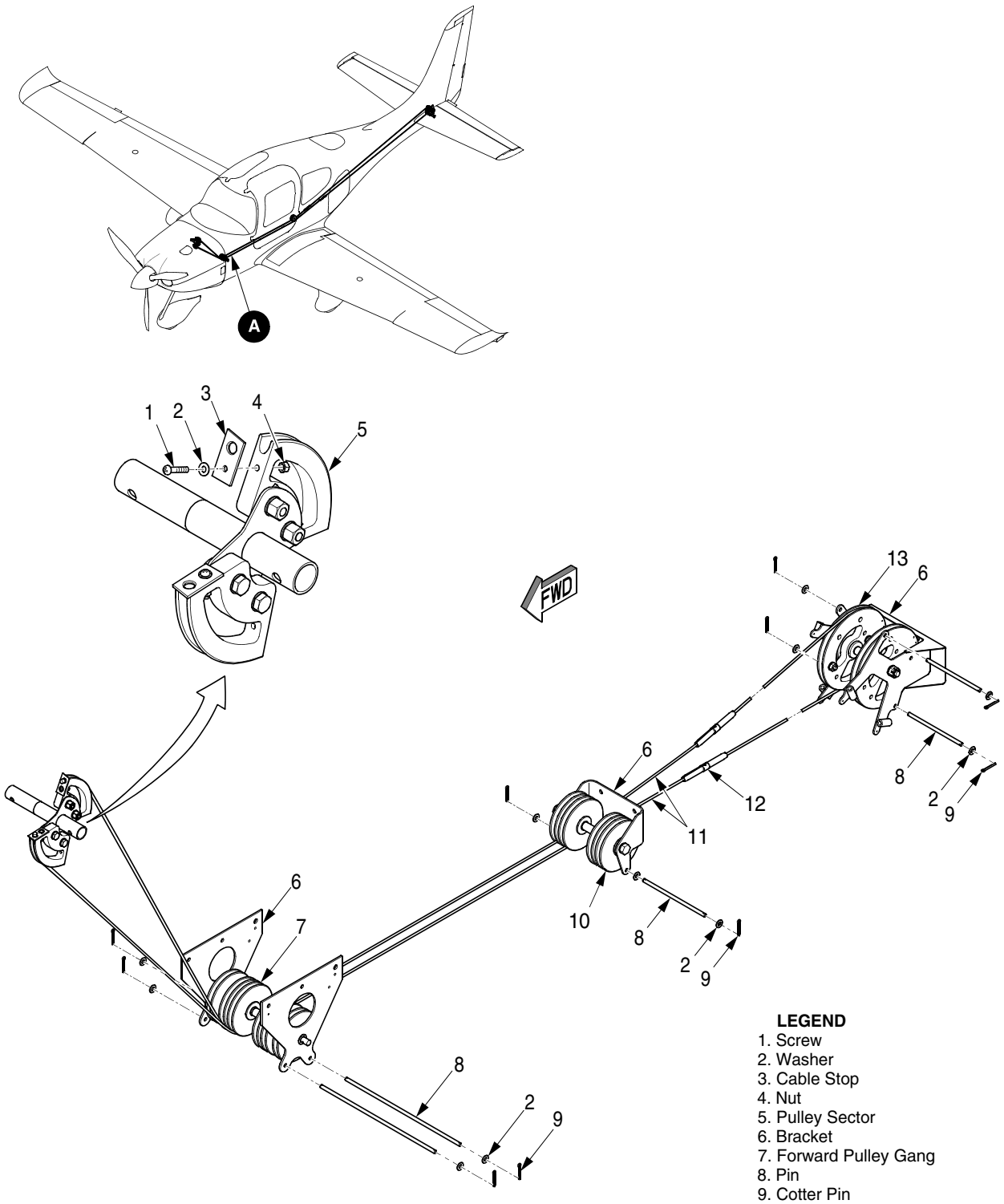
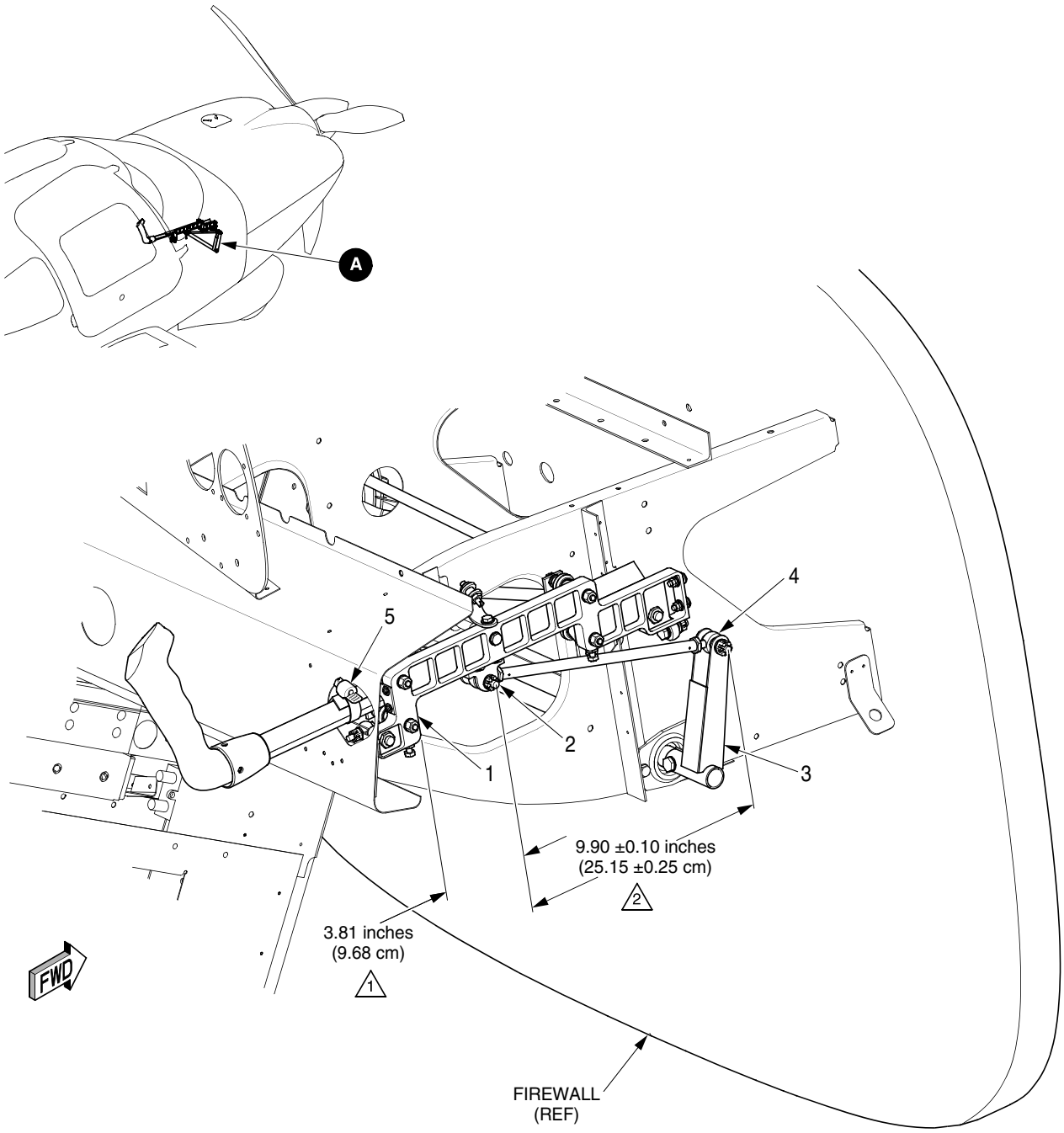


Figure 27-301
Elevator System Cables - Serials 1005 thru 1300, 1302 thru 1306

EFFECTIVITY:
Serials 1005 thru 1300, 1302 thru 1306



NOTE

1. Clamp control yoke so distance from center of aft rod end to front inside face of yoke carriage is 3.81 inches (9.68 cm).
2. Adjust forward elevator push/pull rod so distance from center of aft rod end to center of forward rod end is 9.90 ±0.10 inches (25.15 ±0.25 cm).

DETAIL A

LEGEND

1. Yoke Carriage
2. Aft Rod End
3. End-Fitting Weldment
4. Forward Rod End
5. Hose Clamp

Serials 1005 thru 1300, 1302 thru 1306.

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Figure 27-302
Setting Control Yoke Neutral Pitch Position - Serials 1005 thru 1300, 1302 thru 1306

B. Elevator System Cables - *Serials 1301, 1307 & subs* (See Figure 27-303)

The elevator system bellcrank, cable clevises, and cable turnbuckle ends are marked with red and black paint to allow visual verification of proper cable assembly and installation. (See Figure 27-304)

Description	Color Identification
Top Elevator Empennage Bellcrank Forward Elevator Torque Tube Coupler Weldment Cable Clevises and Turnbuckle Ends	Primary Red
Bottom Elevator Empennage Bellcrank Aft Elevator Torque Tube Coupler Weldment Cable Clevises and Turnbuckle Ends	Black

(1) Removal - Elevator System Cables

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
String	-	Any Source	Cable routing.

(b) Remove RH mid console trim panel. (Refer to 25-10)

(c) Remove LH mid console circuit breaker trim panel. (Refer to 25-10)

(d) Remove passenger seats. (Refer to 25-10)

(e) Remove carpet and access panels CF5. (Refer to 06-00)

Note: Note location of pitch servo bridle cable clamps on elevator cable to facilitate reinstallation.

(f) *Serials 2016 & subs w/ Perspective Avionics:* Remove bolts, nuts, and clamps securing pitch servo bridle cable to elevator cable. (See Figure 22-134)

(g) Remove cotter pins, nuts, washers, and bolts securing elevator cable rod ends to elevator empennage bellcrank.

(h) Remove cotter pin and washer securing pulley guard pin to rudder-elevator pulley gang bracket and remove pin.

(i) Remove cotter pins and washers securing pulley guard pins to forward pulley gang bracket and remove pins.

Note: To facilitate cable routing during installation, attach string to end of cables prior to removing from airplane.

(j) Remove cotter pins, nuts, washers, and bolts securing elevator cable rod ends to bellcrank weldment on torque tube coupler. Attach strings to ends of forward elevator cable

(k) At bellcrank weldment pull forward cable through and remove cable from airplane.

(2) Installation - Elevator System Cables

(a) If installing new cable, paint turnbuckle ends appropriate color. (Refer to 20-90)

(b) At access hole CF5, install turnbuckles on forward and aft elevator cables.

(c) At access hole CF5, route forward elevator cable through mid and forward pulley gangs.

(d) Install bolts washers, nuts, and cotter pins securing elevator cables rod ends to bellcrank weldment on torque tube coupler.

(e) At forward pulley gang, verify cable routing, insert pulley guard pins, and install washers and cotter pins.

(f) At rudder-elevator pulley gang, verify cable routing, insert pulley guard pin, and install washer and cotter pin.

(g) At elevator empennage bellcrank, verify cable routing, install bolts, washers, nuts, and cotter pins securing elevator cable rod end to elevator empennage bellcrank.

(h) Perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30)

(i) Install carpet and access panels CF5. (Refer to 06-00)

(j) Install RH mid console trim panel. (Refer to 25-10)

(k) Install LH mid console circuit breaker trim panel. (Refer to 25-10)

(l) Install passenger seats. (Refer to 25-10)

(3) Adjustment/Test - Elevator System Rigging (See Figure 27-306)

CAUTION: Allow temperature to stabilize for a period of four hours before setting cable tensions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Rigging Lockout Tool	14905-001	Cirrus Design Duluth, MN 55811 218-727-2737	Lockout empennage bellcranks.
3/16” Lockout Pin	-	Any Source	Lockout empennage bellcranks.
BL 60 Template	13057-115	Cirrus Design Duluth, MN 55811 218-727-2737	Elevator rigging.
BL 12 Template	13057-111	Cirrus Design Duluth, MN 55811 218-727-2737	Elevator rigging.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension determination.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.
Hose Clamp	#10	Any Source	Neutral pitch determination.

(b) Remove baggage compartment carpet and access panel CF5. (Refer to 06-00)

(c) Remove access panels RE1 and RE2. (Refer to 06-00)

(d) Remove kick plate. (Refer to 25-10)

Note: *Serials 2016 & subs w/ Perspective Avionics:* Note location of pitch servo bridle cable clamps on elevator cable to facilitate reinstallation.

(e) *Serials 2016 & subs w/ Perspective Avionics:* Remove bolts, nuts, and clamps securing pitch servo bridle cable to elevator cable. (See Figure 22-134)

(f) Set elevator deflection.

1 With full down elevator applied, verify elevator deflection angle is equal to 15 ±1°.

Note: Adjusting push/pull rod length affects both up and down deflection. It may be necessary to set each end off of nominal to meet tolerance on both ends.

2 To increase deflection angle, lengthen push/pull rod by removing bolt securing rod end to aft elevator bellcrank, loosening jam nut, and turning rod end counterclockwise. (See Figure 27-208)

3 Shorten push/pull rod for opposite results.

4 With full up elevator applied, verify elevator deflection angle is equal to 25 +0/-1.0°.

5 If necessary, repeat push/pull rod length adjustment until elevator deflections are both within tolerance.

(g) Set control yoke and torque tube to neutral pitch position. (See Figure 27-305)

CAUTION: Use caution to avoid damaging yoke position placard, trim indicator, or yoke tube with hose clamp.

1 Position hose clamp around trim indicator and yoke tube.

2 Position control yoke so distance from forward edge of yoke tube cover to aft edge of trim indicator is 2.71 ±0.5 inches (6.88 ±1.27 cm).

3 Tighten clamp to secure control yoke firmly in place.

4 Adjust forward elevator push/pull rod so distance from center of aft rod end to center of forward rod end is 9.55 inches (24.26 cm).

5 Verify angle from center of torque tube end fitting weldment to vertical plane equals 19 ±2.5°.

(h) Using rigging lockout tool and pin, lockout elevator empennage bellcrank.

(i) Set elevators to neutral position using BL 12 and BL 60 templates.

1 Align elevator trailing edges to horizontal stabilizer chord line. To move elevator trailing edge up, lengthen push/pull rod by loosening jam nut and turning rod counterclockwise. Shorten push/pull rod for opposite results.

(j) Tighten turnbuckles to adjust elevator control cable tension according to ambient temperature. (See Figure 06-001)

(k) Remove lockout pin.

(l) Fasten inclinometer to elevator and set at 0°.

(m) Remove hose clamp holding control yoke to neutral pitch position.

WARNING: Pulling back on pilot control yoke should deflect elevator trailing edge up. If this is not true, system is improperly rigged. The system MUST BE RIGGED CORRECTLY. Check for crossed or wrapped cables and verify color identification is correct.

(n) Verify pulling back on pilot control yoke deflects elevator trailing edge up.

(o) Streamline elevator.

(p) Adjust forward stops on each control yoke so that for full forward or full aft yoke movement;

1 the empennage elevator bellcrank stops contact before the control yoke secondary stops,

2 control yoke secondary stops show a 0.035 inch ±0.020 (0.89 mm ±0.51 mm) gap between stop and yoke bearing mount when the empennage elevator bellcrank stops are engaged.

(q) Verify trim cartridge minimum rod end thread engagement of 0.313 inch (0.79 cm). Tighten jam nuts.

(r) Perform Inspection/Check - Pitch Trim Cartridge. (Refer to 27-30)

(s) *Serials 2016 & subs w/ Perspective Avionics:* Perform Adjustment/Test - GSM 85A/86 Pitch Servo Mount Bridle Cable Tension. (Refer to 22-13)

(t) Remove inclinometer.

(u) Install kick plate. (Refer to 25-10)

(v) Install access panels RE1 and RE2. (Refer to 06-00)

(w) Install baggage compartment carpet and access panel CF5. (Refer to 06-00)

(4) Inspection/Check - Elevator System Rigging

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scale 6.0 inches (15.24 cm)	-	Any Source	Elevator rigging.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.
Tensiometer	BT-33-75D	Kent Moore Warren, MI 48092 800-345-2233	Cable tension determination.

(b) Remove baggage compartment carpet and access panel CF5. (Refer to 06-00)

(c) Remove access panels RE1 and RE2. (Refer to 06-00)

(d) Perform Inspection/Check - Elevator Gap and Overlap. (Refer to 55-20)

(e) Verify elevator control cable tension. (Refer to 27-30)

(f) Verify elevator neutral position remains at 0 ±1° with control yoke in neutral position.

(g) Verify 15 ±1° down and 25 +0/-1.0° up elevator travel. (Refer to 27-30)

(h) For full forward or full aft yoke movement, verify empennage elevator bellcrank stops contact before the control yoke secondary stops.

(i) Inspect elevator pitch trim motor for security and condition.

(j) For full forward or full aft yoke movement, verify control yoke secondary stops show a 0.035 inch ±0.020 (0.89 mm ±0.51 mm) gap between stop and yoke bearing mount when the empennage elevator bellcrank stops are engaged.

(k) At pitch trim cartridge, verify set screw securing pitch trim actuation arm is tight and no play exists between actuation arm and pitch trim motor shaft.

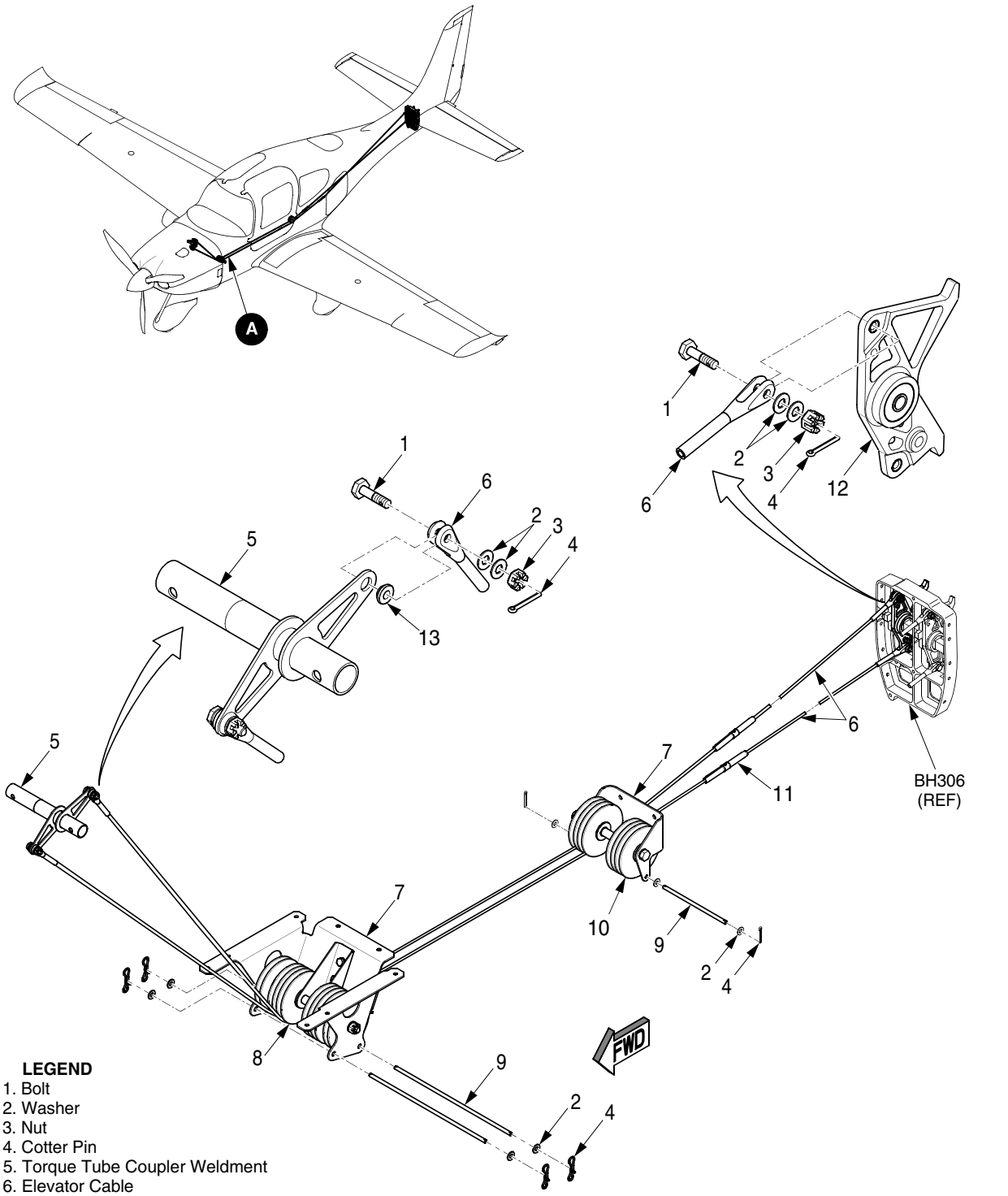
(l) Verify minimum rod end thread engagement of 0.313 inch (0.79 cm).

(m) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts throughout entire elevator control system.

(n) *Serials 2016 & subs w/ Perspective Avionics:* Verify bridle cable tension forward of bridle cable clamps is set to 25.0 +2.0/-0.0 lb (11.3 +0.9/-0.0 kg) (Refer to 22-13)

(o) Install access panels RE1 and RE2. (Refer to 06-00)

(p) Install baggage compartment carpet and access panel CF5. (Refer to 06-00)



LEGEND

1. Bolt
2. Washer
3. Nut
4. Cotter Pin
5. Torque Tube Coupler Weldment
6. Elevator Cable
7. Bracket
8. Forward Pulley Gang
9. Pin
10. Rudder/Elevator Pulley Gang
11. Turnbuckle
12. Elevator Empennage Bellcrank
13. Bushing

DETAIL A

SR20_MM27_1661

Figure 27-303
Elevator System Cables - Serials 1301, 1307 & subs

EFFECTIVITY:
Serials 1301, 1307 & subs

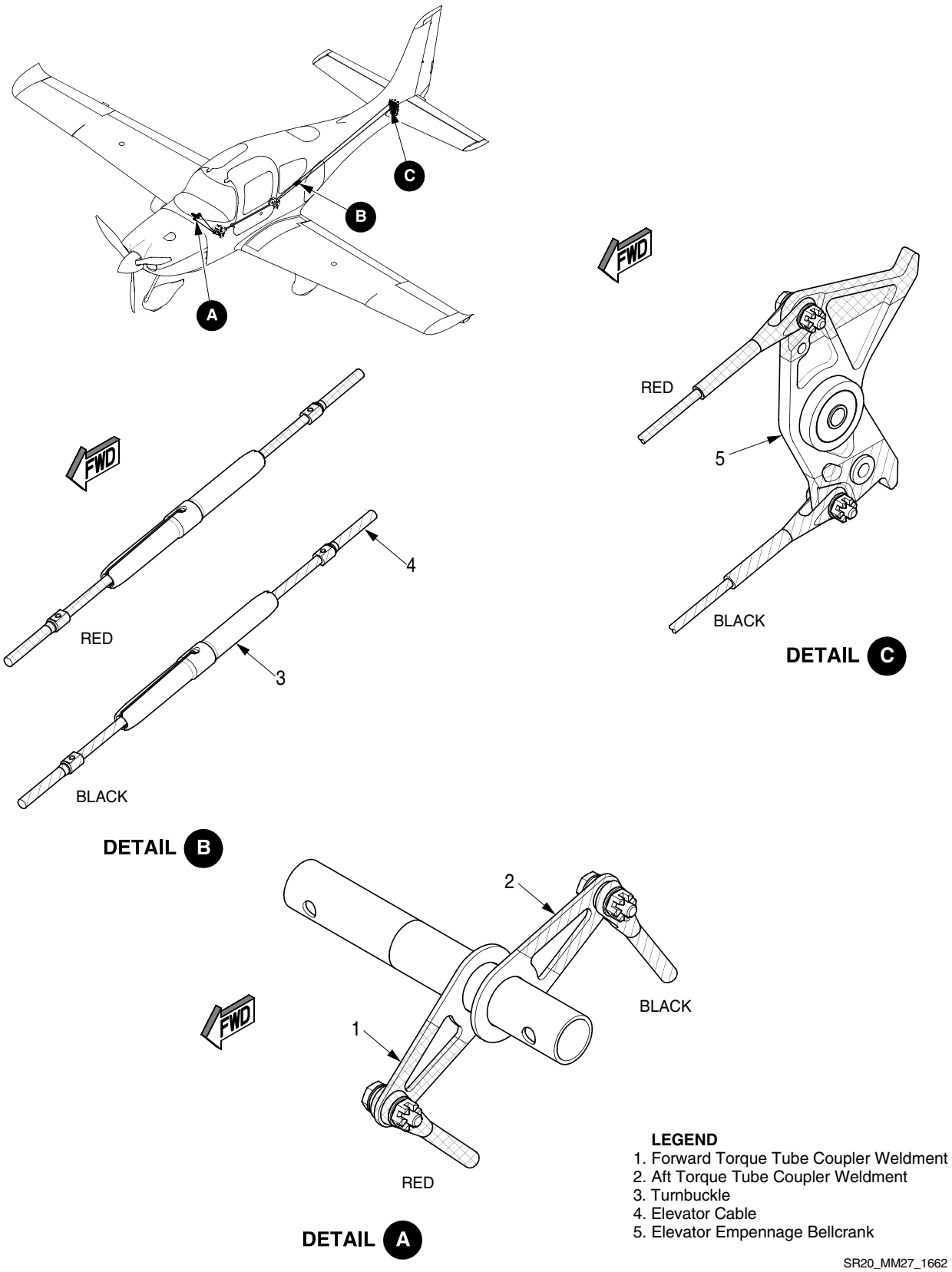
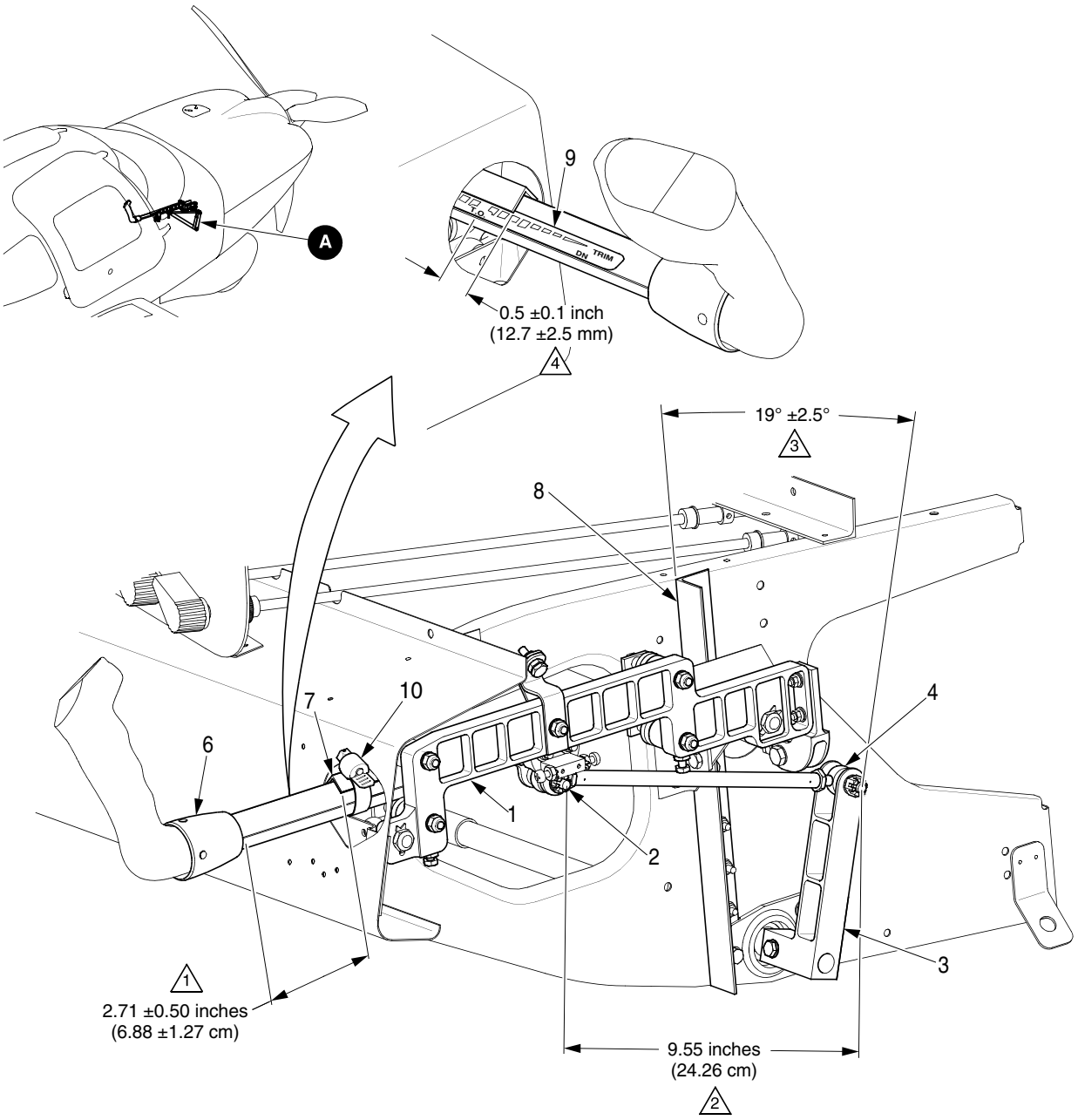


Figure 27-304
Color Identification - Serials 1301, 1307 & subs



NOTE

1. Clamp control yoke so distance from forward edge of yoke tube cover to aft edge of trim indicator is 2.71 ±0.5 inches (6.88 ±1.27 cm).
2. Adjust forward elevator push/pull rod so distance from center of aft rod end to center of forward rod end is 9.55 inches (24.26 cm).
3. Angle from vertical bracket to center of forward rod end is 19° ±2.5°.
4. Distance from aft edge of trim indicator to middle of T.O. range on decal is 0.5 ±0.1 inches (12.7 ±2.5 mm).

LEGEND

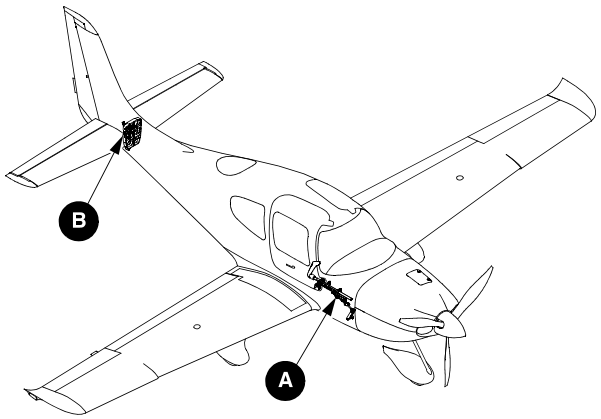
1. Yoke Carriage
2. Aft Rod End
3. End-Fitting Weldment
4. Forward Rod End
5. Firewall
6. Yoke Tube Cover
7. Trim Indicator
8. Bracket
9. Decal
10. Hose Clamp

DETAIL A

SR20_MM27_1663B

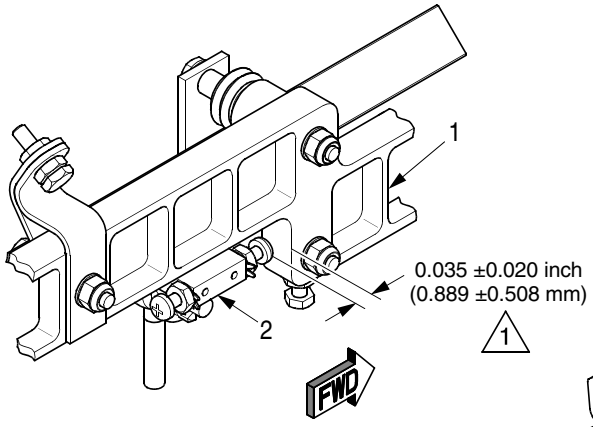
Figure 27-305
Setting Control Yoke Neutral Pitch Position - Serials 1301, 1307 & subs

EFFECTIVITY:
Serials 1301, 1307 & subs



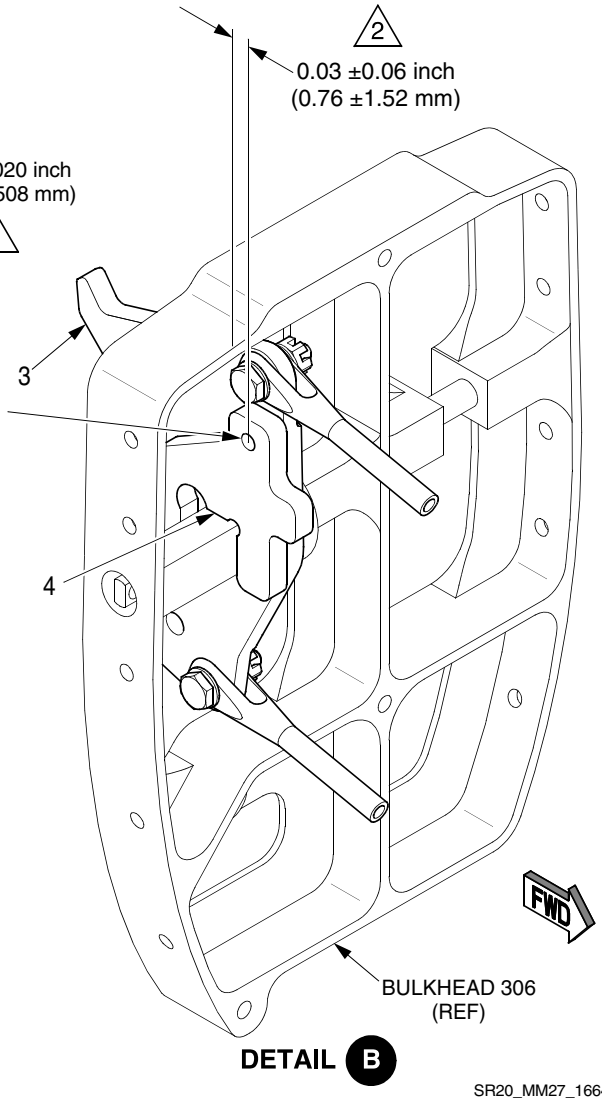
NOTE

1. Verify stop mounted on control yoke assembly shows a 0.035 ±0.020 inch (0.889 ±0.508 mm) gap between stop and yoke bearing mount when elevator is at full up or down deflection.
2. With bellcrank lock-out tool in place, verify distance between center of lock-out hole and forward surface of 306 bulkhead is 0.03 inch ±0.06 inch (0.76 ±1.52 mm).



SHOWN FULL DOWN POSITION

DETAIL A



DETAIL B

LEGEND

1. Yoke Carriage
2. Control Yoke Stop
3. Elevator Bellcrank
4. Bellcrank Lock-out Tool

SR20_MM27_1664A

Figure 27-306
Elevator Rigging

C. Forward Elevator Push/Pull Rod (See Figure 27-307) (See Figure 27-308)

(1) Removal - Forward Elevator Push/Pull Rod

(a) Remove seat. (Refer to 25-10)

(b) Remove kick plate. (Refer to 25-10)

(c) Remove mid-console trim panel. (Refer to 25-10)

(d) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod end to control-yoke elevator stop.

(e) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod end to torque tube end-fitting weldment and remove elevator push/pull rod from airplane.

(2) Installation - Forward Elevator Push/Pull Rod

(a) Position elevator push/pull rod to control-yoke stop and install bolt, washers, nut, and cotter pin.

(b) Position elevator push/pull rod to torque tube end-fitting weldment and install bolt, washers, nut, and cotter pin.

(c) Install mid-console trim panel. (Refer to 25-10)

(d) Install kick plate. (Refer to 25-10)

(e) Install seat. (Refer to 25-10)

D. Elevator Torque Tube (See Figure 27-307) (See Figure 27-308)

(1) Removal - Elevator Torque Tube

(a) Remove MFD. (Refer to 31-60)

(b) Remove pilot and co-pilot seats. (Refer to 25-10)

(c) Remove kick plate. (Refer to 25-10)

(d) Remove mid-console trim panels from LH and RH sides. (Refer to 25-10)

(e) Gain access to torque tube coupler through MFD opening and remove nut, washers, and bolt securing torque tube coupler to elevator torque tube.

(f) Remove nut, washers, and bolt securing elevator torque tube to end-fitting weldment. Disconnect end-fitting weldment from elevator torque tube.

(g) Slide torque tube outboard to disconnect from coupler then slide tube inboard to remove from console bearing plate.

(2) Installation - Elevator Torque Tube

(a) From inboard side of console, insert elevator torque tube into console bearing plate, then position and slide torque tube into torque tube coupler and install bolt, washer, and nut.

(b) Install bolt, washers, and nut securing end-fitting weldment to elevator torque tube.

(c) Install forward center console trim panels. (Refer to 25-10)

(d) Install kick plate. (Refer to 25-10)

(e) Install pilot and co-pilot seats. (Refer to 25-10)

(f) Install MFD. (Refer to 31-60)

E. Elevator Pulley Sector - *Serials 1005 thru 1300, 1302 thru 1306* (See Figure 27-307)

WARNING: A system rigging Inspection/Check must be performed after loosening any flight control cable to assure proper control surface operation. Refer to the appropriate control system's rigging procedures for the Inspection/Check maintenance practices.

(1) Removal - Elevator Pulley Sector - *Serials 1005 thru 1300, 1302 thru 1306*

(a) Remove co-pilot seat. (Refer to 25-10)

(b) Remove right mid console trim. (Refer to 25-10)

(c) Remove carpet and access panel CF5 from baggage compartment floor. (Refer to 06-00)

(d) Identify and loosen elevator cable tension via turnbuckle.

(e) Remove nuts, washers, and screws securing cable to elevator pulley sector.

(f) Remove nuts, washers, and bolts securing elevator pulley sector to torque tube coupler flange and remove from airplane.

(2) Installation - Elevator Pulley Sector - *Serials 1005 thru 1300, 1302 thru 1306*

(a) Position pulley sector on torque tube coupler flange and install bolts, washers, and nuts.

(b) Position cable on elevator pulley sector and install screws, washers, and nuts.

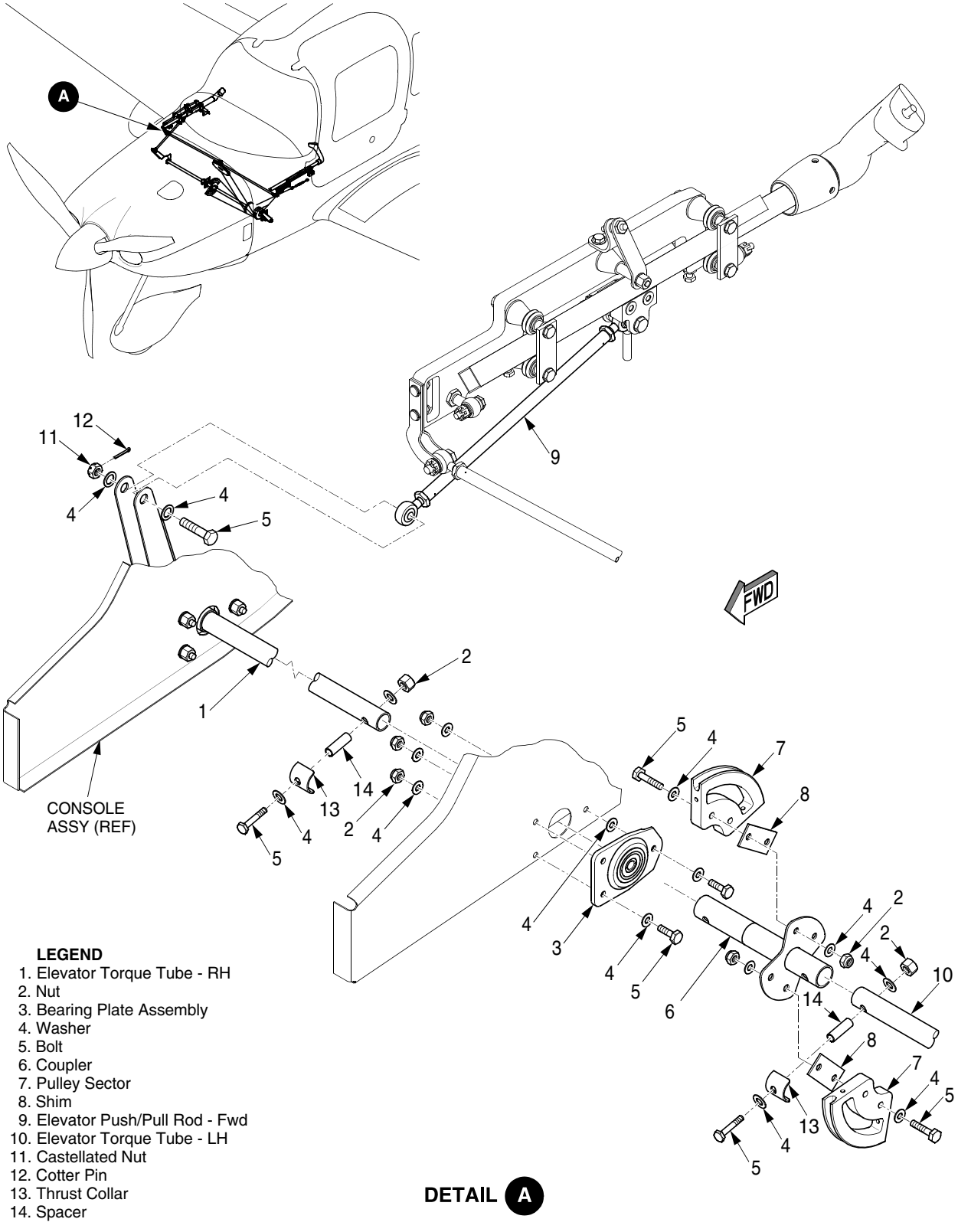
(c) Rig and perform Adjustment/Test - Elevator System Rigging. (Refer to 27-30).

(d) Install access panel and carpet. (Refer to 06-00)

(e) Install co-pilot seat. (Refer to 25-10)

F. Bellcrank Weldment - *Serials 1301, 1307 & subs* (See Figure 27-308)

On these airplanes, the elevator pulley sector is replaced with a bellcrank weldment located on the elevator torque tube coupler. Maintenance practices pertinent to the elevator torque tube coupler are covered under the Elevator Torque Tube section. (Refer to 27-30)



LEGEND

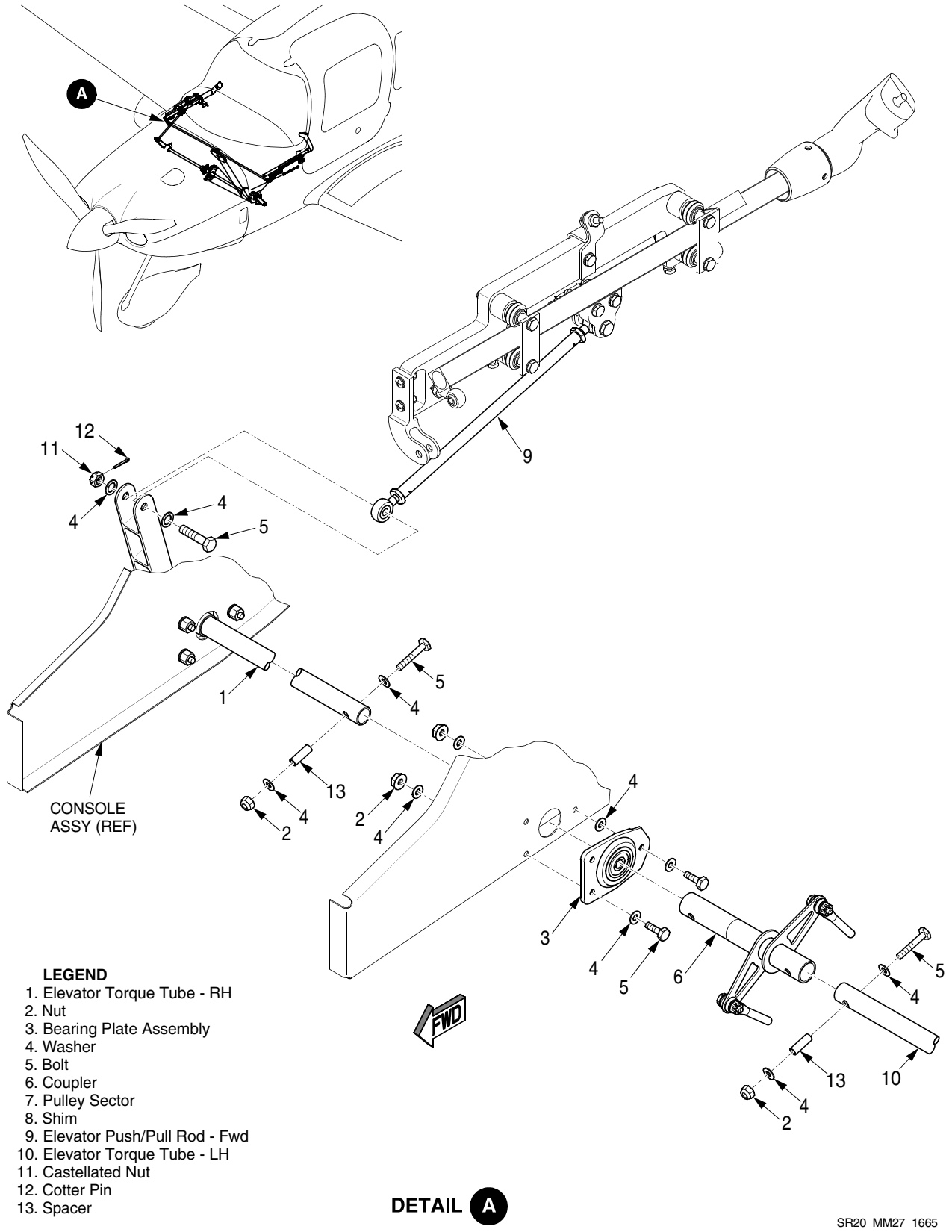
1. Elevator Torque Tube - RH
2. Nut
3. Bearing Plate Assembly
4. Washer
5. Bolt
6. Coupler
7. Pulley Sector
8. Shim
9. Elevator Push/Pull Rod - Fwd
10. Elevator Torque Tube - LH
11. Castellated Nut
12. Cotter Pin
13. Thrust Collar
14. Spacer

DETAIL A

Serials 1005 thru 1300, 1302 thru 1306.

SR20_MM27_1173D

Figure 27-307
Elevator System - Serials 1005 thru 1300, 1302 thru 1306



LEGEND

1. Elevator Torque Tube - RH
2. Nut
3. Bearing Plate Assembly
4. Washer
5. Bolt
6. Coupler
7. Pulley Sector
8. Shim
9. Elevator Push/Pull Rod - Fwd
10. Elevator Torque Tube - LH
11. Castellated Nut
12. Cotter Pin
13. Spacer

Figure 27-308
Elevator System - Serials 1301, 1307 & subs

EFFECTIVITY:
Serials 1301, 1307 & subs

G. Forward Pulley Gang (See Figure 27-106) (See Figure 27-107)

The forward pulley gang is used to route the aileron, rudder, and elevator system control cables. Maintenance practices pertinent to the forward pulley gang are covered under the Aileron and Roll Trim System. (Refer to 27-10)

H. Rudder-Elevator Pulley Gang (See Figure 27-206)

The rudder-elevator pulley gang is used to route the rudder and elevator system control cables. Maintenance practices pertinent to the rudder-elevator pulley gang are covered under the Rudder and Yaw Trim System. (Refer to 27-20)

I. Empennage Pulley Gang - *Serials 1005 thru 1300, 1302 thru 1306* (See Figure 27-207)

The rudder and elevator control system utilize separate pulleys which mount to a shared pulley-gang bracket mounted inside the empennage. Maintenance practices pertinent to the empennage pulley gang are covered under the Rudder and Yaw Trim System (Refer to 27-20)

J. Empennage Elevator Bellcrank - *Serials 1301, 1307 & subs* (See Figure 27-208)

The rudder and elevator control system utilize separate bellcranks which mount directly to the FS 306 bulkhead. Maintenance practices pertinent to the empennage bellcranks are covered under the Rudder and Yaw Trim System. (Refer to 27-20)

K. Pitch Trim System - *Serials 1005 thru 1300, 1302 thru 1306* **(See Figure 27-309)**

(1) Servicing - Pitch Trim Cartridge Lubrication

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
LPS Chain Mate	02416	LPS Laboratories Tucker, GA 30085-5052 800-241-8334	Lubrication of the pitch trim cartridge.

(b) Remove empennage access panels LE1 and RE1. (Refer to 06-00)

(c) At access hole RE1, cover area below and around pitch trim cartridge with cloth to catch lubricant overspray.

(d) Attach extension tube to lubricant spray nozzle.

(e) At access hole LE1, apply lubricant to pitch trim cartridge inner housing for 3 seconds while working elevator up and down several times to spread lubrication.

(f) Inspect elevator pitch trim motor for security and condition.

(g) Remove cloth from access hole RE1.

(h) Install empennage access panels LE1 and RE1. (Refer to 06-00)

(2) Removal - Pitch Trim Cartridge

WARNING: A maintenance check flight must be performed after the installation of a replacement (new or different) trim cartridge.

(a) Remove RE1, RE2 and LE1 access panels. (Refer to 06-00)

(b) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to trim motor actuation arm.

(c) Remove cotter pin, nut, washers, spacer, and bolt securing trim cartridge to elevator bellcrank and remove trim cartridge from airplane.

(3) Installation - Pitch Trim Cartridge

(a) Insert spacer and align trim cartridge with mounting hole on elevator bellcrank and install bolt, washers, nut, and cotter pin.

(b) Install bolt, washers, nut, and cotter pin securing trim cartridge push/pull rod to trim motor actuation arm.

(c) Perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(d) Install RE1, RE2, and LE1 access panels. (Refer to 06-00)

(e) If replacement (new or different) trim cartridge installed, perform maintenance check flight. If airplane can not be trimmed properly during maintenance check flight, perform Adjustment/Test - Elevator Trim Tab. (Refer to 55-20)

(4) Adjustment/Test - Pitch Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
BL 60 Template	13057-115	Cirrus Design Duluth, MN 55811 218-727-2737	Elevator rigging.
BL 12 Template	13057-111	Cirrus Design	Elevator rigging.

EFFECTIVITY:
Serials 1005 thru 1300, 1302 thru 1306

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Remove access panels RE1 and RE2. (Refer to 06-00)

(c) Set elevators to neutral position using BL 12 and BL 60 templates.

1 Align elevator trailing edges to horizontal stabilizer chord line. To move elevator trailing edge up, lengthen push/pull rod by loosening jam nut and turning rod counterclockwise. Shorten push/pull rod for opposite results.

(d) Fasten inclinometer to elevator and set at 0°.

(e) Run trim motor to full nose-down trim position until travel is stopped by lower limit switch.

(f) Adjust pitch trim cartridge push/pull rod so elevator deflection angle is -10.5 ±1.0°:

1 To increase elevator trailing edge down movement, shorten pitch trim cartridge by loosening jam nut and turning push/pull rod clockwise.

2 Lengthen pitch trim cartridge for opposite results.

(g) Run trim motor to full nose-up trim position until travel is stopped by upper limit switch.

(h) Adjust pitch trim cartridge push/pull rod so minimum elevator deflection angle is +17°:

1 To increase elevator trailing edge up movement, lengthen pitch trim cartridge by loosening jam nut and turning push/pull rod counterclockwise.

2 Shorten pitch trim cartridge for opposite results.

(i) Perform Inspection/Check - Pitch Trim Cartridge. (Refer to 27-30)

(j) Verify pitch trim cartridge minimum rod end thread engagement of 0.312 inch (0.79 cm). Tighten jam nuts.

(k) Install access panels RE1 and RE2. (Refer to 06-00)

(5) Inspection/Check - Pitch Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Verify correct elevator system rigging. (Refer to 27-30) (Refer to 27-30)

(c) Fasten inclinometer to elevator and set at 0°.

(d) Run trim motor to full nose-down trim position until travel is stopped by lower limit switch.

(e) Verify elevator deflection angle is -10.5 ±1.0°. If pitch trim is out of adjustment, perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(f) Run trim motor to full nose-up trim position until travel is stopped by upper limit switch.

(g) Verify minimum elevator deflection angle is +17°. If pitch trim is out of adjustment, perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(h) Remove inclinometer.

(i) Verify positive clearance between trim cartridge and actuation pulley under full range of trim motor positions.

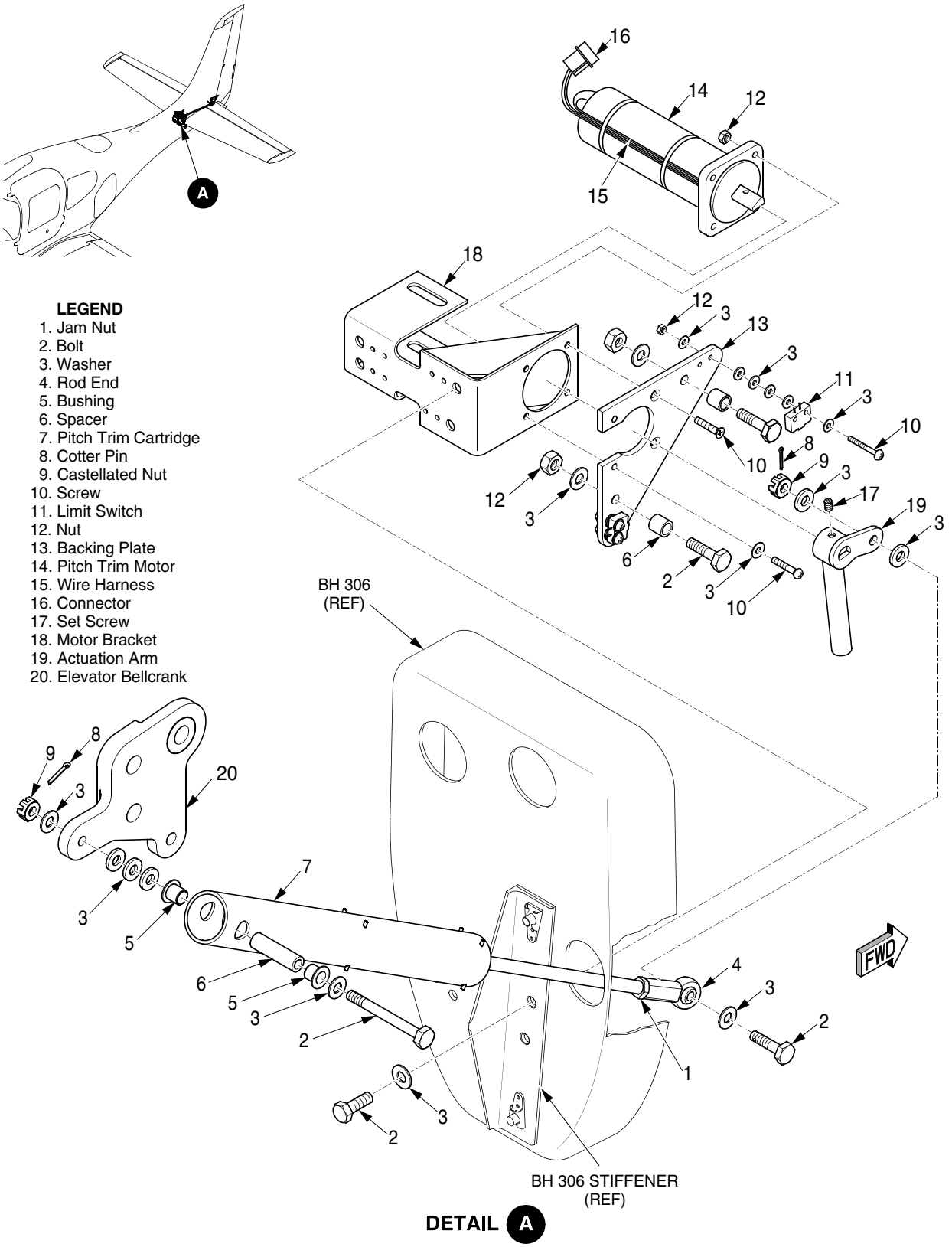
(j) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(k) Verify proper installation of safety wires and cotter pins on all fasteners.

(6) Removal - Pitch Trim Motor

(a) Set BATTERY and AVIONICS switches to OFF positions.
(b) Pull PITCH TRIM circuit breaker.
(c) Remove access panel RE2. (Refer to 06-00)
(d) Remove composite rudder bottom. (Refer to 55-40)
(e) Remove nut, washer, and screw securing pulley gang support brace to empennage.
(f) Disconnect trim motor electrical connection.
(g) Remove cotter pin, nut, washers, and bolt securing trim cartridge push/pull rod to trim motor actuation arm.
(h) Remove bolts and washers securing pitch trim motor assembly to FS 306 Bulkhead and remove from airplane.

(7) Installation - Pitch Trim Motor
(a) Position pitch trim motor assembly to FS 306 Bulkhead and install bolts and washers.
(b) Install bolt, washers, nut, and cotter pin securing trim cartridge push/pull rod to trim motor actuation arm.
(c) Connect trim motor electrical connection.
(d) Install screw, washer, and nut securing pulley gang support brace to empennage.
(e) Install composite rudder bottom. (Refer to 55-40)
(f) Install access panel RE2. (Refer to 06-00)
(g) Reset PITCH TRIM circuit breaker.



LEGEND

1. Jam Nut
2. Bolt
3. Washer
4. Rod End
5. Bushing
6. Spacer
7. Pitch Trim Cartridge
8. Cotter Pin
9. Castellated Nut
10. Screw
11. Limit Switch
12. Nut
13. Backing Plate
14. Pitch Trim Motor
15. Wire Harness
16. Connector
17. Set Screw
18. Motor Bracket
19. Actuation Arm
20. Elevator Bellcrank

Serials 1005 thru 1300, 1302 thru 1306.

Figure 27-309
Pitch Trim System - Serials 1005 thru 1300, 1302 thru 1306

L. Pitch Trim System - *Serials 1301, 1307 & subs* **(See Figure 27-3010)**

(1) Servicing - Pitch Trim Cartridge Lubrication - *Serials 1301, 1307 thru 1383*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
LPS Chain Mate	02416	LPS Laboratories Tucker, GA 30085-5052 800-241-8334	Lubrication of the pitch trim cartridge.

(b) Remove empennage access panel RE1 and RE2. (Refer to 06-00)

(c) At access hole RE1, cover area below and around pitch trim cartridge with cloth to catch lubricant overspray.

(d) Attach extension tube to lubricant spray nozzle.

(e) Fully extend elevator down to compress pitch trim cartridge.

(f) At access hole RE2, apply lubricant to forward end of pitch trim cartridge inner housing for 3 seconds while working elevator up and down several times to spread lubrication.

(g) Remove cloth from access hole RE1.

(h) Install empennage access panel RE1 and RE2. (Refer to 06-00)

(2) Removal - Pitch Trim Cartridge

WARNING: A maintenance check flight must be performed after the installation of a replacement (new or different) trim cartridge.

(a) Remove RE1, RE2 and LE1 access panels. (Refer to 06-00)

(b) Remove cotter pin, nut, washers, and bolt securing trim cartridge to aft elevator bellcrank.

(c) Loosen jam nut, unthread trim cartridge push/pull rod from rod end on trim motor assembly, and remove trim cartridge from airplane.

(3) Installation - Pitch Trim Cartridge

(a) Thread trim cartridge push/pull rod into rod end on trim motor assembly and tighten jam nut.

(b) Align trim cartridge to mounting hole on aft elevator bellcrank and install bolt, washers, nut, and cotter pin.

(c) Perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(d) Install RE1, RE2, and LE1 access panels. (Refer to 06-00)

(e) If replacement (new or different) trim cartridge installed, perform maintenance check flight. If airplane can not be trimmed properly during maintenance check flight, perform Adjustment/Test - Elevator Trim Tab. (Refer to 55-20)

(4) Adjustment/Test - Pitch Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Rigging Lockout Tool	14905-001	Cirrus Design Duluth, MN 55811 218-727-2737	Lockout empennage bellcranks.
3/16” Lockout Pin	-	Any Source	Lockout empennage bellcranks.

EFFECTIVITY:
Serials 1301, 1307 & subs

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Remove access panels RE1 and RE2. (Refer to 06-00)

(c) Set elevators to neutral position:

1 Using rigging lockout tool and pin, lockout elevator empennage bellcrank.

2 Align elevator trailing edges to horizontal stabilizer chord line. To move elevator trailing edge up, lengthen push/pull rod by loosening jam nut and turning rod counterclockwise. Shorten push/pull rod for opposite results.

3 Remove lockout pin.

(d) Fasten inclinometer to elevator and set at 0°.

(e) Run trim motor to full nose-down trim position until travel is stopped by lower limit switch.

(f) Adjust cartridge push/pull rod so elevator deflection angle is -10.5 ±1.0°:

1 To increase elevator trailing edge down movement, shorten cartridge by loosening jam nut and turning push/pull rod clockwise.

2 Lengthen cartridge for opposite results.

(g) Run trim motor to full nose-up trim position until travel is stopped by upper limit switch.

(h) Adjust cartridge push/pull rod so minimum elevator deflection angle is +17°:

1 To increase elevator trailing edge up movement, lengthen cartridge by loosening jam nut and turning push/pull rod counterclockwise.

2 Shorten cartridge for opposite results.

(i) Perform Inspection/Check - Pitch Trim Cartridge. (Refer to 27-30)

(j) At pitch trim cartridge, verify set screw securing pitch trim actuation arm is tight and no play exists between actuation arm and pitch trim motor shaft.

(k) Verify trim cartridge minimum rod end thread engagement of 0.313 inch (0.79 cm). Tighten jam nuts.

(l) Install access panels RE1 and RE2. (Refer to 06-00)

(5) Inspection/Check - Pitch Trim Cartridge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Verify correct elevator system rigging. (Refer to 27-30) (Refer to 27-30)

(c) Fasten inclinometer to elevator and set at 0°.

(d) Run trim motor to full nose-down trim position until travel is stopped by lower limit switch.

(e) Verify elevator deflection angle is -10.5 ±1.0°. If pitch trim is out of adjustment, perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(f) Run trim motor to full nose-up trim position until travel is stopped by upper limit switch.

(g) Verify minimum elevator deflection angle is +17°. If pitch trim is out of adjustment, perform Adjustment/Test - Pitch Trim Cartridge. (Refer to 27-30)

(h) Remove inclinometer.

(i) Verify positive clearance between trim cartridge and forward and aft empennage bell-cranks under full range of trim motor positions.

(j) Verify minimum rod end thread engagement of 0.313 inch (0.79 cm).

(k) Verify proper installation of safety wires and cotter pins on all fasteners.

(6) Removal - Pitch Trim Motor Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull PITCH TRIM circuit breaker.

(c) Remove pitch trim cartridge. (Refer to 27-30)

(d) Disconnect pitch trim motor electrical connector.

(e) Remove bolts and washers securing pitch trim motor assembly to FS 306 Bulkhead and remove pitch trim motor assembly from airplane.

(7) Disassembly - Pitch Trim Motor Assembly

(a) Remove set screw securing actuation arm to shaft of pitch trim motor.

(b) Remove cotter pin, nut, washers, and bolt securing rod end to actuation arm.

(c) Remove screws and washers securing limit switches to mounting bracket.

(d) Remove screws and nuts securing pitch trim motor to mounting bracket.

(8) Assembly - Pitch Trim Motor Assembly (See Figure 27-3011)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
5 VDC Power Supply	-	Any Source	Rotate shaft of motor to correct installation position.

(b) Position pitch trim motor to mounting bracket so wires face towards front of airplane, secure with screws and nuts.

(c) Position limit switches to mounting bracket and secure with screws and washers.

(d) Install cotter pin, nut, washers, and bolt securing rod end to actuation arm.

(e) Install actuation arm.

Note: To ease installation of pitch trim motor assembly, install actuation arm so arm contacts upper stop on mounting bracket.

1 Connect pitch trim motor to 5 VDC power supply.

2 Rotate pitch trim motor shaft until flat of shaft is parallel with flat on upper stop of mounting bracket.

3 Disconnect pitch trim motor from 5 VDC power supply.

Note: Actuation arm must be oriented on shaft of motor so set screw aligns with flat on shaft of motor. Incorrect alignment may result in a loose actuation arm and possible degradation of pitch trim.

4 Position actuation arm to shaft of pitch trim motor and secure with set screw.

5 Verify set screw is tight and no play exists between actuation arm and pitch trim motor shaft.

(9) Installation - Pitch Trim Motor Assembly

(a) Position pitch trim motor assembly to FS 306 Bulkhead and secure with bolts and washers. Bolts must engage threaded insert to within a minimum of 0.063 inch (1.6 mm) of flush with bulkhead surface or protrude past bulkhead surface.

(b) Connect trim motor electrical connector.

(c) Install pitch trim cartridge. (Refer to 27-30)

(d) Reset PITCH TRIM circuit breaker.

M. Elevator Trim Tab

Pitch trim adjustment is ground adjustable only and is achieved by changing the deflection angle of the elevator trim tab. For maintenance practices pertinent to the elevator trim tab, see Elevator. (Refer to 55-20)

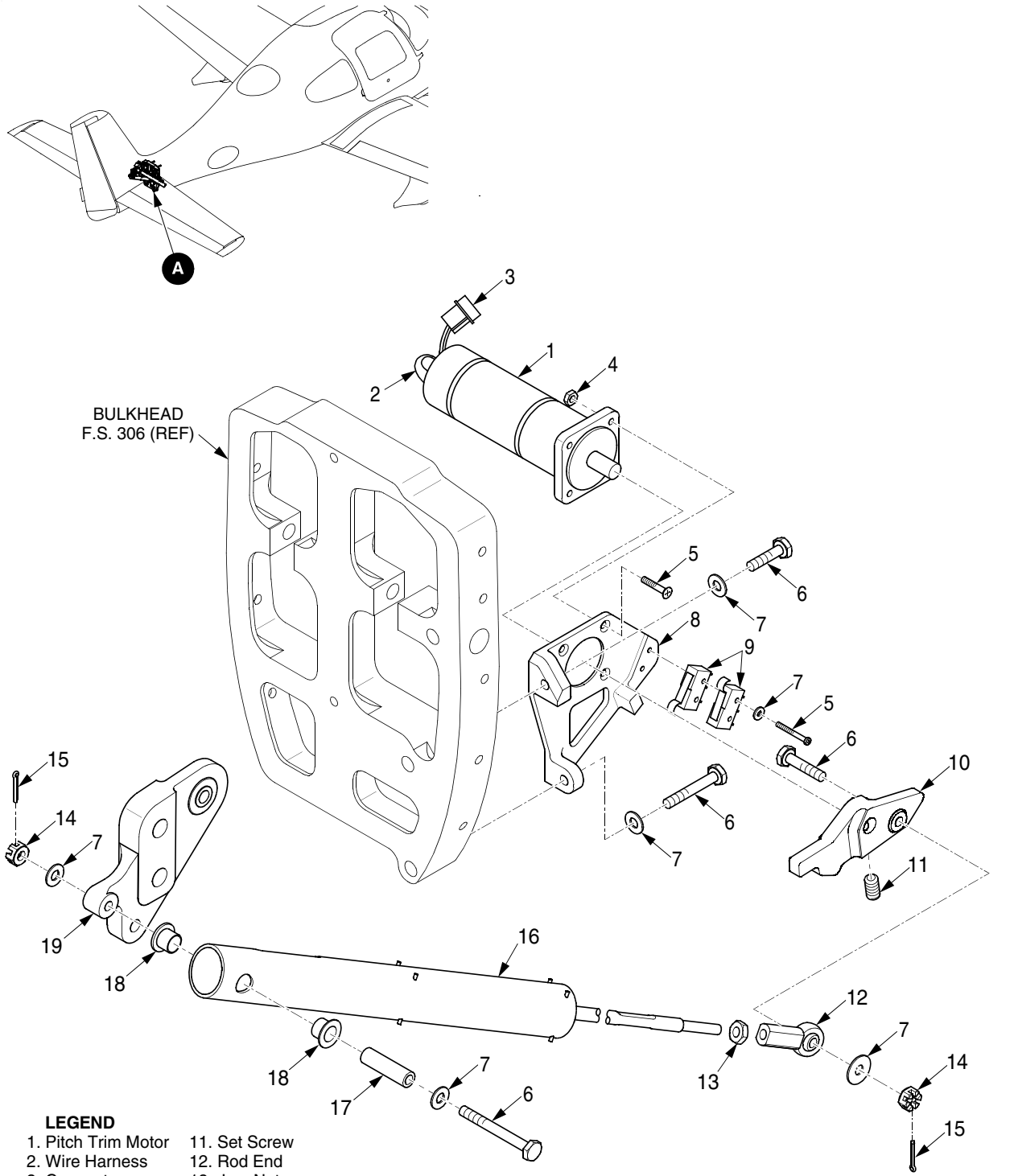
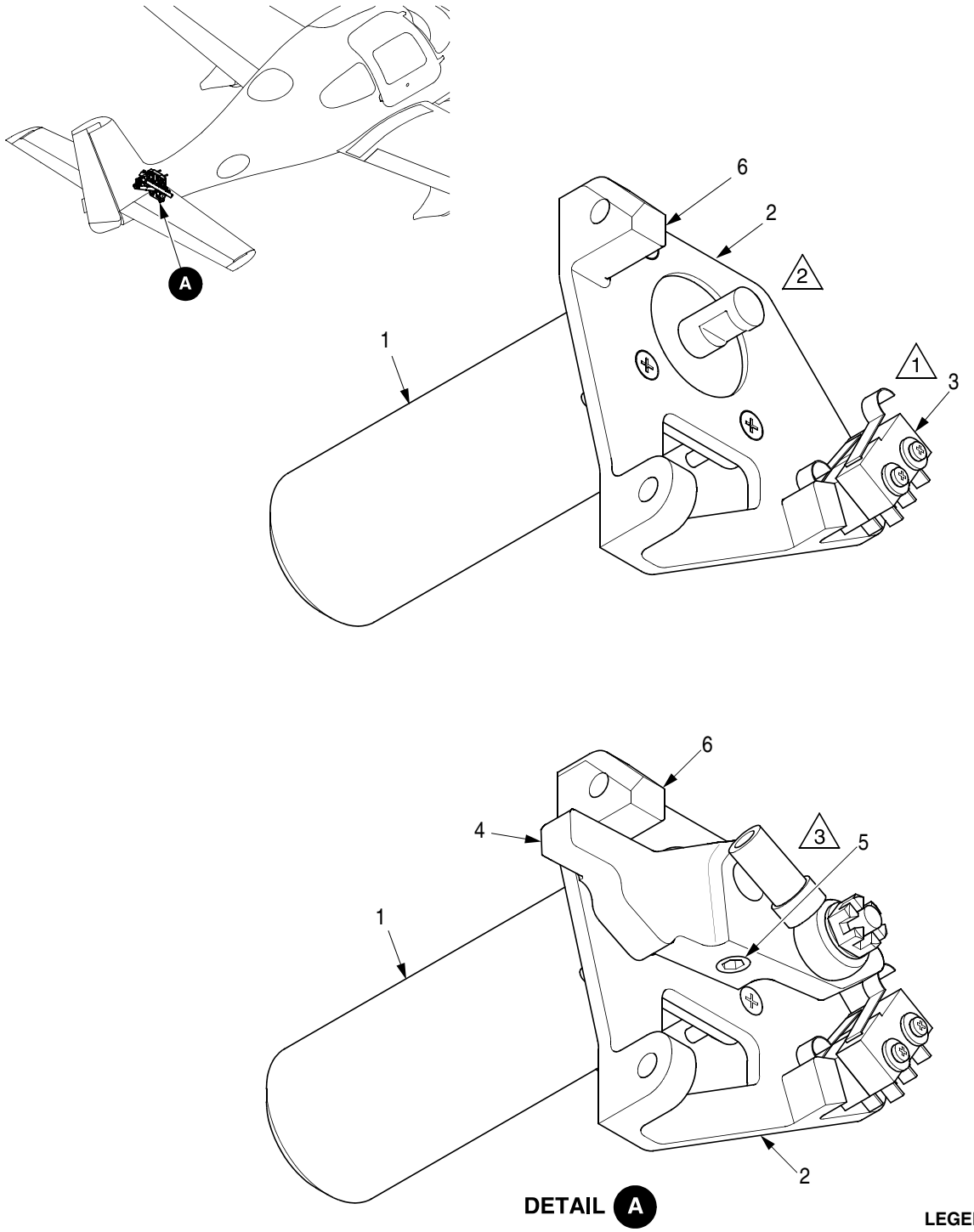


Figure 27-3010
Pitch Trim System - Serials 1301, 1307 & subs

EFFECTIVITY:
Serials 1301, 1307 & subs



NOTE

1. Ensure limit switches are installed in correct orientation.
2. Rotate shaft of pitch trim motor until flat on shaft is parallel with flat on upper stop of mounting bracket.
3. Actuation arm must be oriented on shaft of motor so screw aligns with flat on shaft of motor.

LEGEND

1. Pitch Trim Motor
2. Motor Bracket
3. Limit Switch
4. Actuation Arm
5. Set Screw
6. Upper Stop

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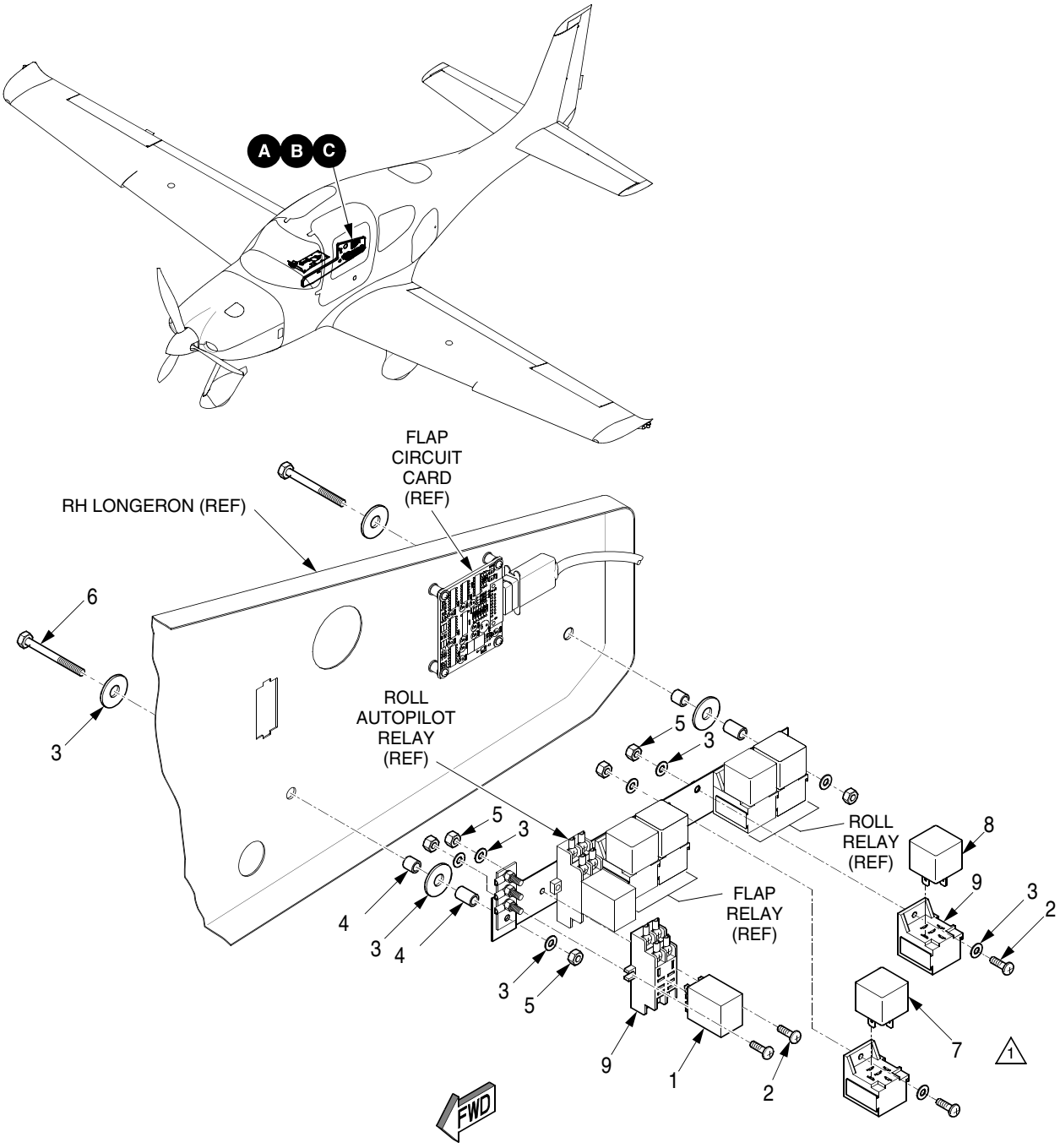
Figure 27-3011
Actuation Arm Installation and Adjustment - Serials 1301, 1307 & subs

N. Pitch Relays (See Figure 27-3012)

CAUTION: Failure of either pitch relay is cause for replacement of both relays. Replace both relays upon failure of one.

(1) Removal - Pitch Relay
  (a) Pull PITCH TRIM circuit breaker.
  (b) *Serials 1005 thru 1422:* Remove rear passenger seats. (Refer to 25-10)
  (c) *Serials 1005 thru 1422:* Remove access panel CF4C. (Refer to 06-00)
  (d) *Serials 1423 & subs w/o Perspective Avionics:* Remove access panel CF3R. (Refer to 06-00)
  (e) Remove relay from socket.

(2) Installation - Pitch Relay
  (a) Position relay to socket and push firmly to install.
  (b) *Serials 1005 thru 1422:* Install access panel CF4C. (Refer to 06-00)
  (c) *Serials 1423 & subs w/o Perspective Avionics:* Install access panel CF3R. (Refer to 06-00)
  (d) *Serials 1005 thru 1422:* Install rear passenger seats. (Refer to 25-10)
  (e) Reset PITCH TRIM circuit breaker.



DETAIL A

Serials 1005 thru 1422.

LEGEND

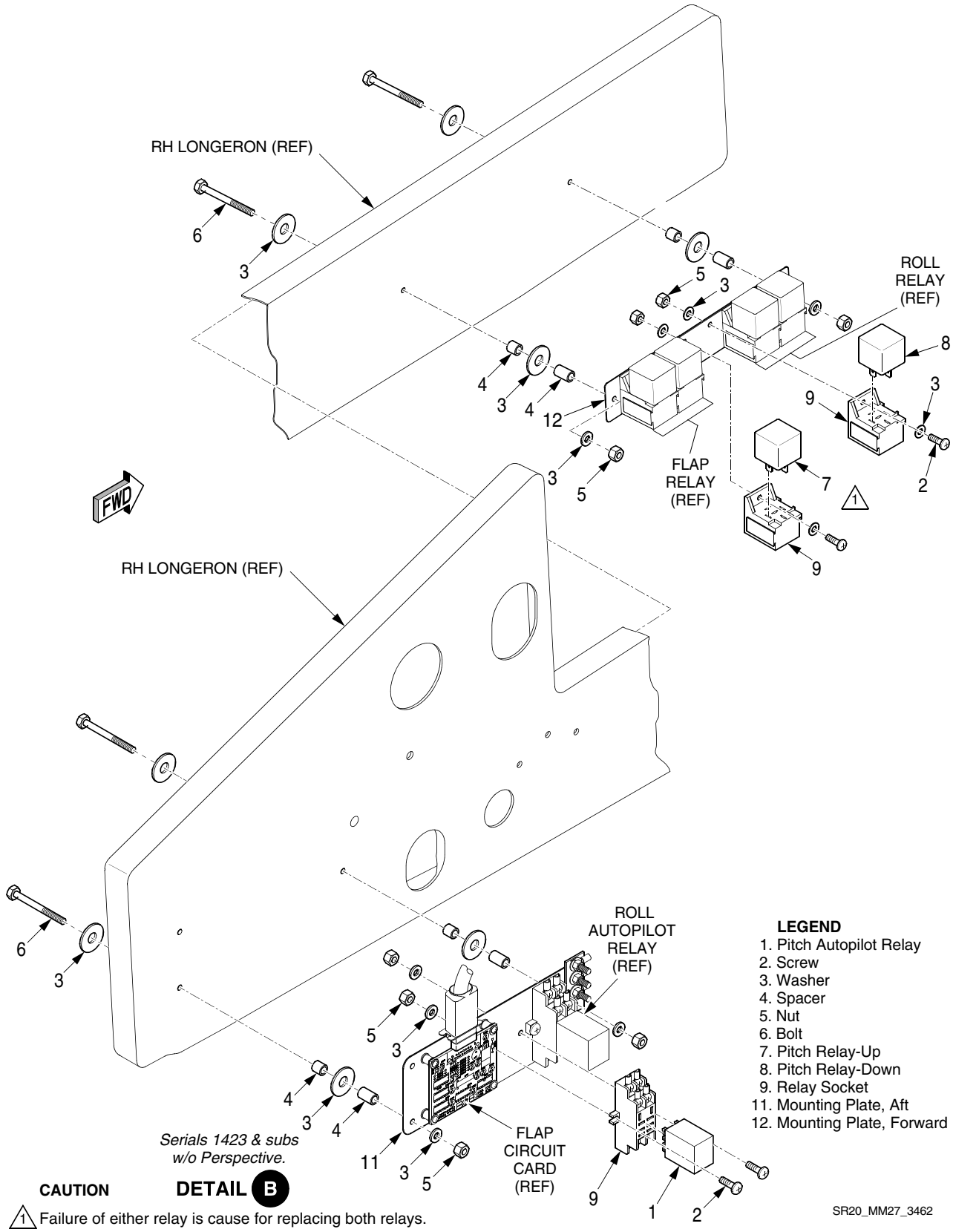
1. Pitch Autopilot Relay
2. Screw
3. Washer
4. Spacer
5. Nut
6. Bolt
7. Pitch Relay-Up
8. Pitch Relay-Down
9. Relay Socket
10. Mounting Plate

CAUTION

1 Failure of either relay is cause for replacing both relays.

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Figure 27-3012
Pitch Relay Assembly - Serials 1005 thru 1422 (Sheet 1 of 3)



CAUTION

1 Failure of either relay is cause for replacing both relays.

Figure 27-3012
Pitch Relay Assembly - Serials 1423 & subs w/o Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 1423 & subs w/o Perspective Avionics

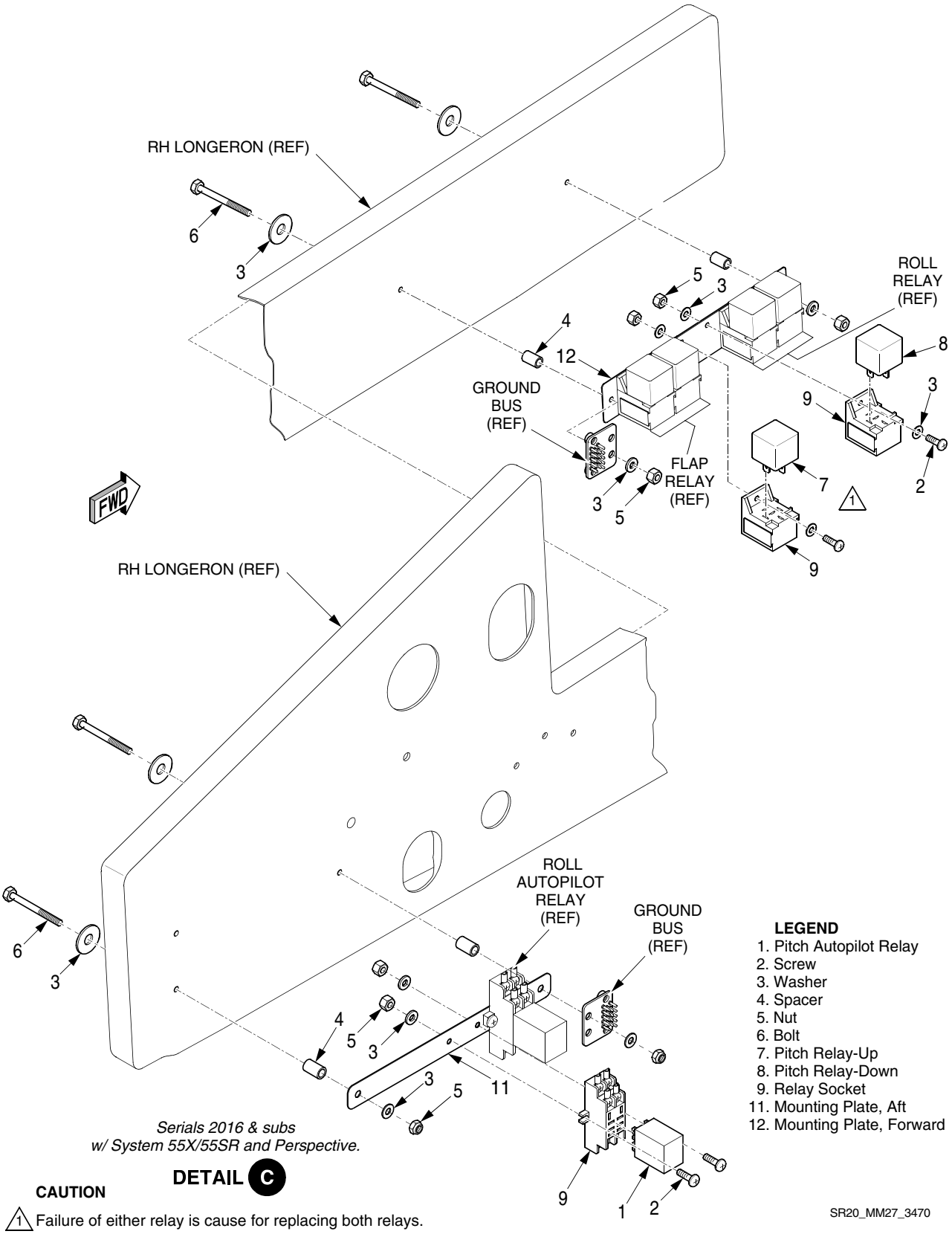


Figure 27-3012
Pitch Relay Assembly - Serials 2016 & subs w/ System 55X/55SR and Perspective (Sheet 3 of 3)

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STALL WARNING SYSTEM

1. DESCRIPTION

A. Stall Warning System - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The airplane uses an electro-pneumatic stall warning system. As the angle of attack increases and the airplane approaches an aerodynamic stall, the stagnation point moves lower on the leading edge causing low pressure on the upper leading edge to increase. As low pressure passes over the stall warning port located on the leading edge of the right wing, negative pressure is sensed by a pressure switch which activates the stall warning horn.

The stall warning horn, located on the top flange of the LH center console rib, is a piezo-ceramic audio indicator. *Serials 1005 & subs before SB 2X-27-15:* When activated, the horn supplies a continuous 94 dB, 2800 Hz tone. *Serials 1005 & subs after SB 2X-27-15:* When activated, the horn supplies a continuous 95 dB, 2000 Hz tone.

The pressure switch, located on the mid-console LH side panel, is a normally open, diaphragm-operated switch.

Serials 1005 thru 1267: The switch is powered by 28 VDC supplied through the 2-amp ANNUNCATOR POWER circuit breaker on the Essential Bus. In the case of emergency procedures that require the MASTER switch to be turned OFF, power is supplied to the stall warning system directly from the airplane battery on the clock circuit. In addition, this provides a ground check of the stall warning system with the power off. In the event of a total electrical failure, power for the stall warning system is supplied by the turn coordinator battery back-up by turning the EMERG. switch ON.

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics: The switch is powered by 28 VDC supplied through the 2-amp STALL WARNING circuit breaker on the Essential Bus.

B. Stall Warning System - *Serials 2016 & subs w/ Perspective Avionics*

The airplane uses an electro-pneumatic stall warning system. As the angle of attack increases and the airplane approaches an aerodynamic stall, the stagnation point moves lower on the leading edge causing low pressure on the upper leading edge to increase. As low pressure passes over the stall warning port located on the leading edge of the right wing, negative pressure is sensed by a pressure switch which provides a signal to the avionics system to activate the aural stall warning and enables the Crew Alerting System (CAS) to display a STALL annunciation on the PFD.

The pressure switch, located on the mid-console LH side panel, is a normally open, diaphragm-operated switch. The switch is powered by 28 VDC supplied through the 2-amp STALL WARNING circuit breaker on the Essential Bus.

2. MAINTENANCE PRACTICES

A. Stall Warning Horn - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 27-311)

(1) Removal - Stall Warning Horn

(a) Remove glareshield. (Refer to 25-10)

(b) Remove MFD (Refer to 31-60).

(c) Disconnect stall warning horn electrical connector.

(d) *Serials 1005 & subs before SB 2X-27-15:* Remove screws, washers, and nuts securing horn to console rib. Remove horn from airplane.

(e) *Serials 1005 & subs after SB 2X-27-15:* Remove bolt and nut securing horn assembly mounting bracket to console rib. Remove horn assembly from airplane.

(2) Installation - Stall Warning Horn

(a) *Serials 1005 & subs before SB 2X-27-15:* Position horn to console rib and secure with screws, washers, and nuts.

(b) *Serials 1005 & subs after SB 2X-27-15:* Position horn assembly mounting bracket to console rib at a $45^{o} \pm 5^{o}$ angle and secure with bolt and nut.

(c) Connect stall warning horn electrical connector.

(d) Install MFD. (Refer to 31-60)

(e) Install glareshield. (Refer to 25-10)

(f) Perform Stall Warning Operational Check - Ground. (Refer to 27-31)

(g) Perform Stall Warning Operational Check - Flight. (Refer to 27-31)

B. Stall Warning Pressure Switch (See Figure 27-311)

(1) Removal - Stall Warning Pressure Switch

(a) Switch AVIONICS and MASTER switches to OFF position.

(b) Pull ANNUNCIATOR POWER circuit breaker.

(c) Remove LH mid-console circuit breaker trim panel.

(d) Open circuit breaker panel.

(e) Disconnect pressure switch electrical connector.

(f) Disconnect stall warning line from pressure switch.

(g) Remove screws, washers, and nuts securing pressure switch to console. Remove pressure switch from airplane.

(2) Installation - Stall Warning Pressure Switch

(a) Position pressure switch on console and install screws, washers, and nuts.

(b) Connect stall warning line to pressure switch.

(c) Connect electrical leads to pressure switch.

(d) Close circuit breaker panel.

(e) Install LH mid-console circuit breaker trim panel.

(f) Reset ANNUNCIATOR POWER circuit breaker.

(g) Perform Stall Warning Operational Check - Ground. (Refer to 27-31)

(h) Perform Stall Warning Operational Check - Flight. (Refer to 27-31)

(3) Inspection/Check - Stall Warning Operational Check - Ground

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Suction Cup	-	Any Source	Application of negative pressure.

(b) Pull STARTER and FUEL PUMP circuit breakers.

(c) Set BAT 1 and AVIONICS switches to ON positions.

(d) On RH wing leading edge, clean area surrounding stall warning port.

(e) Moisten suction cup and firmly press cup over stall warning port.

(f) Activate stall warning pressure switch by sharply pulling suction cup directly away from stall warning port. Verify horn sounds audible warning signal.

(g) Set BAT 1 and AVIONICS switches to OFF positions.

(h) Reset STARTER and FUEL PUMP circuit breakers.

(4) Inspection/Check - Stall Warning Operational Check - Flight

WARNING: The following Adjustment/Test must be performed by a Cirrus Design authorized pilot.

(a) Remove access cap covering stall warning pressure switch located on lower portion of the left mid-console circuit breaker trim panel.

(b) Perform Stall Warning Operational Check - Ground. (Refer to 27-31)

(c) Place airplane in stall attitude.

(d) Record airplane speed that stall warning signal sounds.

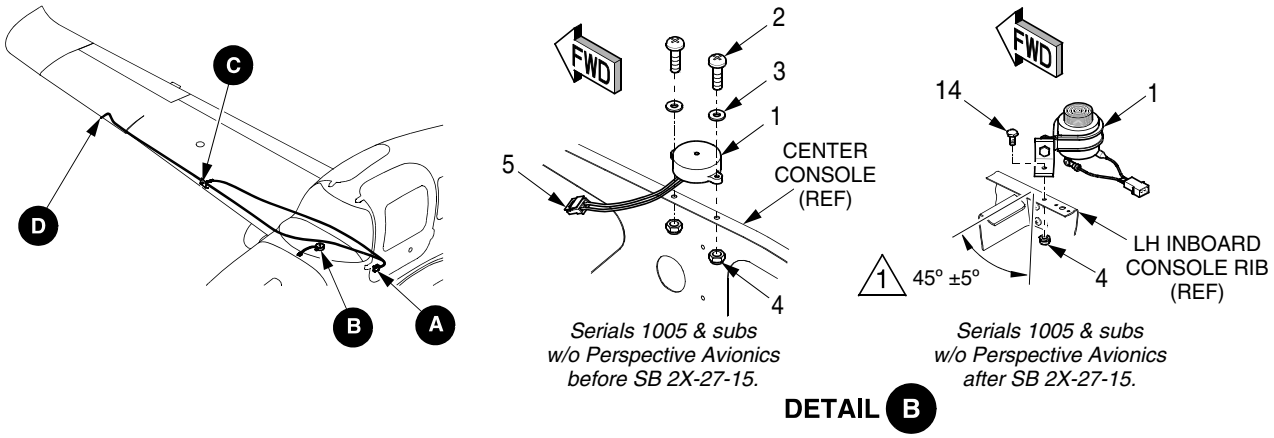
(e) Record airplane speed that stall occurred.

(f) Stall warning signal should sound 5 to 10 KIAS prior to stall.

(g) If necessary, adjust stall warning pressure switch until stall warning signal sounds 5 to 10 KIAS prior to stall.

1 Rotating the adjustment screw 1 full turn clockwise will raise the speed at which the stall warning horn sounds by approximately 2 knots.

2 Rotating the adjustment screw 1 full turn counterclockwise will lower the speed at which the stall warning horn sounds by approximately 2 knots.



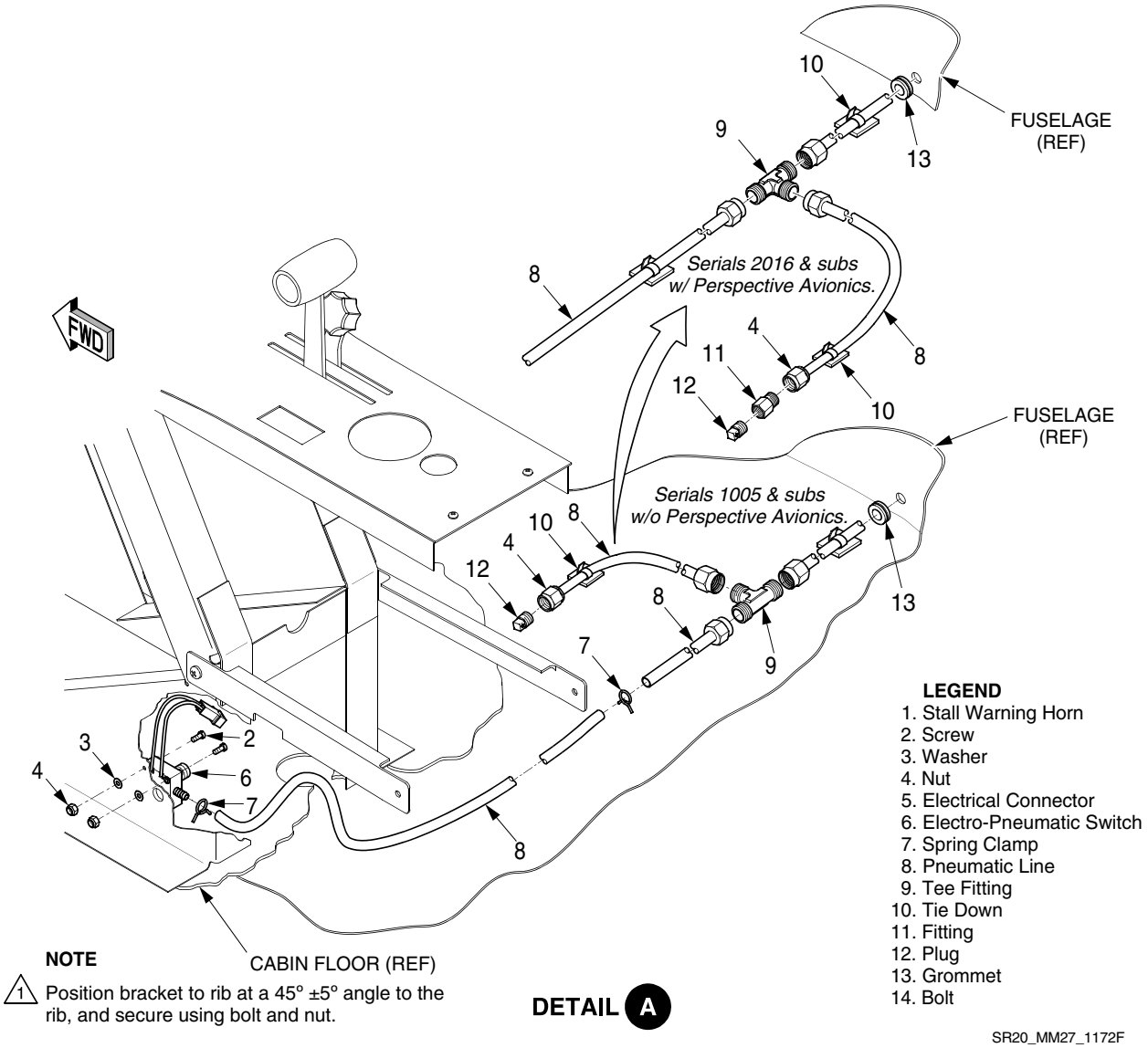
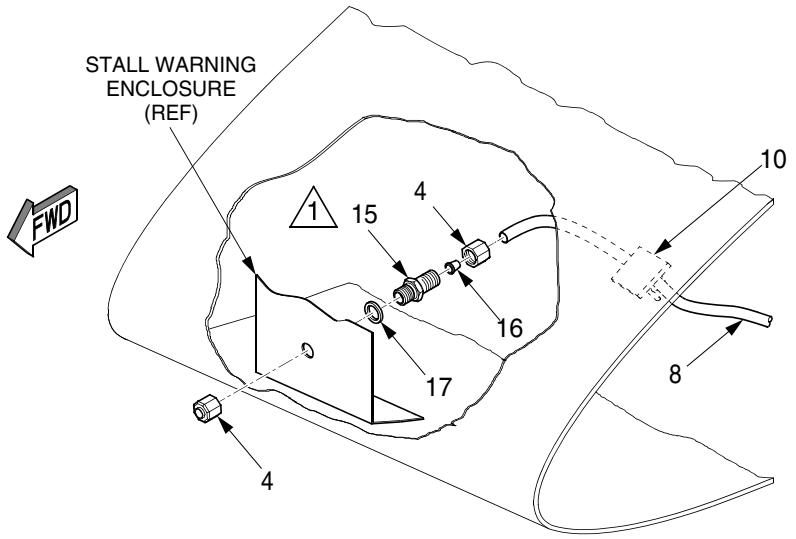
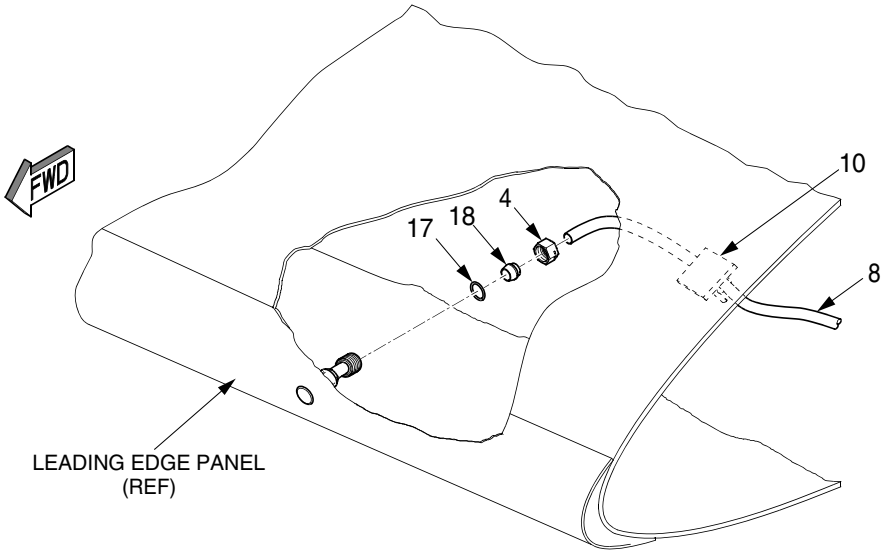


Figure 27-311
Stall Warning System Installation (Sheet 1 of 2)



Serials 1005 thru 1877, 1879 thru 1885.

DETAIL C



Serials 1878, 1886 & subs.

DETAIL D

LEGEND

4. Nut
8. Pneumatic Line
10. Tie Down
15. Bulkhead Union
16. Nylon Insert
17. O-Ring
18. Olive

NOTE

1. If thread relief is present on forward threaded end of bulkhead fitting, trim at thread relief to secure fitting flush to stall warning enclosure.

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Figure 27-311
Stall Warning System Installation (Sheet 2 of 2)

FLAPS

1. GENERAL

This section describes that portion of the flight control system which controls the position and movement of the flaps. Included are the flap actuator assembly, torque tube assembly, flap switch assembly, flap switch panel, flap circuit card assembly, flap relays, and EMI suppression cores.

Flap control is achieved via a flap activation switch mounted on the center console. Indicator lights identify flap position. A linear actuator, located under the baggage floor, drives a torque tube interconnect between the left and right flaps. A load limiting clutch on the actuator prevents flap deployment at high speeds. Proximity sensors on the flap linear actuator identify flap position and surface travel. In the event of a sensor failure, torque tube/actuator geometry prevents the flaps from causing an uncontrollable flight condition.

Serials 1205 & subs: Electromagnetic Interference Suppression (EMI) cores are integral to the flap system wire harness.

Serials 1005 thru 1204 after SB 20-27-05: Electromagnetic Interference Suppression (EMI) cores are installed between the existing wire harness and the flap circuit card.

2. MAINTENANCE PRACTICES

A. Flap Actuator Assembly (See Figure 27-502)

(1) Removal - Flap Actuator Assembly

CAUTION: To prevent damage to flap hinges and flaps, tape flaps to wing prior to disconnecting flap actuator.

(a) Pull FLAPS circuit breaker.
(b) Remove passenger seats. (Refer to 25-10)
(c) Remove carpet. (Refer to 25-10)
(d) Remove access panels CF4C and CF5. (Refer to 06-00)
(e) *Serials 2065 & subs w/ Air Conditioning:* Remove condenser. (Refer to 21-50)
(f) Remove cotter pin, nut, washers, and bolt securing flap actuator to torque tube coupler.
(g) Disconnect flap actuator electrical connector.
(h) Remove retainer rings and pin securing flap actuator assembly to mounting bracket.
(i) Remove flap actuator assembly from airplane.
(j) *Serials 1005 thru 2085 after SB2X-27-16, 2086 & subs:* If replacing flap actuator with new assembly, remove screws securing collar at flap actuator shaft. Retain collar and screws.

(2) Disassembly - Flap Actuator Assembly
(a) Loosen jam nut securing rod end to flap actuator end fitting.
(b) Remove rod end and jam nut.
(c) Loosen jam nut securing flap actuator end fitting to flap actuator.
(d) Remove end fitting.

(3) Assembly - Flap Actuator Assembly
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Threadlocker	Loctite 242	Henkel Technologies Madison Heights, MI 48071 248-583-9300	Bond jam nut threads.

(b) Back jam nut to bottom of flap actuator and install end fitting on actuator.
(c) Bottom out end fitting onto flap actuator to ensure maximum thread engagement.
(d) Apply Loctite to jam nut thread area. (Refer to 20-40)
(e) Torque jam nut to 140.0 - 155.0 in-lbs (15.8 - 17.5 Nm).
(f) Bottom out jam nut onto rod end.
(g) Install rod end into actuator end fitting and bottom out. Leave jam nut loose at this time.

(4) Installation - Flap Actuator Assembly
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Threadlocker	Loctite 242	Henkel Technologies Madison Heights, MI 48071 248-583-9300	Bond jam nut threads.

(b) If secured, cut cable ties securing proximity sensor wiring to flap actuator.

(c) Position flap actuator assembly to mounting bracket and secure with pin and retaining rings.
(d) Manually extend actuator to approximately 50% full deployment.
(e) Connect flap actuator electrical connector.
(f) Reset FLAPS circuit breaker.
(g) Turn flap switch to UP.
(h) Set BAT 1 switch to ON position.
(i) After flap actuator stops, turn flap switch to 50%.
(j) Set BAT 1 switch to OFF position.
(k) Pull FLAPS circuit breaker.
(l) Loosen adjustment screws and reposition full up proximity sensor to within 1.0 inch (2.5 cm) of middle proximity sensor.
(m) Loosen adjustment screws and reposition full down proximity sensor to within 1.0 inch (2.5 cm) of middle proximity sensor.

Note: Stack-up order may be altered to allow for better alignment between flap actuator and torque tube coupler.

(n) Install bolt and washers connecting rod end to torque tube coupler and secure with new nut. Do not install cotter pin at this time.
(o) Remove tape securing flaps to wing.
(p) *Serials 1005 thru 2085 after SB2X-27-16, 2086 thru 2299:* If removed, position collar onto flap actuator shaft and loosely install screws securing collar to flap actuator shaft.
(q) *Serials 2300 & subs:* If removed, position collar so that screws are seated against flats on flap actuator rod. Tighten screws securing collar to flap actuator rod.
(r) Reset FLAPS circuit breaker.
(s) Perform Adjustment/Test - Flap Travel. (Refer to 27-50)
(t) If jam nut was loosely installed during flap actuator assembly:
    1 Apply Loctite to jam nut thread area. (Refer to 20-40)
    2 Tighten jam nut securing rod end to actuator end fitting. Torque jam nut to 60.0 - 70.0 in-lbs (6.8 - 7.9 Nm).
(u) Torque bolt securing rod end to torque tube coupler. (Refer to 20-60)
(v) Install new cotter pin at attaching hardware securing rod end to torque tube coupler. (Refer to 20-70)
(w) Install cable ties securing proximity switch wiring to flap actuator.
(x) Set BAT 1 switch to ON position.
(y) Rotate FLAPS switch to 100% position.
(z) *Serials 1005 thru 2085 after SB2X-27-16, 2086 thru 2299:* Adjust and torque collar.
    1 Adjust collar on flap actuator shaft as required to obtain 0.05 ±0.01 inch (1.27 ±0.25 mm) gap between face of collar and actuator seal.

    Note: By design, the collar will deform when specified torque is applied to screws.

    2 Torque screws to 160.0 ±5.0 in-lb (18.1 ±0.6 Nm).
(aa) Rotate FLAPS switch to UP position.
(ab) Set BAT 1 switch to OFF position.
(ac) *Serials 2065 & subs w/ Air Conditioning:* Install condenser. (Refer to 21-50)
(ad) Install access panels CF4C and CF5. (Refer to 06-00)
(ae) Install carpet. (Refer to 25-10)

(af) Install passenger seats. (Refer to 25-10)

(5) Adjustment/Test - Flap Travel

Note: When in the 0% position, a minimum 0.05 inch (1.27 mm) clearance must be maintained between end fitting and torque tube coupler.

When adjusting position proximity sensors, it may be necessary to lengthen actuator to achieve full 0% position. Accomplish by backing out rod end, but do not exceed 2 turns maximum.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
WS 40 Wing Template	13057-101/-102	Cirrus Design	Flap Rigging
WS 132 Wing Template	13057-107/-108	Cirrus Design	Flap Rigging
Inclinometer	PRO360	Macklanburg Duncan	Deflection Angle

Note: Flap may exhibit a slight twist from root to tip. Average the inboard and outboard angle to set the neutral point.

(b) Remove passenger seats. (Refer to 25-10)

(c) Remove carpet and access panels CF4C and CF5. (Refer to 06-00)

(d) If secured, cut cable ties securing proximity sensor wiring to flap actuator.

(e) *Serials 1005 thru 1034:* Ensure minimum engagement length of flap actuator end fitting to flap actuator rod is 0.250 inch (0.635 cm).

(f) *Serials 1035 thru 2085 before SB2X-27-16:* Adjust flap actuator end fitting so that flap actuator rod and rod end connected to torque tube coupler are installed to a depth between end fitting inspection holes.

(g) Set BAT 1 switch to ON position.

(h) Turn flap switch to UP.

(i) Mark WS 132 reference line for left and right wing templates as follows:

1 From wing cuff, measure 1.75 inches inboard and mark.

2 From flap outboard edge, measure 10.7 inches inboard and mark.

3 Draw WS 132 reference mark line from leading edge to trailing edge.

(j) Mark WS 40 reference line for left and right wing templates as follows:

1 From flap inboard edge, measure 1.75 inches outboard and mark.

2 From wing cuff, measure 90 inches inboard and mark.

3 Draw WS 40 reference mark line from leading edge to trailing edge.

(k) Position WS 40 and WS 132 template on left and right wing to verify flaps are in full up position.

(l) If flaps are not in full up position, adjust flap actuator proximity sensor.

1 Turn flap switch to 50%.

2 Set BAT 1 switch to OFF position.

Note: For best results in determining proximity sensor location, do not move sensor more than 0.10 inch (2.5 mm) per positioning attempt.

3 Adjust full up proximity sensor by loosening screw and repositioning sensor on flap actuation extension tube.

4 Set BAT 1 switch to ON position.
5 Turn flap switch to UP.
6 Using the templates, verify flaps are in full up position.
7 If necessary, repeat repositioning of proximity switch until flaps are in full up position.

(m) Fasten inclinometer to inboard side of left flap and set at 0°.
(n) Turn flap switch to 100%.
(o) Verify flap exhibits a 32° angle change.
(p) If flaps are not in 100% deployed position, adjust flap actuator proximity sensor.
1 Turn flap switch to 50%.
2 Set BAT 1 switch to OFF position.

Note: For best results in determining proximity sensor location, do not move sensor more than 0.10 inch (2.5 mm) per positioning attempt.

3 Adjust 100% proximity sensor by loosening screw and repositioning sensor on flap actuation extension tube.
4 Set BAT 1 switch to ON position.
5 Turn flap switch to 100%.
6 If necessary, repeat repositioning of proximity switch until flaps are in 100% deployed position.

(q) Turn flap switch to UP. After flaps stop, turn flap switch to 50%.
(r) Verify flap exhibits a 16° angle change.
(s) If flaps are not in 50% deployed position, adjust flap actuator proximity sensor.
1 Turn flap switch to UP.
2 Set BAT 1 switch to OFF position.

Note: For best results in determining proximity sensor location, do not move sensor more than 0.10 inch (2.5 mm) per positioning attempt.

3 Adjust 50% proximity sensor by loosening screw and repositioning sensor on flap actuation extension tube.
4 Set BAT 1 switch to ON position.
5 Turn flap switch to 50%.
6 If necessary, repeat repositioning of proximity switch until flaps are in 50% deployed position.

(t) Remove inclinometer from flap.
(u) Verify operation of flaps circuit.
1 Activate flaps circuit from 0% position to 50% position and press Push-to-Talk Switch while flaps are in transit. Flaps shall travel to 50% position without hesitation and stop.
2 Activate flaps circuit from 100% position to 50% position and press Push-to-Talk Switch while flaps are in transit. Flaps shall travel to 50% position without hesitation and stop.
3 Activate flaps circuit from 50% position to 0% position.

(v) Verify torque tube clearance.
1 Push torque tube all the way to the left.
2 Verify gap between left end of torque tube and nearest part of flap assembly, hinge, or linkage is at least 0.1 inch (2.54 mm).
3 Push torque tube all the way to the right.

4 Verify gap between right end of torque tube and nearest part of flap assembly, hinge, or linkage is at least 0.1 inch (2.54 mm).

(w) Install cable ties securing proximity switch wiring to flap actuator.

(x) Install access panels CF4C and CF5 and carpet. (Refer to 06-00)

(y) Install passenger seats. (Refer to 25-10)

(6) Inspection/Check - Flap Rigging (See Figure 27-501)

Note: The gap and overlap inspection of the following procedure need only be performed after the installation of a *replacement (new or different) flap*. If the following flap leading edge gap and overlap inspections do not fall within the specified clearances, contact Cirrus Design Customer Service Department for disposition.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
90° Square	-	Any Source	Flap Rigging

(b) *Serials 1005 thru 1885 Replacement Flap Installation Only:* Verify flap gap and overlap.

1 Using 90° square with flaps fully extended, verify maximum gap between crown of flap and trailing edge of wing is 0.965 inch +/- 0.200 (2.45 cm +/- 5.0 mm) at root of the flap, and 0.843 inch +/- 0.200 (2.14 cm +/- 5.0 mm) at tip of flap.

2 Using 90° square with flaps fully extended, verify maximum overlap between leading edge of flap and trailing edge of wing is 1.485 inch +/- 0.300 (3.77 cm +/- 7.6 mm) at root of flap, and 0.813 inch +/- 0.300 (2.07 cm +/- 7.6 mm) at tip of flap.

(c) *Serials 1886 & subs Replacement Flap Installation Only:* Verify flap gap and overlap.

1 Using 90° square with flaps fully extended, verify maximum gap between crown of flap and trailing edge of wing is 0.917 +/- 0.200 inch (2.33 +/- 0.50 cm) at root of the flap, and 0.958 +/- 0.200 inch (2.43 +/- 0.50 cm) at tip of flap.

2 Using 90° square with flaps fully extended, verify maximum overlap between leading edge of flap and trailing edge of wing is 1.512 +/- 0.200 inch (3.84 +/- 0.50 cm) at root of flap, and 0.562 inch +/- 0.200 (1.43 +/- 0.50 cm) at tip of flap.

(d) Verify flap UP, 50%, and 100% deployment positions. (Refer to 27-50)

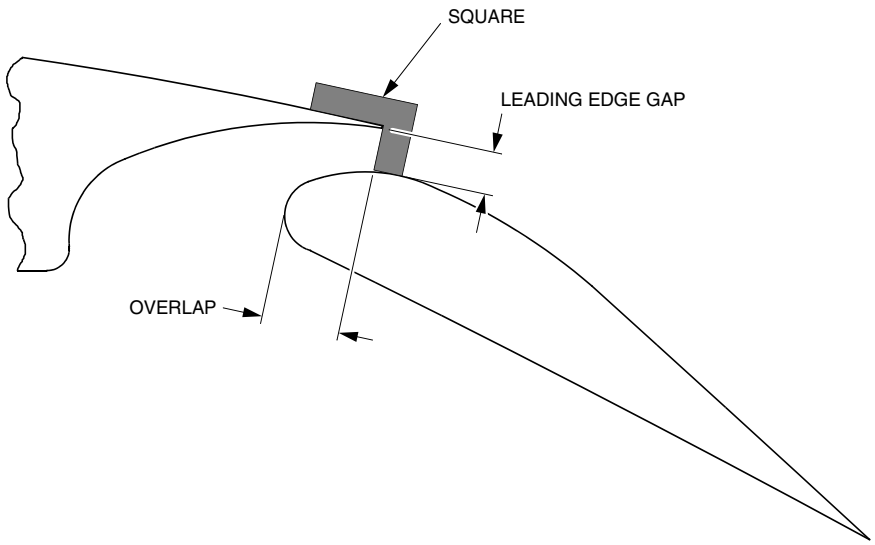
(e) Verify minimum rod end thread engagement of 0.312 inch (0.79 cm).

(f) Verify flap actuator end fitting engagement length.

(g) *Serials 1005 thru 1034:* Ensure minimum engagement length of flap actuator end fitting to flap actuator rod is 0.250 inch (0.635 cm).

(h) *Serials 1035 thru 2085 before SB2X-27-16:* Verify the flap actuator and the rod end at the flap actuator end fitting are installed to a depth between the end fitting inspection holes.

(i) Verify proper installation of safety wires and cotter pins on all fasteners and engagement of all jam nuts through complete flap control system.

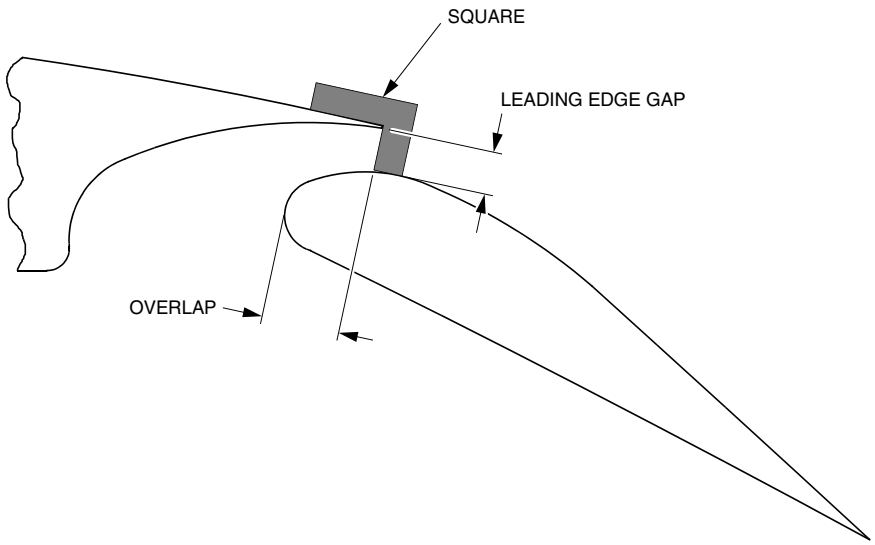


	Max. at Root of Flap	Min. at Root of Flap	Max. at Tip of Flap	Min. at Tip of Flap
Leading Edge Gap	1.165" 2.96cm	0.765" 1.94 cm	1.043" 2.65 cm	0.643" 1.63 cm
Overlap	1.785" 4.53 cm	1.185" 3.0 cm	1.113" 2.83 cm	0.513" 1.3 cm

Serials 1005 thru 1877, 1879 thru 1885.

SR20_MM27_1229A

Figure 27-501
Flap Gap and Overlap Inspections - Serials 1005 thru 1885 (Sheet 1 of 2)



	Max. at Root of Flap	Min. at Root of Flap	Max. at Tip of Flap	Min. at Tip of Flap
Leading Edge Gap	1.117" 2.83 cm	0.717" 1.83 cm	1.158" 2.93 cm	0.758" 1.93 cm
Overlap	1.712" 4.34 cm	1.312" 3.34 cm	0.762" 1.93 cm	0.362" 0.93 cm

SR20_MM27_2752

Figure 27-501
Flap Gap and Overlap Inspections - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs

B. Torque Tube Assembly (See Figure 27-502)

(1) Removal -Torque Tube Assembly

(a) Remove nuts, washers, spacers, and bolts securing torque tube thrust collar and end fitting to flap torque tube.

(b) Remove passenger seats. (Refer to 25-10)

(c) Remove carpet and access panel CF4C. (Refer to 06-00)

(d) Remove cotter pin, nut, washers, and bolt securing flap actuator push/pull rod to torque tube coupler.

(e) Remove nuts, washers, spacers, and bolts securing torque tube coupler and torque tubes.

(f) Withdraw torque tube from outboard tube bushing.

(g) Withdraw torque tube coupler from inboard tube bushing.

(2) Installation -Torque Tube Assembly

(a) Insert torque tube coupler into inboard tube bushing.

(b) Insert LH torque tube through outboard bushing into torque tube coupler.

(c) Insert RH torque tube through outboard bushing into torque tube coupler.

(d) Install bolts, washers, spacers, and nuts securing torque tube coupler and torque tubes.

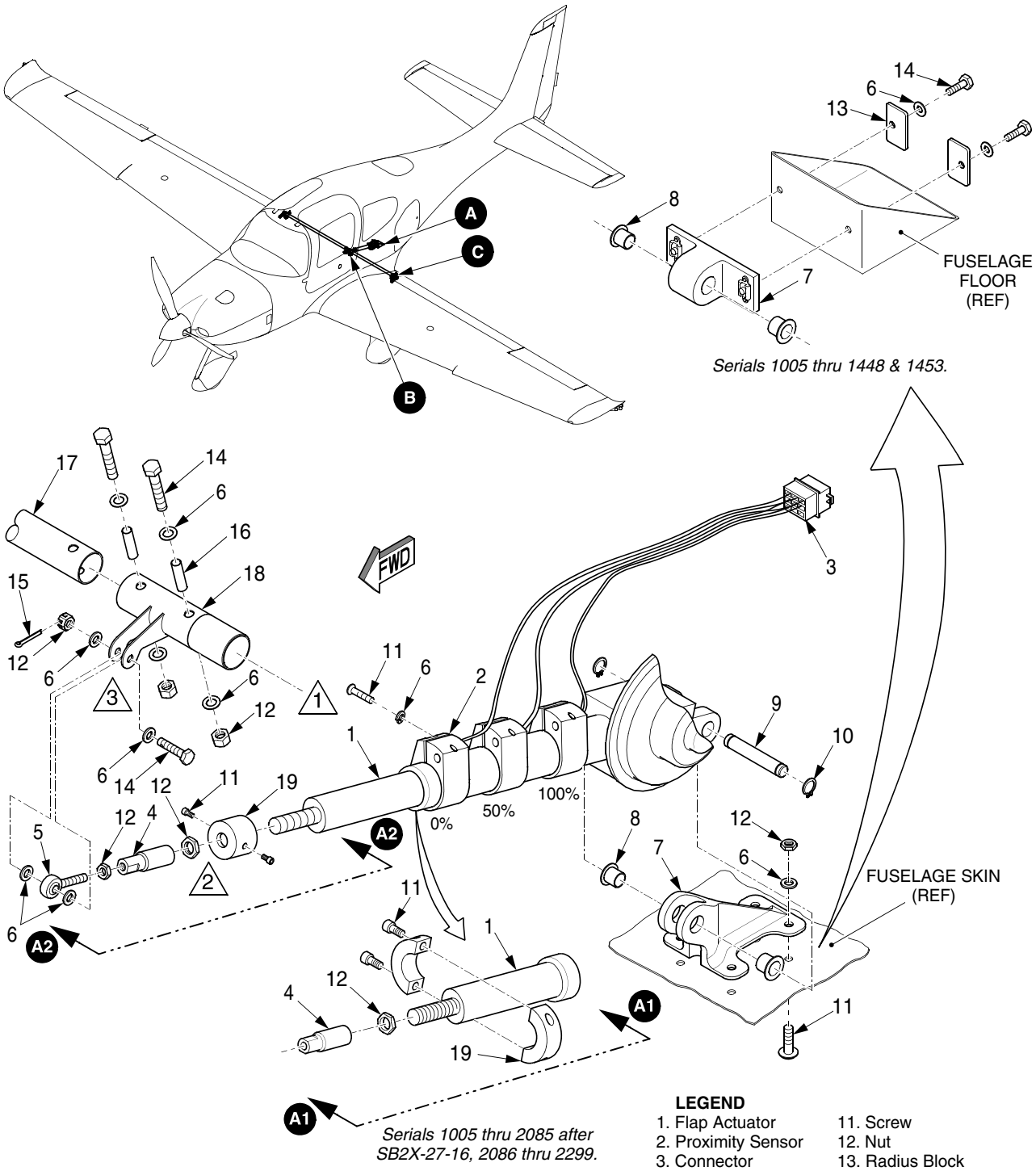
(e) Install bolts, washers, spacers, and nuts securing torque tube thrust collar and end fitting to flap torque tube.

(f) Install bolt, washers, nut, and cotter pin securing flap actuator push/pull rod to torque tube coupler.

(g) Perform Adjustment/Test - Flap Travel. (Refer to 27-50)

(h) Install access panel CF4C and carpet. (Refer to 06-00)

(i) Install passenger seats. (Refer to 25-10)



NOTE

1. Refer to sheet 2 for continuation.
2. *Serials 2300 & subs:* Collar Installation.
3. Stack-up order may be altered to allow for better alignment between flap actuator and torque tube coupler.

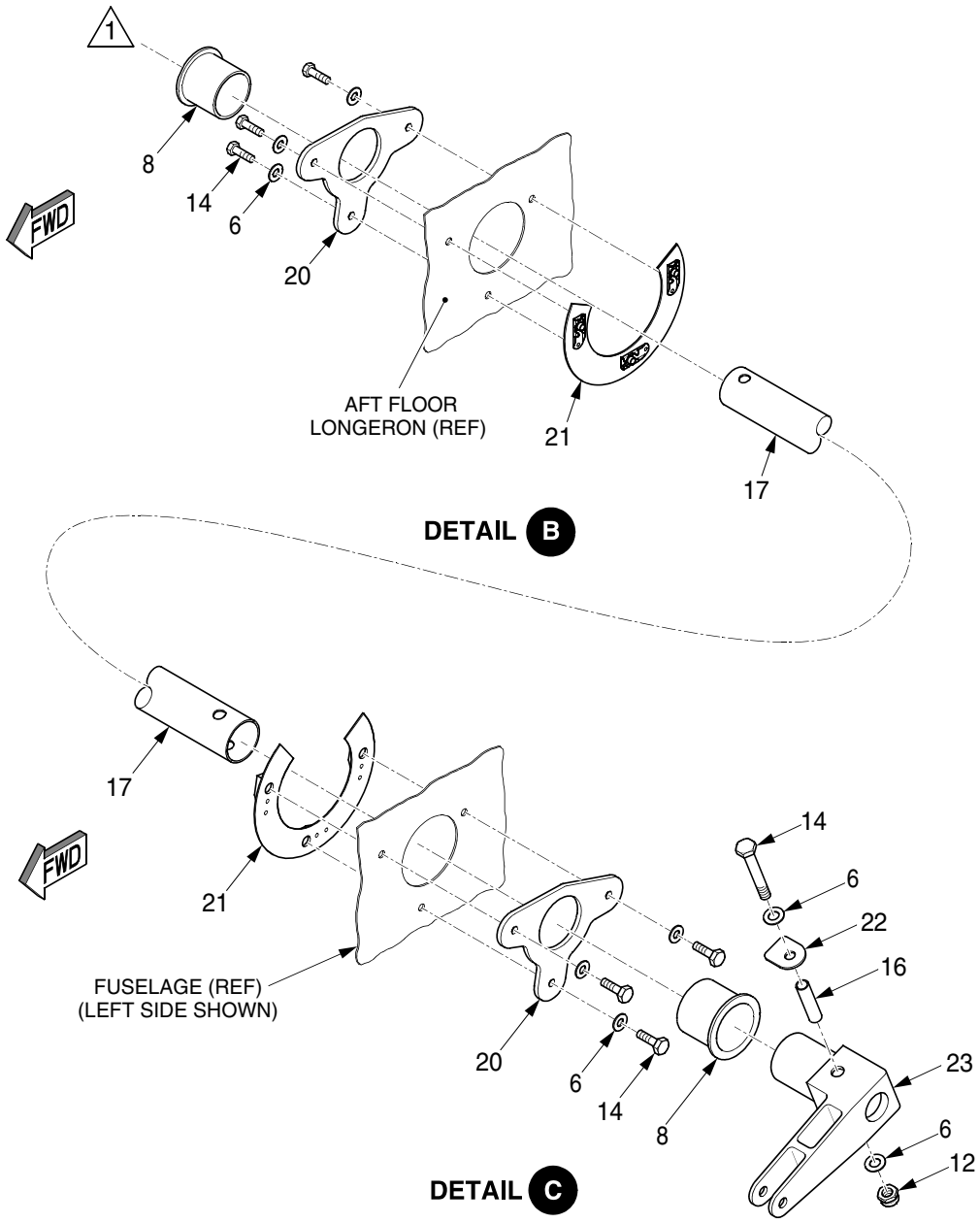
DETAIL A

LEGEND

1. Flap Actuator	11. Screw
2. Proximity Sensor	12. Nut
3. Connector	13. Radius Block
4. Actuator End Fitting	14. Bolt
5. Rod End	15. Cotter Pin
6. Washer	16. Spacer
7. Bracket	17. Torque Tube
8. Bushing	18. Torque Tube Coupler
9. Pin	19. Collar
10. Retainer Ring	

SR20_MM27_1174H

Figure 27-502
Flap Actuator and Torque Tube Installation (Sheet 1 of 4)



LEGEND

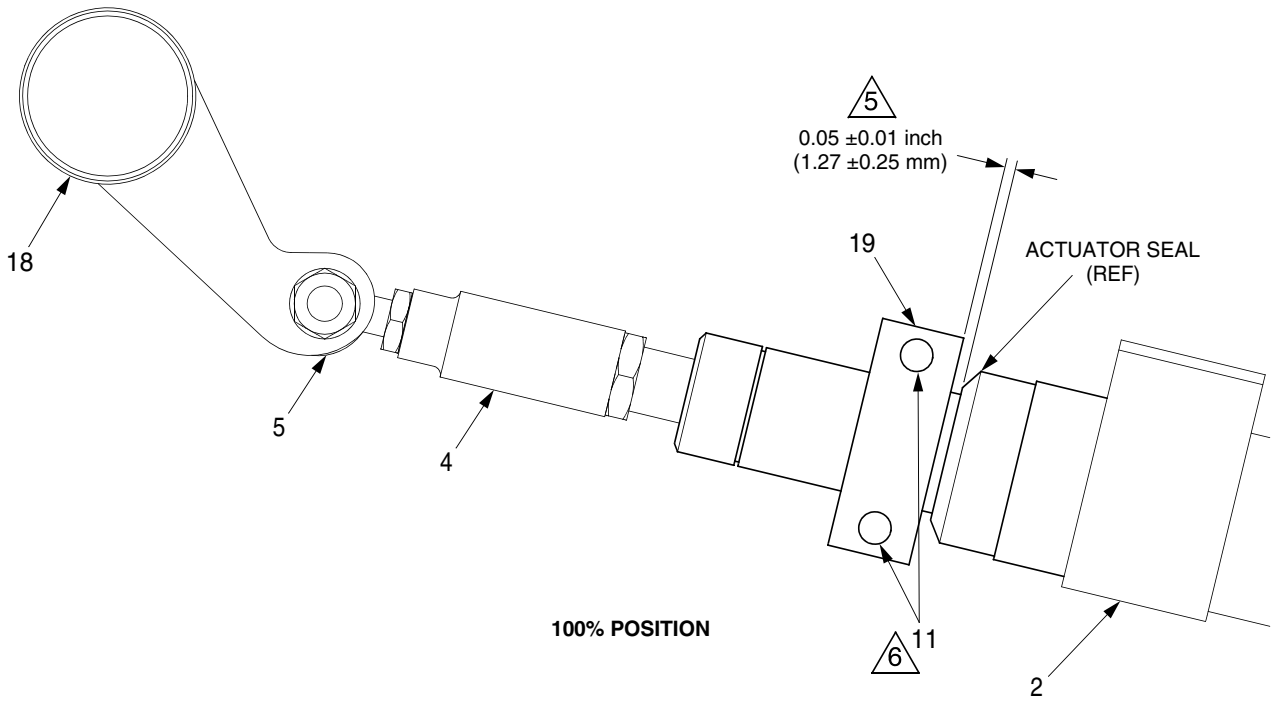
6. Washer
8. Bushing
12. Nut
14. Bolt
16. Spacer
17. Torque Tube
20. Bushing Mount
21. Backing Plate
22. Thrust Collar
23. Torque Tube End Fitting

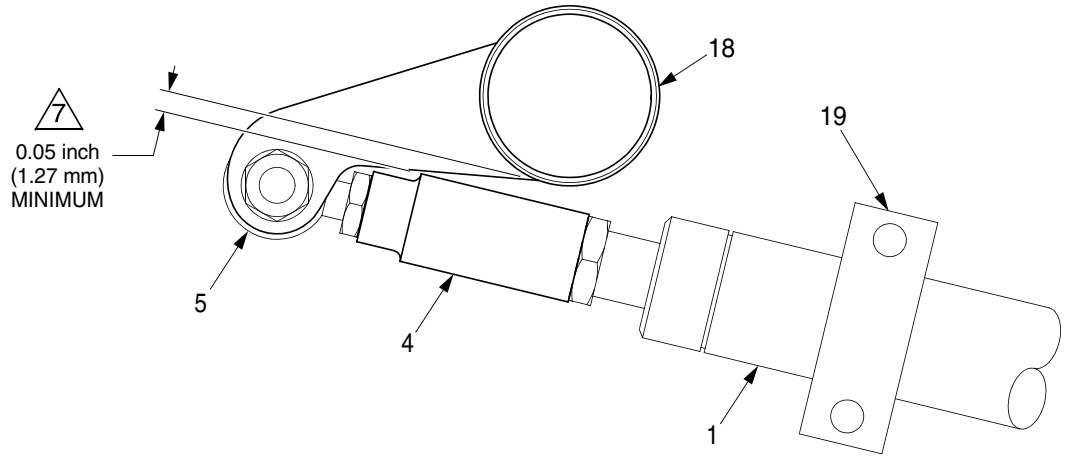
NOTE

1 Refer to sheet 1 for continuation.

SR20_MM27_1175H

Figure 27-502
Flap Actuator and Torque Tube Installation (Sheet 2 of 4)





VIEW A1

Serials 2086 thru 2299,
1005 thru 2085 after SB2X-27-16.

LEGEND

1. Flap Actuator
2. Proximity Sensor
4. Actuator End Fitting
5. Rod End
11. Screw
18. Torque Tube Coupler
19. Collar

NOTE

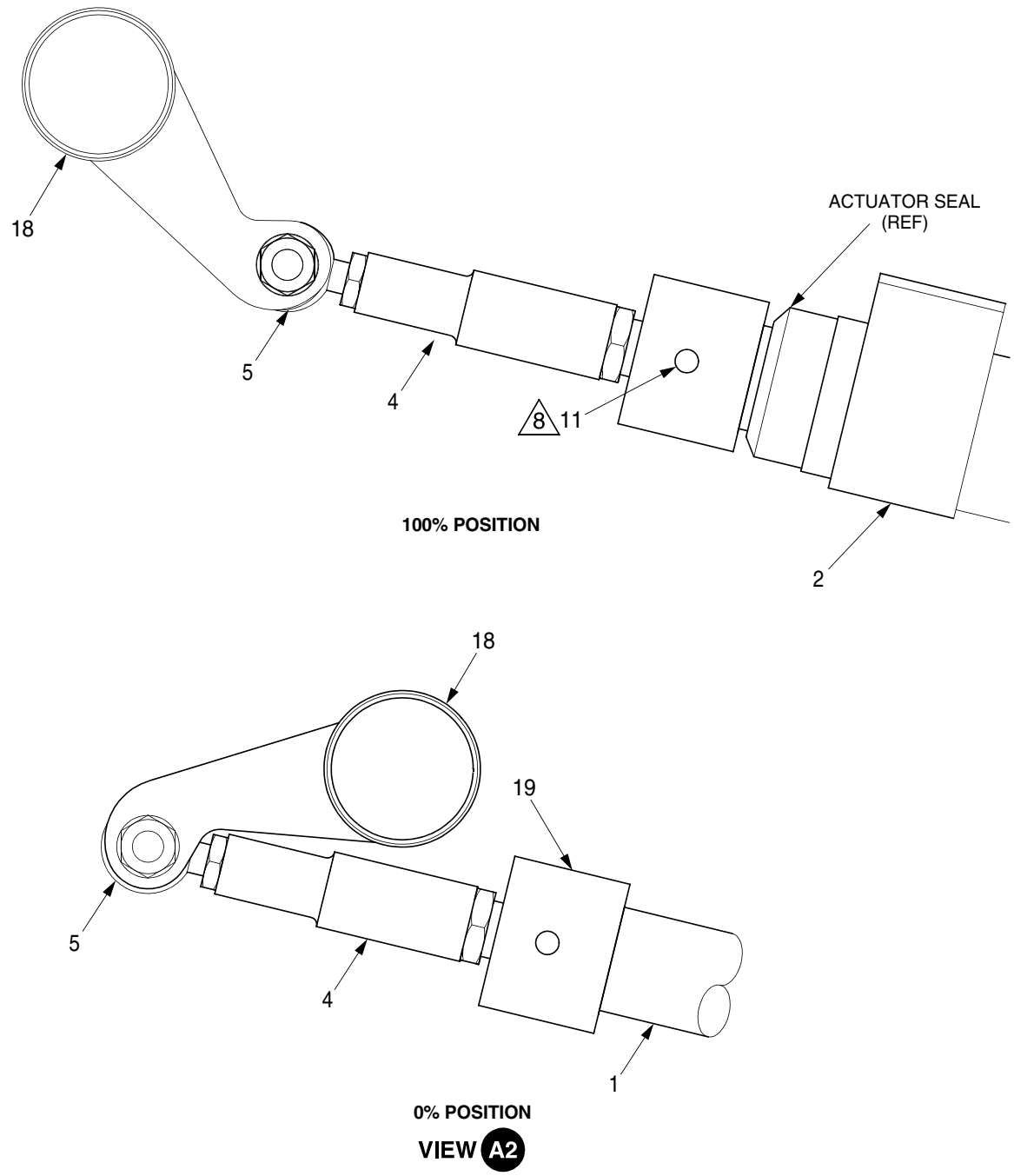
5 With flaps in 100% position, adjust collar on flap actuator shaft as required to obtain 0.05 ±0.01 inch (1.27 ±0.25 mm) gap between face of collar and actuator seal.

6 Torque screws to 160.0 ±5.0 in-lb (18.1 ±0.6 Nm).

7 With flaps in 0% position, ensure a minimum gap of 0.05 inch (1.27 mm) exists between end fitting and torque tube coupler.

SR20_MM27_3452

Figure 27-502
Flap Actuator and Torque Tube Installation (Sheet 3 of 4)



Serials 2300 & subs.

LEGEND
1. Flap Actuator
2. Proximity Sensor
4. Actuator End Fitting
5. Rod End
11. Screw
18. Torque Tube Coupler
19. Collar

NOTE

8 Position collar so that screws are seated against flats on flap actuator rod.

SR20_MM27_2905

Figure 27-502
Flap Actuator and Torque Tube Installation (Sheet 4 of 4)

C. Flap Switch Assembly - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 27-503)

(1) Removal - Flap Switch Assembly

(a) Pull FLAPS circuit breaker.

(b) Remove right mid console trim. (Refer to 25-10)

(c) To facilitate access to flap switch assembly, remove lower mounting tray from radio rack.

Note: Radio rack components vary with optional equipment installation. Refer to appropriate AMM section to remove avionics component from lower mounting tray.

1 Remove avionics component from lower mounting tray.

2 At LH and RH sides of mounting tray, remove screws, washers, and nuts securing tray to radio rack.

3 At forward inner side of mounting tray, loosen but do not remove screws securing connector plate to mounting tray.

4 Disengage screw heads from slots on mounting tray and slide tray aft from radio rack.

5 Remove bolt and adel clamp securing wire harness to radio rack.

(d) Disconnect flap switch connector.

(e) *Serials 1005 thru 1815:* Remove bolt, washer, and clamp securing switch wiring to center console assembly.

(f) *Serials 1816 & subs:* Remove cable tie securing switch wiring to clamp on center console assembly.

(g) Loosen set screws securing switch handle to switch shaft. Remove handle

(h) Remove nut, star washer, and adjustable stop washer securing switch handle to console panel.

(i) Remove LED sleeves and securing LEDs to console panel.

(j) Withdraw switch assembly from console panel and remove assembly from airplane.

(2) Installation - Flap Switch Assembly

Note: Prior to securing switch to console panel, ensure that alignment tab on switch aligns with hole in panel and the adjustable stop washer is installed to limit switch travel to 3 positions, starting from the counterclockwise position.

(a) Position flap switch in panel hole and install adjustable stop washer, star washer, and jam nut.

(b) Position switch handle on switch and install set screws.

(c) Position flap LEDs in panel holes and install LED sleeves.

(d) Connect electrical connector.

(e) *Serials 1005 thru 1815:* Install clamp, washer, and bolt securing switch wiring to center console assembly.

(f) *Serials 1816 & subs:* Position switch wiring to clamp on center console assembly and secure with cable tie.

(g) Install lower mounting tray.

1 Install bolt and adel clamp securing wire harness to radio rack.

2 Slide mounting tray forward into radio rack and engage screw heads into slots on tray.

3 At forward inner side of mounting tray, tighten screws securing connector plate to mounting tray.

4 At LH and RH sides of mounting tray, install screws, washers, and nuts securing tray to radio rack.

Note: Radio rack components vary with optional equipment installation. Refer to appropriate AMM section to install avionics component to lower mounting tray.

5 Install avionics component to lower mounting tray.

(h) Install right mid console trim. (Refer to 25-10)

(i) Reset FLAPS circuit breaker.

(j) Perform Operational Test - Flap Switch Panel. (Refer to 27-50)

(3) Operational Test - Flap Switch Panel

(a) Set BAT 1 switch to ON position.

(b) Before testing the flaps system, verify flaps and flaps actuator are connected and no obstructions to movement are present.

(c) Set flaps switch to same position as current flaps position.

(d) Set flaps switch to "UP" position. Verify flaps position is up with "UP" LED illuminated.

(e) Set flaps switch to "50%" position. Verify flaps position stops at 50% with "50%" LED illuminated.

(f) Set flaps switch to "100%" position. Verify flaps position stops at 100% with "100%" LED illuminated.

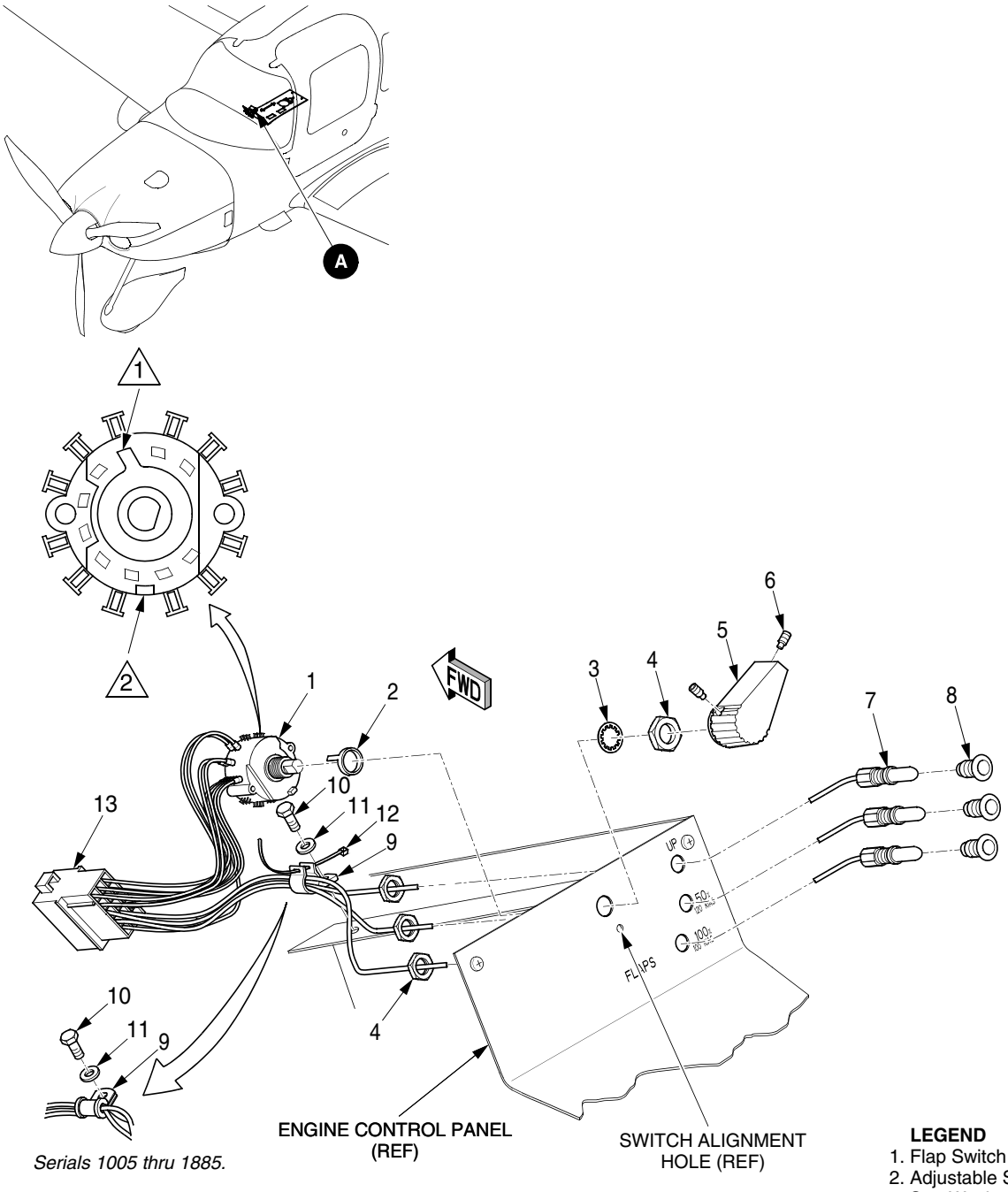
(g) Set flaps switch to "50%" position. Verify flaps position stops at 50% with "50%" LED illuminated.

(h) Set flaps switch to "UP" position. Verify flaps position stops at up position with "UP" LED illuminated.

(i) Set flaps switch to "100%". While flaps are passing 50%, verify 50% LED only flashes once.

(j) Set flaps switch to "UP". While flaps are passing 50%, verify 50% LED only flashes once.

(k) Set BAT 1 switch to OFF position.



Serials 1005 thru 1885.

NOTE

1. Install adjustable stop washer as shown so switch is limited to 3 positions starting from counterclockwise position.
2. Align tab on switch with hole in panel.

LEGEND

1. Flap Switch Assembly
2. Adjustable Stop Washer
3. Star Washer
4. Nut
5. Control Knob
6. Set Screw
7. LED
8. LED Sleeve
9. Clamp
10. Bolt
11. Washer
12. Cable Tie
13. Connector

DETAIL A

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics.

SR20_MM27_2851

Figure 27-503
Flap Switch Assembly Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

D. Flap Switch Panel - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 27-504)**

(1) Removal - Flap Switch Panel
- (a) Pull FLAPS circuit breaker.
- (b) Remove screws securing flap switch panel to engine control panel.
- (c) Disconnect flap switch connector.
- (d) Remove flap switch panel from airplane.

(2) Installation - Flap Switch Panel
- (a) Connect flap switch connector.
- (b) Position flap switch panel to engine control panel and secure with screws.
- (c) Reset FLAPS circuit breaker.
- (d) Perform Operational Test - Flap Switch Panel. (Refer to 27-50)

(3) Operational Test - Flap Switch Panel
- (a) Set BAT 1 switch to ON position.
- (b) Before testing the flaps system, verify flaps and flaps actuator are connected and no obstructions to movement are present.
- (c) Set flaps switch to same position as current flaps position.
- (d) Set flaps switch to "UP" position. Verify flaps position is up with "UP" LED illuminated.
- (e) Set flaps switch to "50%" position. Verify flaps position stops at 50% with "50%" LED illuminated.
- (f) Set flaps switch to "100%" position. Verify flaps position stops at 100% with "100%" LED illuminated.
- (g) Set flaps switch to "50%" position. Verify flaps position stops at 50% with "50%" LED illuminated.
- (h) Set flaps switch to "UP" position. Verify flaps position stops at up position with "UP" LED illuminated.
- (i) Set flaps switch to "100%". While flaps are passing 50%, verify 50% LED only flashes once.
- (j) Set flaps switch to "UP". While flaps are passing 50%, verify 50% LED only flashes once.
- (k) Set BAT 1 switch to OFF position.

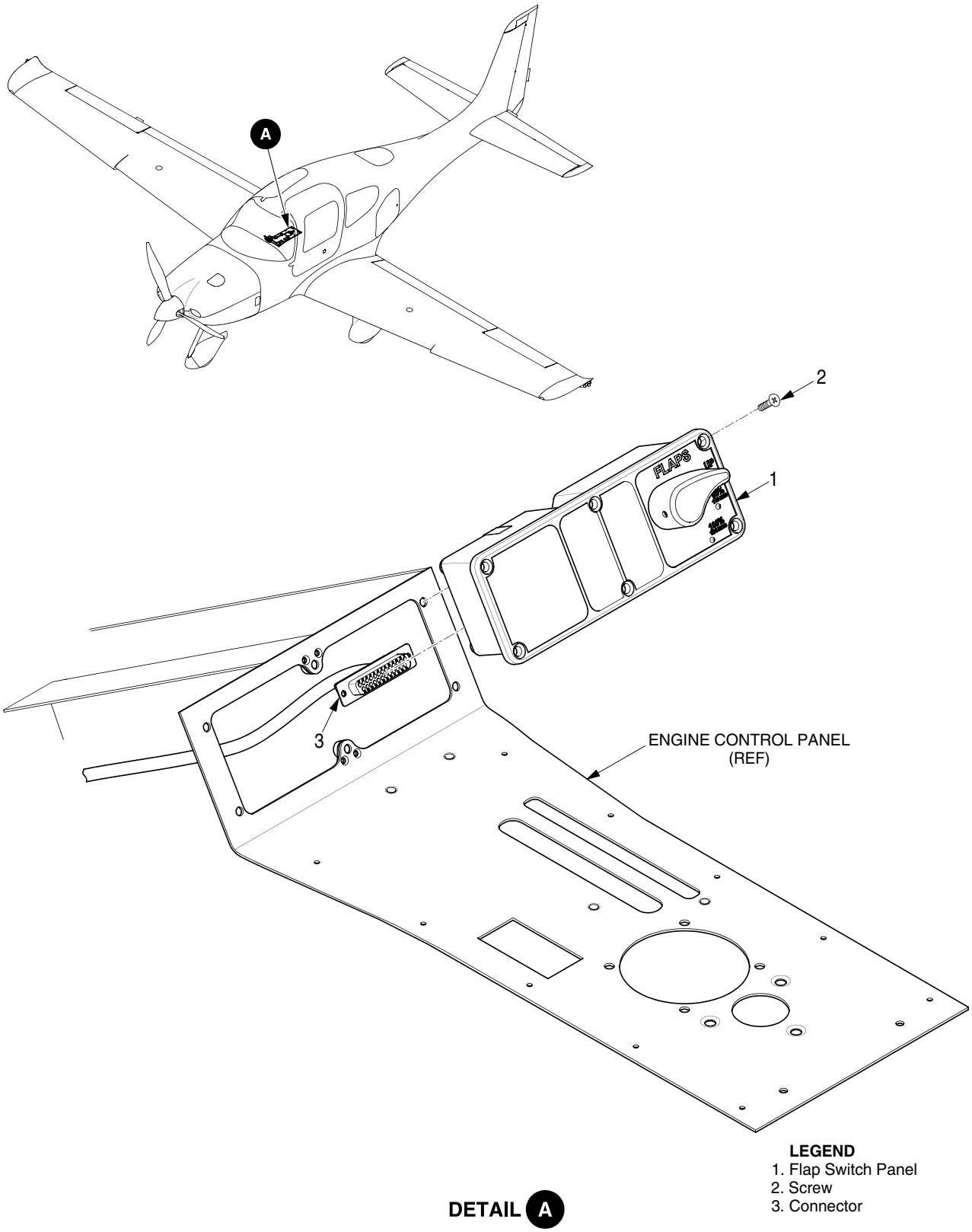


Figure 27-504
Flap Switch Panel Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

E. Flap Circuit Card Assembly - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 27-505)

(1) Removal - Flap Circuit Card Assembly
- (a) Pull FLAPS circuit breaker.
- (b) Remove passenger seats. (Refer to 25-10)
- (c) *Serials 1005 thru 1422:* Remove access panel CF4C. (Refer to 06-00)
- (d) *Serials 1423 & subs:* Remove access panel CF4R. (Refer to 06-00)
- (e) Disconnect flap CCA connector.
- (f) Remove screws, washers, spacers, and nuts securing flap CCA to longeron.

(2) Installation - Flap Circuit Card Assembly
- (a) Position flap CCA to longeron and secure with screws, washers, spacers, and nuts.
- (b) Connect flap CCA connector.
- (c) *Serials 1005 thru 1422:* Install access panel CF4C. (Refer to 06-00)
- (d) *Serials 1423 & subs:* Install access panel CF4R. (Refer to 06-00)
- (e) Install passenger seats. (Refer to 25-10)
- (f) Reset FLAPS circuit breaker.

F. Flap Relays (See Figure 27-505) (See Figure 27-506)

CAUTION: *Serials 1005 thru 2198:* Failure of either flap relay is cause for replacement of both relays. Replace both relays upon failure of one.

(1) Removal - Flap Relay
  (a) Pull FLAPS circuit breaker.
  (b) *Serials 1005 thru 1422:* Remove passenger seats. (Refer to 25-10)
  (c) *Serials 1005 thru 1422:* Remove access panel CF4C. (Refer to 06-00)
  (d) *Serials 1423 & subs:* Remove access panel CF3R. (Refer to 06-00)
  (e) Remove relay from socket.

(2) Installation - Flap Relay
  (a) Position relay to socket and push firmly to install.
  (b) *Serials 1005 thru 1422:* Install access panel CF4C. (Refer to 06-00)
  (c) *Serials 1423 & subs:* Install access panel CF3R. (Refer to 06-00)
  (d) *Serials 1005 thru 1422:* Install passenger seats. (Refer to 25-10)
  (e) Reset FLAPS circuit breaker.

G. EMI Suppression Cores - *Serials 1005 thru 1204 after SB 20-27-05* **(See Figure 27-505)**

(1) Removal - EMI Suppression Cores

(a) Turn ignition key to “OFF” and remove key from ignition switch.

(b) Set BATTERY, ALT, and AVIONICS switches to OFF position.

(c) Remove upper engine cowl. (Refer to 71-10)

(d) Disconnect battery. (Refer to 24-30)

(e) Remove passenger seats. (Refer to 25-10)

(f) Remove aft floor carpet to obtain entry to access hole CF4C. (Refer to 06-00)

(g) Remove EMI suppression core connectors from flap circuit card and P631 connector.

(2) Installation - EMI Suppression Cores

(a) Secure EMI suppression core connector J631A to connector P631

(b) Secure EMI suppression core connector P631A to flap circuit card.

CAUTION: Secure wire harness with cable ties to ensure it remains secure and away from flight control cables and related hardware.

(c) Using cable ties, secure EMI suppression cores away from flight controls.

(d) Verify wire harness is secure and free from all flight controls.

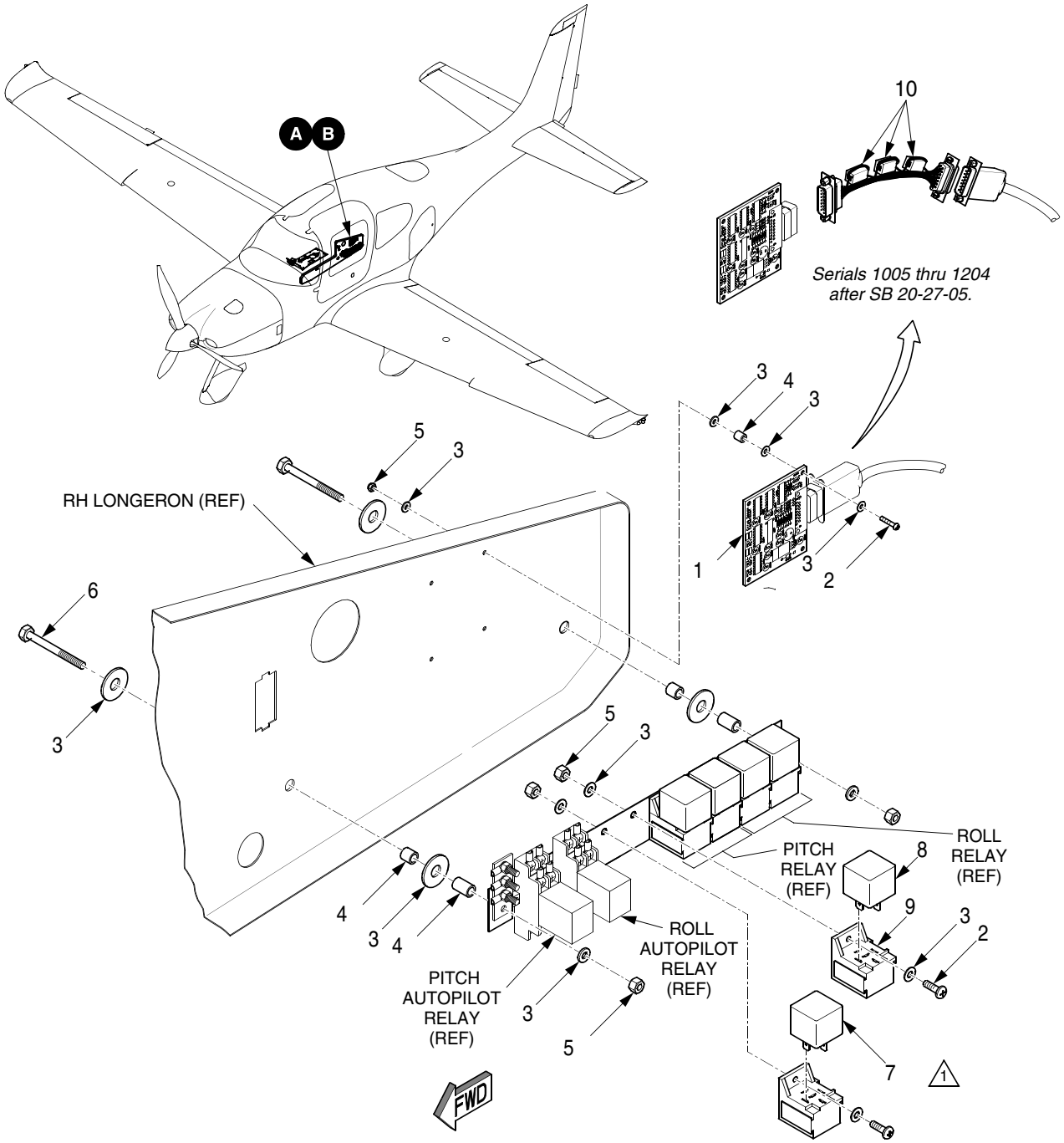
(e) Connect battery. (Refer to 24-30)

(f) Perform Adjustment/Test - Flap Travel.

(g) Install upper engine cowl. (Refer to 71-10)

(h) Secure aft floor carpet.

(i) Install passenger seats. (Refer to 25-10)



Serials 1005 thru 1422.

DETAIL A

LEGEND

1. Flap Circuit Card Assembly
2. Screw
3. Washer
4. Spacer
5. Nut
6. Bolt
7. Flap Relay-Down
8. Flap Relay-Up
9. Relay Socket
10. EMI Suppresion Cores

CAUTION

1 Failure of either relay is cause for replacing both relays.

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Figure 27-505
Flap Relay and Circuit Card Assembly - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422

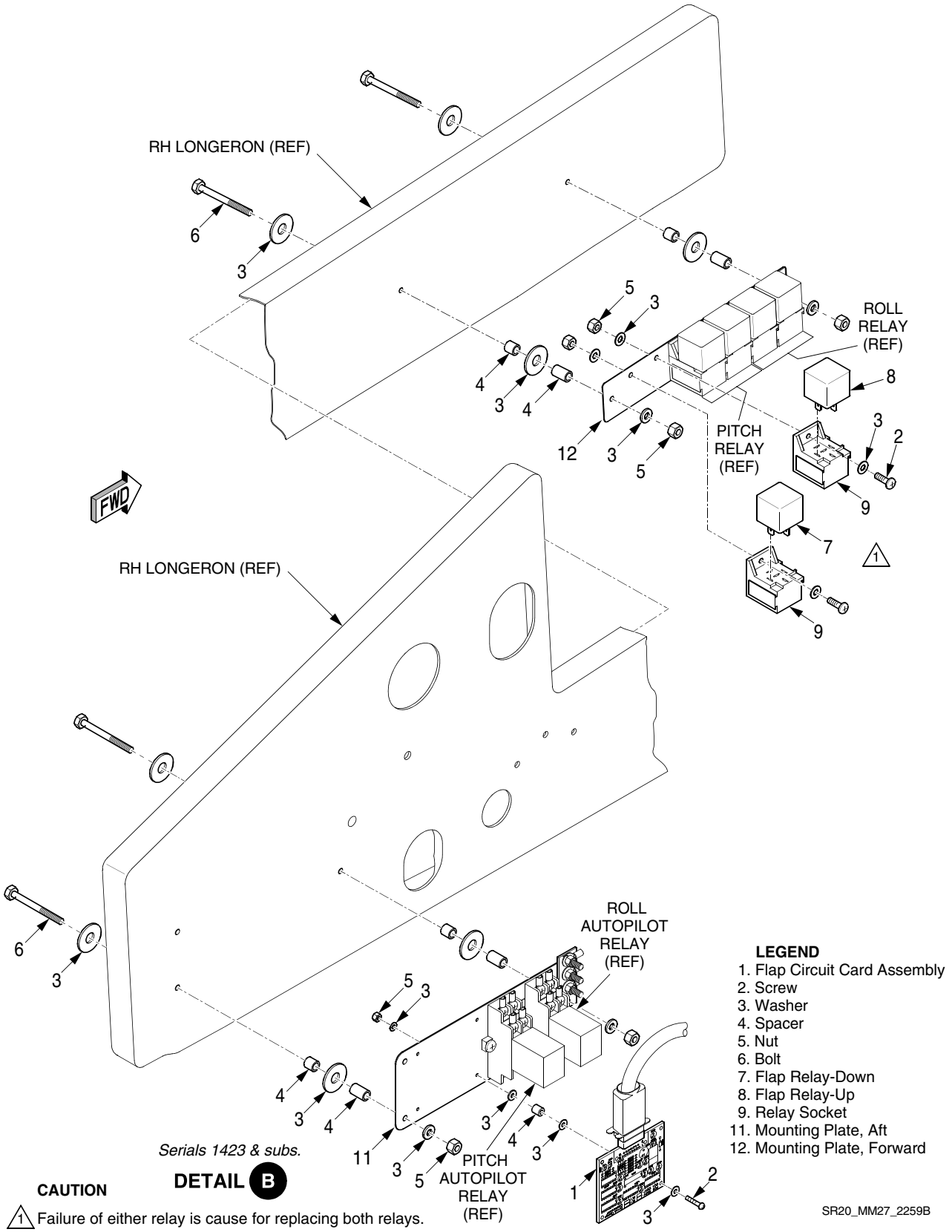
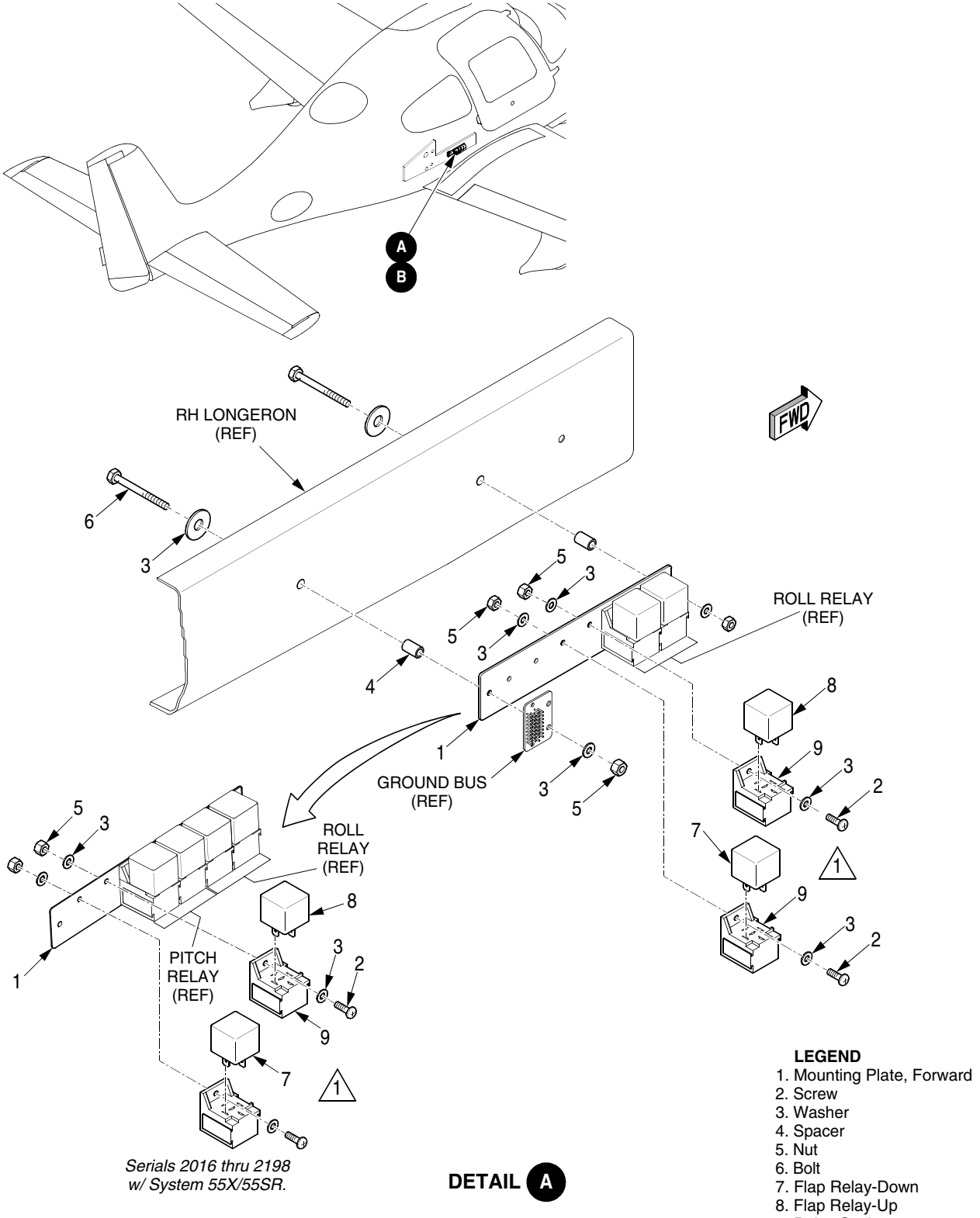


Figure 27-505

Flap Relay and Circuit Card Assembly - Serials 1423 thru 2015, 2016 & subs w/o Perspective Avionics (2 of 2)



CAUTION

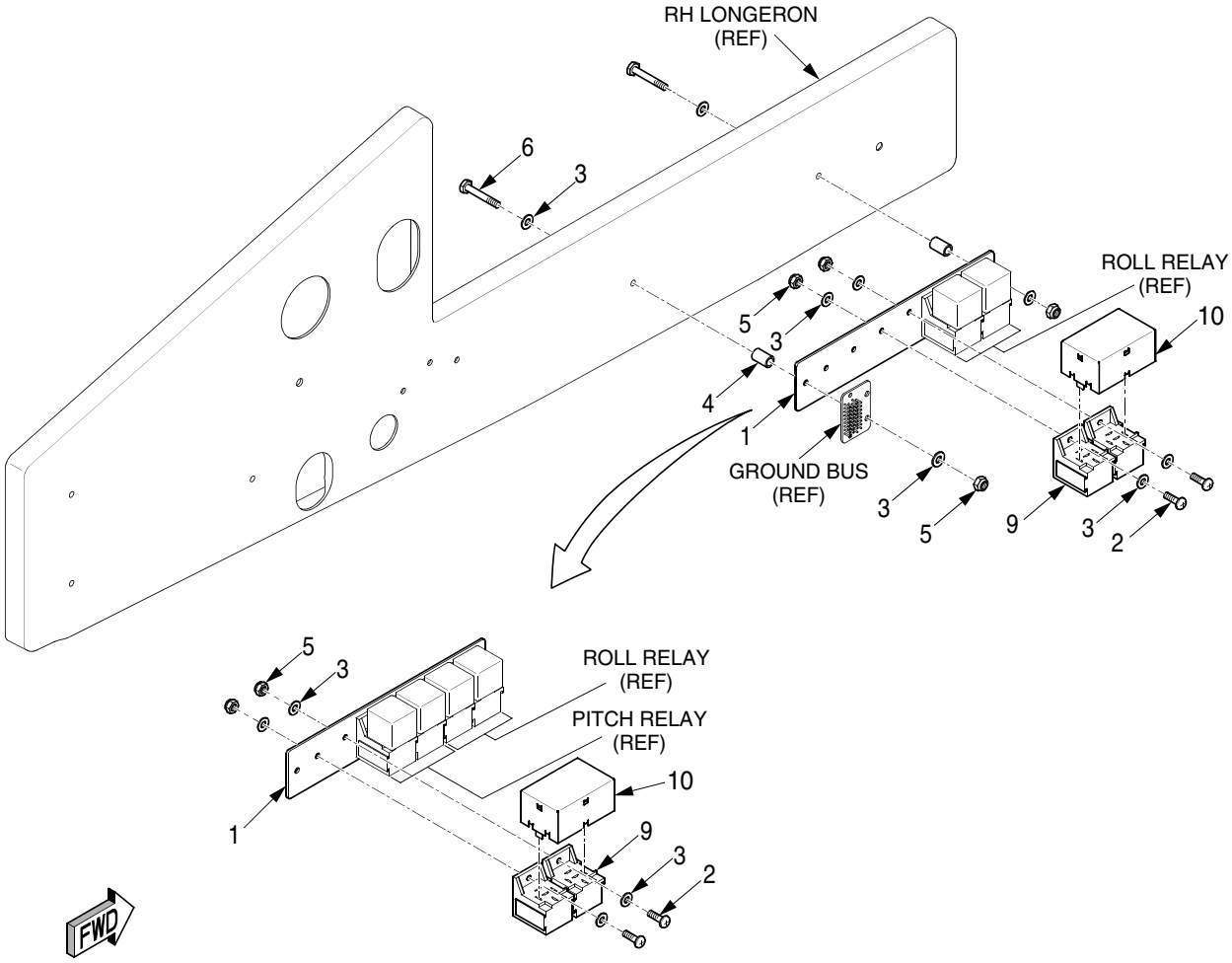
1 Failure of either relay is cause for replacing both relays.

SR20_MM27_2926B

Figure 27-506

Flap Relay Installation - Serials 2016 thru 2198 w/ Perspective Avionics and/or System 55X/55SR (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 thru 2198 w/ Perspective Avionics and/or System 55X/55SR



Serials 2199 & subs w/ System 55X/55SR.

LEGEND

1. Mounting Plate, Forward
2. Screw
3. Washer
4. Spacer
5. Nut
6. Bolt
9. Relay Socket
10. Flap Relay

DETAIL B

SR20_MM27_3552

Figure 27-506

Flap Relay Installation - Serials 2199 & subs w/ Perspective Avionics and/or System 55X/55SR (Sheet 2 of 2)

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CHAPTER 28

FUEL

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CHAPTER 28 - FUEL

LIST OF EFFECTIVE PAGES

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28-TOC	4	19 SEP 2017
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CHAPTER 28 - FUEL

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28-40	7	01 FEB 2013
28-40	8	01 FEB 2013
28-40	9	01 MAY 2012
28-40	10	01 MAY 2012

EFFECTIVITY:
All

CHAPTER 28 - FUEL

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28-40	11	01 MAY 2012
28-40	12	01 MAY 2012
28-40	13	01 MAY 2012
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28-40	15	01 MAY 2012
28-40	16	01 MAY 2012
28-40	17	01 JAN 2016
28-40	18	01 JAN 2016
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FUEL

1. GENERAL

This chapter contains information on the storage, distribution, and indicating components of the fuel system.

The engine is supplied with fuel drawn out of the left or right integral fuel tank (depending on the fuel selector valve position). Fuel flows through a check valve, collector tank, selector valve, electric auxiliary fuel pump, gascolator, engine-driven fuel pump, fuel flow sensor, throttle body, fuel injection manifold, and is then distributed to the fuel nozzles. All fuel line fittings installed in the cabin area of the fuselage are enclosed in a vented and drained enclosure.

Fuel system troubleshooting flowchart: (See Figure 28-001)

Fuel system layout: (See Figure 28-002)

Fuel system schematic: (See Figure 28-003)

For maintenance practices pertinent to the engine-driven fuel pump, fuel flow sensor, and fuel nozzles refer to Chapter 73, Engine Fuel Systems. (Refer to 73-00)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Filler cap leaks.	Filler cap improperly installed.	Install filler cap properly.
	Seal improperly installed.	Replace fuel cap seal.
	Deteriorated seal.	Replace fuel cap seal.
	Improperly tightened cap fuel nuts.	Tighten or loosen fuel cap nuts as required.
Fuel connector(s) leak.	Loose connector(s).	Inspect and tighten connector(s).
	Defective seals.	Replace seals.
	Defective thread.	Replace threaded component.
Insufficient fuel flow.	Restricted fuel filter/screen.	Clean filter or screen.
	Defective mechanical fuel pump.	Replace pump.
	Defective fuel pressure sensor or insufficient voltage supplied.	Replace pressure sensor. Find voltage problem.
	Cracked fuel line.	Replace line.
Normal starting procedures result in difficult starting.	Faulty electric fuel pump.	Replace pump.
No fuel flow to engine driven fuel pump.	Fuel selector valve not in the on position.	Turn selector valve on.
	Fuel tanks empty.	Fill tanks with approved fuel.
	Fuel line disconnected or broken.	Repair or replace line.
	Fuel tank screen plugged.	Clean or replace screen.
	Defective fuel selector valve.	Replace selector valve.
	Plugged gascolator.	Clean or replace gascolator.
	Fuel line plugged.	Remove obstruction.
	Frozen fuel line.	Thaw and drain complete fuel system.
Fuel starvation after start up.	Insufficient fuel flow.	See remedies from above.
	Malfunction of engine-driven fuel pump or fuel system.	Replace pump.
	Fuel vents plugged.	Remove obstruction.
	Water in fuel.	Remove water.

Trouble	Probable Cause	Remedy
No fuel output indicated from fuel flow gage when auxiliary pump is operated. NOTE: If the auxiliary pump is turned on when the engine is off, the fuel flow gage will show a momentary fuel flow.	Mixture control set in lean position and throttle lever is pulled back.	Adjust mixture control richer and move throttle lever forward.
	Fuel line disconnected before fuel flow sensor.	Check all fuel lines and connect.
	Defective fuel pump switch.	Replace switch.
	Open or defective circuit breaker.	Reset or replace circuit breaker.
	Loose connections or open circuit.	Tighten connections/Repair wire.
	Defective electric fuel pump.	Replace pump.
	Defective engine-driven fuel pump bypass or defective fuel system.	Replace pump/troubleshoot fuel system.

Trouble	Probable Cause	Remedy
Fuel quantity indicator indicates inaccurate fuel level.	Resistance to fuel level indicator from fuel level sending units are unstable and/or greater than 66 ohms (depending on fuel level).	Disconnect airplane harness from console indicator and verify resistance of RH wing (pins 4 & 9) and LH wing (pins 2 & 9) is stable and measures between 0-66 ohms (depending on fuel level).
		Perform System Test - Fuel Sending Unit. (Refer to 28-40)
		Check continuity in airplane wire harness between indicator and sending units.
		Perform Adjustment/Test - Fuel Quantity Indicator. (Refer to 28-40)
	Resistance of each fuel level sender dial from inboard through outboard locations are unstable and/or greater than 33 ohms (depending on fuel level).	Verify resistance from inboard through outboard fuel level sender dials are stable and between 0-33 ohms depending on fuel level.
		Perform Functional Test - Fuel Quantity Sensor Dial. (Refer to 28-40)
		Perform System Test - Fuel Sending Unit. (Refer to 28-40)
		Perform Adjustment/Test - Fuel Quantity Sensors. (Refer to 28-40)
	Fuel level out of calibration.	Adjust calibration using fuel indicator trim adjustments. If unable to calibrate, ensure both sending units indicate “E” at zero calibration and maximum at high gain.
		Perform Adjustment/Test - Fuel Quantity Indicator. (Refer to 28-40) Note: Indicator has active dampening. Allow indicator to stabilize for approximately one minute before making adjustments.
	Defective fuel sensor.	Replace sensor.
	Defective fuel quantity indicator.	Replace indicator.
	Incorrectly adjusted fuel sensor.	Adjust sensor.
	Faulty fuel system wiring.	Repair/Replace wire(s).

Trouble	Probable Cause	Remedy
No fuel quantity indication.	Fuel tanks empty.	Fill with approved fuel.
	Left or right fuel tank circuit breaker open or defective.	Reset or replace circuit breaker.
	Loose connections or open circuit.	Tighten connections/repair wire.
	Incorrect power to fuel level indicator in console.	Disconnect airplane harness from indicator and verify voltage between pins 1 & 9 measures between ~24-28v.
		Check airplane power source and resolve.
	Resistance to fuel level indicator from fuel level sending units are unstable and/or greater than 66 ohms (depending on fuel level).	Disconnect airplane harness from indicator and verify resistance of RH wing (pins 4 & 9) and LH wing (pins 2 & 9) is stable and measures between 0-66 ohms (depending on fuel level).
		Perform Functional Test - Fuel Quantity Sensor Dial. (Refer to 28-40)
		Perform System Test - Fuel Sending Unit. (Refer to 28-40)
		Check continuity in airplane wire harness between indicator and sending units.
		Perform Adjustment/Test - Fuel Quantity Indicator. (Refer to 28-40)
	Defective fuel sensor.	Replace sensor.
	Defective fuel quantity indicator.	Replace indicator.
	Incorrectly adjusted fuel sensor.	Adjust sensor.
	Faulty fuel system wiring.	Repair/Replace wire(s).

Trouble	Probable Cause	Remedy
Fluctuating fuel level indications.	Incorrect power to fuel level indicator in console.	Disconnect airplane harness from indicator and verify voltage between pins 1 & 9 measures between ~24-28v.
		Check airplane power source and resolve.
	Resistance to fuel level indicator from fuel level sending units are unstable and/or greater than 66 ohms (depending on fuel level).	Disconnect airplane harness from console indicator and verify resistance of RH wing (pins 4 & 9) and LH wing (pins 2 & 9) is stable and measures between 0-66 ohms (depending on fuel level).
		Perform Functional Test - Fuel Quantity Sensor Dial. (Refer to 28-40)
		Perform System Test - Fuel Sending Unit. (Refer to 28-40)
		Check continuity in airplane wire harness between indicator and sending units.
		Perform Adjustment/Test - Fuel Quantity Indicator. (Refer to 28-40)
	Resistance of each fuel level sender dial from inboard through outboard locations are unstable and/or greater than 33 ohms (depending on fuel level).	Verify resistance from inboard through outboard fuel level sender dials are stable and between 0-33 ohms depending on fuel level.
		Perform System Test - Fuel Sending Unit. (Refer to 28-40)
		Perform Adjustment/Test - Fuel Quantity Sensors. (Refer to 28-40)
Fluctuating fuel flow indications.	Fuel flow indicator/transducer.	Replace fuel flow indicator/transducer.
	Vapor in fuel lines.	Turn on auxiliary fuel pump.
Fuel leaks from electric fuel pump drain manifold fitting.	Faulty internal fuel pump seal.	Replace electric fuel pump.

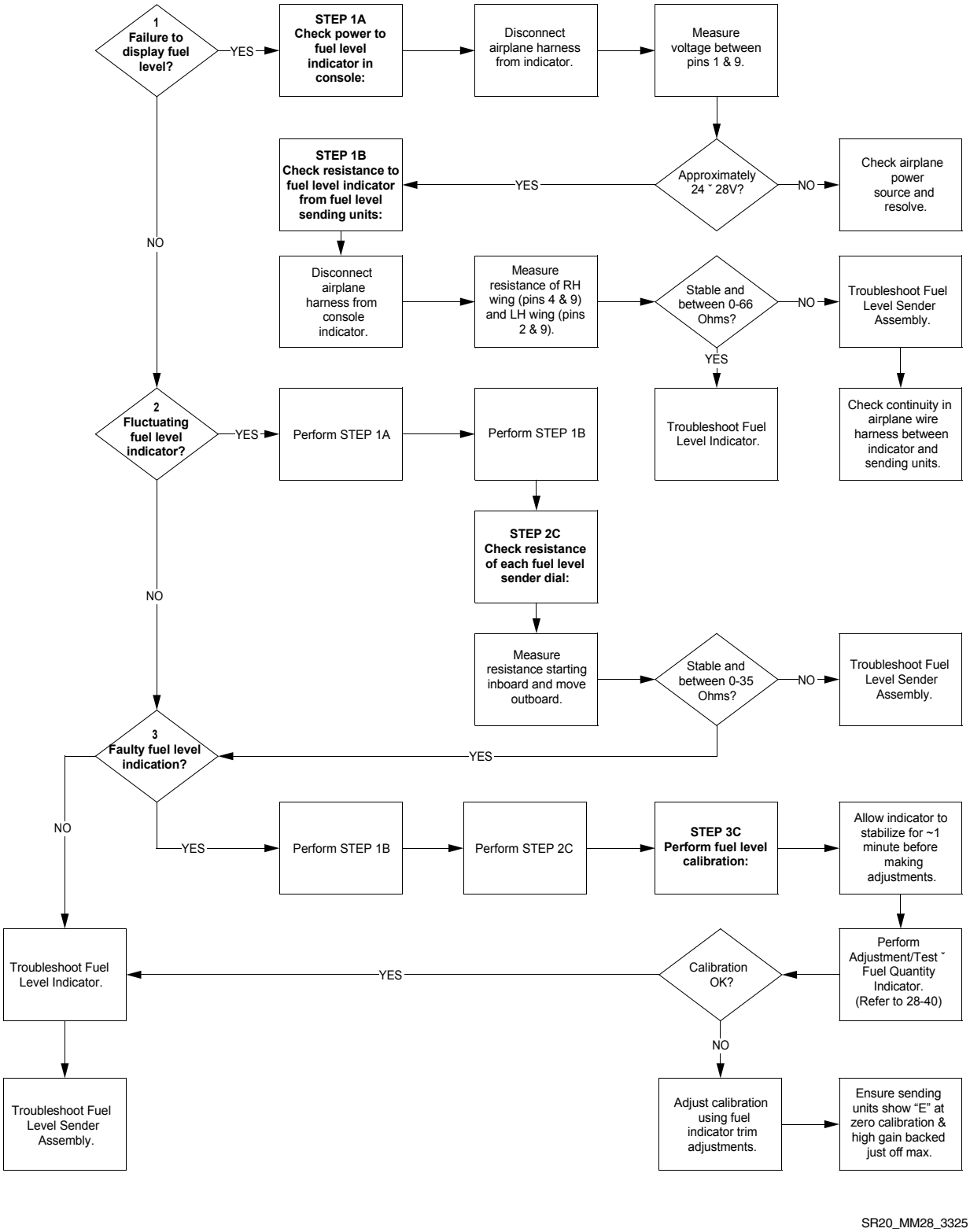
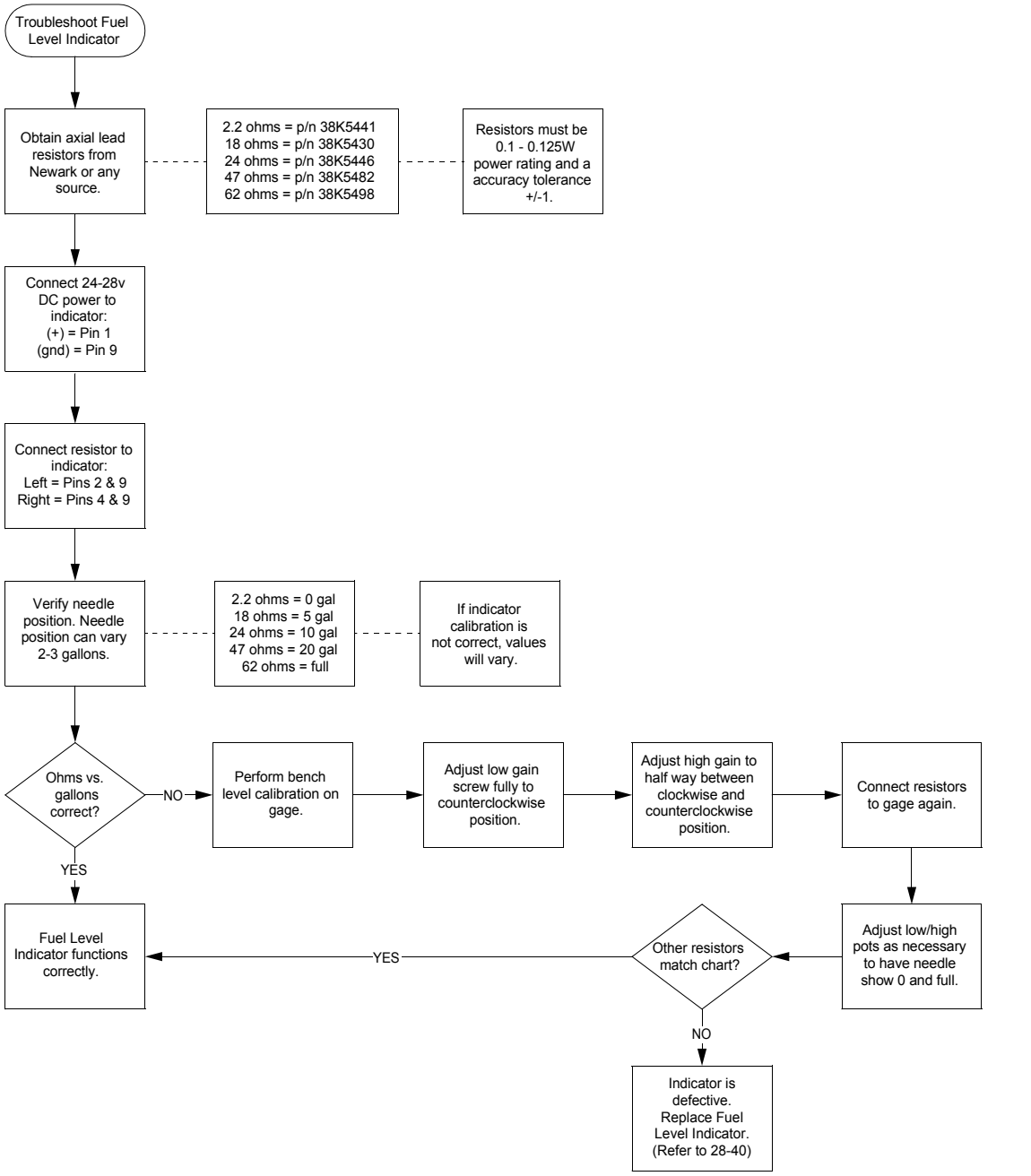
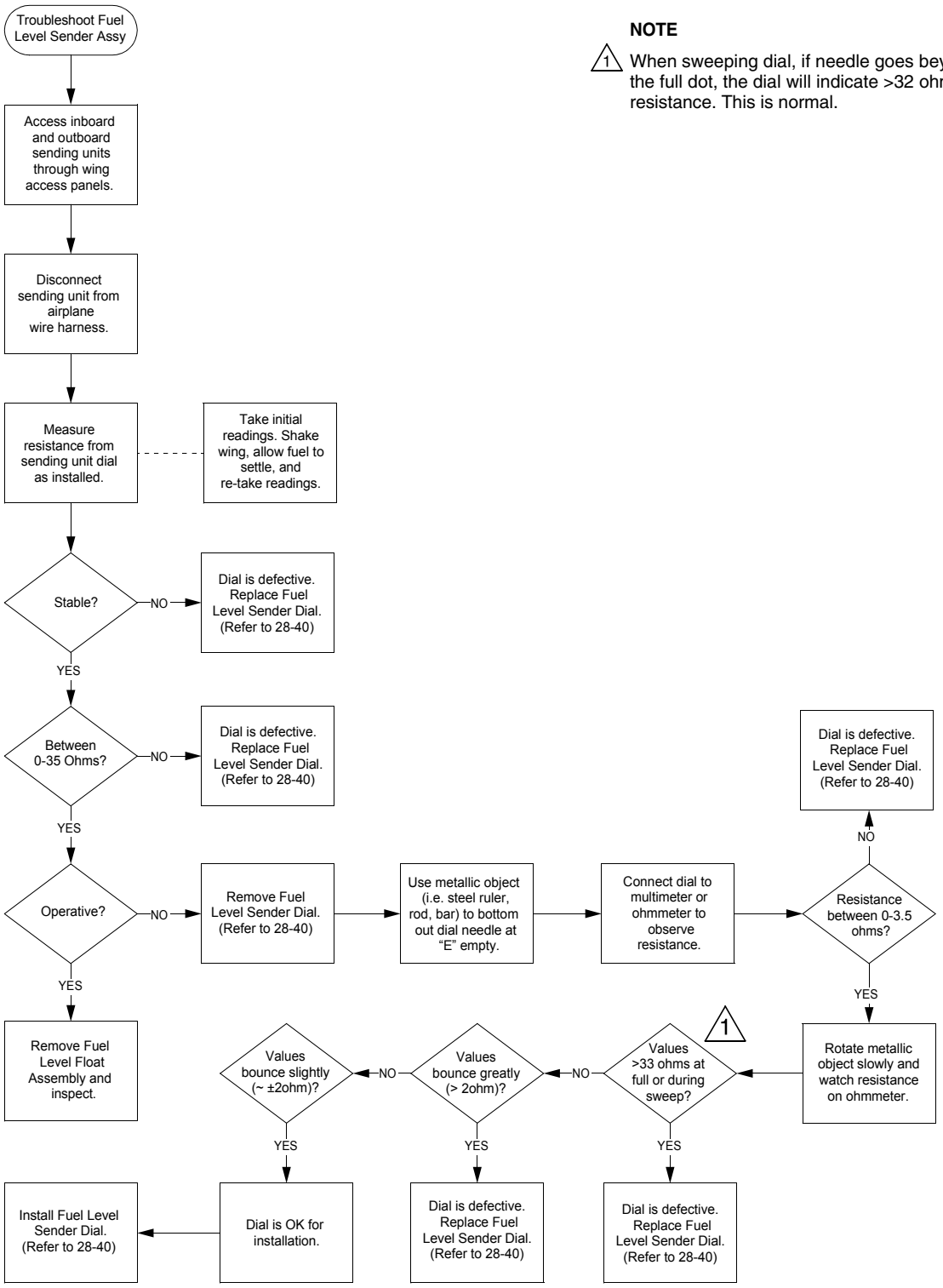


Figure 28-001
Fuel System Troubleshooting Flowchart (Sheet 1 of 3)



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Figure 28-001
Fuel System Troubleshooting Flowchart (Sheet 2 of 3)

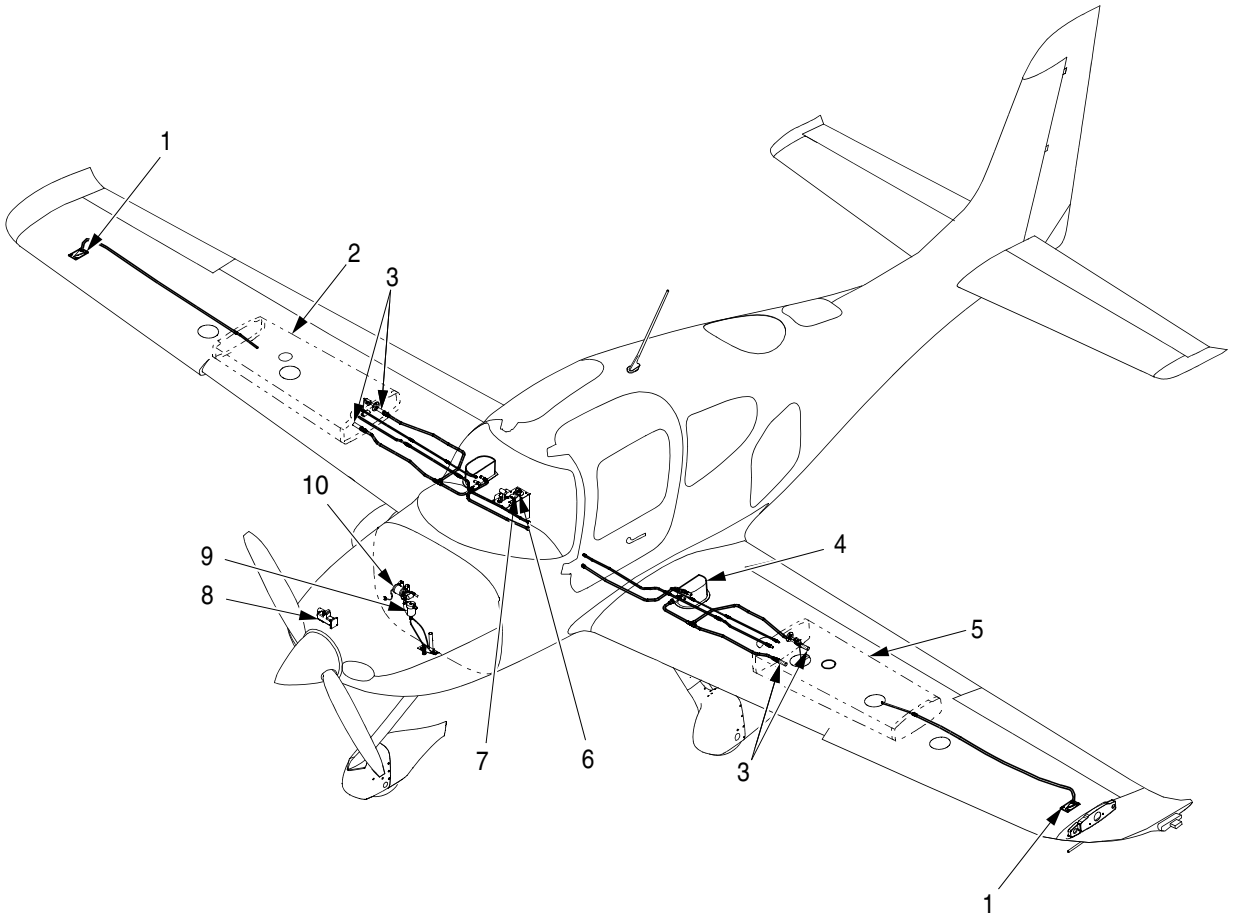


NOTE

1 When sweeping dial, if needle goes beyond the full dot, the dial will indicate >32 ohms resistance. This is normal.

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Figure 28-001
Fuel System Troubleshooting Flowchart (Sheet 3 of 3)



LEGEND

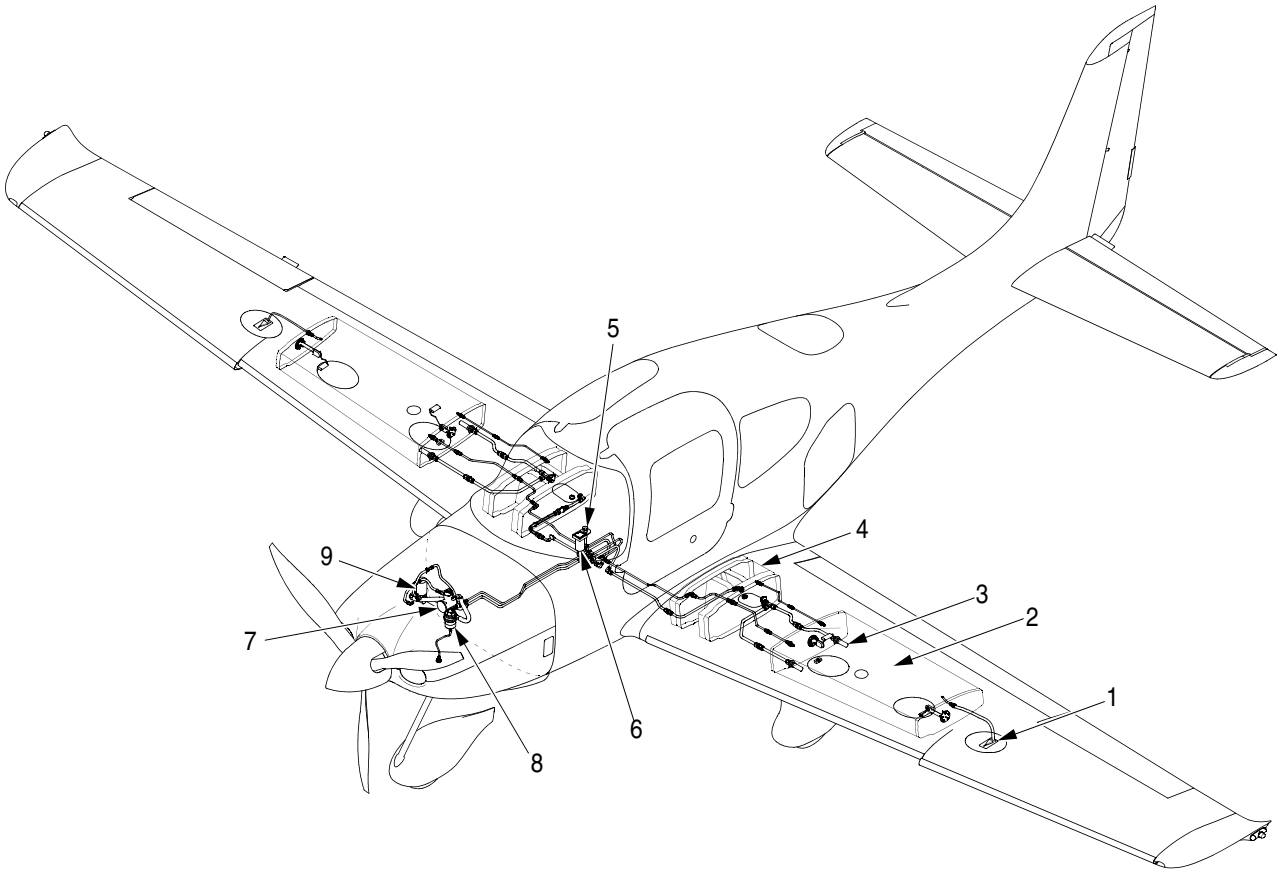
1. Fuel System Vent (Underside of Wing)
2. Right Fuel Tank
3. Fuel Tank Strainers
4. Left Collector Tank
5. Left Fuel Tank
6. Selector Valve
7. Fuel Gage
8. Engine Driven Fuel Pump
9. Gascolator
10. Electric Boost Pump

Serials 1005 thru 1877, 1879 thru 1885.

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Figure 28-002
Fuel System - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885

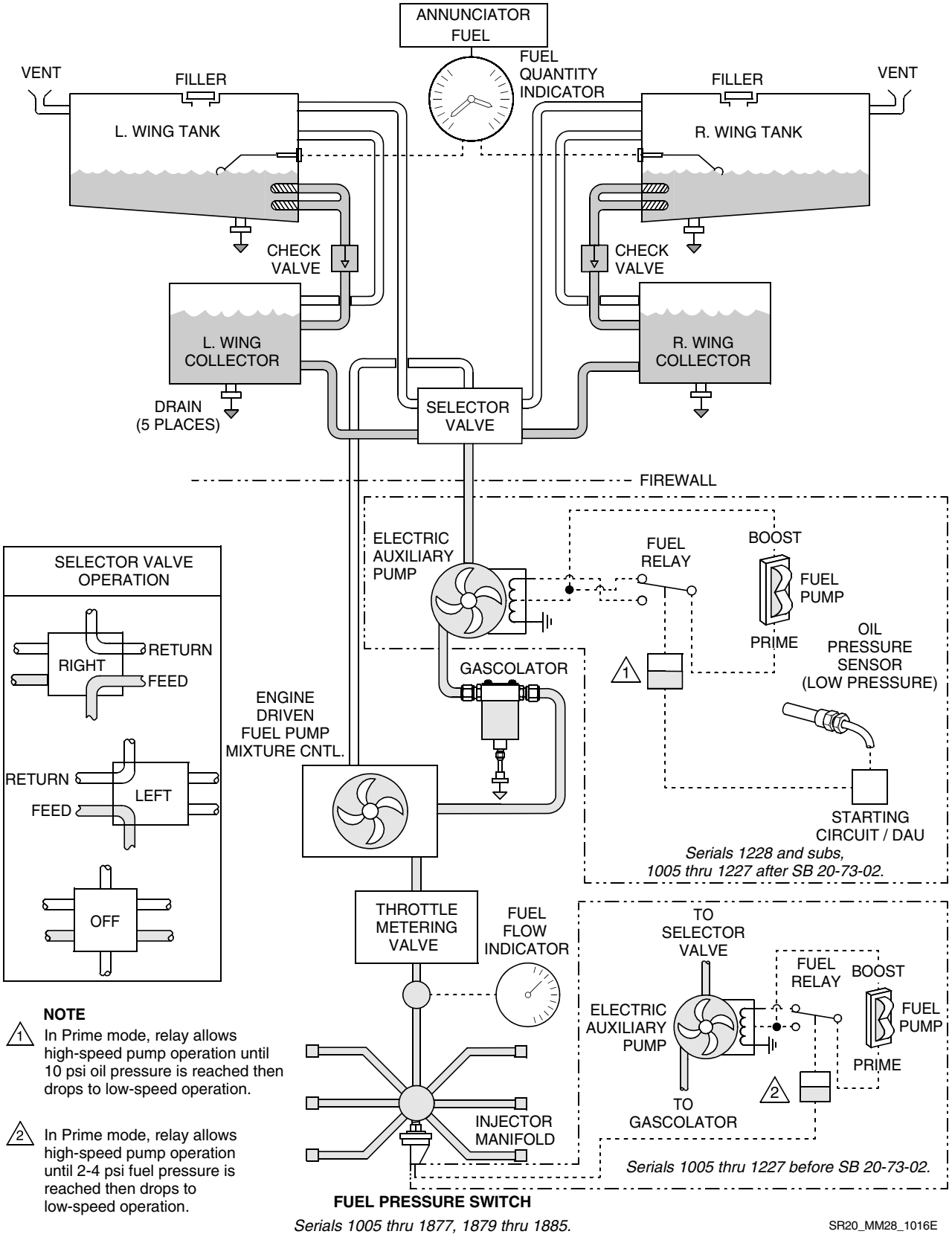


LEGEND

1. Fuel System Vent, NACA (Underside of Wing)
2. Fuel Tank
3. Fuel Tank Strainers
4. Collector Tank
5. Selector Valve
6. Fuel Gage
7. Engine Driven Fuel Pump
8. Gascolator
9. Electric Boost Pump

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Figure 28-002
Fuel System - Serials 1886 & subs (Sheet 2 of 2)



NOTE

1. In Prime mode, relay allows high-speed pump operation until 10 psi oil pressure is reached then drops to low-speed operation.

2. In Prime mode, relay allows high-speed pump operation until 2-4 psi fuel pressure is reached then drops to low-speed operation.

Figure 28-003
Fuel System Schematic - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885

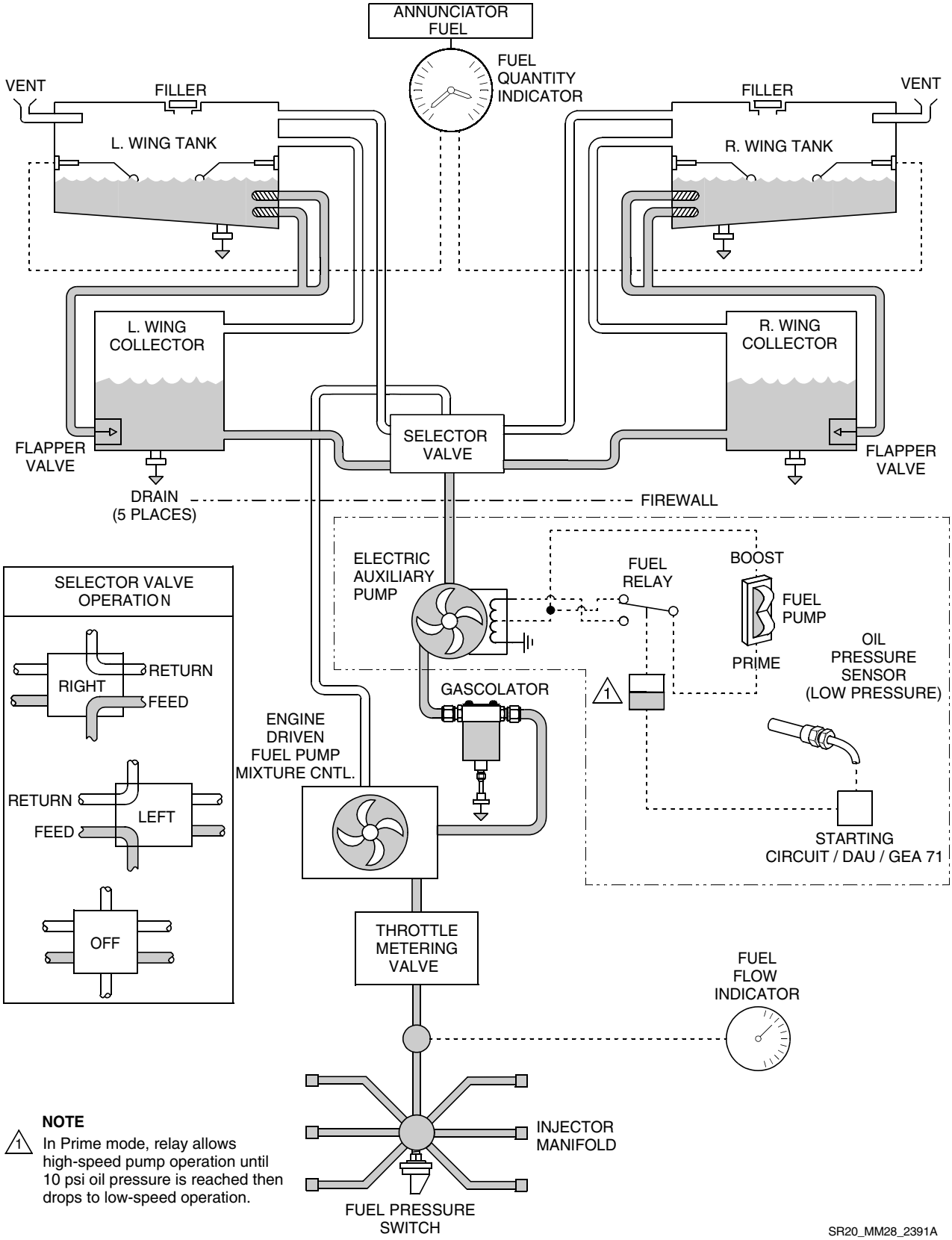


Figure 28-003
Fuel System Schematic - Serials 1886 & subs (Sheet 2 of 2)

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STORAGE

1. DESCRIPTION

A. Fuel Storage System - *Serials 1005 thru 1885*

The fuel storage system consists primarily of a vented integral 30.3-gallon (114.5-liters) capacity fuel tank in each wing, a fuel collector tank/sump in each wing, a three-position selector valve, an electric boost pump, gascolator, an engine-driven fuel pump, and five fuel drains.

Each wing contains an integral fuel tank bounded by the upper and lower wing skins, main spar web, aft wing shear web, and the inboard and outboard fuel tank ribs. The wing skins and fuel ribs, are of fiberglass composite with foam core sandwich construction. A fuel baffle rib is integral to each tank to reduce fuel slosh. Fuel return lines are fed to the top of each fuel tank. Access panels are located in each fuel tank bay for servicing. Fuel tank fittings and screens are accessible through wing access panels. Fuel flows by gravity from each fuel tank to the corresponding collector tank. Fuel then feeds into a fuel tube located in the fuselage.

Sumps are built into the fuel tanks and collector tanks. A collector tank is located at the inboard wing root area of each wing. The collector tank offers a sediment and water collection area, and capacity for ensuring fuel flow to the engine during uncoordinated maneuvering. A drain is located in each tank for preflight inspection. The collector tank drains are located at the fuel system low points. The center of the fuel drains can be pushed inward with the fuel sampler to inspect for water or contaminates. A check valve is installed in the line from the wing tanks to the collector tank to keep fuel in the collector tanks during uncoordinated maneuvers. Each collector tank holds approximately 0.67 gallons (2.54 Liters). The collector tank access cover is supported by a continuous flange around the lower skin opening.

A 1/16-inch mesh strainer is installed on each of the two ports in each integral fuel tank. The strainers are accessible by removing the inboard fuel tank access cover. The stainless steel strainers are brazed to stainless steel nuts that connect to a bulkhead fitting on the wing rib. The fuel strainers in the fuel tanks should always be cleaned after the airplane has been in storage. If any damage or restrictions are noted during inspection, the strainers must be replaced.

Each fuel cap assembly has a viton o-ring which seals the fitting in the upper wing skin. The fuel cap is grounded to the airframe through a resistive (approximately 100 ohm) connection through the aircraft lightning protection. Fuel tabs are integrated into the fuel filler necks and indicate approximately 13.0 usable gallons (49.2 Liters) in each tank.

Each integral fuel tank is vented from the top of each fuel tank to a flush NACA style scoop vent located in an access panel on the lower wing skin. Vent lines from the main fuel tanks are constructed of fuel resistant plastic. The fuel tank vent lines do not have any points in which moisture can accumulate during normal ground or level flight operation. The top of each collector tank is vented to the inboard fuel rib of the corresponding fuel tank.

Fuel drains are provided at various locations throughout the fuel system for drainage of water and sediment from the fuel system. To activate the drain valves, a fuel sampler cup/screwdriver is furnished with the flyaway kit. Drain valves are located at the inboard access panel of each integral fuel tank, both collector tanks, and the gascolator.

Note: When servicing fuel system pipe thread fittings, apply a small amount of grease (MIL-G-60320 Type 1) to the external threads.

B. Fuel Storage System - *Serials 1886 & subs*

The fuel storage system consists primarily of a vented integral 29.3-gallon (110.9-liters) capacity fuel tank in each wing, a integral fuel collector tank/sump in each wing, a three-position selector valve, an electric boost pump, gascolator, an engine-driven fuel pump, and five fuel drains.

Each wing contains an integral fuel tank bounded by the upper and lower wing skins, main spar web, aft wing shear web, and the inboard and outboard fuel tank ribs. The wing skins and fuel ribs, are of fiberglass composite with foam core sandwich construction. One fuel baffle rib is integral to each tank to reduce fuel slosh. Fuel return lines are fed to the top of each fuel tank. Access panels are located in each fuel tank bay for servicing. Fuel tank fittings and screens are accessible through wing access panels. Fuel flows by gravity from each fuel tank to the corresponding integral collector tank. Fuel then feeds into a fuel tube located in the fuselage.

Sumps are built into the fuel tanks and collector tanks. Integral collector tanks are located at the inboard wing root area of each wing. The collector tank offers a sediment and water collection area, and capacity for ensuring fuel flow to the engine during uncoordinated maneuvering. A drain is located in each tank for preflight inspection. The collector tank drains are located at the fuel system low points. The center of the fuel drains can be pushed inward with the fuel sampler to inspect for water or contaminates. A flapper assembly (swing check valve) is installed in the line from the wing tanks to the collector tank to keep fuel in the collector tanks during uncoordinated maneuvers. Each collector tank holds approximately 2.8 gallons (10.6 liters). The integral collector tank access cover is supported by a continuous flange around the lower skin opening.

A 1/16-inch mesh strainer is installed on each of the two ports in each integral fuel tank. The strainers are accessible by removing the inboard fuel tank access cover. The stainless steel strainers are brazed to stainless steel nuts that connect to a bulkhead fitting on the wing rib. The fuel strainers in the fuel tanks should always be cleaned after the airplane has been in storage. If any damage or restrictions are noted during inspection, the strainers must be replaced.

Each fuel cap assembly has a viton o-ring which seals the fitting in the upper wing skin. The fuel cap is grounded to the airframe through a resistive (approximately 100 ohm) connection through the aircraft lightning protection. Fuel tabs are integrated into the fuel filler necks and indicate approximately 13.0 usable gallons (49 liters) in each tank.

Each integral fuel tank is vented from the top of each fuel tank to a flush NACA style scoop vent located in an access panel on the lower wing skin. Vent lines from the main fuel tanks are constructed of fuel resistant plastic. The fuel tank vent lines do not have any points in which moisture can accumulate during normal ground or level flight operation. The top of each collector tank is vented to the inboard fuel rib of the corresponding fuel tank.

Fuel drains are provided at various locations throughout the fuel system for drainage of water and sediment from the fuel system. To activate the drain valves, a fuel sampler cup/screwdriver is furnished with the flyaway kit. Drain valves are located at the inboard access panel of each integral fuel tank, both collector tanks, and the gascolator.

Note: When servicing fuel system pipe thread fittings, apply a small amount of grease (MIL-G-60320 Type 1) to the external threads.

2. MAINTENANCE PRACTICES

A. Fuel Cap Assembly - *Serials 1005 thru 1885* (See Figure 28-101)

(1) Removal - Fuel Cap Assembly

WARNING: Never attempt to remove fuel cap assembly with pressure in fuel system.

(a) Unlock fuel cap with key and remove.
(b) Remove screws securing fuel cap housing to wing.
(c) Remove gasket.

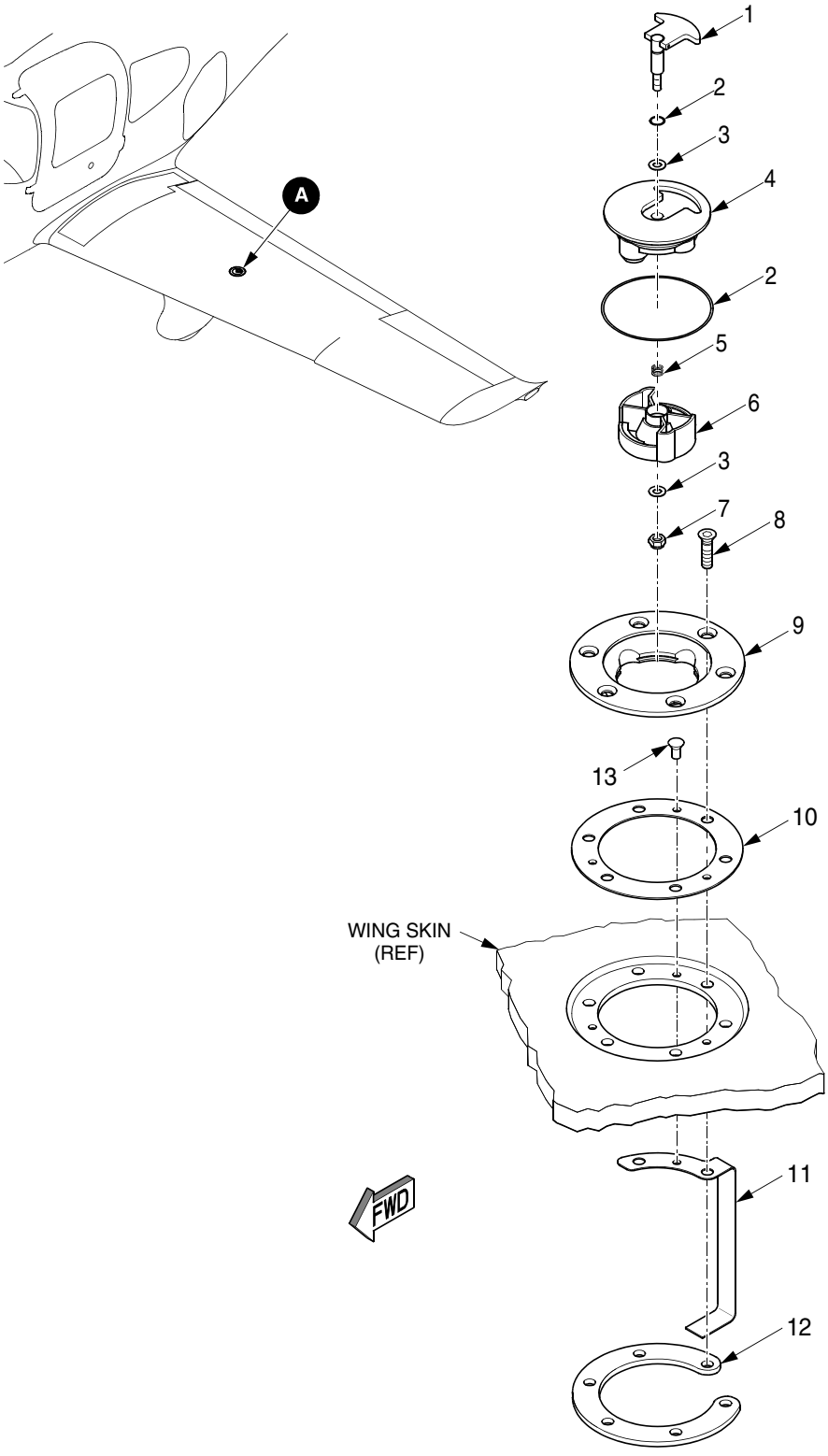
(2) Disassembly - Fuel Cap
(a) Remove nut and washer securing fuel cap stem.
(b) Remove clip securing lock core.
(c) Remove outer o-ring.
(d) Remove stem o-ring.

(3) Reassembly - Fuel Cap
(a) Install stem o-ring.
(b) Install outer o-ring.
(c) Install clip securing lock core.
(d) Install nut and washer securing fuel cap stem.

(4) Installation - Fuel Cap Assembly
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant	PR-2200, Class B	PRC-Desoto International Indianapolis, IN 46278 317-290-1600	Sealant / Ground path.
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaner.
White Petroleum Jelly	VV–P–236	Any Source	Lubricant.

(b) Solvent clean gasket installation area on wing with isopropyl alcohol. (Refer to 20-30)
(c) Apply sealant to bottom of gasket.
(d) Position gasket to wing and press to install.
(e) Position fuel cap housing to wing and secure with screws.
(f) Insert fuel cap and lock with key.
(g) Lightly lubricate lock, lever, and center pin with petroleum jelly.
(h) Perform Functional Test - Fuel Cap Assembly Ground Resistance. (Refer to 28-10)



LEGEND

1. Fuel Cap Stem
2. O-Ring
3. Washer
4. Fuel Cap
5. Spring
6. Fuel Cap Saddle
7. Locknut
8. Screw
9. Ring
10. Gasket
11. Fuel Level Tab
12. Nut Ring
13. Rivet

Serials 1005 thru 1877, 1879 thru 1885.

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Figure 28-101
Fuel Cap Assembly - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885

B. Fuel Cap Assembly - *Serials 1886 & subs* (See Figure 28-102)

(1) Removal - Fuel Cap Assembly

WARNING: Never attempt to remove the fuel cap assembly with pressure in the fuel system.

(a) Unlock fuel cap with key and remove.
(b) Rotate fuel cap housing counter-clockwise to remove from wing.

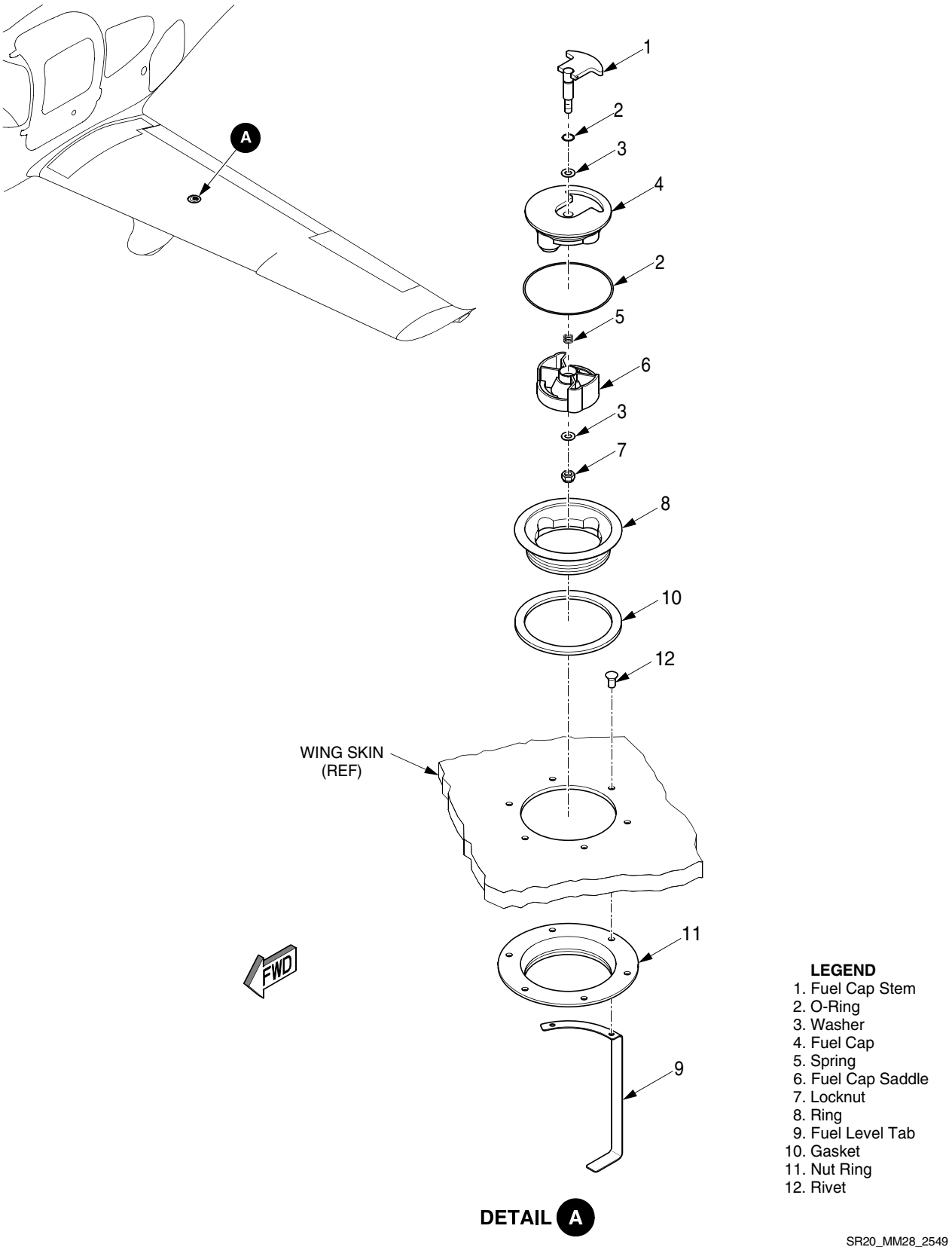
(2) Disassembly - Fuel Cap
(a) Remove nut and washer securing fuel cap stem.
(b) Remove clip securing lock core.
(c) Remove outer o-ring.
(d) Remove stem o-ring.

(3) Reassembly - Fuel Cap
(a) Install stem o-ring.
(b) Install outer o-ring.
(c) Install clip securing lock core.
(d) Install nut and washer securing fuel cap stem.

(4) Installation - Fuel Cap Assembly
(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant	PRC-2200, Class B	PRC-Desoto International Indianapolis, IN 46278 317-290-1600	Sealant / Ground path.
White Petroleum Jelly	VV–P–236	Any Source	Lubricant.

(b) Apply sealant to fuel cap housing threads.
(c) Position fuel cap housing to wing and rotate clockwise to secure. Hand tighten fuel cap housing, then back off 1/4 turn for correct orientation.
(d) Insert fuel cap and lock with key.
(e) Lightly lubricate lock, lever, and center pin with petroleum jelly.
(f) Perform Functional Test - Fuel Cap Assembly Ground Resistance. (Refer to 28-10)



LEGEND

1. Fuel Cap Stem
2. O-Ring
3. Washer
4. Fuel Cap
5. Spring
6. Fuel Cap Saddle
7. Locknut
8. Ring
9. Fuel Level Tab
10. Gasket
11. Nut Ring
12. Rivet

Figure 28-102
Fuel Cap Assembly - Serials 1886 & subs

EFFECTIVITY:
Serials 1886 & subs

C. Functional Test

(1) Functional Test - Fuel Cap Assembly Ground Resistance

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.

(b) Measure resistance from RH exhaust pipe.

1 Connect one lead of ohmmeter to RH exhaust pipe.

Note: At fuel cap ring, measure resistance from screws (*Serials 1005 thru 1877, 1879 thru 1885)* or flange *(Serials 1878, 1886 & subs).*

2 Measure and record resistance from RH exhaust pipe to RH fuel cap ring.

3 Verify ground resistance is less than 100 ohms.

(c) Measure resistance from LH exhaust pipe.

1 Connect one lead of ohmmeter to LH exhaust pipe.

Note: At fuel cap ring, measure resistance from screws (*Serials 1005 thru 1877, 1879 thru 1885)* or flange *(Serials 1878, 1886 & subs).*

2 Measure and record resistance from LH exhaust pipe to LH fuel cap ring.

3 Verify ground resistance is less than 100 ohms.

4 Connect one lead of ohmmeter to RH exhaust pipe, and connect other lead of ohmmeter to LH exhaust pipe.

5 Verify ground resistance is less than 10 ohms between both exhaust pipes.

(d) If any measured ground resistance exceeds maximum values, perform Functional Test - High Resistance/Disconnect in Fuel Cap Assembly Ground Path. (Refer to 28-10)

(2) Functional Test - High Resistance/Disconnect in Fuel Cap Assembly Ground Path (See Figure 28-103)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.
Sandpaper	-	Any Source	Paint/primer removal and EMM burnishing.

Note: Measure resistance between the following test points. If measured resistance does not represent a significant portion of overall fuel cap assembly ground path, continue to next measurement location.

Resistance measurements are not required to meet or fall below stated typical resistance values. Most increased resistance is due to connection points and not the wing skin. Typically, a small amount of resistance exists between any points in fuel cap assembly ground path. However, locating and repairing location(s) causing significant resistance will likely lower overall resistance to an acceptable level.

(b) Remove lower engine cowling. (Refer to 71-10)

(c) Measure resistance between exhaust pipe and firewall ground terminal (typically less than 1 ohm).

(d) Measure resistance between firewall ground terminal and main wing attach ground strap (typically less than 1 ohm).

(e) Expose wing skin EMM on upper wing skin.

1 Locate area approximately 1.0 inch (2.5 cm) inboard from forward edge of main wing attach ground strap.

2 Remove paint and bodywork until wing skin EMM is exposed.

CAUTION: Wing skin EMM is extremely thin. When removing paint and bodywork, do not damage wing skin EMM.

Note: Required area of exposed wing skin EMM is less than 1.0 sq-in (6.45 sq-cm). (Refer to 51-20)

(f) Measure resistance between main wing attach ground strap and exposed wing skin EMM. (typically less than 1 ohm).

(g) If measured resistance between main wing attach ground strap and exposed wing skin EMM is a significant portion of overall fuel cap assembly ground path, perform Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap. (Refer to 57-10)

Note: At fuel cap ring, measure resistance from screws (*Serials 1005 thru 1877, 1879 thru 1885)* or flange *(Serials 1878, 1886 & subs).*

(h) Measure resistance between exposed wing skin EMM and fuel cap ring screws/flange (typically less than 7 ohms).

(i) If measured resistance between exposed wing skin EMM and fuel cap ring screws/flange is a significant portion of overall fuel cap assembly ground path, remove fuel cap assembly to expose copper tape (*Serials 1005 thru 1877, 1879 thru 1885*) or aluminum mesh EMM (*Serials 1878, 1886 & subs*) installed in fuel cap offset. (Refer to 28-10)

CAUTION: When removing fuel cap ring and gasket, do not damage copper tape/aluminum mesh EMM located on outer surface of fuel cap offset.

1 Measure resistance between exposed wing skin EMM and copper tape/aluminum mesh EMM (typically less than 7 ohms).

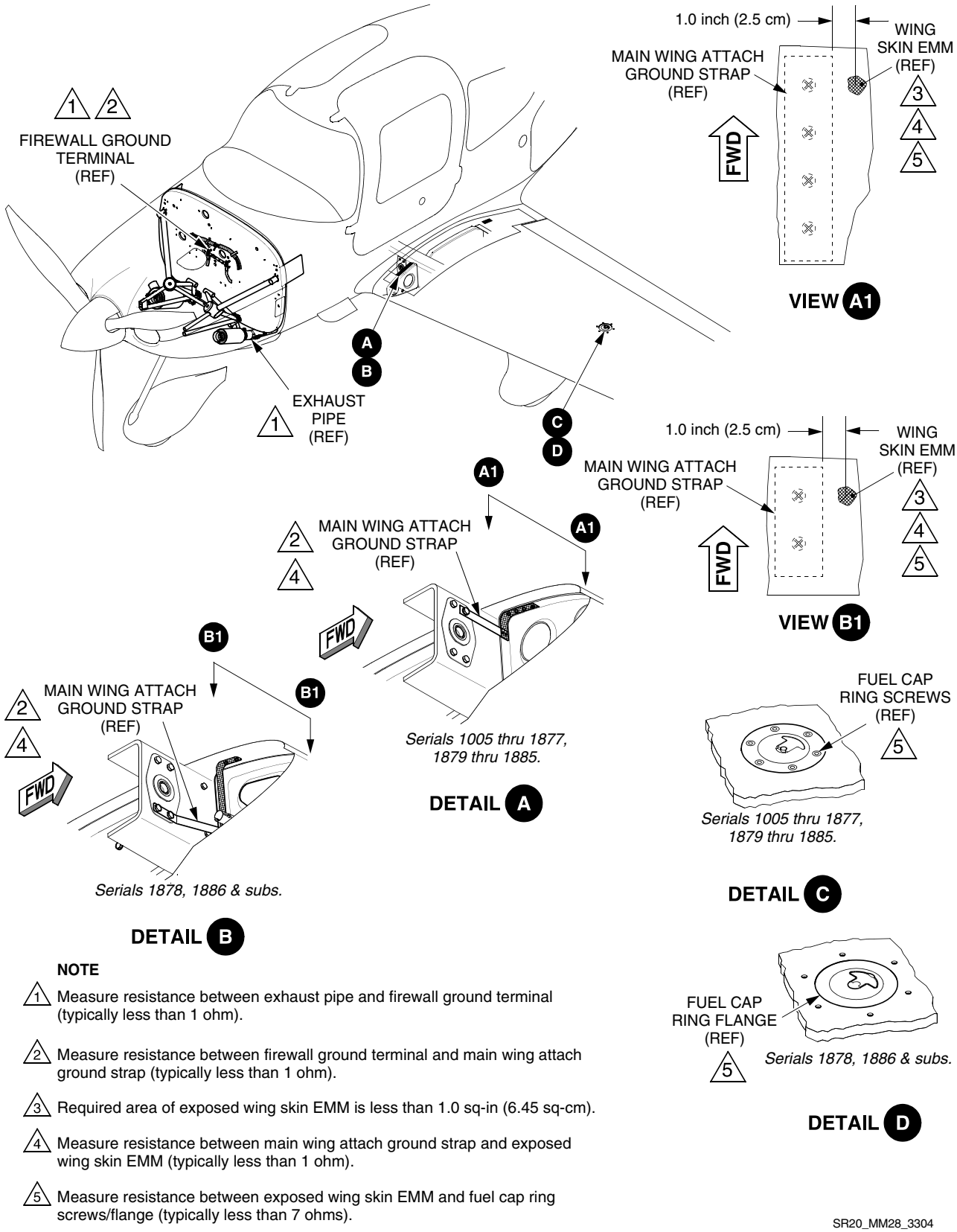
2 If measured resistance between exposed wing skin EMM and copper tape/aluminum mesh EMM is a significant portion of overall fuel cap assembly ground path, perform Approved Repair - Ground Path Between Wing Skin EMM and Fuel Cap Assembly. (Refer to 57-10)

3 If measured resistance between exposed wing skin EMM and copper tape/aluminum mesh EMM is not a significant portion of overall fuel cap assembly ground path, install fuel cap assembly to establish ground path. (Refer to 28-10)

(j) Perform Functional Test - Fuel Cap Assembly Ground Resistance. (Refer to 28-10)

(k) Repair wing skin and paint. (Refer to 51-20)

(l) Install lower engine cowling. (Refer to 71-10)



NOTE

1. Measure resistance between exhaust pipe and firewall ground terminal (typically less than 1 ohm).
2. Measure resistance between firewall ground terminal and main wing attach ground strap (typically less than 1 ohm).
3. Required area of exposed wing skin EMM is less than 1.0 sq-in (6.45 sq-cm).
4. Measure resistance between main wing attach ground strap and exposed wing skin EMM (typically less than 1 ohm).
5. Measure resistance between exposed wing skin EMM and fuel cap ring screws/flange (typically less than 7 ohms).

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Figure 28-103
Functional Test - High Resistance/Disconnect in Fuel Cap Assembly Ground Path

D. Wing Fuel Tank (See Figure 28-104)

(1) Adjustment/Test - Wing Fuel Tank Pressure Test

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Rubber Vent Hose	-	Any Source	Test fuel system.
Tee Fitting	-	Any Source	Test fuel system.
Air Pressure Gage	0-5 psi	Any Source	Verify pressure.
Water Manometer	-	Any Source	Verify pressure.
Soapy Water Solution	-	Any Source	Inspect for leaks.

(b) Drain fuel tanks. (Refer to 12-10)

(c) Set fuel selector valve to OFF position.

(d) *Serials 1005 thru 1885:* Remove wing access panel LW6 or RW6. (Refer to 06-00)

(e) *Serials 1886 & subs:* Remove wing access panel LW10 or RW10. (Refer to 06-00)

(f) Remove clamps securing vent hoses to NACA scoop vents.

(g) Plug outboard end of either vent hose.

(h) Connect a rubber hose and tee to the unplugged vent hose.

Note: The water manometer will be the primary checking device for pressure measurements. The low pressure air gage is the backup gage and will serve as a check on the manometer.

(i) Attach a water manometer and a low pressure air gage to the tee.

(j) Record ambient and calculated maximum water pressure and level readings.

WARNING: Never attempt to remove fuel cap with pressure in fuel system. Never apply regulated or unregulated air from an air compressor to fuel vent hose.

CAUTION: Do not pressurize fuel tanks to more than 55.4 inches of water (2.0 psi). Major structural damage to the fuel tank/wing may occur if more than 55.4 inches of water (2.0 psi) is applied. Stop pressurizing fuel system when either gage indicates maximum allowable pressure or level. If pressure or level exceeds 55.4 inches of water (2.0 psi), the fuel system may sustain damage that cannot be repaired. Always blow into hose, never inhale fuel or vapor.

(k) Blow into open end of hose until manometer indicates 55.4 inches of water (2.0 psi).

(l) Pinch or clamp hose to maintain maximum pressure in fuel tanks.

(m) Leave fuel system pressurized for 10-20 minutes.

(n) Inspect fuel tanks, collector tanks, fittings, and caps for signs of leakage.

(o) If leakage is suspected (manometer level or pressure readings drop), apply soapy water to area in question and inspect for bubbles.

WARNING: **If fuel system leaks, release all pressure from system before removing fuel caps. Never attempt to remove fuel cap with pressure in fuel system. Never remove fuel cap when a soapy water solution is present or contamination of fuel system could occur.**

Note: Inspect fuel tank seams, fuel lines, hoses, caps, connections, collector tank seams and fittings, and all other fuel related areas for leakage with soapy water.

Minor fuel cap leaks may be stopped by adjusting fuel cap nut clockwise to apply more tension on stem o-ring.

(p) If fuel cap leaks, replace outer o-ring. If leak is observed in recessed area around stem, disassemble fuel cap, and replace stem o-ring.

(q) If either tank leaks, release all pressure from fuel system. Repair fuel tank as required. (Refer to 28-10)

(r) Install fuel caps.

(s) Remove manometer, low pressure air gage, plug, rubber hose, and tee from vent hoses.

(t) Position vent hoses to NACA scoop vents and secure with clamps.

(u) *Serials 1005 thru 1885:* Install wing access panel LW6 or RW6. (Refer to 06-00)

(v) *Serials 1886 & subs:* Install wing access panel LW10 or RW10. (Refer to 06-00)

(w) Set selector valve to ON position.

(2) Inspection/Check - Wing Fuel Tank

Note: No detectable fuel leaks are allowed after repair procedure has been performed. (Refer to 28-10)

(a) Drain a pint of fuel from fuel tank drain valve into a clean, clear container. Visually inspect fuel sample for evidence of contaminates.

(b) Drain a quart of fuel from collector tank drain valve. Visually inspect fuel sample for evidence of contaminates.

(c) If no contaminates are found then no further action is required. Make an entry in the airplane logbook stating the inspection was performed.

(d) If contaminates are found then the fuel tank must be drained and cleaned. (Refer to 12-10)

(3) Cleaning - Wing Fuel Tank

WARNING: **Special precautions must be observed when using solvents for cleaning. Solvents used in cleaning are toxic and flammable. Fresh air masks and/or adequate ventilation, eye protection, and skin protection must be used in all closed areas.**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Methyl Ethyl Ketone (MEK)	ASTM D-740 Type 1or 2	Any Source	Cleaning.
Acetone	ASTM D-329	Any Source	Cleaning.

(b) Vacuum thoroughly to remove all chips, filings, and dirt from the tank area.

CAUTION: Always pour solvent on cloth to prevent contaminating solvent. Do not allow cloth to drip. Wipe surfaces with clean, dry cloths until white haze disappears. Never use contaminated solvent.

(c) Solvent clean all surfaces to be sealed by wiping with a clean cloth dampened with Methyl Ethyl Ketone (MEK), acetone or similar solvent. Dry surfaces with a clean cloth before solvent evaporates.

(4) Approved Repair - Wing Fuel Tank

The following procedures are to be used for sealing integral fuel tanks made of composite materials. If a repair must be made to a bondline, joint or seam, the repair should be made using a sealant that meets or exceeds MIL-S-8802. (Refer to 20-10) If the leak is coming from a small pinhole located away from any bondlines, joints or seams, the repair must be made using a Type 2, Class 1 non-structural resin system. Repair procedures for composites are covered in Chapter 51-00. (Refer to 51-00)

WARNING: **Purge fuel tank with argon or carbon dioxide gas prior to sealing leaks. This will help minimize the possibility of an explosion. Use a portable vapor detector to determine when it is safe to seal the fuel tank(s). Use only non-sparking tools during the sealing process.**

Prevent fuel drains, vent openings, and outlet screens from becoming restricted when sealing fuel tanks.

(a) Acquire necessary tools, equipment, and supplies.

Item	P/N or Spec.	Supplier	Purpose
Methyl Ethyl Ketone (MEK)	ASTM D740 Type 1or 2	Any Source	General cleaning.
Non-Structural Resin Repair System	Shell EPON 862/ heloxy 68 & Teta 3234 resin system Type 2 Class 1	Shell Oil	Seal pinholes that are away from bondlines, joints or seams.
Gloves	-	Any Source	Protect hands.
Cotton Cloth (clean and lint free)	-	Any Source	General cleaning.
Application Brush (Nylon)	-	Any Source	Tank repair.
Compressed Air (clean, oil and moisture free)	-	Any Source	General cleaning.
Argon or CO_2 gas	-	Any Source	Eliminate fuel vapors.
Vapor Detector	18995T57	McMaster-Carr	Detect fuel vapor.
Sealant Gun	-	Any Source	Apply sealant.
Sandpaper - Aluminum Oxide	200 grit	Any Source	Prepare surface.

(b) Ground airplane exhaust pipe to the earth and a suitable fuel drainage container.

(c) Disconnect battery 1. (Refer to 24-30)

(d) Drain fuel tank. (Refer to 12-10)

(e) *Serials 1005 thru 1885:* Remove appropriate wing access panel LW4, RW4, LW5, or RW5. (Refer to 06-00)

(f) *Serials 1886 & subs:* Remove appropriate wing access panel LW6, RW6, LW7, RW7, LW8, or RW8. (Refer to 06-00)

(g) Position inert gas supply hose to fuel tank and allow gas to flow into tank until no fuel vapor remains.

(h) Using vapor detector in accordance with the manufacturer's instructions, verify no fuel vapors exist in the fuel tank.

(i) Solvent clean repair area with acetone. (Refer to 20-30)

Note: Prepare and seal an area larger than initial repair area.

(j) Lightly sand composite areas to be sealed with 200-grit sandpaper. Sand an area larger than initial repair area.

CAUTION: Do not sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for composite repair.

(k) Using a stiff bristle brush, remove all large contaminates.

(l) Solvent clean surfaces to be sealed with acetone or isopropyl alcohol. (Refer to 20-30)

Note: If fuel leak is located at a bondline, joint or seam, mix sealant (MIL-8802 Type 2 Class A and/or Class B) per manufacturer's instructions. (Refer to 20-10)

If the leak is coming from a small pinhole located away from any bondlines, joints or seams, mix non-structural resin (Type 2, Class 1) per the manufacturer's instructions. (Refer to 20-10)

(m) Fillet, fay or injection seal as required. Brush sealant or resin over repair area making sure brushed area is larger than the repaired area. (Refer to 20-10)

(n) Allow sealant or resin to fully cure.

(o) *Serials 1005 thru 1885:* Install wing access panel LW4, RW4, LW5, or RW5. (Refer to 06-00)

(p) *Serials 1886 & subs:* Install wing access panel LW6, RW6, LW7, RW7, LW8, or RW8. (Refer to 06-00)

(q) Fill fuel tank. (Refer to 12-10)

(r) Visually inspect tank seams for any signs of leakage or stains. If any leaks are present, repair tank as needed. (Refer to 28-10)

(s) Connect battery 1. (Refer to 24-30)

(t) Remove ground from airplane exhaust pipe.

E. Collector Tank - *Serials 1005 thru 1885* (See Figure 28-104)

(1) Removal - Collector Tank
- (a) Drain corresponding fuel and collector tanks for the side being serviced. (Refer to 12-10)
- (b) Remove wing access panel RW1 or LW1. (Refer to 06-00)
- (c) Remove fuel supply and vent lines from collector tank.
- (d) Remove collector tank from wing.

(2) Installation - Collector Tank
- (a) Position collector tank to wing.
- (b) Connect fuel supply and vent lines to collector tank.
- (c) Install wing access panel RW1 or LW1. (Refer to 06-00)
- (d) Fill fuel tank.
- (e) Inspect fuel tank, collector tank, hoses, and lines for any signs of leakage. Service as required.

(3) Adjustment/Test - Collector Tank
- (a) Perform Adjustment/Test - Wing Fuel Tank Pressure Test. (Refer to 28-10)

(4) Inspection/Check - Collector Tank
- (a) Drain corresponding fuel and collector tanks for the side being serviced. (Refer to 12-10)
- (b) Remove wing access panel RW1 or LW1. (Refer to 06-00)
- (c) Visually inspect tank and welded seams for any signs of leakage or stains. Inspect tank for any signs of wear or thin spots. If any damage, wear, or leaks are present, replace tank.
- (d) Install wing access panel RW1 or LW1. (Refer to 06-00)
- (e) Fill fuel tank.
- (f) Inspect fuel tank, collector tank, hoses, and lines for any signs of leakage. Service as required.

F. Collector Tank - *Serials 1886 & subs* (See Figure 28-104)

(1) Adjustment/Test - Collector Tank

(a) Perform Adjustment/Test - Wing Fuel Tank Pressure Test. (Refer to 28-10)

(2) Inspection/Check - Collector Tank

(a) Drain corresponding fuel and collector tanks for the side being serviced. (Refer to 12-10)

(b) Remove wing access panel RW3 or LW3. (Refer to 06-00)

(c) Visually inspect collector tank bay for any signs of damage, leaks or stains. If any damage, stains or leaks are present, repair tank.

(d) Install wing access panel RW3 or LW3. (Refer to 06-00)

(e) Fill fuel tank.

(f) Inspect fuel tank, collector tank, hoses, and lines for any signs of leakage. Service as required.

G. Fuel Strainers (See Figure 28-104)

(1) Removal - Fuel Strainers
  (a) Drain corresponding fuel tank for side being serviced. (Refer to 12-10)
  (b) *Serials 1005 thru 1885:* Remove wing access panel LW3 or RW3. (Refer to 06-00)
  (c) *Serials 1886 & subs:* Remove wing access panel LW6 or RW6. (Refer to 06-00)
  (d) Remove fuel strainer from bulkhead fitting.

(2) Installation - Fuel Strainers
  (a) Install fuel strainer to bulkhead fitting.
  (b) *Serials 1005 thru 1885:* Install wing access panel LW3 or RW3. (Refer to 06-00)
  (c) *Serials 1886 & subs:* Install wing access panel LW6 or RW6. (Refer to 06-00)
  (d) Fill fuel tank.
  (e) Inspect fuel tank for any signs of leakage. Service as required.

(3) Inspection/Check - Fuel Strainers
  (a) Visually inspect strainers for signs of damage or restrictions. If damage or restrictions exist, replace fuel strainer.

H. Fuel System Ventilation (See Figure 28-104)

(1) Removal - Fuel System Ventilation

(a) *Serials 1005 thru 1885:* Remove wing access panel LW6 or RW6. (Refer to 06-00)

(b) *Serials 1886 & subs:* Remove wing access panel LW10 or RW10. (Refer to 06-00)

(c) Remove clamp securing vent hose to NACA scoop vent.

(d) Remove clamp securing vent hose to bulkhead fitting on wing rib.

(e) Remove vent hose from airplane.

(2) Installation - Fuel System Ventilation

(a) Position vent hose to bulkhead fitting on wing rib and secure with clamp.

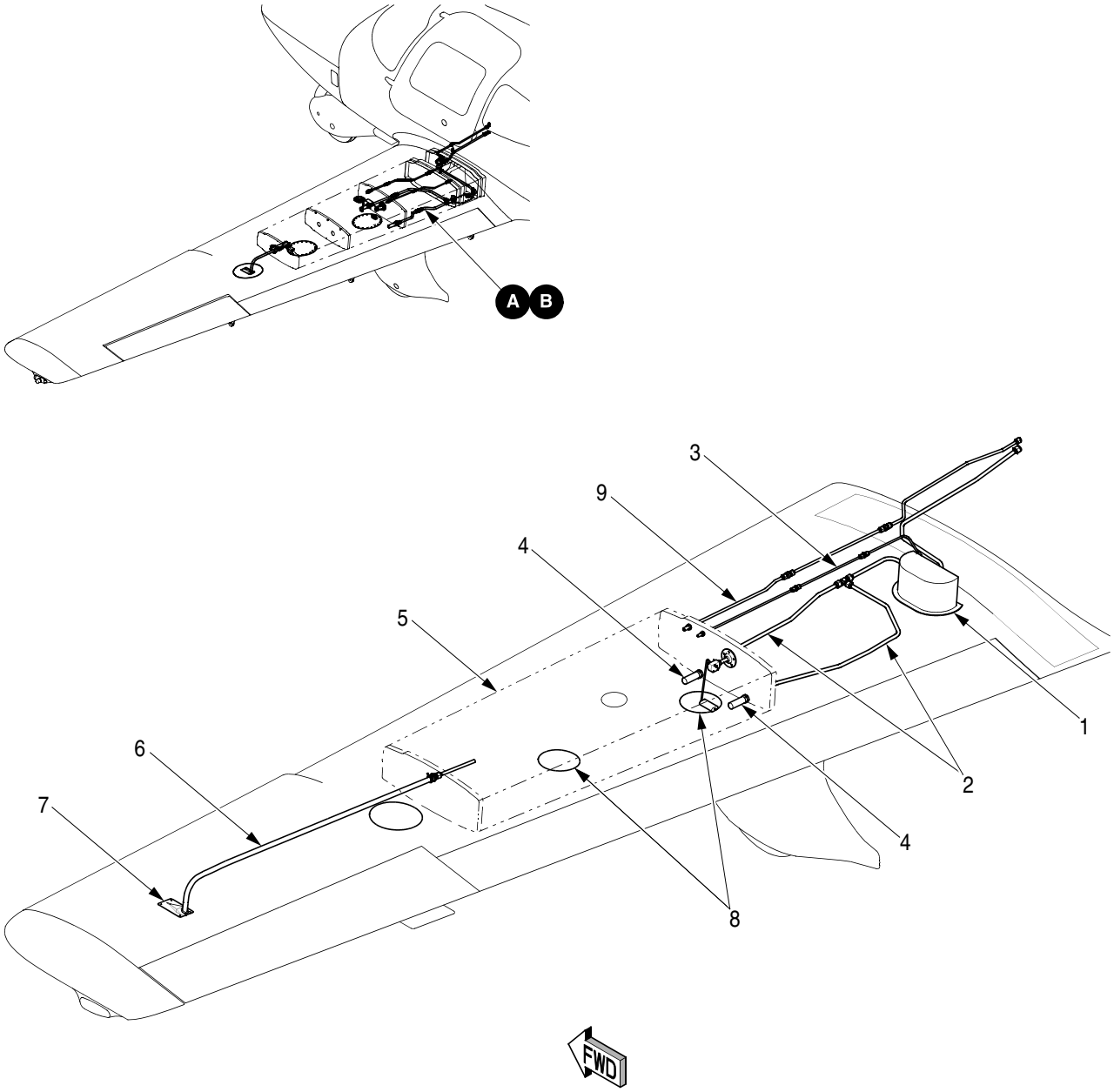
(b) Position vent hose to NACA scoop vent and secure with clamp.

(c) *Serials 1005 thru 1885:* Install wing access panel LW6 or RW6. (Refer to 06-00)

(d) *Serials 1886 & subs:* Install wing access panel LW10 or RW10. (Refer to 06-00)

(3) Inspection/Check - Fuel System Ventilation

(a) Inspect vent hose for obstructions, kinks, chaffing, or cuts. Replace hose if damaged.



LEGEND

1. Collector Tank
2. Fuel Supply Line
3. Fuel Vent Line
4. Fuel Tank Strainers
5. Fuel Tank, Left Integral
6. Fuel System Vent Hose
7. NACA Vent
8. Fuel Tank Access Panel (Underside of Wing)
9. Fuel Return Line

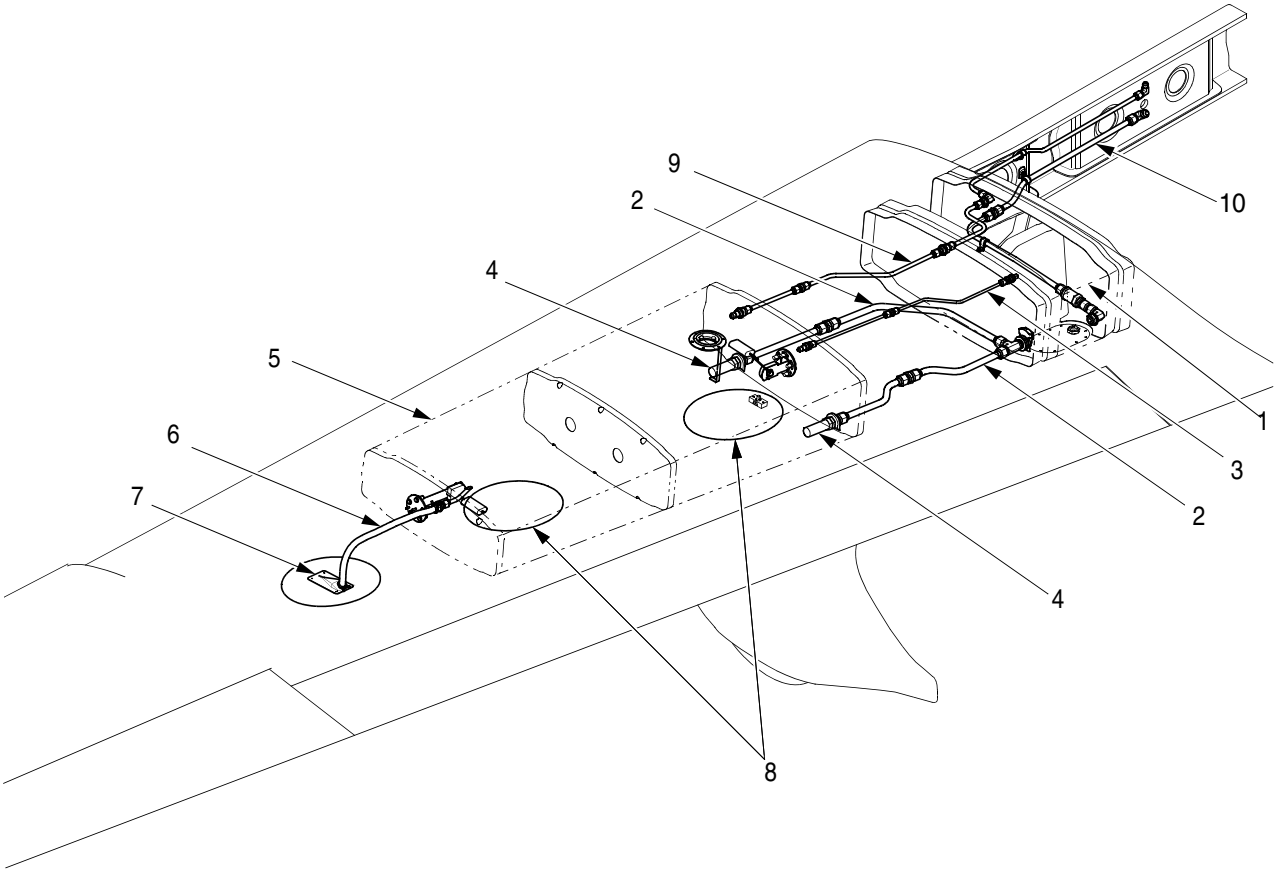
DETAIL A

Serials 1005 thru 1877, 1879 thru 1885.

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Figure 28-104
Wing Fuel System Components - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885



LEGEND

1. Collector Tank
2. Fuel Supply Line
3. Fuel Vent Line
4. Fuel Tank Strainers
5. Fuel Tank, Left Integral
6. Fuel System Vent Hose
7. NACA Vent
8. Fuel Tank Access Panel (Underside of Wing)
9. Fuel Return Line
10. Supply Tube Assembly

SR20_MM28_2553

Figure 28-104
Wing Fuel System Components - Serials 1886 & subs (Sheet 2 of 2)

I. Fuel Tank Drain Valve (See Figure 28-105)

(1) Removal - Fuel Tank Drain Valve

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Fire Extinguisher (Type AB, or ABC)	-	Any Source	Extinguish fire in an emergency.
Fuel Drain Container	-	Any Source	Drain old fuel into.
Fuel Sampler Cup	Refer to IPC, Fly Away Kit for approved cup	Cirrus Design	Drain gascolator and collector tanks.

(b) Position fuel drain container under fuel drain valve.

(c) Ground fuel drain container to exhaust pipe outlet and airplane to a suitable earth ground.

(d) Remove safety wire securing fuel drain valve to retainer block mounting screw.

(e) Remove fuel drain valve from access panel.

(f) Allow all fuel and any contaminates to drain from fuel tank.

(g) To completely drain fuel system, use fuel sampler cup to remove all fuel and any contaminates from gascolator and collector tanks.

(h) Remove and discard o-ring from fuel drain valve.

(2) Installation - Fuel Tank Drain Valve

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Fuel Sampler Cup	Refer to IPC, Fly Away Kit for approved cup	Cirrus Design	Drain gascolator and collector tanks.
Fuel Drain Valve O-Ring	Refer to IPC, Fuel System - Storage for approved o-ring	Any Source	Replacement o-ring for fuel drain valve.

(b) Install new o-ring to fuel drain valve.

CAUTION: Ensure o-ring fits securely in valve body groove.

(c) Secure fuel drain valve to access panel with nut.

Note: The valve can be identified by the crimped (cad plated steel) or chamfered (brass) stem.

(d) *Cad Plated Steel Valve:* Torque fuel drain valve to 60 - 80 in-lb (6.8 - 9.0 Nm).

(e) Brass Valve: Torque fuel drain valve to 45 - 50 in-lb (5.1 - 5.6 Nm).

(f) Safety wire fuel drain valve to retainer block mounting screw. (Refer to 20-50)

(g) Fuel airplane. (Refer to 12-10)

(h) Place fuel sampler cup under fuel drain valve and test valve for proper operation. Inspect fuel for any contaminates.

(i) Inspect complete fuel system for any signs of leaks and service as required.

CAUTION: If fuel system is drained or a fuel tank is empty for any reason, air may enter the system. To ensure proper engine operation, ground run engine for several minutes on each fuel tank until air is removed. Refer to the Pilot's Operating Handbook before starting and operating engine.

(j) Ground run engine to purge air from fuel system.

(k) Reinspect complete fuel system for any signs of leaks and service as required.

J. Collector Tank Drain Valve - *Serials 1005 thru 1885* (See Figure 28-105)

For maintenance practices pertinent to the collector tank drain valves, see Removal - Fuel Tank Drain Valve. (Refer to 28-10)

K. Collector Tank Drain Valve - *Serials 1886 & subs* **(See Figure 28-105)**

(1) Removal - Collector Tank Drain Valve

(a) Drain corresponding wing fuel tank. (Refer to 12-10)

(b) Remove wing access panel LW3 or RW3. (Refer to 06-00)

(c) Remove nut securing fuel drain valve to access panel.

(d) Remove and discard o-ring from fuel drain valve.

(2) Installation - Collector Tank Drain Valve

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Fuel Sampler Cup	Refer to IPC, Fly Away Kit for approved cup	Cirrus Design	Drain gascolator and collector tanks.
Fuel Drain Valve O-Ring	Refer to IPC, Fuel System - Storage for approved o-ring	Any Source	Replacement o-ring for fuel drain valve.

CAUTION: To maintain lightning protection, the drain valves must be installed onto a clean, bare metal surface. Ensure entire base of drain valve makes contact with the access panel and no paint or contaminates exist between the surfaces. Failure to do so may result in potential ignition sources in the collector tank due to lightning.

(b) Inspect drain valve contact area for any paint or other contaminates. Remove contaminates as necessary to obtain a clean and bare metal contact area.

(c) Install new o-ring to fuel drain valve.

CAUTION: Ensure o-ring fits securely in valve body groove.

(d) Secure fuel drain valve to access panel with nut.

(e) *Black/Red Valve:* Torque nut to 90 - 100 in-lb (10.2 - 11.3 Nm).

(f) *Red Valve:* Torque nut to 48 - 60 in-lb (5.4 - 6.7 Nm).

(g) Verify entire base of fuel drain valve makes contact with access panel.

(h) Install wing access panel LW3 or RW3. (Refer to 06-00)

(i) Fuel airplane. (Refer to 12-10)

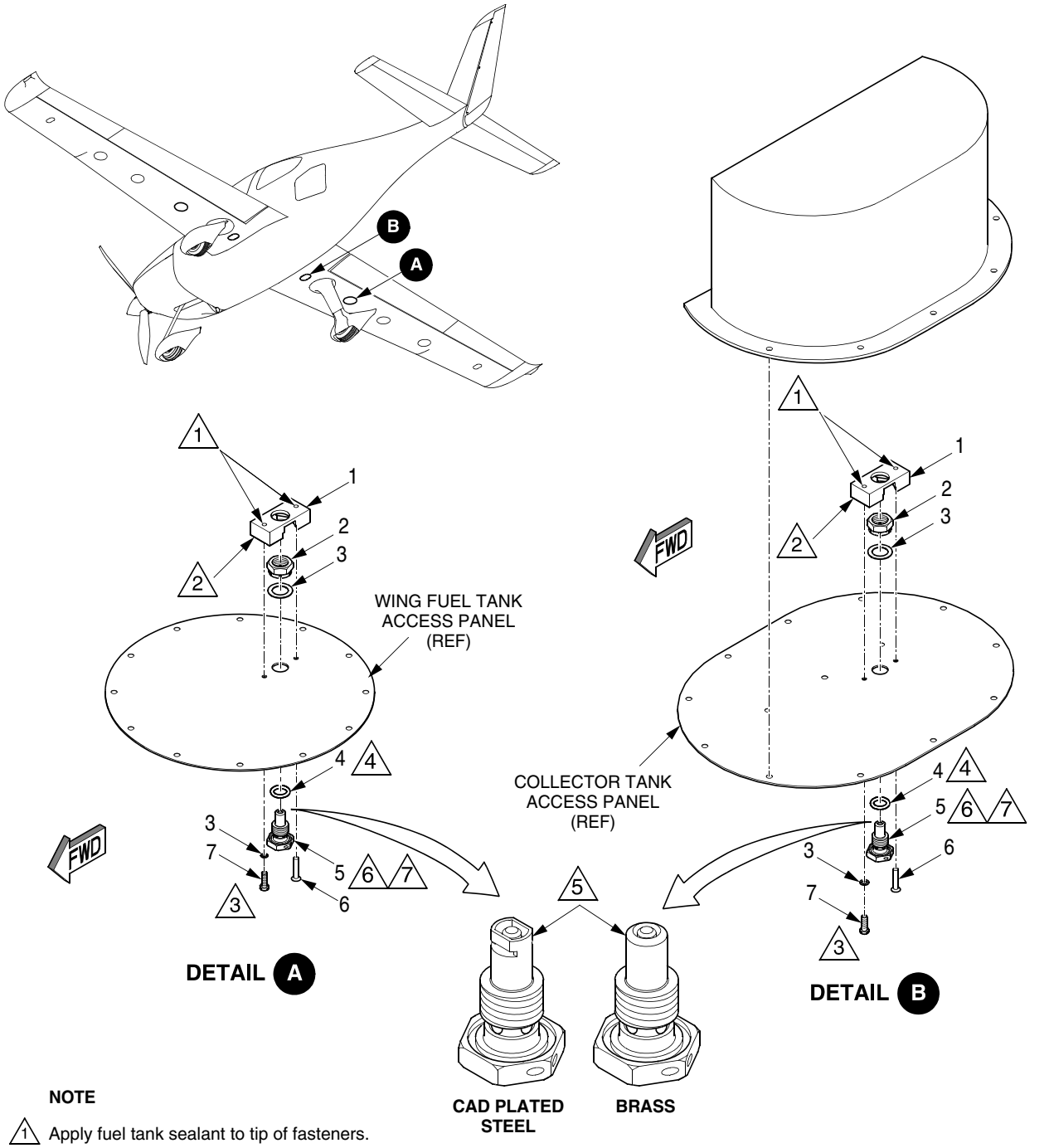
(j) Place fuel sampler cup under fuel drain valve and test valve for proper operation. Inspect fuel for any contaminates.

(k) Inspect complete fuel system for any signs of leaks and service as required.

CAUTION: If fuel system is drained or a fuel tank is empty for any reason, air may enter the system. To ensure proper engine operation, ground run engine for several minutes on each fuel tank until air is removed. Refer to the Pilot's Operating Handbook before starting and operating engine.

(l) Ground run engine to purge air from fuel system.

(m) Reinspect complete fuel system for any signs of leaks and service as required.



NOTE

1. Apply fuel tank sealant to tip of fasteners.
2. Apply fuel tank sealant to lower mating surface.
3. Safety wire fuel drain valve to screw.
4. Ensure o-ring fits securely in valve body groove.
5. The valve can be identified by the crimped (cad plated steel) or chamfered (brass) stem.
6. *Cad Plated Steel Valve:* Torque fuel drain valve to 60 - 80 in-lb (6.8 - 9.0 Nm).
7. *Brass Valve:* Torque fuel drain valve to 45 - 50 in-lb (5.1 - 5.6 Nm).

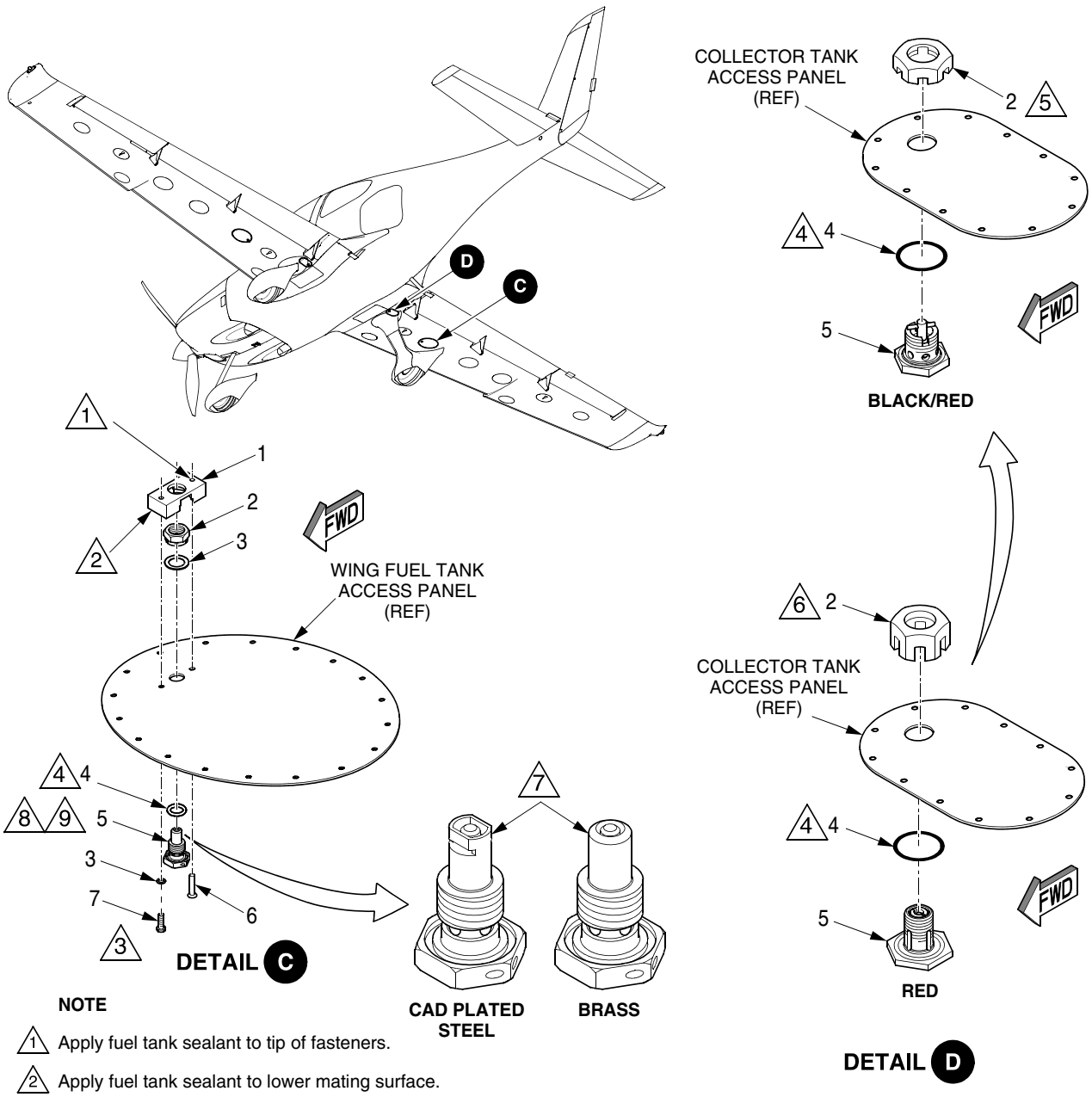
LEGEND

1. Retainer
2. Nut
3. Washer
4. O-ring
5. Drain Valve
6. Rivet
7. Screw

SR20_MM28_1130C

Figure 28-105
Fuel Drain Valve Installation - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885



NOTE

1. Apply fuel tank sealant to tip of fasteners.
2. Apply fuel tank sealant to lower mating surface.
3. Safety wire fuel drain valve to screw.
4. Ensure o-ring fits securely in valve body groove.
5. *Black/Red Valve:* Torque nut to 90 - 100 in-lb (10.2 - 11.3 Nm).
6. *Red Valve:* Torque nut to 48 - 60 in-lb (5.4 - 6.7 Nm).
7. The valve can be identified by the crimped (cad plated steel) or chamfered (brass) stem.
8. *Cad Plated Steel Valve:* Torque fuel drain valve to 60 - 80 in-lb (6.8 - 9.0 Nm).
9. *Brass Valve:* Torque fuel drain valve to 45 - 50 in-lb (5.1 - 5.6 Nm).

LEGEND

1. Retainer
2. Nut
3. Washer
4. O-ring
5. Drain Valve
6. Rivet
7. Screw

Serials 1886 & subs.

SR20_MM28_2700A

Figure 28-105
Fuel Drain Valve Installation - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs

L. Inspection/Check - Fuel Storage System

A wet or stained spot on the wing can be an indication of a fuel leak. Not all fuel leaks require immediate repair. Fuel leaks which do not constitute a flight hazard can be repaired at the next scheduled servicing. Fuel leaks that do not constitute a flight hazard are stains, seeps, and heavy seeps which are not in an enclosed area. Fuel tanks are sealed with MIL-S-8802 Type II sealant.

Repairs that break the fuel tank access panel seal will necessitate resealing of that fuel tank. All repairs made within the fuel tank must be fay surface sealed and fillet sealed. All boundaries and any other place that could leak must be sealed. Stains and seeps which are not immediately repaired must be inspected prior to and immediately after each flight until they have been repaired.

(1) Stain
   (a) Stains are 3/4 of an inch in size or less.
(2) Seep
   (a) Seeps range in size from 3/4 of an inch up to 1 1/2 inches.
(3) Heavy seep
   (a) Heavy seeps range in size from 1 1/2 inches up to 4 inches.
(4) Running Leak
   (a) A running leak will vary in size depending on location and intensity of the leak. Fuel usually will flow and immediately drip after being wiped dry.

DISTRIBUTION

1. DESCRIPTION

This section contains information on the distribution system. The fuel distribution system consists of electric and mechanical (engine-driven) fuel pumps, fuel gascolator, fuel hose, fuel lines, fuel selector valve, and fuel pump switches.

A. Gascolator - *Serials 1005 thru 1877, 1879 thru 1885, 2032 & subs*

A gascolator is installed on the forward side of the firewall after the electric fuel pump and before the engine driven fuel pump. A drain valve, connected to the bowl of the gascolator, is used to drain off contaminates during the preflight inspection. The gascolator provides 100 to 140 micron filtration and has a 4.9 fluid ounce (144.89 milliliters) capacity. The filter element can be cleaned or replaced when the bowl is removed.

B. Gascolator - *Serials 1878, 1886 thru 2031*

A gascolator is installed on the forward side of the firewall after the electric fuel pump and before the engine driven fuel pump. A drain valve, connected to the bowl of the gascolator, is used to drain off contaminates during the preflight inspection. The gascolator provides 10 micron filtration and has a 6.7 fluid ounce (198.14 milliliters) bowl capacity. The gascolator contains a filter bypass that is activated when pressure drop through the filter reaches 1.20 ±0.2 PSI. The filter element cannot be cleaned. The filter element can be replaced when the bowl is removed.

Serials 1878, 1886 thru 2015, 2016 thru 2031 w/o Perspective Avionics: Prior to bypassing fuel, the gascolator indicates that the pressure drop is becoming greater than normal with a mechanical pop-up tab indicator. The red pop-up tab extends 0.25 inch (6.35 mm) out of the top of the assembly at 0.8 ±0.2 PSI and remains extended until manually reset.

Serials 2016 thru 2031 w/ Perspective Avionics: Fuel flow is measured at the gascolator and the signal sent to the Engine Airframe Unit, processed, and transmitted to the Engine Indicating System for display.

Note: The majority of all fuel system problems are directly related to contaminated fuel. Therefore, inspecting and cleaning the fuel drains and filter in the gascolator should be considered to be of utmost importance. Under normal operating conditions, the fuel drains and filter in the gascolator should be inspected and cleaned as indicated in Chapter 5. If the airplane is used in dusty or dirty environments, the fuel drains and filter in the gascolator should be cleaned more often.

Serials 1886 thru 2031: If significant contamination is noted during preflight sump check, the filter element should be replaced.

The engine-driven fuel pump is mounted to the forward side of the engine. An electric fuel pump is installed on the forward side of the firewall. Mounted on the center console (adjacent to the fuel selector valve) is a Fuel Pump BOOST-PRIME rocker switch. The prime position on the switch is momentary. The boost position is continuous. The boost pump operates on 28 VDC supplied through the 5-amp FUEL PUMP circuit breaker on Main Bus 2.

Serials 1005 thru 1227 before SB 20-73-02: A fuel pressure based system is used to control boost pump operation. Both positions of the pump normally operate on the low-speed setting. For engine priming, a pressure actuated switch located on the fuel injection distribution manifold allows the pump to run on high speed when fuel system pressure is below 3 PSI. This allows rapid priming of the fuel system for starting. Once the fuel system is primed, the electric pump is switched to the low-speed setting by the pressure switch. The boost position operates the electric pump at the low-speed setting only, regardless of fuel system pressure.

Serials 1228 & subs, 1005 thru 1227 after SB 20-73-02: An oil pressure based system is used to control boost pump operation. The oil pressure/oil temperature gauge provides a signal to the starting circuit/DAU

to generate a ground for the oil annunciator and the fuel system. This system allows the fuel pump to run at the prime (high speed) when the engine oil pressure is less than 10 PSI. Whenever the engine oil pressure exceeds 10 PSI, pressing the prime switch will have no effect. The boost position energizes the boost pump in low-speed mode regardless of oil pressure to deliver a continuous 4-6 psi boost to the fuel flow for vapor suppression in a hot fuel condition.

A fuel tank selector valve is installed in the center console between the crew seats, and is isolated from the cabin in case of leakage. The valve has a left, right, and off position. Each position has a positive detent. A knob is located at the top of the handle, and must be pulled to switch the valve to the off position; the valve can be rotated back to on without any further action. The selector valve can be switched between left and right fuel tanks by simply rotating the valve. The valve handle points in the direction of the tank being selected. The selector valve only allows feed from one tank at a time.

Drain hoses are provided for the auxiliary fuel pump, gascolator, engine driven fuel pump, fuel injection manifold (spider), and the engine manifolds (cylinder heads). Drain hoses are routed to a drain manifold located on the bottom center of the firewall. A check valve is installed on the cylinder drain manifold to prevent loss of manifold pressure. The valve closes when manifold pressure is below ambient pressure. An aft side firewall fuel enclosure, and a selector valve enclosure prevent fuel from leaking into the cabin.

Note: When servicing fuel system pipe thread fittings, apply a small amount of grease (MIL-G-60320 Type 1) to the external threads.

2. MAINTENANCE PRACTICES

A. Gascolator - *Serials 1005 thru 1877, 1879 thru 1885, 2032 & subs* (See Figure 28-201)

(1) Servicing - Gascolator

(a) Set fuel selector valve to OFF position.

(b) Using fuel sampler, drain fuel from gascolator and drain tube. (Refer to 12-10)

(c) Disconnect drain tube nut securing drain tube to drain fitting.

(d) Disassemble gascolator. (Refer to 28-20)

(e) Soak fuel filter screen in approved fuel to loosen contaminates.

(f) Using compressed air, blow from the inside of fuel filter screen to the outside to remove contaminates.

(g) Assemble gascolator. (Refer to 28-20)

(h) Connect drain tube nut securing drain tube to drain fitting.

(i) Set fuel selector valve to ON position.

(2) Removal - Gascolator

(a) Disconnect battery 1. (Refer to 24-30)

(b) Set fuel selector valve to OFF position.

(c) Using fuel sampler, drain fuel from gascolator and drain tube. (Refer to 12-10)

(d) Disconnect inlet and outlet lines from gascolator.

(e) Disconnect drain tube nut securing drain tube to drain fitting.

(f) Remove screws and washers securing gascolator to mounting bracket. Remove gascolator from airplane.

(3) Disassembly - Gascolator

Note: To aid disassembly, lightly tap on side of gascolator or rotate bowl while pulling apart to loosen o-ring seal.

(a) Remove drain fitting and Stat-O-Seal washer securing gascolator bowl to base.

(b) Remove retaining ring securing filter screen to gascolator base.

(4) Assembly - Gascolator

(a) Position filter screen to gascolator base and secure with retaining ring.

(b) Install new o-ring to gascolator base.

(c) Position gascolator bowl to base and secure with drain fitting and new Stat-O-Seal washer.

(5) Installation - Gascolator

(a) Position gascolator to mounting bracket and loosely secure with screws and washers.

(b) Connect drain tube nut securing drain tube to drain fitting.

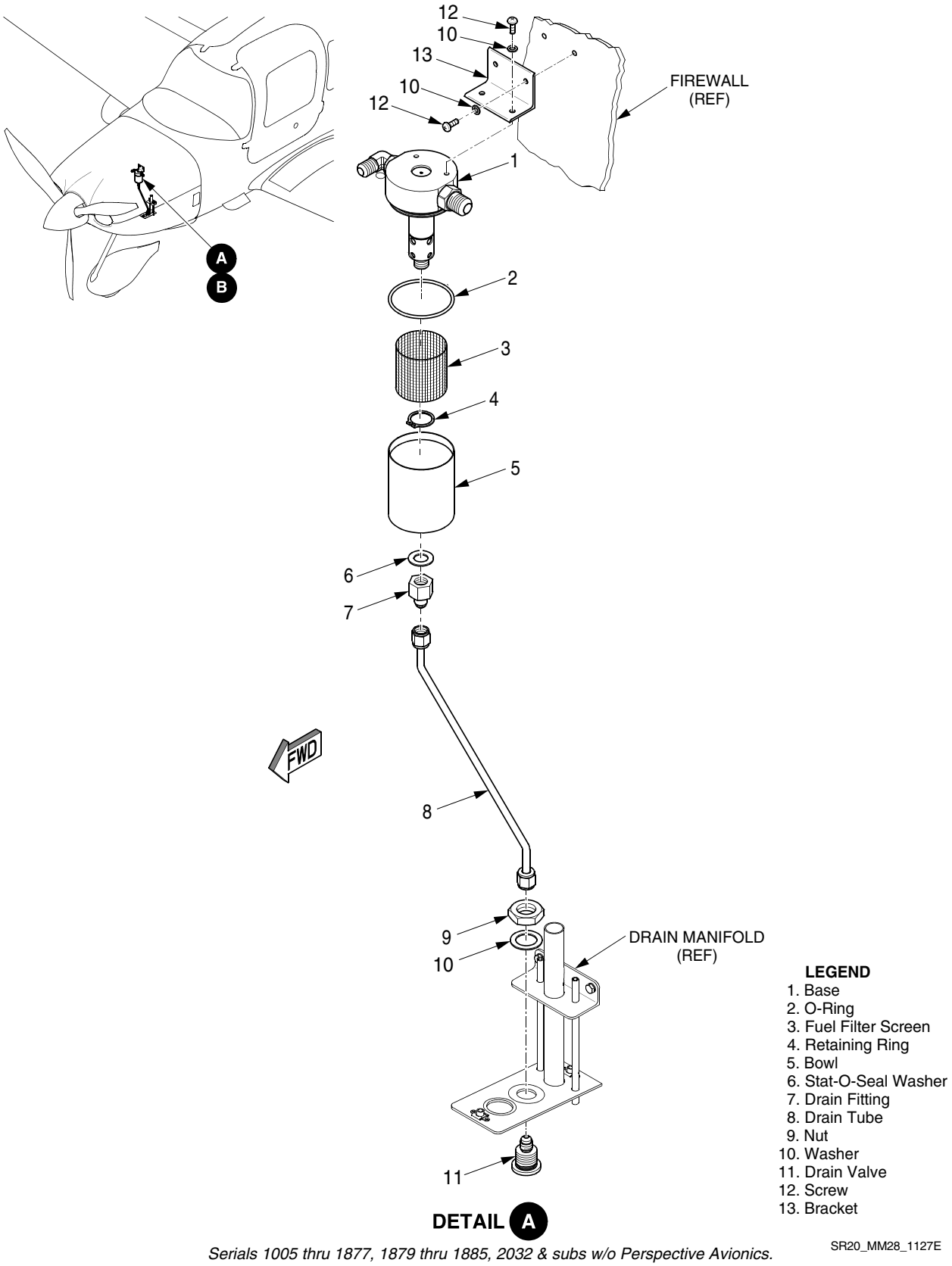
(c) Connect inlet and outlet lines to gascolator.

(d) Tighten screws and washers securing gascolator to mounting bracket.

(e) Set fuel selector valve to ON position.

(f) Inspect gascolator and fuel lines for signs of leakage.

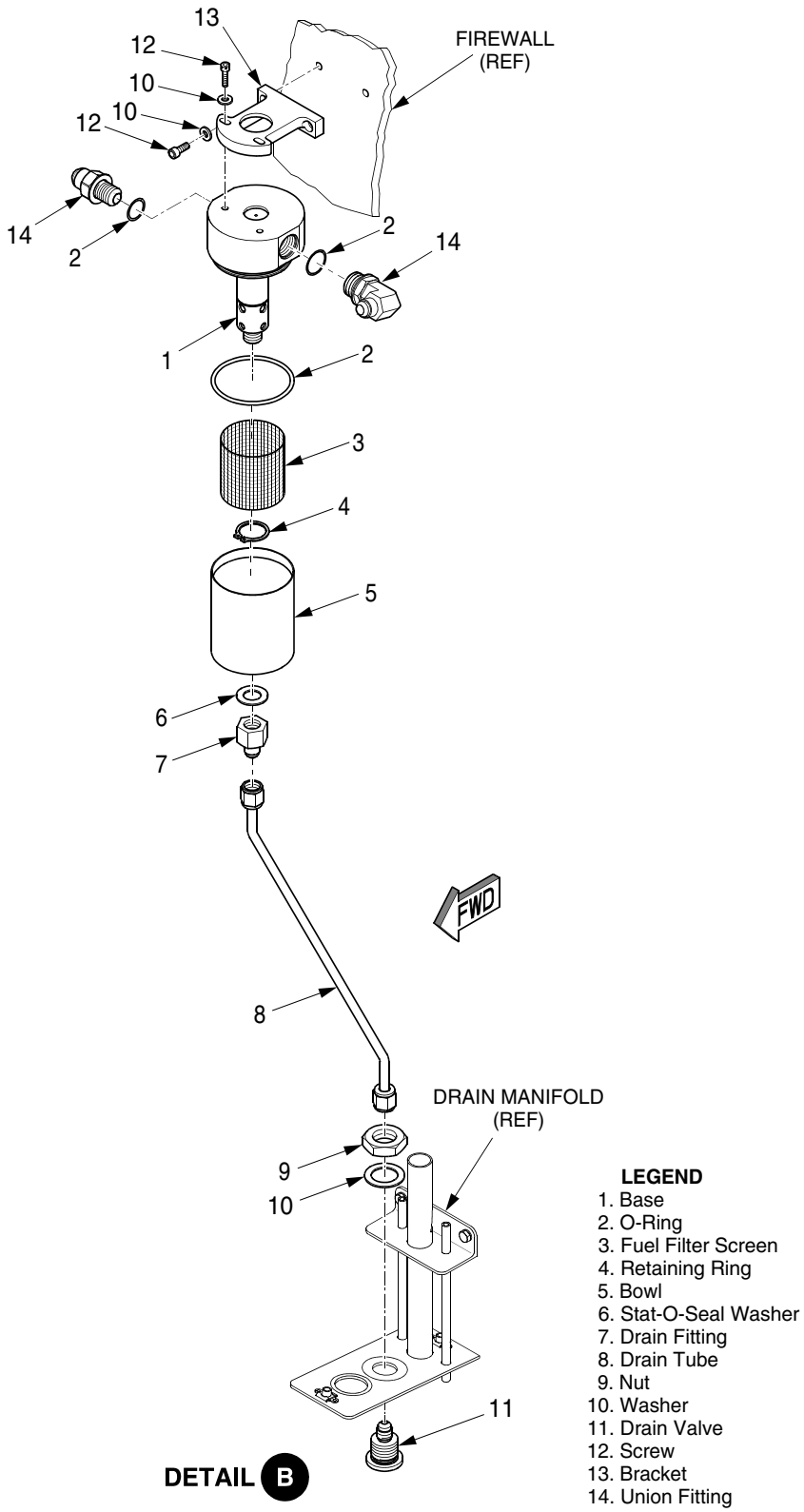
(g) Connect battery 1. (Refer to 24-30)



Serials 1005 thru 1877, 1879 thru 1885, 2032 & subs w/o Perspective Avionics.

Figure 28-201
Gascolator Assembly - Serials 1005 thru 1885, 2032 & subs w/o Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885, 2032 & subs w/o Perspective Avionics



Serials 2032 & subs w/ Perspective Avionics.

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Figure 28-201
Gascolator Assembly - Serials 2032 & subs w/ Perspective Avionics (Sheet 2 of 2)

B. Gascolator - *Serials 1878, 1886 thru 2031* (See Figure 28-202)

(1) Servicing - Gascolator

(a) Set fuel selector valve to OFF position.

(b) Using fuel sampler, drain fuel from gascolator and drain tube. (Refer to 12-10)

(c) Disconnect drain tube nut securing drain tube to drain fitting.

(d) Remove screws and washers securing heat shield to gascolator bracket.

(e) Disassemble gascolator. (Refer to 28-20)

Note: Filter element can not be cleaned and must be replaced upon evidence of clogging (red indicator pin pops up) or at scheduled inspection intervals.

(f) Replace filter element.

(g) Assemble gascolator. (Refer to 28-20)

(h) Position heat shield to gascolator bracket and secure with screws and washers.

(i) Connect drain tube nut securing drain tube to drain fitting.

(j) Set fuel selector valve to ON position.

(2) Removal - Gascolator

(a) Remove upper and RH lower engine cowling. (Refer to 71-10)

(b) Disconnect battery 1. (Refer to 24-30)

(c) Set fuel selector valve to OFF position.

(d) Using fuel sampler, drain fuel from gascolator and drain tube. (Refer to 12-10)

(e) Remove screws and washers securing heat shield to gascolator bracket.

(f) Disconnect inlet and outlet lines from gascolator.

(g) Disconnect drain tube nut securing drain tube to drain fitting.

(h) Remove screws and washers securing gascolator to mounting bracket.

(i) *Serials 2016 thru 2031 w/ Perspective Avionics:* Remove sensor from gascolator.

(j) Remove gascolator from airplane.

(3) Disassembly - Gascolator

Note: Removal of drain fitting and Stat-O-Seal washer is not required when performing Servicing - Gascolator.

(a) Remove drain fitting and Stat-O-Seal washer securing drain tube to gascolator base.

(b) Remove safety wire securing gascolator bowl to base.

(c) Rotate gascolator bowl from base.

(d) Remove filter element from gascolator base.

(4) Assembly - Gascolator

(a) Position filter element into gascolator base.

(b) Apply a light coat of engine oil to new o-ring. Install new o-ring to gascolator base.

(c) Rotate gascolator bowl onto base.

(d) Secure gascolator bowl to base with safety wire.

Note: Unless removed during disassembly, installation of drain fitting and Stat-O-Seal washer is not required when performing Servicing - Gascolator.

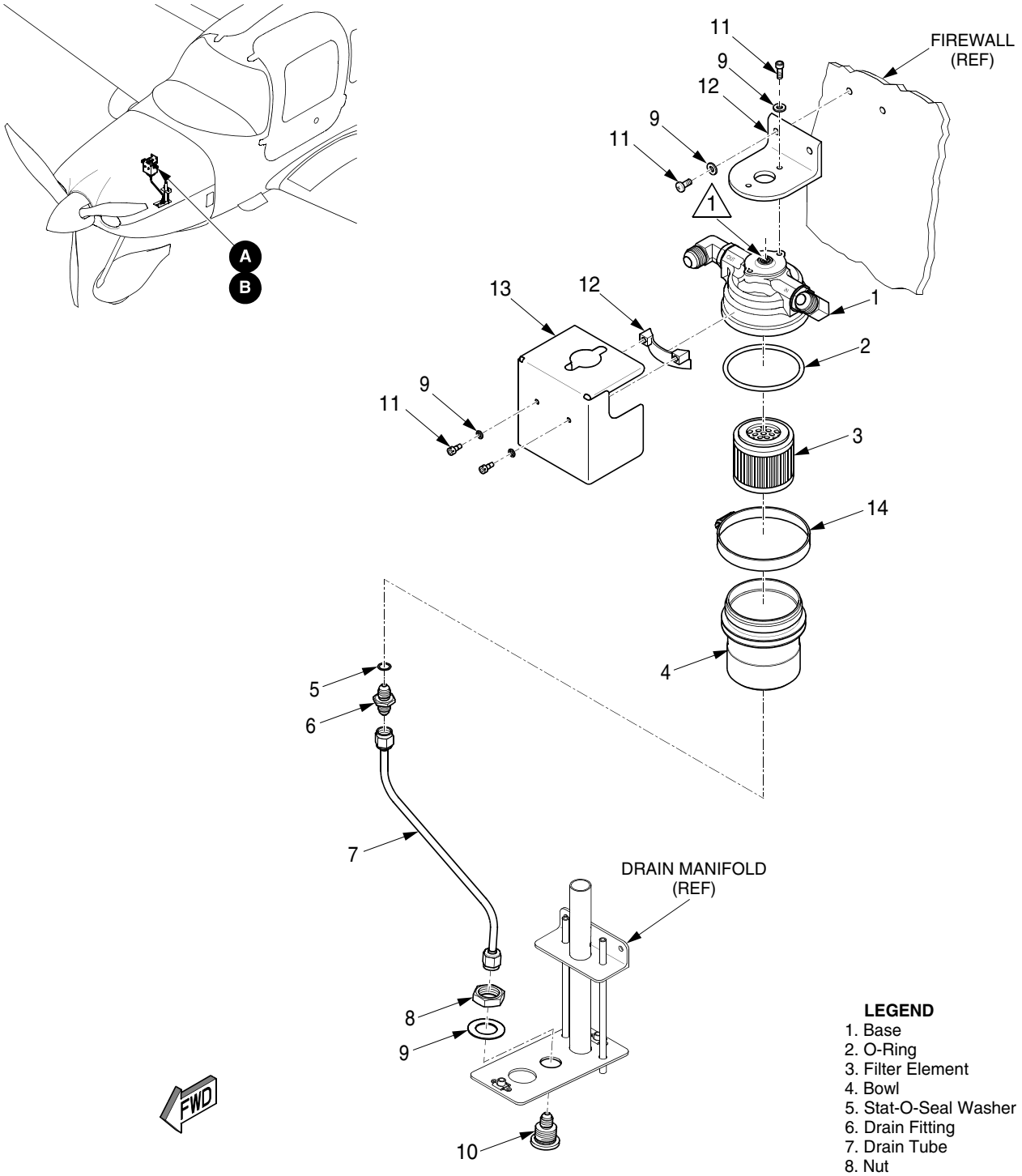
(e) Install drain fitting and new Stat-O-Seal washer securing drain tube to gascolator base.

(5) Installation - Gascolator

(a) *Serials 2016 thru 2031 w/ Perspective Avionics:* Position sensor to gascolator.

(b) Position gascolator to mounting bracket and loosely secure with screws and washers.

(c) Connect drain tube nut securing drain tube to drain fitting.
(d) Connect inlet and outlet lines to gascolator.
(e) Position heat shield to gascolator bracket and secure with screws and washers.
(f) Tighten screws and washers securing gascolator to mounting bracket.
(g) Set fuel selector valve to ON position.
(h) Inspect gascolator and fuel lines for signs of leakage.
(i) Connect battery 1. (Refer to 24-30)
(j) Install upper and RH lower engine cowling. (Refer to 71-10)



Serials 1878, 1886 thru 2015,
2016 thru 2031 w/o Perspective Avionics.

DETAIL A

LEGEND

1. Base
2. O-Ring
3. Filter Element
4. Bowl
5. Stat-O-Seal Washer
6. Drain Fitting
7. Drain Tube
8. Nut
9. Washer
10. Drain Valve
11. Screw
12. Bracket
13. Heat Shield
14. Clamp

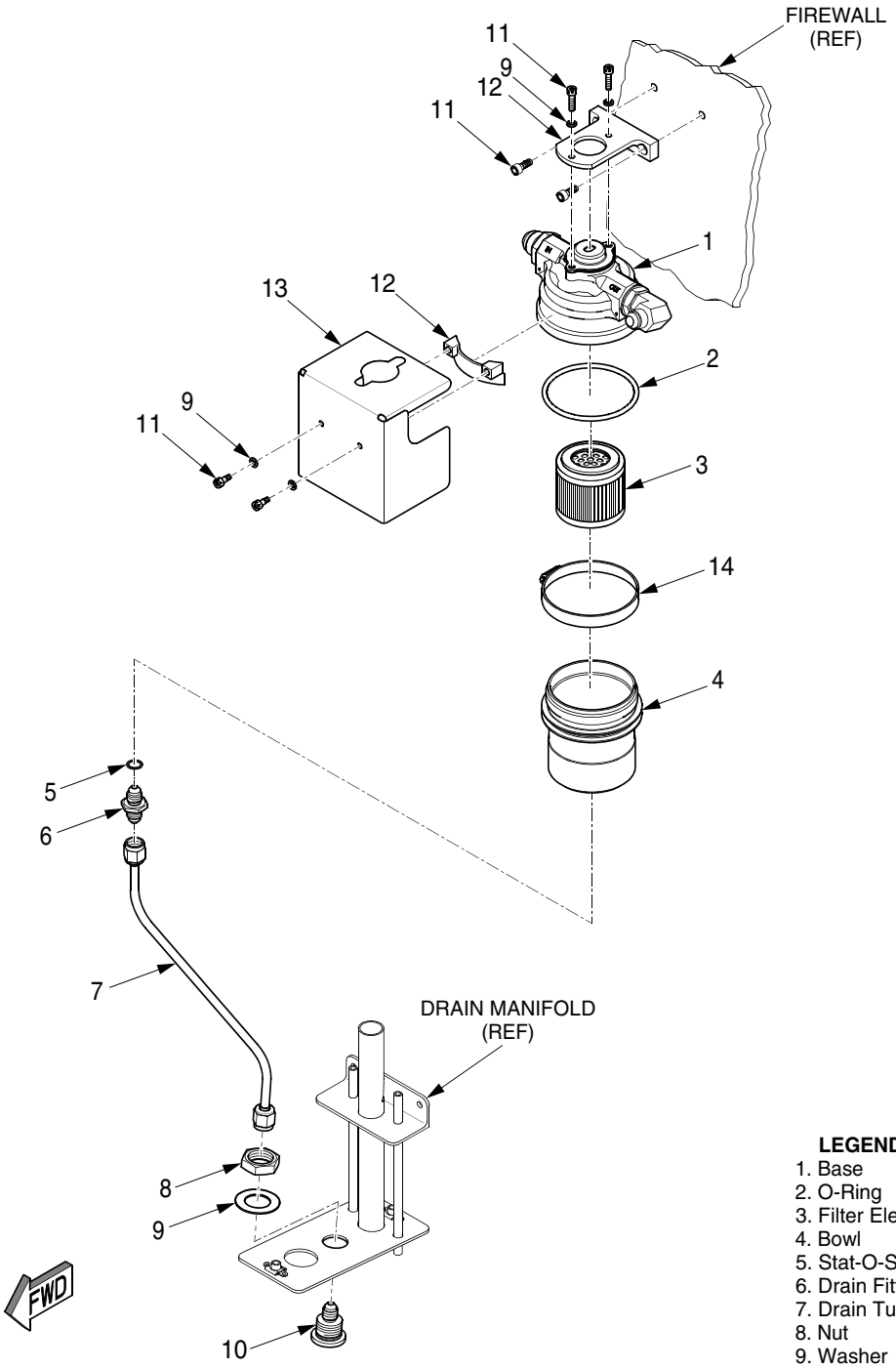
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NOTE

1 Filter element can not be cleaned and must be replaced upon evidence of clogging (red indicator pin pops up) or at scheduled inspection intervals.

Figure 28-202
Gascolator Assembly - Serials 1886 thru 2015, 2016 thru 2031 w/o Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 1886 thru 2015, 2016 thru 2031 w/o Perspective Avionics



LEGEND

1. Base
2. O-Ring
3. Filter Element
4. Bowl
5. Stat-O-Seal Washer
6. Drain Fitting
7. Drain Tube
8. Nut
9. Washer
10. Drain Valve
11. Screw
12. Bracket
13. Heat Shield
14. Clamp

DETAIL B

Serials 2016 thru 2031 w/ Perspective Avionics.

NOTE

1. Filter element can not be cleaned and must be replaced upon evidence of clogging (red indicator pin pops up) or at scheduled inspection intervals.

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Figure 28-202
Gascolator Assembly - Serials 2016 thru 2031 w/ Perspective Avionics (Sheet 2 of 2)

C. Electric Fuel Pump (See Figure 28-203)

(1) Removal - Electric Fuel Pump

(a) Disconnect battery 1. (Refer to 24-30)

(b) Set fuel selector valve to OFF position.

(c) Disconnect inlet tube from fuel pump.

(d) Disconnect outlet tube from fuel pump. Drain fuel from tube.

(e) Disconnect drain hose from fuel pump.

(f) Disconnect fuel pump wires.

(g) Loosen screws on clamps securing fuel pump to firewall. Remove fuel pump from airplane.

(2) Installation - Electric Fuel Pump

CAUTION: If fittings were removed from fuel pump, install fittings using new o-rings.

(a) Position fuel pump to firewall and loosely secure with clamps.

(b) Connect inlet tube to fuel pump.

(c) Connect outlet tube to fuel pump.

(d) Connect drain hose to fuel pump.

(e) Connect fuel pump wires.

(f) Tighten clamps securing fuel pump to firewall. Torque screws to 6.0 - 8.0 in-lb (0.68 - 0.90 Nm).

(g) Connect battery 1. (Refer to 24-30)

(3) Functional Test - Electric Fuel Pump Leak Check

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Collection Container	-	Any Source	Collect fluid.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Serials 2016 & subs w/ Perspective Avionics:

1 Remove engine cowling. (Refer to 71-10)

2 Remove clamp securing fuel pump drain hose to tee.

3 Position fuel pump drain hose to collection container.

(d) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Position collection container below fuel pump drain hose on right-hand side of drain manifold.

(e) Set throttle control lever to full aft position (IDLE).

(f) Set mixture control lever to full aft position (CUTOFF).

(g) Set BAT 1 switch to ON position.

(h) Press and hold PRIME on fuel pump switch for minimum of twenty seconds.

(i) Set BAT 1 switch to OFF position.

(j) Verify no fuel has leaked into collection container.

Note: Fuel may discharge from engine cylinder drain hose or left-hand drain manifold. If discharge is found, verify it originates in electric fuel pump. It may be necessary to connect additional hose to drain manifold to isolate fuel from electric fuel pump drain hose.

(k) If fuel is present in collection container, replace electric fuel pump.

(l) Serials 2016 & subs w/ Perspective Avionics:

1 Install clamp securing fuel pump drain hose to tee.

2 Install engine cowling. (Refer to 71-10)

D. Fuel Pump Switch (See Figure 28-204)

(1) Removal - Fuel Pump Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL PUMP circuit breaker.

(c) Remove LH mid console trim panel. (Refer to 25-10)

(d) Identify and disconnect wires from fuel pump switch.

(e) Compress retainers securing switch to center console and push up to remove switch from airplane.

(2) Installation - Fuel Pump Switch

(a) Position switch to center console, compress retainers, and push down to secure.

(b) Identify and connect wires to fuel pump switch.

(c) Install LH mid console trim panel. (Refer to 25-10)

(d) Reset FUEL PUMP circuit breaker.

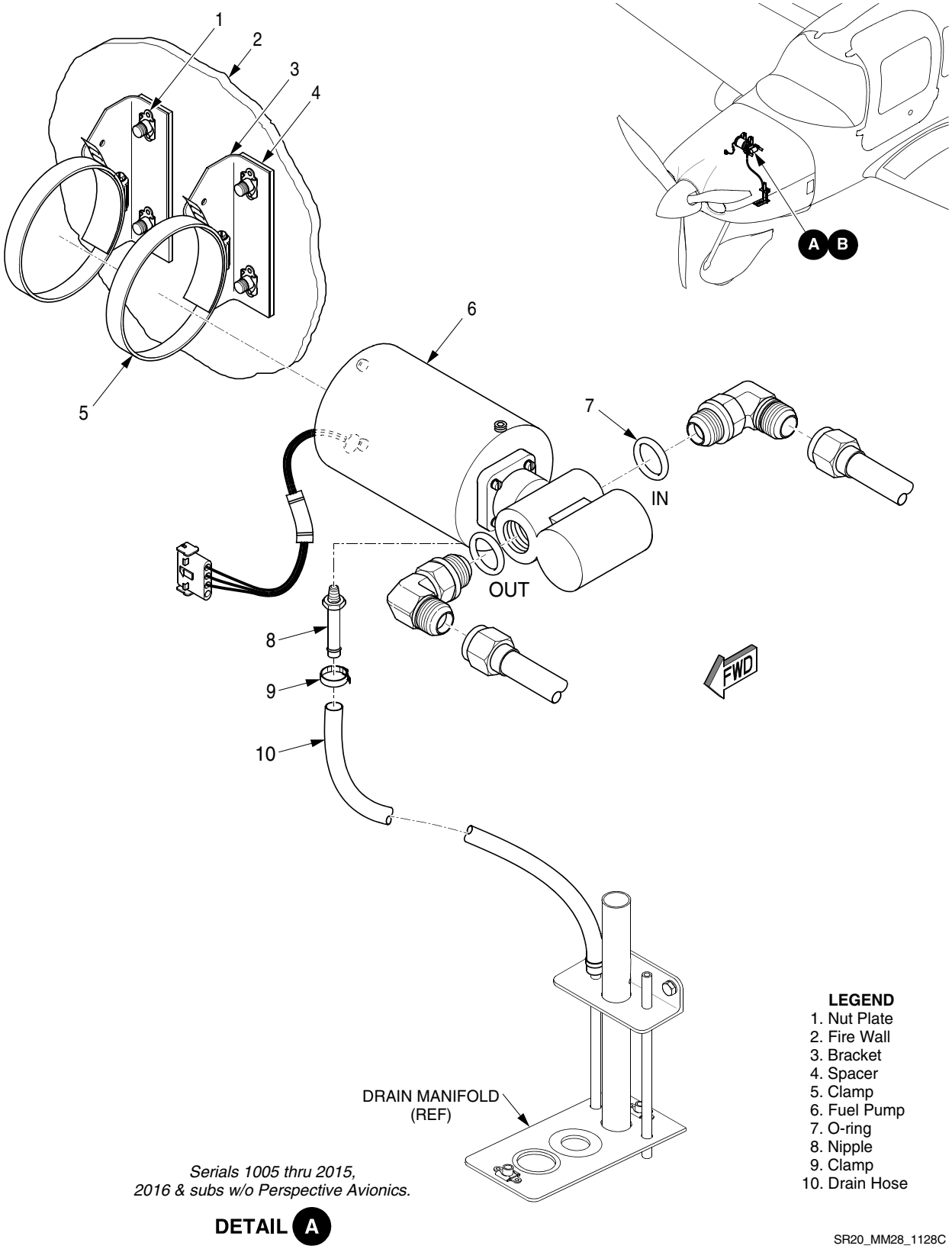
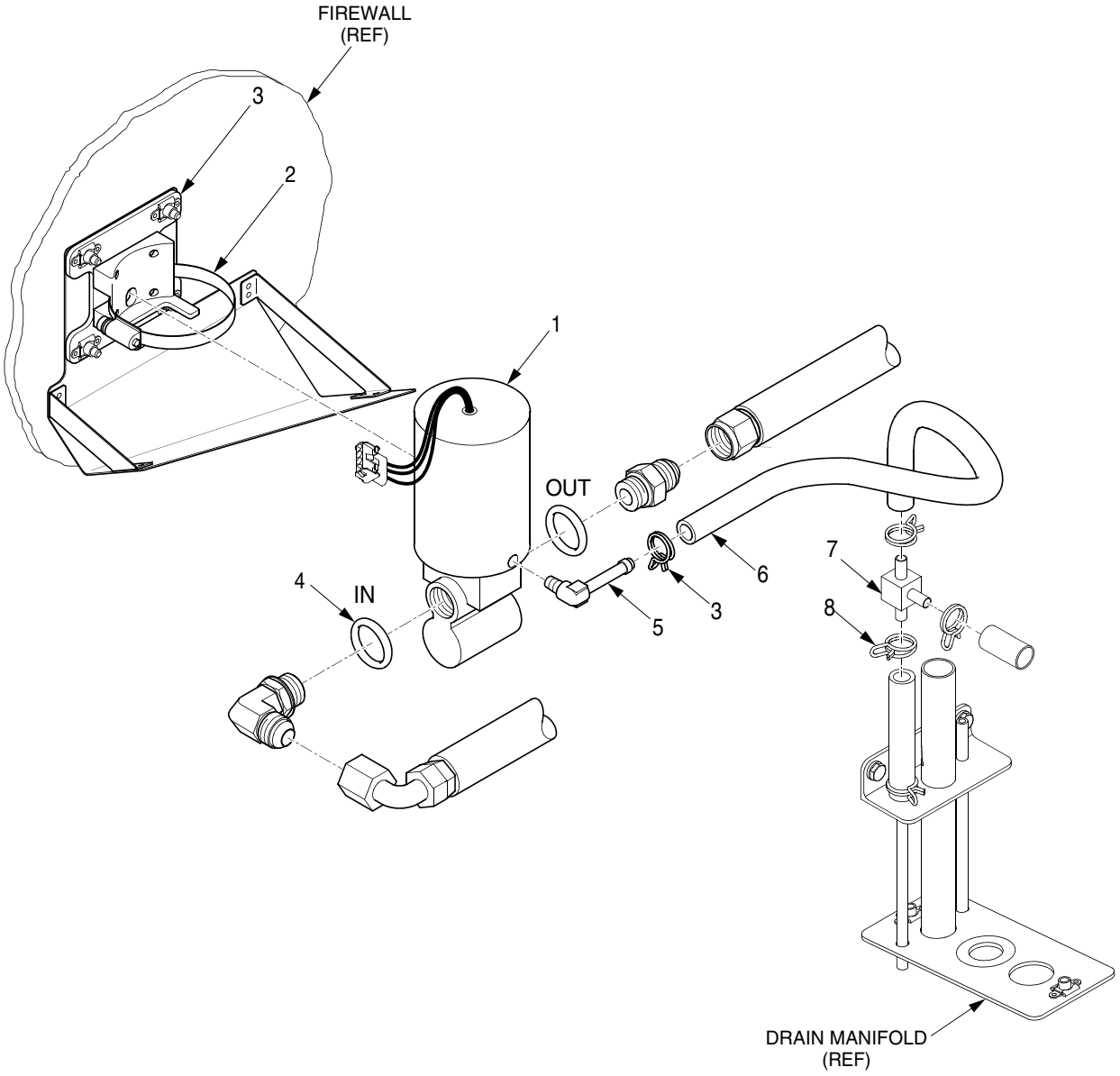


Figure 28-203
Electric Fuel Pump Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics



LEGEND
1. Fuel Pump
2. Bracket
3. Clamp
4. O-ring
5. Nipple
6. Drain Tube
7. Tee
8. Clamp

DETAIL B

Serials 2016 & subs w/ Perspective Avionics.

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Figure 28-203
Electric Fuel Pump Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

E. Selector Valve - *Serials 1005 thru 1336* **(See Figure 28-204)**

(1) Removal - Selector Valve

WARNING: **Disconnect the battery prior to servicing the selector valve.**

(a) Disconnect battery 1. (Refer to 24-30)
(b) Remove crew seats. (Refer to 25-10)
(c) Remove LH and RH mid console trim panels. (Refer to 25-10)
(d) Remove screw securing fuel selector knob to shaft of fuel selector valve.
(e) Remove screws, washers, and nuts securing selector valve to engine control panel.
(f) Remove screws securing engine control panel to center console.

CAUTION: Use care not to strain or bend attaching wires and components when lifting engine control panel.

(g) Carefully lift engine control panel just enough to allow removal of selector valve shaft.
(h) Remove screws and washers securing front panel of selector valve enclosure.
(i) Remove screws and washers securing side panels and gaskets to selector valve enclosure.
(j) Disconnect fuel supply and return lines from selector valve.
(k) Remove screws and washers securing selector valve to top enclosure panel.
(l) Remove screws, washers, and nuts securing selector valve to bottom enclosure panel.
(m) Remove fuel selector valve from airplane.

(2) Installation - Selector Valve

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Extrusion Gun Sealant	MIL-S-8802 Type 2 Class B CS3204 C1.B GC408B P/S 890B PR1440B EC1675B AC-240B	 Chem Seal - Flame Master Goal PRC Aerospace Sealants PRC Aerospace Sealants 3M Dynamold Aerospace	Faying surface seal fuel system enclosure in cabin.

(b) Position selector valve assembly to bottom enclosure panel and secure with screws, washers, and nuts.
(c) Install screws and washers securing selector valve to top enclosure panel.
(d) Connect fuel supply and return lines to selector valve.

WARNING: **Fuel line grommets seal fuel and vapors inside the selector valve enclosure. Ensure grommets are properly installed to prevent fuel from entering cabin.**

(e) Verify fuel line grommets are flat against interior and exterior surfaces of the selector valve enclosure.
(f) Fay surface seal front enclosure panel to top and bottom enclosure panels. Secure front enclosure panel with screws and washers. (Refer to 20-10)

WARNING: **Installed gaskets must have equal overlap on all enclosure panels to prevent fuel or vapor leaks from entering cabin.**

(g) Place selector valve enclosure side panels and gaskets into position and secure with screws, washers and nuts.

CAUTION: Use care not to strain or bend attaching wires and components when lifting engine control panel.

(h) Carefully lift engine control panel just enough to allow installation of selector valve shaft.
(i) Install screws securing engine control panel to center console.
(j) Pressure check complete fuel system. (Refer to 28-10)
(k) Inspect selector valve and enclosure for any signs of potential fuel leakage.
(l) Install LH and RH mid console trim panels. (Refer to 25-10)
(m) Install crew seats. (Refer to 25-10)
(n) Connect battery 1. (Refer to 24-30)

F. Selector Valve - *Serials 1337 & subs* **(See Figure 28-204)**

(1) Removal - Selector Valve

WARNING: Disconnect the battery prior to servicing the selector valve.

(a) Disconnect battery 1. (Refer to 24-30)
(b) Remove crew seats. (Refer to 25-10)
(c) Remove LH and RH mid console trim panels. (Refer to 25-10)
(d) Remove engine control panel from center console.
1 Remove flap switch assembly and LEDs from engine control panel. (Refer to 27-50)
2 Remove fuel pump switch from engine control panel. (Refer to 28-20)
3 *Serials 1005 & subs w/o Perspective Avionics:* Remove screw and nut securing power level knob to power lever.
4 *Serials 2016 & subs w/ Perspective Avionics:* Remove screws securing power level knob to power lever.
5 Remove screw securing mixture control knob to mixture control lever.
6 Remove screw securing fuel selector knob to shaft of fuel selector valve.
7 Remove screws, washers, and nuts securing selector valve to engine control panel.
8 *Serials 1005 thru 2155:* Disconnect fuel quantity indicator wire harness.
9 Remove screws, washers, and nuts securing engine control panel to center console.
(e) Remove screws, washers, and nuts securing front panel and gasket to valve enclosure.
(f) Remove screws securing top panel of selector valve enclosure.
(g) Disconnect fuel supply and return lines from selector valve.
(h) Remove screws securing selector valve to selector valve enclosure.
(i) Remove selector valve assembly from airplane.

(2) Installation - Selector Valve
(a) Position selector valve assembly to enclosure and secure with screws.
(b) Connect fuel supply and return lines to selector valve.

WARNING: Fuel line grommets seal fuel and vapors inside the selector valve enclosure. Ensure grommets are properly installed to prevent fuel from entering cabin.

(c) Verify fuel line grommets are flat against interior and exterior surfaces of the valve enclosure.
(d) Place top panel of selector valve enclosure into position and secure with screws.
(e) Place gasket and front panel of selector valve enclosure into position and secure with screws, washers, and nuts.
(f) Install engine control panel to center console.
1 Install screws, washers, and nuts securing engine control panel to center console.
2 *Serials 1005 thru 2155:* Connect fuel quantity indicator wire harness.
3 Install screws, washers, and nuts securing selector valve to engine control panel.
4 Install screw securing fuel selector knob to shaft of fuel selector valve.
5 Install screw securing mixture control knob to mixture control lever.
6 *Serials 1005 & subs w/o Perspective Avionics:* Install screw and nut securing power level knob to power lever.
7 *Serials 2016 & subs w/ Perspective Avionics:* Install screws securing power level knob to power lever.
8 Install fuel pump switch to engine control panel. (Refer to 28-20)

EFFECTIVITY:
Serials 1337 & subs

9 Install flap switch assembly and LEDs to engine control panel. (Refer to 27-50)

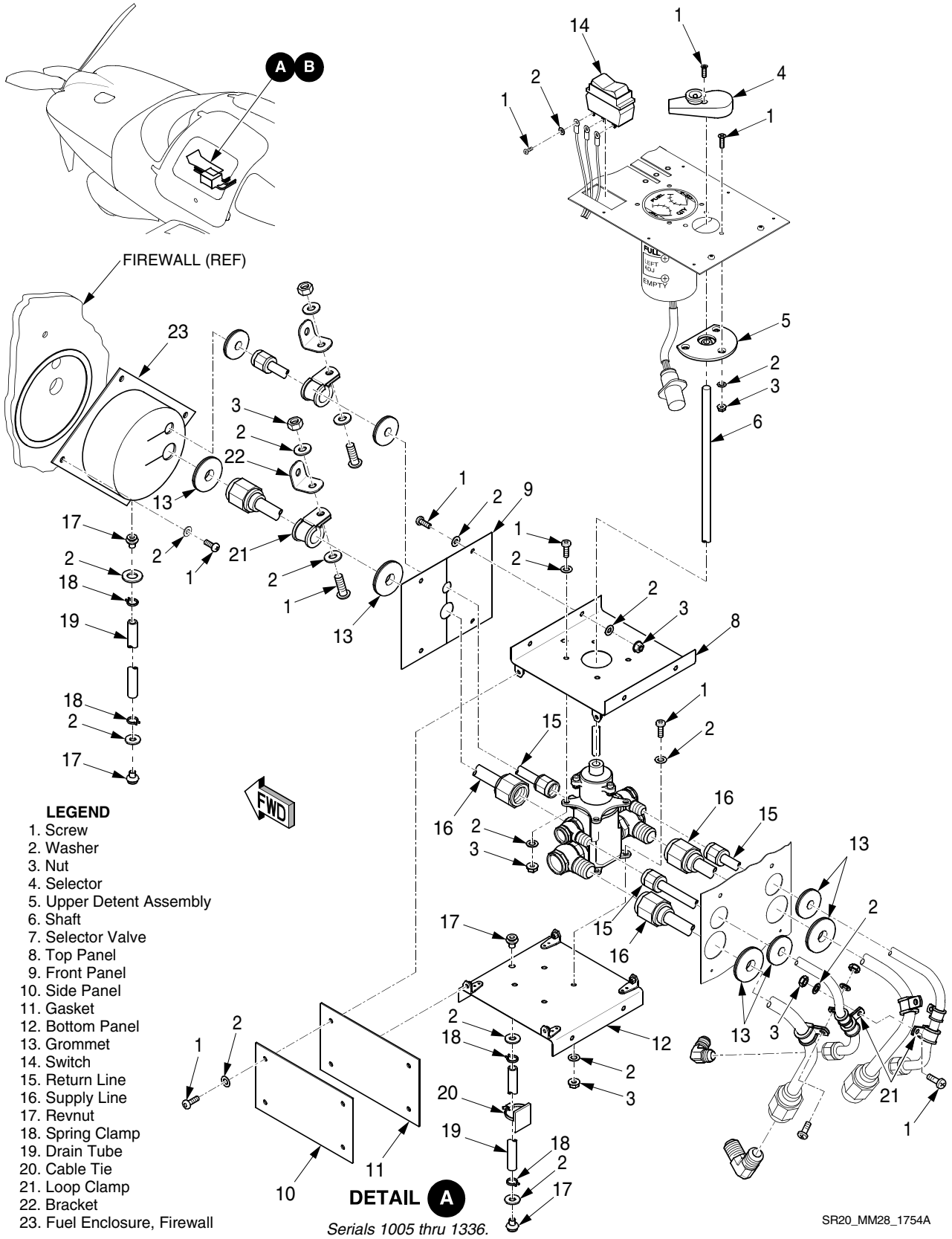
(g) Pressure check complete fuel system. (Refer to 28-10)

(h) Inspect selector valve and enclosure for any signs of potential fuel leakage.

(i) Install LH and RH mid console trim panels. (Refer to 25-10)

(j) Install crew seats. (Refer to 25-10)

(k) Connect battery 1. (Refer to 24-30)



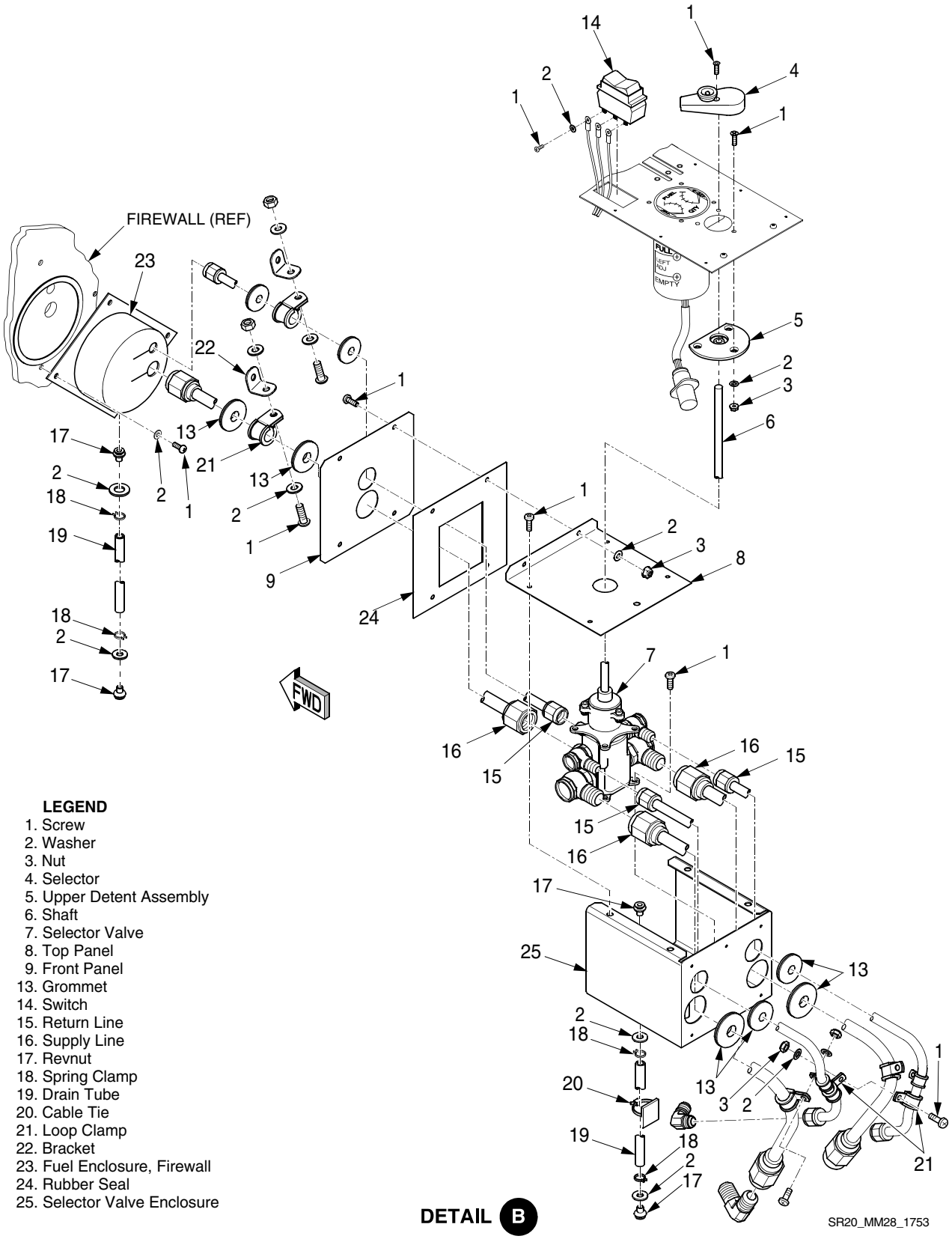
LEGEND

1. Screw
2. Washer
3. Nut
4. Selector
5. Upper Detent Assembly
6. Shaft
7. Selector Valve
8. Top Panel
9. Front Panel
10. Side Panel
11. Gasket
12. Bottom Panel
13. Grommet
14. Switch
15. Return Line
16. Supply Line
17. Revnut
18. Spring Clamp
19. Drain Tube
20. Cable Tie
21. Loop Clamp
22. Bracket
23. Fuel Enclosure, Firewall

Serials 1005 thru 1336.

Figure 28-204
Fuel Selector Valve Installation - Serials 1005 thru 1336 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1336



LEGEND

1. Screw
2. Washer
3. Nut
4. Selector
5. Upper Detent Assembly
6. Shaft
7. Selector Valve
8. Top Panel
9. Front Panel
13. Grommet
14. Switch
15. Return Line
16. Supply Line
17. Revnut
18. Spring Clamp
19. Drain Tube
20. Cable Tie
21. Loop Clamp
22. Bracket
23. Fuel Enclosure, Firewall
24. Rubber Seal
25. Selector Valve Enclosure

Figure 28-204
Fuel Selector Valve Installation - Serials 1337 & subs (Sheet 2 of 2)

G. Cabin Fuel System Fuel Enclosure (Firewall)

(1) Removal - Cabin Fuel System Fuel Enclosure

WARNING: Disconnect the battery prior to servicing the selector valve.

(a) Disconnect battery 1. (Refer to 24-30)
(b) Slide spring clamp downward on drain tube.
(c) Disconnect drain tube from fitting on enclosure.
(d) Remove screws and washers securing bracket, enclosure, and gasket to firewall.
(e) Disconnect fuel supply and return lines from fittings inside fuel enclosure.

Note: To remove fuel enclosure from airplane, the fuel lines at the forward side of selector valve must be disconnected.

(f) Disconnect fuel supply and return lines from forward side of selector valve. (Refer to 28-20)
(g) Remove screws, washers, and nuts securing loop clamps to center console.
(h) Slide fuel enclosure off fuel supply and return lines.

(2) Installation - Cabin Fuel System Fuel Enclosure

(a) Slide fuel enclosure over fuel supply and return lines.
(b) Connect fuel enclosure supply and return fuel lines.

WARNING: Fuel line grommets seal fuel and vapors inside the selector valve enclosure. Ensure grommets are properly installed to prevent fuel from entering the cabin.

(c) Verify fuel line grommets are flat against interior and exterior surfaces of the selector valve enclosure.

WARNING: Installed gaskets must have equal overlap on all enclosure panels to prevent fuel or vapor leaks from entering cabin.

(d) Position bracket, gasket, and enclosure to firewall and secure with screws and washers.
(e) Slide drain tube over fitting on enclosure.
(f) Slide spring clamp upward on drain tube until clamp is centered over fitting.
(g) Connect fuel supply and return lines to forward side of selector valve. Reassemble selector valve enclosure. (Refer to 28-20)
(h) Install screws, washers, and nuts securing loop clamps to center console.
(i) Pressure check complete fuel system. (Refer to 28-10)
(j) Inspect fuel enclosures for any signs of potential fuel leakage.
(k) Connect battery 1. (Refer to 24-30)

H. Supply Tube Assembly - *Serials 1886 & subs* **(See Figure 28-205)**

(1) Removal - Supply Tube Assembly

(a) Drain corresponding fuel tank for side being serviced. (Refer to 12-10)

(b) Remove access panels LW1 and RW1. (Refer to 06-00)

CAUTION: Do not rotate 90° fuel tank fittings during removal of supply tube.

(c) Remove screw, washers, and spacer securing clamp on supply tube assembly to rib.

(d) Disconnect end fittings securing supply tube assembly to fuel line. Remove supply tube assembly.

(2) Installation - Supply Tube Assembly

CAUTION: Do not rotate 90° fuel tank fittings during installation of supply tube.

(a) At end fittings of fuel line, position supply tube assembly with HINGE label facing upward and flow arrow indicator pointing forward.

(b) Install supply tube assembly to end fittings of fuel line. Torque nuts to 230 - 260 in-lb (25.98 - 29.37 Nm) and apply torque seal to both connections.

(c) Position clamp on supply tube assembly at restraint clip.

(d) Install screw, washers, and spacer securing clamp on supply tube assembly to rib.

(e) Fill the corresponding fuel tank. (Refer to 12-10)

(f) Perform Functional Test - Bleed Fuel Lines. (Refer to 28-20)

CAUTION: To prevent damage from prop wash, removed wing root fairing must be fixtured into installed positions.

(g) Using tarp tape, secure removed lower wing root fairing to installation location.

(h) Perform Functional Test - Leak Check. (Refer to 28-20)

(i) Install access panels LW1 and RW1. (Refer to 06-00)

(j) Perform Airplane Operational and Functional Check. (Refer to 05-30)

(3) Functional Test - Bleed Fuel Lines

(a) Set fuel selector valve to corresponding fuel tank for side being serviced.

(b) Set electric fuel pump switch to PRIME position.

(c) Hold open gascolator drain valve until fuel flows.

(d) Set electric fuel pump switch to OFF position.

(e) Verify supply tube assembly shows no signs of leakage.

(4) Functional Test - Leak Check

(a) Set fuel selector valve to corresponding fuel tank for the side being serviced.

(b) Set BAT 1 switch to ON position.

(c) Start engine in accordance with Pilot's Operating Handbook procedures.

(d) Allow continuous engine run-time for a minimum of three minutes.

(e) Remove tape securing wing root fairings to airplane.

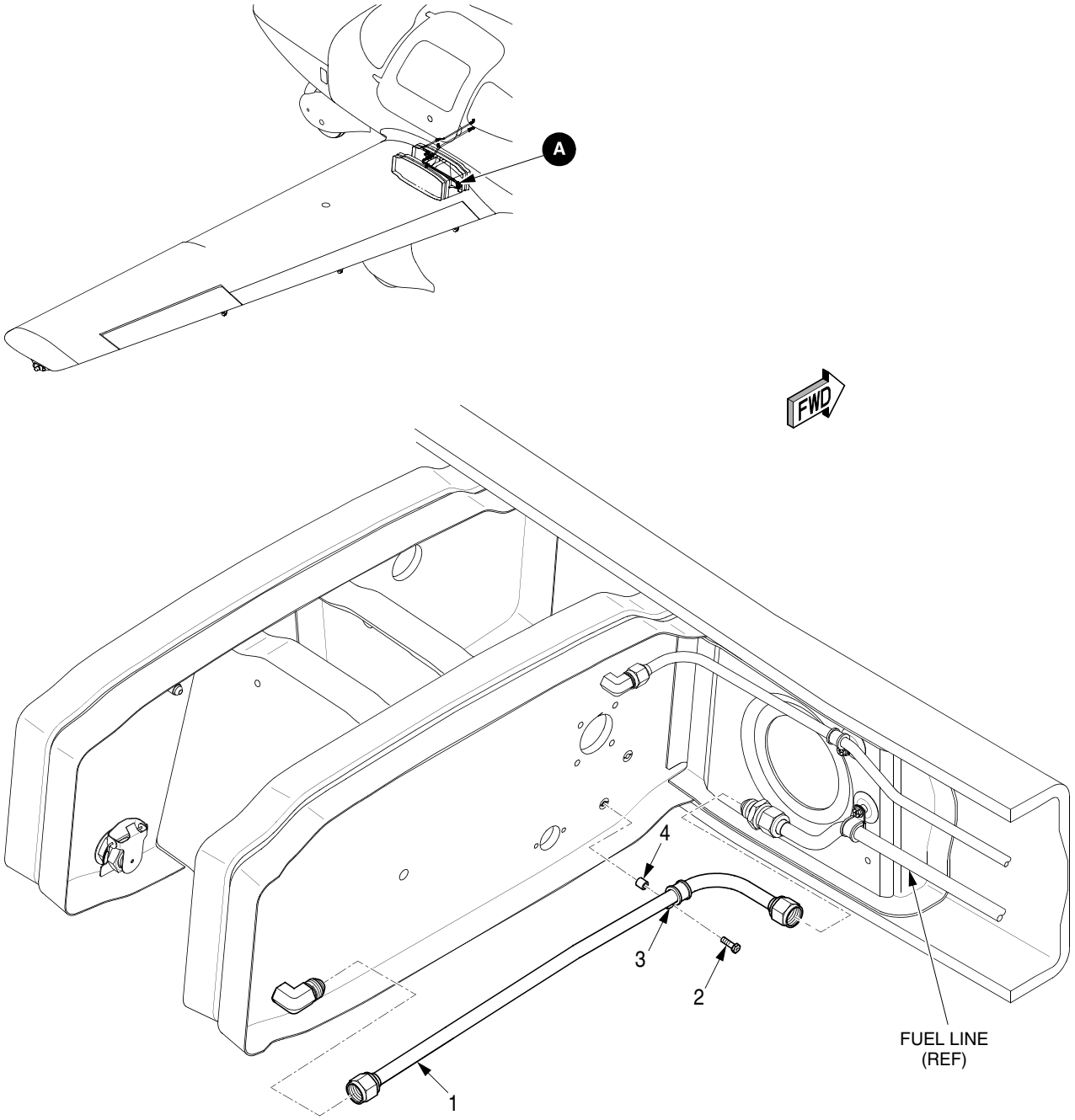
(f) Check fuel line system.

1 Verify supply tube assembly shows no signs of leakage.

2 Verify any air is bled from fuel line system.

(g) Shutdown engine in accordance with Pilot's Operating Handbook procedures.

(h) Set BAT 1 switch to OFF position.



LEGEND
1. Supply Tube Assembly
2. Screw
3. Clamp
4. Spacer

DETAIL A

SR20_MM28_2701

Figure 28-205
Supply Tube Assembly Installation

INDICATING

1. DESCRIPTION

A. Fuel Quantity

Serials 1005 thru 1885: A fuel quantity gage is installed in the center console directly forward of the fuel selector valve. The fuel quantity gage indicates the amount of usable fuel remaining in each fuel tank. One float type fuel quantity sensor is installed in each integral fuel tank. The fuel level sending units are not adjustable. To adjust the fuel quantity gage reading, the gage itself must be adjusted. The fuel quantity gage is a 2¼" dual indicator, with separate needles and markings for the LH and RH fuel tanks, and a range of 0 gallons to full (F). The gage has a yellow arc from 0 to 8.2 gallons, a red line at 0 gallons, and a red arc from 0 gallons down to the minimum meter movement. The gage has 4 separate needle adjustment trim potentiometers for full and empty indications on the LH and RH tanks. Each indicator also provides an output signal to illuminate the FUEL caution light when the fuel quantity is low. These outputs are monitored by the caution/warning annunciator panel to indicate a low fuel condition. The gage is internally lighted with externally replaceable lamps, and has non-reflective glass. 28 VDC for fuel quantity system operation is supplied through the 3-amp FUEL QTY circuit breaker on Main Bus 1.

Serials 1886 thru 2155: A fuel quantity gage is installed in the center console directly forward of the fuel selector valve. The fuel quantity gage indicates the amount of usable fuel remaining in each fuel tank. Two float type fuel quantity sensors are installed in each integral fuel tank, one on the inboard rib and one on the outboard rib. The fuel level sending units are not adjustable. To adjust the fuel quantity gage reading, the gage itself must be adjusted. The fuel quantity gage is a 2¼" dual indicator, with separate needles and markings for the LH and RH fuel tanks, and a range of 0 gallons to full (F). The gage has a yellow arc from 0 to 8.2 gallons and a red line at 0 gallons. The gage has 4 separate needle adjustment trim potentiometers for full and empty indications on the LH and RH tanks. The annunciator indicates low fuel with 8.5 to 17 gallons remaining during level flight. These outputs are monitored by the caution/warning annunciator panel to indicate a low fuel condition. The gage is internally lighted with externally replaceable lamps, and has non-reflective glass. 28 VDC for fuel quantity system operation is supplied through the 3-amp FUEL QTY circuit breaker on Main Bus 1.

Serials 2156 & subs: A dual reading fuel quantity indicator is displayed in the Fuel Qty block of the ENGINE page along calibrated vertical bars. The fuel quantity indicator indicates the amount of usable fuel remaining in each fuel tank. When the ENGINE page is not shown, all essential fuel information is shown on the engine strip displayed along the edge of the MFD. The LEFT pointer indicates left tank fuel quantity and sweeps a scale marked from 0 to 28 U.S. gallons. The RIGHT pointer sweeps an identical scale for the right tank. Each scale is marked with a red line at zero, a yellow band from 0 to 8.2 U.S. gallons, and a green band from 8.2 to 28 U.S. gallons. The indicators are calibrated to read 0 gallons when no usable fuel remains in level flight attitude. Two float type fuel quantity sensors are installed in each integral fuel tank, one on the inboard rib and one on the outboard rib. The fuel level sending units are not adjustable. Fluid quantity information is sent to the Engine Airframe Unit, processed, and transmitted to the Fuel Quantity Gage for display. 28 VDC for the fuel quantity system is supplied through the 3-amp FUEL QTY circuit breaker on MAIN BUS 1.

Serials 2156 thru 2292: The 28 VDC is converted to 12 VDC for the fuel quantity sensors through the Level Sensor Power Circuit Card. For information pertaining to the Level Sensor Power Circuit Card, see Chapter 24, Section 50 - Electrical Load Distribution. (Refer to 24-50)

B. Fuel Flow

Serials 1005 thru 1581: A 2¼" combination Fuel Flow and Manifold Pressure indicator is mounted on the right instrument panel immediately below the tachometer. The indicator is internally lighted. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1. The fuel flow pointer sweeps a scale marked from 0 to 30 Gal/Hr. The electrically operated fuel flow indicator receives a rate signal from a fuel flow transducer installed in the fuel line between the throttle body metering valve and the injector manifold. For maintenance practices pertaining to fuel flow indication, see Chapter 77-10, Engine Indicating, Power. (Refer to 77-10)

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Fuel flow is shown as text in the fuel data block located in the lower right corner of the MFD and is also continuously displayed in the engine data block located in the lower right corner of the PFD. The MFD and PFD receive a fuel flow rate signal via the DAU from a fuel flow sensor on the right side of the engine in the fuel line between the throttle body metering valve and the injector manifold. In the event fuel flow exceeds 26.7 Gal/Hr, the MFD will display “Check Fuel Flow” in a yellow advisory box in the lower right corner of the MFD. If fuel flow exceeds 30 Gal/Hr, the MFD will display “Check Fuel Flow” in a red advisory box in the lower right corner of the MFD.

Serials 2016 & subs w/ Perspective Avionics: Fuel flow is shown in the upper right corner of the MFD as both a simulated pressure gage and as text. The simulated gage receives a signal from a fuel flow sensor on the right side of the engine in the fuel line between the throttle body metering valve and the injector manifold via the GEA 71 engine airframe unit. The gage sweeps a scale marked from 0 to 35 Gal/Hr in 2.5 Gal/Hr increments. Fuel flow rate is also continuously displayed in the engine data block located on the left side of the PFD. In the event fuel flow exceeds 30 Gal/Hr, the PFD will display “Check Fuel Flow” in a red advisory box in the lower right corner of the PFD.

For maintenance practices pertinent to the fuel flow gage and sensor refer to Chapter 73, Engine Fuel System. (Refer to 73-30)

C. Fuel Totalizer and Calculated Information

Fuel totalizer calculations are located in the lower right section of the ENGINE page and are separate and independent of the fuel quantity gage and float sensor system.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: The fuel totalizer monitors fuel flow and calculates fuel used, fuel remaining, time remaining, and nautical miles per gallon.

Serials 2016 & subs w/ Perspective Avionics: The fuel totalizer monitors fuel flow and calculates fuel-to-destination, fuel used, fuel remaining, time remaining, fuel range, and nautical miles per gallon.

Upon system startup, the fuel totalizer initial fuel screen appears and prompts the user to enter the total fuel on board at start. The option to enter the number of gallons added since last fuel fill and the ability to set fuel to “Full” or to “Tabs” buttons is also available. For maintenance practices pertinent to MFD display refer to Chapter 31, Central Display Systems. (Refer to 31-60)

D. Fuel System Annunciations

Serials w/o Perspective Avionics: The amber FUEL caution light in the annunciator panel comes on to indicate a low fuel condition. The light is illuminated by switches in the fuel quantity indicator if the fuel quantity is low. The light could illuminate with 8.5 to 17 gallons remaining during level flight. If FUEL caution light comes on in flight, refer to Fuel Quantity gages to determine fuel quantity. The light is powered by 28 VDC through the 2- amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Serials w/ Perspective Avionics: Fuel system advisory, caution, and warning messages are displayed in color-coded text in Crew Alerting System (CAS) window located to right of the Altimeter and Vertical Speed Indicator. In combination with CAS alert, the affected fuel parameter displayed on the ENGINE page changes to corresponding color of CAS alert and the annunciation system issues an audio alert.

- A white Advisory message is generated when either fuel tank goes below 8 gallons.
- An amber Caution message is generated when both fuel tanks go below 8 gallons.
- A red Warning message is generated when the fuel totalizer amount goes below 7 gallons. Note that the Warning message is generated based on the fuel totalizer which is dependent on correct input by the pilot.

For maintenance practices pertinent to system annunciations and alerts refer to Chapter 31, Indicating/Recording Systems. (Refer to 31-50)

2. MAINTENANCE PRACTICES

Note: When servicing fuel system pipe thread fittings, apply a small amount of grease (MIL-G-60320 Type 1) to the external threads.

A. Fuel Quantity Gage (Analog) - *Serials 1005 thru 2155* (See Figure 28-401)

(1) Removal - Fuel Quantity Gage

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.

(c) *Serials 1582 thru 2155:* Pull FUEL QTY / HOBBS circuit breaker.

(d) Remove right mid console trim. (Refer to 25-10)

(e) Disconnect wire harness from fuel quantity gage.

(f) Remove screws and washers securing fuel quantity gage to center console.

(2) Installation - Fuel Quantity Gage

(a) Position fuel quantity gage to center console and secure with screws and washers.

(b) Connect wire harness to fuel quantity gage.

(c) Perform Adjustment/Test - Fuel Quantity Gage. (Refer to 28-40)

(d) Install right mid console trim. (Refer to 25-10)

(e) *Serials 1005 thru 1581:* Reset ENGINE INST circuit breaker.

(f) *Serials 1582 thru 2155:* Reset FUEL QTY / HOBBS circuit breaker.

(3) Adjustment/Test - Fuel Quantity Gage

(a) Remove right mid console trim. (Refer to 25-10)

(b) Drain LH and RH fuel tanks and collector tanks. (Refer to 12-10)

(c) Level airplane laterally and longitudinally. (Refer to 08-10), (Refer to 08-10)

(d) *Serials 1886 thru 2155:* At inboard and outboard sending unit dials, ensure red needle points at E or below.

(e) *Serials 1005 thru 1885:* Add 2.25 gallons of fuel to each tank and allow fuel to settle.

(f) *Serials 1886 thru 2155:* Add 1.25 gallons of fuel to each tank and allow fuel to settle.

(g) Set BAT 1 switch to ON position.

Note: If installing new fuel level gage, do not adjust gain screws prior to calibration.

(h) Remove tape covering fuel quantity gage trim potentiometers.

CAUTION: DO NOT press down hard or force potentiometers outside 280° range during adjustments. Doing so will damage potentiometers resulting in physical damage to fuel quantity gage.

Note: Adjust FULL trim potentiometers to center of travel prior to making EMPTY adjustment. Failure to do so may result in FULL trim potentiometers running out of travel before FULL adjustment can be obtained.

(i) Adjust FULL trim potentiometers to center of travel.

(j) Slowly adjust LH EMPTY trim potentiometer until needle indicates zero gallons. Repeat for RH EMPTY trim potentiometer.

Note: Fuel level gage responds slowly. Lightly tap on metallic rim of fuel level gage and allow approximately one minute between each adjustment.

(k) Set BAT 1 switch to OFF position.

(l) Fill both fuel tanks to within one inch of filler cap.

(m) Set BAT 1 switch to ON position.

(n) Slowly adjust LH FULL trim potentiometer until needle indicates full. Repeat for RH FULL trim potentiometer.

Note: Fuel level gage responds slowly. Lightly tap on metallic rim of fuel level gage and allow approximately one minute between each adjustment.

(o) Set BAT 1 switch to OFF position.

(p) Cover fuel quantity gage trim potentiometers with tape.

(q) Install right mid console trim. (Refer to 25-10)

(4) System Test - Fuel Sending Unit

(a) Verify ignition switch is in OFF position and remove key.

(b) Set BAT 1 switch to OFF position.

(c) Fill each fuel tank with 28 gallons of fuel. (Refer to 12-10)

(d) Remove right mid console trim. (Refer to 25-10)

(e) Disconnect wire harness from fuel quantity gage.

(f) Set multimeter to 100-ohm scale and zero the ohmmeter.

CAUTION: If battery power is on for the following test, the ohmmeter could become permanently damaged.

(g) Measure resistance of LH fuel tank.

1 Connect black (-) ohmmeter lead to pin # 9 (blue, ground) fuel sending unit wire.

2 Connect red (+) ohmmeter lead to pin # 2 (white, power) fuel sending unit wire.

Note: If these specifications are not met, inspect the fuel sending unit or the wires and connectors to the sending unit.

3 *Serials 1005 thru 1885:* Verify meter indicates 86.9 to 92.9 ohms when LH tank is full. If LH tank were empty (dry), the meter should indicate 16.1 to 20.1 ohms.

4 *Serials 1886 thru 2155:* Verify meter indicates 58 to 62 ohms when LH tank is full. If LH tank were empty (dry), the meter should indicate 0.0 to 5.0 ohms.

(h) Measure resistance of RH fuel tank.

1 Connect black (-) ohmmeter lead to pin # 9 (blue, ground) fuel sending unit wire.

2 Connect red (+) ohmmeter lead to pin # 4 (orange, power) fuel sending unit wire.

Note: If these specifications are not met, inspect the fuel sending unit or the wires and connectors to the sending unit.

3 *Serials 1005 thru 1885:* Verify meter indicates 86.9 to 92.9 ohms when RH tank is full. If RH tank were empty (dry), the meter should indicate 16.1 to 20.1 ohms.

4 *Serials 1886 thru 2155:* Verify meter indicates 58 to 62 ohms when RH tank is full. If RH tank were empty (dry), the meter should indicate 0.0 to 5.0 ohms.

(i) Connect fuel quantity gage wire harness to fuel sending unit wire harness.

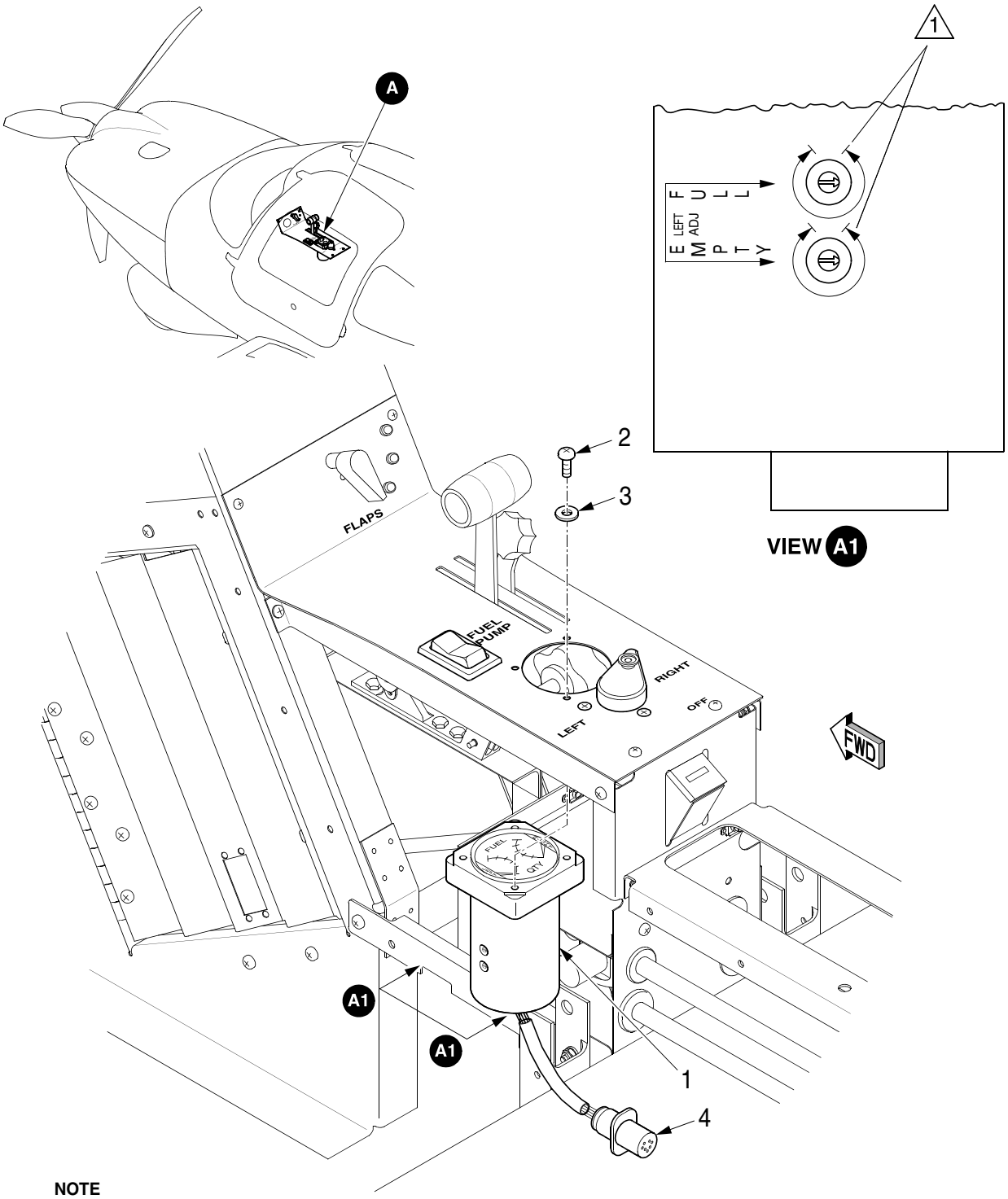
(j) Set multimeter to DC 30-volt scale.

(k) Set key switch (main power supply) to ON position.

(l) Connect red (+) voltmeter lead to fuel gage pin # 1 (power), connect black (-) voltmeter lead to fuel gage pin # 9 (ground). Battery voltage should be present.

Note: If battery voltage is not present, inspect circuit breakers, wiring harness, voltmeter, and battery. If fuel sending unit resistance meets specifications and battery voltage is present at the gage, then either the gage or the wires and connector to the gage are faulty.

(m) Install right mid console trim. (Refer to 25-10)



NOTE

1 DO NOT press down hard or force potentiometers outside 280° range during adjustments. Doing so will damage potentiometers resulting in physical damage to fuel quantity gage.

DETAIL A

Serials 1005 thru 2155.

LEGEND
1. Fuel Quantity Gage
2. Screw
3. Washer
4. Connector

SR20_MM28_1132D

Figure 28-401
Fuel Quantity Gage - Serials 1005 thru 2155

B. Fuel Quantity Gage (Analog-Electric) - *Serials 2156 & subs* (See Figure 28-401)

Fuel quantity is measured by a float type quantity sensors installed in the fuel tanks. Fluid quantity information is sent to the Engine Airframe Unit, processed, and transmitted to the analog electronic Fuel Quantity Gage and CAS window for display.

(1) Adjustment/Test - Fuel Quantity Indication

(a) Drain LH and RH fuel tanks and collector tanks. (Refer to 12-10)

(b) Level airplane laterally and longitudinally. (Refer to 08-10), (Refer to 08-10)

Note: To achieve the required fuel quantity precision, it is recommended that the fuel quantities be weighed with a calibrated scale. Fuel density of 6 lbs/gallon is acceptable for purposes of this procedure.

(c) Set the fuel selector to OFF.

(d) Connect 28VDC external power supply to the aircraft.

(e) Add 1.25 +0.125 / -0.0 gallons of unusable fuel to each tank and allow fuel to settle.

(f) Pull MFD and PFD circuit breakers.

(g) On MFD and PFD, remove and retain any SD cards from top and bottom SD card slots.

(h) Set BAT1, BAT2, and AVIONICS switches to ON positions.

(i) While holding ENT key on PFD, restore power by closing PFD circuit breaker.

(j) When words “Initializing System” appear in upper left corner of PFD, release ENT key.

(k) Restore power to MFD. (PFD should now be in Configuration mode, and MFD should be in Normal mode).

(l) On MFD, press ENGINE softkey to display full page engine instrumentation.

(m) Using PFD, go to FUEL TANK CALIBRATION page.

(n) Press softkeys 12, 11, 10, and 9 in order to unlock this page:

Note: Press TNK SEL softkey to activate cursor in CURRENT TANK field. Rotate FMS knob as necessary to select RIGHT or LEFT tanks.

(o) Empty Calibration:

1 Verify that unusable fuel (1.25 +0.125 / -0.0 gallons) has been added to both tanks. Allow both fuel probes to stabilize for at least 2 minutes.

2 Select LEFT tank on PFD.

3 Press EMPTY softkey. The ACTUAL FUEL QUANTITY field value will default to 00.00, and cursor will automatically activate and select CALIBRATE? option.

4 Press ENT key. If prompt appears requesting overwrite acknowledgement, select YES and press ENT key. The Perspective system will ‘zero’ ACTUAL FUEL QUANTITY field value to be displayed at the current CALIBRATED VALUE.

5 Observe CALIBRATED TOTAL indication for LEFT tank. Verify that it remains at 0.00.

6 On MFD, verify fuel quantity indicators correctly point to ‘0’.

7 Repeat empty calibration for RIGHT tank.

(p) Tank Calibration:

1 Fill LEFT tank with a specified volume of usable fuel at 5.0 ±0.5 gallons.

Note: Dispensed usuable fuel shall be measured to within 0.5% accuracy (Actual vs. Indicated).

Note: Typically, fuel dispensing equipment that is certified for retail sale of fuel by the state Division of Weights and Measures exceeds 0.5% accuracy.

2 Allow fuel probe to stabilize at least 2 minutes.

3 Enter dispensed fuel volume into ACTUAL FUEL QUANTITY field and press ENT key. The cursor automatically selects CALIBRATE? Option.

4 Press ENT key again to calibrate, setting the ACTUAL FUEL QUANTITY to be displayed at the current CALIBRATED VALUE.

5 Verify a corresponding point appears in CALIBRATION TABLE.

6 Verify that CALIBRATED TOTAL value equals amount of usable fuel added to tank.

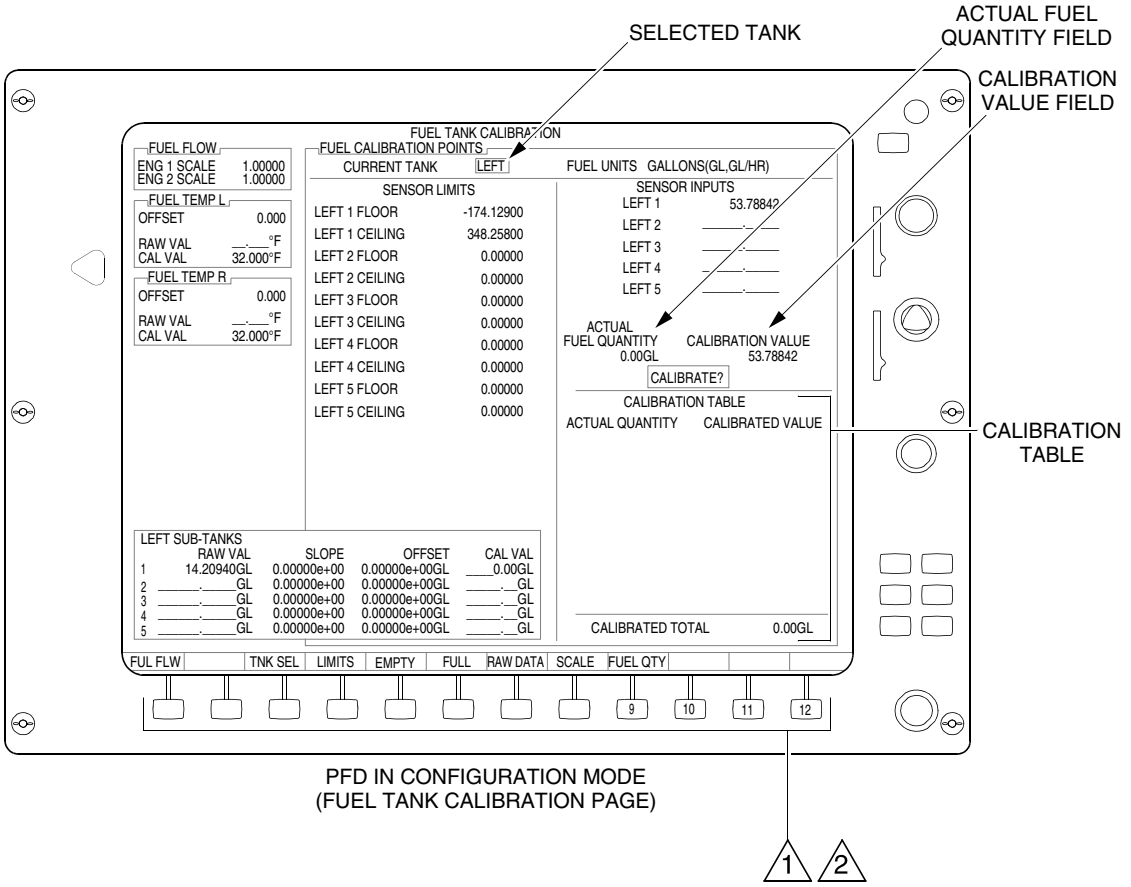
7 On MFD, verify fuel quantity indicators correctly point to usable fuel added to tank.

8 Repeat tank calibration for RIGHT tank.

9 Repeat tank calibration with specified volumes of usable fuel at 15, 20, and 28 (±0.5) gallons.

(q) Re-install any retained SD cards to top and bottom SD card slots on MFD and PFD.

(r) Reset MFD and PFD circuit breakers.



NOTE

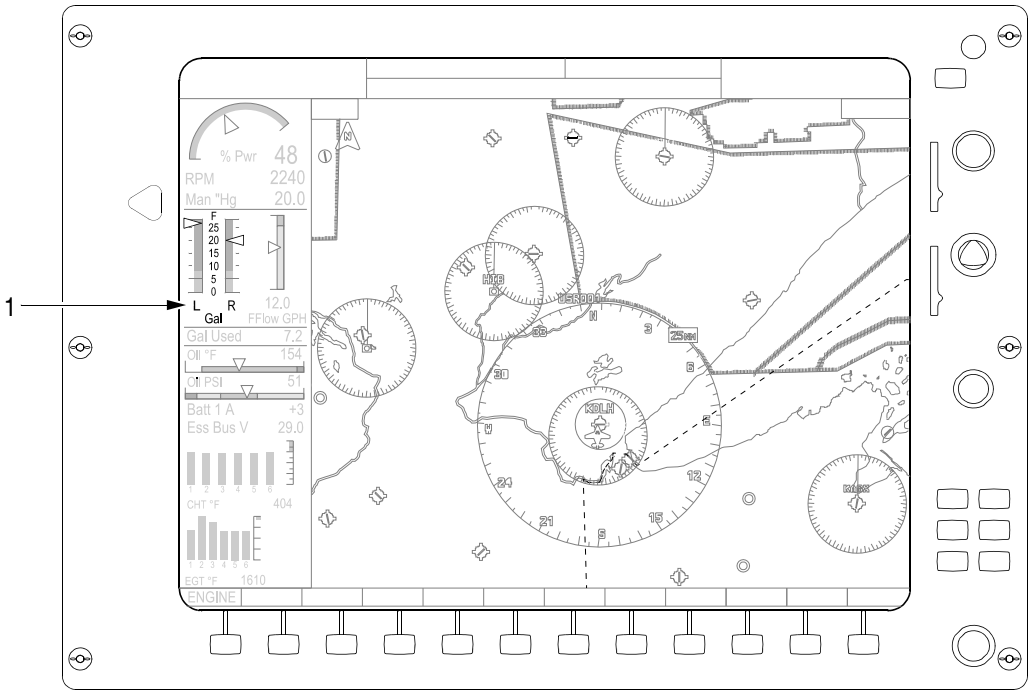
1. Press softkeys 12, 11, 10, and 9 in order to unlock this page.

2. The PFD softkeys may be used to place the cursor in the desired field, similar to scrolling using the outer FMS knob.
   - TANK SEL: Places cursor in CURRENT TANK field.
   - EMPTY: The ACTUAL FUEL QUANTITY defaults to 0.00 GL and places cursor in CALIBRATE? field.
   - FULL: The ACTUAL FUEL QUANTITY defaults to 28.00 GL and places cursor in CALIBRATE? field.
   - FUEL QTY: Places cursor in ACTUAL FUEL QUANTITY field.
   - CAL TBL: Places cursor in CALIBRATION TABLE field at the first calibration point.

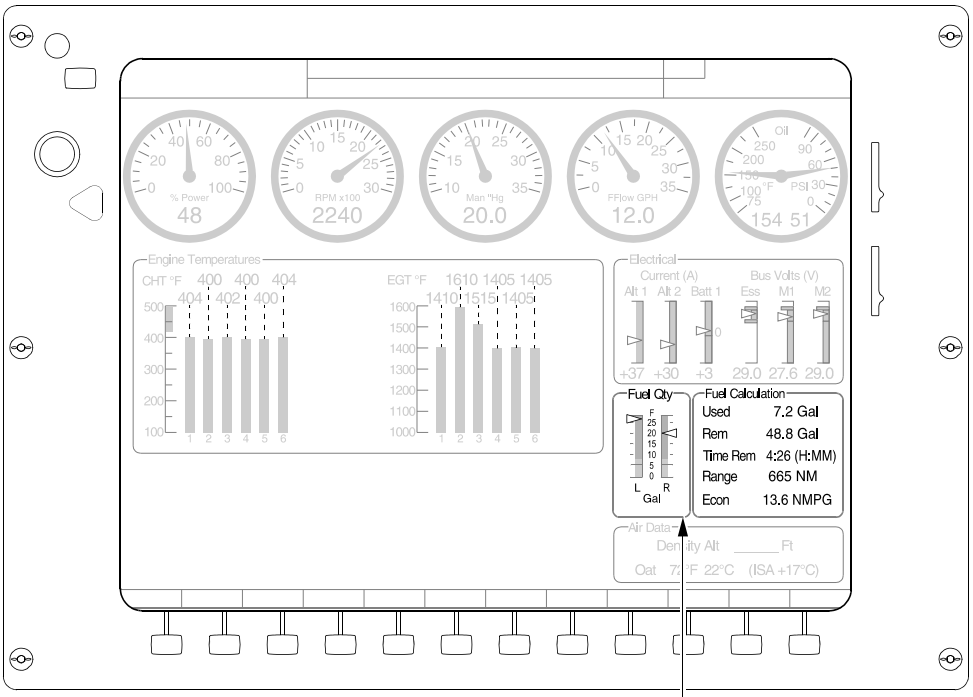
Serials 2156 & subs.

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Figure 28-402
Fuel Quantity Indication - Serials 2156 & subs (Sheet 1 of 3)



PFD w/ EIS DISPLAY (ENGINE PAGE)



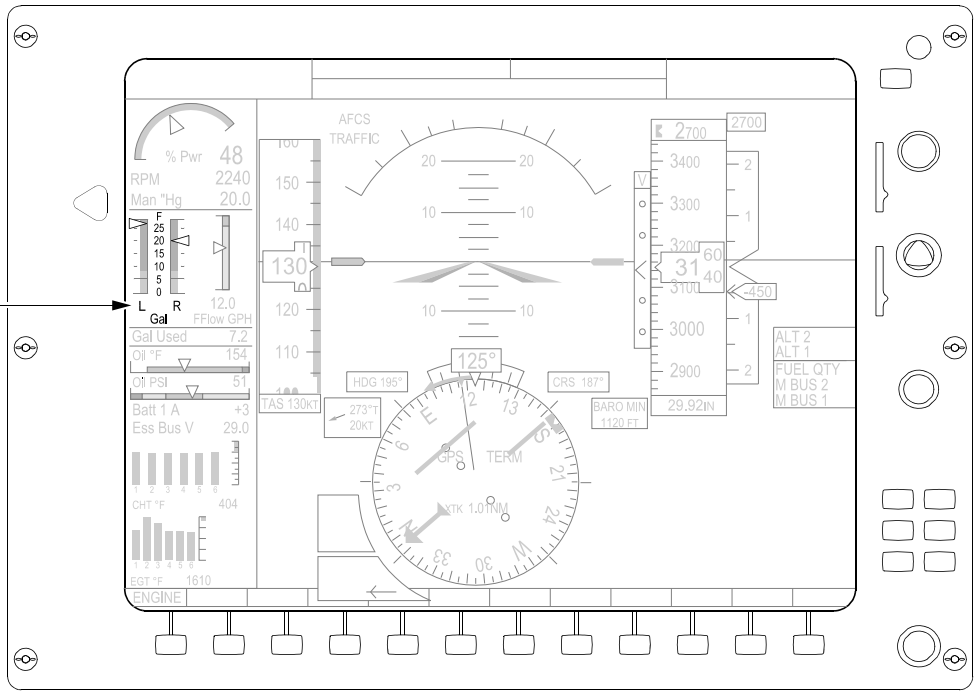
MFD w/ EIS DISPLAY (ENGINE PAGE)

LEGEND
1. Fuel Quantity Indicator

Serials 2156 & subs.

SR20_MM28_3514

Figure 28-402
Fuel Quantity Indication - Serials 2156 & subs (Sheet 2 of 3)



MFD / PFD w/ EIS DISPLAY (REVERSIONARY MODE)

LEGEND
1. Fuel Quantity Indicator

Serials 2156 & subs.

SR20_MM28_3522

Figure 28-402
Fuel Quantity Indication - Serials 2156 & subs (Sheet 3 of 3)

C. Fuel Quantity Sensor - *Serials 1005 thru 1885* (See Figure 28-403)

(1) Removal - Fuel Tank Quantity Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.

(c) *Serials 1582 thru 1885:* Pull FUEL QTY / HOBBS circuit breaker.

(d) De-fuel airplane. (Refer to 12-10)

(e) Remove access panels LW3 and LW4 or RW3 and RW4. (Refer to 06-00)

(f) Remove nut and washer securing wire to center terminal of sensor.

Note: One of the sensor mounting screws also secures a wire to the sensor base. To aid reinstallation, note which screw attaches the wire prior to removing sensor.

(g) Remove screws and washers securing sensor to wing rib. Remove sensor from airplane.

(2) Installation - Fuel Tank Quantity Sensor

(a) Thread gasket onto sensor and position next to sensor base.

(b) Insert sensor through mounting hole in wing rib and position sensor base to rib.

(c) Loosely secure wire to sensor base with screw and washer.

(d) Install remaining screws and washers securing sensor and gasket to wing rib. Torque screws to 30 in-lb (3.4 Nm) plus nut drag.

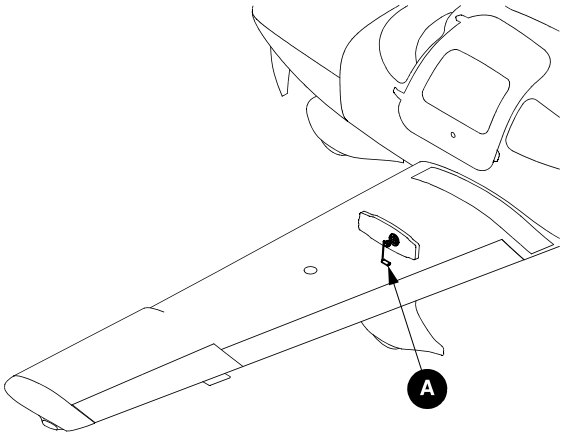
(e) Install washer and nut securing wire to center terminal of sensor. Torque nut to 12 in-lb (1.35 Nm).

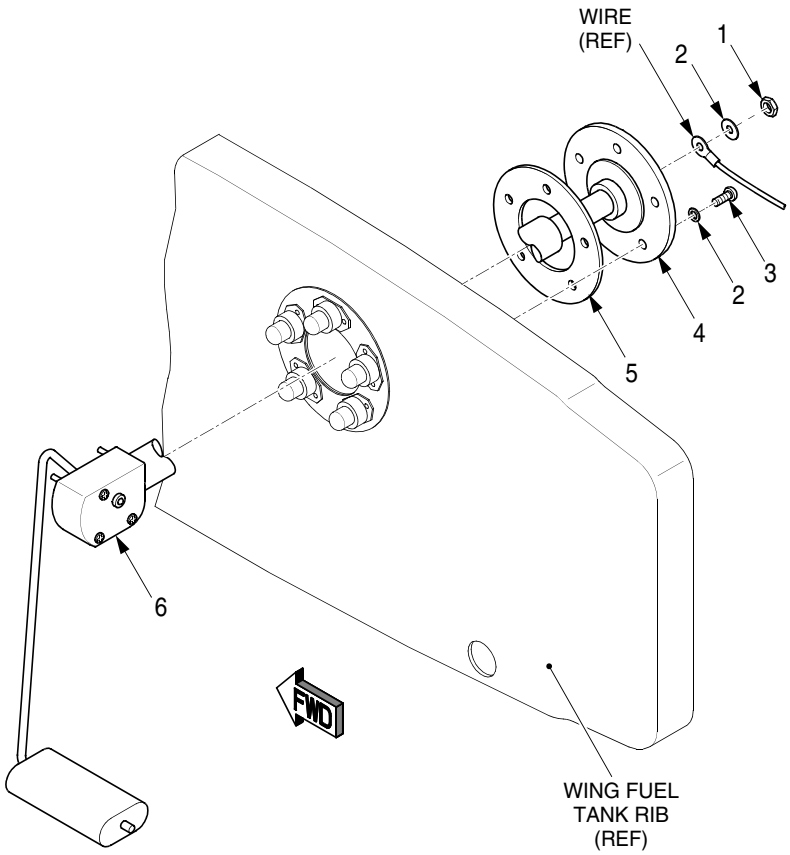
(f) Install access panels LW3 and LW4 or RW3 and RW4. (Refer to 06-00)

(g) Perform Adjustment/Test - Fuel Quantity Gage. (Refer to 28-40)

(h) *Serials 1005 thru 1581:* Reset ENGINE INST circuit breaker.

(i) *Serials 1582 thru 1885:* Reset FUEL QTY / HOBBS circuit breaker.





DETAIL A

LEGEND
1. Nut
2. Washer
3. Screw
4. Mounting Ring
5. Gasket
6. Sending Unit

SR20_MM28_1131C

Figure 28-403
Fuel Quantity Sensor - Serials 1005 thru 1885

D. Fuel Quantity Sensors - *Serials 1886 thru 2155* **(See Figure 28-404)**

CAUTION: Do not allow isopropyl alcohol or acetone to contact sensor dial or cracking and crazing will occur.

(1) Removal - Fuel Quantity Sensors
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull FUEL QTY / HOBBS circuit breaker.
- (c) Remove wing access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)
- (d) Disconnect sensor connector from wire harness.
- (e) Remove screws securing sensor dial to sending unit. Remove sensor dial from airplane.
- (f) If necessary, remove sending unit.
  - 1 De-fuel airplane. (Refer to 12-10)
  - 2 Remove bolts and washers securing sending unit to wing rib. Remove sending unit and gasket from airplane.

(2) Installation - Fuel Quantity Sensors
- (a) If necessary, install sending unit.
  - 1 Install gasket onto sending unit.
  - 2 Position sending unit and gasket to wing rib and secure with bolts and washers. Torque screws to 30 in-lb (3.4 Nm) plus nut drag.
- (b) Verify sensor dial needle indicates a fuel level of E (empty) or below.

  CAUTION: When installed, the sensor dial needle must indicate a fuel level of E (empty) or below to calibrate correctly.

- (c) If sensor dial needle does not indicate a fuel level of E (empty) or below, adjust sensor dial needle.
  - 1 From back of sensor dial, position metallic (steel) object against magnetic portion of sensor dial to manually adjust needle position.
  - 2 Rotate needle to indicate a fuel level of E (empty) or below.
- (d) Position sensor dial to sending unit and secure with screws. Torque screws to 4 - 9 in-lb (0.5 - 1.0 Nm)
- (e) Connect sensor connector to wire harness.
- (f) Install wing access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)
- (g) Perform Adjustment/Test - Fuel Quantity Gage. (Refer to 28-40)
- (h) Reset FUEL QTY / HOBBS circuit breaker.

(3) Adjustment/Test - Fuel Quantity Sensors
- (a) De-fuel airplane. (Refer to 12-10)
- (b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (c) Pull FUEL QTY / HOBBS circuit breaker.
- (d) Remove access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)
- (e) Place multimeter in the 50-ohm scale and zero out the ohmmeter.

  CAUTION: If ohmmeter leads come in contact with battery power, the ohmmeter could become permanently damaged.

- (f) Connect black (-) ohmmeter lead to one of the sensor connector pins.
- (g) Connect red (+) positive ohmmeter lead to other connector pin.
- (h) Verify meter indicates 0.6 to 3.0 ohms when sensor is in the empty (down) position and 33 to 35 ohms when sensor is in the full (up) position.

(i) If sensor fails to indicate correct resistance values, replace sensor.
(j) Install access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)
(k) Reset FUEL QTY / HOBBS circuit breaker.

(4) Functional Test - Fuel Quantity Sensor Dial
(a) Remove fuel quantity sensor dial. (Refer to 28-40)
(b) Verify sensor dial needle indicates a fuel level of E (empty) or below.
(c) If sensor dial needle does not indicate a fuel level of E (empty) or below, adjust sensor dial needle.
1 From back of sensor dial, position metallic (steel) object against magnetic portion of sensor dial to manually adjust needle position.
2 Rotate needle to indicate a fuel level of E (empty) or below.
(d) Connect sensor dial to ohmmeter to observe resistance.
(e) Verify resistance value indicates between 0.0 to 3.5 ohms.
(f) From back of sensor dial, position metallic (steel) object against magnetic portion of sensor dial to manually adjust needle position.
(g) Rotate metallic device slowly and watch resistance on ohmmeter.
(h) Verify resistance increases and observe values.
1 If measured value increases but varies by less than or equal to 2ohms, sensor dial is functional.
2 If measured value increases but varies greater than 2ohms, sensor dial is defective.
3 If measured value is greater than 33 ohms at anytime, sensor dial is defective.
(i) Install fuel quantity sensor dial. (Refer to 28-40)

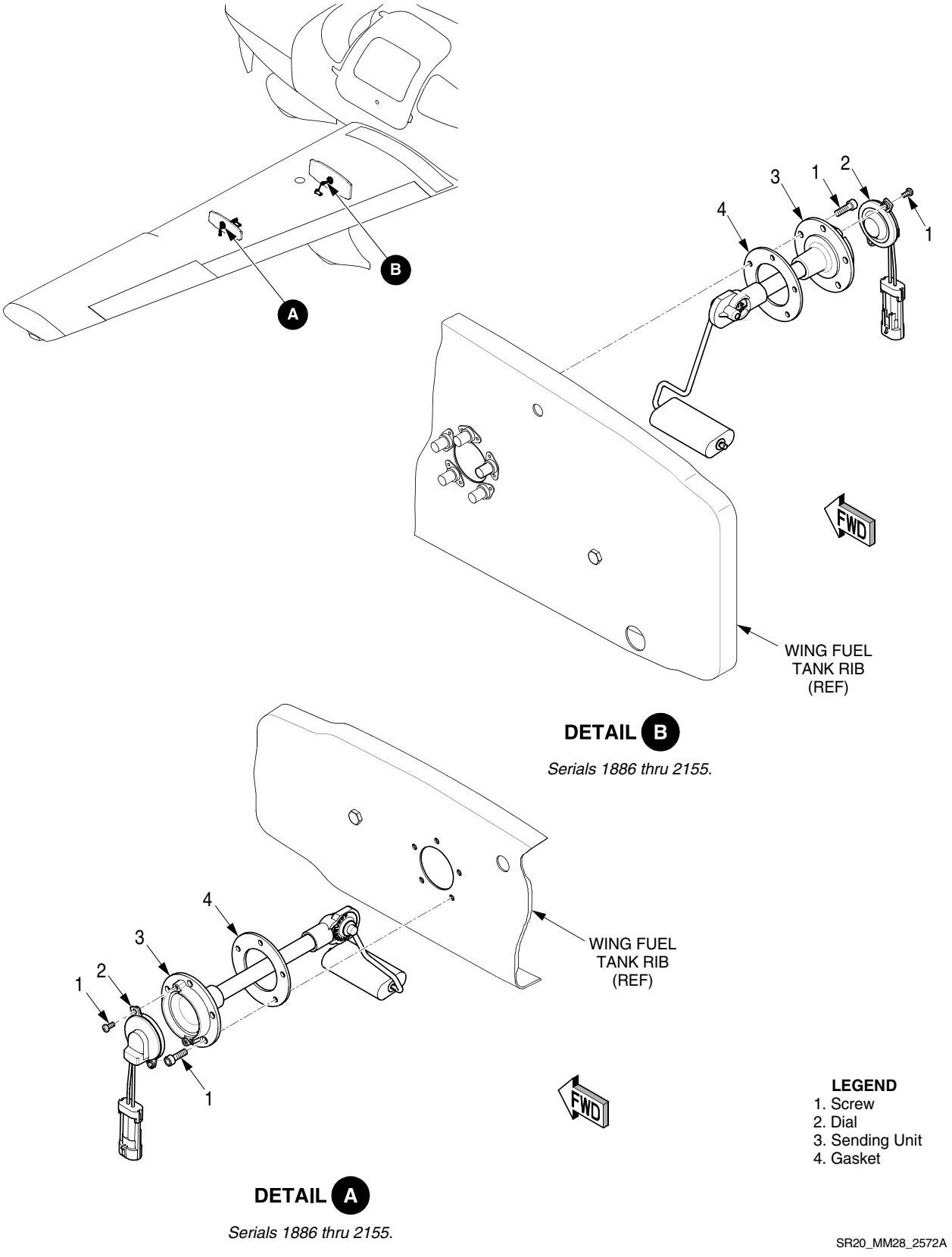


Figure 28-404
Fuel Quantity Sensor - Serials 1886 thru 2155

E. Fuel Quantity Sensors - *Serials 2156 & subs* (See Figure 28-405)

(1) Removal - Fuel Quantity Sensors

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL QTY circuit breaker.

(c) De-fuel airplane. (Refer to 12-10)

(d) Remove wing access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)

(e) Disconnect sensor connector from wire harness.

(f) Remove screws and washers securing sending unit to wing rib. Remove sending unit and gasket from airplane.

(2) Installation - Fuel Quantity Sensors

(a) Install gasket onto sending unit.

(b) Position sending unit and gasket to wing rib and secure with screws and washers. Torque screws to 20 in-lb (2.26 Nm) plus nut drag.

(c) Connect sensor connector to wire harness.

(d) Install wing access panel LW5, RW5, LW10, or RW10. (Refer to 06-00)

(e) Perform Adjustment/Test - Fuel Quantity Indication. (Refer to 28-40)

(f) Reset FUEL QTY circuit breaker.

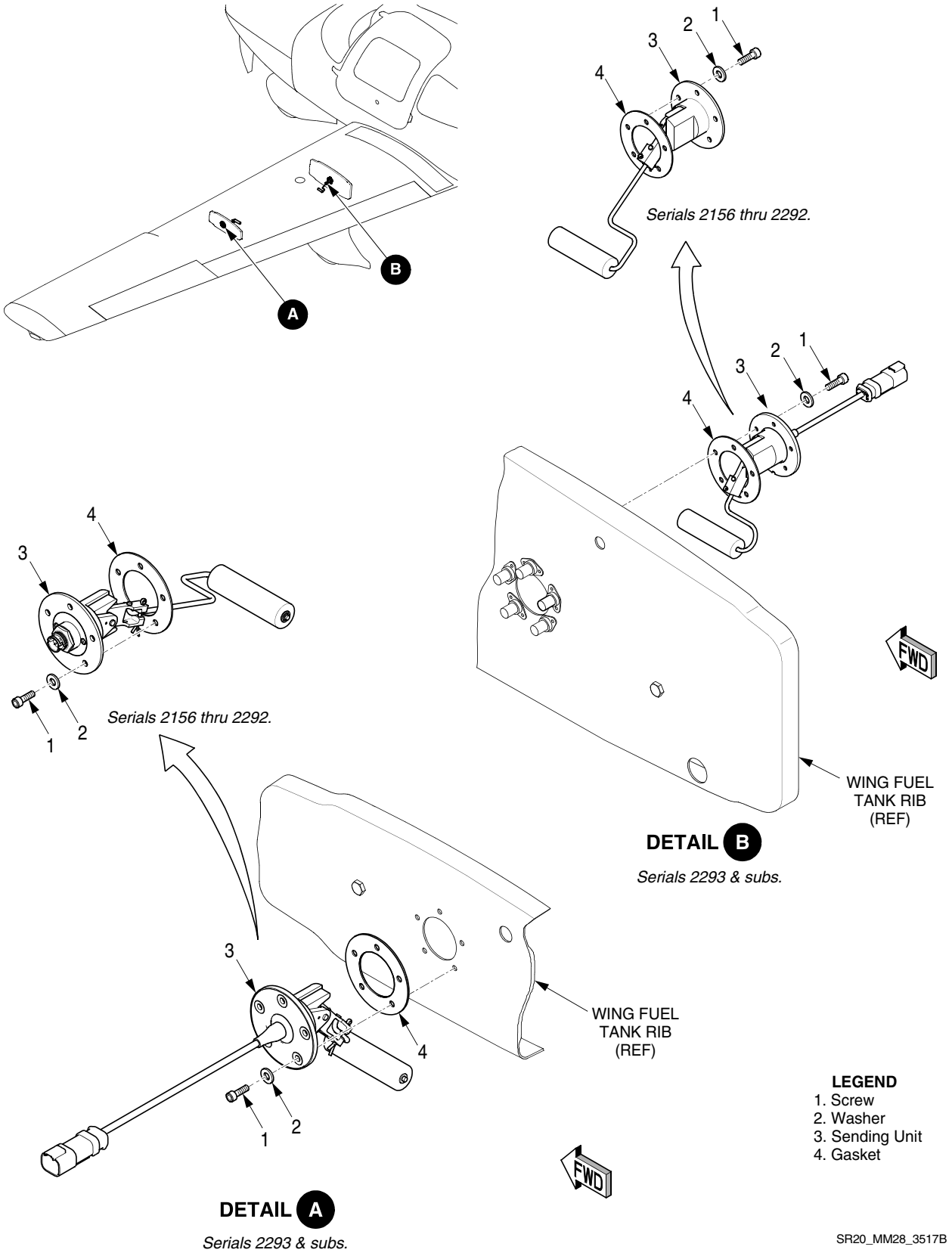


Figure 28-405
Fuel Quantity Sensors - Serials 2156 & subs

EFFECTIVITY:
Serials 2156 & subs

F. Fuel Pressure Switch

For maintenance practices pertinent to the fuel pressure switch, see Chapter 73-20, Engine Fuel System, Controlling. (Refer to 73-20)

G. Fuel Flow Sensor

For maintenance practices pertinent to the fuel flow sensor, see Chapter 73-30, Engine Fuel System, Indicating. (Refer to 73-30)

H. Fuel Flow Gage - *Serials 1005 thru 1581*

For maintenance practices pertinent to the fuel flow gage on these airplanes, see Chapter 77-10, Engine Indicating, Power. (Refer to 77-10)

I. Fuel Flow Indication - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 28-406)**

Note: Fuel flow is displayed electronically on the MFD and PFD screens.

(1) Operational Test - Fuel Flow Indication

(a) Set BAT1 and AVIONICS switches to ON positions.

(b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.

(c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.

(d) Rotate left knob to select Engine page.

(e) Verify fuel flow gage display indicates zero.

(f) Set BAT1 and AVIONICS switches to OFF positions.

J. Fuel Flow Indication - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 28-406)**

Note: Fuel flow is displayed electronically on the MFD and PFD screens.

(1) Operational Test - Fuel Flow Indication

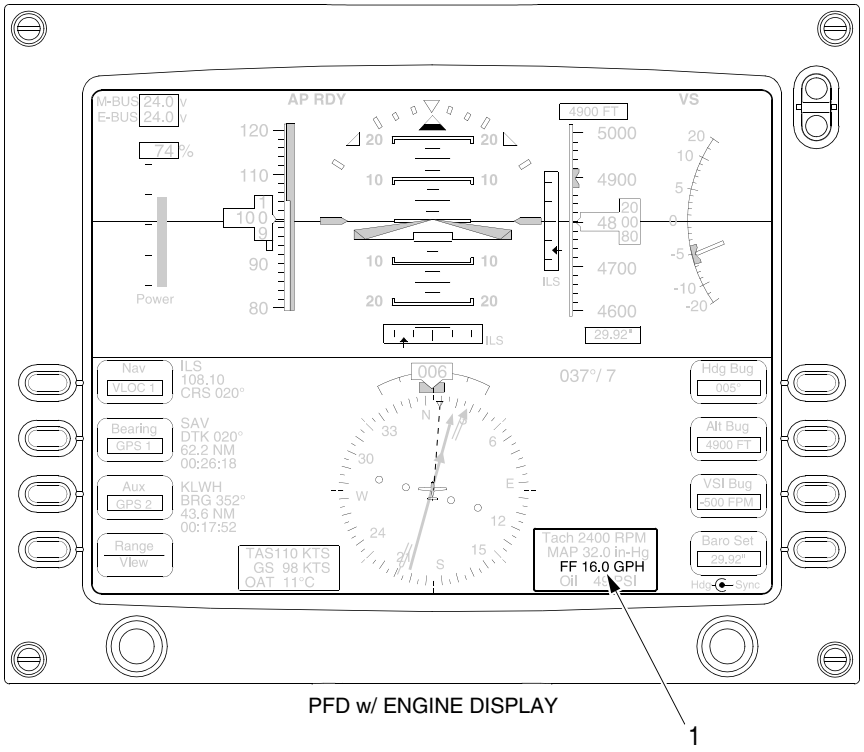
(a) Set BAT1 and AVIONICS switches to ON positions.

(b) On MFD, follow on-screen instructions to enter normal MFD operation.

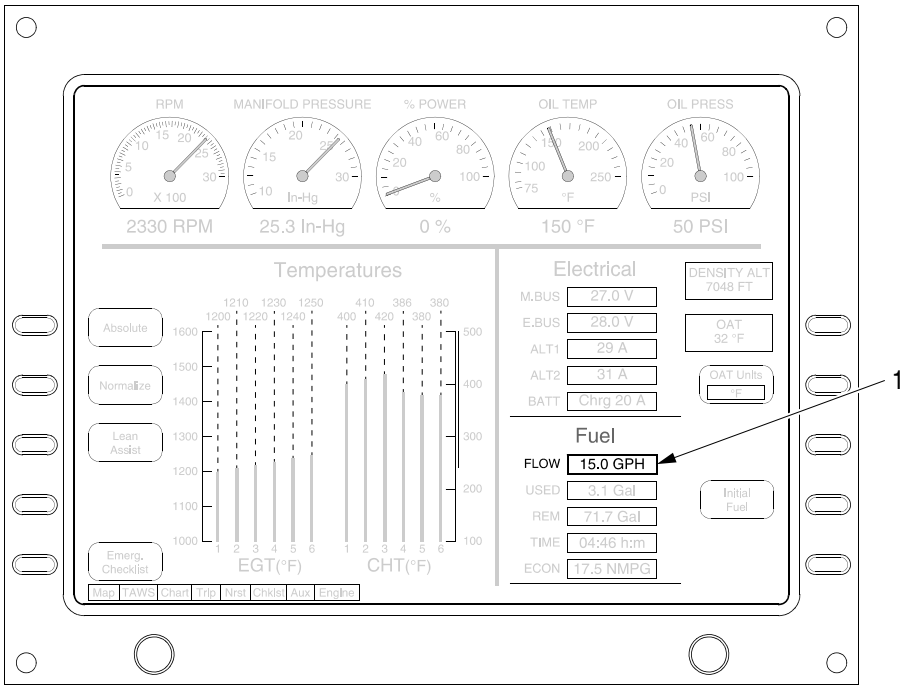
(c) Press [Engine] to select Engine page.

(d) Verify fuel flow gage display indicates zero.

(e) Set BAT1 and AVIONICS switches to OFF positions.



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

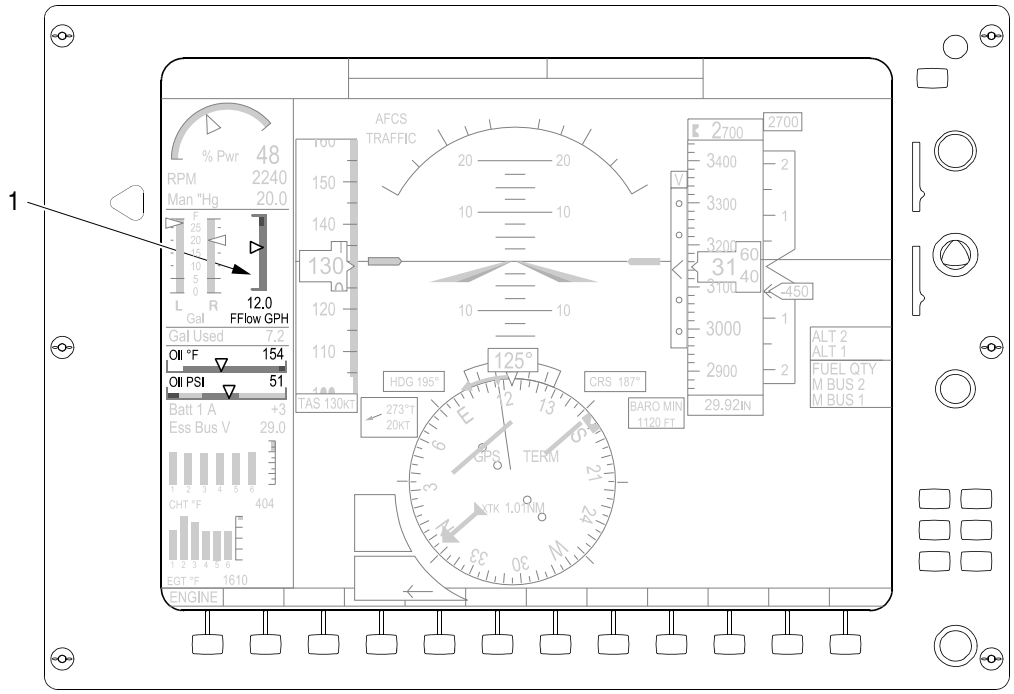
Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics.

LEGEND
1. Fuel Flow Indicator

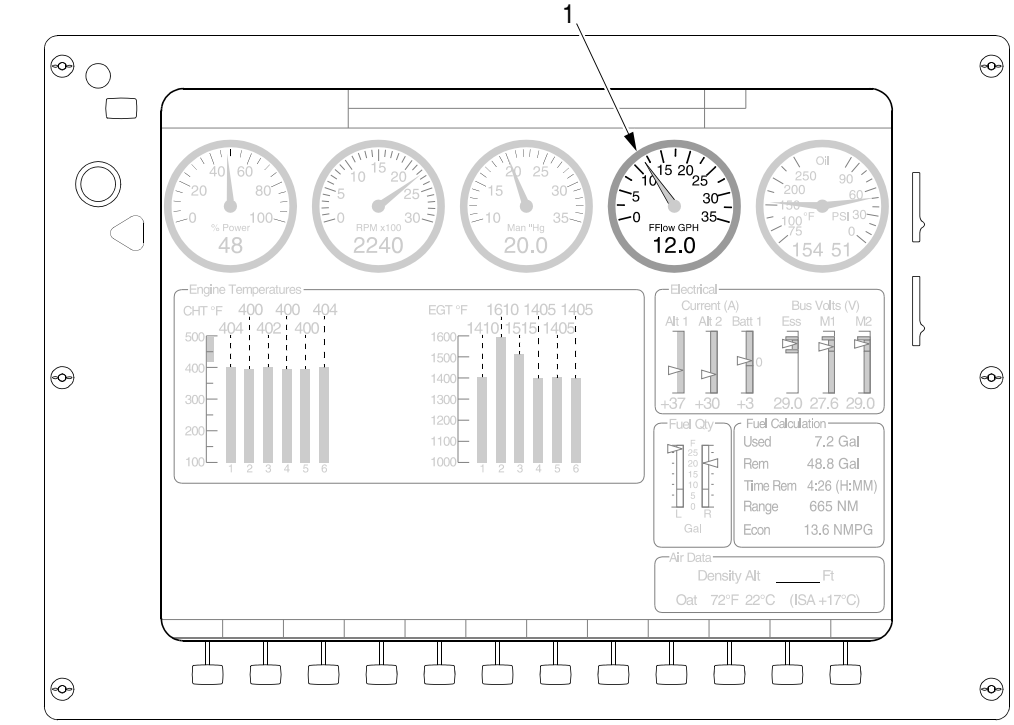
SR20_MM28_3159A

Figure 28-406
Fuel Flow Indication - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 3)

EFFECTIVITY:
Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics



PFD w/ EIS DISPLAY (ENGINE PAGE)



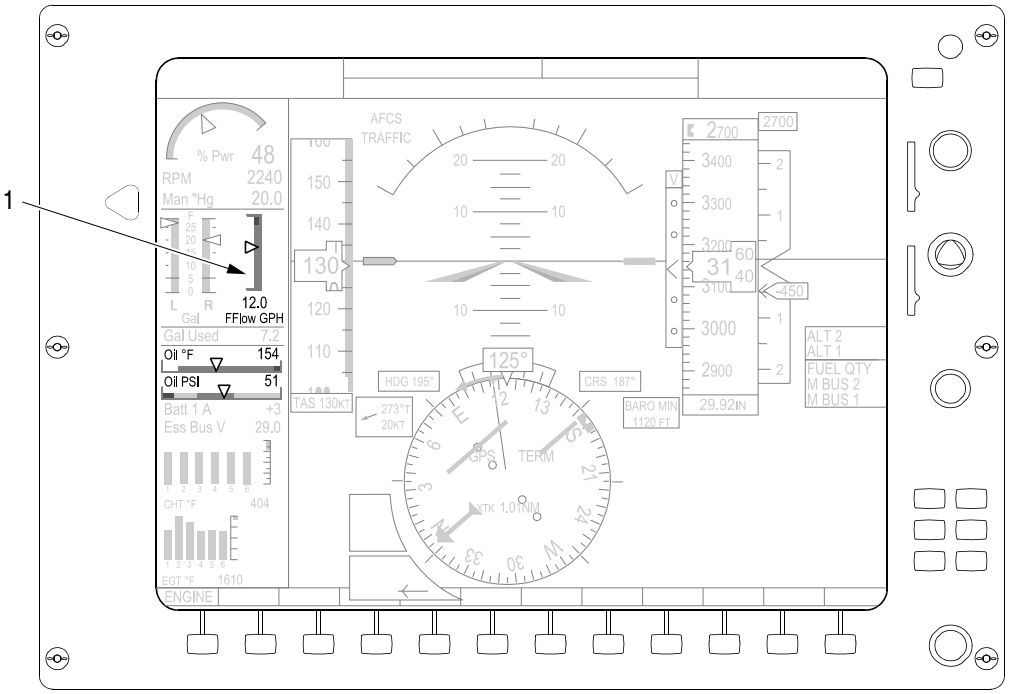
MFD w/ EIS DISPLAY (ENGINE PAGE)

LEGEND
1. Fuel Flow Indicator

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM28_3161A

Figure 28-406
Fuel Flow Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 3)



MFD / PFD w/ EIS DISPLAY (REVERSIONARY MODE)

LEGEND
1. Fuel Flow Indicator

Serials w/ Perspective Avionics.

SR20_MM28_3524

Figure 28-406
Fuel Flow Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

CHAPTER 31

INDICATING AND RECORDING

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INDICATING/RECORDING SYSTEMS

1. GENERAL

This chapter describes those units which give visual or aural warning of conditions in unrelated systems. This includes the carbon monoxide detector, Hour Meters, Aircraft Data Logger, GIA 63 Integrated Avionics Unit, Annunciator Panel, Multi-Function Display (MFD), Primary Function Display (PFD).

A. Instrument Panel

The instrument panel is designed for glare-free use in all flight conditions. The instrument panel is arranged primarily for use by the pilot in the left seat; however, it can be viewed from either seat.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The flight instruments and annunciators are located on LH side of panel and engine instruments are located on RH side of panel. A large Multi-Function Display (MFD) is located between the flight instruments and engine instruments.

Serials 1337 thru 1422 w / PFD, 1423 thru 1581: The Primary Flight Display (PFD) and annunciators are located on LH side of panel and engine instruments are located on RH side of panel. A large Multi-Function Display (MFD) is located between the PFD and the engine instruments.

Serials 1582 & subs w/o Perspective Avionics: The Primary Flight Display (PFD) and annunciators are located on the LH side of panel and a glove box is located on RH side of panel. A large Multi-Function Display (MFD) is located between the PFD and the glove box.

Serials w/ Perspective Avionics: The Primary Flight Display (PFD) is located on the LH side of panel. A large Multi-Function Display (MFD) is located on the RH side of panel.

B. Aircraft Data Logger

Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics: The Aircraft Data Logger (ADL) system acquires serial information from the Data Acquisition Unit (DAU), and GPS systems. Also, discrete data from various sensors monitoring CAPS handle status, autopilot mode, ice protection status, stall warning status, low fuel indicator, and flap position is recorded. This data is formatted at the Data Transfer Unit (DTU) and transmitted to the Recoverable Data Module (RDM-100) where it is stored in the event data recovery is required.

Serials 2016 & subs w/ Perspective Avionics: The Aircraft Data Logger (ADL) system acquires serial information from the primary GIA 63W integrated avionics unit. This data is transmitted to the Recoverable Data Module (RDM-100) where it is stored in the event data recovery is required.

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INSTRUMENT AND CONTROL PANEL

1. DESCRIPTION

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The airplane uses standard flight instruments arranged in the “basic-six” pattern. The airspeed indicator, attitude gyro, altimeter, turn coordinator, directional gyro or horizontal situation indicator, and vertical speed indicator are mounted in the instrument panel. Ignition switch is mounted on the LH console.

Serials 1268 thru 1422 w/o PFD: Ignition switch is mounted in a bolster plate located on the LH console.

Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o Perspective Avionics: An Avidyne FlightMax Entegra-Series Primary Flight Display (PFD) is mounted in the instrument panel. Backup instruments for airspeed, attitude, and altitude are mounted in a bolster plate located on the LH console. In airplanes with SRV configuration, the backup attitude indicator is not installed. The ignition switch is mounted in the instrument panel.

Serials 2016 & subs w/ Perspective Avionics: A Garmin Primary Flight Display (PFD) is mounted in the instrument panel. Backup instruments for airspeed, attitude, and altitude are mounted in a bolster plate located on the LH console. The ignition switch is mounted in the instrument panel.

Serials 2273 & subs w/ MD302 Standby Attitude Module: A Garmin Primary Flight Display (PFD) is mounted in the instrument panel. The MD302 Standby Attitude Module is a combined standby airspeed indicator, standby altimeter, and standby attitude indicator and is mounted in a bolster plate located on the LH console. The ignition switch is mounted in the instrument panel.

A switch panel located in the bolster panel below the flight instruments contains the avionics power switch, pitot heat switch, lighting dimmer switches and the battery and alternator switches.

Serials 1886 & subs: The bolster panel switches are illuminated in the on position. An EL voltage inverter, located on the LH console strut converts DC power to AC power for the bolster switch panel backlight. The lights are powered by 28 VDC supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

A center console contains the avionics, flap control and position lights, power lever and mixture controls, fuel system indicator and controls, and audio controls. System circuit breakers, the alternate static source valve, alternate induction air control, and ELT panel switch are located on the left side of the console for easy access by the pilot. The parking brake actuation knob is mounted below the flight instruments on the left side of the center console. A friction knob for adjusting throttle and mixture control feel and position stability is located on the right side of the console. An accessory outlet, map compartment and audio controls are located in the console between the front seats. An hour meter, emergency egress hammer, and headset jacks are installed below the console armrest.

2. MAINTENANCE PRACTICES

A. Instrument Panel - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 31-101)

(1) Removal - Instrument Panel

(a) Disconnect battery. (Refer to 24-30)

(b) Remove glareshield. (Refer to 25-10)

(c) Remove MFD. (Refer to 31-60)

(d) Remove annunciator panel. (Refer to 31-50)

(e) Serials 1005 thru 1336, 1337 thru 1422 w/o PFD:

1 Remove altimeter. (Refer to 34-10)

2 Remove attitude indicator. (Refer to 34-20)

3 Remove airspeed indicator. (Refer to 34-10)

4 Remove outside air temperature/clock gage. (Refer to 34-10)

5 Remove vertical speed indicator. (Refer to 34-10)

6 Remove horizontal situation indicator, if installed. (Refer to 34-50)

7 Remove turn coordinator/roll computer, if installed. (Refer to 22-10)

8 Remove turn coordinator, if installed. (Refer to 34-20)

9 Remove course deviation indicator, if installed. (Refer to 34-50)

10 Remove directional gyro, if installed. (Refer to 34-20)

11 Remove remote GPSS switch, if installed. (Refer to 22-11)

12 Remove altitude selector/alerter, if installed. (Refer to 22-12)

(f) *Serials 1005 thru 1267:* Remove vacuum gage, if installed. (Refer to 37-20)

(g) Serials 1337 thru 1422 w/ PFD, 1423 & subs:

1 Remove PFD. (Refer to 31-60)

2 Remove Fight Director switch assemblies, if installed. (Refer to 22-12)

3 Remove TAWS control switches, if installed. (Refer to 34-40)

4 Remove ignition switch. (Refer to 74-30)

(h) Serials 1005 thru 1581:

1 Remove ammeter select switch, if installed. (Refer to 24-30)

2 *Serials 1005 thru 1581 w/o Emax:* Remove EGT/CHT gage. (Refer to 77-20)

3 *Serials 1005 thru 1581 w/ Emax:* Remove EGT/CHT insert. (Refer to 31-10)

4 Remove tachometer. (Refer to 77-10)

5 Remove volt/amp meter. (Refer to 24-30)

6 Remove oil pressure/temperature gage. (Refer to 79-30)

7 Remove manifold pressure/fuel flow gage. (Refer to 77-10)

(i) *Serials 1582 & subs:* Remove glove box. (Refer to 25-10)

(j) Remove temperature control knobs. (Refer to 21-60)

(k) Remove screws, washers, and spacers securing instrument panel to console. Remove instrument panel from airplane.

(2) Installation - Instrument Panel

(a) Position instrument panel to console and secure with screws, washers, and spacers.

(b) Install temperature control knobs. (Refer to 21-60)

(c) *Serials 1582 & subs:* Install glove box. (Refer to 25-10)

(d) Serials 1005 thru 1581:

1 Install manifold pressure/fuel flow gage. (Refer to 77-10)

2 Install oil pressure/temperature gage. (Refer to 79-30)

3 Install volt/amp meter. (Refer to 24-30)

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

4 Install tachometer. (Refer to 77-10)
5 *Serials 1005 thru 1581 w/o Emax:* Install EGT/CHT gage. (Refer to 77-20)
6 *Serials 1005 thru 1581 w/ Emax:* Install EGT/CHT insert. (Refer to 31-10)
7 Install ammeter select switch, if installed. (Refer to 24-30)

(e) Serials 1337 thru 1422 w/ PFD, 1423 & subs:
1 Install ignition switch. (Refer to 74-30)
2 Install TAWS control switches, if installed. (Refer to 34-40)
3 Install Fight Director switch assemblies, if installed. (Refer to 22-12)
4 Install PFD. (Refer to 31-60)

(f) Serials 1005 thru 1336, 1337 thru 1422 w/o PFD:
1 Install remote GPSS switch, if installed. (Refer to 22-11)
2 Install altitude selector/alerter, if installed. (Refer to 22-12)
3 Install directional gyro, if installed. (Refer to 34-20)
4 Install course deviation indicator. (Refer to 34-50)
5 Install turn coordinator, if installed. (Refer to 34-20)
6 Install turn coordinator/roll computer, if installed. (Refer to 22-10)
7 Install horizontal situation indicator, if installed. (Refer to 34-50)
8 Install vertical speed indicator. (Refer to 34-10)
9 Install outside air temperature/clock gage. (Refer to 34-10)
10 Install airspeed indicator. (Refer to 34-10)
11 Install attitude indicator. (Refer to 34-20)
12 Install altimeter. (Refer to 34-10)

(g) Perform Functional Test - Pitot System Leak Test. (Refer to 34-10)
(h) Perform Functional Test - Static System Leak Test. (Refer to 34-10)
(i) Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)
(j) Install annunciator panel. (Refer to 31-50)
(k) Install MFD. (Refer to 31-60)
(l) Install glareshield. (Refer to 25-10)
(m) Connect battery. (Refer to 24-30)
(n) Perform Functional Test - Instrument Panel. (Refer to 31-10)
(o) Perform Airplane Operational and Functional Checks. (Refer to 05-30)

(3) Functional Test - Instrument Panel
(a) Perform Operational Test - Multi-Function Display. (Refer to 31-60)
(b) Perform Functional Test - Annunciator. (Refer to 31-50)
(c) *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD:* Perform functional and operational tests.
1 Perform Functional Test - Altimeter. (Refer to 34-10)
2 Perform Operational Test - Attitude Indicator. (Refer to 34-20)
3 Perform Functional Test - Airspeed Indicator. (Refer to 34-10)
4 Perform Functional Test - OAT Gage/Clock. (Refer to 34-10)
5 Perform Functional - Vertical Speed Indicator. (Refer to 34-10)
6 Perform Operational Test - HSI. (Refer to 34-50)
7 Perform Operational Test - Turn Coordinator. (Refer to 34-20)
8 Perform Operational Test - Directional Gyro, if installed. (Refer to 34-20)

(d) *Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics:* Perform functional and operational tests.
1 Perform Functional Check - Ignition Switch. (Refer to 74-30)
2 Perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)

3 Perform Operational Test - Flight Director, if installed. (Refer to 22-12)

4 Perform Operational Test - TAWS Processor, if installed. (Refer to 34-40)

(e) *Serials 1005 thru 1581:* Perform functional and operational tests.

1 Perform Operational Test - Tachometer. (Refer to 77-10)

2 *Serials 1005* thru 1581 *w/o EMax Engine Monitoring:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)

3 Perform Operational Test - MAP/Fuel Flow Gage. (Refer to 77-10)

4 Perform Operational Test - Oil Pressure/Temperature Gage. (Refer to 79-30)

5 Perform Operational Test - Volt / Amp Meter. (Refer to 24-30)

6 Perform Operational Test - Ammeter Select Switch. (Refer to 24-30)

B. Instrument Panel - *Serials 2016 & subs w/ Perspective Avionics and 12-Inch Displays* (See Figure 31-101)

(1) Removal - Instrument Panel
- (a) Disconnect battery. (Refer to 24-30)
- (b) Remove glareshield. (Refer to 25-10)
- (c) Remove MFD. (Refer to 31-60)
- (d) Remove PFD. (Refer to 31-60)
- (e) Remove LH instrument panel.
  1. Remove clamp securing environmental duct to instrument panel.
  2. Remove ignition switch. (Refer to 74-30)
  3. Remove Fight Director switch assemblies, if installed. (Refer to 22-12)
  4. Remove screw, washer, and spacer securing instrument panel to bolster panel.
  5. Remove screws and washers securing instrument panel to support.
- (f) Remove center instrument panel.
  1. Remove reversionary switch. (Refer to 31-60)
  2. Remove screws and washers securing instrument panel to console. Remove instrument panel from airplane.
- (g) Remove RH instrument panel.
  1. Remove clamp securing environmental duct to instrument panel.
  2. Remove environmental control module. (Refer to 21-60)
  3. Remove screw, washer, and spacer securing instrument panel to bolster panel.
  4. Remove screws and washers securing instrument panel to support.

(2) Installation - Instrument Panel
- (a) Install LH instrument panel.
  1. Position instrument panel to bolster panel and secure with screw, washer, and spacer.
  2. Position instrument panel to support and secure with screws and washers.
  3. Install ignition switch. (Refer to 74-30)
  4. Install Fight Director switch assemblies, if installed. (Refer to 22-12)
- (b) Install center instrument panel.
  1. Position instrument panel to console and secure with screws and washers.
  2. Install reversionary switch. (Refer to 31-60)
- (c) Install RH instrument panel.
  1. Position instrument panel to bolster panel and secure with screw, washer, and spacer.
  2. Position instrument panel to support and secure with screws and washers.
  3. Install environmental control module.
  4. Position environmental duct to instrument panel and secure with clamp.
- (d) Install PFD. (Refer to 31-60)
- (e) Install MFD. (Refer to 31-60)
- (f) Install glareshield. (Refer to 25-10)
- (g) Connect battery. (Refer to 24-30)

(3) Functional test - Instrument Panel
- (a) Perform Operational Test - Multi-Function Display. (Refer to 31-60)
- (b) Perform Functional Check - Ignition Switch. (Refer to 74-30)
- (c) Perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)
- (d) Perform Operational Test - Flight Director, if installed. (Refer to 22-12)

C. Instrument Panel - *Serials 2016 & subs w/ Perspective Avionics and 10-Inch Displays* (See Figure 31-101)

(1) Removal - Instrument Panel
- (a) Disconnect battery. (Refer to 24-30)
- (b) Remove glareshield. (Refer to 25-10)
- (c) Remove MFD. (Refer to 31-60)
- (d) Remove PFD. (Refer to 31-60)
- (e) Remove clamps securing environmental ducts to instrument panel.
- (f) Remove ignition switch. (Refer to 74-30)
- (g) Remove Fight Director switch assemblies, if installed. (Refer to 22-12)
- (h) Remove reversionary switch. (Refer to 31-60)
- (i) Remove environmental control module. (Refer to 21-60)
- (j) Remove screws, washers, and spacers securing instrument panel to bolster panel.
- (k) Remove screws and washers securing instrument panel to supports. Remove instrument panel from airplane.

(2) Installation - Instrument Panel
- (a) Position instrument panel to bolster panel and secure with screws, washers, and spacers.
- (b) Position instrument panel to supports and secure with screws and washers.
- (c) Install environmental control module.
- (d) Install reversionary switch. (Refer to 31-60)
- (e) Install Fight Director switch assemblies, if installed. (Refer to 22-12)
- (f) Install ignition switch. (Refer to 74-30)
- (g) Position environmental ducts to instrument panel and secure with clamps.
- (h) Install PFD. (Refer to 31-60)
- (i) Install MFD. (Refer to 31-60)
- (j) Install glareshield. (Refer to 25-10)
- (k) Connect battery. (Refer to 24-30)

(3) Functional Test - Instrument Panel
- (a) Perform Operational Test - Multi-Function Display. (Refer to 31-60)
- (b) Perform Functional Check - Ignition Switch. (Refer to 74-30)
- (c) Perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)
- (d) Perform Operational Test - Flight Director, if installed. (Refer to 22-12)

D. Bolster Plate - *Serials 1268 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 31-101)**

(1) Removal - Bolster Plate

(a) Disconnect battery. (Refer to 24-30)

(b) Remove LH kick plate. (Refer to 25-10)

(c) Remove nut securing ignition switch to bolster plate. (Refer to 74-30)

(d) Remove screws and washers securing bolster plate to console. Remove bolster plate.

(2) Installation - Bolster Plate

(a) Install screws and washers securing bolster plate to console.

(b) Install nut securing ignition switch to bolster plate. (Refer to 74-30)

(c) Install LH kick plate. (Refer to 25-10)

(d) Connect battery. (Refer to 24-30)

E. Bolster Plate - *Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 Standby Attitude Module* (See Figure 31-101)

(1) Removal - Bolster Plate

(a) Disconnect battery. (Refer to 24-30)

(b) Remove airspeed indicator. (Refer to 34-10)

(c) Remove attitude indicator, if installed. (Refer to 34-20)

(d) Remove altimeter. (Refer to 34-10)

(e) Remove screws, washers, and spacers securing bolster plate to console. Remove bolster plate.

(2) Installation - Bolster Plate

(a) Place bolster plate into position and secure to console with screws, washers, and spacers.

(b) Install airspeed indicator. (Refer to 34-10)

(c) Install attitude indicator, if installed. (Refer to 34-20)

(d) Install altimeter. (Refer to 34-10)

(e) Perform Adjustment/Test - Pitot System Leak Test. (Refer to 34-10)

(f) Perform Adjustment/Test - Static System Leak Test. (Refer to 34-10)

(g) Connect battery. (Refer to 24-30)

F. Bolster Plate - *Serials 2273 & subs w/ MD302 Standby Attitude Module* **(See Figure 31-101)**

(1) Removal

(a) Disconnect battery. (Refer to 24-30)

(b) Remove MD302 Standby Attitude Module. (Refer to 34-10)

(c) Remove center bolster trim. (Refer to 25-10)

(d) Remove screws, washers, and spacers securing bolster plate to console. Remove bolster plate.

(2) Installation

(a) Place bolster plate into position and secure to console with screws, washers, and spacers.

(b) Install center bolster trim. (Refer to 25-10)

(c) Install MD302 Standby Attitude Module. (Refer to 34-10)

(d) Connect battery. (Refer to 24-30)

G. EGT/CHT Gage Insert - *Serials 1232 thru 1581 w/ EMax, 1337 thru 1581 w/ SRV* (See Figure 31-101)

(1) Removal - EGT/CHT Insert

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Remove screws, washers, and nuts securing gage insert to instrument panel.

(2) Installation - EGT/CHT Insert

(a) Position gage insert to instrument panel and secure with screws, washers, and nuts.

(b) Install glareshield. (Refer to 25-10)

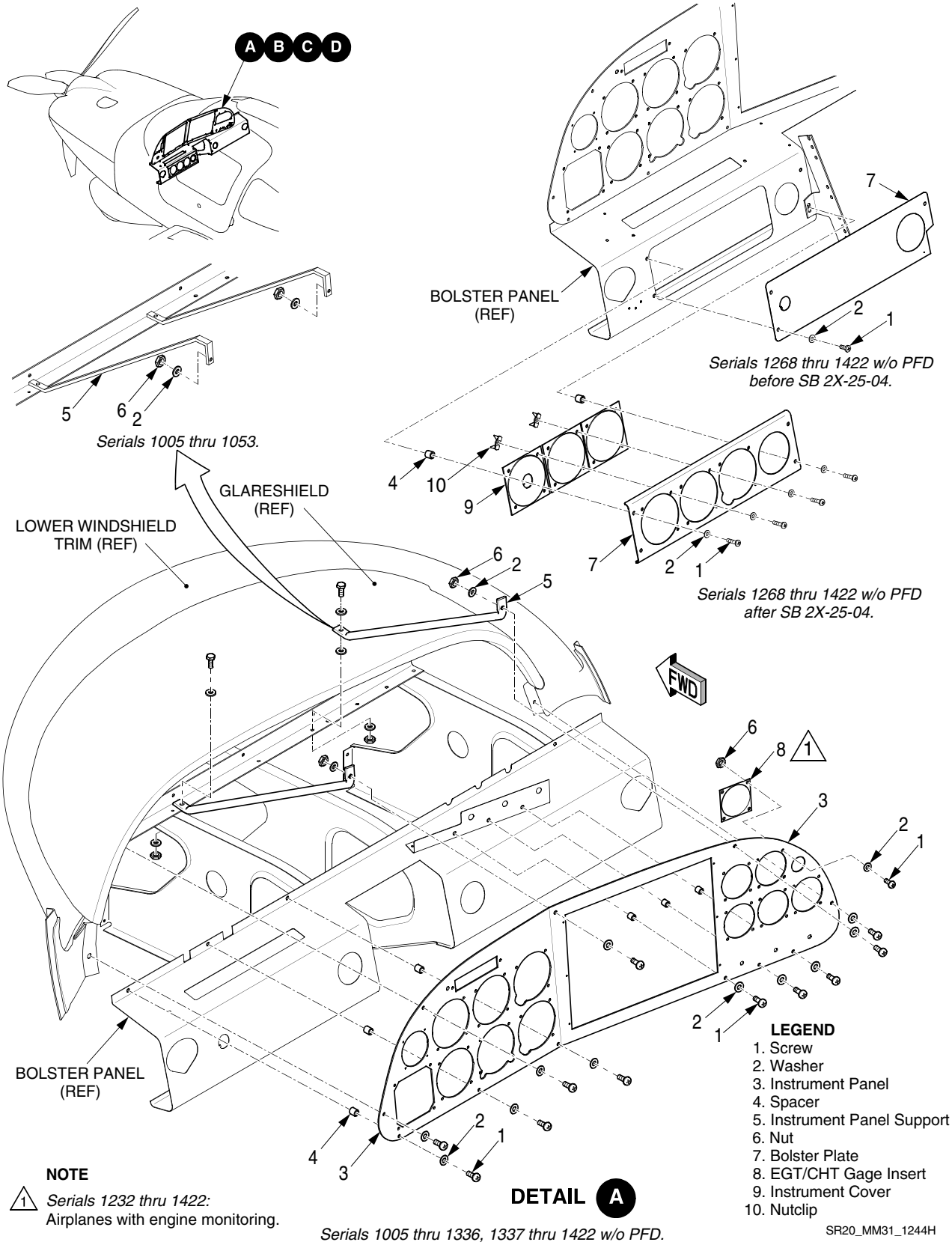
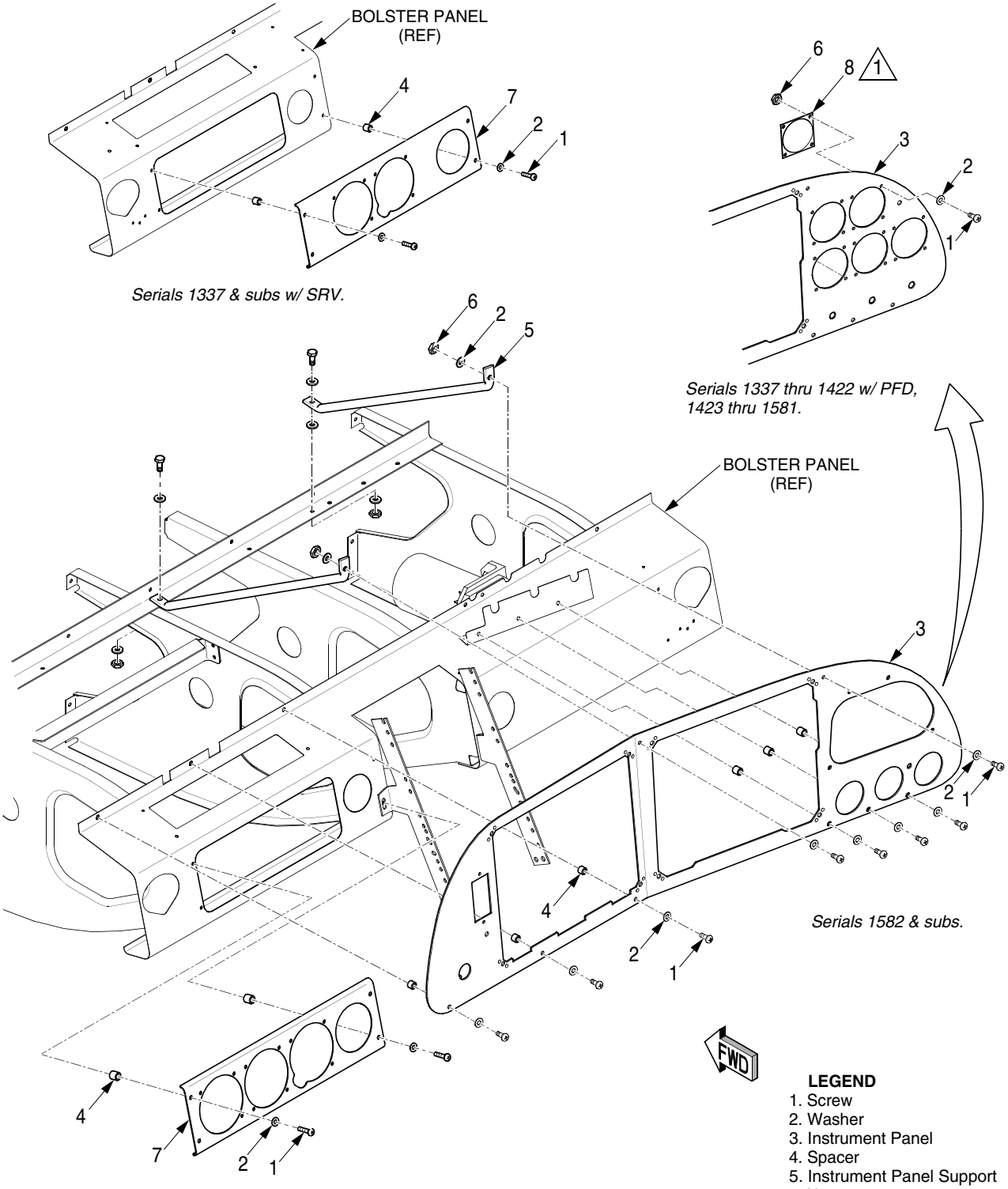


Figure 31-101
Instrument Panel - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 4)



LEGEND

1. Screw
2. Washer
3. Instrument Panel
4. Spacer
5. Instrument Panel Support
6. Nut
7. Bolster Plate
8. EGT/CHT Gage Insert

NOTE

1 *Serials 1423 thru 1581:*
Airplanes with engine monitoring.

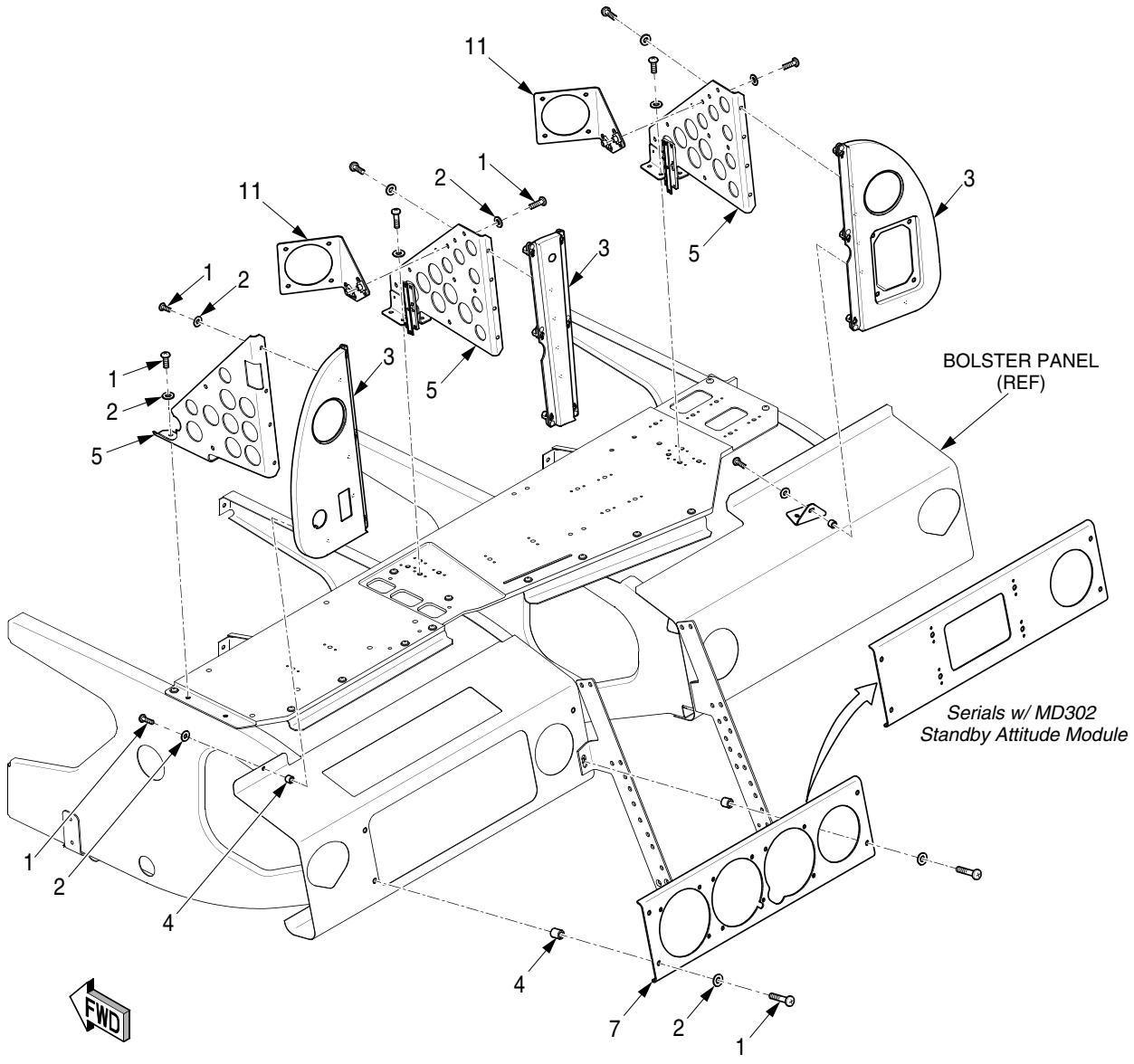
DETAIL B

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics.

SR20_MM31_1581I

Figure 31-101
Instrument Panel - Serials 1337 - 1422 w/ PFD, 1423 - 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 4)

EFFECTIVITY:
Serials 1337 - 1422 w/ PFD, 1423 - 2015, 2016 & subs w/o Perspective Avionics



LEGEND

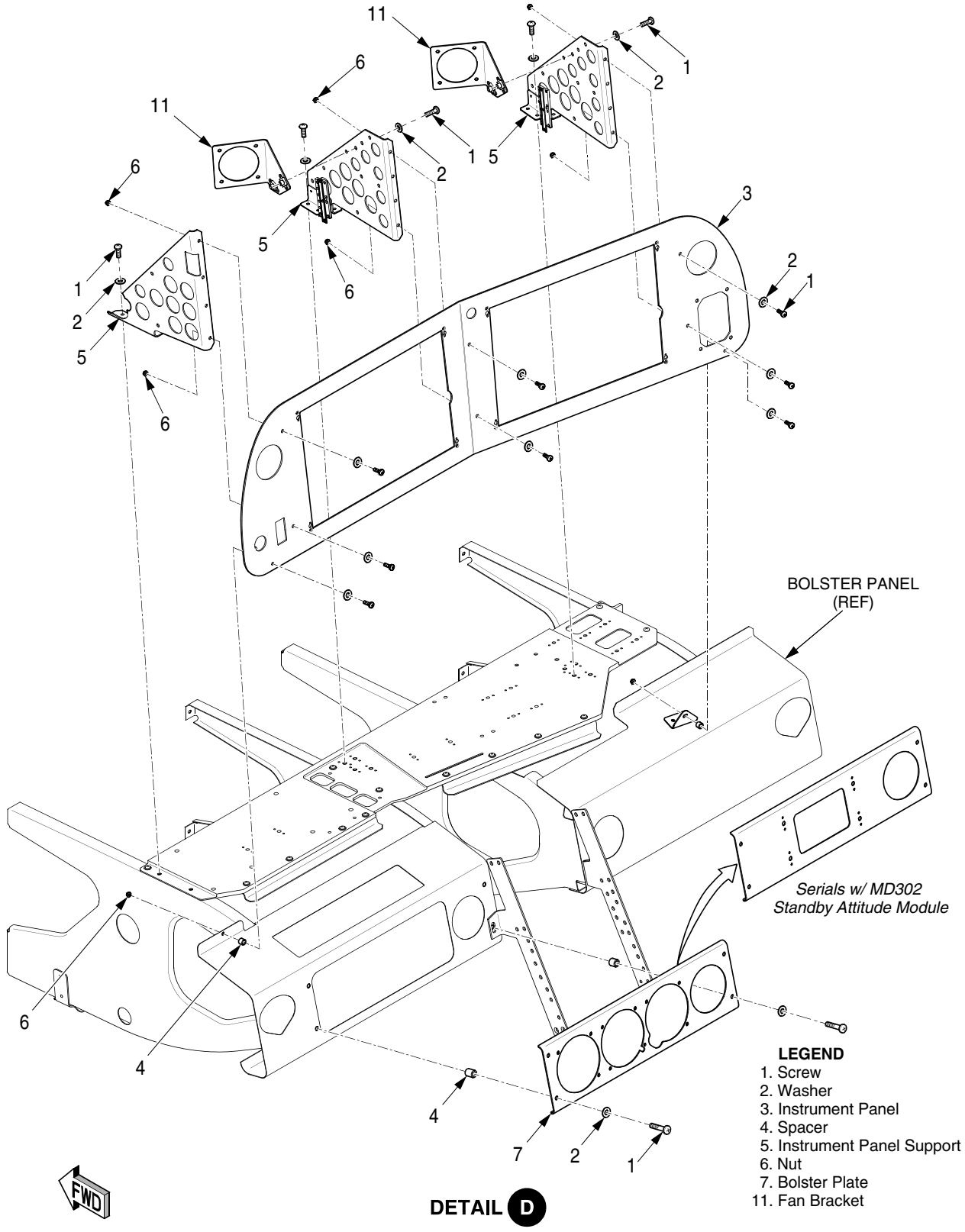
1. Screw
2. Washer
3. Instrument Panel
4. Spacer
5. Instrument Panel Support
6. Nut
7. Bolster Plate
11. Fan Bracket

DETAIL C

SR20_MM31_2722B

Serials 2016 & subs w/ Perspective Avionics and 12-inch Displays.

Figure 31-101
Instrument Panel - Serials 2016 & subs w/ Perspective Avionics and 12-inch Displays (Sheet 3 of 4)



Serials 2016 & subs w/ Perspective Avionics and 10-inch Displays. SR20_MM31_3040B

Figure 31-101
Instrument Panel - Serials 2016 & subs w/ Perspective Avionics and 10-inch Displays (Sheet 4 of 4)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics and 10-inch Displays

H. Circuit Breaker Panel

(1) Removal - Circuit Breaker Panel

(a) Disconnect battery. (Refer to 24-30)

(b) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Remove screws securing circuit breaker panel to console. (Refer to 24-50)

(c) *Serials 2016 & subs w/ Perspective Avionics:* Remove turn studs securing circuit breaker panel to console.

(d) Identify and disconnect all wire terminal connectors. Remove circuit breaker panel from airplane.

(2) Installation - Circuit Breaker Panel

(a) Place circuit breaker panel into position and connect all wire terminal connectors.

(b) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Position circuit breaker panel to center console and secure with screws.

(c) *Serials 2016 & subs w/ Perspective Avionics:* Position circuit breaker panel to center console and secure with turn studs.

(d) Connect battery. (Refer to 24-30)

I. Bolster Switch Panel - *Serials 1005 thru 1183* **(See Figure 31-102)**

(1) Removal - Bolster Switch Panel

(a) Disconnect battery. (Refer to 24-30)

(b) Remove dimmer switch control knobs from bolster panel.

(c) Remove screws, washers, and nut securing switch panel and finish panel to console.

(d) Disconnect electrical connectors from switch panel.

(2) Installation - Bolster Switch Panel

(a) Connect electrical connectors to switch panel.

(b) Position switch panel and finish panel to console and secure with screws, washers, and nut.

(c) Install dimmer switch control knobs to bolster panel.

(d) Connect battery. (Refer to 24-30)

J. Bolster Switch Panel - *Serials 1184 & subs* **(See Figure 31-102)**

(1) Removal - Bolster Switch Panel

(a) Disconnect battery. (Refer to 24-30)

(b) Remove screws securing bolster switch panel to console.

(c) Disconnect electrical connectors from bolster switch panel.

(2) Installation - Bolster Switch Panel

(a) Connect electrical connectors to bolster switch panel.

(b) Position bolster switch panel to console and secure with screws.

(c) Connect battery. (Refer to 24-30)

K. EL Voltage Inverter - *Serials 1886 & subs* **(See Figure 31-102)**

(1) Removal - EL Voltage Inverter

(a) Disconnect battery. (Refer to 24-30)

(b) Remove LH kick plate. (Refer to 25-10)

(c) Disconnect EL voltage inverter connector from bolster switch panel.

(d) Remove screws, washers, and nuts securing EL voltage inverter to rib strut.

(2) Installation - EL Voltage Inverter

(a) Position EL voltage inverter to rib strut and secure with screws, washers, and nuts.

(b) Connect EL voltage inverter connector to bolster switch panel.

(c) Install LH kick plate. (Refer to 25-10)

(d) Connect battery. (Refer to 24-30)

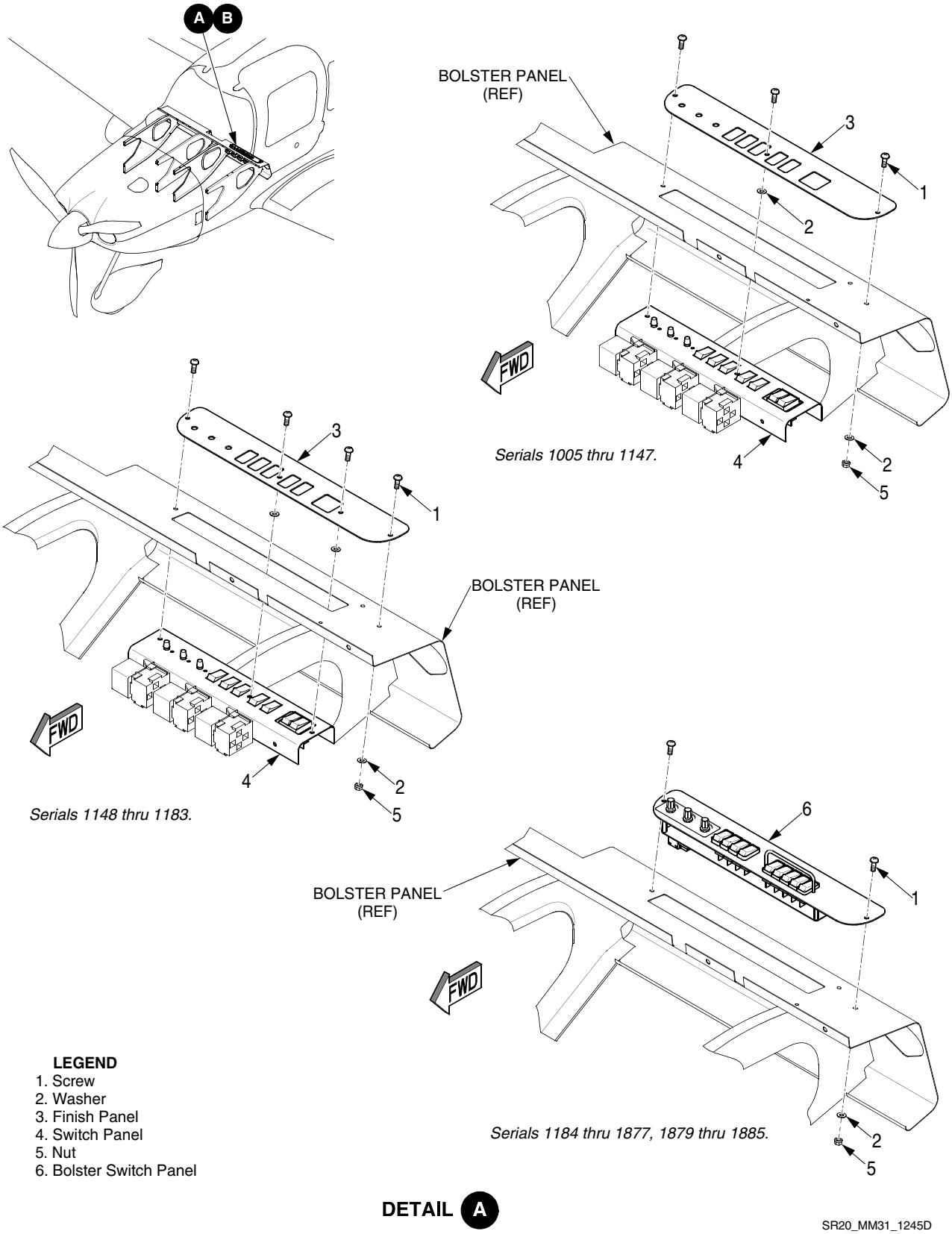
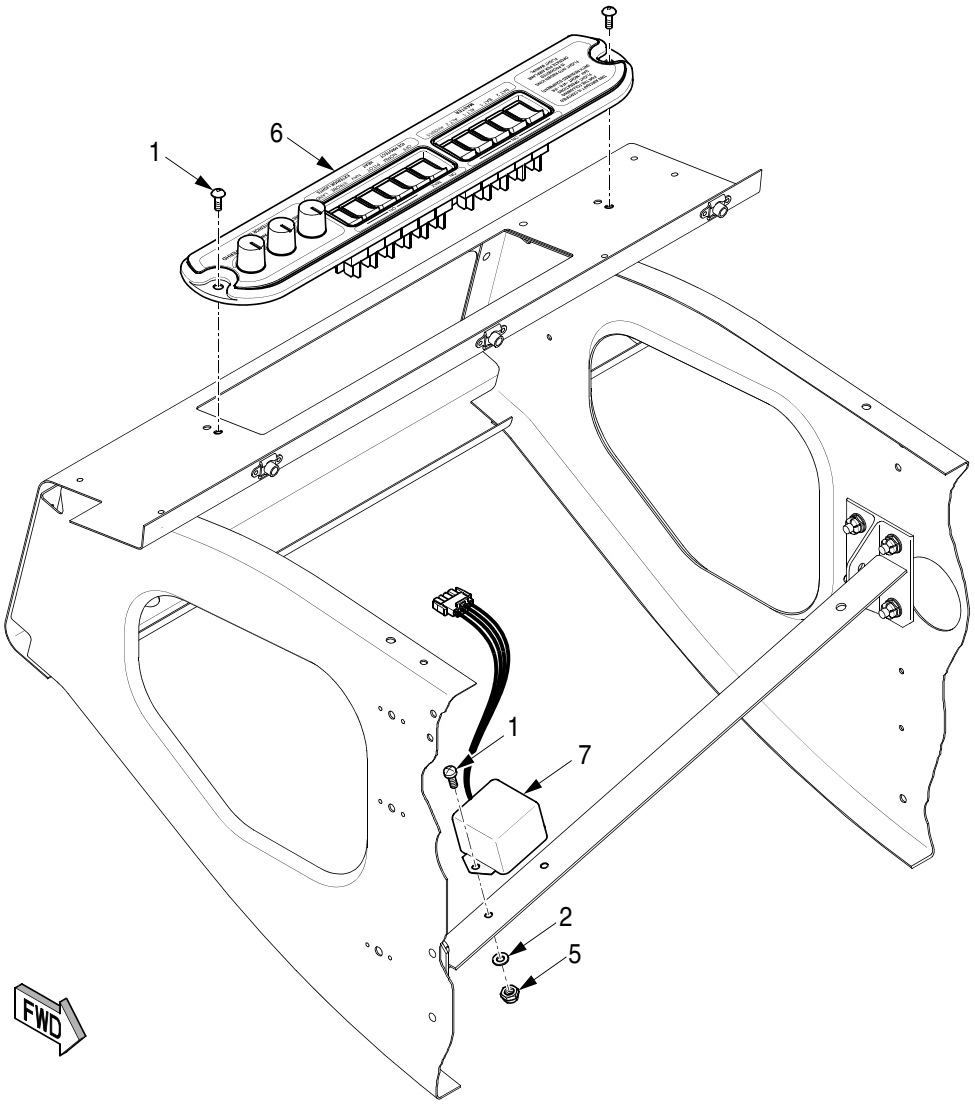


Figure 31-102
Bolster Switch Panel Installation - Serials 1005 thru 1885 (Sheet 1 of 2)



LEGEND
1. Screw
2. Washer
5. Nut
6. Bolster Switch Panel
7. EL Inverter

DETAIL B

SR20_MM31_2743

Figure 31-102
Bolster Switch Panel Installation - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs

INDEPENDENT INSTRUMENTS

1. DESCRIPTION

This section describes those instruments, units and components which are not related to specific systems. This includes the carbon monoxide detector.

A. Carbon Monoxide Detector

The carbon monoxide detector, mounted to the LH outboard console rib, continuously senses the concentration of carbon monoxide (CO) in the cockpit. A visual warning displays on the PFD whenever the carbon monoxide level reaches 50 parts per million (PPM) by volume or above. The CO detector has a built in three-minute delay at startup for the CO sensor to stabilize before it will detect CO. 28 VDC for CO detector operation is supplied through the 5-amp AVIONICS FAN 2 circuit breaker on Main Bus 2.

The carbon monoxide detector is integral to the Perspective Integrated Avionics system. For an overview of the Perspective system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. MAINTENANCE PRACTICES

A. Carbon Monoxide (CO) Detector - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 31-201)

(1) Removal - Carbon Monoxide (CO) Detector

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AVIONICS FAN 2 circuit breaker.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect electrical connector from CO detector.

(e) Remove screws and washers securing CO detector to console rib.

(2) Installation - Carbon Monoxide (CO) Detector

(a) Position CO detector to console rib and secure with screws and washers.

(b) Connect electrical connector to CO detector.

(c) Install LH kick plate. (Refer to 25-10)

(d) Reset AVIONICS FAN 2 circuit breaker.

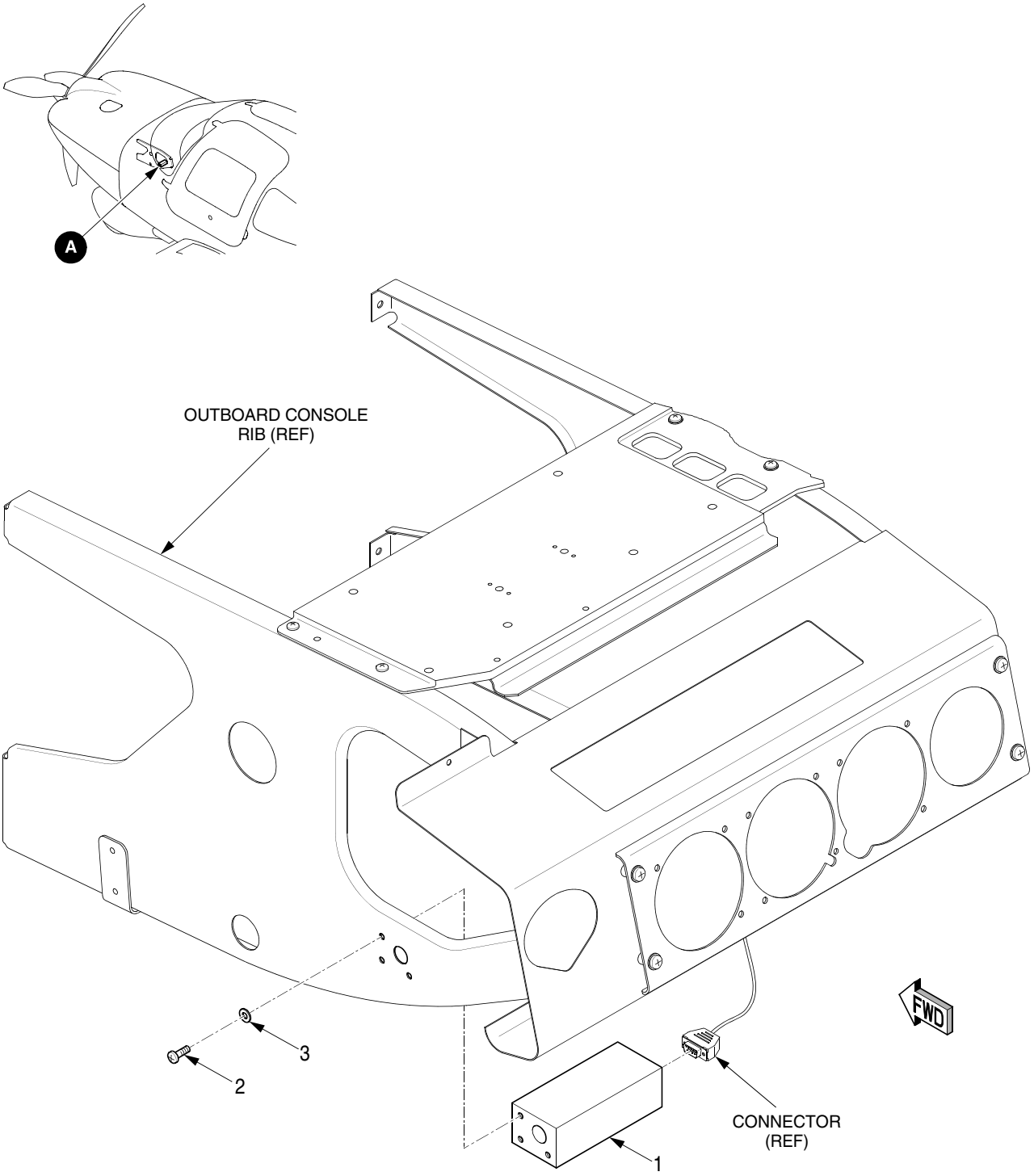


Figure 31-201
Carbon Monoxide Detector Installation - Serials 2016 & subs w/ Perspective Avionics

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RECORDERS

1. DESCRIPTION

This section describes those components used for recording data not related to specific systems. This includes the hour meters and aircraft data logger.

A. Hour Meters

Serials 1005 thru 1632, 1634 thru 1638 before SB 2X-31-01: The airplane is equipped with an hour meter located inside the aft console glove box between the crew seats. Recording begins when the BAT 1 switch is ON and either the ALT 1 or ALT 2 switch is ON.

Serials 1005 thru 1581: 28 VDC for hour meter operation is supplied through the 5-amp ENGINE INST circuit breaker.

Serials 1582 thru 1632, 1634 thru 1638: 28 VDC for hour meter operation is supplied through the 5-amp FUEL QTY / HOBBS circuit breaker on Main Bus 1.

Serials 1633, 1639 & subs and Serials 1005 thru 1632, 1634 thru 1638 after SB 2X-31-01: The airplane is equipped with two hour meters located inside the aft console glove box between the crew seats. The #1 hour meter, labeled HOBBS, begins recording when the BAT 1 switch is ON and either the ALT 1 or ALT 2 switch is ON.

Serials 1633, 1639 thru 2015, 2016 & subs w/o Perspective Avionics and Serials 1005 thru 1632, 1634 thru 1638 after SB 2X-31-01: The #2 hour meter records flight time and is labeled FLIGHT. Recording begins when the airplane reaches a speed of approximately 35 kts and is controlled by a differential pressure switch connected to the pitot-static system.

Serials 2016 & subs w/ Perspective Avionics: The #2 hour meter records flight time and is labeled FLIGHT. Recording begins when the airplane reaches a speed of approximately 35 kts and is controlled by the GEA 71 engine airframe unit.

Serials 1005 thru 1581: 28 VDC for #1 hour meter operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: 28 VDC for both hour meter operation is supplied through the 5-amp FUEL QTY / HOBBS circuit breaker on Main Bus 1.

Serials 2016 & subs w/ Perspective Avionics: 28 VDC for both hour meter operation is supplied through the 3-amp FUEL QTY circuit breaker on Main Bus 1.

B. Aircraft Data Logger - *Serials 1886 & subs*

Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics: The Aircraft Data Logger (ADL) consists of two main components: the Data Transfer Unit (DTU) and the Recoverable Data Module (RDM).

The Data Transfer Unit is located behind the console under the RH glareshield. The DTU-100 controls and writes data to the recoverable data module. A range of inputs are transmitted to the DTU from other devices including GPS and data acquisition unit information, CAPS status, autopilot mode, stall warning, low fuel, and flap position. In addition, voltage levels on two electrical buses are recorded. The Recoverable Data Module is located in the shear web of the aft vertical spar in front of the rudder. Data transmitted to the DTU is formatted and stored to the RDM.

The ADL system is powered by 28 VDC through the 5-amp STALL WARNING circuit breaker on the Essential Bus and the 5-amp FUEL QUANTITY circuit breaker on the Main Bus #1.

Serials 2016 & subs w/ Perspective Avionics: The Aircraft Data Logger (ADL) consists of the Recoverable Data Module (RDM). The RDM, located in the shear web of the aft vertical spar in front of the rudder, receives airplane data from the primary GIA 63W integrated avionics unit.

The ADL system is powered by 28 VDC through the 2-amp STALL WARNING circuit breaker on the Essential Bus 2 and the 3-amp FUEL QTY circuit breaker on the Main Bus 1.

2. MAINTENANCE PRACTICES

A. Hour Meter (See Figure 31-301)

(1) Removal - Hour Meter

(a) *Serials 1005 thru 1581:* Pull ENGINE INSTRUMENTS circuit breaker.

(b) *Serials 1582 & subs:* Pull FUEL QTY / HOBBS circuit breaker.

(c) Remove LH crew seat. (Refer to 25-10)

(d) Remove left aft console trim. (Refer to 25-10)

(e) Disconnect electrical terminals from hour meter.

(f) Open center console glove box.

(g) Using a plastic scraper, gently pry hour meter loose from double sided tape. Remove hour meter from airplane.

(2) Installation - Hour Meter

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Tape, Two Sided Foam, 1/2”	4932 Acrylic Adhesive	3M	Adhesive.

(b) Solvent clean mating surfaces of hour meter and center console bracket. (Refer to 20-30)

(c) Apply two sided tape to hour meter.

(d) Position hour meter to center console bracket and press firmly to adhere.

(e) Connect electrical terminals to hour meter.

(f) Install left aft console trim. (Refer to 25-10)

(g) Install LH crew seat. (Refer to 25-10)

(h) *Serials 1005 thru 1581:* Reset ENGINE INSTRUMENTS circuit breaker.

(i) *Serials 1582 & subs:* Reset FUEL QTY / HOBBS circuit breaker.

B. Differential Pressure Switch - *Serials 1005 thru 1632, 1634 thru 1638 after SB 2X-31-01* (See Figure 31-301)

(1) Removal - Differential Pressure Switch
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.
- (c) *Serials 1582 thru 1632, 1634 thru 1638:* Pull FUEL QTY / HOBBS circuit breaker.
- (d) Remove LH crew seat. (Refer to 25-10)
- (e) Remove access panel CF2L. (Refer to 06-00)
- (f) Disconnect electrical terminals from switch.
- (g) Remove spring clip securing pitot line to switch.
- (h) Remove spring clip securing static line to switch.

(2) Installation - Differential Pressure Switch
- (a) Position pitot line to switch and secure with spring clip.
- (b) Position static line to switch and secure with spring clip.
- (c) Connect electrical terminals to switch.
- (d) Perform Functional Test - Pitot System Leak Test. (Refer to 34-10)
- (e) Perform Functional Test - Static System Leak Test. (Refer to 34-10)
- (f) Install access panel CF2L. (Refer to 06-00)
- (g) Install LH crew seat. (Refer to 25-10)
- (h) *Serials 1005 thru 1581:* Reset ENGINE INST circuit breaker.
- (i) *Serials 1582 thru 1632, 1634 thru 1638:* Reset FUEL QTY / HOBBS circuit breaker.

C. Differential Pressure Switch - *Serials 1639 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 31-301)

(1) Removal - Differential Pressure Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL QTY / HOBBS circuit breaker.

(c) Remove right mid console trim. (Refer to 25-10)

(d) Disconnect electrical terminals from switch.

(e) Remove spring clip securing pitot line to switch.

(f) Remove spring clip securing static line to switch.

(g) Remove screw, washer, and nut securing switch to center console.

(2) Installation - Differential Pressure Switch

(a) Position switch to center console and secure with screw, washer, and nut.

(b) Position pitot line to switch and secure with spring clip.

(c) Position static line to switch and secure with spring clip.

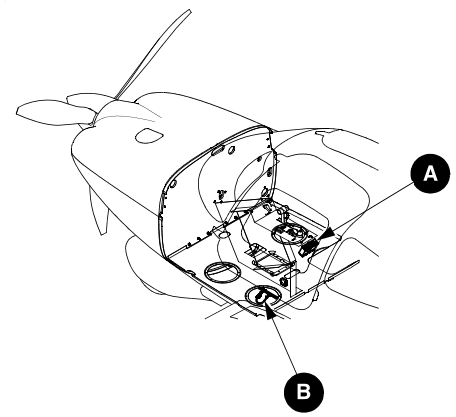
(d) Connect electrical terminals to switch.

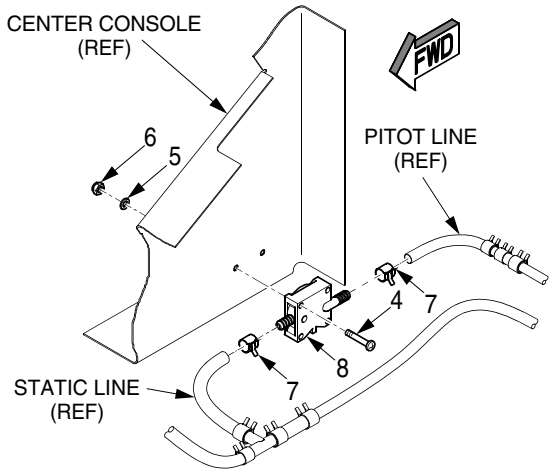
(e) Perform Functional Test - Pitot System Leak Test. (Refer to 34-10)

(f) Perform Functional Test - Static System Leak Test. (Refer to 34-10)

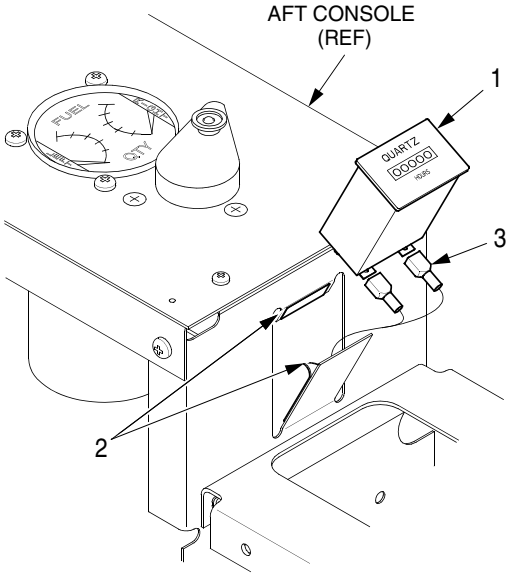
(g) Install right mid console trim. (Refer to 25-10)

(h) Reset FUEL QTY / HOBBS circuit breaker.

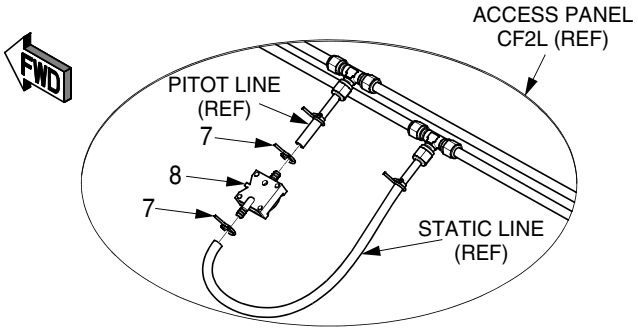




Serials 1633, 1639 & subs.

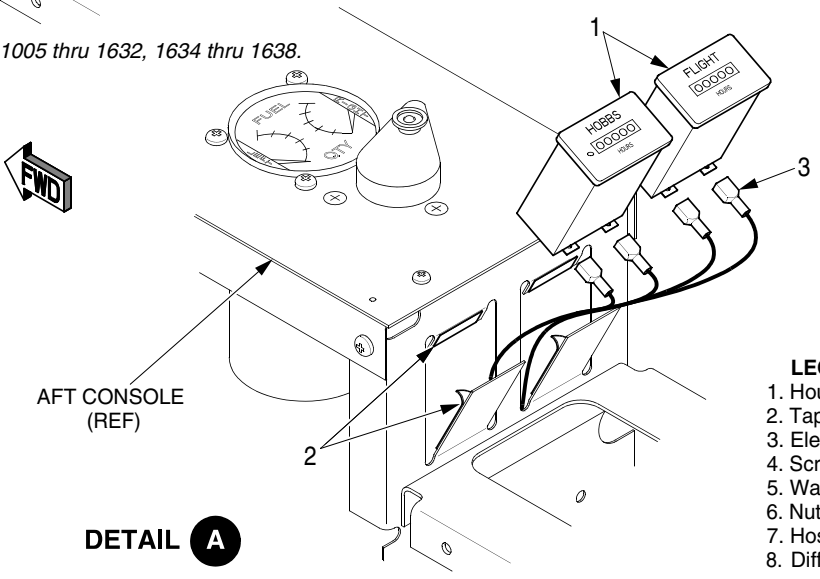


Serials 1005 thru 1632, 1634 thru 1638.



Serials 1005 thru 1632, 1634 thru 1638 after SB 2X-31-01.

DETAIL B



DETAIL A

Serials 1633, 1639 & subs,
Serials 1005 thru 1632, 1634 thru 1638.

LEGEND
1. Hour Meter
2. Tape
3. Electrical Terminal
4. Screw
5. Washer
6. Nut
7. Hose Clamp
8. Differential Pressure Switch

SR20_MM31_1687B

Figure 31-301
Hour Meter Installation

D. Data Transfer Unit - *Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 31-302)

(1) Removal - Data Transfer Unit (DTU)

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL QTY and STALL WARNING circuit breakers.

(c) Remove RH kick plate. (Refer to 25-10)

(d) Disconnect transfer cable from DTU.

(e) At RH forward console, remove screws and washers securing DTU to attach brackets. Remove DTU from airplane.

(2) Installation - Data Transfer Unit (DTU)

(a) At RH forward console, position DTU to attach brackets and secure with screws and washers.

(b) Connect transfer cable connector to DTU.

(c) Install RH kick plate. (Refer to 25-10)

(d) Reset FUEL QTY and STALL WARNING circuit breakers

(e) Perform Operational Test - Aircraft Data Logger System. (Refer to 31-30)

E. Data Transfer Unit Brackets - *Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 31-302)**

(1) Removal - Data Transfer Unit Brackets

(a) Remove data transfer unit. (Refer to 31-30)

(b) Remove screws, washers, and nuts securing aft attach bracket to console ribs. Remove aft attach bracket.

(c) Remove screws and washers securing forward attach bracket to strut between console ribs. Remove forward attach bracket.

(2) Installation - Data Transfer Unit Brackets

(a) Position forward attach bracket to strut between console ribs and secure with screws and washers.

(b) Position aft attach bracket to console ribs and secure with screws, washers, and nuts.

(c) Install data transfer unit. (Refer to 31-30)

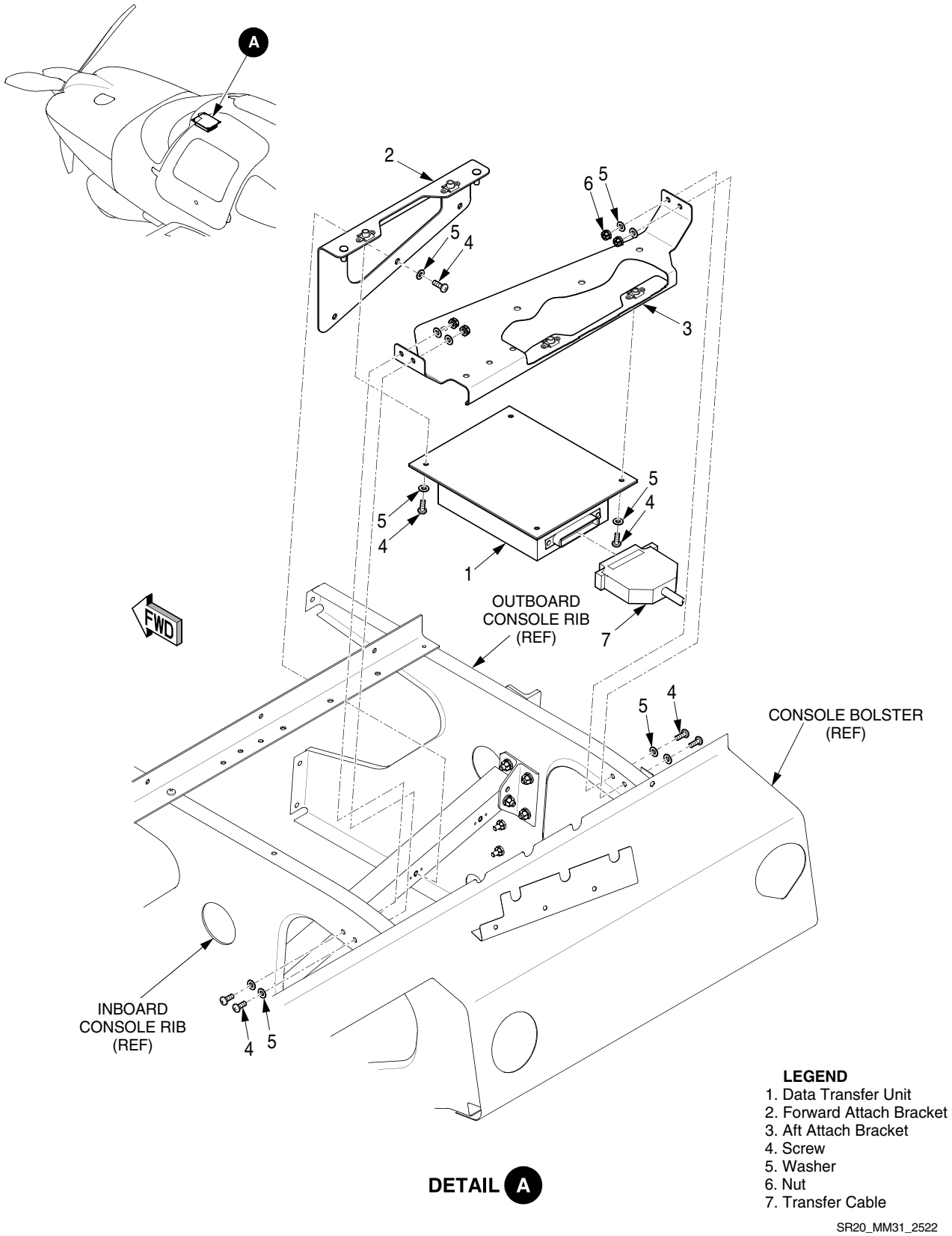


Figure 31-302
Data Transfer Unit Installation - Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics

EFFECTIVITY:
Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics

F. Recoverable Data Module (RDM) - *Serials 1886 & subs* (See Figure 31-303)

(1) Removal - Recoverable Data Module

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull FUEL QTY and STALL WARNING circuit breakers.

(c) *Serials 2016 & subs w/ Perspective Avionics:* Pull GPS NAV GIA 1 circuit breaker.

(d) Remove access panel RE2. (Refer to 06-00)

(e) Remove access panel LE1. (Refer to 06-00)

(f) Remove rudder. (Refer to 55-40)

Note: To facilitate access to RDM cable and cable ties, the pitch trim cartridge may be disconnected from the aft empennage bellcrank. (Refer to 27-30)

(g) Remove cable ties securing RDM cable to empennage.

(h) Disconnect RDM connector from wire harness.

(i) Remove screws and washers securing RDM to empennage. Remove RDM from airplane.

(2) Installation - Recoverable Data Module

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant	Loctite 5140	Henkel	Seal connectors.
Acid Brush, 3/8 inch, Horsehair	-	Any Source	Coat connectors.

(b) Position RDM to empennage and secure with screws and washers.

(c) Mate RDM connector halves together and lock.

(d) Temporarily orient and stabilize connectors in a level position inside tail area with open back-shells facing up.

Note: Use brush to coat entire inside of back-shell with sealant, including wiring, connector body, walls and ring lug. Ensure small gaps and features between wires and connector are coated.

(e) Coat outer surfaces of mated connectors with sealant.

(f) Pour sealant into open connector backshells to fill up to top of connector. Allow 24 hours undisturbed to cure.

(g) Attach backshell cover plates and brush coat entire outer surface of mated connectors including connector interfaces and cable entries. Allow time to cure.

WARNING: Verify no interference exists between RDM cable and flight controls.

CAUTION: Ensure mated connectors are secured along fuselage wall and off BL0 floor.

(h) Install cable ties securing RDM to empennage.

(i) If disconnected during removal, connect pitch trim cartridge to aft empennage bellcrank. (Refer to 27-30)

(j) Install rudder. (Refer to 55-40)

(k) Install access panel LE1. (Refer to 06-00)

(l) Install access panel RE2. (Refer to 06-00)

(m) Reset FUEL QTY and STALL WARNING circuit breakers.

(n) *Serials 2016 & subs w/ Perspective Avionics:* Reset GPS NAV GIA 1 circuit breaker.

(o) Perform Operational Test - Aircraft Data Logger System. (Refer to 31-30)

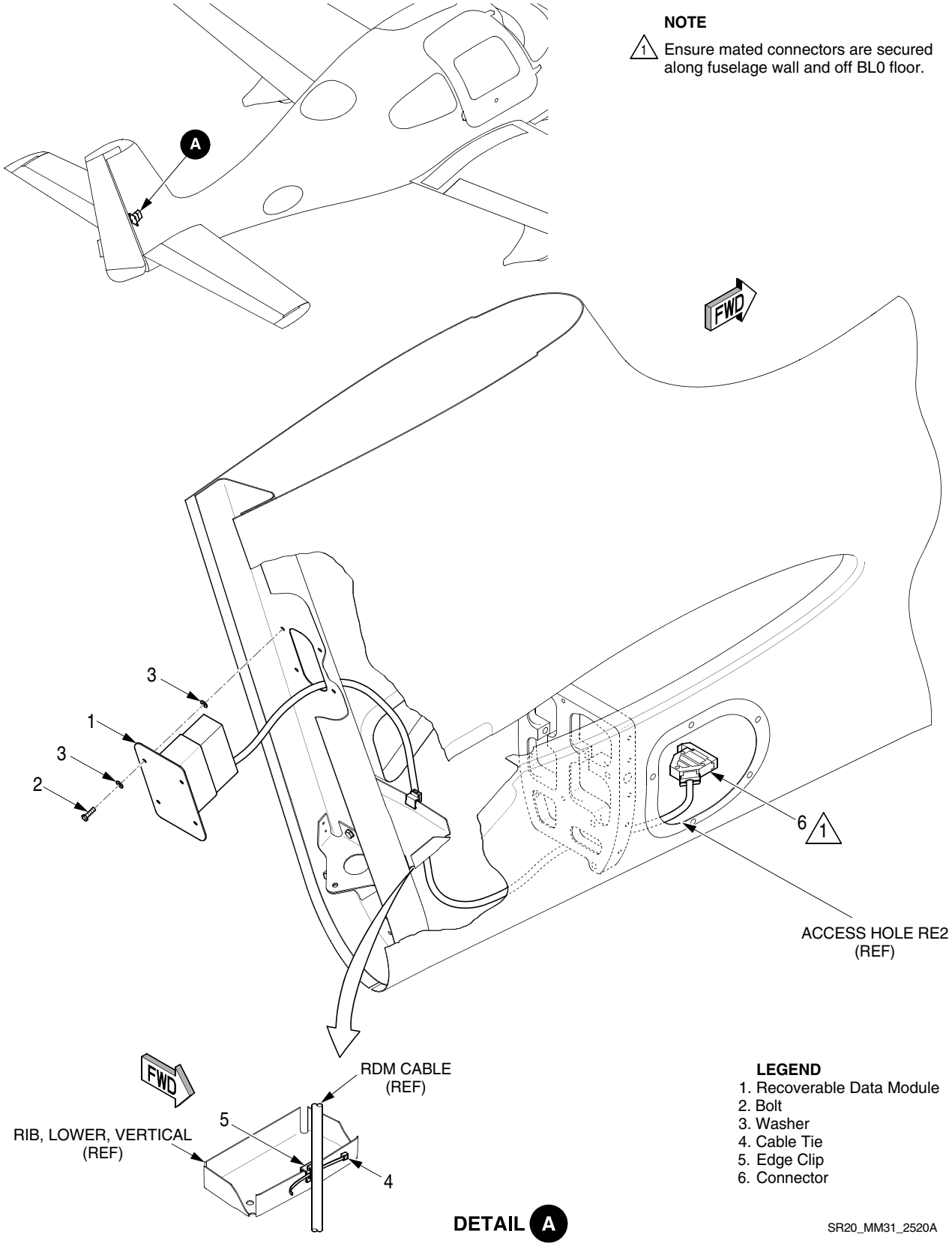


Figure 31-303
Recoverable Data Module Installation - Serials 1886 & subs

EFFECTIVITY:
Serials 1886 & subs

G. Operational Tests - Aircraft Data Logger System - *Serials 1886 & subs*

(1) Operational Test - Aircraft Data Logger System - *Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics*

Note: During the system power-up sequence, the diagnostic LED does illuminate briefly. This is a normal indication that the system is functioning properly.

(a) Set BAT 1 switch to ON position.
(b) Open center armrest console, and remove glove box trim. (Refer to 25-10)
(c) Locate Diagnostic LED, and observe if illuminated.
(d) If LED is not illuminated, the system is functioning properly.
(e) If LED is illuminated, the data transfer unit is not receiving communications from the recoverable data module. Perform the following:
1 Verify transfer cable connections between data transfer unit and recoverable data module.
2 If LED remains illuminated, the Recoverable Data Module has failed. No replacement parts are currently available from the manufacture. Placard Diagnostic LED with label reading “ADL SYSTEM INOPERATIVE”. A Service Advisory will be released when parts become available.
(f) Install glove box trim. (Refer to 25-10)
(g) Set BAT 1 switch to OFF position.

(2) Operational Test - Aircraft Data Logger System - *Serials 2016 & subs w/ Perspective Avionics*
(a) Set BAT 1 switch to ON position.
(b) Open center armrest console and remove glove box trim to access diagnostic LED. (Refer to 25-10)
(c) Verify diagnostic LED indicates normal operation (2Hz continuous blink). If diagnostic LED does not indicate normal operation, refer to the following troubleshooting table.

Note: During system power-up sequence, the diagnostic LED will briefly cycle through conditions 1, 3, and 4 before reaching final condition 5.

Condition	LED Status	RDM Status	Troubleshooting
1	Off	No power to RDM	Verify power connections to RDM. If condition remains, replace RDM. If condition still remains, contact Cirrus for disposition.
2	Steady on	RDM failure	Verify power and data connections to RDM. If condition remains, replace RDM. If condition still remains, contact Cirrus for disposition.
3	Blinking 0.25 second on, 0.25 second off	RDM initializing	Verify power and data connections to RDM. If condition remains, replace RDM. If condition still remains, contact Cirrus for disposition.

Condition	LED Status	RDM Status	Troubleshooting
4	Blinking 1.0 second on, 1.0 second off	No data from GIA 63W Integrated Avionics Unit	Verify data connections from GIA 63W to RDM. If condition remains, replace RDM. If condition still remains, contact Cirrus for disposition.
5	Three to four 0.03 second blinks per second	Normal operation	-

(d) Install glove box trim. (Refer to 25-10)

(e) Set BAT 1 switch to OFF position.

CENTRAL COMPUTERS

1. DESCRIPTION

This section describes those components used for computing data from a number of different sources without a preponderance of functions in any one system. This includes the GIA 63W integrated avionics unit.

The airplane is equipped with two GIA 63W integrated avionics units located behind the PFD and MFD, respectively. The GIA 63W functions as the main communications hub for the Perspective Avionics system, linking all system components with the PFD and MFD. The main processor interfaces with all of the Perspective Avionics components and performs calculations for the GFC 700 autopilot. The integrated avionics units are not paired together and do not communicate with each other directly.

Each GIA 63W integrated avionics unit contains the following:

- A 15 channel WAAS certified GPS receiver.
- A VHF COM transceiver that provides tuning from 118.00 to 136.975 MHz in 25 kHz or 8.33 kHz spacing for 760 or 3040 channel configuration respectively.
- A VOR/ILS localizer receiver that provides tuning from 108.00 to 117.95 MHz in 50 kHz increments.
- An ILS glideslope receiver that provides tuning from 328.6 to 335.4 MHz as paired with the frequency tuned on the VOR/ILS localizer receiver.
- A flight director system if optional automatic flight control system is installed.
- System Integration microprocessors.

28 VDC for GIA 63W integrated avionics unit 1 operation is supplied through the 7.5-amp COM 1 and 5-amp GPS NAV GIA 1 circuit breakers on Essential Bus 1. 28 VDC for GIA 63W integrated avionics unit 2 operation is supplied through the 7.5-amp COM 2 and 5-amp GPS NAV GIA 2 circuit breakers on Main Bus 2.

The GIA 63W integrated avionics unit is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
NAV1 or COM 1 not receiving valid data.	Software or configuration error.	Check PFD Alert Window for GIA1 configuration, software, or failed data path error messages. Correct any errors before proceeding.
	GIA 63 integrated avionics unit is offline.	Swap GIA1 and GIA2 and reconfigure for new positions to verify location of problem. If problem follows GIA1, replace GIA1. Check Ethernet interconnect from GIA1 to PFD and unit connector pins for faults. If problem persists, replace PFD.
NAV2 or COM 2 not receiving valid data.	Software or configuration error.	Check PFD Alert Window for GIA2 configuration, software, or failed data path error messages. Correct any errors before proceeding.
	GIA 63 integrated avionics unit is offline.	Swap GIA1 and GIA2 and reconfigure for new positions to verify location of problem. If problem follows GIA2, replace GIA2. Check Ethernet interconnect from GIA2 to MFD and unit connector pins for faults. If problem persists, replace MFD.

Trouble	Probable Cause	Remedy
GPS INTEG or Time not receiving valid data.	Software configuration problem.	Check PFD Alert Window for GIA1/2 configuration, software or failed data path error messages. Correct any errors before proceeding.
	External interference from nearby objects.	Check for possible external interference to the GPS receivers. 1. Verify the aircraft is located where the GPS antennas have a clear view of the sky. 2. Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. 3. Turn to the MFD AUX – GPS STATUS page and check the GPS strength bars on both GPS receivers. If the signal strength levels are erratic, disappear and reappear rapidly, or switch between a solid and hollow bar frequently there is an external device interfering with the GPS receivers. Turn off any devices that radiate a signal in the local area or move the aircraft to another location to remove the interference. 4. Verify the aircraft is not parked in close proximity to a hanger with the doors open and equipped with a GPS repeater.
	GIA 63 integrated avionics unit is offline.	Verify the GIA's are online by checking for a green checkmark next to the GIA on the MFD Aux – System Status page. If a GIA is not online (a Red-X will be present instead of a green check mark), check for power input faults. Refer to the GIA GPS Troubleshooting Section for additional actions.

3. MAINTENANCE PRACTICES

A. GIA 63W Integrated Avionics Unit - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 31-401)

(1) Removal - GIA 63W Integrated Avionics Unit 1

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull COM 1 and GPS 1 / NAV 1 circuit breakers.

(c) Remove PFD. (Refer to 31-60)

(d) Loosen screw securing handle-lock mechanism to integrated avionics unit.

(e) Lift handle-lock mechanism to disengage integrated avionics unit from connectors.

(f) Remove integrated avionics unit from mounting rack.

(2) Installation - GIA 63W Integrated Avionics Unit 1

(a) Position integrated avionics unit to mounting rack, ensuring handle-lock mechanism engages slot on side of rack.

(b) Using handle-lock mechanism, gently push integrated avionics unit into mounting rack to engage connectors.

(c) Position handle-lock mechanism to integrated avionics unit and secure with screw.

(d) Install PFD. (Refer to 31-60)

(e) Reset COM 1 and GPS 1 / NAV 1 circuit breakers.

(f) If GIA 63W units have been installed in opposite locations, perform Functional Test - GIA 63W Location Reconfiguration. (Refer to 31-40)

(g) If GIA 63W has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(3) Removal - GIA 63W Integrated Avionics Unit 2

(a) Pull COM 2 and GPS 2 / NAV 2 circuit breakers.

(b) Remove MFD. (Refer to 31-60)

(c) Loosen screw securing handle-lock mechanism to integrated avionics unit.

(d) Lift handle-lock mechanism to disengage integrated avionics unit from connectors.

(e) Remove integrated avionics unit from mounting rack.

(4) Installation - GIA 63W Integrated Avionics Unit 2

(a) Position integrated avionics unit to mounting rack, ensuring handle-lock mechanism engages slot on side of rack.

(b) Using handle-lock mechanism, gently push integrated avionics unit into mounting rack to engage connectors.

(c) Position handle-lock mechanism to integrated avionics unit and secure with screw.

(d) Install MFD. (Refer to 31-60)

(e) Reset COM 2 and GPS 2 / NAV 2 circuit breakers.

(f) If GIA 63W units have been installed in opposite locations, perform Adjustment/Test - GIA 63W Location Reconfiguration. (Refer to 31-40)

(g) If GIA 63W has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(5) Adjustment/Test - GIA 63W Location Reconfiguration

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

CAUTION: Failure to remove database cards may result in cards becoming corrupted.

(c) Remove SD cards from top and bottom slots of MFD and PFD.

(d) Insert Cirrus Perspective software loader card into top slot of PFD.

(e) Perform GIA 63W Reconfiguration according to Cirrus Perspective Line Maintenance Manual.

(f) Remove Cirrus Perspective software loader card from PFD.

(g) Insert SD cards into top and bottom slots of MFD and PFD.

(h) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(i) Disconnect 28 ±1 VDC external power from external power receptacle.

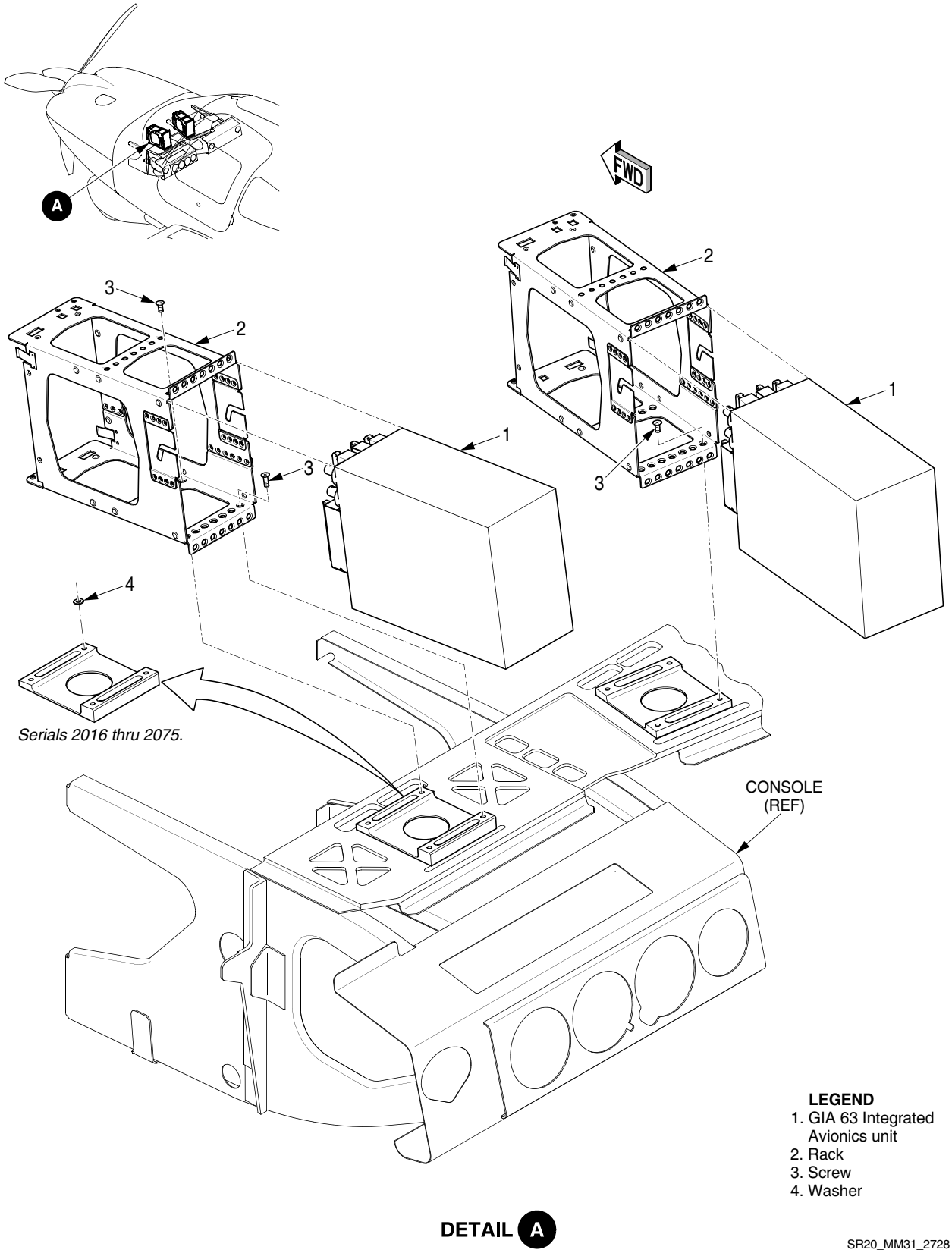


Figure 31-401
GIA 63W Integrated Avionics Unit - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

CENTRAL WARNING SYSTEMS

1. DESCRIPTION

This section describes the Central Warning Systems which consists of an Annunciator Panel and related sensors and switches.

A. Annunciator Panel - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The annunciator assembly is mounted on the flight instrument panel and contains six annunciators. Each annunciator has two individual LEDs as light sources. The annunciator panel has bright, dim, and test modes, which are activated by a toggle switch mounted next to the annunciator panel. In test mode all annunciators illuminate in the bright mode, allowing the pilot to verify that all LEDs are functional. The entire annunciator assembly is mounted on a printed circuit board, which decodes information from the individual sensors and illuminates the necessary annunciator. 28 VDC for annunciator operation is supplied through the 2-amp ANNUNCIATOR POWER circuit breaker on the Essential Bus.

The OIL annunciator will illuminate if the oil temperature is greater than 240° F or if the oil pressure is less than 10 PSI. The oil pressure/oil temperature gage provides a logic low signal if either the oil pressure or oil temperature meets the above temperature or pressure criteria. The OIL annunciator illuminates red.

The original FUEL annunciator will illuminate if the fuel quantity is less than 8.5 ± 0.5 gallons in both tanks. The fuel quantity gage provides a logic low signal when each tank is below 8.5 ± 0.5 gallons. The annunciator decodes these two signals and illuminates when both signals are low.

Note: A spare to the original annunciator will illuminate if the fuel quantity is less than 8.5 ± 0.5 gallons in either tank. The fuel quantity gage provides a logic low signal when either tank is below 8.5 ± 0.5 gallons. The annunciator decodes each signal and illuminates when either signal is low. See the IPC for more information (Refer to IPC, Annunciator Panel for approved replacement).

The FUEL annunciator illuminates amber.

The LOW VOLTS annunciator will illuminate under low RPM conditions or if the system voltage falls below 25.0 ± 0.35 volts. The MCU provides a logic low signal when the voltage is low. The LOW VOLTS annunciator illuminates red.

Serials 1005 thru 1267: The VACUUM annunciator will illuminate if the system vacuum is below 3.0 ± 0.25 in Hg. A vacuum sensor, mounted on the main vacuum side of the vacuum manifold, provides a logic low signal when the vacuum falls to unacceptable levels. The VACUUM annunciator illuminates red.

Serials 1005 thru 1267: The AUX VAC annunciator will illuminate if the standby vacuum pump operates. The vacuum switch on the standby side of the vacuum manifold provides a ground when the pump is activated and working correctly. The AUX VAC annunciator illuminates amber.

Serials 1268 & subs: The ALT 1 annunciator provides two indications. During an overload condition, when alternator 1 is generating more than maximum rated alternator amperage, the light will flash approximately 40 times per minute. When the alternator is generating less than 2.0 ± 2.0 amps, the ALT 1 annunciator will illuminate steady, notifying the pilot that the alternator is not generating power. The ALT 1 annunciator illuminates amber.

Serials 1268 & subs w/o single alternator SRV: The ALT 2 annunciator also provides two indications. During an overload condition, where alternator 2 is generating more than maximum rated alternator amperage, the light will flash approximately 40 times per minute. When the alternator is generating less than 2.0 ± 2.0 amps, the ALT 2 annunciator will illuminate steady, notifying the pilot that the alternator is not generating power. The ALT 2 annunciator illuminates amber.

The PITOT HEAT annunciator will illuminate if the pitot heat is inoperative. If the Pitot Heat switch is “ON” and there is no current in the line, indicating a circuit malfunction, the PITOT HEAT annunciator

will illuminate. A current sensor provides a logic low signal to the annunciator when current is absent in the pitot heat circuit and the pitot heat switch is “ON”. The PITOT HEAT annunciator illuminates amber.

Serials 1441 thru 2015 w/ TAWS, 2016 & subs w/ TAWS and w/o Perspective Avionics: TAWS terrain annunciations and control functions are incorporated into the Annunciator Panel. The panel consists of a momentary push button switch (SELF TEST), an illuminated push button switch (TERR INHIBIT), and three LEDS for Terrain Warning (TERR WARN), Terrain Caution (TERR CAUT), and Terrain Inoperative (TERR INOP). The annunciators are dimmed via the instrument panel lighting bus. The TAWS annunciator panel is powered by 28 VDC through the 2-amp ANNUN circuit breaker on the Essential Bus.

B. Crew Alerting System - *Serials 2016 & subs w/ Perspective Avionics*

Aircraft annunciations and alerts are displayed in the Crew Alerting System (CAS) window located to the right of the altimeter and VSI. Aircraft annunciations are grouped by criticality and sorted by order of appearance with the most recent message on top. The color of the message text is based on its urgency and required action:

- Warning (red) – Immediate crew awareness and action required.
- Caution (yellow) – Immediate crew awareness and future corrective action required.
- Advisory (white) – Crew awareness required and subsequent action may be required.

In combination with the CAS window, the system issues an audio alert when specific system conditions are met and an expanded description of the condition is displayed in the Alerts Window located in the lower RH corner of the PFD.

For additional Crew Alerting System information for the Perspective Integrated Avionics System refer to the latest revision of Cirrus Perspective Line Maintenance Manual, Garmin publication number 190-00920-00.

Refer to the following Figures for detailed descriptions of CAS messages. (See Figure 31-501),(See Figure 31-502),(See Figure 31-503),(See Figure 31-504),(See Figure 31-505), (See Figure 31-506)

2. CIRRUS PERSPECTIVE ANNUNCIATIONS AND ALERTS

CAS Warning Text	Alerts Window Text	Definition
AUTO DESCENT	Aircraft descent to 14,000 feet in 60 seconds.	Emergency descent warning.
AUTO DESCENT	Aircraft descent to 14,000 feet.	Emergency descent in progress (initial descent)
AUTO DESCENT	Aircraft descent to 12,500 feet.	Emergency descent in progress (secondary descent)
BRAKE TEMP	Brake temperature is high.	Brake temperature > 293°F.
CHT	Cylinder head temperature is high.	Temperature of one or more cylinder heads > 460°F.
CO LVL HIGH	Carbon monoxide level is too high.	Carbon monoxide level is too high.
ESS BUS	Check essential power bus voltage.	Voltage output for Alternator 1 or Alternator 2 < 24.5v for more than 20 seconds or > 32.0v. This is usually associated with an Alternator 1 or Alternator 2 failure and will be displayed in combination with a M BUS 1 or M BUS 2 voltage annunciation for the corresponding Alternator.
FUEL FLOW	Check fuel flow.	Fuel flow > 30 GPH.
FUEL QTY	Check fuel tank levels.	Fuel Totalizer quantity < 9 gallons.
M BUS 1	Check main power bus 1 voltage.	Alternator voltage output > 32.0v. This is usually associated with an alternator failure
M BUS 2	Check main power bus 2 voltage.	Alternator voltage output > 32.0v. This is usually associated with an alternator failure
OIL PRESSURE	Oil pressure is out of range.	Oil pressure < 10 psi or > 100 psi. If low oil pressure is low, the engine has probably lost a significant amount of its oil and engine failure may be imminent. If low oil pressure is accompanied by normal oil temperature, it is possible that the oil pressure sensor, gage, or relief valve is malfunctioning.
OIL TEMP	Oil temperature is high.	Oil temperature > 240°F.
OXYGEN FAULT	*Serials w/ Oxygen:* Oxygen system fault.	Tank solenoid has failed (open or closed) or flow rate is low. If flow is checked and confirmed present, solenoid has failed open.
OXYGEN QTY	*Serials w/ Oxygen:* Oxygen quantity is low.	Altitude > 10,000 ft and tank pressure < 400 psi.
RPM	Check engine RPM.	Engine speed is between 2710 RPM and 2730 RPM for 10 seconds or more, OR engine speed > 2730 RPM for 5 seconds or more.

Figure 31-501
CAS Warning Messages

CAS Warning Text	Alerts Window Text	Definition
STALL	Stall warning.	Impending stall.
START ENGAGED	Starter is engaged.	Starter stuck engaged. MCU detects 24 VDC to Starter 30 seconds after initial engagement.
UNDERSPEED PROTECT ACTIVE	None	Underspeed Protection (USP) is active.

Figure 31-501
CAS Warning Messages (Continued)

CAS Caution Text	Alerts Window Text	Definition
ALT 1	Check alternator 1 current.	Illumination of ALT 1 indicates that the ampere output < 2 amps for 20 seconds or more.
ALT 2	Check alternator 2 current.	Illumination of ALT 2 indicates that the ampere output < 2 amps for 20 seconds or more.
ALT AIR OPEN	Alternate air door is open.	Alternate air door is open.
AP MISCOMPARE	Autopilot miscompare, autopilot is not available.	Autopilot miscompare, autopilot is not available.
AP/PFD DIF ADC	Autopilot and PFD are using different ADCs.	Autopilot and PFD are using different ADCs.
AP/PFD DIF AHRS	Autopilot and PFD are using different AHRSs.	Autopilot and PFD are using different AHRSs.
AVIONICS OFF	Avionics master switch is off.	Avionics master switch is off.
BATT 1	Check battery 1 current.	Battery 1 current is discharging at a rate > 4 amps for 30 seconds or more.
BRAKE TEMP	Brake temperature is high.	Brake temperature is between 270°F and 293°F for more than 5 seconds.
CHT	Cylinder head temperature is high.	Temperature of one or more cylinder heads has exceeded 420°F.
FLAP OVERSPEED	Flaps are extended beyond airspeed limitations.	Flaps at 100%, airspeed > 109 KIAS for 5 seconds or more, OR Flaps at 50%, airspeed > 124 KIAS for 5 seconds or more.
FUEL FILTER	Fuel filter in bypass	The fuel filter is in bypass mode. The fuel filter element must be replaced.
FUEL QTY	Check fuel tank levels.	Check fuel tank levels.
M BUS 1	Check main power bus 1.	Illumination of M BUS 1 indicates that the alternator voltage output < 24.5v. This is usually associated with an alternator failure.
M BUS 2	Check main power bus 2.	Illumination of M BUS 2 indicates that the alternator voltage output < 24.5v. This is usually associated with an alternator failure.
NO ADC MODES	Autopilot air data modes are not available.	Autopilot air data modes are not available.
NO VERT MODES	Autopilot vertical modes are not available.	Autopilot vertical modes are not available.
OIL PRESSURE	Oil pressure is out of range.	Oil pressure between 10 psi and 30 psi at or above 1000 RPM. This message will appear prior to engine start and should clear after engine start.

Figure 31-502
CAS Caution Messages

CAS Caution Text	Alerts Window Text	Definition
OIL TEMP	Oil temperature is high.	Oil temperature > 235°F.
OXYGEN QTY	*Serials w/ Oxygen:* Oxygen quantity is low.	Altitude > 10,000 ft and tank pressure < 800 psi.
OXYGEN RQD	*Serials w/ Oxygen:* Oxygen is required.	Oxygen is required.
PARK BRAKE	Parking break is set.	Parking break is set.
PITOT HEAT FAIL	Pitot heat failure.	Pitot heat failure. Displayed when Pitot heat switch is ON and Pitot heat current is not detected.
PITOT HEAT REQD	Pitot heat is required.	Displayed 20 seconds after system detects OAT < 41°F (5°C) and Pitot Heat Switch is OFF.
START ENGAGED	Starter is engaged.	Starter stuck engaged. MCU detects 24 VDC to Starter 15 seconds after initial engagement.

Figure 31-502
CAS Caution Messages (Continued)

CAS Advisory Text	Alerts Window Text	Definition
ALTITUDE SEL	Climbing away from selected altitude.	Climbing away from selected altitude for more than 5 seconds.
ALTITUDE SEL	Descending away from selected altitude.	Descending away from selected altitude for more than 5 seconds.
ARE YOU ALERT?	Are you alert?	No pilot interaction within a reasonable time period.
COURSE SEL	Current track will not intercept selected course.	Current track will not intercept selected course.
HIGH MP FF	Avoid fuel flow 18 to 30 GPH and MP above 26”.	Avoid fuel flow 18 to 30 GPH and MP above 26”.
L FUEL QTY	Check left fuel tank level.	Left fuel quantity < 18 gallons.
OXYGEN LEFT ON	*Serials w/ Oxygen:* Oxygen system is left on after shutdown.	Oxygen system is left on after shutdown.
OXYGEN QTY	*Serials w/ Oxygen:* Oxygen quantity is low.	Altitude < 10,000 ft and tank pressure < 800 psi.
R FUEL QTY	Check right fuel tank level.	Right fuel quantity < 18 gallons.

Figure 31-503
CAS Advisory Messages

Comparator Window Text	Condition
ALT MISCOMP	Difference in altitude sensors > 200 ft. If both airspeed sensors detect < 35 knots, this is inhibited.
IAS MISCOMP	If either airspeed sensor detects > 35 knots, and the difference in sensors > 10 kts. If either airspeed sensor detects > 80 knots, and the difference in sensors > 7 knots.
HDG MISCOMP	Difference in heading sensors > 6 degrees.
PIT MISCOMP	Difference in pitch sensors > 5 degrees.
ROL MISCOMP	Difference in roll sensors > 6 degrees.
ALT NO COMP	No data from one or both altitude sensors.
IAS NO COMP	No data from one or both airspeed sensors.
HDG NO COMP	No data from one or both heading sensors.
PIT NO COMP	No data from one or both pitch sensors.
ROL NO COMP	No data from one or both roll sensors.

Figure 31-504
CAS Comparator Window Messages

Reversionary Sensor Window Text	Condition
USING ADC2	The PFD is displaying data from the #2 Air Data Computer.
USING AHRS2	The PFD is displaying data from the #2 AHRS.

Figure 31-505
CAS Reversionary Sensor Messages

Alerts Window Message	Condition
CO DET FAIL – The carbon monoxide detector is inoperative.	Carbon monoxide detector fault.
CO DET SRVC – The carbon monoxide detector needs service.	Carbon monoxide detector fault.
ESP CONFIG – ESP config error. Config service required.	ENABLE / unlock mis-match for ESP. Software for ESP option was not installed as specified in Service Bulletin 2X-22-07.
ESP FAIL – ESP is inoperative.	GFC 700 is unavailable.
ESP OFF – ESP selected off.	Pilot DISABLED ESP.
ESP DEGRADE – ESP IAS mode is inoperative.	ADC failure, limited GFC availability.
FAILED PATH – An autopilot servo data path has failed.	Servo or servo wiring fault.

Figure 31-506
CAS Alerts Messages

Alerts Window Message	Condition
MFD FAN FAIL – The cooling fan for the MFD is inoperative.	
PFD FAN FAIL – The cooling fan for PFD is inoperative.	

Figure 31-506
CAS Alerts Messages (Continued)

3. MAINTENANCE PRACTICES

A. Annunciator Panel - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 31-507)

(1) Removal - Annunciator Panel

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ANNUNCIATOR PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Remove dress nut and washers securing annunciator toggle switch to instrument panel.

(e) Disconnect electrical connector from annunciator.

(f) *Serials 1441 thru 2015 w/ TAWS, 2016 & subs w/ TAWS and w/o Perspective Avionics:* Disconnect LED wire harness.

Note: Label all wires and pins before disconnecting to facilitate re-installation.

1 Disconnect J703 connector from wire harness.

2 At S500 connector, depin LED wires at pin locations 1 and 3.

(g) Remove screws, washers, and nuts securing annunciator to instrument panel. Remove annunciator from airplane.

(2) Installation - Annunciator Panel

(a) Position annunciator to instrument panel and secure with screws, washers, and nuts.

(b) *Serials 1441 thru 2015 w/ TAWS, 2016 & subs w/ TAWS and w/o Perspective Avionics:* Connect LED wire harness.

1 At S500 connector, pin LED wires at pin locations 1 and 3.

2 Connect J703 connector to wire harness.

(c) Connect electrical connector to annunciator.

(d) Install washer on toggle switch and position on instrument panel so keyway on switch faces down. Install washer and dress nut.

(e) Install glareshield. (Refer to 25-10)

(f) Reset ANNUNCIATOR PANEL circuit breaker.

(g) Perform Functional Test - Annunciator Panel. (Refer to 31-50)

(3) Functional Test - Annunciator Panel

(a) Ensure that all flight controls are clear.

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Pull Starter Relay and Fuel Pump Relay circuit breaker.

(d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(e) Set annunciator switch to center BRIGHT position.

(f) If each tank has less than 8.5 gallons, ensure FUEL annunciator light is on.

(g) Ensure OIL annunciator light is on.

(h) Check functionality of LOW VOLTS annunciator.

1 Turn off external power supply.

Note: If system voltage is less than 24.5 ±2.0 VDC, the LOW VOLTS annunciator light is on.

2 Turn on large electrical loads (landing light, nav lights, pitot heat, etc.) until the LOW VOLTS annunciator light is on.

3 Turn off loads and turn on external power supply.

(i) Ensure ALT 1 annunciator light is on.

(j) Ensure ALT 2 annunciator light is on.

(k) Ensure PITOT HEAT annunciator light is off.

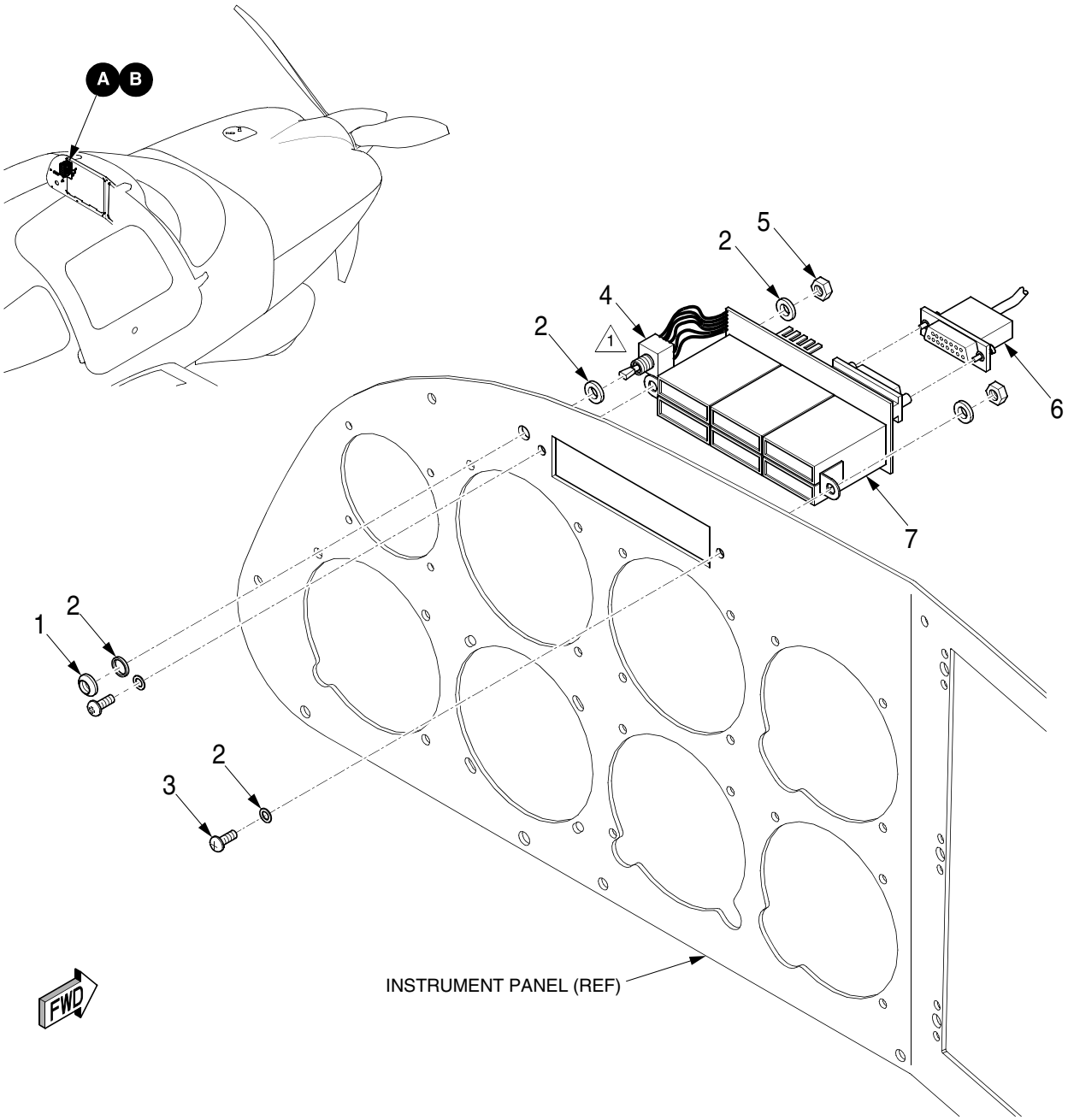
(l) Set annunciator switch to DIM position.
Annunciator lights will dim.

(m) Set annunciator switch to TEST position.
Annunciator lights will brighten.

(n) Ensure annunciator legends and colors are correct.

OIL	Red
LOW VOLTS	Red
FUEL	Amber
PITOT HEAT	Amber
ALT 1	Amber
ALT 2	Amber

(o) Disconnect 28 ±1 VDC external power from external power receptacle.



LEGEND
1. Dress Nut
2. Washer
3. Screw
4. Toggle Switch
5. Nut
6. Electrical Connector
7. Annunciator

NOTE

1 Keyway on toggle switch faces down.

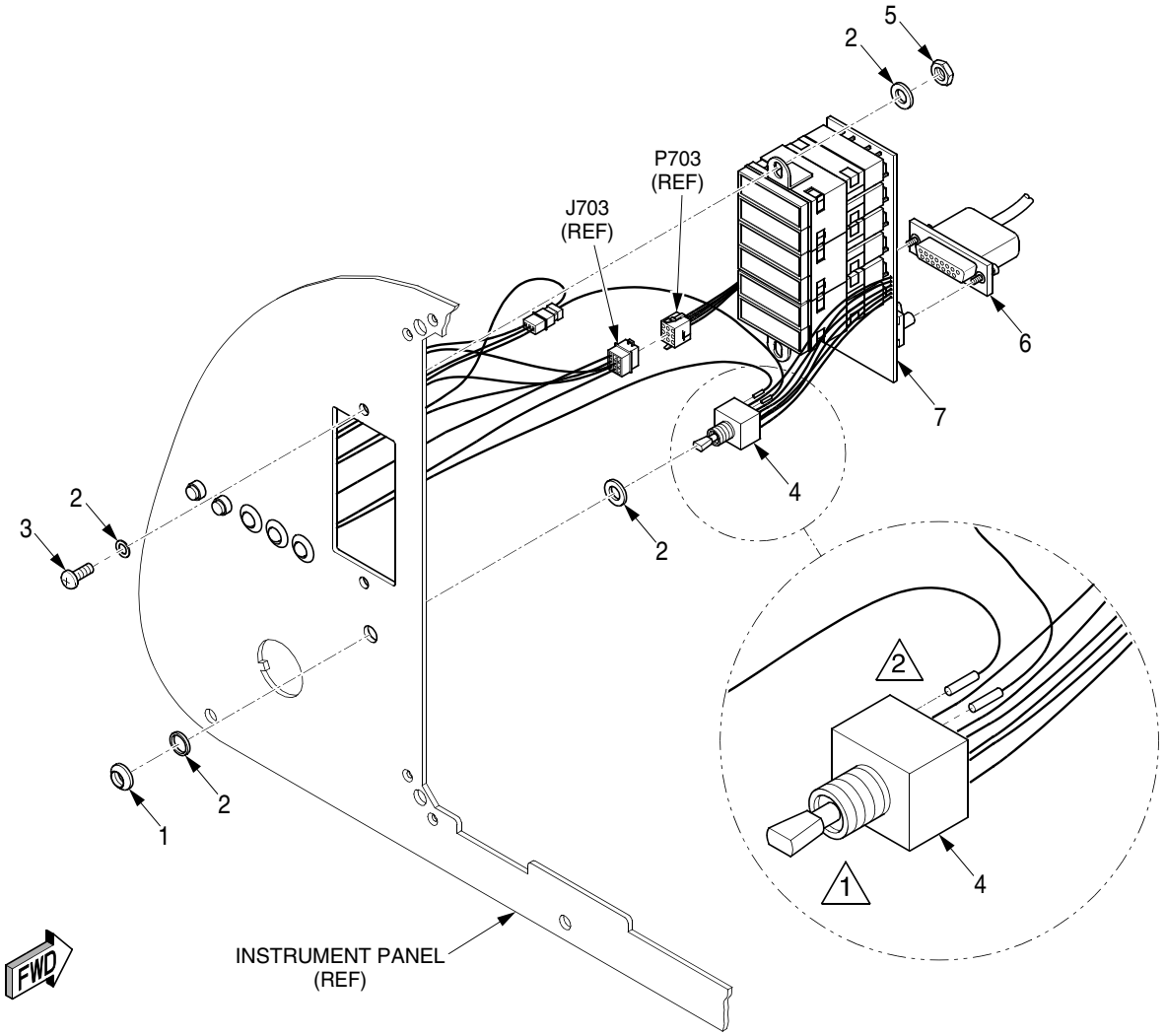
DETAIL A

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

SR20_MM31_1182C

Figure 31-507
Annunciator Panel Installation - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



NOTE

1. Keyway on toggle switch faces down.
2. At S500 connector, depin wires at pin locations 1 and 3.

DETAIL B

LEGEND

1. Dress Nut
2. Washer
3. Screw
4. Toggle Switch, (S500)
5. Nut
6. Electrical Connector
7. Annunciator
8. Push Button Switch

SR20_MM31_1732C

Figure 31-507

Annunciator Panel - Serials 1337-1422 w/ PFD, 1423-2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 2)

EFFECTIVITY:
Serials 1337-1422 w/ PFD, 1423-2015, 2016 & subs w/ o Perspective Avionics

CENTRAL DISPLAY SYSTEMS

1. DESCRIPTION

This section covers those systems and components which give visual display of conditions in unrelated systems. This includes the multi-function display and primary flight display.

A. Multi-Function Display (MFD)

(1) ARNAV MFD

The multi-function display, located on the instrument panel, provides 10.4-inch diagonal, color depiction of navigational data from its own database and position and flight-plan data from the GPS receiver. 28 VDC is supplied through the 5-amp MFD circuit breaker on the Avionics Non-Essential Bus. For additional information on the ARNAV MFD, refer to the ICDS 2000 Operations Handbook. (Refer to 05-10)

(2) Avidyne MFD

The multi-function display, located on the instrument panel, provides 10.4-inch diagonal, color depiction of navigational data from its own database and position and flight-plan data from the GPS receiver. 28 VDC is supplied through the 5-amp MFD circuit breaker on the Avionics Non-Essential Bus.

Serials 1005 thru 1581 w/ EMax Engine Monitoring, 1582 & subs: The MFD displays fuel flow, nautical miles per gallon, fuel remaining, fuel-to-waypoint, fuel-to-destination, cylinder head temperatures (CHT), exhaust gas temperatures (EGT), engine crankshaft speed, manifold pressure, oil temperature, oil pressure, outside air temperature (OAT), and electrical bus voltages. For additional information on the Avidyne MFD, refer to the FlightMax EX-Series MFD Pilot's Guide. (Refer to 05-10)

(3) Perspective MFD

Airplanes are equipped with either a Garmin GDU 1040 10-inch or Garmin GDU 1240 12-inch multi-function display. The MFD, located above the center console, depicts navigation, terrain, lightning, traffic data, NAV/COM frequencies, and annunciation information. All engine data is displayed on a dedicated ENGINE page. When the ENGINE page is not shown, all essential engine information is shown on an engine strip at the edge of the display.

Redundant power sources provide 28 VDC for MFD operation. Power is supplied through the 5-amp MFD PWR 1 circuit breaker on the MAIN BUS 3 and the 5-amp MFD PWR 2 circuit breaker on MAIN BUS 1. Either circuit is capable of powering the MFD. System start-up is automatic once power is applied. Power-on default brightness is determined by ambient lighting and is user adjustable. For additional information on the Perspective MFD, refer to the Cirrus Perspective Integrated Avionics System Pilot's Guide. (Refer to 05-10)

B. Primary Flight Display (PFD)

(1) Avidyne PFD

Airplanes are equipped with the Avidyne FlightMax Entegra-Series Primary Flight Display (PFD). The PFD is a 10.4-inch landscape-oriented display located in the LH instrument panel. The PFD is intended to be the primary display for attitude, airspeed, heading, and altitude.

The PFD acts as the primary attitude indicator, heading indicator, airspeed indicator, altimeter, vertical speed indicator, directional gyro, course deviation indicator, and altitude pre-select controller within a single electronic display. The PFD replaces the Horizontal Situation Indicator (HSI), Vertical Speed Indicator (VSI), VOR/LOC Indicator, altitude alerter, and the OAT gage/clock.

Serials 1582 & subs: The PFD provides for the primary display of engine speed, manifold pressure, fuel flow, and oil pressure. Percent power is provided on the upper LH portion of the display in vertical tape format and as text. This vertical tape representation of percent power is the primary indicator to set engine power. Engine RPM, manifold pressure (MAP), fuel flow, and oil

pressure are displayed full time as text in the engine parameters field located in the lower right corner of the PFD.

The PFD communicates with GPS 1, GPS 2, NAV 1, NAV 2 and accepts data from GPS sensors and System 55X Autopilot. The airplane's Pitot-Static system is connected to the PFD to provide airspeed, altitude, and vertical speed.

A magnetometer assembly is mounted in the RH wing to provide three axis magnetic field vector measurements and outside air temperature (OAT) data. (Refer to 34-20)

To provide roll data to the autopilot system, a turn coordinator is mounted inside the console. (Refer to 34-20)

An integral air data/attitude and heading reference system (ADAHRS) uses a 3-axis solid state gyro and accelerometer system combined with a flux-gate compass to replace the vertical and directional gyros. ADAHRS also provides roll, pitch, heading data and continually updates the winds aloft and true airspeed (TAS) indications on the PFD.

In case of total or partial PFD failure, backup instruments for airspeed, attitude, and altitude are mounted on the LH bolster panel.

Battery power is supplied directly to the PFD from either one of the two airplane batteries. Because the PFD does not have an on/off switch, the PFD will become energized as soon as either battery switch is turned on. The pilot can control intensity of the PFD display by using the brightness control on the upper RH side of the PFD bezel. The brightness of the buttons is controlled by the dimmer control switch on the bolster panel. For additional information on the Avidyne PFD, refer to the FlightMax Entegra PFD Pilot's Guide. (Refer to 05-10)

(2) Perspective PFD

Airplanes are equipped with either a Garmin GDU 1040 10-inch or Garmin GDU 1240 12-inch multi-function display. The PFD, located directly in front of the pilot, is intended to be the primary display of flight parameter information (attitude, airspeed, heading, and altitude) during normal operations. The PFD accepts data from a variety of sources, including the MFD and the Integrated Avionics Units through a high-speed data bus connection. In conjunction with Flight Management System Keyboard, the PFD also controls and displays all communication and navigation frequencies as well as displaying warning/status annunciations on aircraft systems.

During engine start, reversionary operation (MFD failure), or when the reversionary switch is selected, engine system information is displayed on the PFD. Redundant power sources provide 28 VDC for PFD operation. Power is supplied through the 5-amp PFD PWR 1 circuit breaker on the ESS BUS 1 and the 5-amp PFD PWR 2 circuit breaker on MAIN BUS 2. Either circuit is capable of powering the PFD. System start-up is automatic once power is applied. Power-on default brightness is determined by ambient lighting and is user adjustable. Typical alignment time is 60 seconds from battery turn on.

In the event of a detected display failure, the Perspective Avionics System automatically switches to reversionary mode. In reversionary mode, all essential flight information from the PFD is presented on the remaining display in the same format as in normal operating mode with the addition of the engine indicating system. The reversionary switch, located on the center instrument panel between the PFD and MFD, may be used to manually activate the reversionary mode. For additional information on the Perspective PFD, refer to the Cirrus Perspective Integrated Avionics System Pilot’s Guide. (Refer to 05-10)

C. Troubleshooting - *Serials 1337 & subs w/ Avidyne PFD*

Trouble - PFD Attitude Display	Probable Cause	Remedy
Pitch ladder and horizon removed and replaced with red X.	PFD Air Data Attitude Heading Reference System (ADAHRS) failure.	Replace PFD. (Refer to 31-60)

Trouble - PFD Altitude, Airspeed, Vertical Velocity Display	Probable Cause	Remedy
Instruments removed and replaced with red X.	PFD Air Data Computer failure.	Replace PFD. (Refer to 31-60)
	Pitot-Static failure.	Repair pitot-static system.

Trouble - PFD Heading	Probable Cause	Remedy
Heading indication removed and replaced with red X.	Open or shorted wire between PFD and Magnetometer.	Test and repair wiring.
	Magnetometer failed.	Replace Magnetometer/OAT assembly. (Refer to 34-20)
	PFD RS-422 or Magnetometer output power failure.	Replace PFD. (Refer to 31-60)
Excessive heading error.	Magnetometer not properly calibrated.	Calibrate Magnetometer. (Refer to 34-20)

Trouble - PFD OAT	Probable Cause	Remedy
Display indicates red dashes.	OAT probe failed.	Replace Magnetometer/OAT assembly. (Refer to 34-20)
Excessive temperature error.	OAT probe failed.	Replace Magnetometer/OAT assembly. (Refer to 34-20)

Trouble - PFD True Airspeed	Probable Cause	Remedy
Display indicates red dashes.	OAT probe failed.	Replace Magnetometer/OAT assembly. (Refer to 34-20)

Trouble - PFD VHF/GPS NAV 1	Probable Cause	Remedy
PFD Primary Nav, Bearing, or Auxiliary indication displays dashes when GPS 1 or VLOC 1 selected.	VHF/GPS NAV 1 not configured properly.	Configure Garmin 430.
	Open or shorted wire between PFD and VHF/GPS NAV 1.	Test and repair wiring.
	VHF/GPS NAV 1 ARINC 429 output failed.	Replace VHF/GPS NAV 1.
	PFD ARINC 429 input failed.	Replace PFD. (Refer to 31-60)
GPS1 does not slave to PFD course pointer in OBS mode.	Open or shorted ARINC 429 wire between PFD and GPS NAV 1.	Test and repair wire.
	ARINC 429 receive input failed.	Replace VHF/GPS NAV 1.
	ARINC 429 transmit output failed.	Replace PFD. (Refer to 31-60)

Trouble - PFD VHF/GPS NAV 2	Probable Cause	Remedy
PFD Primary Nav, Bearing, or Auxiliary indication displays dashes when GPS 2 or VLOC 2 selected.	VHF/GPS NAV 2 not configured properly.	Configure Garmin 430.
	Open or shorted wire between PFD and VHF/GPS NAV 2.	Test and repair wiring.
	VHF/GPS NAV 2 ARINC 429 output failed.	Replace VHF/GPS NAV 2.
	PFD ARINC 429 input failed.	Replace PFD. (Refer to 31-60)

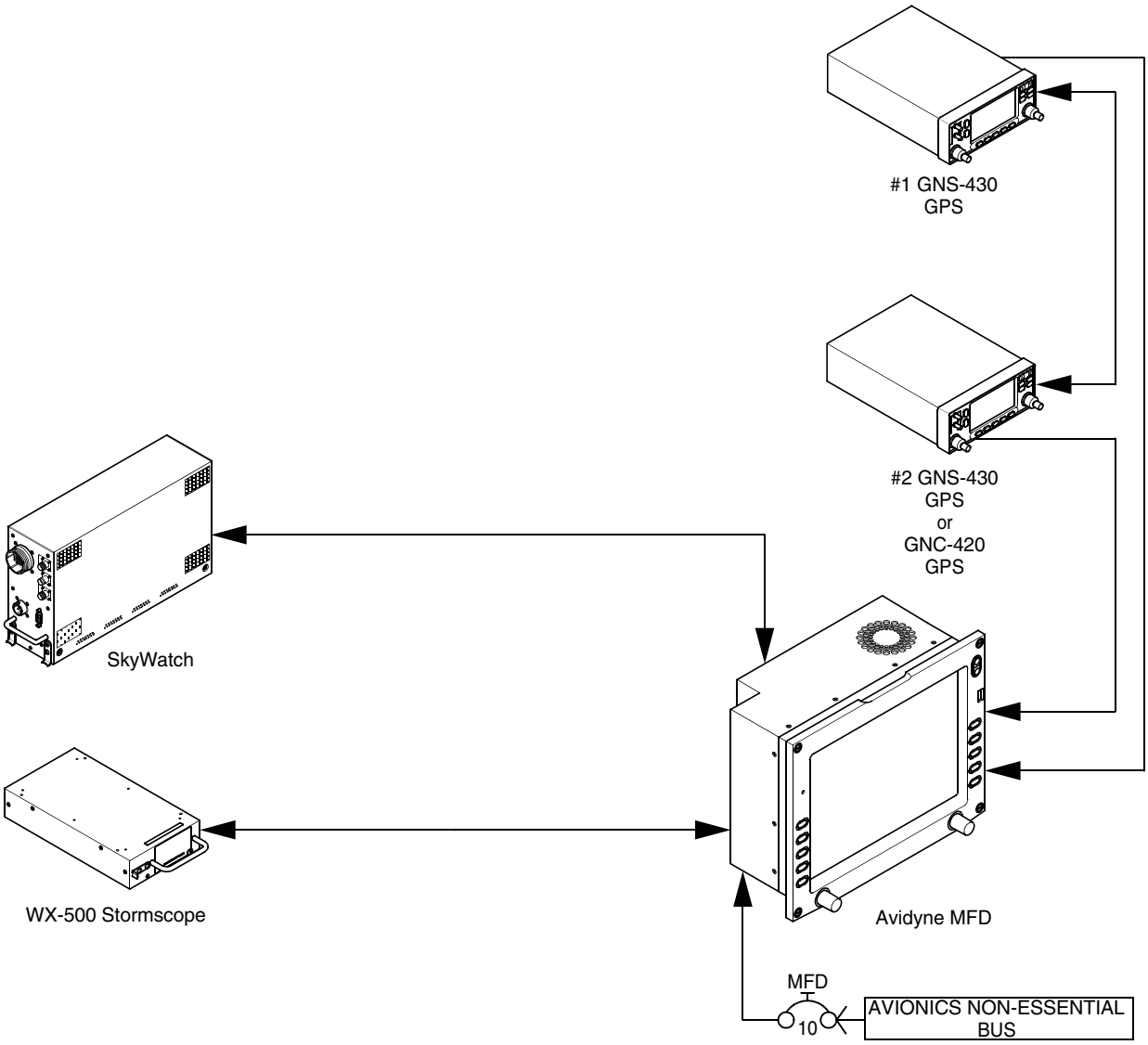
Trouble - PFD Autopilot Integration	Probable Cause	Remedy
Airspeed, Heading, or Altitude bugs do not "fill" but autopilot modes still engage.	Open or shorted annunciator wires between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
Autopilot VS mode does not track PFD Vertical Speed setting, but autopilot mode engages.	Open or shorted VS command wires between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)

Trouble - PFD Autopilot Integration	Probable Cause	Remedy
Autopilot HDG mode does not track PFD Heading setting, but autopilot mode engages.	Open or shorted heading datum wire between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
	PFD heading bug out of alignment.	Perform PFD heading bug calibration.
Autopilot NAV mode does not track PFD Nav Course Pointer setting or CDI.	Open or shorted course datum and cross track wires between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
	Autopilot out of alignment.	Perform autopilot alignment in NAV mode.
Autopilot NAV annunciator flashes and FAIL indication appears.	Open or shorted CDI flag wire between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	VHF/GPS NAV 1 or 2 Nav data invalid.	Refer to VHF/GPS NAV 1 & 2 Troubleshooting procedure.
	PFD interface failure.	Replace PFD. (Refer to 31-60)
Autopilot APR mode does not track PFD CDI or VDI.	Open or shorted CDI and VDI wires between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
Autopilot APR mode fails to engage.	Open or shorted glideslope flag or LOC switch wires between PFD and autopilot computer.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)

Trouble - PFD Autopilot Integration	Probable Cause	Remedy
Autopilot computer display indicates vertical speed value.	Open or shorted ALT select wire between PFD and autopilot.	Test and repair wiring.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
Autopilot GPSS mode fails to engage.	Open or shorted PFD ARINC 429 transmit or autopilot relay control wire.	Test and repair wiring.
	Autopilot relay failure.	Replace autopilot relay.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)
Autopilot GPSS only follows GPS 1 source.	Break in autopilot relay control wire.	Test and repair wire.
	Autopilot relay failure.	Replace autopilot relay.
	Autopilot computer interface failure.	Replace autopilot unit. (Refer to 22-12)
	PFD interface failure.	Replace PFD. (Refer to 31-60)

D. Troubleshooting - *Serials 2016 & subs w/ Perspective Avionics*

Trouble - PFD	Probable Cause	Remedy
PFD display does not power up.	PFD failure.	Ensure power is present at display backshell connector.
		Replace PFD. (Refer to 31-60)
GIA1 and/or GIA2 to LRU data path not working.	GIA1 and/or GIA2 configuration failure.	Ensure GIA1 and GIA2 are configured correctly.
		Check wiring, connectors & pins as needed.

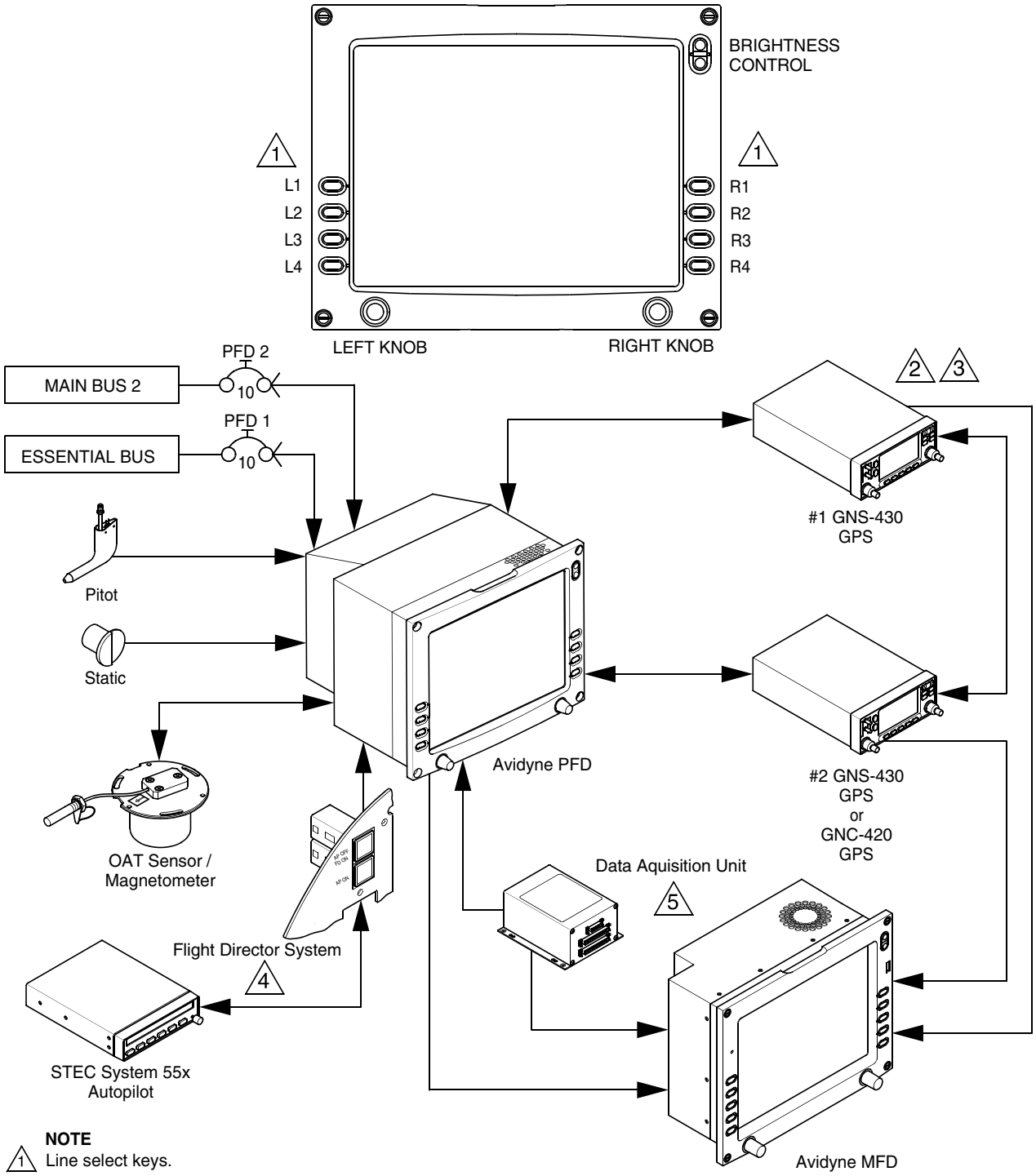


Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

SR22_MM31_2525

Figure 31-601
Flight Display System Schematic - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



NOTE

1 Line select keys.

2 Airplanes may be equipped with GNS-430 GPS in the COM 1 position with no GPS configured for the COM 2 position.

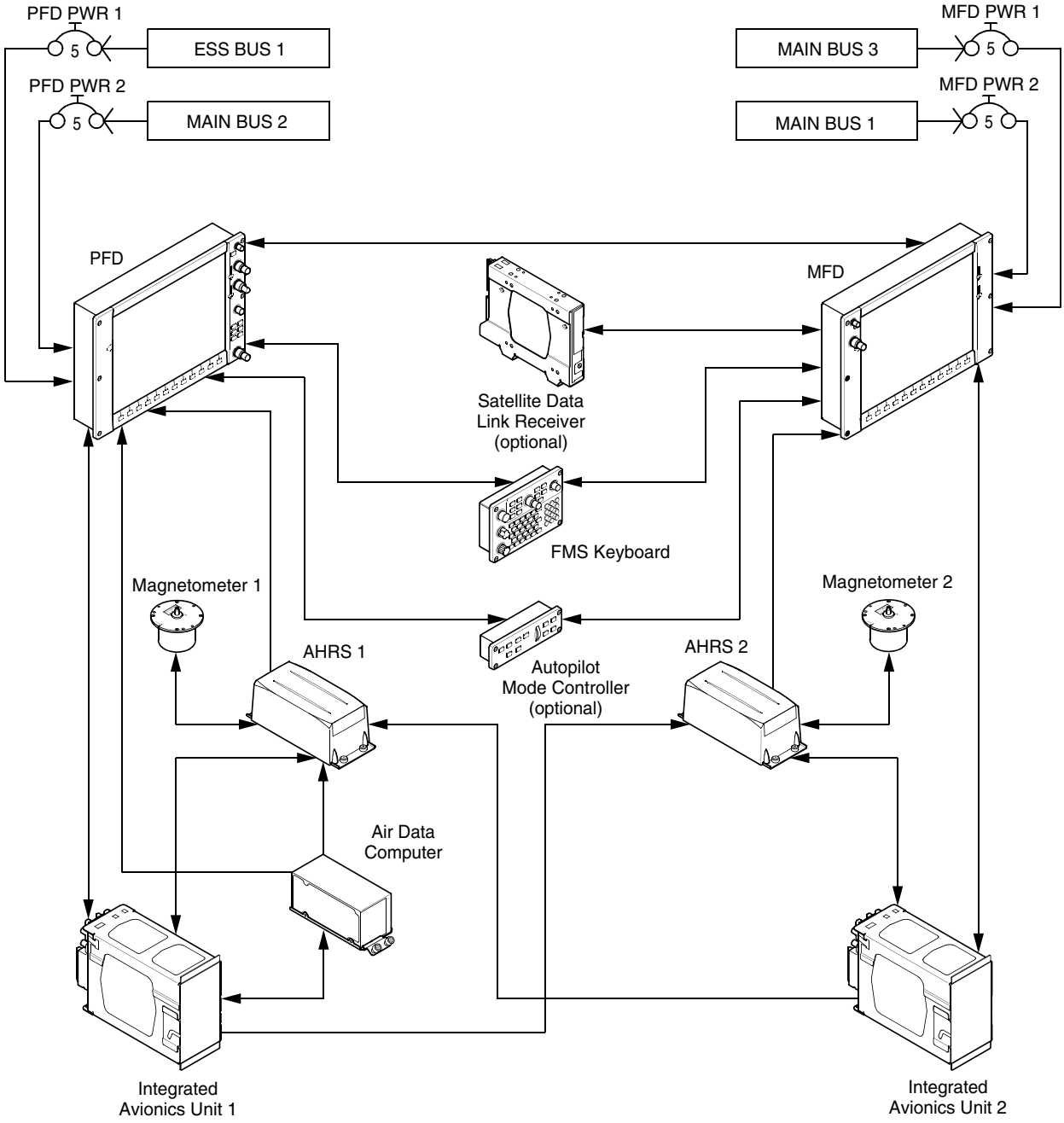
3 Airplanes with GNC-420 GPS in the COM 1 position do not have a GPS configured for the COM 2 position.

4 Serials 1494 & subs w/ factory installed Flight Director, 1337 & subs after SB 2X-22-03.

5 Serials 1582 & subs.

SR20_MM31_1696B

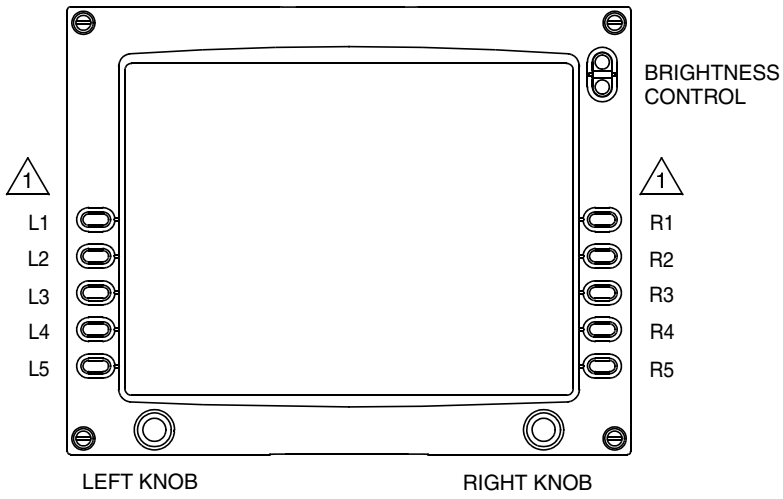
Figure 31-601
Flight Display System Schematic - Serials 1337 thru 1422 w/ PFD, 1423 & subs (Sheet 2 of 3)



SR20 _MM31_2937

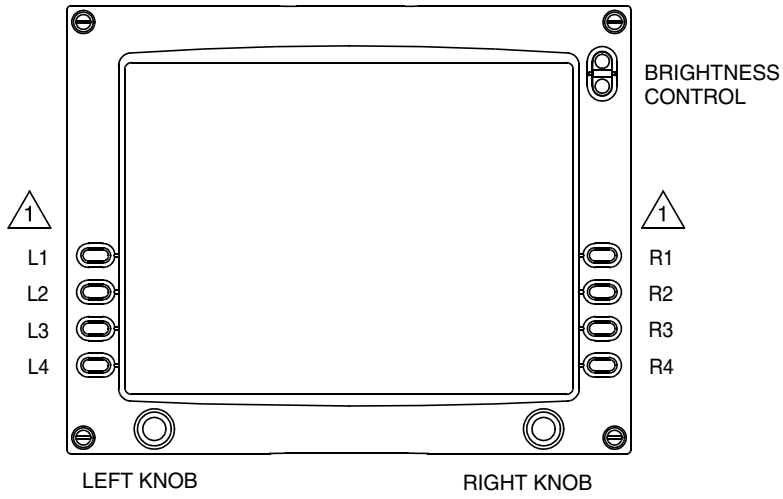
Figure 31-601
Flight Display System Schematic - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics



Multi-Function Display (MFD).

Serials 1005 & subs.



Primary Flight Display (PFD).

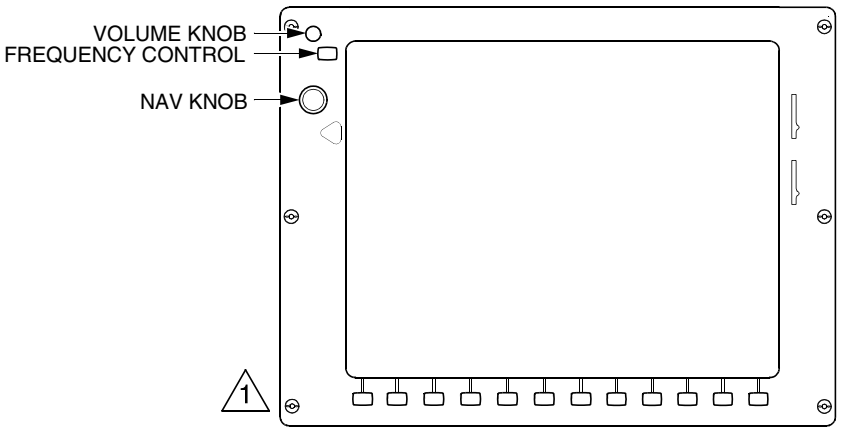
Serials 1337 thru 1422 w/ PFD, 1423 & subs.

NOTE

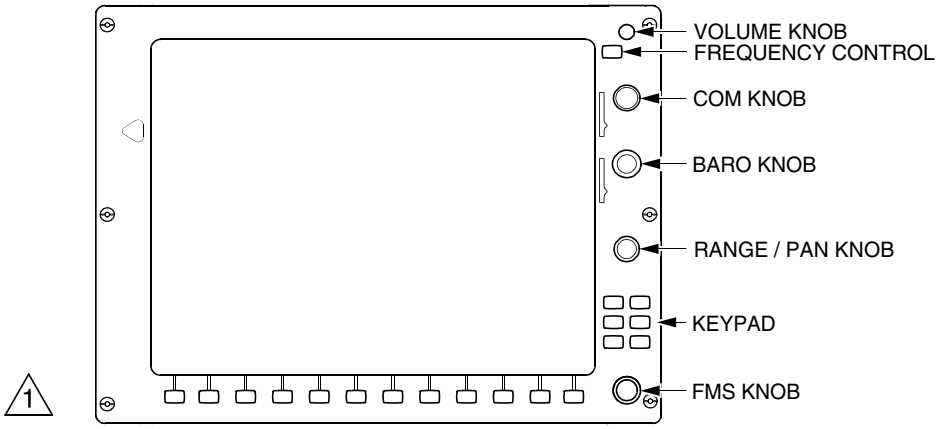
1 Line select keys.

SR22_MM31_2555

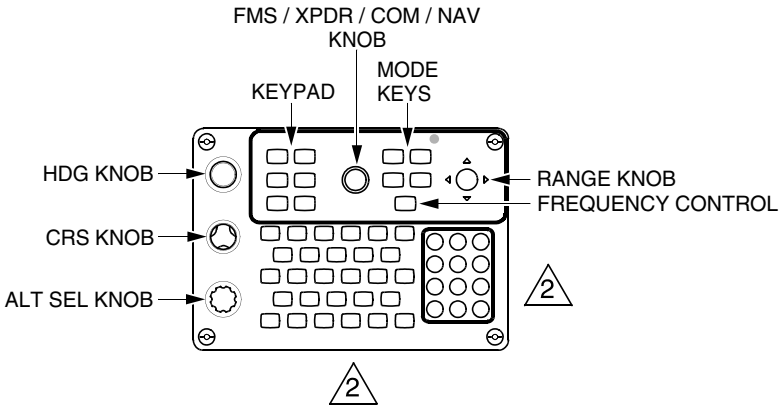
Figure 31-602
Display Controls - Serials 1337 & subs w/ Avidyne MFD & PFD (Sheet 1 of 2)



Multi-Function Display (MFD).
Serials 2016 & subs w/ Perspective Avionics.



Primary Flight Display (PFD).
Serials 2016 & subs w/ Perspective Avionics.



Flight Management System Keyboard
Serials 2016 & subs w/ Perspective Avionics.

NOTE

1 Soft keys.

2 Alphanumeric keys.

SR20_MM31_2939

Figure 31-602
Display Controls - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

2. MAINTENANCE PRACTICES

A. Multi-Function Display (MFD) - *Serials 1005 thru 1267 w/ ARNAV MFD* (See Figure 31-603)

(1) Removal - ARNAV MFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull MFD circuit breaker.

(c) Remove center bolster trim. (Refer to 25-10)

(d) Rotate captive screws counter-clockwise to loosen MFD from instrument panel.

CAUTION: When removing MFD, do not strain wire harness by pulling cable too far from instrument panel.

(e) Pull MFD from instrument panel just sufficiently to expose cable connector.

(f) Rotate cable plug counter-clockwise, then remove from receptacle.

(g) Remove MFD from airplane. (Refer to 31-60)

(2) Installation - ARNAV MFD

(a) Position MFD close enough to instrument panel cutout to connect cable plug to receptacle without straining wire harness.

(b) Slide MFD forward into instrument panel cutout until captive screws align with instrument panel mounting holes.

(c) Rotate captive screws clockwise until detent position is felt, indicating screw is aligned with receptacle. Continue clockwise rotation approximately 1/4 rotation until screw is secure.

(d) Reset MFD circuit breaker.

(e) If MFD is a different unit from the originally installed MFD:

1 Perform Functional Test - ARNAV MFD Setup. (Refer to 31-60)

2 Perform Operational Test - ARNAV MFD. (Refer to 31-60)

(f) If MFD is the same unit as the originally installed MFD:

1 Perform Operational Test - ARNAV MFD. (Refer to 31-60)

(g) Install center bolster trim. (Refer to 25-10)

(3) Operational Test - ARNAV MFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) Set GNS or GNC power in GPS 1 position to ON position.

(d) On MFD, before approving the Database page, press [MAPPING] to display Map page.

(e) Verify values match the following:

GROUNDSPEED	150 knots
BEARING TO WAYPOINT	135°
ACTIVE WAYPOINT	“GARMIN”
DISTANCE TO GO	10.0 nautical miles
TIME TO GO	4 minutes
PRESENT POSITION	N39°04.05’, W94°53.86

(f) Set GNS or GNC power in GPS 1 position to OFF position.

(g) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(h) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(4) Functional Test - ARNAV MFD Setup

Note: MFD configuration values provided in this test are typical, but may not correlate with all airplanes. Use the appropriate RS232 designation for avionics equipment as it is configured on the airplane.

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(c) On MFD, press RH top button to enter Software Main page.
(d) Press [Checklist].
(e) Press [End Program].
(f) At [LEFT] and [RIGHT] arrows, press [LEFT] arrow to highlight "End", then press [Sel].
(g) Press [Setup/User Graphics].
(h) With "no Demo" highlighted, press [Sel].
(i) At [LEFT] and [RIGHT] arrows, press [LEFT] arrow to highlight "Yes", then press [Sel].
(j) Press [System Configuration].
(k) Press [Ack] repeatedly to move cursor to “Stormscope” selection.
(l) Press [Next] to highlight “1 for Stormscope ON”, then press [Sel].
(m) At [LEFT] and [RIGHT] arrows, press [LEFT] arrow to highlight "Yes", then press [Sel].
(n) Press [End].
(o) Press [Diagnostics].
(p) Press [Stormscope].
(q) Press [Heading Stabilization].
(r) At [LEFT] and [RIGHT] arrows, press [LEFT] arrow to highlight "Enable", then press [Sel].
(s) Press [Reset Antenna Configuration].
(t) At [LEFT] and [RIGHT] arrows, press [LEFT] arrow to highlight "Top", then press [Sel].
(u) Press [Configuration/Heading].

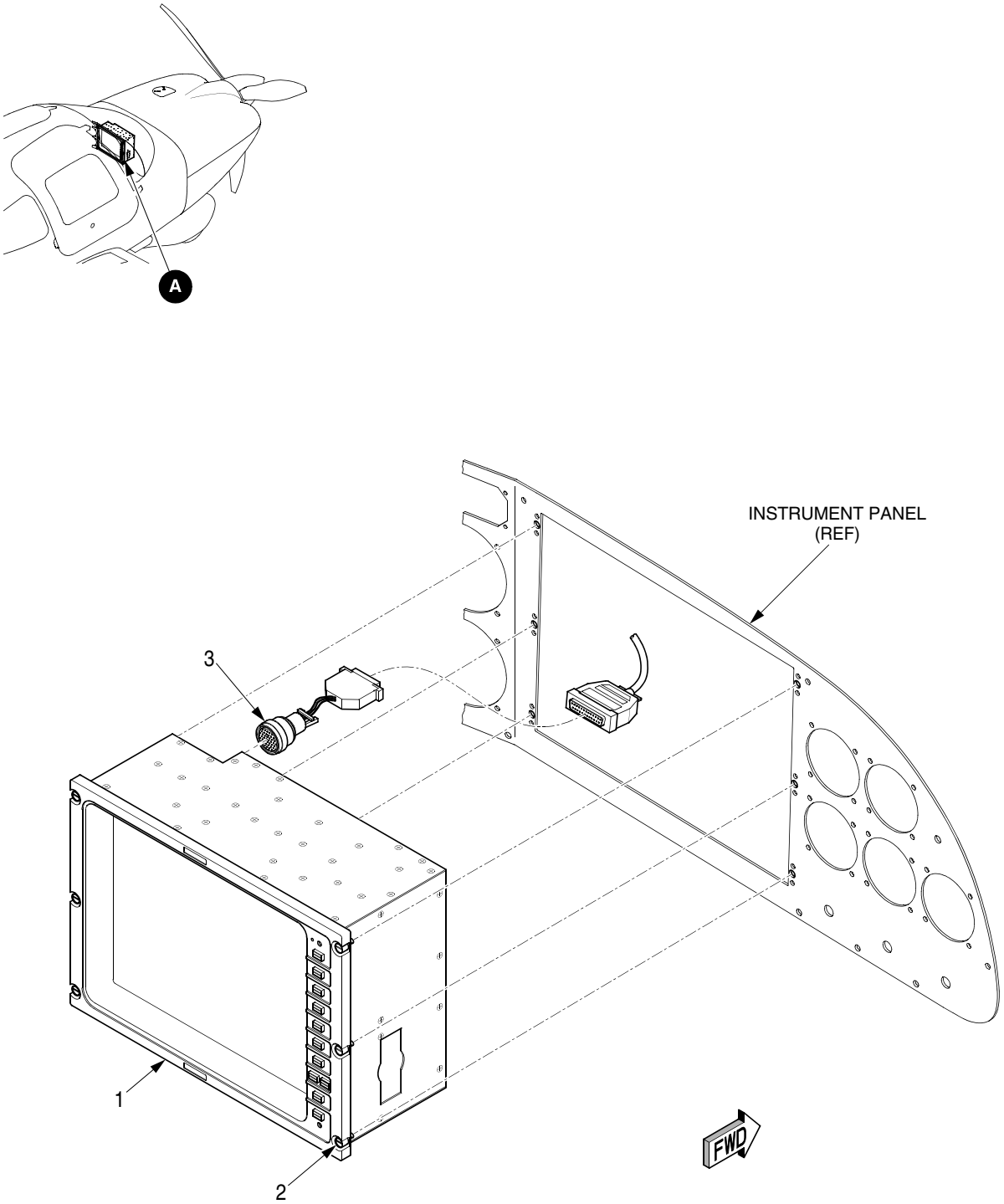
CAUTION: If values do not match those below, call Cirrus Design Customer Service.

(v) Verify values and jumper setting match the following:

HDG: XYZ: J3 - 1	Jumper
J2 - 2	Open
HDG VALID FLAG	No Fla
FLAG SENSE	+ vld
J3 - 4	Jumper
HDG VALUE	### (Value should match HSI reading)
INHIBIT LINE	Off
ANTENNA MOUNT	Top
J3 - 3	Jumper

(w) Press RH top button.
(x) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(y) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

EFFECTIVITY:
Serials 1005 thru 1267 w/ ARNAV MFD



LEGEND
1. MFD
2. Captive Screw
3. Connector

DETAIL A

Serials 1005 thru 1267.

SR20_MM31_2928

Figure 31-603
MFD Installation - Serials 1005 thru 1267 w/ ARNAV MFD

EFFECTIVITY:
Serials 1005 thru 1267 w/ ARNAV MFD

B. Multi-Function Display (MFD) - *Serials 1179 & subs w/ Avidyne MFD* (See Figure 31-604)

(1) Removal - Avidyne MFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull MFD circuit breaker.

(c) Remove center bolster trim. (Refer to 25-10)

(d) Rotate captive screws counter-clockwise to loosen MFD from instrument panel.

CAUTION: When removing MFD, do not strain wire harness by pulling cable too far from instrument panel.

(e) Pull MFD from instrument panel just sufficiently to expose cable connector.

(f) Loosen cable plug retaining screws, then remove from receptacle.

(g) Remove MFD from airplane. (Refer to 31-60)

(2) Installation - Avidyne MFD

(a) Position MFD close enough to instrument panel cutout to connect cable plug to receptacle without straining wire harness.

(b) Slide MFD forward into instrument panel cutout until captive screws align with instrument panel mounting holes.

(c) Rotate captive screws clockwise until detent position is felt, indicating screw is aligned with receptacle. Continue clockwise rotation approximately 1/4 rotation until screw is secure.

(d) Reset MFD circuit breaker.

(e) If MFD is a different unit from the originally installed MFD:

1 Perform Functional Test - Avidyne MFD Setup. (Refer to 31-60)

2 Perform Operational Test - Avidyne MFD. (Refer to 31-60)

(f) If MFD is the same unit as the originally installed MFD:

1 Perform Operational Test - Avidyne MFD. (Refer to 31-60)

(g) Install center bolster trim. (Refer to 25-10)

(3) Operational Test - Avidyne MFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) Set GNS or GNC power in GPS 1 position to ON position.

(d) On MFD, before approving the Database page, press [MAPPING] to display Map page.

(e) Verify values match the following:

GROUNDSPEED	150 knots
BEARING TO WAYPOINT	135°
ACTIVE WAYPOINT	“GARMIN”
DISTANCE TO GO	10.0 nautical miles
TIME TO GO	4 minutes
PRESENT POSITION	N39°04.05’, W94°53.86

(f) Set GNS or GNC power in GPS 1 position to OFF position.

(g) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(h) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(4) Functional Test - Avidyne MFD Setup - *Serials w/ MFD Software P/Ns 530-00162-000 Rev 03 or lower*

Note: MFD configuration values provided in this test are typical, but may not correlate with all airplanes. Use the appropriate RS232 designation for avionics equipment as it is configured on the airplane.

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(c) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
(d) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
(e) Rotate left knob to select Setup page.

Note: The five line select keys on the LH side of the MFD are L1 through L5, with L1 in the uppermost position. The five line select keys on the RH side of the MFD are R1 through R5, with R1 in the uppermost position.

(f) Press and hold [L1] and [L3] until Maintenance page is displayed.
(g) Press [GPS Setup].
(h) For EX3000C:
1 Set RECEIVER to "King/Aviation Format".
2 Set PORT to "RS232 1".
3 Set BAUD to "9600".
4 Press [Save].
(i) For EX5000C:
1 Set RECEIVER A to "GAMA 429 Format".
2 Set PORT to "ARINC429 1-GPS A Default".
3 Set SPEED to "Low".
4 Set RECEIVER B to "GAMA 429 Format".
5 Set PORT to "ARINC429 2-GPS".
6 Set SPEED to "Low".
7 Press [Save].
(j) Press [Traffic Setup].
1 *Serials w/o SkyWatch:* Set SENSOR to "Not Installed".
2 *Serials w/ SkyWatch:* Set SENSOR to "TAS".
3 *Serials w/ SkyWatch:* Set PORT to "ARINC429 3-Traffic Default".
4 Serials w/ SkyWatch: Set TAS TYPE to "SkyWatch".
5 *Serials w/ SkyWatch:* Deselect check box for EXTERNAL CONTROLLER.
6 Press [Save].
(k) Press [Lightning Setup].
1 *Serials w/o Stormscope:* Set SENSOR to "Not Installed".
2 *Serials w/ Stormscope:* Set SENSOR to "WX-500".
3 *Serials w/ Stormscope:* Set OPERATING MODE to "Weather".
4 *Serials 1005 thru 1455 w/ Stormscope:* Set PORT to "RS232 1-Lightning Default".
5 *Serials 1456 thru 1581 w/ Stormscope:* Set PORT to "RS232 3-Lightning Default".
6 *Serials w/ Stormscope & w/o PFD:* Set STAB TYPE to "Synchro".
7 *Serials w/ Stormscope & w/ PFD:* Set STAB TYPE to "Use Map Heading/Track".
8 *Serials w/ Stormscope:* Select check box for ENABLE LIGHTNING AHEAD WARNING?.
9 *Serials w/ Stormscope:* Select check box for ANTENNA ON TOP?.
10 Press [Save].
(l) Press [Engine Setup].

1 *Serials w/o EMax Engine Monitoring:* Set SENSOR TYPE to "Not Installed".
2 *Serials w/ EMax Engine Monitoring:* Set SENSOR TYPE to "Avidyne SIU".
3 *Serials w/ EMax Engine Monitoring:* Set PORT to "RS232 2".
4 *Serials w/ EMax Engine Monitoring:* Set AIRCRAFT MODEL to "SR20, Serial Number 1148 Up".

Note: The data box at the bottom of the Engine Setup page shows you the configuration of the SIU. If page settings do not match with the DIP switch settings of the SIU, a yellow annunciator indicates to recheck configuration of this page and/or the DIP switches on the SIU.

5 *Serials w/ EMax Engine Monitoring:* Set ELECTRICAL to appropriate setting.
6 Press [Save].

(m) Press [TAWS Setup].
1 *Serials w/o TAWS:* Set SENSOR to "Not Installed".
2 *Serials w/ TAWS:* Set SENSOR to "Honeywell EGPWS".
3 *Serials w/ TAWS:* Set ARINC 429 PORT to "ARINC 429 4-TAWS Default".
4 *Serials w/ TAWS:* Set ARINC 453 PORT to "ARINC 453 2-TAWS Default".
5 *Serials w/ TAWS:* Select check box for ALTITUDE ANNUNCIATION ON.
6 Press [Save].

(n) For EX3000C, press [Map Heading].
1 Set MAP HEADING to "None (Use GPS Track)".
2 Press [Save].

(o) For EX5000C, press [Map Heading].
1 Serials w/ PFD or Sandel: Set MAP HEADING to "FMS/GPS".
2 *Serials w/ Stormscope & w/o PFD or Sandel:* Set MAP HEADING to "Stormscope".
3 *Serials w/ SkyWatch & w/o PFD, Sandel, or Stormscope:* Set MAP HEADING to "SkyWatch".
4 *Serials w/o PFD, Sandel, Stormscope, or SkyWatch:* Set MAP HEADING to "None".
5 Press [Save].

(p) Press [Aircraft Setup].
1 Set CHECKLIST to appropriate configuration.
2 Set BRIGHTEST DIMMING VOLTAGE to "24.0" volts.
3 Set DARKEST DIMMING VOLTAGE to "5.0" volts.
4 *Serials w/o XM Weather:* Set BROADCAST to "Not Installed".
5 *Serials w/ XM Weather:* Set BROADCAST to "XM Radio".
6 *Serials w/ XM Weather:* Set PORT to "RS232 4-Broadcast Default".
7 Press [Save].

(q) Press [Restart System].
1 When PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
2 If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
3 Rotate left knob to select Setup page.

(r) Press [System Time].
1 Set Time Source to "GPS".
2 Set Time Zone to present time zone offset for UTC.
3 Set Menu Timeout to "Never".
4 Press [Save].

(s) Press [Back To Setup].

EFFECTIVITY:
Serials 1179 & subs w/ Avidyne MFD

(t) For EX3000C, rotate left knob to select Map page.

Note: If no GPS signal is acquired, TRK will not be displayed on MFD.

1 Verify MFD TRK value matches GPS 1 TRK value displayed on 4th Nav page.
2 Verify that no error messages display.

(u) For EX5000C, rotate left knob to select Map page.

Note: If no GPS signal is acquired, HDG will not be displayed on MFD.

1 Verify HDG value matches PFD heading.
2 Verify that no error messages display.

(v) *Serials w/ EMax Engine Monitoring:* Perform test for OAT sensor and MFD accuracy.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Thermometer	-	Any Source	Measure temperature at OAT sensor.

2 Use thermometer to measure temperature approximately 4 inches from OAT sensor located on fuselage forward of RH door.
3 Verify OAT reading on MFD matches thermometer reading ±2° C.

(w) *Serials w/ SkyWatch:* Perform test for SkyWatch installation.

1 Confirm selected ranges:

MFD	5NM
GNC 420 or GNS 430	10NM

2 On MFD, rotate left knob to select Setup page.
3 Press [Traffic Self Test].
During test, "Traffic 9 o'clock/2.0NM/-200FT" should be displayed at bottom of MFD.
When test is complete, "Traffic advisory system test-passed" should be heard over the headset and speaker.

(x) *Serials w/ Stormscope:* Perform test for Stormscope installation.

1 Confirm selected ranges:

MFD	30NM
SANDEL	30NM
GNC 420 or GNS 430	35NM

2 On MFD, rotate left knob to select Setup page.
3 Press [Lightning Self Test].

For Avidyne MFD, a strike should be displayed every 2-3 seconds, in the 2 o'clock position-relative to aircraft heading.

For PFD, heading must be available with ADAHRS operational.

For Sandel, STST should flash on the display indicating Stormscope is in test mode.

For GNS 430 on 2nd Nav page, strikes should be displayed in the 2 o'clock position-relative to aircraft heading.

4 When test is complete, verify LIGHTNING SENSOR IS OPERATING NORMALLY is displayed at bottom of MFD display.

(y) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(z) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(5) Functional Test - Avidyne MFD Setup - *Serials w/ MFD Software P/Ns 530-00180-000 Rev 00 & subs*

Note: MFD configuration values provided in this test are typical, but may not correlate with all airplanes. Use the appropriate RS232 designation for avionics equipment as it is configured on the airplane.

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.

(d) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.

(e) Rotate left knob to select AUX page.

Note: The five line select keys on the LH side of the MFD are L1 through L5, with L1 in the uppermost position. The five line select keys on the RH side of the MFD are R1 through R5, with R1 in the uppermost position.

(f) Press and hold [L1] and [L3] until Maintenance page is displayed.

(g) Press [GPS Setup].

1 Set RECEIVER 1 to "GAMA 429 Format".

2 Set PORT to "ARINC429 1".

3 Set SPEED to "Low".

4 Set RECEIVER 2 to "GAMA 429 Format".

5 Set PORT to "ARINC429 2".

6 Set SPEED to "Low".

7 Press [Save].

(h) Press [Traffic Setup].

1 *Serials w/o SkyWatch:* Set SENSOR to "Not Installed".

2 *Serials w/ SkyWatch:* Set SENSOR to "TAS".

3 *Serials w/ SkyWatch:* Set PORT to "ARINC429 3".

4 *Serials w/ SkyWatch:* Deselect check box for EXTERNAL CONTROLLER.

5 Press [Save].

(i) Press [Lightning Setup].

1 *Serials w/o Stormscope:* Set SENSOR to "Not Installed".

2 *Serials w/ Stormscope:* Set SENSOR to "WX-500".

3 *Serials w/ Stormscope:* Set OPERATING MODE to "Weather".

4 *Serials w/ Stormscope:* Set PORT to "RS232 3".

5 *Serials w/ Stormscope:* Set STAB TYPE to "Use Map Heading/Track".

6 *Serials w/ Stormscope:* Select check box for ENABLE LIGHTNING AHEAD WARNING?.

7 *Serials w/ Stormscope:* Select check box for ANTENNA ON TOP?.

8 Press [Save].

(j) Press [Engine Setup].

1 *Serials w/o EMax Engine Monitoring:* Set SENSOR TYPE to "Not Installed".

2 *Serials w/ EMax Engine Monitoring:* Set SENSOR TYPE to "Avidyne DAU".

3 *Serials w/ EMax Engine Monitoring:* Set PORT to "RS232 2".

4 *Serials w/ EMax Engine Monitoring:* Set AIRCRAFT MODEL to "SR20".

Note: The data box at the bottom of the Engine Setup page shows the configuration of the DAU. If page settings do not match with the configuration jumper setting of the DAU, a yellow annunciator indicates to recheck configuration of this page and/or the configuration jumper setting of the DAU.

5 *Serials w/ MFD Software P/Ns 530-00195-100 Rev 00 & subs*: Set FUEL TANK SIZE to "56".

6 *Serials w/ MFD Software P/Ns 530-00195-100 Rev 00 & subs*: Set FUEL TO TABS to "26".

7 Press [Save].

(k) Press [TAWS Setup].

1 *Serials w/o TAWS:* Set SENSOR to "Not Installed".

2 *Serials w/ TAWS:* Set SENSOR to "Honeywell EGPWS".

3 *Serials w/ TAWS:* Set ARINC 429 PORT to "ARINC 429 4".

4 *Serials w/ TAWS:* Set ARINC 453 PORT to "ARINC 453 2".

5 *Serials w/ TAWS:* Select check box for ALTITUDE ANNUNCIATION ON.

6 Press [Save].

(l) Press [Map Heading].

1 Set MAP HEADING to "FMS/GPS".

2 Press [Save].

(m) Press [Aircraft Setup].

1 Set CHECKLIST to appropriate configuration.

2 *Serials w/o XM Weather:* Set BROADCAST to "Not Installed".

3 *Serials w/ XM Weather:* Set BROADCAST to "XM Radio".

4 Serials w/ XM Weather: Set PORT to "RS232 4".

5 Set AUX DATA to "Entegra PFD".

6 Set PORT to "RS232 1".

7 Set BRIGHTEST DIMMING VOLTAGE to "24.0" volts.

8 Set DARKEST DIMMING VOLTAGE to "5.0" volts.

9 Press [Save].

(n) Press [Restart System].

1 When PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.

2 If Engine Monitoring is selected, press [Fuel Done] to enter Map page.

3 Rotate left knob to select AUX page.

(o) Press [Data Blocks].

1 Set parameters for the Data Blocks Setup page.

TO WPT	DEST WPT
GND SPD	NRST ARPT
FUEL	UTC
FUEL RMNG	LOCAL TIME
LEAN	
%PWR/EGT/CHT	

2 Press [Save].

(p) Press [System Time].

1 *Airplanes w/ MFD software 530-00180-() Rev 02 or lower:* Set Time Source to "GPS".

2 *Airplanes w/ MFD software 530-00180-() Rev 03 or higher:* Set Time Source to "Auto".

3 Set Time Zone to present time zone offset for UTC.

4 Set Menu Timeout to "Never".

5 Press [Save].

(q) Rotate left knob to select Map page.

Note: If no GPS signal is acquired, HDG will not be displayed on MFD.

1 Verify HDG value matches PFD heading.

2 Verify that no error messages display.

(r) *Serials w/ SkyWatch:* Perform test for SkyWatch installation.

1 Confirm selected ranges:

MFD	5NM
GNC 420 or GNS 430	10NM

2 On MFD, rotate left knob to select AUX page.

3 Press [Traffic Self Test].

During test, "Traffic 9 o'clock/2.0NM/-200FT" should be displayed at bottom of MFD.

When test is complete, "Traffic advisory system test-passed" should be heard over the headset and speaker.

(s) *Serials w/ Stormscope:* Perform test for Stormscope installation.

1 Confirm selected ranges:

MFD	30NM
GNC 420 or GNS 430	35NM

2 On MFD, rotate left knob to select AUX page.

3 Press [Lightning Strk Test].

For Avidyne MFD, a strike should be displayed every 2-3 seconds, in the 2 o'clock position-relative to aircraft heading.

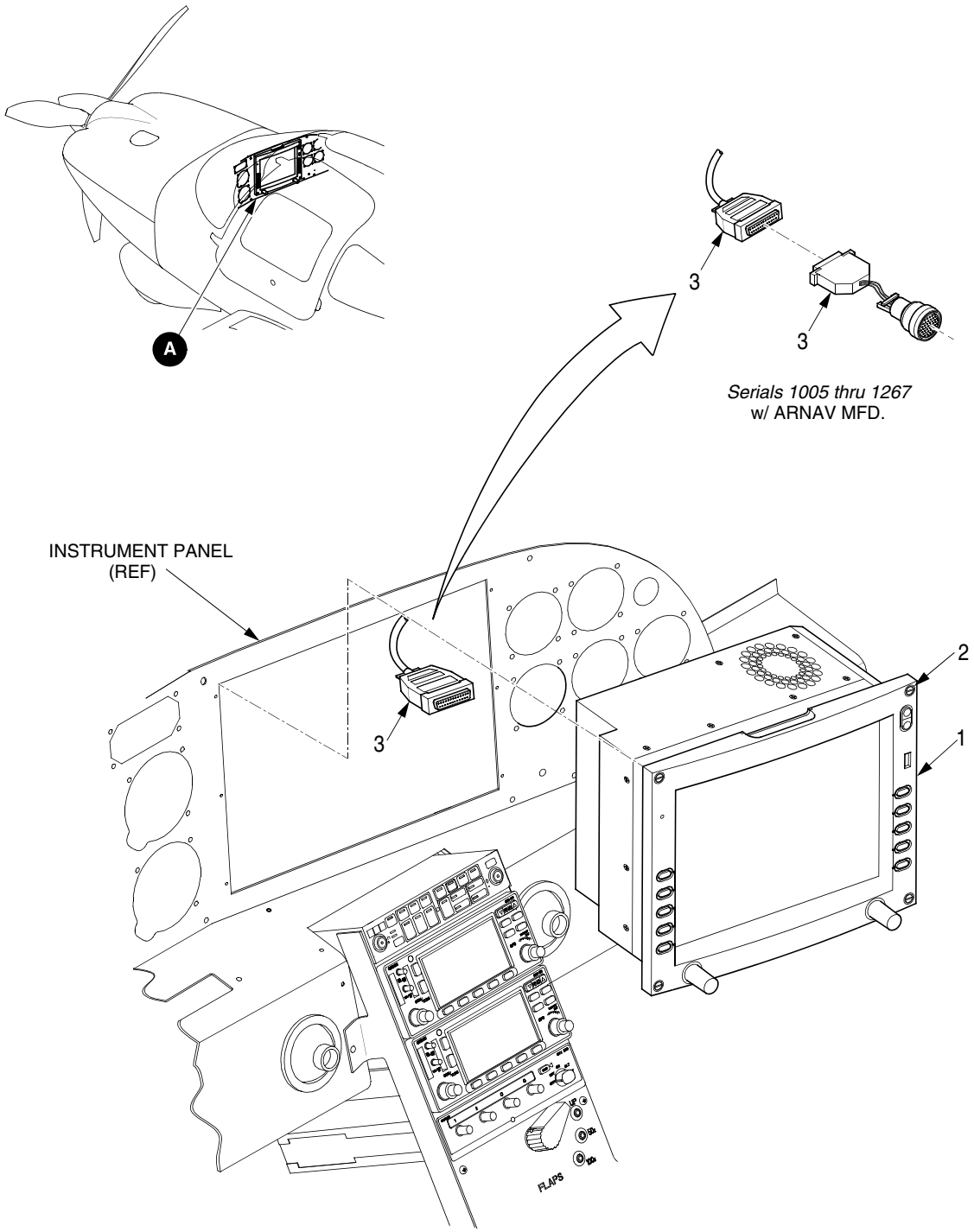
For PFD, heading must be available with ADAHRS operational.

For GNS 430 on 2nd Nav page, strikes should be displayed in the 2 o'clock position-relative to aircraft heading.

4 When test is complete, verify LIGHTNING SENSOR IS OPERATING NORMALLY is displayed at bottom of MFD display.

(t) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(u) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.



LEGEND
1. Multi-Function Display
2. Captive Screw
3. Connector

DETAIL A

SR20_MM34_1994

Figure 31-604
MFD Installation - Serials 1179 & subs w/ Avidyne MFD

C. Multi-Function Display (MFD) - *Serials 2016 & subs w/ Perspective MFD* **(See Figure 31-605)**

(1) Removal - Perspective MFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull MFD #1 and MFD #2 circuit breakers.

(c) Rotate captive screws counter-clockwise to loosen MFD from instrument panel.

CAUTION: When removing MFD, do not strain wire harness by pulling cable too far from instrument panel.

(d) Pull MFD from instrument panel just sufficiently to expose cable connector.

(e) Disconnect connector from MFD.

(f) Remove MFD from airplane.

(2) Installation - Perspective MFD

(a) Position MFD close enough to instrument panel to connect connector without straining wire harness.

(b) Slide MFD forward into instrument panel until captive screws align with instrument panel mounting holes.

(c) Rotate captive screws clockwise until detent position is felt, indicating screw is aligned with receptacle. Continue clockwise rotation approximately 1/4 rotation until screw is secure.

(d) Reset MFD #1 and MFD #2 circuit breakers.

(e) If MFD has been repaired or is a new or different unit from originally installed unit, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(f) Perform Operational Test - Perspective MFD. (Refer to 31-60)

(3) Operational Test - Perspective MFD

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(c) Allow PFD and MFD to initialize for approximately one minute.

Note: In normal operating mode, a large red X through a data field indicates the data field is invalid. Valid data fields will not display a red X.

(d) At top corners of PFD and MFD, verify all NAV and COM fields are valid.

(e) On PFD, verify altitude, airspeed, vertical speed, TAS, and OAT fields are valid.

(f) Verify engine instrument fields are valid and read as follows:

1 Percent Power should read zero.

2 RPM should read zero.

3 Manifold Pressure should read the current barometric pressure ±0.5 inHg.

4 Fuel Used should read zero.

5 Fuel Flow should read zero.

6 Oil Temperature should read ambient.

7 Oil Pressure should read 0±2 PSI.

8 BAT1 Current should read between 0 and 10 amps.

Note: Turn on large electrical loads (landing light, navigation lights, pitot heat, etc.) to ensure more amps are drawn when larger electrical loads are introduced.

9 Essential Bus Voltage should read 26±2 VDC.

10 Main Bus 1 Voltage should read 26±2 VDC.

11 Main Bus 2 Voltage should read 26±2 VDC.

12 CHT should read bottom of scale (All six CHTs).

13 EGT should read bottom of scale (All six EGTs).

14 ALT1 should read 0 amps.

15 ALT2 should read 0 amps.

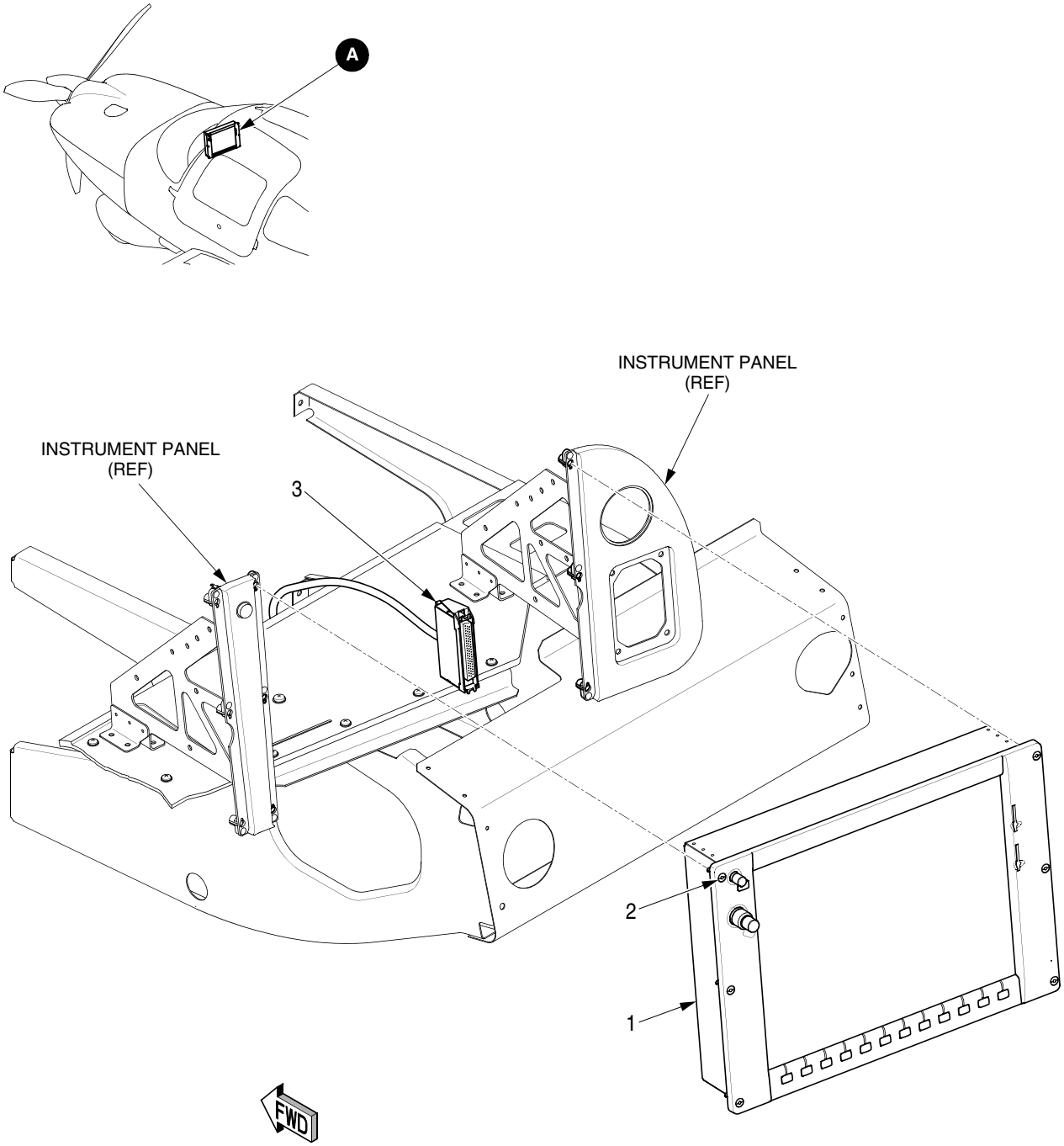
(g) Press reversionary switch and verify both the PFD and MFD enter reversion mode. Both displays should have valid altitude, airspeed, vertical speed, and engine instrument fields.

(h) Press reversionary switch again and verify both the PFD and MFD switch back to normal display mode.

(i) Verify that no MANIFEST or CONFIGURATION alert messages appear in the lower right corner of the PFD (press the flashing ALERTS softkey to view alert messages). If any MANIFEST errors appear, the correct software to the related LRU must be loaded before proceeding. (Refer to 31-60)

(j) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(k) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

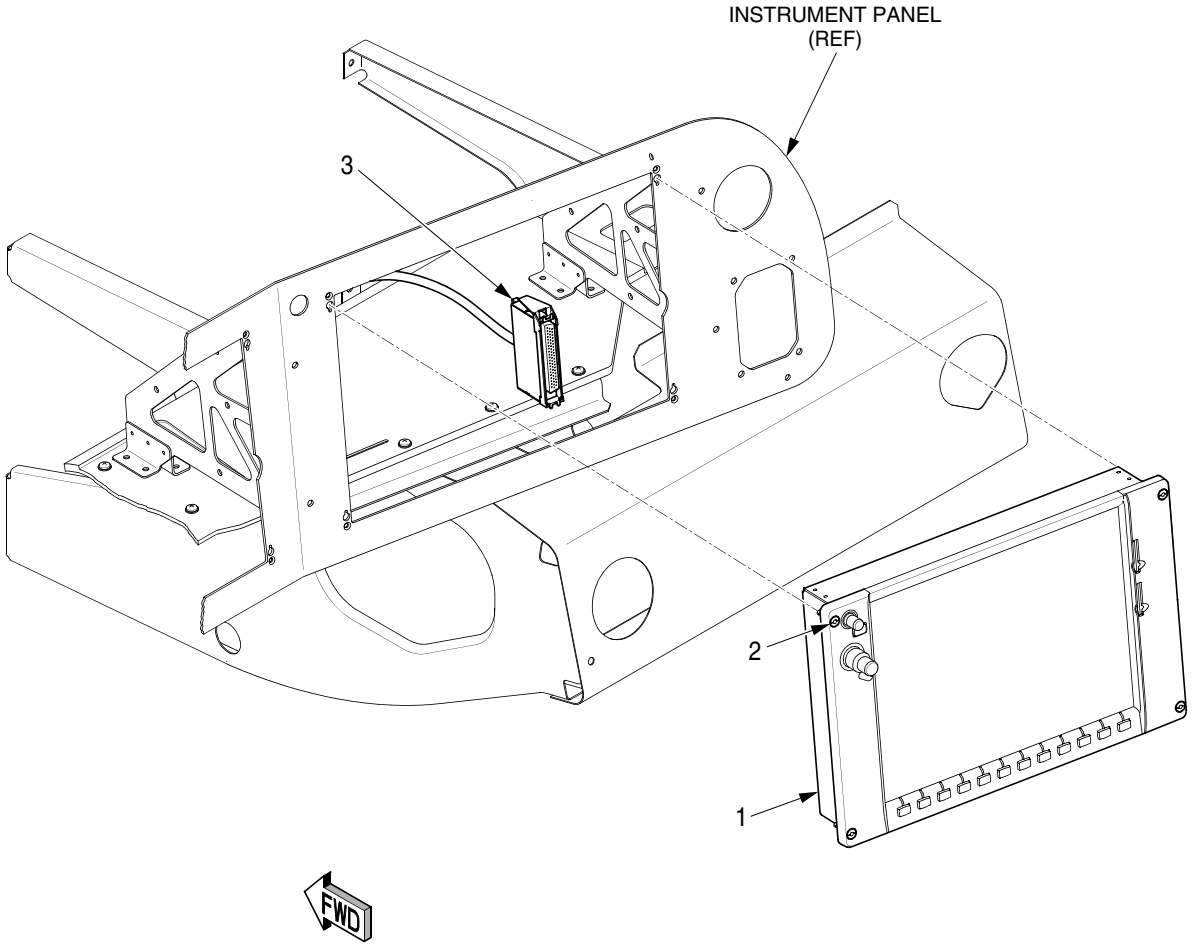


LEGEND
1. MFD
2. Captive Screw
3. Connector

DETAIL A

SR20_MM31_2815

Figure 31-605
MFD Installation - Serials 2016 & subs w/ Garmin 12-Inch MFD (Sheet 1 of 2)



LEGEND
1. MFD
2. Captive Screw
3. Connector

DETAIL B

SR20_MM31_3023

Figure 31-605
MFD Installation - Serials 2016 & subs w/ Garmin 10-Inch MFD (Sheet 2 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Garmin 10-Inch MFD

D. Primary Flight Display (PFD) - *Serials 1337 & subs w/ Avidyne PFD* **(See Figure 31-606)**

CAUTION: Pitot and Static System Leak Tests must be performed every time a static or pitot line is disconnected from the PFD. If the PFD unit is replaced, the new PFD must be recalibrated. The Pitot and Static connections are marked by using color coding. The Pitot connector on the PFD is color coded red.

(1) Removal - Avidyne PFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

Note: To assist in PFD removal, remove MFD or glareshield.

(b) Remove MFD. (Refer to 31-60)

(c) Remove screws securing PFD to instrument panel.

CAUTION: When removing PFD, do not strain wire harnesses, pitot lines, or static lines by pulling them too far from instrument panel. Note color of static and pitot lines for reassembly. The Pitot connector on the PFD is color coded red.

(d) Partially slide PFD out of instrument panel, then disconnect static line, pitot line, and electrical connectors.

(e) Cap off static and pitot lines, then remove PFD.

(f) Cap off static and pitot fittings on PFD.

(2) Installation - Avidyne PFD

CAUTION: The Pitot connector on the PFD is color coded red. If pitot line and static lines are not properly connected, instrument damage may occur.

(a) Remove caps from static line, pitot line, static fitting on PFD, and pitot fitting on PFD.

CAUTION: Do not angle PFD downward when installing PFD into instrument panel to avoid impacting the GPSS Interconnect Relay. The GPSS Interconnect Relay is mounted below PFD and could become disconnected from its socket.

(b) Partially slide PFD into instrument panel, then connect static line, pitot line, and electrical connectors to corresponding fittings.

(c) Install screws securing PFD to instrument panel. Torque screws to 30.0 ± 3.0 in-lb (3.4 ± 0.34 Nm).

(d) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Install MFD. (Refer to 31-60)

(g) If PFD is a different unit from the originally installed PFD:

1 Perform Functional Test - PFD Setup. (Refer to 31-60)

2 Perform Functional Test - Magnetometer Calibration. (Refer to 34-20)

3 *Airplanes w/ PFD software 530-00159-000 Rev 01 or lower;* Perform Functional Test - IRU Calibration. (Refer to 31-60)

(h) Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)

(i) Perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)

(3) Functional Test - Avidyne PFD Setup

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Pull HSI/PFD#1 circuit breaker, verify PFD remains on, then reset HSI/PFD#1 circuit breaker.

(e) Pull HSI/PFD#2 circuit breaker, then verify PFD remains on.

(f) Pull HSI/PFD#1 circuit breaker, then verify PFD shuts off.

(g) Reset HSI/PFD#1 and HSI/PFD#2 circuit breakers.

Serials w/ PFD Software P/N 530-00159-000 Rev 02 or lower: The system will begin its normal start up procedure and INITIAL AHRS ALIGNMENT-REMAIN STATIONARY-OK TO TAXI will be displayed.

Serials w/ PFD Software P/N 530-00177-000 Rev 00 or higher: The system will begin its normal start up procedure. A series of "AHRS ALIGNMENT" messages followed by "AHRS WARMING UP - OK TO TAXI" will be displayed.

(h) Simultaneously, press and hold [L1] and [L3] keys until countdown timer in lower left corner of display indicates zero.

Note: The four line select keys on the LH side of the PFD are L1 through L4, with L1 in the uppermost position. The four line select keys on the RH side of the PFD are R1 through R4, with R1 in the uppermost position.

(i) *Serials w/ PFD Software P/N 530-00159-000 Rev 02 or lower:* At end of displayed countdown, the System Setup page will appear.

Note: Verify no faults are indicated on System Setup page at top portion of display.

(j) *Serials w/ PFD Software P/N 530-00177-000 Rev 00 or higher:* At end of displayed countdown, the System page will appear.

(k) For SRV, verify that AIRCRAFT MAKE indicates "Cirrus SRV".

(l) For SR20. verify that AIRCRAFT MAKE indicates "Cirrus".

Note: If AIRCRAFT MAKE is incorrect, the wrong configuration may be installed.

(m) *Serials w/ PFD Software P/N 530-00177-000 Rev 01 or lower:* Press [A/C Model].

1 For SRV, select "SRV".

2 For SR20. select "SR20".

(n) *Serials w/ PFD Software P/N 530-00183-000 Rev 00, 01, or 02:* Press [A/C Model].

1 *Serials w/o Engine Monitoring:* Select "SR20".

2 *Serials w/o Engine Monitoring for SRV:* Select "SRV".

3 *Serials w/ Engine Monitoring:* Select "SR20+".

4 *Serials w/ Engine Monitoring for SRV:* Select "SRV+".

(o) *Serials w/ PFD Software P/N 530-00194-000 Rev 00 or higher:* Press [A/C Model].

1 *Serials 1005 thru 1885 w/o Engine Monitoring:* Select "SR20".

2 *Serials 1005 thru 1885 w/o Engine Monitoring for SRV:* Select "SRV".

3 *Serials 1005 thru 1885 w/ Engine Monitoring:* Select "SR20+".

4 *Serials 1005 thru 1885 w/ Engine Monitoring for SRV:* Select "SRV+".

5 *Serials 1886 & subs:* Select "SR20 (W2)".

(p) *Serials 1886 & subs w/ PFD Software P/N 530-00194-000 Rev 00 or higher:* Press [Configure ASI].

Note: Press [NEXT SELECTION] to navigate through ASI configuration settings. Rotate RH knob to change value.

1 For ASI TYPE, select "Fixed Vne".
2 For VSO, set value to "61 Knots".
3 For VS1, set value to "69 Knots".
4 For VFE, verify value is "104 Knots".
5 For VNO, verify value is "163 Knots".
6 For VNE, verify value is "200 Knots".
7 For VG MIN WEIGHT, select "95 Knots".
8 For VG MAX WEIGHT, set value to "99 Knots".
9 For VX AT SEA LEVEL, verify value is "83 Knots".
10 For VX ALTITUDE GRADIENT, set value to "0.4 Knots per 1000 Feet".
11 For VY AT SEA LEVEL, verify value is "96 Knots".
12 For VY ALTITUDE GRADIENT, verify value is "-0.4 Knots per 1000 Feet".

(q) Rotate left knob to select Avionics page.
(r) For ENGINE DAU, verify value is "Installed".
(s) Press [Nav1].
1 In a single GNC 420 setup, select "420".
2 In a single GNS 430 setup, select "430/530".
3 In a dual GNS 430 setup, select "430/530".
4 In a dual GNS 430/GNC 420 setup, select "430/530".
5 In a dual GNS 430/GNC 250XL setup, select "430/530".
(t) Press [Nav2].
1 In a single GNC 420 or GNS 430 setup, select "NONE".
2 In a dual GNS 430 setup, select "430/530".
3 In a dual GNS 430/GNC 420 setup, select "420".
4 In a dual GNS 430/GNC 250XL setup, select "NONE".
(u) Press [Perform A/P Cal].
(v) Press [A/P Type].
1 *Serials w/ S-TEC FIFTY FIVE SR Autopilot:* Select "STEC55SR".
2 *Serials w/ S-TEC FIFTY FIVE X Autopilot:* Select "STEC55X".
3 *Serials w/o autopilot:* Select "NONE".
(w) *Serials w/ PFD Software P/N 530-00177-000 Rev 00 or higher:* For ADF, select "None".
(x) *Serials w/ PFD Software P/N 530-00177-000 Rev 00 or higher:* Rotate left knob to select Display page.
1 For A/P ANN., select "HIDE".
2 For V-SPEEDS, select "SHOW".
3 For HORIZ MARKS, select "SHOW".
(y) *Serials w/ Flight Director:* For TRIM ANN, select “HIDE”.

Note: For metric countries, select "hPa" for hectopascals or "Mb" for millibars.

(z) Press [Baro Unit] to select "inHg" for inches of mercury.
(aa) *Serials w/ PFD Software P/N 530-00177-000 Rev 00 or higher:* Press [ARS].
1 *Serials w/o Flight Director:* Select "W".
2 *Serials w/ Flight Director:* Select "DELTA".

(ab) Rotate left knob to advance past Logging page, then select SystemInfo page.

(ac) Verify no faults are listed on the SystemInfo page.

Note: If any changes have been made to Setup Configuration, you must select "Back To PFD" for changes to be saved.

(ad) Select "Back To PFD".

CAUTION: PFD unit must be powered down and then powered up again to effect previous settings.

The new settings may not be displayed if you do not allow a 30 second wait prior to cycling power.

(ae) To effect settings, toggle BAT 1 switch to OFF position, then to ON position.

(af) *Serials w/o EMax Engine Monitoring:* Perform test for OAT sensor and PFD accuracy.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Thermometer	-	Any Source	Measure temperature at OAT sensor.

2 Use thermometer to measure temperature approximately 4 inches from OAT sensor located on fuselage forward of RH door.

3 Verify OAT reading on PFD matches thermometer reading ±2° C.

(ag) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(ah) Disconnect 28 ±1 VDC external power from external power receptacle.

(ai) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(4) Functional Test - Avidyne IRU Calibration - *Airplanes w/ PFD software 530-00159-000 Rev 01 or lower*

The following Functional Test must be performed whenever the PFD is replaced with a different unit.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Digital Level, 0.25° Resolution	±0.25° Accuracy	Any Source	PFD calibration.
Straight Edge minimum 5.0 ft (1.5 m)	-	Any Source	Level platform.
Spacer Blocks 1.0 × 2.0 inches (2.54 × 5.08 cm)	-	Any Source	Level platform.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(c) Allow PFD to align for approximately 3 minutes, until Air Data Attitude Heading Reference System (ADAHRS) countdown timer expires and gyro warm-up box disappears.

(d) Once aligned, allow PFD to remain in aligned state for 10 additional minutes.

(e) Enter the setup mode on the PFD by simultaneously pressing and holding top left, and 3rd down from top left keys until the countdown timer in the lower left corner of the display indicates zero.

(f) After System Setup page appears, press [Perform IRU Cal] and the IRU Calibration page will appear.

(g) Open both doors on airplane.

(h) At LH door opening, position digital level on lower composite ledge located below door seal, pointing fore and aft, to represent pitch axis for pitch attitude. Measure at three positions along ledge and determine the average measurement. (See Figure 31-607)

(i) Follow directions on IRU Calibration page to increase or decrease pitch attitude as required.

1 To increase pitch, press [Increase Pitch].

2 To decrease pitch, press [Decrease Pitch].

(j) Place spacer blocks on LH and RH door sills so that height of blocks is higher than door seals.

(k) Place a straight edge on top and perpendicular to spacer blocks positioned on door sills, centered.

(l) Place digital level on top and parallel to straight edge, centered, so it points outboard to represent roll axis.

(m) Follow directions on IRU Calibration page to increase or decrease roll attitude as required.

1 To increase roll, press [Increase Roll].

2 To decrease roll, press [Decrease Roll].

(n) Press [Calibrate IRU].

(o) Press [Back to PFD].

Note: If you are going to perform the Functional Test - Magnetometer Calibration immediately after this procedure, time can be saved by powering down the PFD one time, after the Functional Test - Magnetometer Calibration has been performed.

(p) Perform Functional Test - Magnetometer Calibration. (Refer to 34-20)

CAUTION: PFD unit must be powered down and then powered up again to retain previous calibration settings.

The calibration may be adversely affected if you do not allow a 10 second wait prior to cycling power.

(q) To retain calibration settings, toggle BAT 1 switch to OFF position, then to ON position.

(r) Verify initial countdown timer goes to zero and calibrated PFD screen is displayed.

(s) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(t) Perform Functional Test - Flight Guidance Programmer/Computer. (Refer to 22-12)

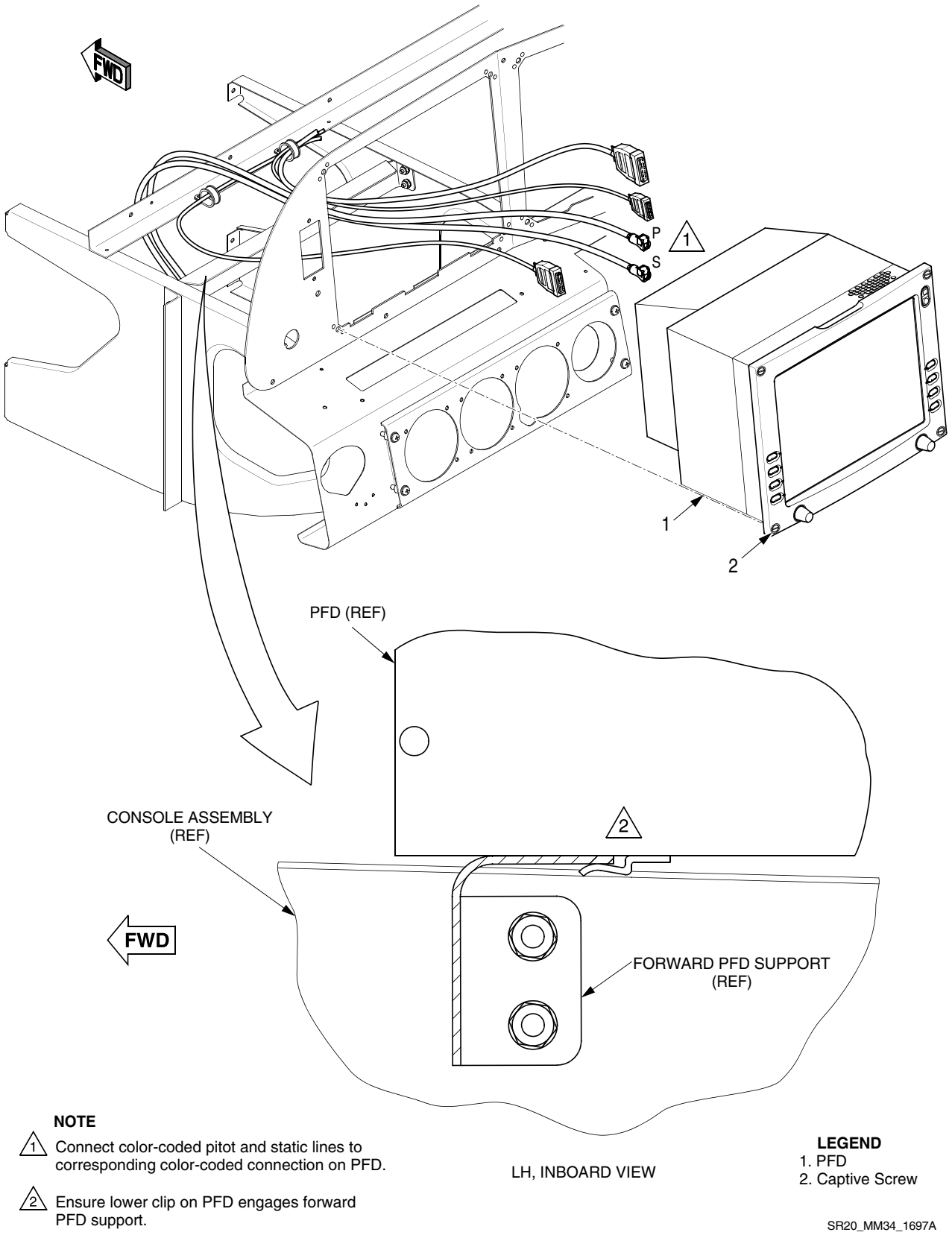
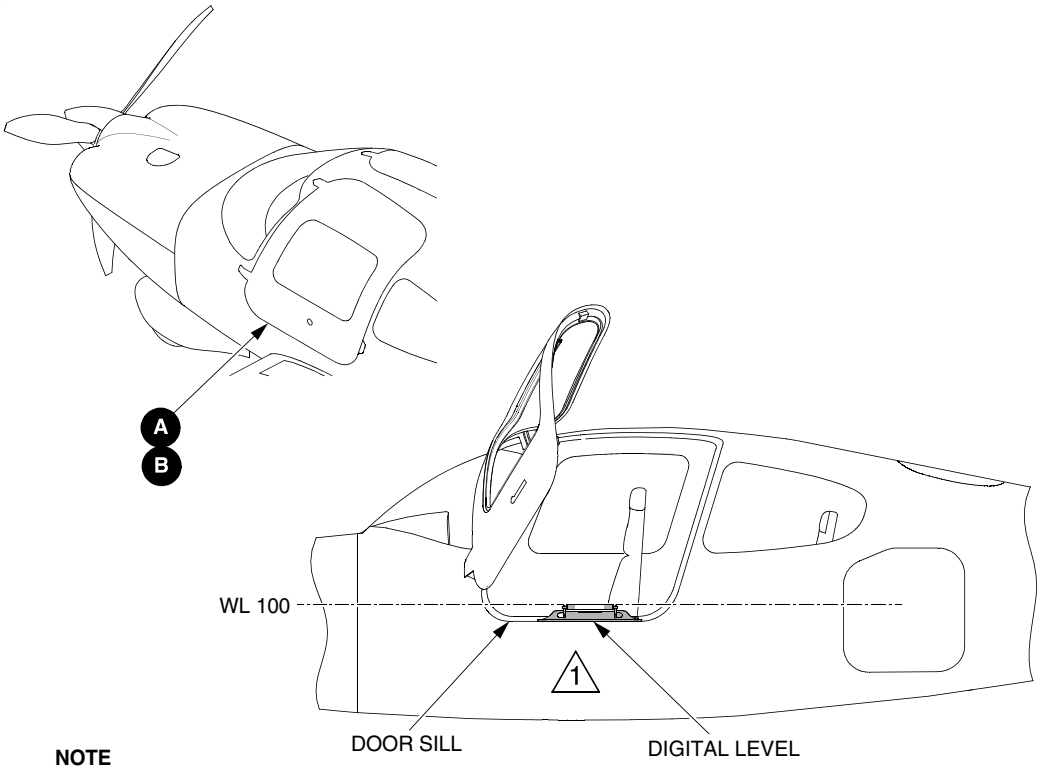


Figure 31-606
PFD Installation - Serials 1337 & subs w/ Avidyne PFD

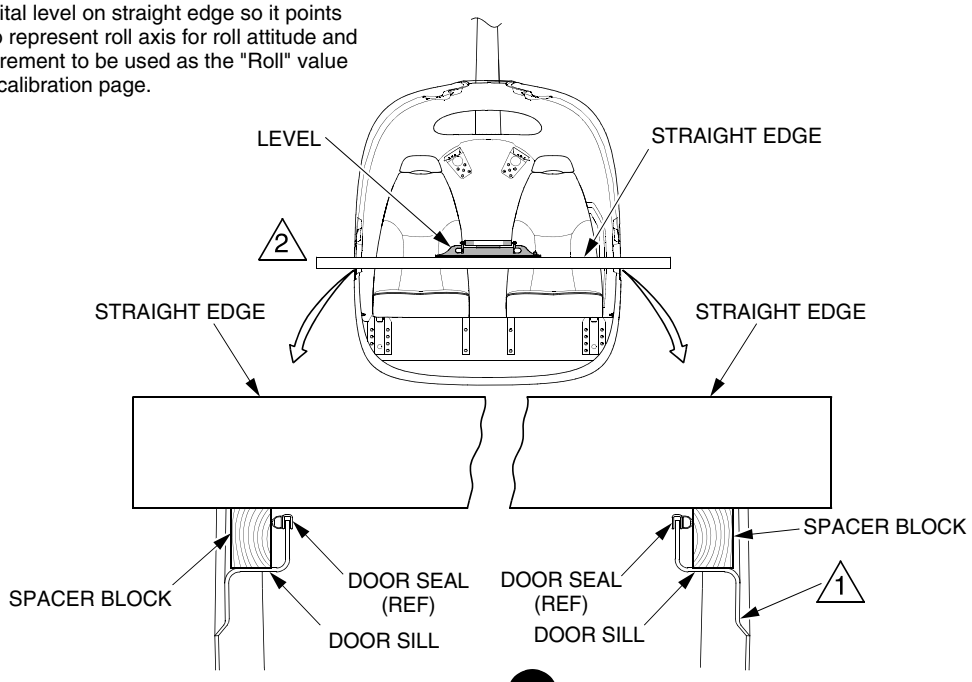


DETAIL A

NOTE

1. At LH door opening, position digital level along lower composite ledge located below door seal, to represent pitch axis for pitch attitude. Measure at three positions along ledge and determine the average measurement to be used as the "Pitch" value on the IRU calibration page.

2. Position digital level on straight edge so it points outboard, to represent roll axis for roll attitude and take measurement to be used as the "Roll" value on the IRU calibration page.



DETAIL B

SR20_MM31_2025

Figure 31-607
Roll and Pitch Measurements for PFD Calibration - Serials 1337 & subs w/ Avidyne PFD

E. Primary Flight Display (PFD) - *Serials 2016 & subs w/ Perspective PFD* **(See Figure 31-608)**

(1) Removal - Perspective PFD

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove screws securing PFD to instrument panel.

CAUTION: When removing PFD, do not strain wire harness by pulling them too far from instrument panel.

(c) Partially slide PFD out of instrument panel, then disconnect electrical connector.

(d) Remove PFD from airplane.

(2) Installation - Perspective PFD

Note: If replacing the PFD with a new, repaired, or exchanged PFD, the new PFD must be temporarily installed in the MFD location while loading software and configuration files. Failure to do so may cause the system ID residing in the config module to be deleted. After system files have been installed, the PFD may be installed in the correct location.

(a) If installing a new, repaired, or exchanged PFD, perform the following:

1 Remove MFD. (Refer to 31-60)

2 Partially slide PFD into MFD location of instrument panel, then connect electrical connector to corresponding fitting.

3 Install screws securing PFD to instrument panel.

4 Perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

5 Remove PFD from MFD location. (Refer to 31-60)

6 Partially slide PFD into PFD location of instrument panel, then connect electrical connector to corresponding fitting.

7 Install screws securing PFD to instrument panel.

8 Install MFD. (Refer to 31-60)

9 Perform Operational Test - Perspective PFD. (Refer to 31-60)

(b) If installing existing PFD, perform the following:

1 Partially slide PFD into instrument panel, then connect electrical connector to corresponding fitting.

2 Install screws securing PFD to instrument panel.

3 Perform Operational Test - Perspective PFD. (Refer to 31-60)

(3) Operational Test - Perspective PFD

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(c) Allow PFD and MFD to initialize for approximately one minute.

Note: In normal operating mode, a large red X through a data field indicates the data field is invalid. Valid data fields will not display a red X.

(d) At top corners of PFD and MFD, verify all NAV and COM fields are valid.

(e) On PFD, verify altitude, airspeed, vertical speed, TAS, and OAT fields are valid.

(f) Press reversionary switch and verify both the PFD and MFD enter reversion mode. Both displays should have valid altitude, airspeed, vertical speed, and engine instrument fields.

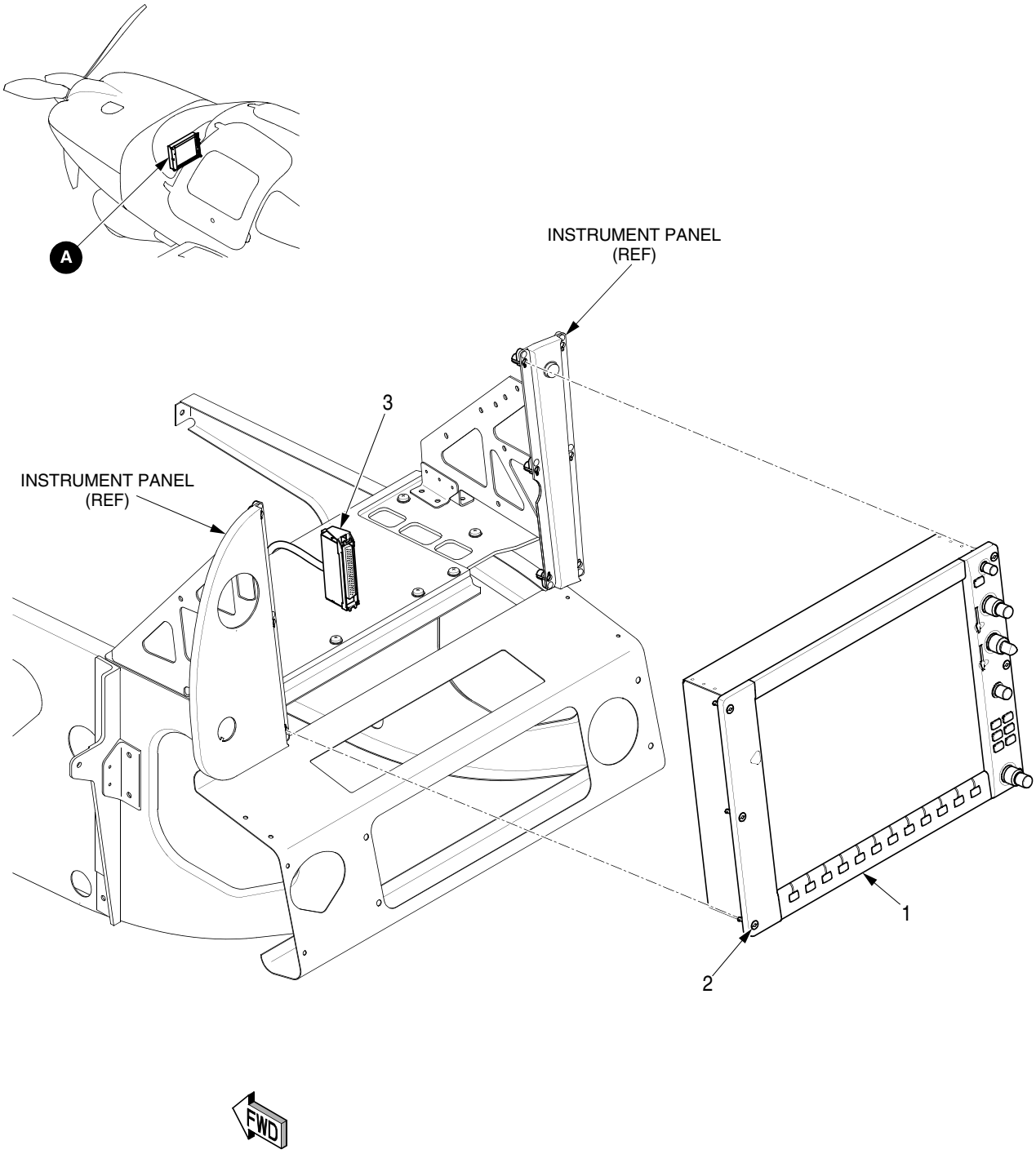
(g) Press reversionary switch again and verify both the PFD and MFD switch back to normal display mode.

EFFECTIVITY:
Serials 2016 & subs w/ Perspective PFD

(h) Verify that no MANIFEST or CONFIGURATION alert messages appear in the lower right corner of the PFD (press the flashing ALERTS softkey to view alert messages). If any MANIFEST errors appear, the correct software to the related LRU must be loaded before proceeding. (Refer to 31-60)

(i) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(j) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.



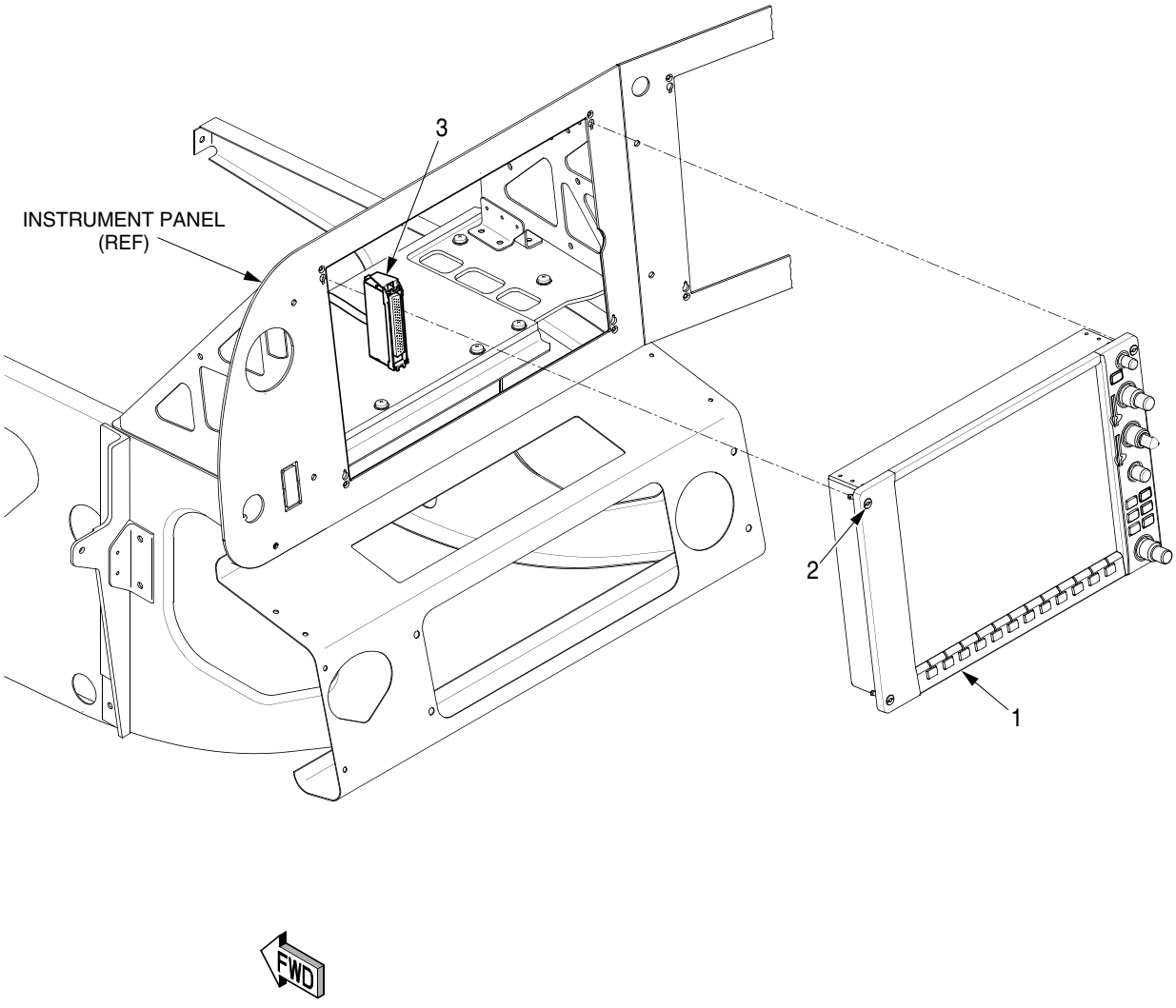
LEGEND
1. PFD
2. Captive Screw
3. Connector

DETAIL A

SR20_MM31_2817

Figure 31-608
PFD Installation - Serials 2016 & subs w/ Garmin 12-Inch PFD (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Garmin 12-Inch PFD



LEGEND
1. PFD
2. Captive Screw
3. Connector

DETAIL B

SR20_MM31_3025

Figure 31-608
PFD Installation - Serials 2016 & subs w/ Garmin 10-Inch PFD (Sheet 2 of 2)

F. Reversionary Switch - *Serials 2016 & subs w/ Perspective Avionics and 12-Inch Displays* (See Figure 31-609)

(1) Removal - Reversionary Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Disconnect switch wiring from wire harness.

(d) Remove cable tie securing switch wiring to instrument panel support.

(e) Remove switch from instrument panel.

(2) Installation - Reversionary Switch

(a) Install switch to instrument panel.

(b) Connect switch wiring to wire harness.

(c) Position switch wiring to instrument panel support and secure with cable tie.

(d) Install glareshield. (Refer to 25-10)

G. Reversionary Switch - *Serials 2016 & subs w/ Perspective Avionics and 10-Inch Displays* (See Figure 31-609)

(1) Removal - Reversionary Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Disconnect wiring from switch terminals.

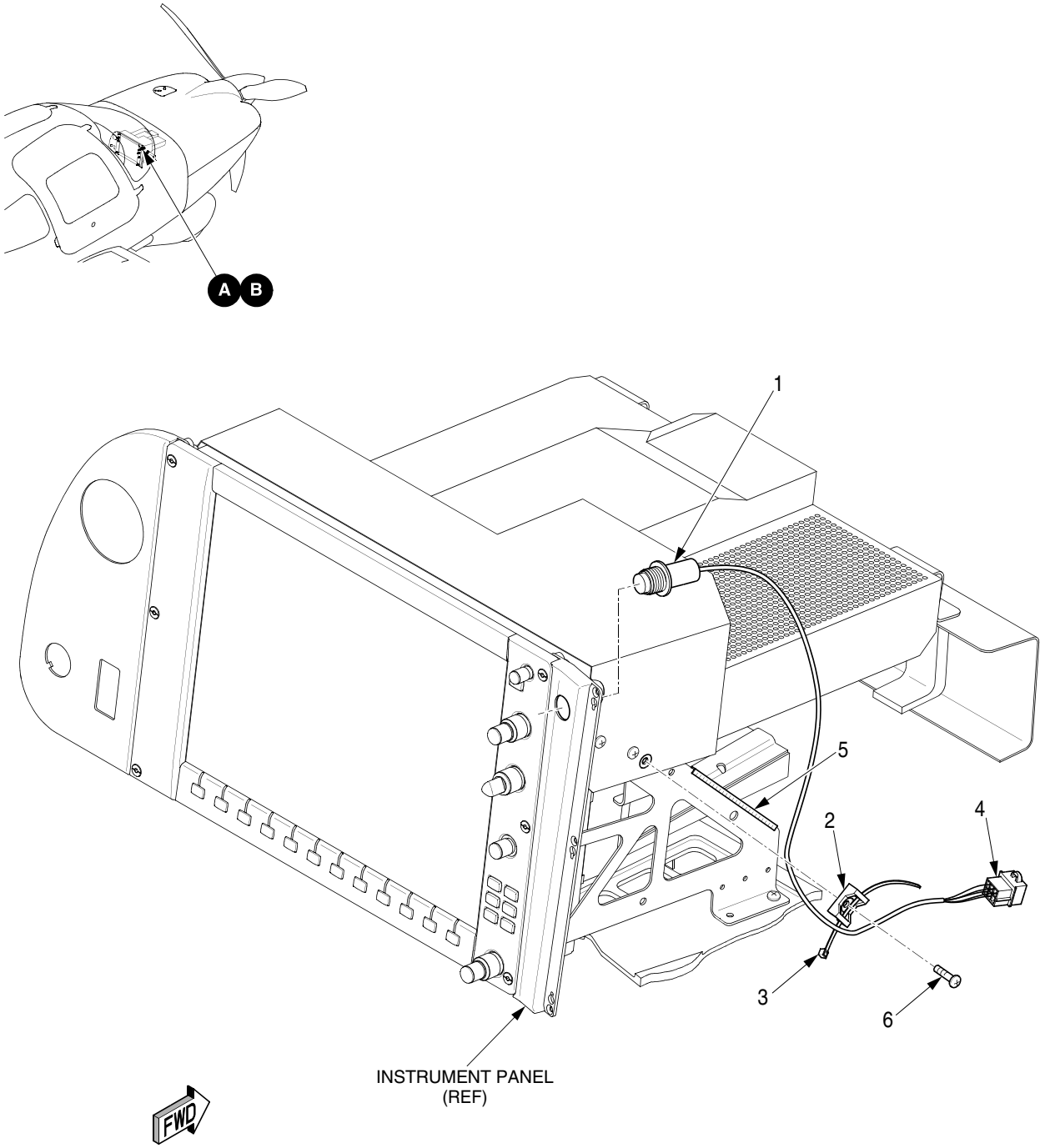
(d) Remove nut, washer, and gasket securing switch to instrument panel. Remove switch from airplane.

(2) Installation - Reversionary Switch

(a) Position switch to instrument panel and secure with gasket, washer, and nut.

(b) Connect wiring to switch terminals.

(c) Install glareshield. (Refer to 25-10)



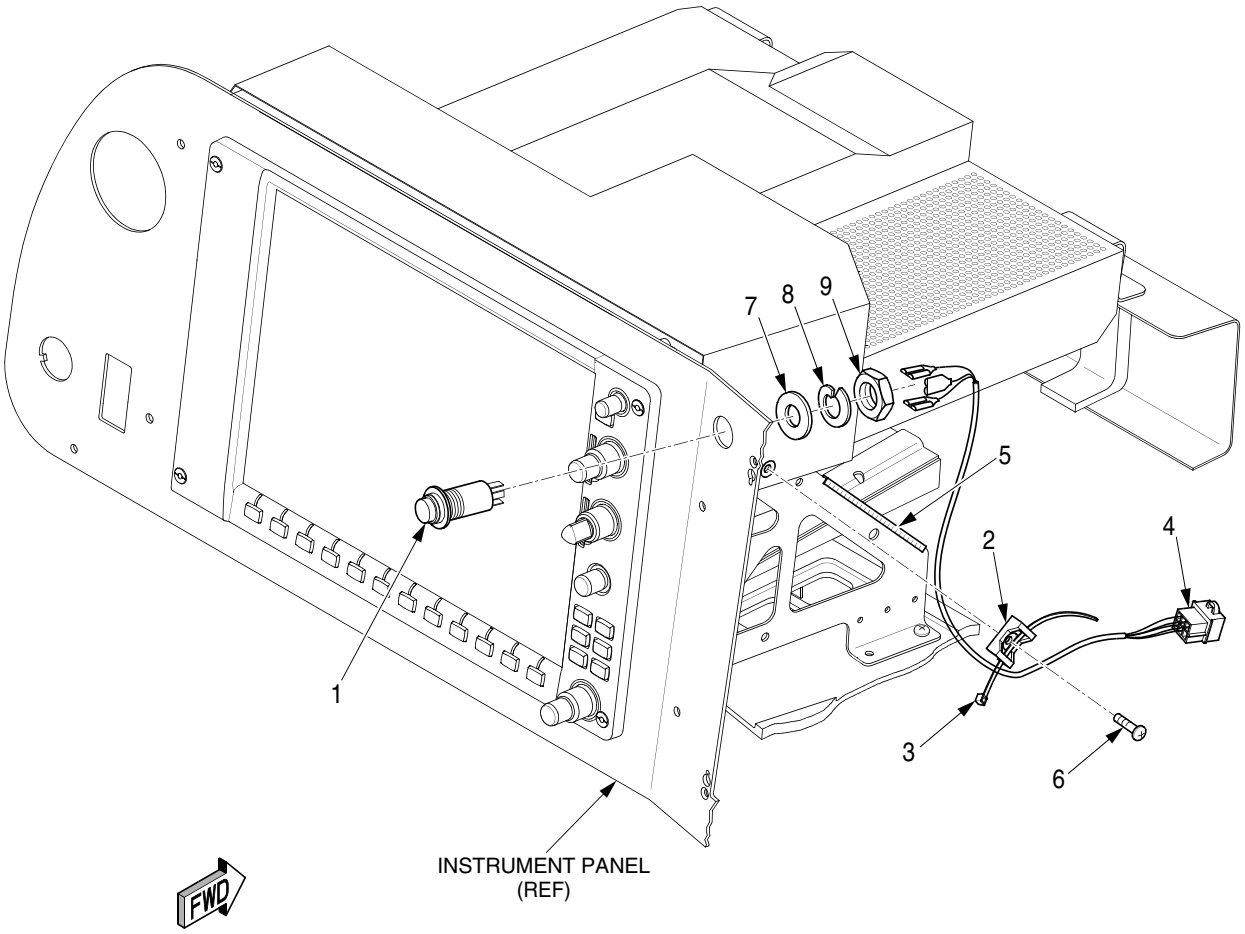
LEGEND
1. Reversionary Switch
2. Cable Tie Anchor
3. Cable Tie
4. Connector
5. Flexible Grommet
6. Screw

DETAIL A

SR20_MM31_2708

Figure 31-609
Reversionary Switch Installation - Serials 2016 & subs w/ Perspective Avionics and 12-Inch Displays (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics and 12-Inch Displays



LEGEND
1. Reversionary Switch
2. Cable Tie Anchor
3. Cable Tie
4. Connector
5. Flexible Grommet
6. Screw
7. Gasket
8. Washer
9. Nut

DETAIL B

SR20_MM31_3027

Figure 31-609
Reversionary Switch Installation - Serials 2016 & subs w/ Perspective Avionics and 10-Inch Displays (Sheet 2 of 2)

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CHAPTER

32

LANDING GEAR

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32-LOEP	4	04 SEP 2018
32-TOC	1	04 SEP 2018
32-TOC	2	04 SEP 2018
32-TOC	3	04 SEP 2018
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32-TOC	5	04 SEP 2018
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LANDING GEAR

1. GENERAL

This chapter describes those units and components which furnish a means of supporting and steering the airplane. The landing gear design is of the fixed tricycle type. The main landing gear are bolted to the composite wing structure (*Serials 1005 thru 1885*) or to the composite wing structure and 2 aluminum lateral ribs (*Serials 1886 & subs*) between the wing spar and shear web. The landing gear struts are constructed of composite material for fatigue resistance. Main gear shock absorption is provided by composite leaf-springs attached to the wing.

The nose gear strut is of tubular steel construction and is attached to the steel engine mount structure. Nose gear shock absorption is provided by polymer shock absorbing pucks.

Serials 1005 thru 1885: The nose wheel is free castering and can turn through an arc of approximately 216 degrees (108 degrees either side of center).

Serials 1886 & subs: The nose wheel is free castering and can turn through an arc of approximately 170 degrees (85 degrees either side of center).

Aluminum nose and main landing gear wheels are installed and are designed to be used with tubes and tires (*Serials 1005 thru 2240 before SB2X-32-21*) or tires (*Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs*). The main wheels have hydraulically operated, single-piston (*Serials 1005 thru 1600*) or dual-piston (*Serials 1601 & subs*) type brakes actuated by pressing the toe brakes at each crew position. Steering is accomplished through differential braking. Standard wheel pants are easily removable to provide access to tires and brakes. Access plugs *(Serials 1005 thru 2221)* in the wheel pants can be removed to allow tire inflation and pressure checking. Access doors *(Serials 2222 & subs)* in the wheel pants can be opened to allow tire inflation and pressure checking.

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MAIN LANDING GEAR

1. DESCRIPTION

Serials 1005 thru 1885: A rugged, maintenance free fiberglass strut assembly is utilized for the main landing gear. The strut attaches to the airplane via a canted wing rib and an upper attach fitting that bolts to the WS 37 rib. The wheel, brake, axle, tire, tube (*Serials 1005 thru 1885 before SB2X-32-21*), wheel bearing, and attaching hardware is mounted on each main gear.

Serials 1886 & subs: A rugged, maintenance free fiberglass strut assembly is utilized for the main landing gear. The strut attaches to the airplane via an upper attach fitting, a lower attach fitting, and two aluminum ribs installed laterally between the WS 27 and WS 37 ribs. The lower attach fitting bolts through the lower wing skin to the WS 37 and lateral ribs, and the upper attach fitting bolts to the WS27 and lateral ribs. The wheel, brake, axle, tire, tube (*Serials 1886 thru 2240 before SB2X-32-21*), wheel bearing, and attaching hardware are mounted on each main gear.

2. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Airplane leans to one side.	Incorrect tire pressure.	Inflate to proper pressure. (Refer to 12-10)
	Attaching parts loose, defective.	Tighten loose parts, replace.
	Bent axles.	Replace with new parts.
Tires wear excessively.	Incorrect tire pressure.	Inflate to proper pressure. (Refer to 12-10)
	Bent axles.	Replace with new parts.
	Dragging brakes.	Inspect and adjust brakes. (Refer to 32-42)
	Wheels out of balance.	Balance wheel and tire.
	Improper toe-in.	Adjust toe-in. (Refer to 32-10)
Obvious vibration on smooth surface.	Wheels out of balance	Balance wheel and tire.
	Worn tire.	Replace.

3. MAINTENANCE PRACTICES

A. Main Gear Fairing - *Serials 1005 thru 1137* (See Figure 32-101)

(1) Removal - Main Gear Fairing

(a) Remove screws along seam securing forward and aft wheel fairings together. Remove aft wheel fairing from airplane.

(b) Remove screws on top, inboard section of forward wheel fairing securing fairing to upper adjustment bracket.

(c) Remove screw on inboard section of forward wheel fairing securing fairing to lower adjustment bracket.

(d) Remove bolt and washer securing forward wheel fairing to axle and remove from airplane.

(e) Remove upper and lower screws clamping trailing edge of strut fairing together.

(f) Remove screw securing strut fairing to strut and remove from airplane.

(g) Remove screws attaching upper strut fairing to wing and remove from airplane.

(2) Installation - Main Gear Fairing

Note: To ensure clearance between wheel assembly and fairing assembly, finger tighten all attaching parts and adjust fairing assembly before final tightening.

Ensure anti-chafe spacers are properly secured by nutplate clip prior to strut fairing installation.

(a) Pry trailing edge seam of strut fairing open, position around strut, and install upper and lower screws clamping trailing edge of strut fairing together.

(b) Install screw securing strut fairing to inboard side of strut.

(c) Pry trailing edge seam of upper strut fairing open, position around strut, and install screws attaching upper strut fairing to wing.

Note: To facilitate proper installation, adjust upper and lower adjustment brackets if necessary.

(d) Position forward wheel fairing around wheel assembly and strut fairing, and install screw securing fairing to lower adjustment bracket.

(e) Install screws at top, outboard section of forward wheel fairing securing fairing to upper adjustment bracket.

(f) Finger tighten washer and bolt securing forward wheel fairing to axle.

(g) Position aft wheel fairing to forward wheel fairing at seams. Apply light force to mate the wheel fairings together and install screws securing seams.

CAUTION: Maintain minimum clearance of 0.75 inch (1.90 cm) between tire and wheel fairings.

(h) Adjust forward and aft wheel fairings as required for proper clearance between tire and fairings.

(i) Torque bolt securing forward wheel fairing to axle to 25 - 30 in-lb (2.82 - 3.39 Nm) and Loctite bolt. (Refer to 20-40)

B. Main Gear Fairing - *Serials 1138 thru 1885* (See Figure 32-101)

(1) Removal - Main Gear Fairing

(a) Remove screws along seam securing inboard and outboard wheel fairings together.

(b) Remove screw securing inboard wheel fairing to lower adjustment bracket and remove from airplane.

(c) Remove bolt and washer securing wheel fairing to axle.

(d) Remove screws and spacer securing wheel fairing to upper adjustment bracket and remove from airplane.

(e) *Serials 1138 thru 1316:* Remove upper and lower screws clamping trailing edge of strut fairing together.

(f) *Serials 1317 thru 1885:* Remove hinge rod.

1 Cut safety wire used to secure upper section of hinge on strut fairing to hinge rod.

2 Support strut fairing and pull hinge rod upward to remove hinge rod from strut fairing assembly.

(g) Remove screw securing strut fairing to strut and remove from airplane.

(h) Remove screws and well nuts attaching upper strut fairing to wing and remove from airplane.

(2) Installation - Main Gear Fairing

Note: To ensure clearance between wheel assembly and fairing assembly, finger tighten all attaching parts and adjust fairing assembly before final tightening.

Serials 1138 thru 1316: Ensure anti-chafe spacers are properly secured by nutplate clip prior to strut fairing installation.

(a) Pry trailing edge seam of upper strut fairing open, position around strut, and install screws and well nuts attaching upper strut fairing to wing.

(b) Pry trailing edge seam of strut fairing open, slide fairing into position under upper strut fairing, and install screw securing fairing to strut.

(c) *Serials 1138 thru 1316:* Install upper and lower screws clamping trailing edge of strut fairing together.

(d) *Serials 1317 thru 1885:* Install hinge rod.

1 Install hinge rod downward between strut fairing seam at hinge.

2 Safety wire hinge rod to hole on upper section of hinge attached to strut fairing. (Refer to 20-50)

Note: To facilitate proper installation, adjust upper and lower adjustment brackets if necessary.

(e) Position outboard wheel fairing around wheel assembly and strut fairing, and install screws and spacer securing fairing to upper adjustment bracket.

(f) Finger tighten washer and bolt securing outboard wheel fairing to axle.

(g) Position inboard wheel fairing to outboard wheel fairing and install screws securing seams.

(h) Loctite and install screw securing inboard wheel fairing to lower adjustment bracket. (Refer to 20-40)

(i) Adjust inboard and outboard wheel fairings as required for clearance between tire and fairings.

(j) Torque bolt securing outboard wheel fairing to axle to 25 - 30 in-lb (2.82 - 3.39 Nm) and Loctite bolt. (Refer to 20-40)

C. Main Gear Fairing - *Serials 1886 & subs* (See Figure 32-101)

(1) Removal - Main Gear Fairing

(a) Remove screws securing access panel to inboard fairing bracket.

(b) Remove screws securing access panel to wheel fairing. Remove access panel from airplane.

(c) Remove screw and washer securing lower fairing to axle. Remove lower fairing from airplane.

(d) Remove screws securing upper fairing to brackets on lower attach fitting.

(e) Remove screws securing trailing edge of upper fairing to strut. Remove upper fairing from airplane.

(2) Installation - Main Gear Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222 (*Serials 1005 thru 2240 before SB2X-32-21*)	Any Source	Secure fairing.
	242 or 243 (*Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs*)		

(b) Pry trailing edge seam of upper fairing open, position around strut and over upper flange of grommet.

(c) Install screws securing trailing edge of upper fairing to strut.

(d) Install screws securing upper fairing to brackets on lower attach fitting.

(e) Position lower fairing around wheel and strut and over lower flange of grommet.

(f) Apply Loctite to threads of screw and install screw and washer securing lower fairing to axel.

(g) Position access panel to lower fairing and secure with screws.

(h) Install screws and washers securing access panel to inboard fairing bracket.

(i) Verify gap between edge of fairings and grommet does not exceed 0.05 inch (1.27 mm).

(j) Verify gap between tire and edge of lower fairing is a minimum of 0.37 inch (9.39 mm) on all sides.

(3) Removal - Main Gear Fairing Strut Grommet

(a) Remove main gear fairing. (Refer to 32-10)

(b) Remove and discard grommet(s) from strut.

(4) Installation - Main Gear Fairing Strut Grommet

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Double-sided Tape	(Refer to IPC)	(Refer to IPC)	Adhere grommet(s).
Isopropyl Alcohol	99% or higher purity	Any Source	Prepare mating surface for double-sided tape.
Adhesion Promoter	111	3M Company	Promote adhesion.

(b) Clean all remaining double-sided tape off strut using isopropyl alcohol. (Refer to 20-30)

(c) *For lower grommet:* Measure 8.0 inches (20.3 cm) from bottom of strut and mark.
(d) *For upper grommet:* Measure 19.4 inches (49.3 cm) from bottom of strut and mark.
(e) Apply adhesion promoter to installation area.
(f) At mark(s), install lower edge of double-sided tape on strut and remove release liner.
(g) Install grommet(s) to taped installation area.
(h) Install main gear fairing. (Refer to 32-10)

EFFECTIVITY:
Serials 1886 & subs

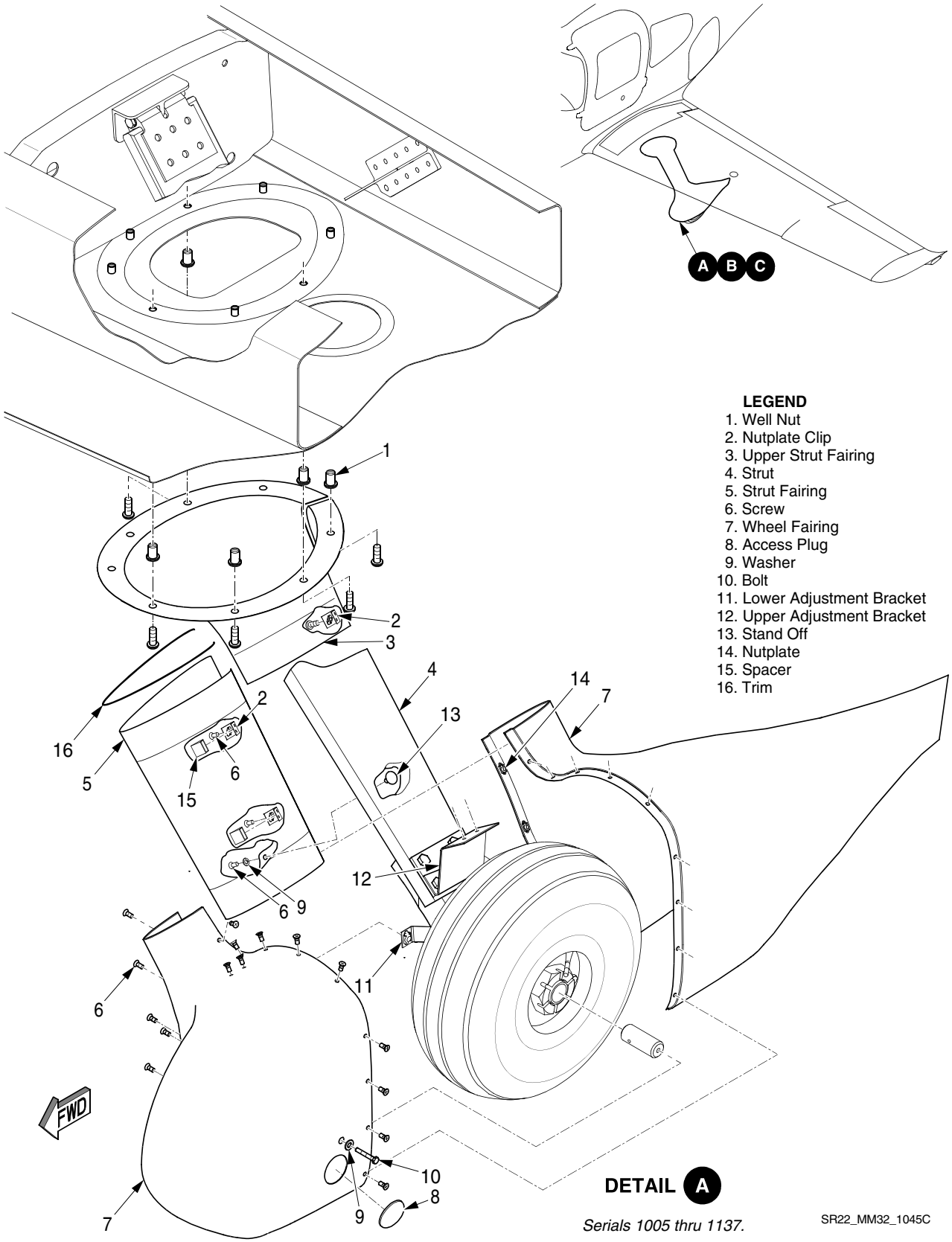


Figure 32-101
Main Gear Fairing Installation - Serials 1005 thru 1137 (Sheet 1 of 3)

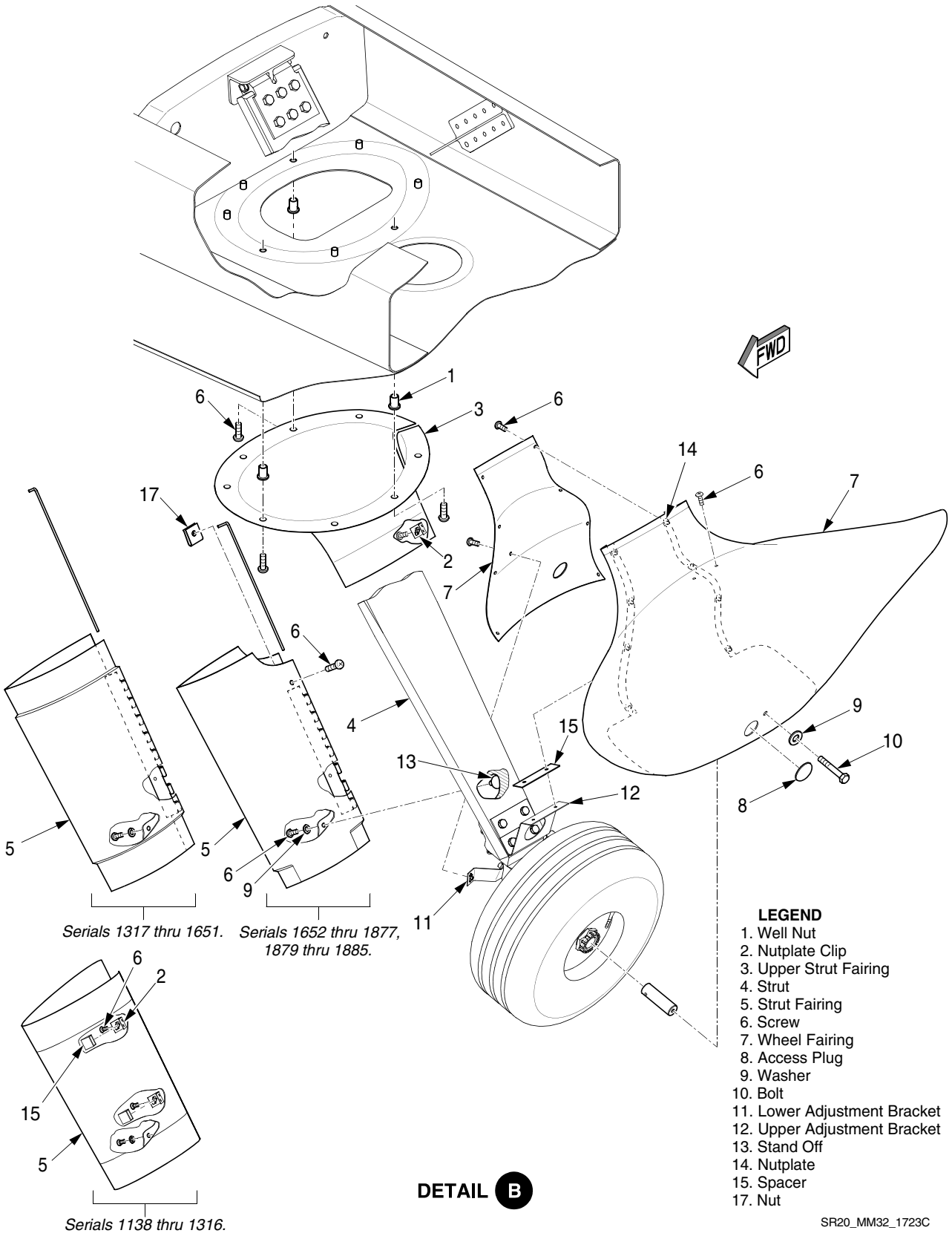


Figure 32-101
Main Gear Fairing Installation - Serials 1138 thru 1885 (Sheet 2 of 3)

EFFECTIVITY:
Serials 1138 thru 1885

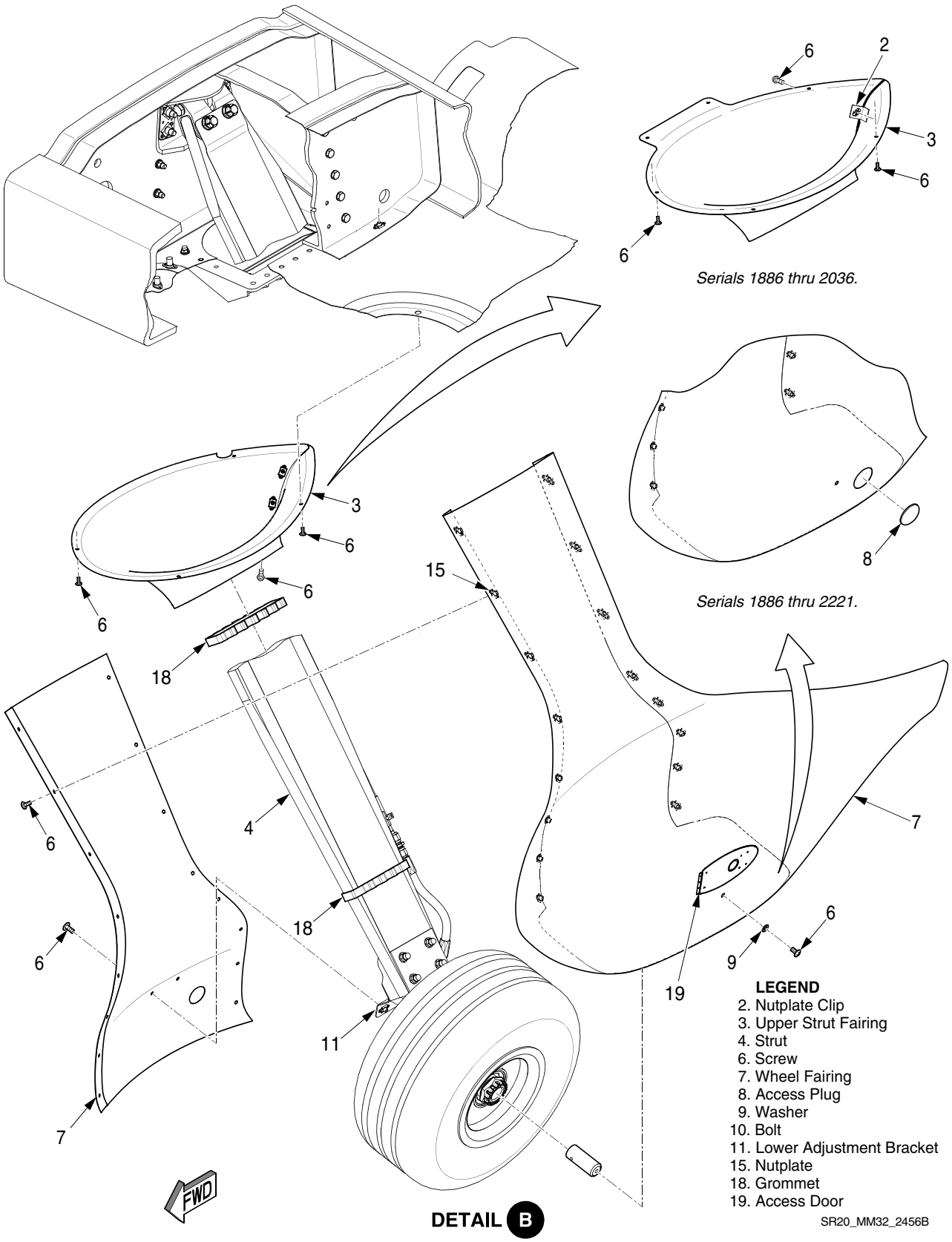


Figure 32-101
Main Gear Fairing Installation - Serials 1886 & subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 1886 & subs

D. Main Gear Assembly - *Serials 1005 thru 1885* (See Figure 32-102)

(1) Removal - Main Gear Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Wedge	-	Any Source	Removal of strut.

(b) Remove main gear fairings. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Drain hydraulic fluid from brake system.

(e) Disconnect and cap flexible brake line at bracket on upper strut fitting.

CAUTION: When strut clamp is removed, exercise caution to prevent strut assembly from coming into contact with wing skin.

(f) Remove nuts, washers, and bolts at clamp securing strut assembly to canted rib.

(g) Squarely strike the upper side of the strut near the clamp fitting with a rubber mallet to move the strut down and away from the clamp fitting.

(h) Insert and drive plastic wedge into space between strut and clamp fitting to dislodge strut from clamp.

(i) Allow strut assembly to gently swing downward.

(j) With gear assembly supported, remove bolt connecting upper attach fitting to rib attach fitting and lower assembly to the ground, clear of airplane.

(2) Disassembly - Main Gear Assembly

(a) Remove bolt, washer, and nut securing brake line bracket to upper strut fitting.

(b) Remove brake line secured to strut. (Refer to 32-42)

(c) Remove main wheel. (Refer to 32-41)

(d) Remove bolts, washers, lower wheel fairing bracket, and nuts securing axle and brake assembly to axle fitting.

(e) Remove bolts, washers, plates, and nuts securing strut to axle fitting and upper wheel fairing bracket.

(f) Remove bolts, washers, and nuts securing upper fitting and shim to strut.

(3) Assembly - Main Gear Assembly

(a) Position upper fitting and shim to strut.

(b) Secure upper fitting and shim to strut with bolts, washers, and nuts.

(c) Align upper wheel fairing bracket with lower holes of plate and position to lower strut. Secure strut to axle fitting and upper wheel fairing bracket with bolts, washers, plates, and nuts.

(d) Position lower wheel fairing bracket to upper holes of lower axle fitting. Secure axle and brake assembly to axle fitting with bolts, washers, and nuts.

(e) Install main wheel. (Refer to 32-41)

(f) Install brake line to strut. (Refer to 32-42)

(g) Install bolt, washer, and nut securing brake line bracket to upper strut fitting.

(4) Installation - Main Gear Assembly

(a) Support main gear assembly under airplane and lift assembly up to align main gear upper attach fitting with wing rib attach fitting. Install bolt securing main gear assembly to wing rib attach fitting and torque to 25.0 - 50.0 in-lb (2.8 - 5.6 Nm).

EFFECTIVITY:
Serials 1005 thru 1885

(b) Swing strut assembly up into position and secure strut clamp fittings to canted rib attach fitting bolts with nuts and washers. Torque to 150.0 in-lb (16.9 Nm).
(c) Connect flexible brake line at bracket on upper strut fitting.
(d) Lower airplane and remove jacks. (Refer to 07-10)
(e) Final torque bolts securing strut to canted rib. Torque to 160.0 - 190.0 in-lb (18.1 - 21.5 Nm).
(f) Fill brake system with hydraulic fluid as required. (Refer to 12-10)
(g) Bleed brake system. (Refer to 32-42)
(h) Install main landing gear fairings. (Refer to 32-10)

(5) Inspection/Check - Main Gear Assembly
(a) Inspect main gear fairings for cracks, wear, and loose fasteners.
(b) Remove main gear fairings. (Refer to 32-10)
(c) Verify lower strut fairing stand-off securely attached.
(d) Inspect anti-chafe spacers for cracking, rubbing, and general condition.
(e) Raise airplane on jacks. (Refer to 07-10)
(f) Inspect main gear attachments and bolts for security, condition, cracks, and corrosion.
(g) Inspect main gear strut assembly for cracking, splintering, condition, and security.
(h) Check brake lines for leakage and security to main gear strut.
(i) Lower airplane and remove from jacks. (Refer to 07-10)
(j) Install main gear fairings. (Refer to 32-10)

E. Main Gear Assembly - *Serials 1886 & subs* **(See Figure 32-102)**

(1) Removal - Main Gear Assembly

(a) Remove main gear fairings. (Refer to 32-10)

(b) Remove access panel LW1 or RW1. (Refer to 06-00)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Drain hydraulic fluid from brake system.

(e) Disconnect strut assembly brake line from bulkhead fitting. Cap brake line to prevent system contaminates.

(f) Remove bolt, washers, and nut securing lightning protection wire to lateral wing rib.

(g) *Serials 2016 & subs w/ Perspective Avionics:* Disconnect electrical connector from brake temperature sensor. (Refer to 32-42)

(h) *Serials 2016 & subs w/ Perspective Avionics:* Remove cable ties securing brake temperature sensor wire harness to strut assembly.

(i) Remove nuts, washers, bolts, and clamp securing strut assembly to lower attach fitting.

CAUTION: When removing strut from lower attach bracket, use caution to prevent damaging upper strut fitting and upper attach bracket.

(j) If necessary, gently tap upper side of strut with a rubber mallet to move strut away from lower attach fitting.

(k) While supporting gear assembly, remove bolts and washers securing strut upper attach fitting to wing rib. Remove strut assembly from airplane.

(2) Disassembly - Main Gear Assembly

(a) Remove strut assembly brake line. (Refer to 32-42)

(b) Remove main wheel. (Refer to 32-41)

(c) *Serials 1886 thru 2074:* Remove bolts, washers, and nuts securing axle and brake assembly to axle fitting.

(d) *Serials 2075 & subs:* Remove bolts, washers, and nuts securing axle, shim, and brake assembly to axle fitting.

(e) Remove bolts, washers, plates, and nuts securing strut and inboard fairing bracket to axle fitting.

(f) Remove bolts, washers, and nuts securing strut upper end fitting assembly to strut.

(3) Assembly - Main Gear Assembly

(a) Position strut upper end fitting assembly to strut and secure with bolts, washers, and nuts.

(b) Position strut and inboard fairing bracket to axle fitting and secure with bolts, washers, plates, and nuts.

(c) *Serials 1886 thru 2074:* Position axle and brake assembly to axle fitting and secure with bolts, washers, and nuts.

(d) *Serials 2075 & subs:* Position axle, shim, and brake assembly to axle fitting and secure with bolts, washers, and nuts.

(e) Install main wheel. (Refer to 32-41)

(f) Install strut assembly brake line. (Refer to 32-42)

(4) Installation - Main Gear Assembly

CAUTION: Install main landing gear carefully so as to not chafe the brake lines.

(a) Position gear assembly to wing rib and secure upper attach bracket with bolts and washers.

(b) Position strut and clamp to lower attach bracket and secure with bolt, washers, and nut. Torque to 160.0 - 190.0 in-lb (18.1 - 21.5 Nm).

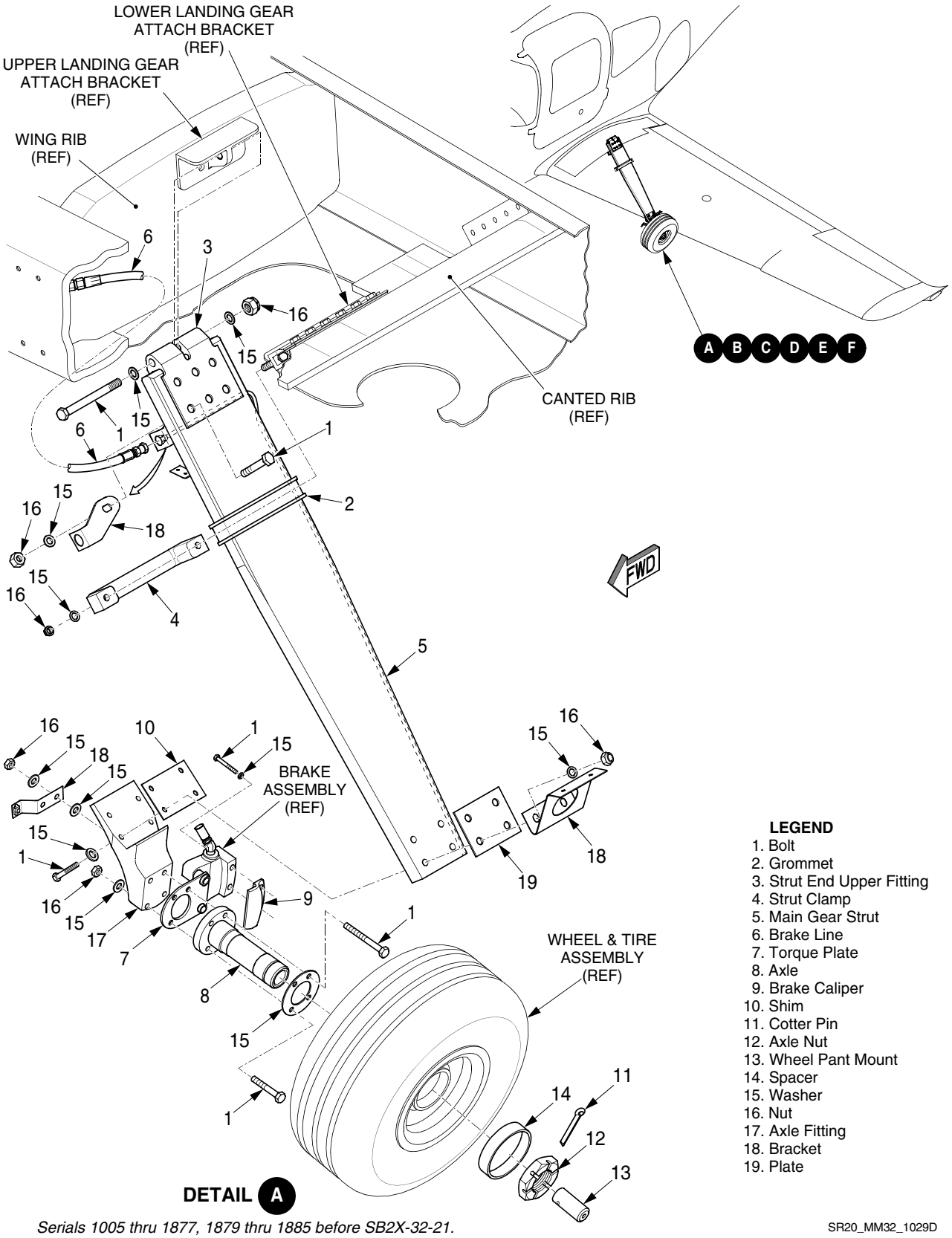
(c) Perform Inspection/Check - Main Gear Assembly. (Refer to 32-10)
(d) *Serials 2016 & subs w/ Perspective Avionics:* Connect electrical connector to brake temperature sensor. (Refer to 32-42)
(e) *Serials 2016 & subs w/ Perspective Avionics:* Position brake temperature sensor wire harness to strut assembly and secure with cable ties.
(f) Position ground wire to lateral wing rib and secure with bolt, washers, and nut.
(g) Connect strut assembly brake line to bulkhead fitting. (Refer to 32-42)
(h) Fill brake system with hydraulic fluid. (Refer to 12-10)
(i) Bleed brake system. (Refer to 32-42)
(j) Lower airplane off jacks. (Refer to 07-10)
(k) Install access panel LW1 or RW1. (Refer to 06-00)
(l) Install main landing gear fairings. (Refer to 32-10)

(5) Inspection/Check - Main Gear Assembly
(a) Inspect main gear fairings for cracks, wear, and loose fasteners.
(b) Remove main gear fairings. (Refer to 32-10)
(c) Remove access panel LW1 or RW1. (Refer to 06-00)
(d) Raise airplane on jacks. (Refer to 07-10)
(e) Inspect main gear attachments and bolts for security, condition, cracks, and corrosion.
(f) Inspect main gear strut assembly for cracking, splintering, condition, and security.
(g) Inspect brake lines for chafing or leakage. Ensure brake line is secured to main gear strut.
(h) Install access panel LW1 or RW1. (Refer to 06-00)
(i) Lower airplane and remove from jacks. (Refer to 07-10)
(j) Install main gear fairings. (Refer to 32-10)

(6) Inspection/Check - Main Gear Gap Measurement
(a) Remove main gear fairings. (Refer to 32-10)
(b) Remove access panel LW1 or RW1. (Refer to 06-00)
(c) Raise airplane on jacks. (Refer to 07-10)
(d) With grommet tight against inboard side of strut, verify 0.001 - 0.016 inch (0.025 - 0.406 mm) gap exists between clamp and grommet.

Note: Additional washers (two maximum, any combination) may be added between clamp and lower attach fitting to obtain gap tolerance. Refer to IPC, Main Landing Gear Installation for approved washers.

(e) If necessary, install additional washers (two maximum) between clamp and lower attach fitting to obtain gap tolerance. If gap tolerance can not be obtained, replace strut grommet. (Refer to 32-10)
(f) Install access panel LW1 or RW1. (Refer to 06-00)
(g) Lower airplane and remove from jacks. (Refer to 07-10)
(h) Install main gear fairings. (Refer to 32-10)



Serials 1005 thru 1877, 1879 thru 1885 before SB2X-32-21.

SR20_MM32_1029D

Figure 32-102
Main Landing Gear Installation - Serials 1005 thru 1885 before SB2X-32-21 (Sheet 1 of 6)

EFFECTIVITY:
Serials 1005 thru 1885 before SB2X-32-21

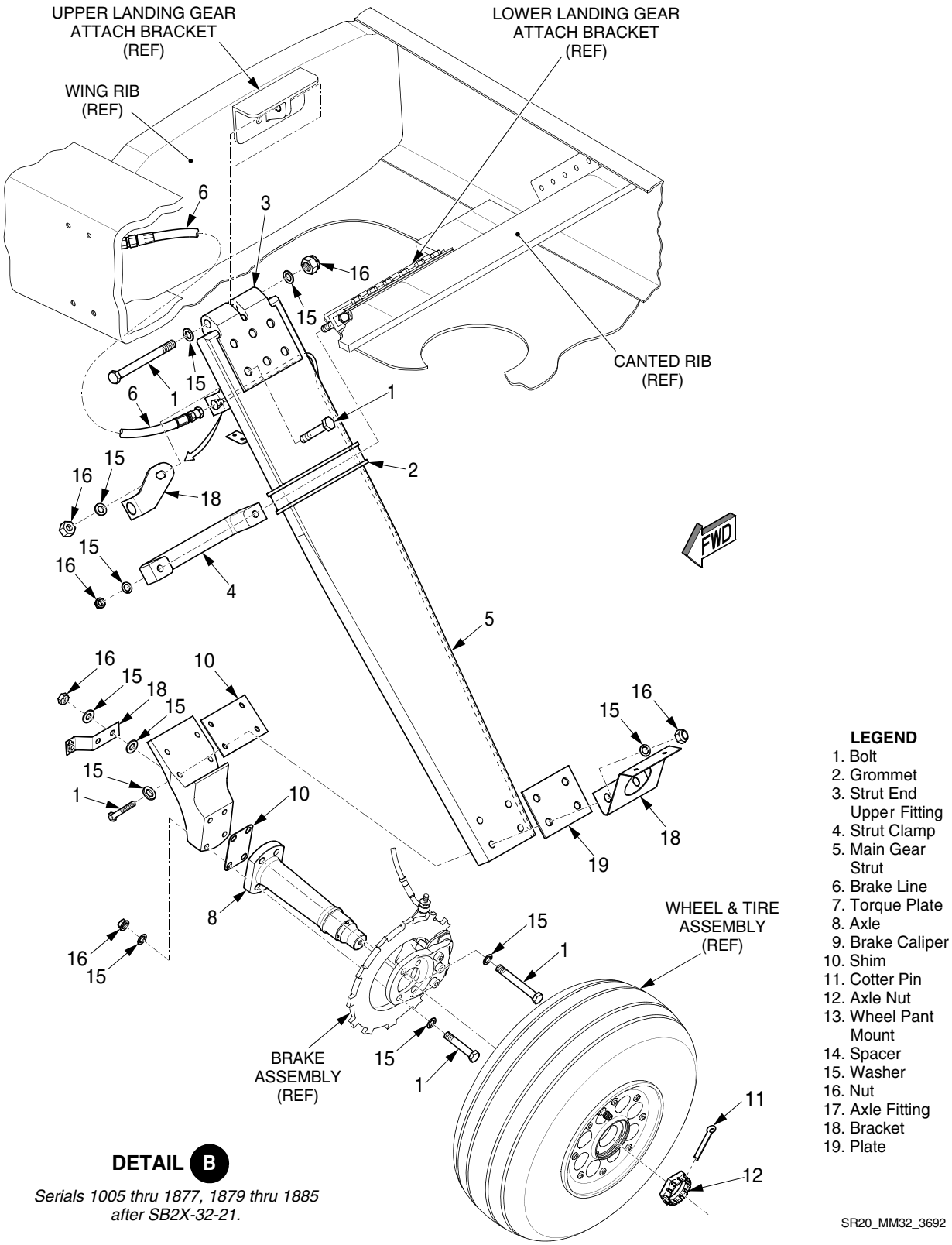


Figure 32-102
Main Landing Gear Installation - Serials 1005 thru 1885 after SB2X-32-21 (Sheet 2 of 6)

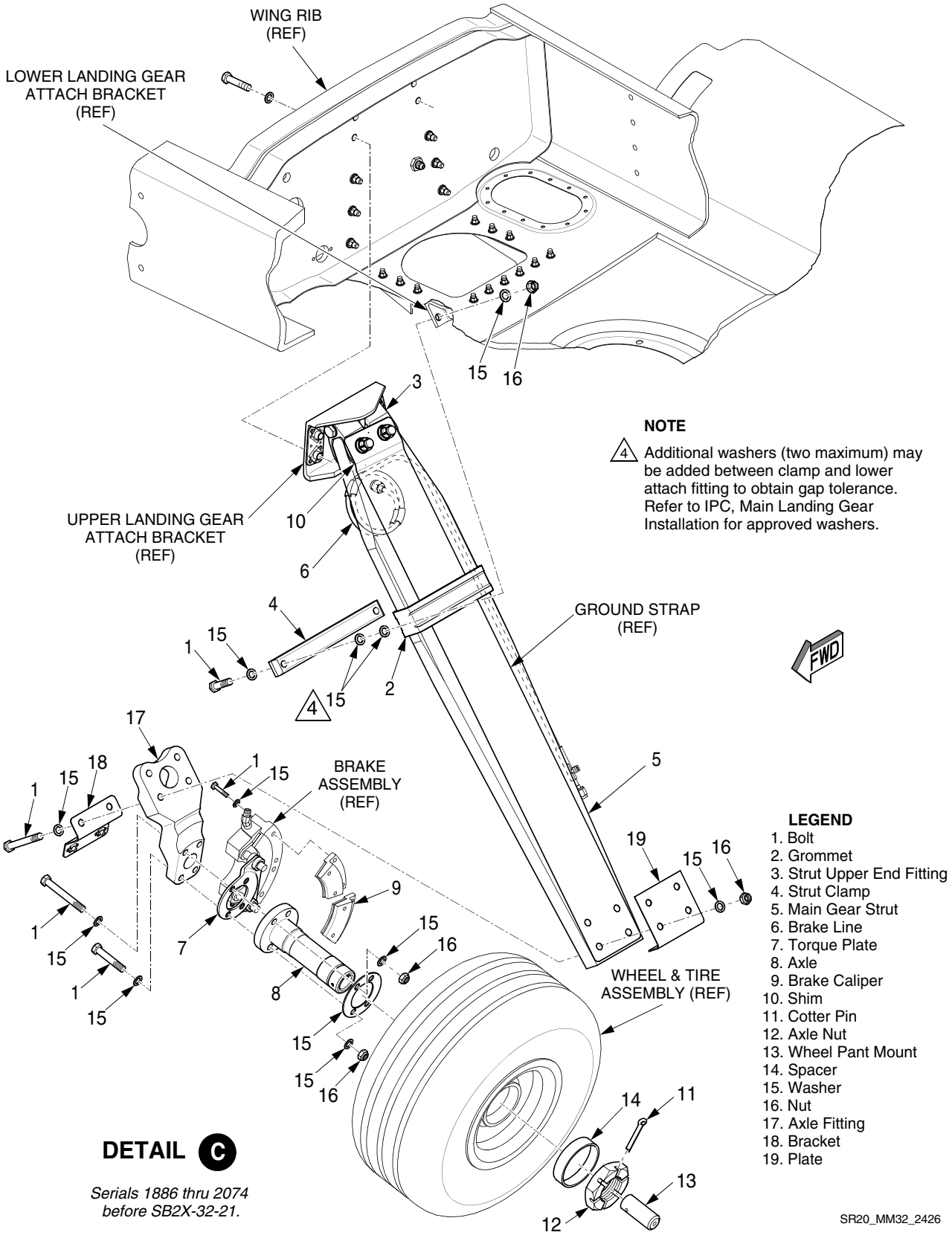


Figure 32-102
Main Landing Gear Installation - Serials 1886 thru 2074 before SB2X-32-21 (Sheet 3 of 6)

EFFECTIVITY:
Serials 1886 thru 2074 before SB2X-32-21

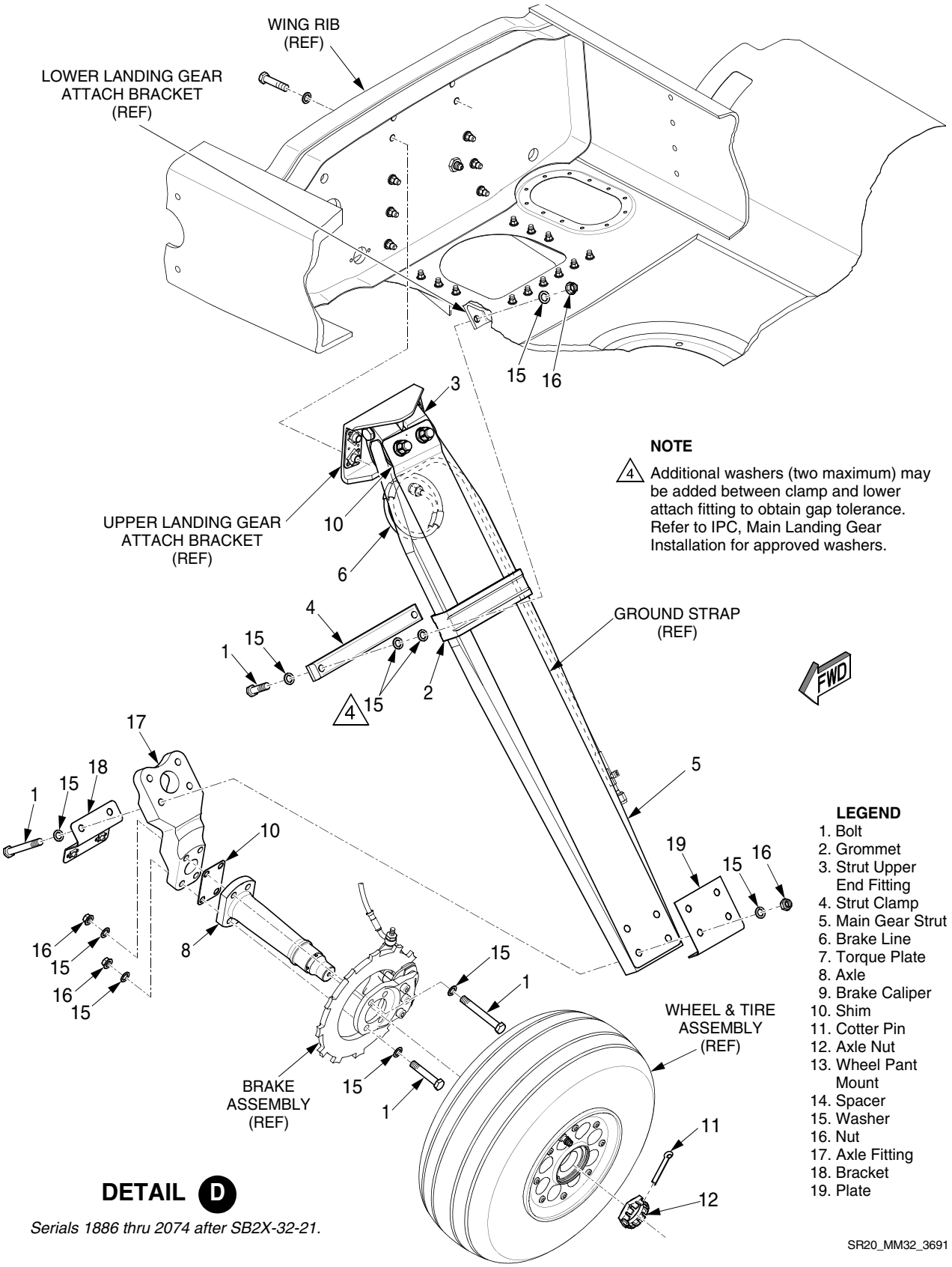


Figure 32-102
Main Landing Gear Installation - Serials 1886 thru 2074 after SB2X-32-21 (Sheet 4 of 6)

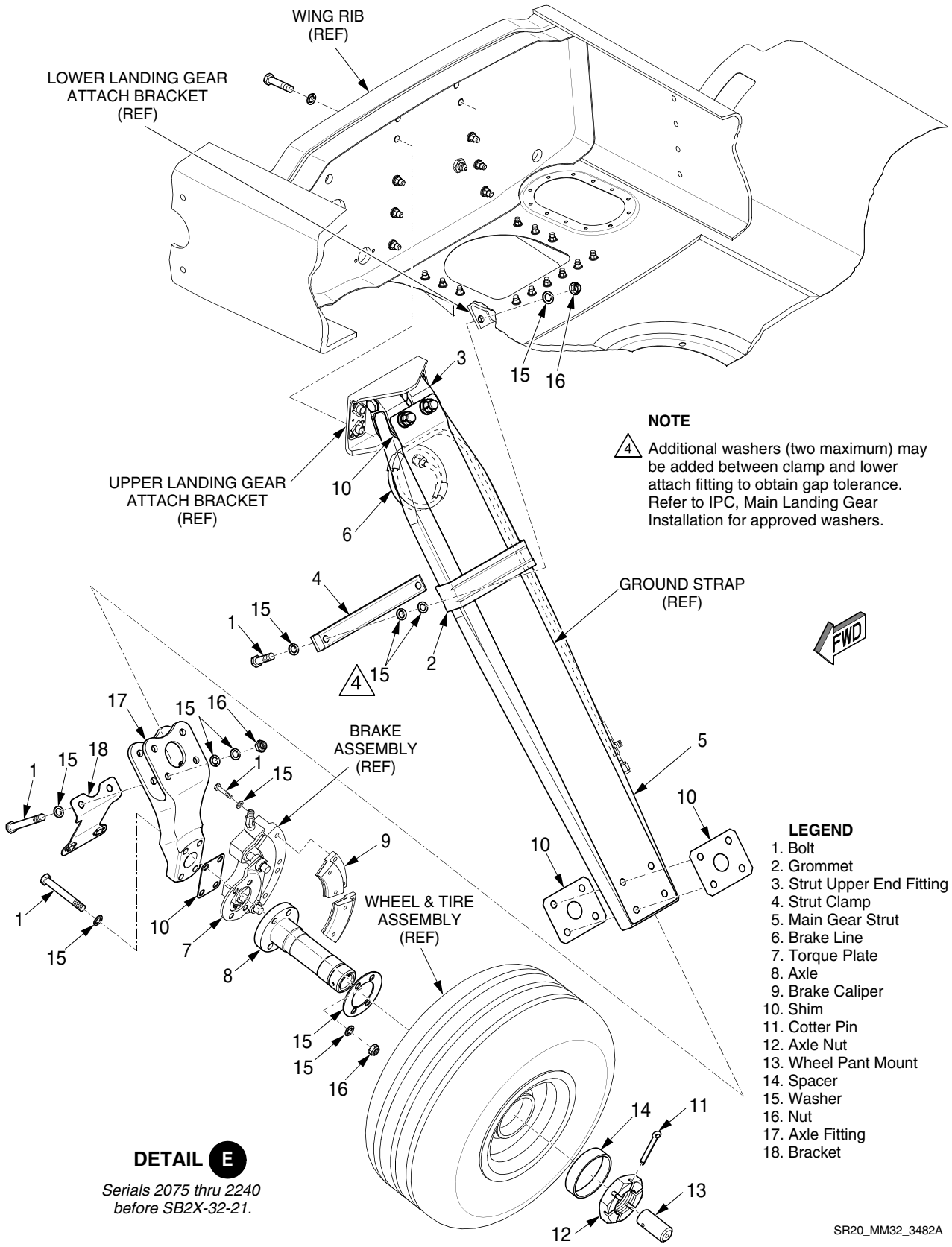


Figure 32-103
Main Landing Gear Installation - Serials 2075 thru 2240 before SB2X-32-21 (Sheet 5 of 6)

EFFECTIVITY:
Serials 2075 thru 2240 before SB2X-32-21

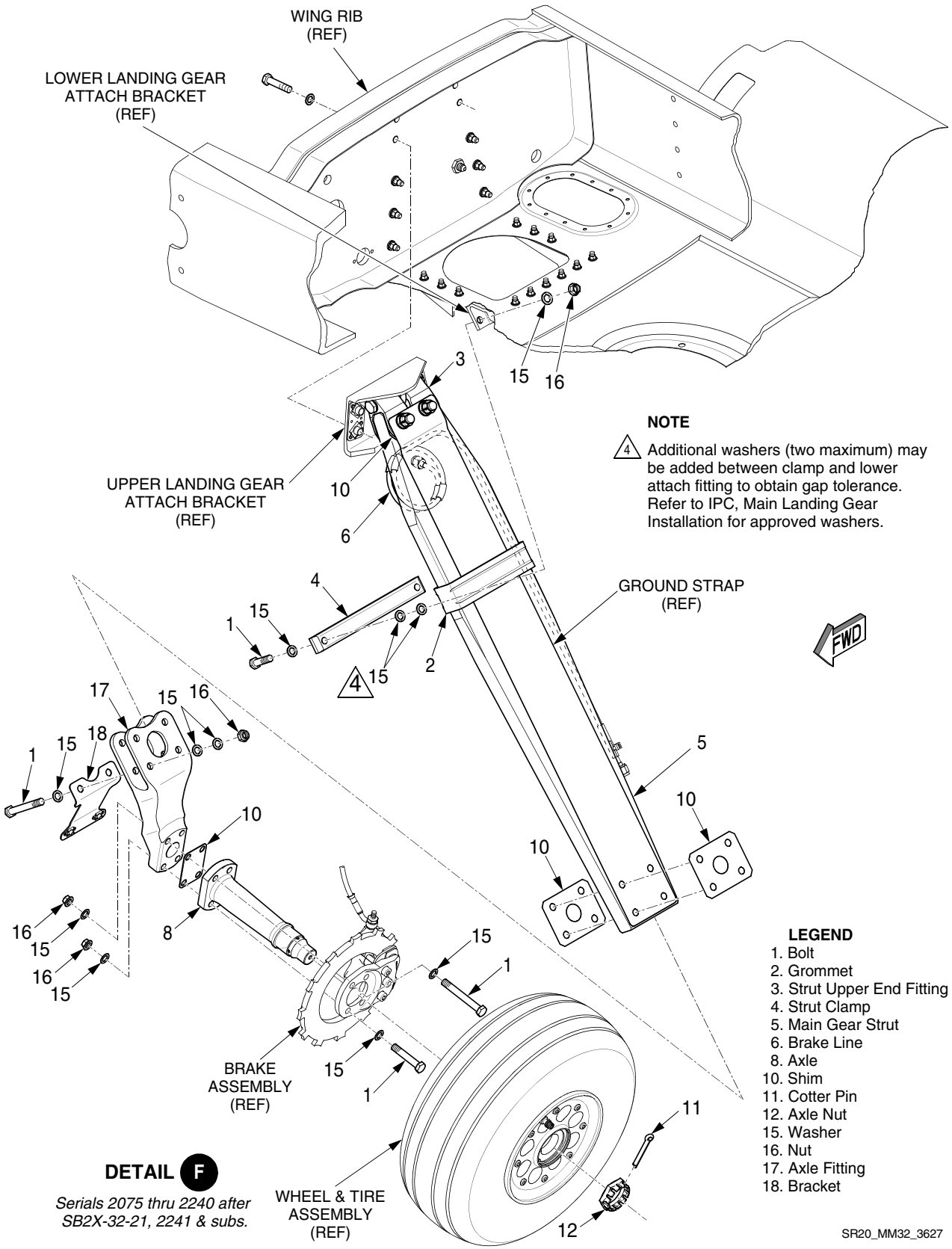


Figure 32-103
Main Landing Gear Installation - Serials 2075 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 6 of 6)

F. Adjustment/Test - Wheel Toe-In Check

(1) Adjustment/Test - Wheel Toe-In Check (See Figure 32-104)

Correct wheel alignment plays a critical role in maintaining tire wear and should be checked whenever abnormal or excessive wear is noted. To correct wheel alignment the airplane is placed on greased-slide plates which allow the main wheels to easily assume their true alignment position. Shims are inserted or removed to adjust camber (*Serials 1005 thru 1885*) and toe-in. Measurements are taken on wheel flange.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plumb Bob	-	Any Source	Determine airplane centerline.
Straightedge	-	Any Source	Measure toe-in.
Framing Squares	-	Any Source	Measure toe-in.
Wood Blocks	-	Any Source	Measure toe-in.
Protractor [a]	-	Any Source	Measure camber.
Shim, Toe-In	Refer to IPC, Main Landing Gear Installation for approved shims	Cirrus Design	Adjust toe-in.
Shim, Camber[a]	Refer to IPC, Main Landing Gear Installation for approved shims	Cirrus Design	Adjust camber.

a. Serials 1005 thru 1885 only.

(b) Remove main landing gear fairings. (Refer to 32-10)

(c) Remove nose landing gear fairing. (Refer to 32-20)

(d) Place airplane on level surface.

(e) *Serials 1005 thru 1885:* For camber measurement, ensure airplane is at maximum gross weight. (Refer to POH)

(f) Ensure tires are properly inflated. (Refer to 12-10)

(g) Place metal slide plates approximately 16.0 inches (40.64 cm) square in front of each main gear wheel.

(h) Grease surface of bottom plate.

(i) Place top plate of same dimension over bottom plate.

(j) Roll main gear wheels onto greased metal slide plates.

(k) Establish airplane centerline by dropping plumb bob line from forward center position (located immediately aft of nose landing gear bridge) and from aft center position (located at tail tie down). Draw chalk line between two plumb bob points.

(l) Establish perpendicular line to airplane centerline just forward of main wheels using intersecting arc method.

(m) Using squares, wood blocks, and straightedge, position straightedge parallel to second chalk line just below axle nut.

(n) Roll airplane forward until tires just touch straightedge.

(o) Place two marks 6.5 inches (16.51 cm) apart on wheel flanges just below axle nut, and level.

(p) Place framing square against straightedge and level with wheel flange marks.

(q) Measure distance between blade of framing square and front flange mark to determine X.

(r) Measure distance between blade of framing square and rear flange mark to determine Y.

(s) Determine toe-in angle by subtracting Y from X.

(t) *Serials 1005 thru 2074:* Adjust toe-in.

Note: Maximum number of shims not to exceed 4 per wheel.

1 If toe-in angle exceeds +0.5° (+0.057”), install or remove shims to obtain proper tolerance.

(u) *Serials 2075 & subs:* Adjust toe-in.

Note: Maximum number of shims not to exceed 2 per wheel.

1 If toe-out angle exceeds -0.25° (-0.028") or toe-in angle exceeds +0.75° (+0.085"), install or remove shims to obtain proper tolerance.

(v) *Serials 1005 thru 1885:* Adjust camber.

Note: Maximum number of shims not to exceed 4 per wheel.

1 Determine camber by reading protractor level held vertically against outboard flanges of wheel.

2 If camber angle is not 0.0° (+0.0”), install or remove shims as required to obtain camber angle as close to 0.0° (+0.0”) as possible.

(w) Install main landing gear fairings. (Refer to 32-10)

(x) Install nose landing gear fairing. (Refer to 32-20)

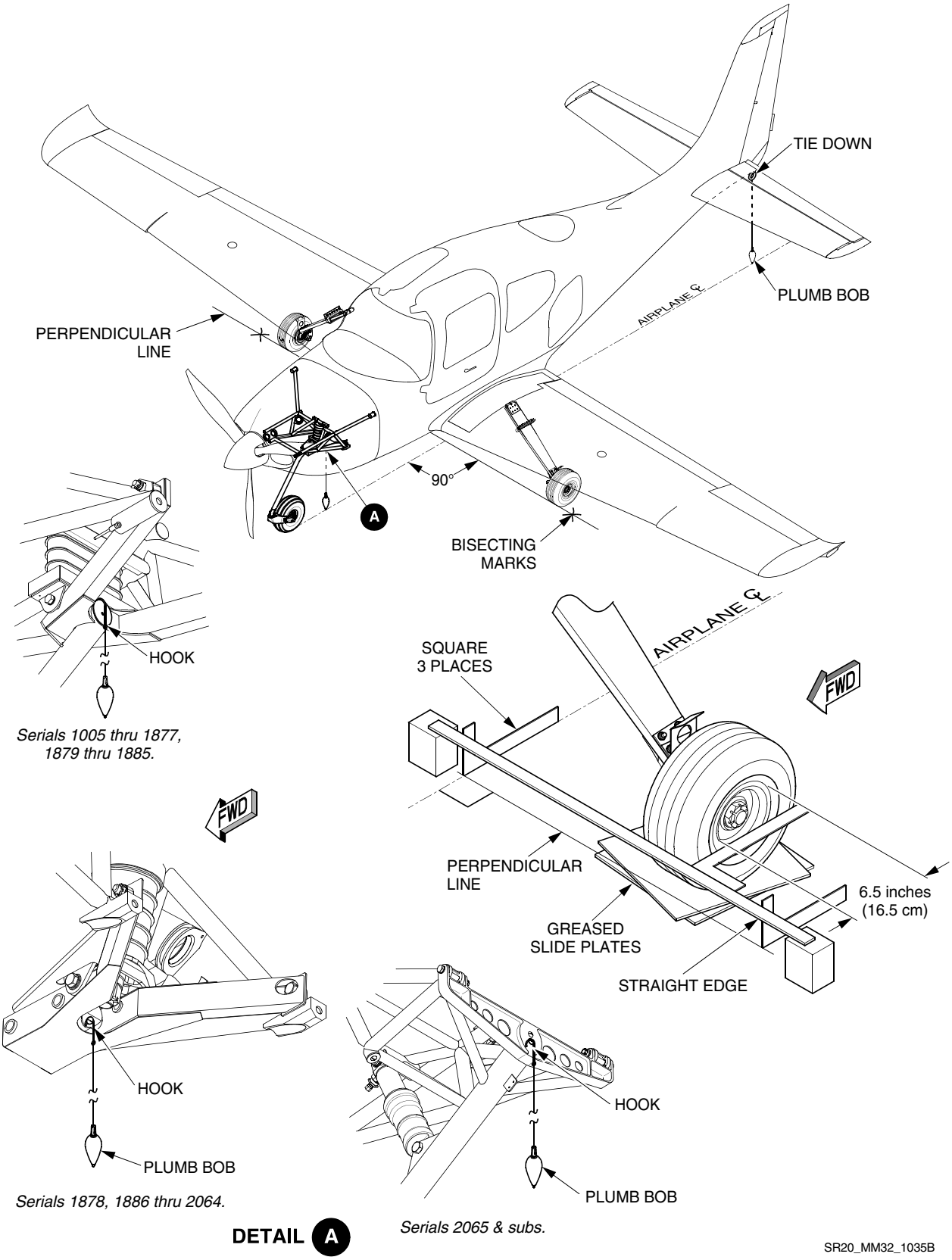
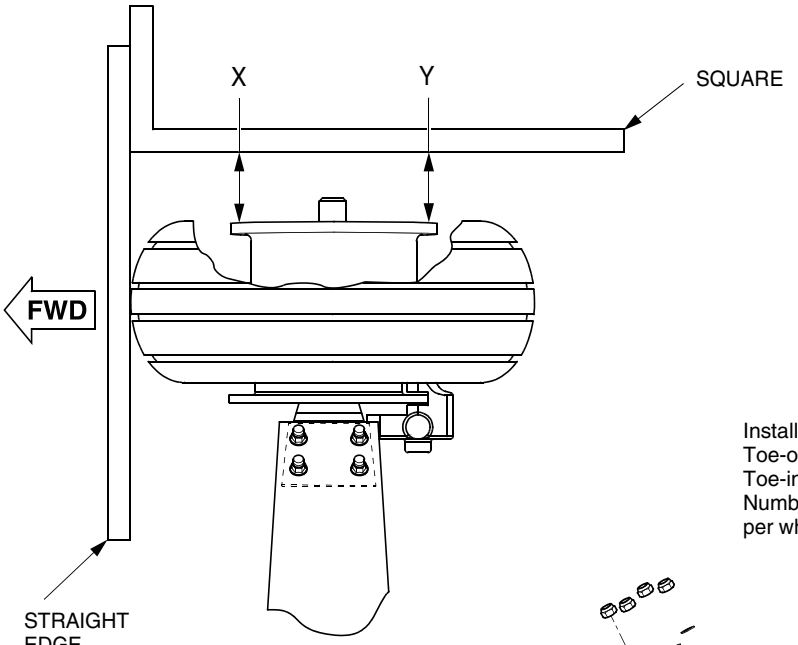


Figure 32-104
Main Wheel Alignment (Sheet 1 of 3)

EFFECTIVITY:
All

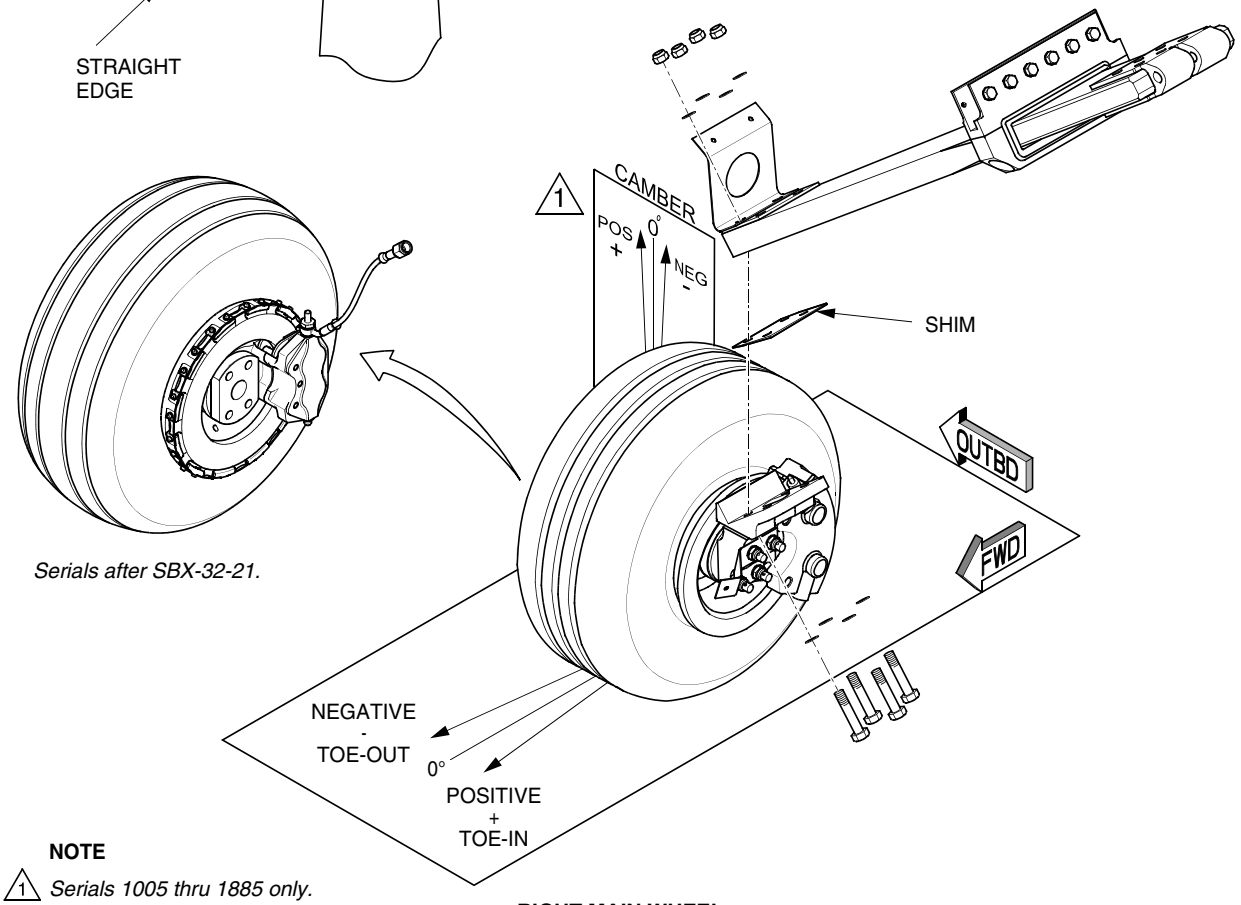
WHEEL TOE - IN AND CAMBER CHECK

Measure dimensions "X" and "Y". Toe-in is difference between X and Y. (i.e. Y - X)
Measure camber by reading protractor level held vertically against outboard flanges of wheel.



TOE - IN CHECK

Install shims to set toe-angle to 0.0°.
Toe-out not to exceed -0.0° (-0.0").
Toe-in not to exceed +0.5° (+0.057").
Number of shims not to exceed four per wheel.



Serials after SBX-32-21.

NOTE

1 *Serials 1005 thru 1885 only.*

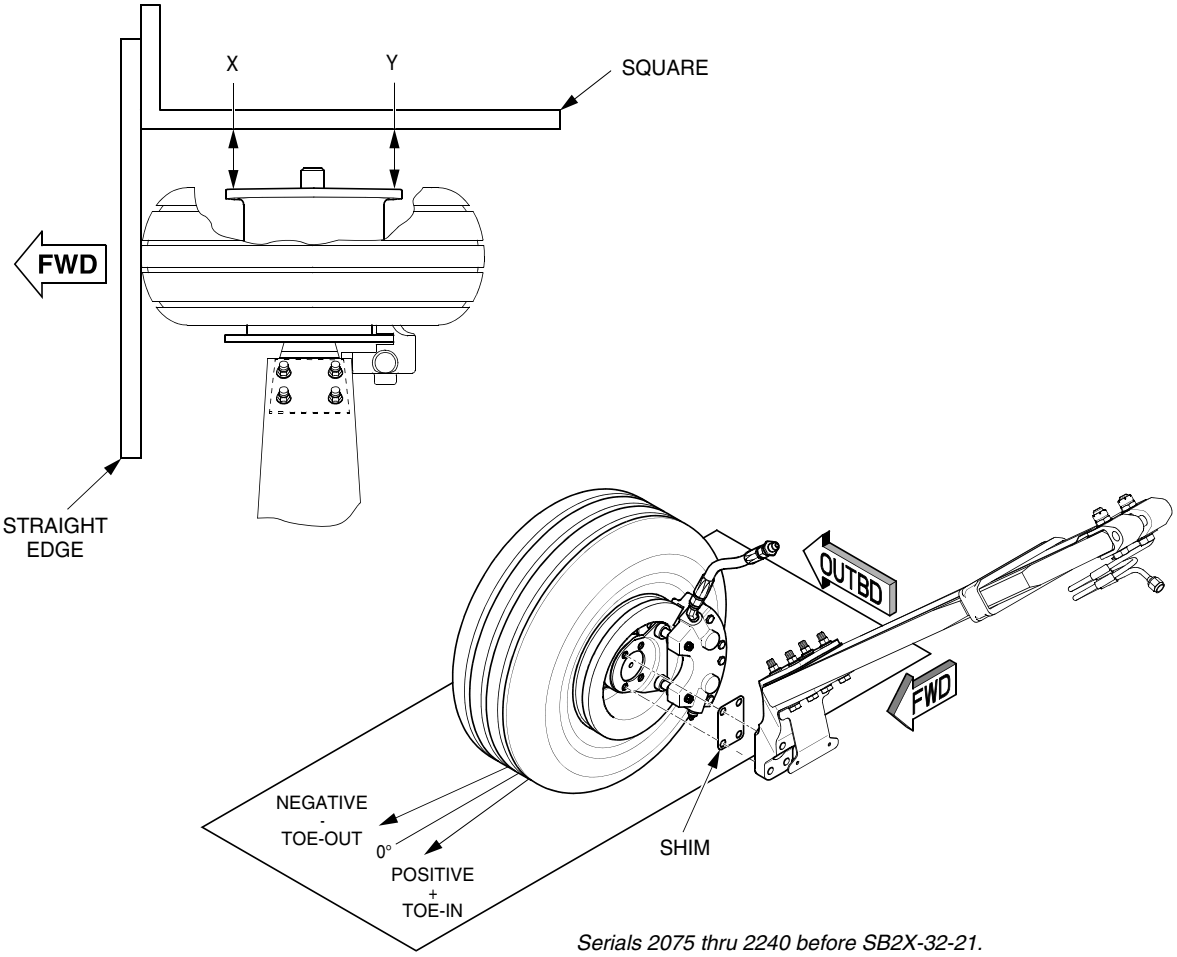
RIGHT MAIN WHEEL

SR20_MM32_1036B

Figure 32-104
Main Wheel Alignment - Serials 1005 thru 2074 (Sheet 2 of 3)

WHEEL TOE - IN CHECK

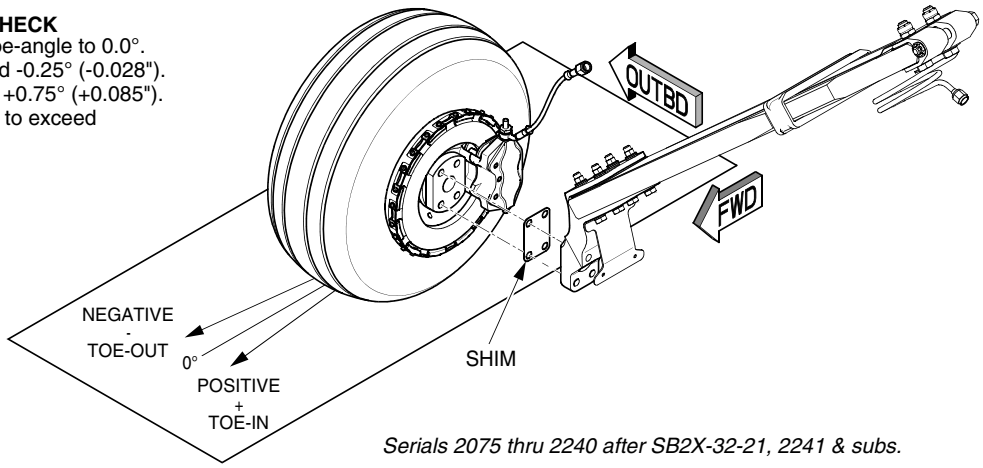
Measure dimensions "X" and "Y". Toe-in is difference between X and Y. (i.e. Y - X).



Serials 2075 thru 2240 before SB2X-32-21.

TOE - IN CHECK

Install shims to set toe-angle to 0.0°.
Toe-out not to exceed -0.25° (-0.028").
Toe-in not to exceed +0.75° (+0.085").
Number of shims not to exceed two per wheel.



Serials 2075 thru 2240 after SB2X-32-21, 2241 & subs.

RIGHT MAIN WHEEL

SR20_MM32_3485A

Figure 32-104
Main Wheel Alignment - Serials 2075 & subs (Sheet 3 of 3)

NOSE GEAR

1. DESCRIPTION

The nose gear consists of a tubular steel strut attached to the engine mount.

Serials 1005 thru 1885 before SB 2X-32-18: The free castering nosewheel's maximum turning arc is 216 degrees (108 degrees either side of center).

Serials 1886 & subs, Serials 1005 thru 1885 after SB 2X-32-18: The free castering nosewheel's maximum turning arc is 170 degrees (85 degrees either side of center).

Serials 1005 thru 2064: Shock absorption is provided by a series of stacked, polymer pucks which react against the engine mount.

Serials 2065 & subs: Shock absorption is provided by a nitrogen and hydraulic fluid filled oleo-pneumatic oleo strut in which compression of a piston rod reacts against the engine mount.

Steering is accomplished by differential application of the main gear brakes. The wheel, axle, tire, tube (*Serials 1005 thru 2240 before SB2X-32-21*), wheel bearing, and seal are mounted on the nose gear.

2. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive tire wear.	Main gear out of alignment.	Align main gear. (Refer to 32-10)
	Nose wheel out of balance	Balance nose wheel and tire.
	Incorrect tire pressure.	Inflate to proper pressure. (Refer to 12-10)
	Nose gear assembly damaged.	Perform Inspection/Check - Nose Gear Assembly. (Refer to 32-20)
Nose wheel shimmy.	Nose wheel out of balance	Balance nose wheel and tire.
	Loose, incorrectly tightened spindle nut.	Perform Adjustment/Test - Nose Wheel Fork Assembly. (Refer to 32-20)
	Worn or incorrectly installed thrust washer.	Perform Inspection - Nose Wheel Fork Assembly. (Refer to 32-20)
	Incorrect tire pressure.	Inflate to proper pressure. (Refer to 12-10)
	Defective tire.	Replace tire.
	Nose gear assembly damaged.	Perform Inspection/Check - Nose Gear Assembly. (Refer to 32-20)
Airplane leans forward.	Incorrect tire pressure.	Inflate to proper pressure. (Refer to 12-10)
	Serials 2065 & subs: Nitrogen pressure requires replenishment.	Replenish nitrogen per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)
	Attaching parts loose, defective.	Tighten loose parts, replace.
	Bent axles.	Replace with new parts.
	Serials 1005 thru 2064: Polymer pucks damaged. *Serials 2065 & subs:* Oleo strut damaged.	Inspect and replace with new parts.
	Nose gear assembly damaged.	Perform Inspection/Check - Nose Gear Assembly. (Refer to 32-20)
Serials 2065 & subs: Oleo Strut Fill Valve leakage.	Looseness of fill valve.	Tighten fill valve.
		If defective, replace sealing ring or fill valve and sealing ring, as required. (Refer to 32-20)

TROUBLE	PROBABLE CAUSE	REMEDY
Serials 2065 & subs: Leakage of hydraulic fluid on surface of piston rod.	Damage to piston rod.	Perform Adjustment/Test - Oleo Strut. (Refer to 32-20)
	Damage to internal sealing elements.	Replace oleo strut. (Refer to 32-20)
Serials 2065 & subs: Loss of hydraulic fluid.	Damage to fill valve seal.	Perform Adjustment/Test - Oleo Strut. (Refer to 32-20)
	Damage to piston rod.	
Serials 2065 & subs: Exposed piston rod length is out-of-tolerance.	Nitrogen pressure requires depletion or replenishment.	Measure nitrogen pressurization per Adjustment/Test - Oleo Strut. (Refer to 32-20)
		Replenish nitrogen per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)
	Increased friction of sealing elements due to low hydraulic fluid level.	Replenish fluid and nitrogen per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)
Serials 2065 & subs: While taxiing airplane, nose landing gear bounce is evident.	Hydraulic fluid volume requires replenishment.	Replenish fluid and nitrogen per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

3. MAINTENANCE PRACTICES

A. Nose Gear Fairing (See Figure 32-201)

(1) Removal - Nose Gear Fairing

(a) *Serials 1005 thru 1885 before SB 2X-32-18:* Turn nose wheel to full 108 degree deflection.

(b) *Serials 1886 & subs, Serials 1005 thru 1885 after SB 2X-32-18:* Turn nose wheel to full 85 degree deflection.

(c) *Serials 1005 thru 2064:* Cut and remove safety wire securing hinge pin to strut fairing and pull hinge pin from strut fairing.

(d) *Serials 1005 thru 2064:* Remove screws securing strut fairing to nose strut and remove strut fairing from airplane.

(e) *Serials 2065 & subs:* Remove screw securing U-nut to strut fairing. Pull hinge pin from strut fairing and remove strut fairing from airplane.

(f) Remove towing lugs from nose wheel assembly.

(g) *Serials 1005 thru 1424, 1431 thru 1475:* Remove wheel pant assembly.

1 Remove screws securing upper access panel to forward wheel pant and remove upper access panel from airplane.

2 Remove screws securing aft wheel pant to forward wheel pant and remove aft wheel pant.

3 Remove screws securing forward wheel pant to nose wheel assembly and remove forward wheel pant from airplane.

(h) *Serials 1425 thru 1430, 1476 & subs:* Remove wheel pant assembly.

1 Remove screws securing forward wheel pant to aft wheel pant and remove forward wheel pant.

2 Remove screws securing aft wheel pant to nose wheel assembly and remove aft wheel pant from airplane.

(2) Disassembly - Nose Gear Fairing - *Serials 2065 & subs*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Remove seal from strut fairing.

(c) Remove residue from installation areas using scraper and isopropyl alcohol. (Refer to 20-30)

(3) Assembly - Nose Gear Fairing - *Serials 2065 & subs*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Epoxy Adhesive	(Refer to 51-30)	Any Source	Secure seal.

(b) Apply adhesive to seal.

(c) Position seal to strut fairing and allow to cure.

(4) Installation - Nose Gear Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Serials 1005 thru 2064: Safety Wire	-	Any Source	Secure hinge pin.
Serials 1005 thru 2064: Loctite®	222	Any Source	Secure strut fairing.

(b) *Serials 1005 thru 1885 before SB 2X-32-18:* Turn nose wheel to full 108 degree deflection.

(c) *Serials 1886 & subs, Serials 1005 thru 1885 after SB 2X-32-18:* Turn nose wheel to full 85 degree deflection.

(d) Pry trailing edge seam of strut fairing open and position strut fairing around nose gear-strut.

(e) *Serials 1005 thru 2064:* From bottom of strut fairing, insert and slide hinge pin into hinge bodies until hinge pin is fully inserted and seated.

(f) *Serials 2065 & subs:* From bottom of strut fairing, insert and slide hinge pin into lower hinge tab, through hinge bodies, and into upper hinge tab.

(g) *Serials 1005 thru 2064:* Secure hinge pin to strut fairing with safety wire.

(h) *Serials 2065 & subs:* Position U-nut to end of hinge pin. Secure U-nut to strut fairing with screw.

(i) *Serials 1005 thru 2064:* Apply Loctite to strut fairing screws. (Refer to 20-40)

(j) *Serials 1005 thru 2064:* Install screws securing strut fairing to nose gear strut.

(k) *Serials 1005 thru 1424, 1431 thru 1475:* Install wheel pant assembly.

1 Place forward wheel pant in proper alignment with nose wheel assembly and install screws.

2 Insert upper access panel in forward wheel pant slot.

3 While supporting upper access panel, place aft wheel pant in proper alignment with forward wheel pant and apply light force to mate the wheel pants together.

4 Install screws along nose pant seam and upper access panel.

(l) *Serials 1425 thru 1430, 1476 & subs:* Install wheel pant assembly.

1 Place aft wheel pant in proper alignment with nose wheel assembly and install screws.

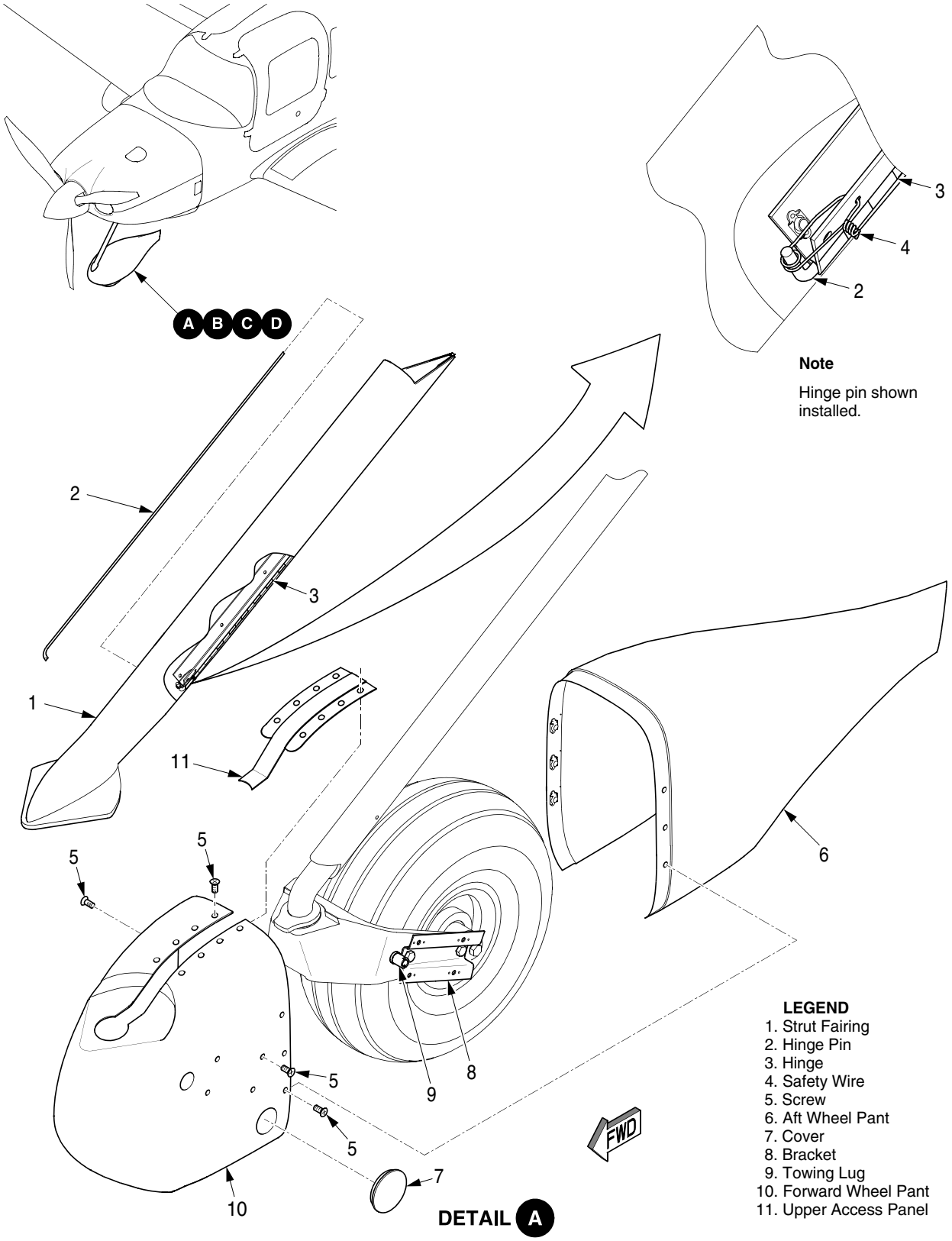
2 Place forward wheel pant in proper alignment with aft wheel pant and apply light force to mate the wheel pants together.

3 Install screws along nose pant seam.

4 *Serials 1886 & subs:* Rotate nose wheel fully from side to side, verifying no contact occurs between wheel pant and strut fairing. Trim strut fairing as required.

(m) Install towing lugs to nose wheel assembly.

(n) Rotate nose wheel assembly to ensure there is no interference through caster travel.



Serials 1005 thru 1424, 1431 thru 1475.

Figure 32-201
Nose Gear Fairing Installation - Serials 1005 thru 1424, 1431 thru 1475 (Sheet 1 of 4)

EFFECTIVITY:
Serials 1005 thru 1424, 1431 thru 1475

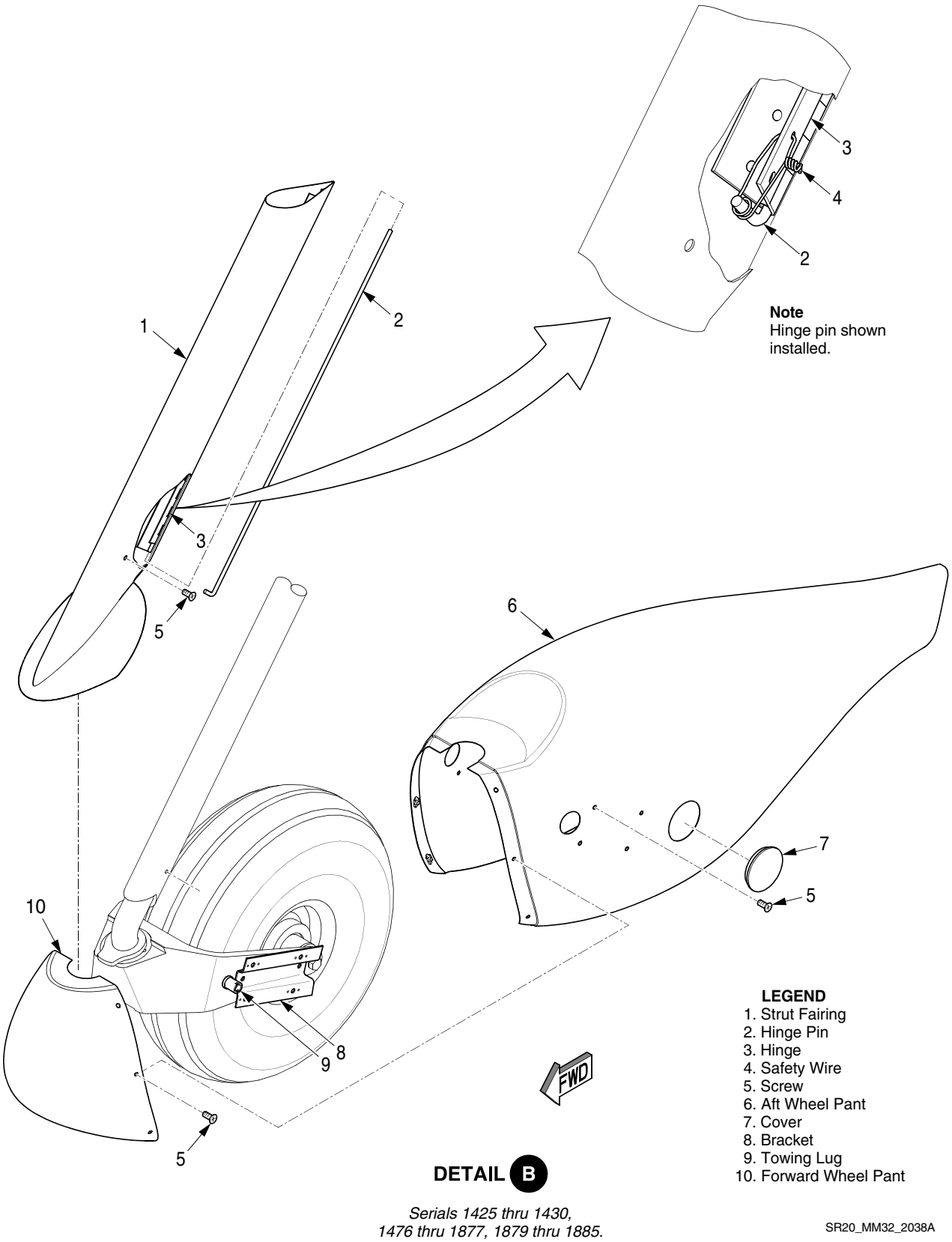
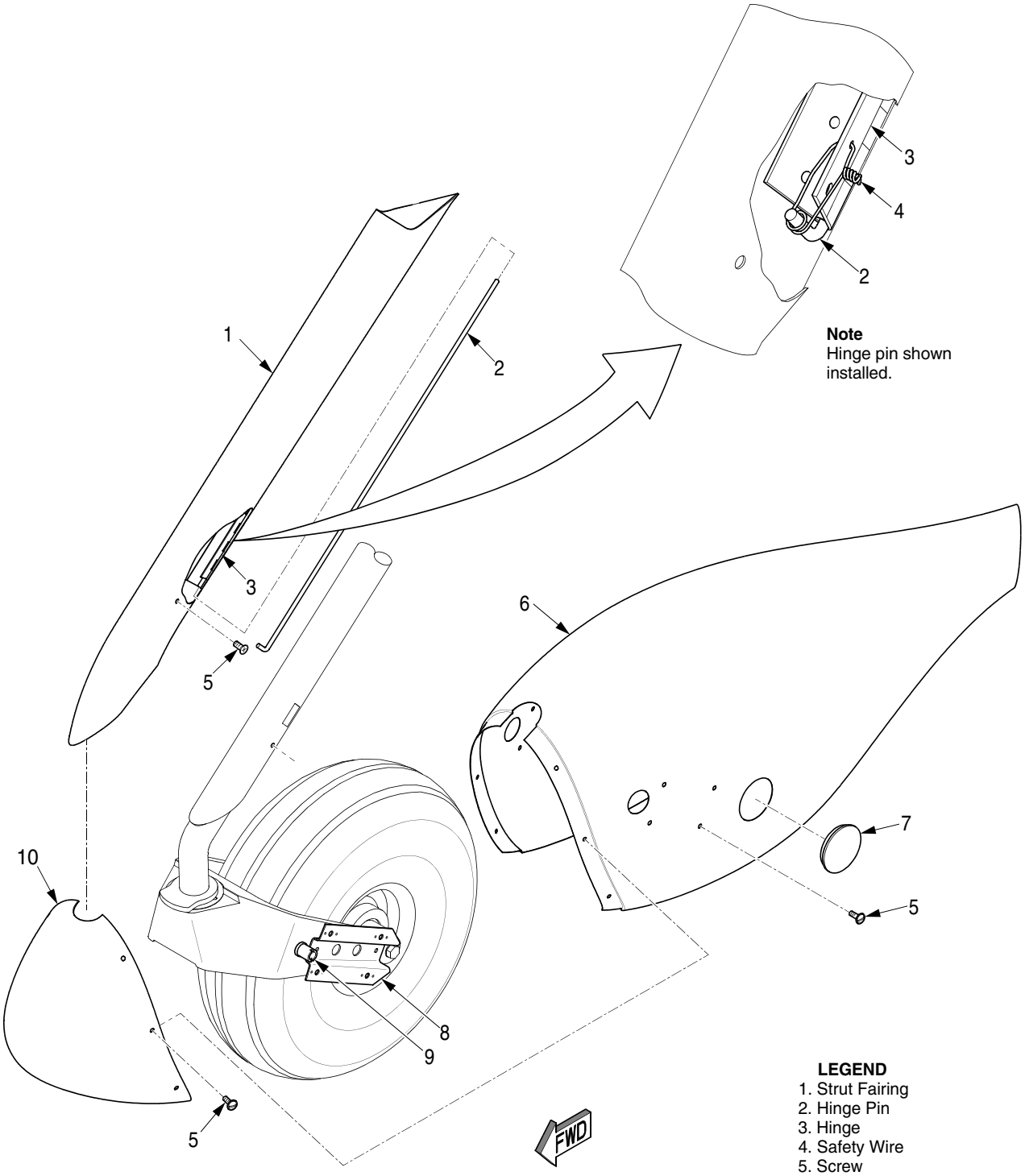


Figure 32-201
Nose Gear Fairing Installation - Serials 1425 thru 1430, 1476 thru 1885 (Sheet 2 of 4)



DETAIL C

Serials 1886 thru 2064, 2065 & subs w/o Perspective Avionics.

SR20_MM32_2434A

Figure 32-201
Nose Gear Fairing Installation - Serials 1886 thru 2064, 2065 & subs w/o Perspective (Sheet 3 of 4)

EFFECTIVITY:
Serials 1886 thru 2064, 2065 & subs w/o Perspective

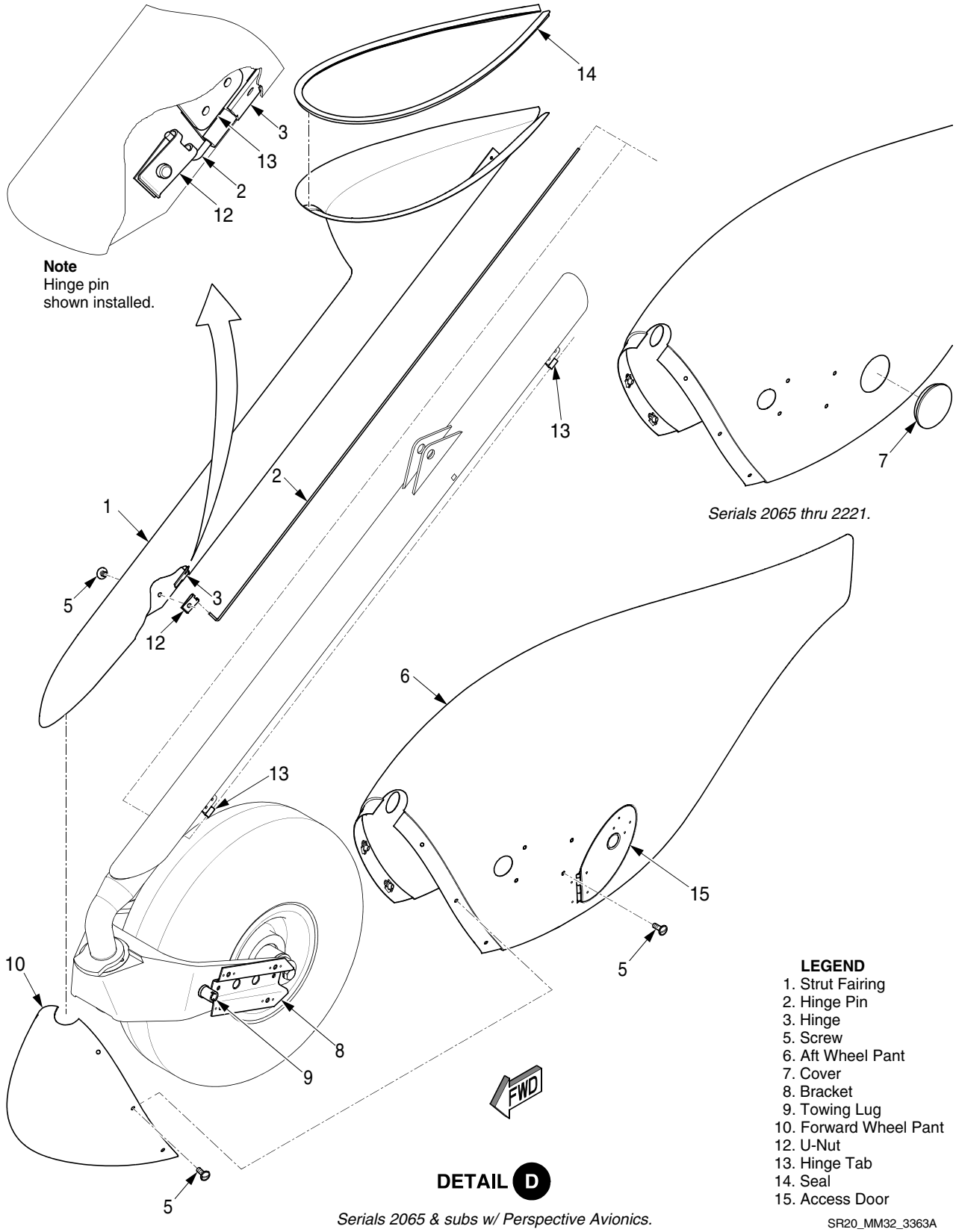


Figure 32-201
Nose Gear Fairing Installation - Serials 2065 & subs w/ Perspective (Sheet 4 of 4)

B. Nose Gear Assembly - *Serials 1005 thru 1885* **(See Figure 32-202)**

(1) Removal - Nose Gear Assembly

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove nose gear fairing. (Refer to 32-20)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Remove nose wheel fork assembly. (Refer to 32-20)

(e) With nose gear strut supported, remove cotter pin, nut, washers, and bolt securing nose gear strut to lower puck pan.

(f) Remove cotter pins, nuts, washers, spacers, and bolts securing nose gear strut to lower engine mount.

(g) Lower nose gear assembly to ground.

(2) Installation - Nose Gear Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.

(b) With nose gear assembly supported under airplane, lift strut up until bolt holes are in proper alignment with engine mount.

(c) Secure nose gear assembly to lower engine mount.

1 Apply a thin coat of grease to bushings.

Note: Additional washers may be installed between nose gear strut and engine mount as required to eliminate any gap. Two washers per side maximum.

2 Install bolts, spacers, washers, and nuts securing nose gear strut to lower engine mount. Torque nuts to 80 - 95 in-lb (9.0 - 10.7 Nm) and install cotter pins.

(d) Secure nose gear strut to lower puck pan.

1 Coat bolt shaft with thin coat of grease.

2 Install bolt, washers, and nut securing nose gear strut to lower puck pan.

3 Torque bolt to 80 - 95 in-lb (9.0 - 10.7 Nm) and install cotter pin.

4 Install nose wheel fork assembly. (Refer to 32-20)

(e) Lower airplane off jacks. (Refer to 07-10)

(f) Install engine cowling. (Refer to 71-10)

(g) Install nose gear fairing. (Refer to 32-20)

C. Nose Gear Assembly - *Serials 1886 & subs* (See Figure 32-202)

(1) Removal - Nose Gear Assembly

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove nose gear fairing. (Refer to 32-20)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Remove nose wheel fork assembly. (Refer to 32-20)

(e) *Serials 1886 thru 2064:* With nose gear strut, remove bolts, washers, and spacers securing nose gear strut to lower puck pan.

(f) *Serials 2065 & subs:* Remove nose gear strut from oleo strut.

1 Remove cap nut from fill valve stem.

2 Slowly open fill valve to bleed nitrogen from oleo strut.

Note: During de-pressurization, drops of hydraulic fluid may be expelled from fill valve. Position shop towel as required below fill valve to prevent spillage.

3 Allow one minute to de-pressurize oleo strut.

4 With nose gear strut supported, remove cotter pin, nut, spacer, flanged bushing, washer, and bolt securing nose gear strut to oleo strut.

(g) *Serials 1886 thru 2064:* Remove cotter pins, nuts, washers, spacers, and bolts securing nose gear strut to lower engine mount.

(h) *Serials 2065 & subs:* Remove cotter pins, nuts, washers, spacers, bushings, flanged bushings, and bolts securing nose gear strut to lower engine mount and firewall.

(i) Lower nose gear assembly to ground.

(2) Installation - Nose Gear Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.
Safety Wire	-	Any Source	Secure nose gear strut bolts.

(b) With nose gear assembly supported under airplane, lift strut up until bolt holes are in proper alignment with engine mount.

(c) Secure nose gear assembly to lower engine mount.

1 Coat bolt shafts and spacers with thin coat of grease.

2 *Serials 1886 thru 2064:* Install bolts, spacers, washers, and nuts.

Note: *Serials 2065 & subs:* Flanged bushing thickness may not exceed maximum allowable gap of 0.01 inch (0.25 mm).

3 *Serials 2065 & subs:* Install bolts, flanged bushings, bushings, spacers, washers, and nuts.

Note: If total gap measures between 0.125 to 0.250 inch (3.18 to 6.35 mm), install one additional washer to each side. If total gap measures between 0.250 to 0.375 inch (6.35 to 9.53 mm), install two additional washers to each side. If total gap exceeds 0.375 inch (9.53 mm), contact Cirrus Design for disposition.

4 With bolt against nose gear strut, measure total gap (add right and left side gaps) between spacer and engine mount. If necessary, install additional washers.

5 *Serials 1886 thru 2064:* Torque nuts to 480 - 690 in-lb (53 - 76 Nm).

6 *Serials 2065 & subs:* Torque nuts to 100 - 140 in-lb (11.4 - 15.8 Nm).

7 Install cotter pins.

(d) *Serials 1886 thru 2064:* Secure nose gear strut to lower puck pan.

1 Coat bolt shafts with thin coat of grease.

2 Install bolts, washers, and spacers.

3 Torque bolts to 480 - 690 in-lb (53 - 76 Nm).

4 Safety wire bolts to nose gear strut.

(e) *Serials 2065 & subs:* Secure nose gear strut to oleo strut.

1 Coat bolt shaft with thin coat of grease.

2 Support nose gear strut under airplane and lift strut up until bolt holes are in proper alignment with bottom of oleo strut.

CAUTION: Ensure flanged bushing is installed to RH inboard side of mounting tab on nose gear strut.

3 Install bolt, washer, flanged bushing, spacer, and nut securing nose gear strut to oleo strut. Torque nut to 480 - 690 in-lb (54 - 77 Nm). Install cotter pin.

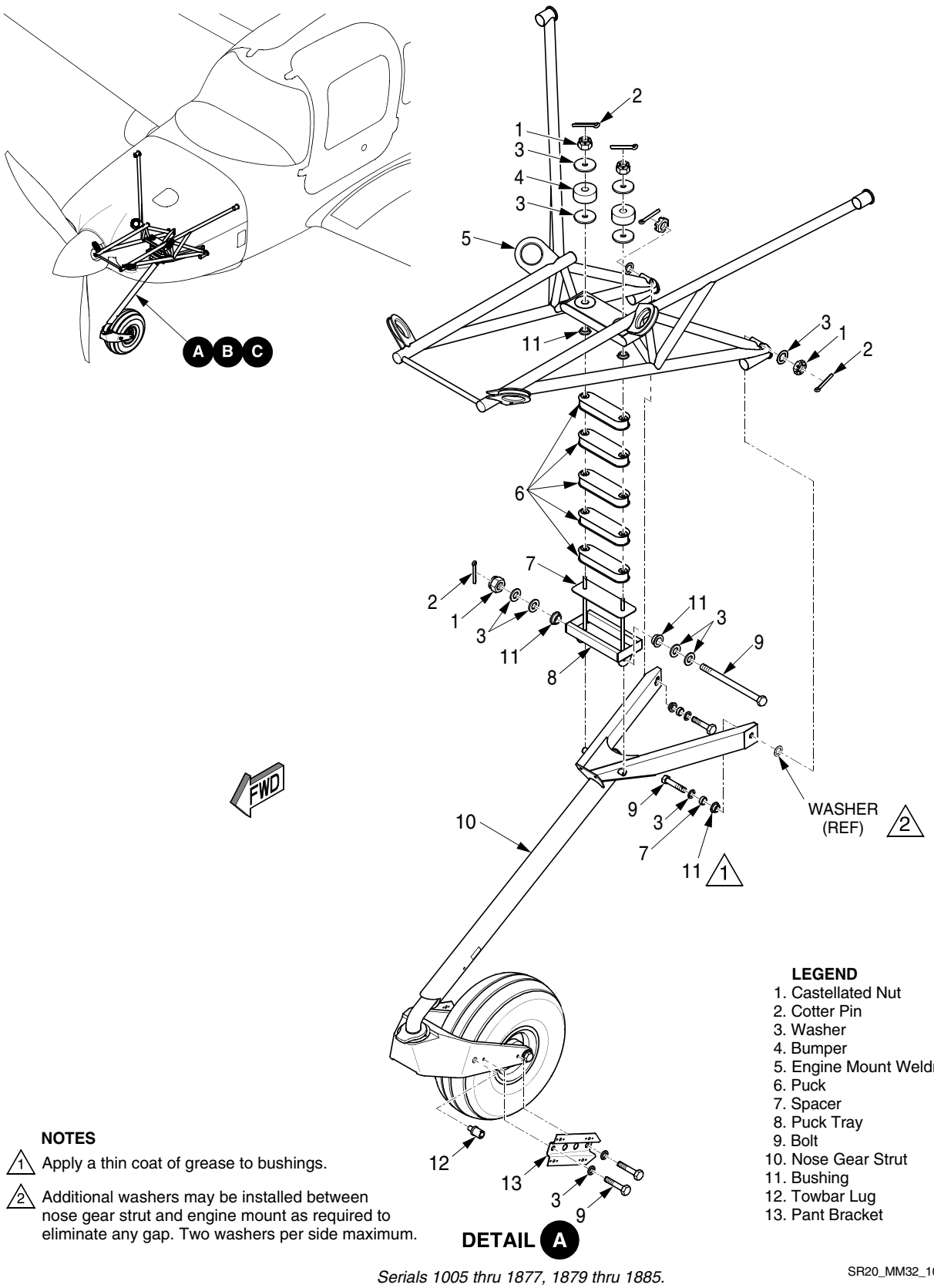
4 Perform Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

(f) Lower airplane off jacks. (Refer to 07-10)

(g) Install nose gear fairing. (Refer to 32-20)

(h) Install engine cowling. (Refer to 71-10)

EFFECTIVITY:
Serials 1886 & subs



NOTES

1. Apply a thin coat of grease to bushings.
2. Additional washers may be installed between nose gear strut and engine mount as required to eliminate any gap. Two washers per side maximum.

LEGEND

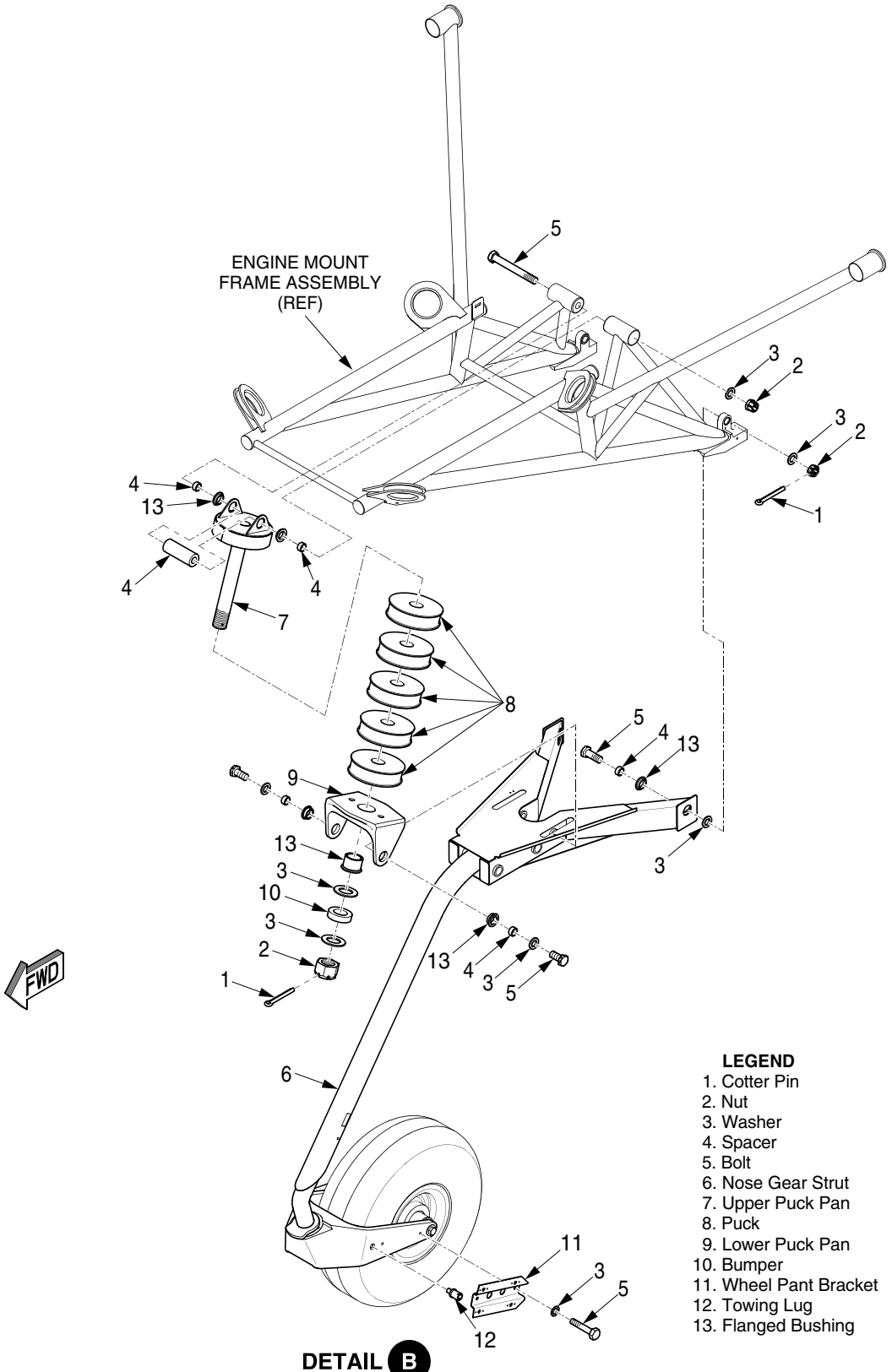
1. Castellated Nut
2. Cotter Pin
3. Washer
4. Bumper
5. Engine Mount Weldment
6. Puck
7. Spacer
8. Puck Tray
9. Bolt
10. Nose Gear Strut
11. Bushing
12. Towbar Lug
13. Pant Bracket

Serials 1005 thru 1877, 1879 thru 1885.

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Figure 32-202
Nose Gear Assembly - Serials 1005 thru 1885 (Sheet 1 of 3)

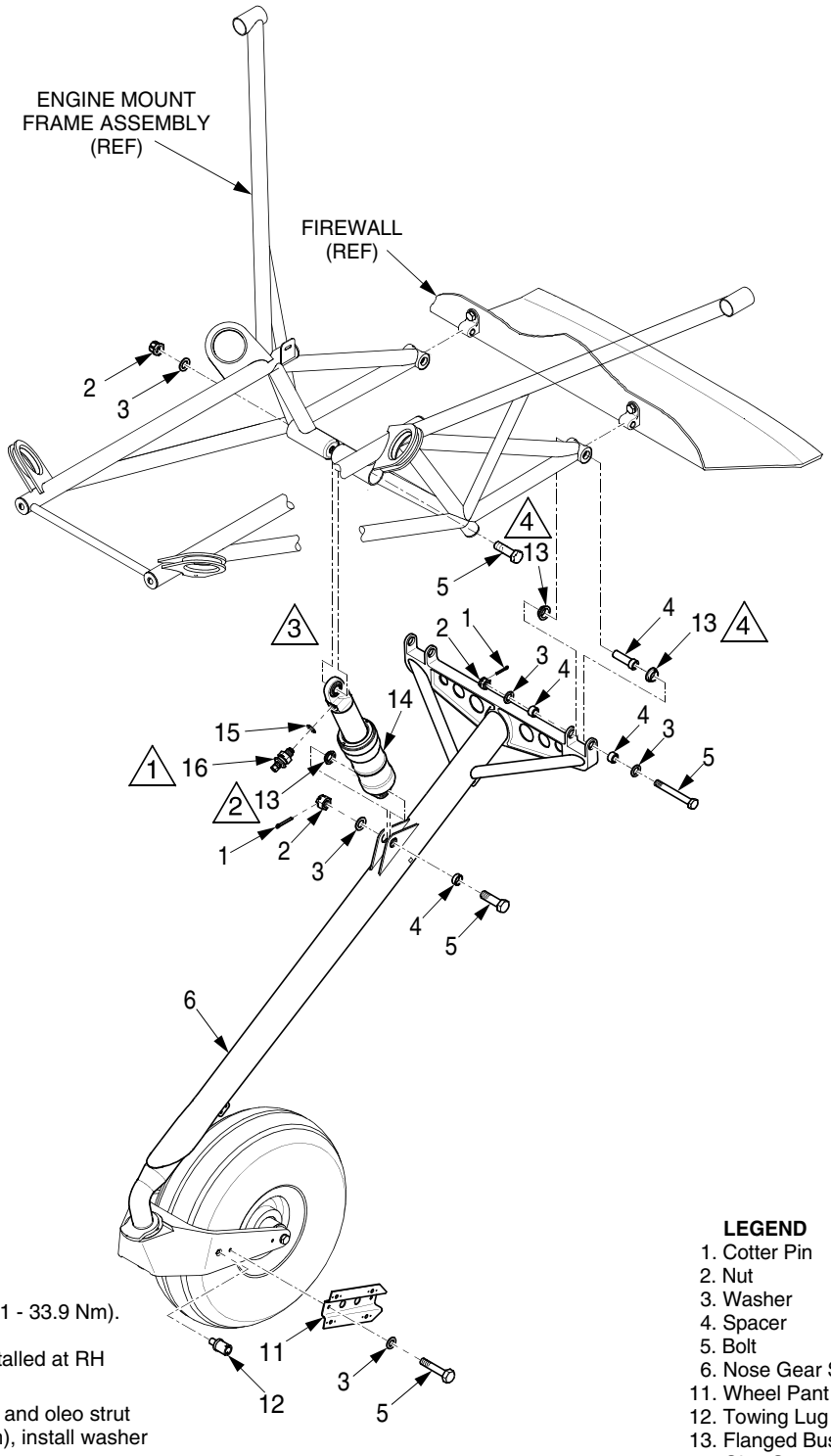
EFFECTIVITY:
Serials 1005 thru 1885



Serials 1886 thru 2064, 2065 & subs w/o Perspective Avionics.

Figure 32-202
Nose Gear Assembly - Serials 1886 thru 2064 (Sheet 2 of 3)

EFFECTIVITY:
Serials 1886 thru 2064



NOTE

1. Torque to 240 - 300 in-lb (27.1 - 33.9 Nm).
2. Flanged bushing must be installed at RH inboard mounting tab.
3. If gap between engine mount and oleo strut exceeds 0.030 inch (0.76 mm), install washer at LH side oleo strut.
4. Flanged bushing thickness may not exceed maximum allowable gap of 0.01 inch (0.25 mm).

LEGEND

1. Cotter Pin
2. Nut
3. Washer
4. Spacer
5. Bolt
6. Nose Gear Strut
11. Wheel Pant Bracket
12. Towing Lug
13. Flanged Bushing
14. Oleo Strut
15. Sealing Ring
16. Fill Valve

Serials 2065 & subs w/ Perspective Avionics.

SR20_MM32_3364A

Figure 32-202
Nose Gear Assembly - Serials 2065 & subs (Sheet 3 of 3)

(3) Inspection/Check - Nose Gear Assembly - *Serials 1005 thru 1885* (See Figure 32-203)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.
Calibrated Spring Scale	5A354	Chatillon 83-30 Kew Gardens Rd Kew Gardens, NY 11415	Load determination.
Flashlight	-	Any Source	Inspect fillet weld.
10X Magnifier	-	Any Source	Inspect fillet weld.

(b) Verify minimum propeller clearance for airplane. (Refer to 06-00)

(c) Remove engine cowling. (Refer to 71-10)

(d) Remove nose gear fairing. (Refer to 32-20)

(e) Raise airplane on jacks. (Refer to 07-10)

(f) Inspect nose gear strut and attach points for security, cracks, and corrosion.

(g) Perform Wheel Spindle Weld Inspection.

Visually inspect the fillet weld between the nose gear strut and wheel spindle in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.

1 Using flashlight and 10X magnifier, visually inspect fillet weld for signs of distress.

2 Verify there is no evidence of cracking in paint on or around surface of fillet weld.

3 Verify there is no evidence of deformation in nose gear strut on or around surface of fillet weld.

(h) Perform Upper Strut Plate Weld Inspection.

Visually inspect the fillet welds between the upper strut plate and attach point arms in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.

1 Using flashlight and 10X magnifier, visually inspect fillet weld for signs of distress.

2 Verify there is no evidence of cracking in paint on or around surface of fillet weld.

3 Verify there is no evidence of deformation in strut plates on or around surface of fillet weld.

(i) Inspect pucks for delamination, cracking, or other distress.

(j) Inspect nose wheel fork assembly and spindle for security, cracks, corrosion, and cleanliness.

(k) Attach spring scale to axle on nose wheel fork assembly and verify a constant force of 20 - 25 lbs (9.1 - 11.3 kg) is required to rotate nose wheel fork and wheel assembly. (See Figure 32-205)

CAUTION: Do not allow grease to come in contact with spindle bearing surface or nose wheel fork bearings. Failure to comply with this caution may result in nose wheel shimmy.

(l) Apply a thin coat of grease to exposed spindle threads.

(m) Verify security of spindle nut cotter pin.

(n) Lower airplane off jacks. (Refer to 07-10)

(o) Install nose gear fairing. (Refer to 32-20)

(p) Install engine cowling. (Refer to 71-10)

EFFECTIVITY:
Serials 1886 & subs

(4) Inspection/Check - Nose Gear Assembly - *Serials 1886 & subs* (See Figure 32-203)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.
Calibrated Spring Scale	5A354	Chatillon 83-30 Kew Gardens Rd Kew Gardens, NY 11415	Load determination.
Flashlight	-	Any Source	Inspect welds.
10X Magnifier	-	Any Source	Inspect welds.
Inspection Mirror	-	Any Source	Inspect for cracking.
Vernier Caliper	-	Any Source	Inspect upper puck pan assembly.
Paint Remover	-	Any Source	Remove paint and primer.
Paint	(Refer to 51-30)	(Refer to 51-30)	Repair inspection area.
Primer	(Refer to 51-30)	(Refer to 51-30)	Repair inspection area.

(b) Verify minimum propeller clearance for airplane.(Refer to 06-00)

(c) Remove engine cowling. (Refer to 71-10)

(d) Remove nose gear fairing. (Refer to 32-20)

(e) Raise airplane on jacks. (Refer to 07-10)

(f) Inspect nose gear strut and attach points for security, cracks, and corrosion.

(g) Perform Wheel Spindle Weld Inspection.

Visually inspect the fillet weld between the nose gear strut and wheel spindle in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.

1 Using flashlight and 10X magnifier, visually inspect fillet weld for signs of distress.

2 Verify there is no evidence of cracking in paint on or around surface of fillet weld.

3 Verify there is no evidence of deformation to nose gear strut on or around surface of fillet weld. If deformation is identified, contact Cirrus Design for disposition.

(h) *Serials 1886 thru 2064:* Perform Upper Gusset Plate Inspection.

At upper gusset plate, use flashlight and inspection mirror to visually inspect in accordance with FAA AC 43.13-1B, Chapter 5, Section 2 for evidence of cracking developing through the gusset plate and extending toward the puck stack fork slots. If crack is identified extending toward either puck stack fork slot, determine extent of damage.

1 If crack does not extend into yoke tube, and does not reach either puck stack fork slot, crack length is allowable for continued operation. Re-inspect every 100 flight hours in accordance with Chapter 5-20, Scheduled Maintenance Checks. (Refer to 05-20)

2 If crack reaches either puck stack fork slot, nose gear assembly must be replaced within 100 flight hours. (Refer to 32-20)

3 If crack extends into yoke tube, contact Cirrus Design for disposition.

(i) *Serials 1886 thru 2064:* Perform Forward Nose Gear Strut Fillet Weld Inspection.

At upper section of nose gear strut where strut enters the nose gear assembly, use flashlight and 10X magnifier to visually inspect forward surface of forward fillet welds attaching strut to nose gear assembly in accordance with FAA AC 43.13-1B, Chapter 5, Section 2 for indications of damage. If welds show indications of damage (i.e. cracks, rust lines, loose paint), determine extent of damage.

1 Using paint remover, remove surface protection to expose welds.

2 Wire brush area to remove all loose debris and/or corrosion.

3 Dye penetrant inspect in accordance with FAA AC 43.13-1B, Chapter 5, Section 5.

4 If crack is identified in either weld, perform Approved Repair - Nose Landing Gear Reinforcement. (Refer to 32-20)

5 Apply primer and paint to inspection area. (Refer to 51-20)

(j) Inspect nose wheel fork assembly and spindle for security, cracks, corrosion, and cleanliness.

(k) Attach spring scale to axle on nose wheel fork assembly and verify a constant force of 20 - 25 lbs (9.1 - 11.3 kg) is required to rotate nose wheel fork and wheel assembly.

CAUTION: Do not allow grease to come in contact with spindle bearing surface or nose wheel fork bearings. Failure to comply with the caution may result in nose wheel shimmy.

(l) Apply a thin coat of grease to exposed spindle threads.

(m) Verify security of spindle nut cotter pin.

(n) Lower airplane off jacks. (Refer to 07-10)

(o) *Serials 2065 & subs:* Inspect oleo strut.

1 Perform Inspection/Check - Oleo Strut. (Refer to 32-20)

(p) Install nose gear fairing. (Refer to 32-20)

(q) Install engine cowling. (Refer to 71-10)

(5) Approved Repair - Nose Landing Gear Reinforcement - *Serials 1886 thru 2064* (See Figure 32-203)

This repair may be used to reinforce fillet welds where strut enters the nose gear assembly. This reinforcement provides an alternate load path for the forward cross tube so that stress to nose gear strut fillet welds is eliminated.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Reamer	0.625-inch	Any Source	Enlarge inner cross tube diameter.
Compressed Air	-	Any Source	Remove debris.
Hammer	-	Any Source	Facilitate bolt insertion.
Grease	ASG22	Aeroshell	Corrosion protection.
Bolt	NAS6610-73	Any Source	Reinforce fillet welds.
Washer	NAS1149F1063P	Any Source	Reinforce fillet welds.
Nut	MS21044N10	Any Source	Reinforce fillet welds.
Torque Wrench	1100 to 1300 in-lb	Any Source	Torque hardware.

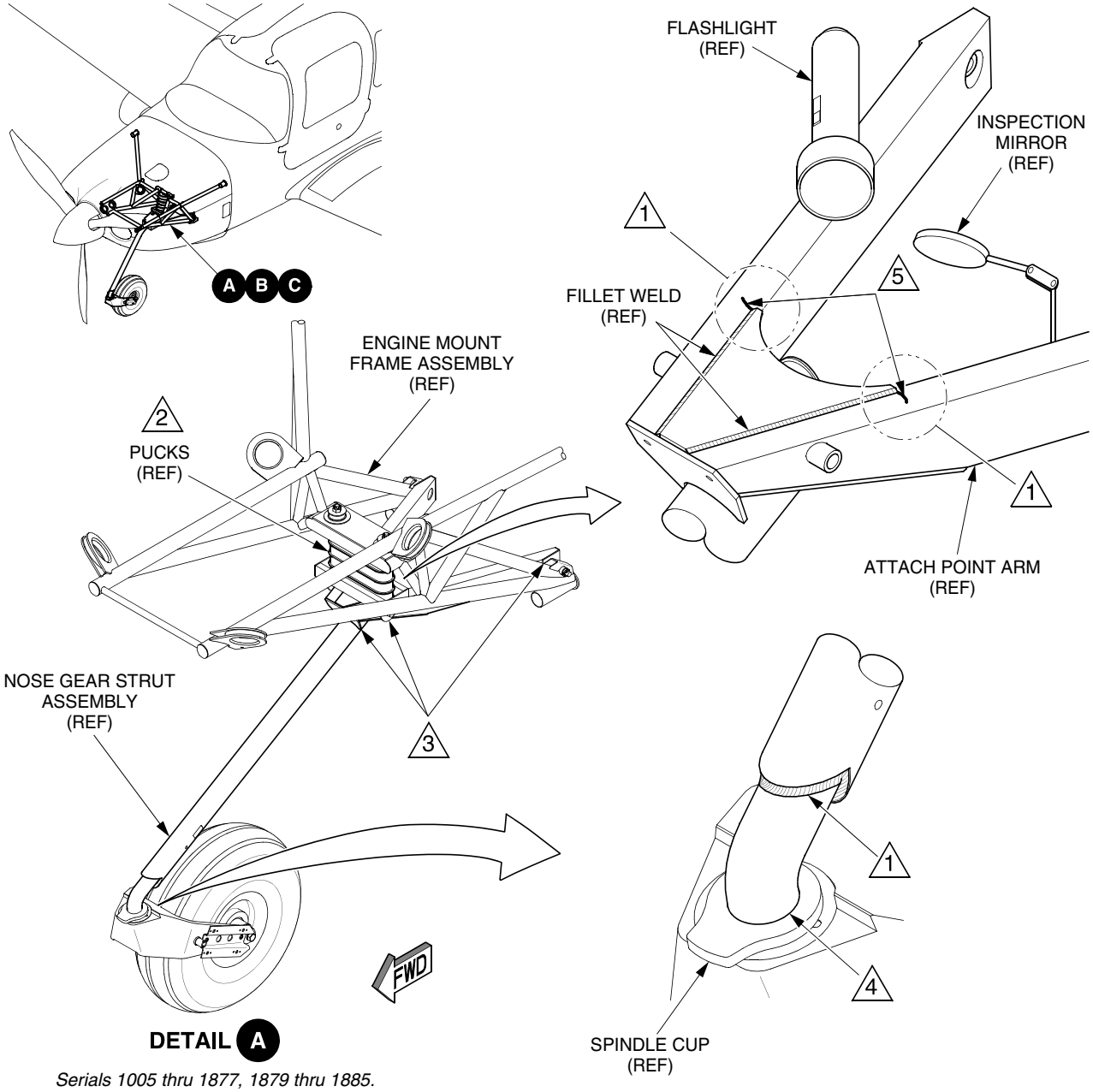
(b) Apply sufficient grease to fully coat bolt.

(c) Ensure bolt passes through forward cross tube of nose gear assembly. It is permissible to lightly tap bolt through forward cross tube with hammer.

(d) If inner diameter of cross tube prevents bolt insertion, use reamer to enlarge cross tube to 0.635 inch (16.129 mm) maximum.

(e) Using compressed air, remove any debris from forward cross tube.

(f) Install bolt, washers, and nut through forward cross tube of nose gear assembly. Torque to 1100 to 1300 in-lb (124.3 to 146.9 Nm).



Serials 1005 thru 1877, 1879 thru 1885.

NOTE

1. Using flashlight and 10X magnifier, visually inspect fillet weld for cracking, deformation, and signs of distress.

2. Using flashlight and 10X magnifier, visually inspect pucks for delamination, cracking, or other signs of distress.

3. Using flashlight and 10X magnifier, visually inspect nose gear strut and attach points for security, cracks, and corrosion.

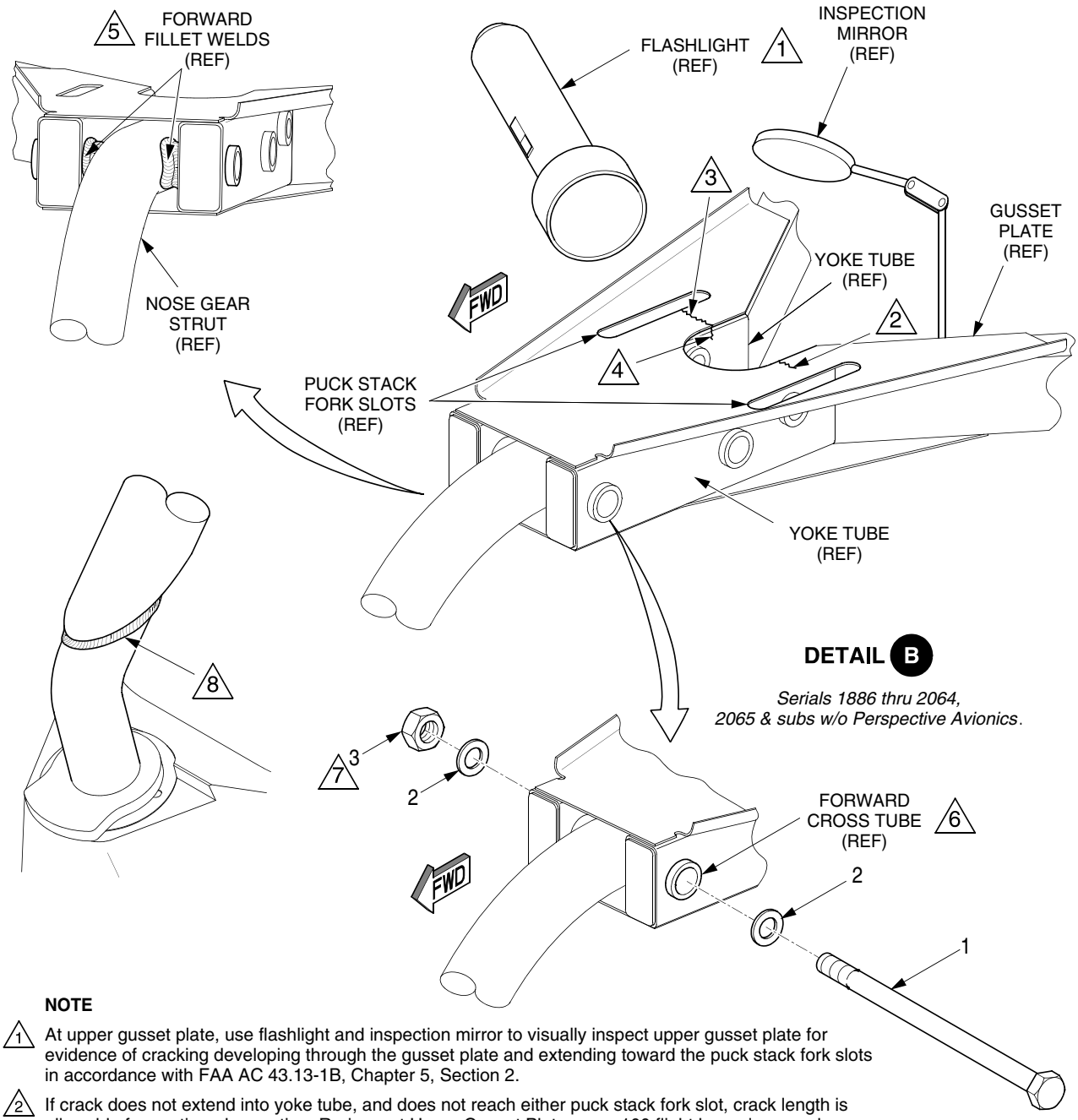
4. Using flashlight and 10X magnifier, visually inspect nose wheel fork assembly and spindle for security, cracks, corrosion, and cleanliness.

5. Using flashlight and inspection mirror at aft fillet weld, verify there is no evidence of cracking developing transverse through the attach point arms.

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Figure 32-203
Inspection/Check - Nose Gear Assembly - Serials 1005 thru 1885 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1885



NOTE

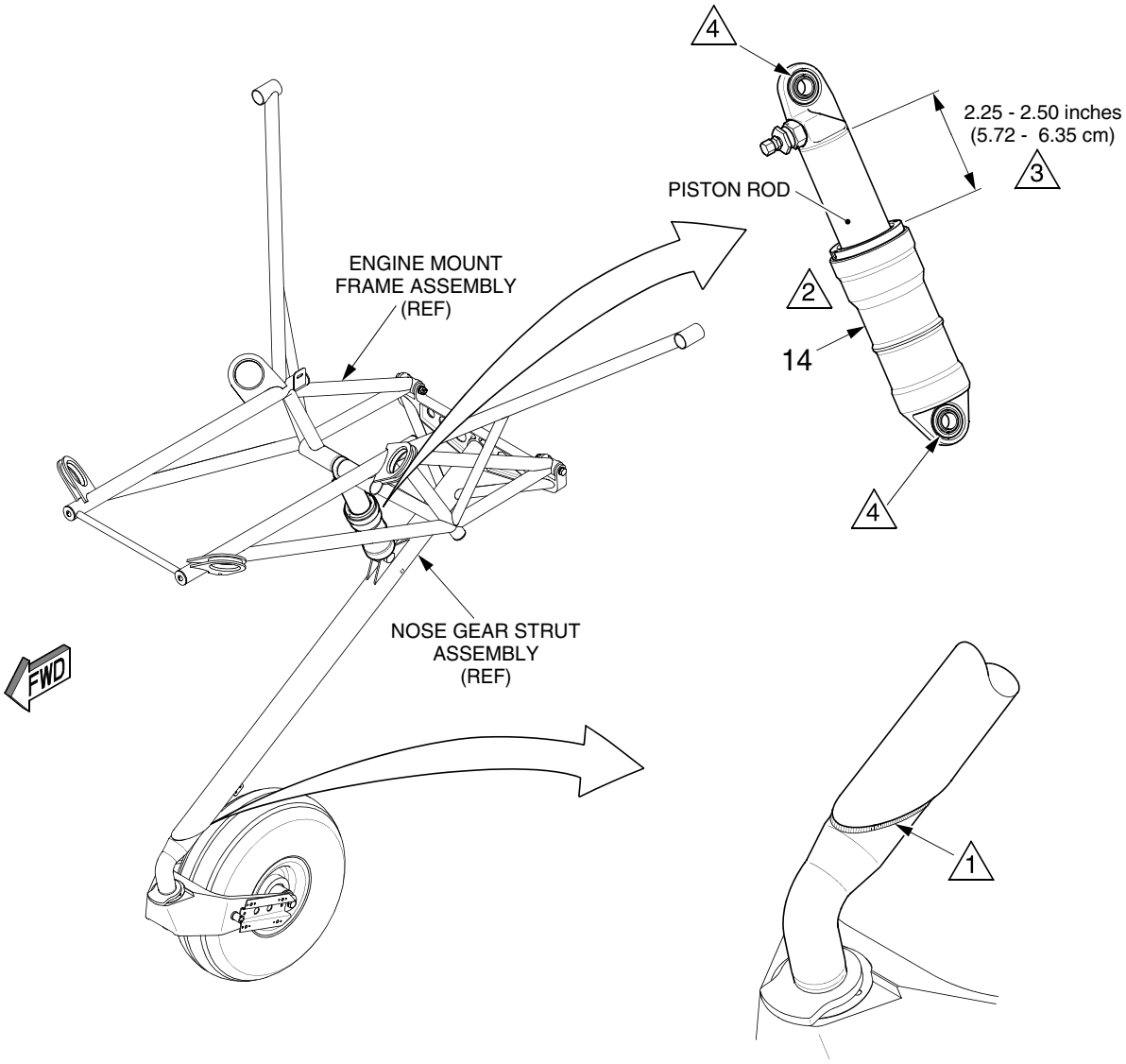
1. At upper gusset plate, use flashlight and inspection mirror to visually inspect upper gusset plate for evidence of cracking developing through the gusset plate and extending toward the puck stack fork slots in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.
2. If crack does not extend into yoke tube, and does not reach either puck stack fork slot, crack length is allowable for continued operation. Re-inspect Upper Gusset Plate every 100 flight hours in accordance with Chapter 5-20, Scheduled Maintenance Checks.
3. If crack reaches either puck stack fork slot, nose gear assembly must be replaced within 100 flight hours.
4. If crack extends into yoke tube, contact Cirrus Design for disposition.
5. At upper section of nose gear strut where strut enters the nose gear assembly, use flashlight and 10X magnifier to visually inspect the forward surface of the forward fillet welds attaching the strut to the nose gear assembly in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.
6. If inner diameter of cross tube prevents bolt insertion, use reamer to enlarge cross tube to 0.635 inch (16.129 mm) maximum.
7. Torque to 1100 to 1300 in-lb (124.3 to 146.9 Nm).
8. Using flashlight and 10X magnifier, visually inspect fillet weld for cracking, deformation, and signs of distress in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.

LEGEND

1. Bolt
2. Washer
3. Nut

SR20_MM32_3294B

Figure 32-203
Inspection/Check - Nose Gear Assembly - Serials 1886-2064, 2065 & subs w/o Perspective (Sheet 2 of 3)



DETAIL C

Serials 2065 & subs w/ Perspective Avionics.

NOTE

1. Using flashlight and 10X magnifier, visually inspect fillet weld for cracking, deformation, and signs of distress in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.
2. Inspect oleo strut for security, cracks, corrosion, and cleanliness.
3. Verify measurement of exposed piston rod is approximately 2.25 - 2.50 inches (5.72 - 6.35 cm).
4. Verify spherical bearings at oleo strut attach points are fully captured.

LEGEND
14. Oleo Strut

SR20_MM32_3365A

Figure 32-203
Inspection/Check - Nose Gear Assembly - Serials 2065 & subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 2065 & subs

D. Nose Gear Puck Stack Assembly - *Serials 1005 thru 1885* **(See Figure 32-202)**

(1) Removal - Nose Gear Puck Stack Assembly

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove nose gear fairing. (Refer to 32-20)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) With nose gear strut supported, remove cotter pin, nut, washers, and bolt securing nose gear strut to lower puck pan.

(e) Remove cotter pins, nuts, washers, and bumpers securing top of puck stack assembly to engine mount and remove puck stack assembly from airplane.

(2) Installation - Nose Gear Puck Stack Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.

(b) Support nose gear strut under airplane and lift strut up until bolt holes are in proper alignment with lower puck pan.

(c) Apply a thin coat of grease to bolt shaft.

(d) Install bolt, washers, and nut securing nose gear strut to lower puck pan. Torque bolts to 80 - 95 in-lb (9.0 - 10.7 Nm) and install cotter pin.

(e) Lower airplane off jacks. (Refer to 07-10)

(f) Perform Inspection/Check - Nose Gear Puck Stack Assembly. (Refer to 32-20)

(g) Install bumpers, washers and nuts securing top of puck stack assembly to engine mount. Tighten nuts such that 2 - 3 threads are showing and install cotter pins.

(h) Install nose gear fairing. (Refer to 32-20)

(i) Install engine cowling. (Refer to 71-10)

(3) Inspection/Check - Nose Gear Puck Stack Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scales	-	Any Source	Weigh the airplane.

Note: Two scales of equal height must be used for the main gear wheels.

(b) Place scale under each wheel.

(c) Level airplane. (Refer to 08-10)

(d) If necessary, add ballast until nose wheel scale indicates 509 lbs (231 kg). Total weight of airplane (all three scales) to equal 2694 lbs (1222 kg) at 16.7% MAC.

(e) Position a propeller blade vertically to the floor.

(f) Measure from propeller blade tip to floor.

(g) Subtract scale height from measurement to determine propeller clearance.

CAUTION: Airplanes with 2 blade propeller at 76.00 inch (193.04 cm) diameter require 7.00 inch (17.78 cm) minimum clearance. Airplanes with 3 blade propeller at 74.00 inch (187.96 cm) diameter require 8.00 inch (20.32 cm) minimum clearance.

(h) If necessary, add shims to nose gear puck stack assembly to obtain propeller clearance.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shim - 0.032 inch (0.081 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.
Shim - 0.063 inch (0.160 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.
Shim - 0.090 inch (0.229 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.
Shim - 0.125 inch (0.318 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.
Shim - 0.250 inch (0.635 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.
Shim - 0.50 inch (1.27 cm)	Refer to IPC	Cirrus Design	Adjust puck stack height.

2 Remove ballast from nose wheel.

3 Remove nose gear puck stack assembly. (Refer to 32-20)

4 Add shims to bottom of puck stack as required to obtain propeller clearance.

5 Install nose gear puck stack assembly. (Refer to 32-20)

E. Nose Gear Puck Stack Assembly - *Serials 1886 thru 2064* **(See Figure 32-202)**

(1) Removal - Nose Gear Puck Stack Assembly

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove nose gear fairing. (Refer to 32-20)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) With nose gear strut supported, remove bolts, washers, and spacers securing nose gear strut to lower puck pan.

(e) Remove nut, washer, spacers, and bolt securing upper puck pan to engine mount. Remove puck stack assembly from airplane.

(2) Disassembly - Nose Gear Puck Stack Assembly

(a) Remove cotter pin, nut, washers, and bumper securing lower and upper puck pans together.

Note: To facilitate reinstallation, note orientation and position of pucks prior to removal. Pucks must be reinstalled in same orientation and order as previous installation.

(b) Remove pucks from shaft of upper puck pan.

(3) Assembly - Nose Gear Puck Stack Assembly

(a) Slide pucks onto shaft of upper puck pan.

CAUTION: Do not torque nut securing lower and upper puck pans together. Tighten nut until cotter pin hole is aligned with nut castellations.

(b) Install bumper, washers, nut, and cotter pin securing lower and upper puck pans together.

(4) Installation - Nose Gear Puck Stack Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.

(b) Coat bolt shafts with thin coat of grease.

(c) Align top of puck stack assembly with engine mount and secure with bolt, washer, spacers, and nut.

(d) Support nose gear strut under airplane and lift strut up until bolt holes are in proper alignment with lower puck pan.

(e) Install bolts, washers, and spacers securing nose gear strut to lower puck pan. Torque bolts to 480 - 690 in-lb (53 - 76 Nm). Safety wire bolts to nose gear strut.

(f) Lower airplane off jacks. (Refer to 07-10)

(g) Install nose gear fairing. (Refer to 32-20)

(h) Install engine cowling. (Refer to 71-10)

(5) Inspection/Check - Nose Gear Puck Stack Assembly **(See Figure 32-204)**

(a) Visual Inspection of pucks for cracking or splitting. Ensure attach bolts are perpendicular to puck tray and puck stack-up is in alignment. If polymer pucks or attaching parts show evidence of excessive wear or damage, perform the following:

(b) Remove and inspect puck pan assembly.

1 Remove cotter pin, nut, washers, and bumper securing lower and upper puck pans together.

2 With nose gear strut supported, remove bolts, washers, and spacers securing nose gear strut to lower puck pan.

Note: To facilitate reinstallation, note orientation and position of pucks prior to removal. Pucks must be reinstalled in same orientation and order as previous installation.

3 Remove pucks and spacer from upper puck pan shaft.

4 Inspect pucks for delamination, cracking, or other distress.

5 At lower puck pan assembly, inspect flanged bushing, bumper, and attaching hardware for wear and condition.

(c) Perform Upper Puck Pan Weld Inspection.

At upper puck pan, visually inspect the weld securing shaft to upper puck pan in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.

1 Using flashlight and 10X magnifier, visually inspect weld for signs of distress.

2 Verify there is no evidence of cracking on or around surface of weld.

3 Verify there is no evidence of deformation to upper puck pan on or around surface of weld. If deformation is identified, contact Cirrus Design for disposition.

(d) Perform Upper Puck Pan Shaft Inspection.

Inspect upper puck pan shaft for wear and condition. If wear is found, perform the following:

1 Using vernier caliper, measure wall thickness of shaft lower end to determine a baseline wall thickness.

2 Using vernier caliper, measure wall thickness of shaft where shaft rubs against lower puck pan. If wear exceeds 50% of baseline wall thickness, the upper puck pan assembly must be replaced. Contact Cirrus Design for disposition.

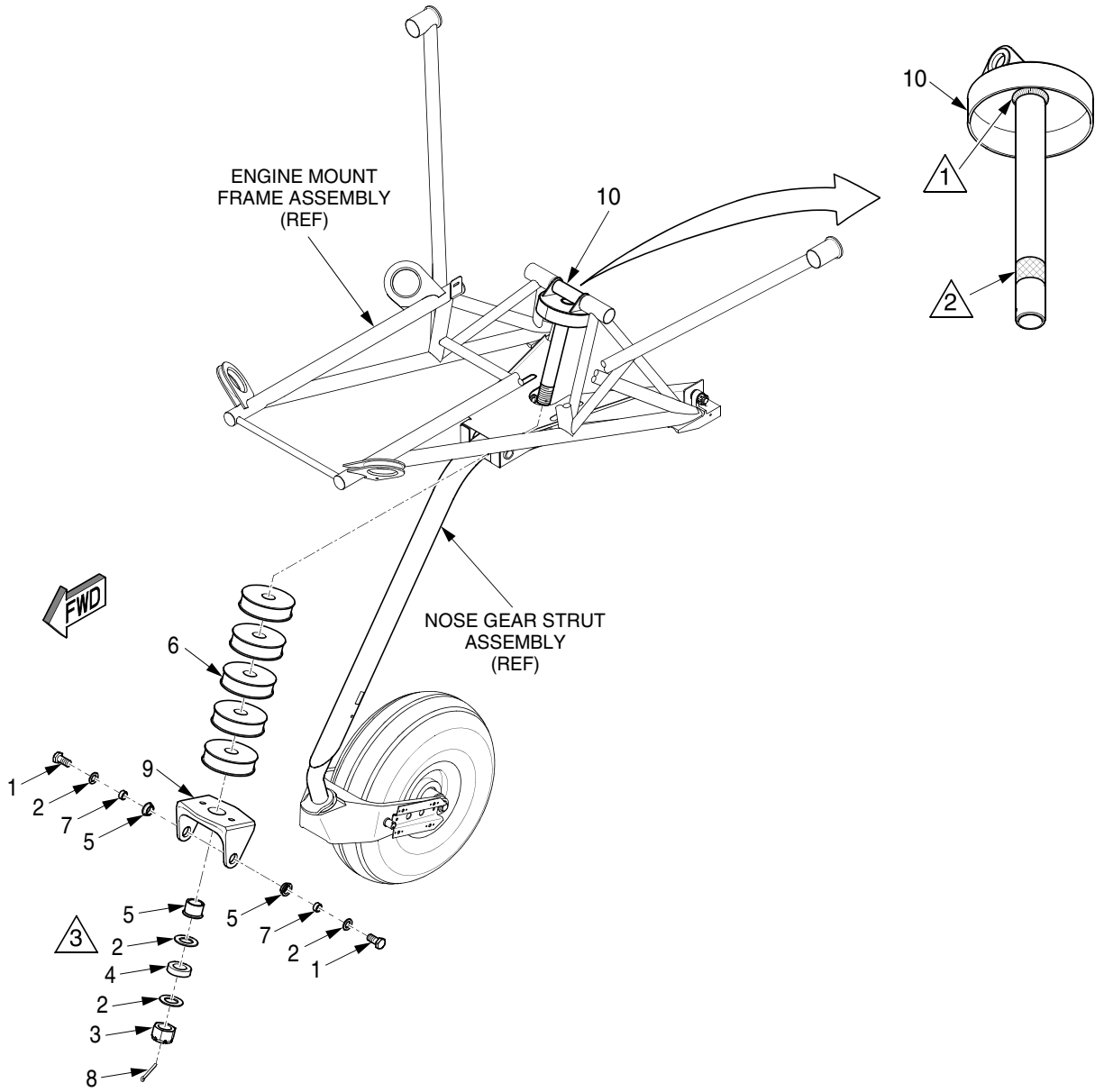
(e) Re-install puck pan assembly.

1 Install spacer and pucks onto shaft of upper puck pan.

CAUTION: Do not torque nut securing lower and upper puck pans together. Tighten nut until cotter pin hole is aligned with nut castellations.

2 Install bumper, washers, nut, and cotter pin securing lower and upper puck pans together.

3 Install bolts, washers, and spacers securing nose gear strut to lower puck pan. Torque bolts to 480 - 690 in-lb (53 - 76 Nm). Safety wire bolts to nose gear strut.



Serials 1886 thru 2064.

NOTE

1. Using flashlight and 10X magnifier, visually inspect the weld securing shaft to upper puck pan for cracking, deformation, and signs of distress in accordance with FAA AC 43.13-1B, Chapter 5, Section 2.
2. Inspect upper puck pan shaft for wear. If wear is found, perform the following: using vernier caliper, measure wall thickness of shaft lower end to determine baseline wall thickness. Using vernier caliper, measure wall thickness of shaft where shaft rubs against lower puck pan. If wear exceeds 50% of baseline wall thickness, the upper puck pan assembly must be replaced.
3. At lower puck pan assembly, inspect flanged bushing, bumper, and attaching hardware for wear and condition.

LEGEND

1. Bolt
2. Washer
3. Nut
4. Bumper
5. Flanged Bushing
6. Puck
7. Spacer
8. Cotter Pin
9. Lower Puck Pan
10. Upper Puck Pan

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Figure 32-204
Inspection/Check - Nose Gear Puck Stack Assembly - Serials 1886 thru 2064

F. Oleo Strut - *Serials 2065 & subs* (See Figure 32-202)

(1) Removal - Oleo Strut

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove nose gear fairing. (Refer to 32-20)

(c) Attach weighted jack stand at aft tail tiedown and raise nose of airplane. (Refer to 07-10)

(d) With nose gear strut supported, remove cotter pin, nut, spacer, flanged bushing, washer, and bolt securing nose gear strut to oleo strut.

(e) Remove cotter pin, nut, spacer, flanged bushing, washer, and bolt securing oleo strut to engine mount. Remove oleo strut from airplane.

(2) Installation - Oleo Strut

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.

(b) Coat bolt shafts with thin coat of grease.

CAUTION: Ensure flanged bushing is installed to RH inboard side of mounting tab on engine mount.

Note: If gap between engine mount and oleo strut exceeds 0.030 inch (0.76 mm), install washer at LH side oleo strut.

(c) Align top of oleo strut with engine mount and secure with bolt, washer, flanged bushing, spacer, and nut. Torque nut to 480 - 690 in-lb (54 - 77 Nm). Install cotter pin.

(d) Support nose gear strut under airplane and lift strut up until bolt holes are in proper alignment with bottom of oleo strut.

CAUTION: Ensure flanged bushing is installed to RH inboard side of mounting tab on nose gear strut.

(e) Install bolt, washer, flanged bushing, spacer, and nut securing nose gear strut to oleo strut. Torque nut to 480 - 690 in-lb (54 - 77 Nm). Install cotter pin.

(f) Lower nose of airplane and remove weighted jack stand from aft tail tiedown. (Refer to 07-10)

(g) Perform Inspection/Check - Oleo Strut. (Refer to 32-20)

(h) Install nose gear fairing. (Refer to 32-20)

(i) Install engine cowling. (Refer to 71-10)

(3) Inspection/Check - Oleo Strut

(a) Remove RH lower engine cowling. (Refer to 71-10)

(b) Inspect oleo strut for security, cracks, corrosion, and cleanliness.

(c) Verify spherical bearings at oleo strut attach points are fully captured.

(d) With aircraft between basic empty weight and maximum ramp weight without cargo or passengers, apply rocking force to nose of airplane. Allow airplane to stabilize.

(e) At room temperature, verify measurement of exposed piston rod is approximately 2.25 - 2.50 inches (5.72 - 6.35 cm). (See Figure 32-203)

(f) If exposed piston rod length is below tolerance, oleo strut requires nitrogen gas replenishment. Perform Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

(g) Install RH lower engine cowling. (Refer to 71-10)

(4) Adjustment/Test - Oleo Strut

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Surface cleaning.
Cotton cloth (clean, white, lint free)	-	Any Source	Surface cleaning.
Sandpaper	400-grit	Any Source	Polish out light scratches.
Paint	(Refer to 51-30)	(Refer to 51-30)	Repair inspection area.
Primer	(Refer to 51-30)	(Refer to 51-30)	Repair inspection area.
Pressurized Nitrogen Tank	-	Any Source	Verify nitrogen pressure.
High-Pressure Hose w/ 5/16-inch Threaded Fitting	-	Any Source	Verify nitrogen pressure.

(b) Remove engine cowling. (Refer to 71-10)

(c) Remove nose gear fairing. (Refer to 32-20)

(d) Attach weighted jack stand at aft tail tiedown and raise nose of airplane. (Refer to 07-10)

(e) Solvent clean oleo strut surfaces and dry with clean cloth. (Refer to 20-30)

(f) Perform visual inspection of fill valve and seal.

(g) If evidence of hydraulic fluid leakage is identified at fill valve, replace seal, or fill valve and seal, as required. (Refer to 32-20)

(h) Perform visual inspection of piston rod surface along entire length.

(i) If corrosion is identified on piston rod surface, remove corrosion.

1 After thorough removal of corrosion, solvent clean oleo strut surfaces and dry with clean cloth. (Refer to 20-30)

2 Apply primer and paint to painted surfaces as required. (Refer to 51-20)

(j) If minor damage to piston rod surface is identified, i.e. light scratches, it is permissible to repair piston rod surface.

1 Use 400-grit sandpaper to polish out scratches on piston rod surface.

2 Solvent clean oleo strut surfaces and dry with clean cloth. (Refer to 20-30)

3 If scratches cannot be minimized, replace oleo strut. (Refer to 32-20)

CAUTION: If minor damage is exceeded, piston rod compression may introduce contaminants past sealing elements and, over time, cause cumulative damage to sealing elements resulting in leakage. Additionally, contaminants drawn past sealing elements can enter hydraulic system causing further damage.

(k) If more extensive damage to piston rod surface is identified, i.e. heavy scratches, gouges, etc., replace oleo strut. (Refer to 32-20)

(l) If evidence of hydraulic fluid leakage is identified by streamlet(s) on piston rod, replace oleo strut. (Refer to 32-20)

Note: A slightly moist film of hydraulic fluid on piston rod is a normal characteristic of sealing element lubrication.

(m) If hydraulic fluid volume is suspected insufficient, replenish fluid and gas per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

(n) If nitrogen gas volume is suspected insufficient, replenish gas per Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

(o) Lower nose of airplane and remove weighted jack stand from aft tail tiedown. (Refer to 07-10)

(p) Install nose gear fairing. (Refer to 32-20)

(q) Install engine cowling. (Refer to 71-10)

G. Oleo Strut Fill Valve - *Serials 2065 & subs* **(See Figure 32-202)**

(1) Removal - Oleo Strut Fill Valve

(a) Remove engine cowling. (Refer to 71-10)

(b) Attach weighted jack stand at aft tail tiedown and raise nose of airplane. (Refer to 07-10)

(c) Remove oleo strut. (Refer to 32-20)

Note: To prevent oil spillage, maintain oleo strut horizontally with fill valve hole up.

(d) Remove cap nut from fill valve stem.

(e) Slowly open fill valve to bleed nitrogen from oleo strut.

WARNING: **Do not attempt to remove fill valve until oleo strut has been completely de-pressurized. Fill valve will be ejected at high velocity if unscrewed before nitrogen pressure has been released.**

Note: During de-pressurization, drops of hydraulic fluid may be expelled from fill valve. Position shop towel as required below fill valve to prevent spillage.

(f) Allow one minute to de-pressurize oleo strut.

(g) Remove fill valve from oleo strut.

(2) Installation - Oleo Strut Fill Valve

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealing Ring	Refer to IPC	Cirrus Design	Replace sealing ring.

(b) Install fill valve with new sealing ring to oleo strut. Torque to 240 - 300 in-lb (27.1 - 33.9 Nm).

(c) Perform Servicing - Oleo Strut Fluid and Gas Replenishment. (Refer to 12-10)

(d) Install cap nut to fill valve stem.

(e) Install oleo strut. (Refer to 32-20)

(f) Lower nose of airplane and remove weighted jack stand from aft tail tiedown. (Refer to 07-10)

(g) Install engine cowling. (Refer to 71-10)

H. Nose Wheel Fork Assembly (See Figure 32-205)

(1) Removal - Nose Wheel Fork Assembly

(a) Remove nose gear fairing. (Refer to 32-20)

(b) Raise airplane on jacks (Refer to 07-10)

(c) While supporting fork assembly, remove cotter pin, nut, flat washers, and Belleville washers from spindle bolt.

(d) Remove fork assembly from nose gear strut.

(2) Disassembly - Nose Wheel Fork Assembly

(a) Bearings:

1 Remove bearings from nose wheel fork assembly.

(b) Towbar Lugs:

1 Remove towbar lugs from LH and RH sides of nose wheel fork assembly.

(c) Pant Brackets:

1 Remove bolts and washers securing brackets from LH and RH sides of nose wheel fork assembly.

(d) Set Screw *(Serials 1214 & subs)*:

1 Remove set screw from upper side of nose wheel fork assembly.

(3) Assembly - Nose Wheel Fork Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Arbor Press	-	Any Source	Install bearings.
Loctite	242	Any Source	Bond threads.

(b) Bearings:

1 Using arbor press, install bearings to nose wheel fork assembly.

(c) Towbar Lugs:

1 Apply Loctite® to lug threads.

2 Position and secure towbar lugs to LH and RH sides of nose wheel fork assembly. Torque lugs 80.0 to 100.0 in-lb (9.0 to 11.2 Nm).

(d) Pant Brackets:

1 If installing non-drilled head bolts, apply Loctite® to bolt threads.

2 Position and secure brackets with washers and bolts to LH and RH sides of nose wheel fork assembly.

3 If installing drilled head bolts, safety wire bolt heads. (Refer to 20-50)

(e) Set Screw *(Serials 1214 & subs)*:

1 Position and secure set screw to upper side of nose wheel fork assembly.

(4) Installation - Nose Wheel Fork Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	ASG22	Aeroshell	Lubrication.
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaning agent.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Spring Scale	5A354	Chatillon Kew Gardens, NY 11415 718-847-5000	Load determination.

(b) Remove contaminates from spindle threads using wire brush and isopropyl alcohol.

(c) Place nose wheel fork assembly and thrust washer into installation position.

CAUTION: Ensure Teflon coating (dark grey color) on thrust washer faces upward.

(d) *Serials 1005 thru 1885 before SB 2X-32-18:* Coat spindle threads with thin coat of grease.

(e) *Serials 1886 & subs, Serials 1005 thru 1885 after SB2X-32-18:* Coat Belleville washers and spindle threads with thin coat of grease.

CAUTION: Ensure Belleville washers are installed in correct orientation. Failure to comply with this caution may result in nose wheel shimmy

Do not allow grease to come in contact with spindle cup bearing surface or nose wheel fork bearings. Failure to comply with this caution may result in nose wheel shimmy.

(f) Install flat washers and Belleville washers in correct orientation.

(g) Secure nose wheel fork assembly with castellated spindle nut.

(h) Perform Adjustment/Test - Nose Wheel Fork Assembly. (Refer to 32-20)

(i) Lower airplane off jacks. (Refer to 07-10)

(j) Install nose gear fairing. (Refer to 32-20)

(5) Adjustment/Test - Nose Wheel Fork Assembly

(a) Remove nose gear fairing. (Refer to 32-20)

(b) Raise airplane on jacks (Refer to 07-10)

(c) Remove cotter pin securing castellated spindle nut to nose gear strut.

(d) Attach spring scale to axle on nose wheel fork assembly and torque castellated spindle nut so a constant force of more than 49 lbs (22.2 kg) is required to rotate nose wheel fork and wheel assembly.

(e) Loosen castellated spindle nut.

(f) Attach spring scale to axle on nose wheel fork assembly and torque castellated spindle nut so a constant force of 20 - 25 lbs (9.1 - 11.3 kg) is required to rotate nose wheel fork and wheel assembly.

CAUTION: To ensure nose gear security, use a new cotter pin on reinstallation.

Note: *Serials 1005 thru 1885 before SB 2X-32-18:* After torquing the castellated spindle nut, the cotter pin installation holes may be aligned so that the cotter pin can not be installed. Tightening the castellated spindle nut to facilitate cotter pin installation may result in an over-torqued condition. Loosening the castellated spindle nut to facilitate cotter pin installation may result in nose wheel shimmy due to an under-torqued condition. If cotter pin can not be installed with castellated spindle nut at specified torque, perform Approved Repairs - Nose Wheel Fork Assembly. (Refer to 32-20)

(g) Secure nut with new cotter pin. Bend cotter around castellated spindle nut as shown. (See Figure 32-205)

CAUTION: Do not allow grease to come in contact with spindle bearing surface or nose wheel fork bearings. Failure to comply with this caution may result in nose wheel shimmy.

(h) Apply a thin coat of grease to exposed spindle threads.

(i) Lower airplane off jacks. (Refer to 07-10)

(j) Install nose gear fairing. (Refer to 32-20)

(6) Inspection - Nose Wheel Fork Assembly (See Figure 32-205)

(a) Remove nose wheel fork assembly. (Refer to 32-20)

Note: If 10% or more of anodizing is still present and lower surfaces of spindle cup flange and spindle cup show no signs of deformation or gouging, the spindle cup may be reused. Otherwise replace the spindle cup.

(b) Inspect lower surface of spindle cup flange for signs of wear, deformation, gouges or deep scratches.

Note: If some of the teflon is still present and thrust washer shows no deformation or gouging, the thrust washer may be reused. Otherwise replace the thrust washer.

If bearing shows no deformation or gouging, the bearing may be reused. Otherwise replace the bearing.

If dowel pin (*Serials 1005 thru 1213*), set screw *(Serials 1214 & subs*), or thrust washer is deformed or if locator hole in thrust washer is worn oblong, call Cirrus Design Customer Service for a nose wheel fork assembly replacement.

(c) Inspect dowel pin (*Serials 1005 thru 1213*), set screw *(Serials 1214 & subs*), and thrust washer for signs of wear, deformation, and gouges.

(d) Install nose wheel fork assembly. (Refer to 32-20)

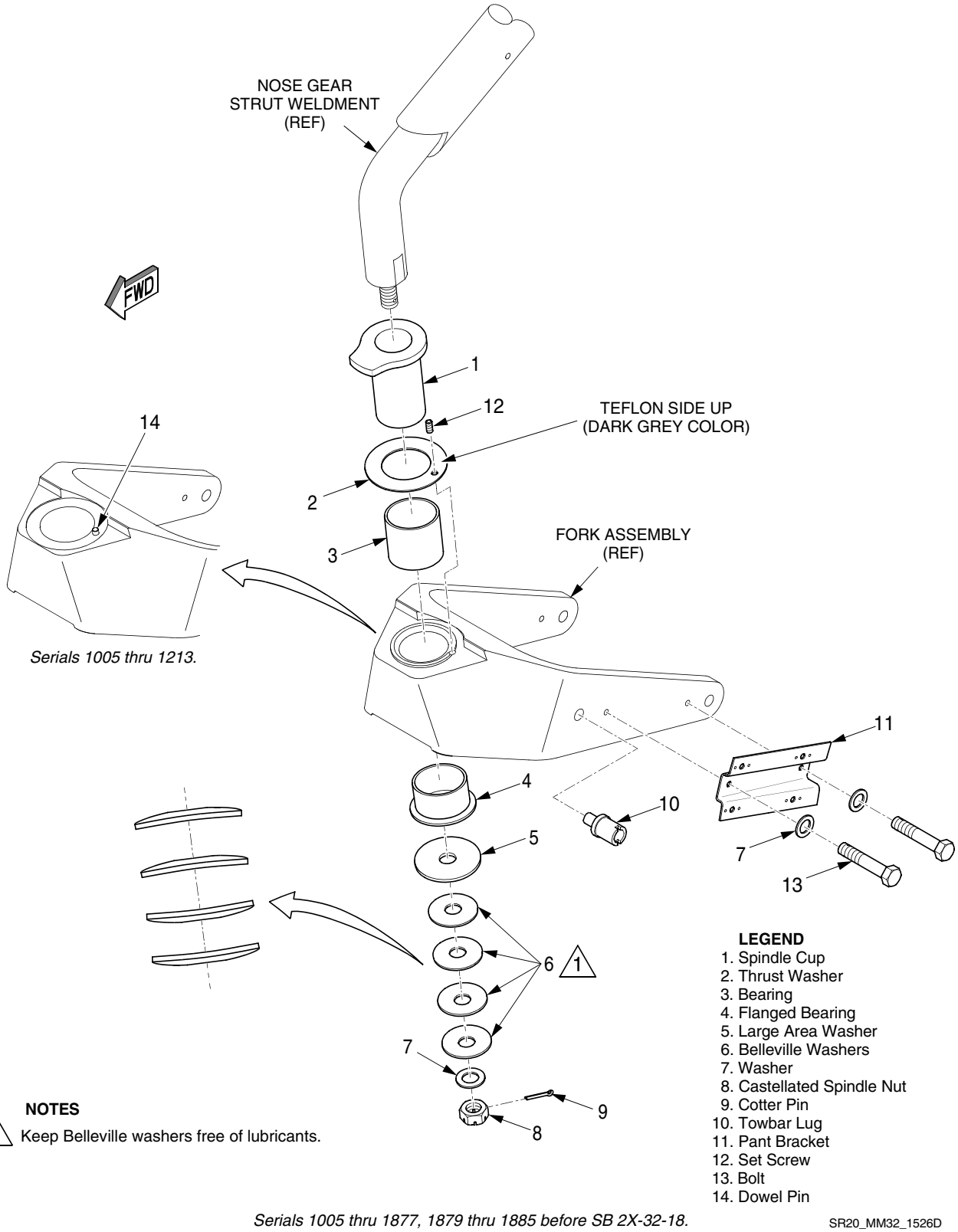
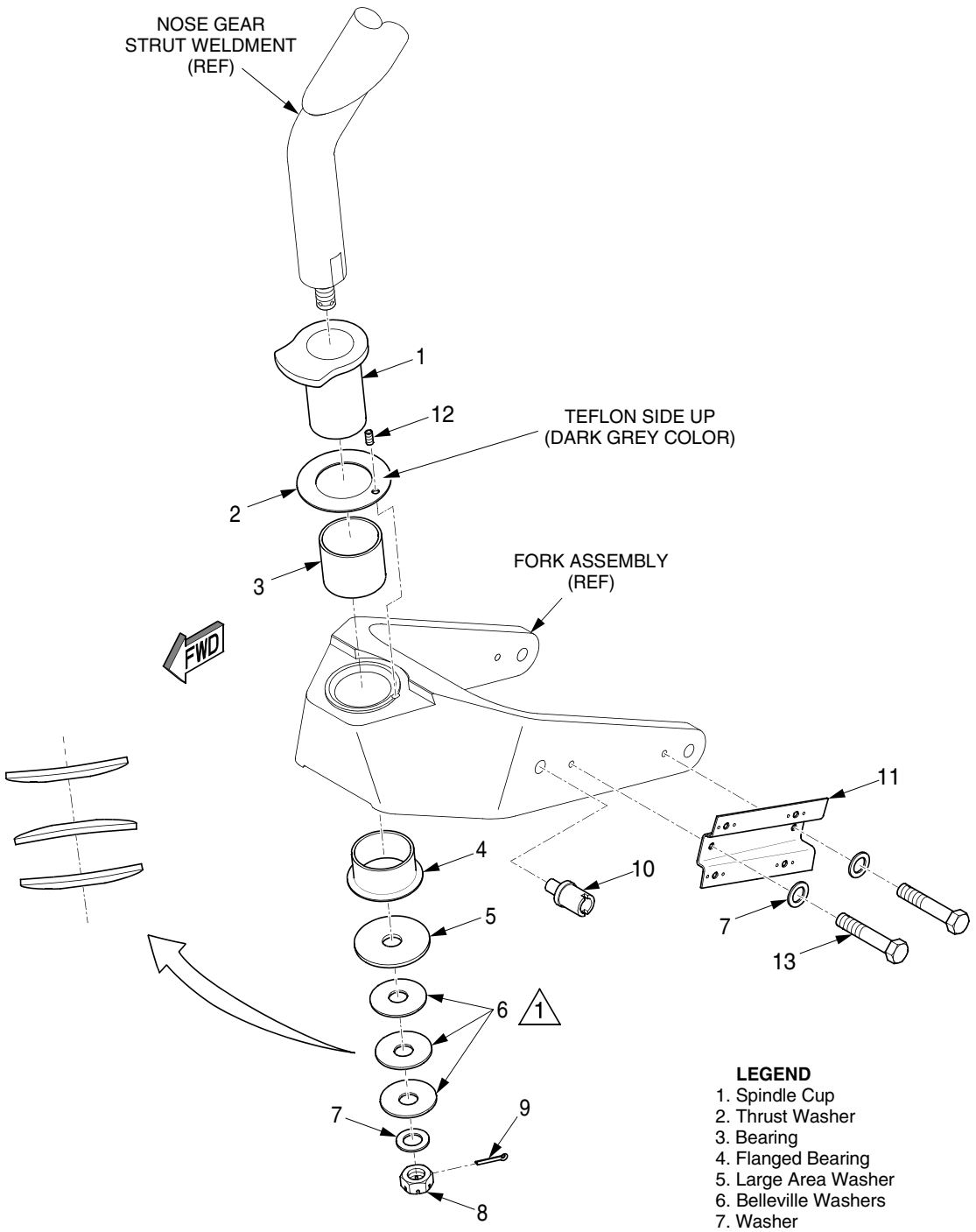


Figure 32-205
Nose Wheel Fork Assembly - Serials 1005 - 1885 before SB2X-32-18 (Sheet 1 of 2)



LEGEND

1. Spindle Cup
2. Thrust Washer
3. Bearing
4. Flanged Bearing
5. Large Area Washer
6. Belleville Washers
7. Washer
8. Castellated Spindle Nut
9. Cotter Pin
10. Towbar Lug
11. Pant Bracket
12. Set Screw
13. Bolt

NOTES

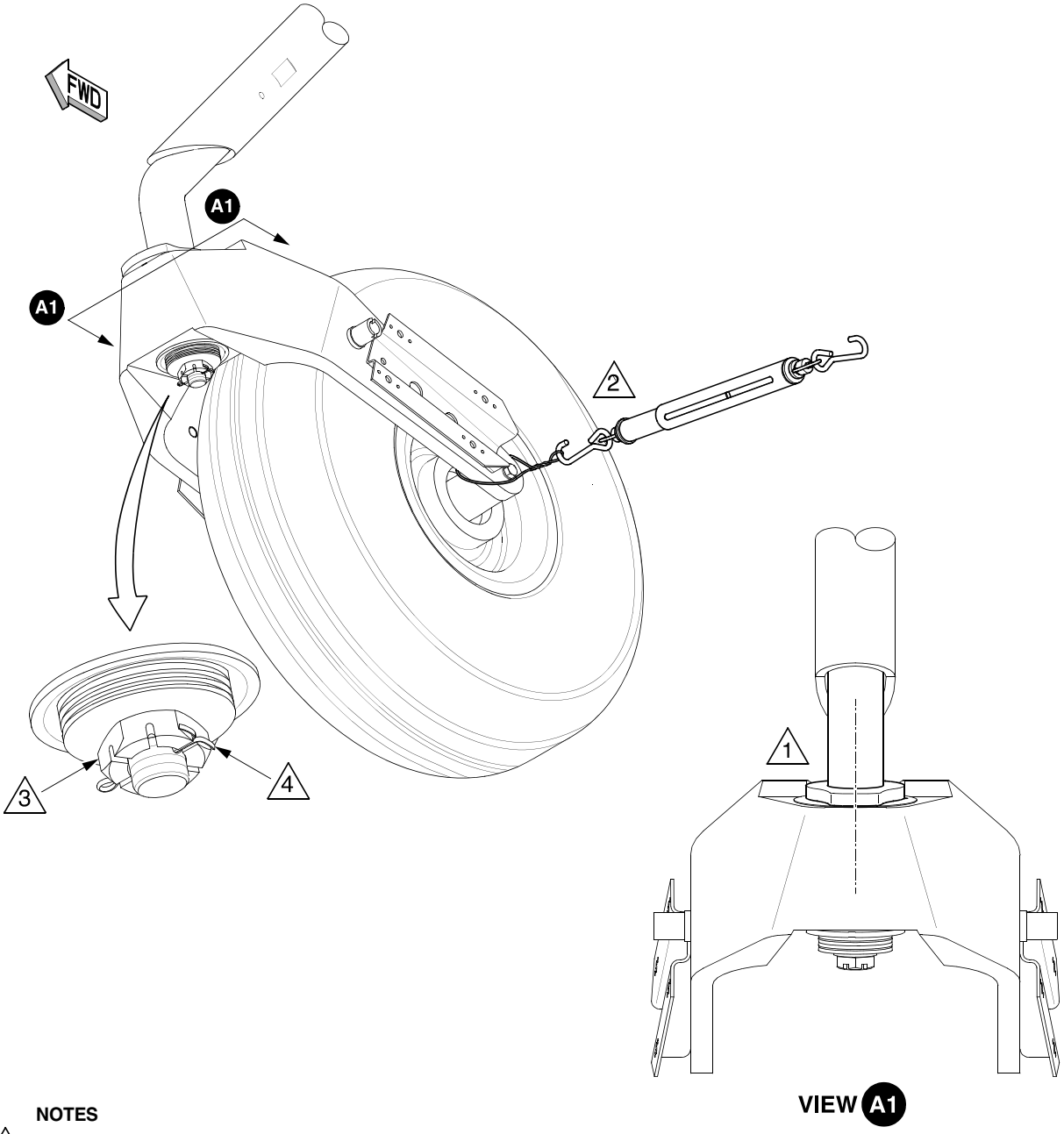
1. Coat Belleville washers with thin coat of grease.

Serials 1878, 1886 & subs,
Serials 1005 thru 1877, 1879 thru 1885 after SB 2X-32-18.

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Figure 32-205
Nose Wheel Fork Assembly - Serials 1005 thru 1885 after SB2X-32-18, 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1005 thru 1885 after SB2X-32-18, 1886 & subs



NOTES

1. Ensure centerline of spindle cup is aligned correctly.
2. Attach spring scale to axle.
3. Torque castellated spindle nut so a constant force of more than 49 lb (22.2 kg) is required to rotate nose wheel fork and wheel assembly. Loosen castellated spindle nut and re-torque so a constant force of 20-25 lb (9.1-11.3 kg) is required to rotate nose wheel fork and wheel assembly.
4. Install new cotter pin as shown.

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Figure 32-206
Nose Wheel Fork Adjustment/Test

I. Spindle Cup (See Figure 32-205)

(1) Removal - Spindle Cup

(a) Remove nose gear strut. (Refer to 32-20)

(b) Remove nose wheel fork assembly. (Refer to 32-20)

(c) Remove grease and other contaminates from nose gear strut weldment.

(d) Determine centerline of existing spindle cup with vernier caliper. Reference centerline by making a mark on nose gear strut weldment.

Note: If required, tap on spindle cup flange until it falls free from nose gear strut weldment.

(e) Use a heating tip and oxyacetylene torch to quickly heat entire spindle cup for approximately 30 - 45 seconds.

(2) Installation - Spindle Cup

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Methyl Ethyl Ketone (MEK)	78-93-3	Any Source	Cleaning agent.
Paste Adhesive	50195-001	Cirrus Design	Bond spindle cup.

(b) Remove remaining adhesive with 80-grit sandpaper.

(c) Solvent clean bonding surfaces of nose gear strut weldment and new spindle cup with MEK.

(d) Determine and mark centerline of new spindle cup with vernier caliper and indelible marker.

(e) Mix paste adhesive thoroughly. Apply generously over entire nose gear strut weldment bond surface.

Note: Ensure reference marks are aligned and spindle cup is completely pushed onto the nose gear strut weldment.

(f) Slide new spindle cup onto nose gear strut weldment.

(g) Wipe off excess adhesive.

(h) To prevent spindle cup from sliding down while adhesive is setting up, place base of old spindle cup against base of new spindle cup and temporarily secure with castellated nut.

(i) Cure adhesive for 2.5 hours at 120 - 180 °F (49 - 82 °C). (Refer to 51-20)

(j) After adhesive is cured, remove and discard old spindle cup and castellated nut.

(k) Install nose wheel fork assembly. (Refer to 32-20)

(l) Install nose gear strut. (Refer to 32-20)

(3) Approved Repair - Spindle Stud Replacement (See Figure 32-207)

This repair may be used to replace a damaged spindle stud on the nose gear assembly.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Serials 1005 thru 1885: Spindle Stud Replacement Kit	70229-002	Cirrus Design	Replace spindle and attaching parts.

Description	P/N or Spec.	Supplier	Purpose
Serials 1886 & subs: Spindle Stud Replacement Kit	70229-001	Cirrus Design	Replace spindle and attaching parts.
Thread Tap	5/8-18 UNF-3B	Any Source	Drill spindle stud hole.
Drill Bit	0.250 +0.006/-0.000 inch	Any Source	Drill spring pin hole.
Compressed Air	-	Any Source	Remove debris.
Threadlocker	Loctite 262	Any Source	Bond spindle stud.
Grease	ASG22	Aeroshell	Corrosion protection.
Methyl Ethyl Ketone (MEK)	73-93-3	Any Source	Clean spindle stud hole.
Spindle Cup	Refer to IPC	Cirrus Design	If damaged, replace spindle cup.
Vise Clamp	-	Any Source	Secure spindle.
Arbor Press	-	Any Source	Install bushings.

(b) *Serials 2065 & subs:* Remove engine cowling. (Refer to 71-10)

(c) Remove nose gear strut. (Refer to 32-20)

(d) Remove spindle cup. (Refer to 32-20)

CAUTION: Do not remove any material from surface of spindle when cutting stud from nose gear assembly spindle. Spindle surface at stud perimeter must remain flat.

(e) Using die grinder, cut existing stud from nose gear assembly spindle.

CAUTION: Do not clamp nose gear assembly at spindle radius or welded transition zone.

(f) Insert nose gear assembly spindle into vise clamp with spindle positioned vertically, supporting remaining nose gear assembly as required.

(g) Prior to drilling, verify location of drill to center of spindle meets positional tolerance of 0.025 inch and orientation of spindle meets parallelism tolerance of 0.010 inch. (See Figure 32-207)

(h) Drill and tap 5/8-18 UNF-3B hole at center of spindle.

(i) Verify length of drilled installation hole is 1.100 +0.000/-0.005 inch (27.94 +0.000/-0.127 mm).

(j) Using compressed air, remove any debris from spindle.

(k) Solvent clean spindle hole with MEK.

(l) At installation end of spindle stud, apply threadlocker to spindle stud threads.

(m) Install spindle stud into drilled hole on nose gear assembly spindle. Fully bottom out stud and torque to 480 - 690 in-lb (54.2 - 77.9 Nm).

(n) Remove nose gear assembly from vise clamp.

(o) Insert nose gear assembly leg into vise clamp with spindle positioned horizontally.

(p) Measure 0.5 inch (12.7 mm) from end of spindle and mark.

(q) Using 0.250 +0.006/-0.000 inch drill bit at mark, drill hole through centerline of spindle and stud assembly.

(r) Install spring pin into drilled hole.

(s) Verify both ends of spring pin are recessed from the spindle outside diameter.

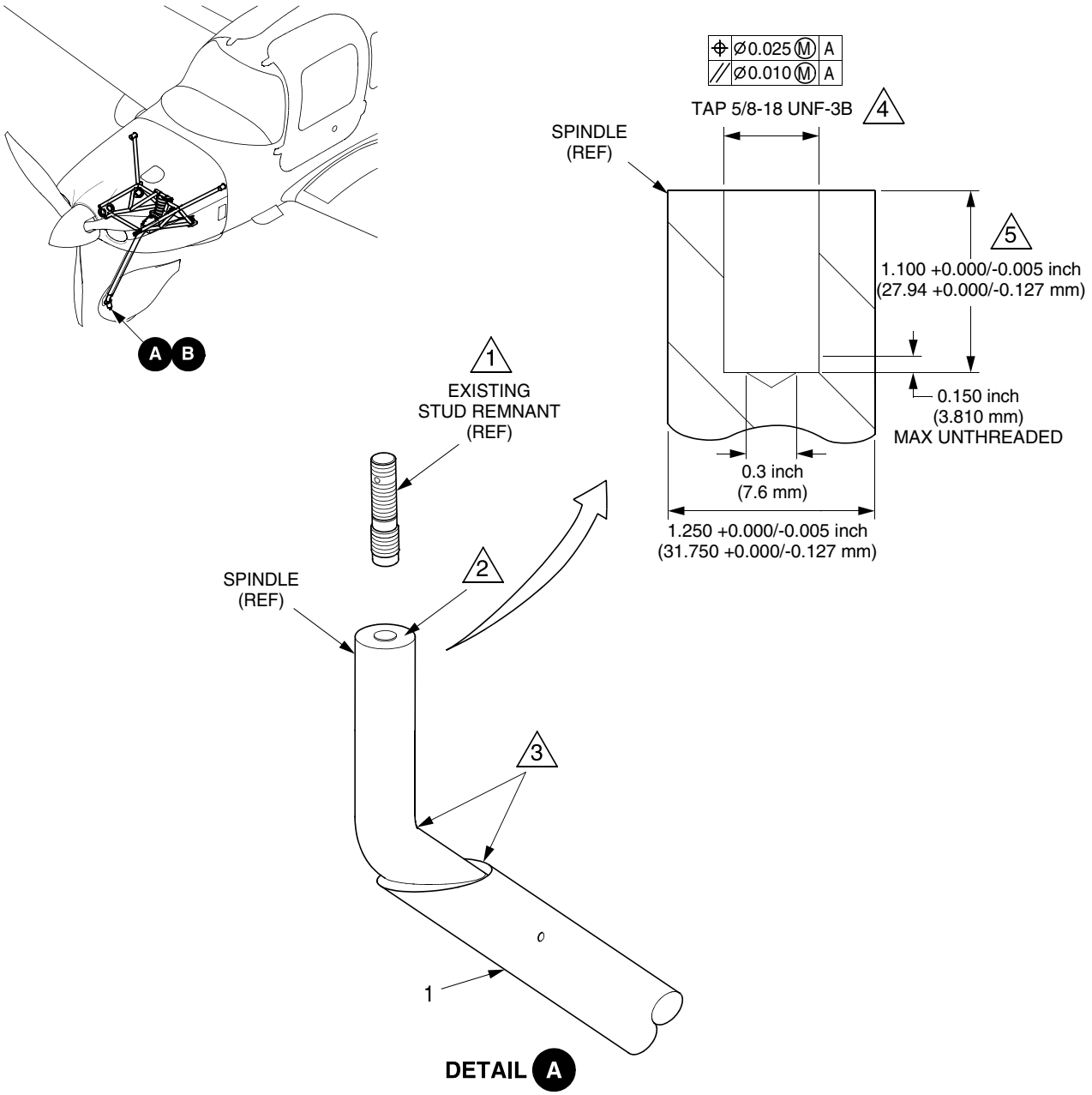
(t) Remove and discard existing nose gear assembly bushings.

(u) Using arbor press, install replacement bushings to nose gear assembly.

(v) Install spindle cup. (Refer to 32-20)

(w) Install nose gear strut using replacement attaching hardware. (Refer to 32-20)

(x) *Serials 2065 & subs:* Install engine cowling. (Refer to 71-10)



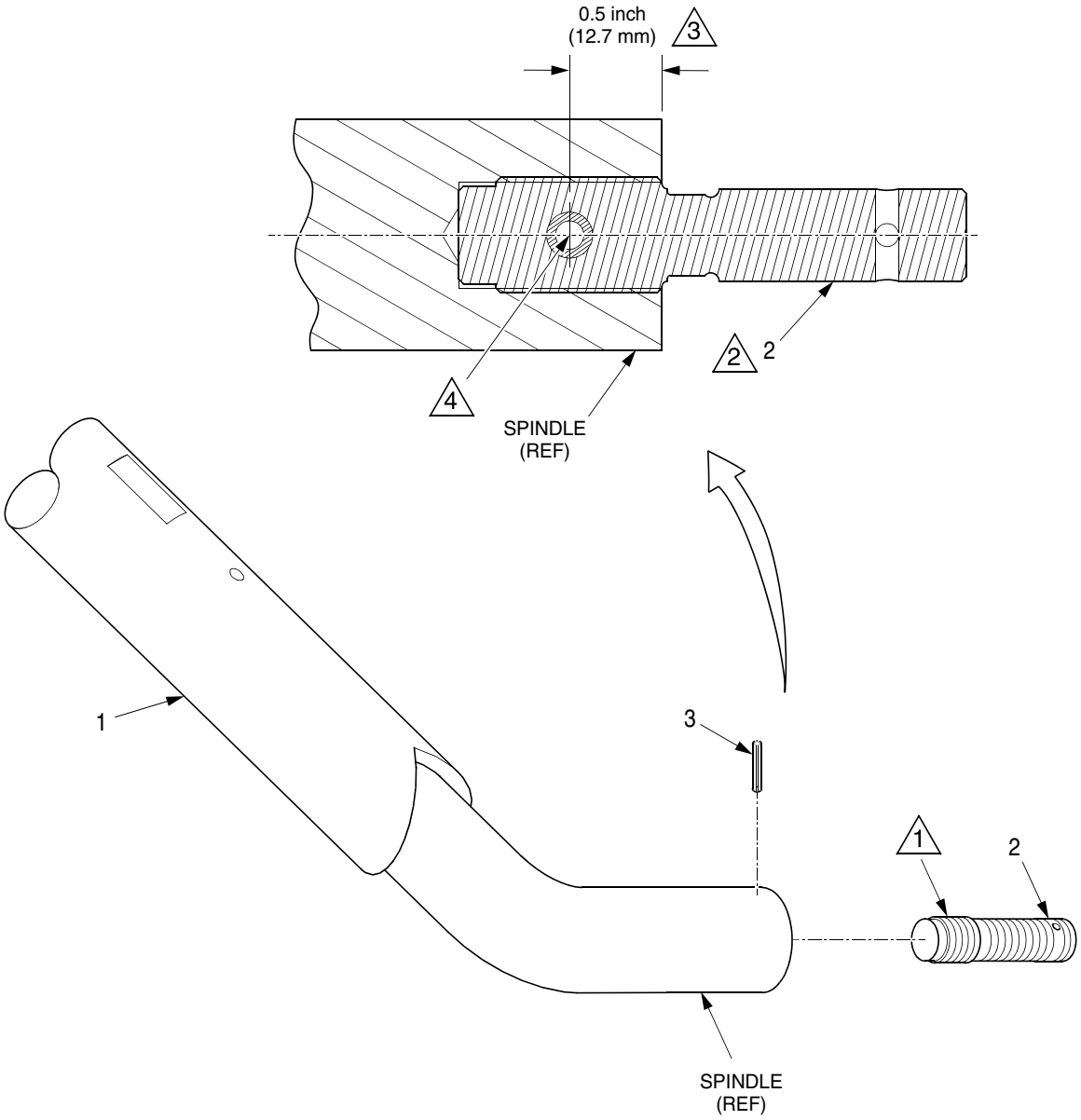
NOTE

1. Using die grinder, cut existing stud from nose gear assembly spindle.
2. Do not remove any material from surface of spindle when cutting stud from nose gear assembly spindle. Spindle surface at stud perimeter must be flat to remain flush with spindle cup.
3. Do not clamp nose gear assembly at spindle radius or welded transition zone.
4. Drill and tap 5/8-18 UNF-3B hole at center of spindle.
5. Verify length of drilled installation hole is 1.100 +0.000/-0.005 inch (27.94 +0.000/-0.127 mm).

LEGEND
1. Nose Gear Strut

SR20_MM32_3238

Figure 32-207
Approved Repairs - Nose Gear Assembly Spindle Stud (Sheet 1 of 2)



DETAIL B

NOTE

1. At installation end of spindle stud, apply threadlocker to spindle stud threads.
2. Install spindle stud into tapped hole on NLG assembly spindle. Fully bottom out stud and torque to 480 - 690 in-lb (54.2 - 77.9 Nm).
3. Measure 0.5 inch (12.7 mm) from end of spindle and mark.
4. Using 0.250 +0.006/-0.000 inch drill bit at mark, drill hole through centerline of spindle and stud assembly.

LEGEND

1. Nose Gear Strut
2. Spindle Stud
3. Spring Pin

SR20_MM32_3240

Figure 32-207
Approved Repairs - Nose Gear Assembly Spindle Stud (Sheet 2 of 2)

(4) Approved Repairs - Spindle Stud Cotter Pin Installation Hole - *Serials 1005 thru 1475 before SB 2X-32-18* (See Figure 32-208)

This repair may be used to add a second cotter pin installation hole through the threaded portion of the spindle stud. The new cotter pin installation hole will be perpendicular to the original installation hole and will allow a finer degree of adjustment when securing the spindle nut.

(a) Procedure - Repair Method #1

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cross Hole Tool	16473-001	Cirrus Design	Drill installation hole.
Drill Bit	0.125 inch (3.2 mm)	Any Source	Drill installation hole.
Compressed Air	-	Any Source	Remove metal chips from nose gear strut.

2 Remove nose wheel fork assembly. (Refer to 32-20)

3 Perform Inspection - Nose Wheel Fork Assembly. (Refer to 32-20)

4 Install upper cross hole tool onto spindle stud and tighten until snug.

5 Align lockout hole on lower cross hole tool with cotter pin installation hole on nose gear strut.

6 Install lockout pin.

Note: If position of lockout pin interferes with tightening handle, reinstall lockout pin on opposite side of cross hole tool.

7 Tighten lower cross hole tool to upper cross hole tool.

Note: Ensure drill bit passes completely through nose gear strut and not just to void from original installation hole.

8 Using 0.125 inch (3.2 mm) drill bit and guide hole on lower cross hole tool, drill new cotter pin installation hole through nose gear strut.

9 Remove lockout pin.

10 Loosen and remove lower cross hole tool from upper cross hole tool.

11 Using compressed air, remove metal chips from drilled installation hole and threaded portion of nose gear strut.

12 Remove upper cross hole tool from nose gear strut.

13 Verify distance from center of drilled installation hole to bottom of spindle cup is 0.655 ±0.020 inch (1.66 ±0.05 cm).

14 Install nose wheel fork assembly. (Refer to 32-20)

(b) Procedure - Repair Method #2

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cross Hole Tool	16585-001	Cirrus Design	Drill installation hole.

Description	P/N or Spec.	Supplier	Purpose
Drill Bit	0.125 inch (3.2 mm)	Any Source	Drill installation hole.
Compressed Air	-	Any Source	Remove metal chips from nose gear strut.

2 Remove nose wheel fork assembly. (Refer to 32-20)

3 Perform Inspection - Nose Wheel Fork Assembly. (Refer to 32-20)

4 Position cross hole tool lower attach block onto spindle stud.

5 Align lockout hole on lower attach block with cotter pin installation hole on nose gear strut.

6 Install lockout pin.

7 Position cross hole tool so that upper attach block rests on top of spindle cup flange and against nose gear strut.

8 Tighten bolts and washers securing cross hole tool to nose gear strut.

Note: Ensure drill bit passes completely through nose gear strut and not just to void from original installation hole.

9 Using 0.125 inch (3.2 mm) drill bit and guide hole on cross hole tool, drill new cotter pin installation hole through nose gear strut.

10 Remove lockout pin.

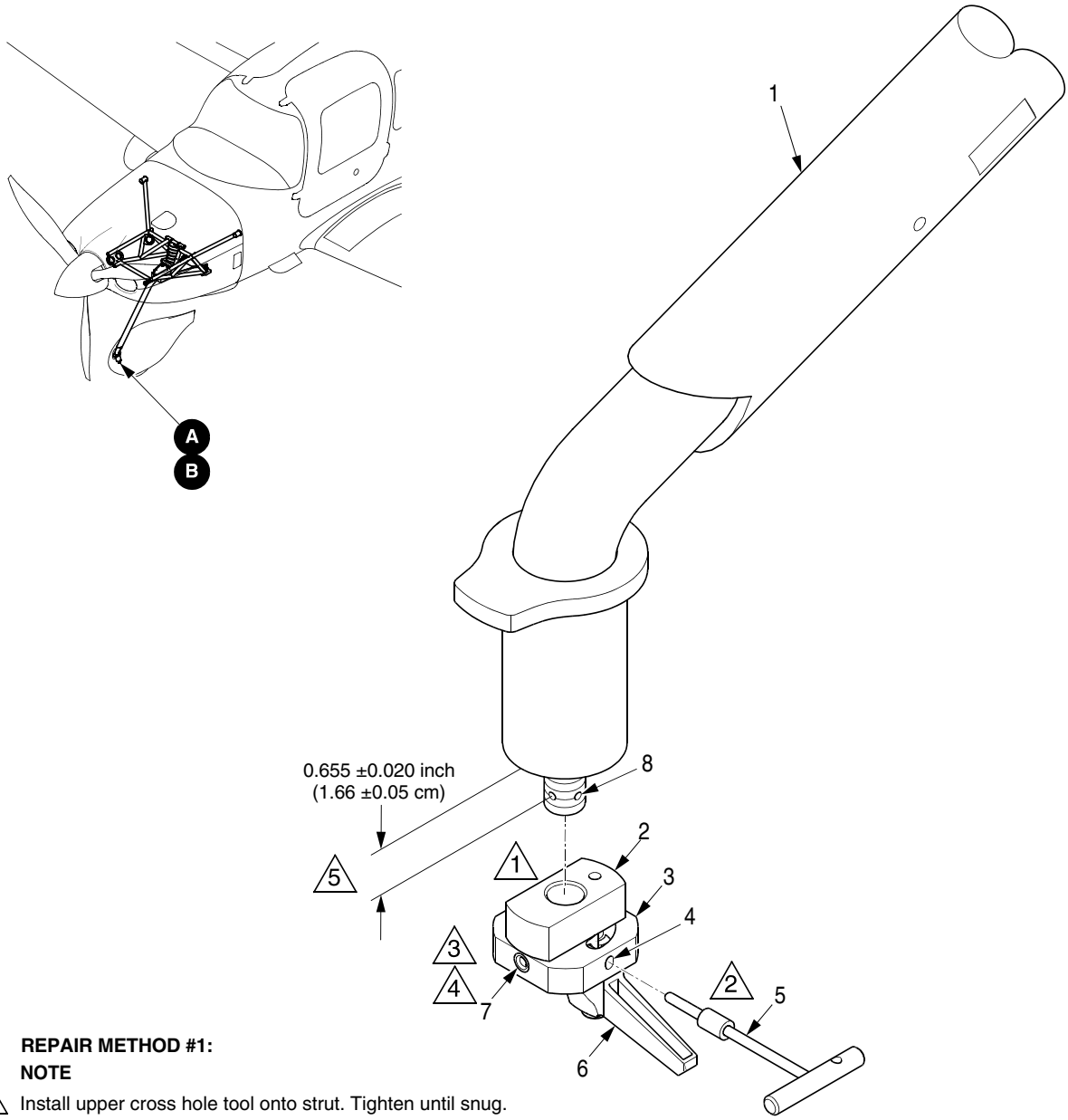
11 Loosen bolts and washers securing cross hole tool to nose gear strut.

12 Remove cross hole tool from nose gear strut.

13 Using compressed air, remove metal chips from drilled installation hole and threaded portion of nose gear strut.

14 Verify distance from center of drilled installation hole to bottom of spindle cup is 0.655 ±0.020 inch (1.66 ±0.05 cm).

15 Install nose wheel fork assembly. (Refer to 32-20)



REPAIR METHOD #1:

NOTE

1. Install upper cross hole tool onto strut. Tighten until snug.
2. Align lockout hole on lower cross hole tool with cotter pin installation hole on strut. Install lockout pin. Tighten lower cross hole tool to upper cross hole tool.
3. Using 1/8" drill bit and guide hole on lower cross hole tool, drill new cotter pin installation hole through strut.
4. Remove lower cross hole tool. Remove metal chips from strut. Remove upper cross hole tool from strut.
5. Verify distance from center of drilled installation hole to bottom of spindle cup is 0.655 ±0.020 inch (1.66 ±0.05 cm).

LEGEND

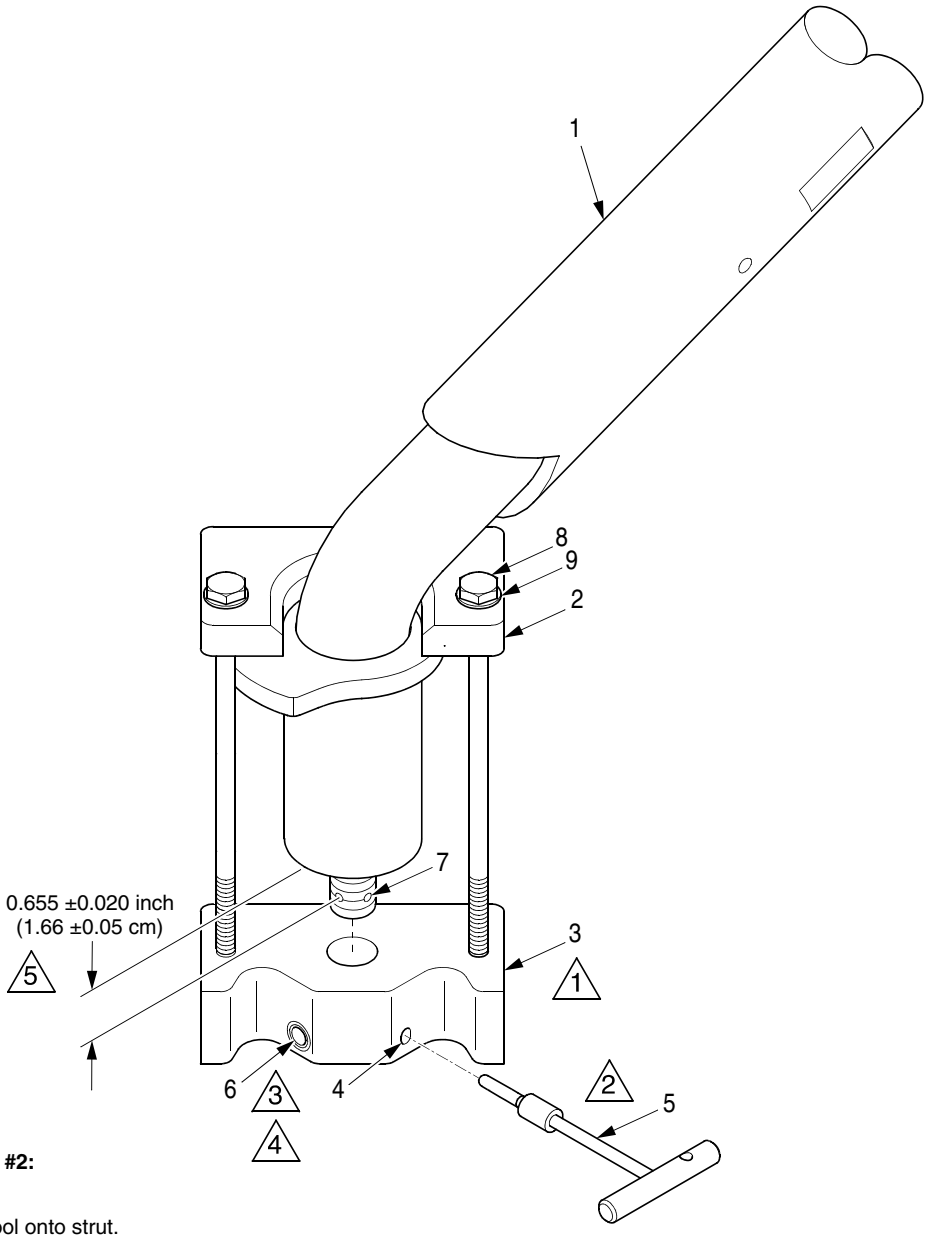
1. Nose Gear Strut
2. Upper Cross Hole Tool
3. Lower Cross Hole Tool
4. Lockout Hole
5. Lockout Pin
6. Tightening Handle
7. Guide Hole
8. Cotter Pin Installation Hole

DETAIL A

Serials 1005 thru 1475.

SR20_MM32_2056B

Figure 32-208
Approved Repairs - Spindle Stud Cotter Pin Installation Hole - Serials 1005 thru 1475 (Sheet 1 of 2)



REPAIR METHOD #2:

NOTE

1. Install cross hole tool onto strut.
2. Align lockout hole on lower attach block with cotter pin installation hole on strut. Install lockout pin. Tighten bolt and washers securing cross hole tool to nose gear strut.
3. Using 1/8" drill bit and guide hole on lower attach block, drill new cotter pin installation hole through strut.
4. Remove lower cross hole tool and metal chips from strut.
5. Verify distance from center of drilled installation hole to bottom of spindle cup is 0.655 ±0.020 inch (1.66 ±0.05 cm).

LEGEND

1. Nose Gear Strut
2. Upper Attach Block
3. Lower Attach Block
4. Lockout Hole
5. Lockout Pin
6. Guide Hole
7. Cotter Pin Installation Hole
8. Bolt
9. Washer

DETAIL B

Serials 1005 thru 1475.

SR20_MM32_2135B

Figure 32-208
Approved Repairs - Spindle Stud Cotter Pin Installation Hole - Serials 1005 thru 1475 (Sheet 2 of 2)

J. Tests

(1) Inspection/Check - Nose Landing Gear Strut Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flashlight	100 foot-candles (1100 lux)	Any Source	Inspect for cracking.
Inspection Mirror	-	Any Source	Inspect for cracking.
10X Magnifier	-	Any Source	Inspect for cracking.
Mild Dishwasher Soap (abrasive free)	-	Any Source	Clean inspection area.
Cotton Cloth (clean, white, lint-free)	-	Any Source	Clean inspection area.
Masking Tape	-	Any Source	Mask surfaces.
Plastic Sheet	-	Any Source	Mask surfaces.
Paint Remover	-	Any Source	Remove paint.
Dye Penetrant	-	Any Source	Detect cracks.
Rust Inhibitor	MIL-PRF-16173E Grade 2	Any Source	Rust protect inspection area.

(b) Remove key from ignition.

(c) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(d) Remove engine cowling. (Refer to 71-10)

(e) Remove nose gear fairing. (Refer to 32-20)

(f) Using dye penetrant, inspect the nose landing gear strut assembly.

1 Solvent clean area on and around welds between strut and gusset tubes. (Refer to 20-30)

Note: Ensure paint removal of the inspection area extends 1 - 1.5 inches (2.5 - 4 cm) from welds around the circumference of the strut and both gusset tubes. (See Figure 32-209)

2 Mask off areas adjacent to inspection area to protect painted surfaces.

3 Using paint remover per manufacturer's instructions, remove surface protection to expose welds and surrounding area.

4 Wire brush area to remove all loose debris and/or corrosion.

5 Dye penetrant inspect in accordance with FAA AC 43.13-1B, Chapter 5, Section 5.

Note: Typical crack formation is at the bottom edge of fillet welds for the LH and RH gussets. As the condition worsens, the cracking continues around the circumference of the nose strut tube.

A false positive dye penetrant inspection result that is not a crack (such as a weld under-cut) will show an indication of a crack along the inner or outer edge of gusset fillet weld.

6 Using flashlight, inspection mirror, and 10X magnifier, verify there is no evidence of cracking on or around surface of fillet welds between the strut tube and the LH and RH gusset tubes. (See Figure 32-209)

WARNING: **If cracking is identified in metal on or around surface of fillet welds, the aircraft is prohibited from flight until the nose landing gear strut assembly is replaced.**

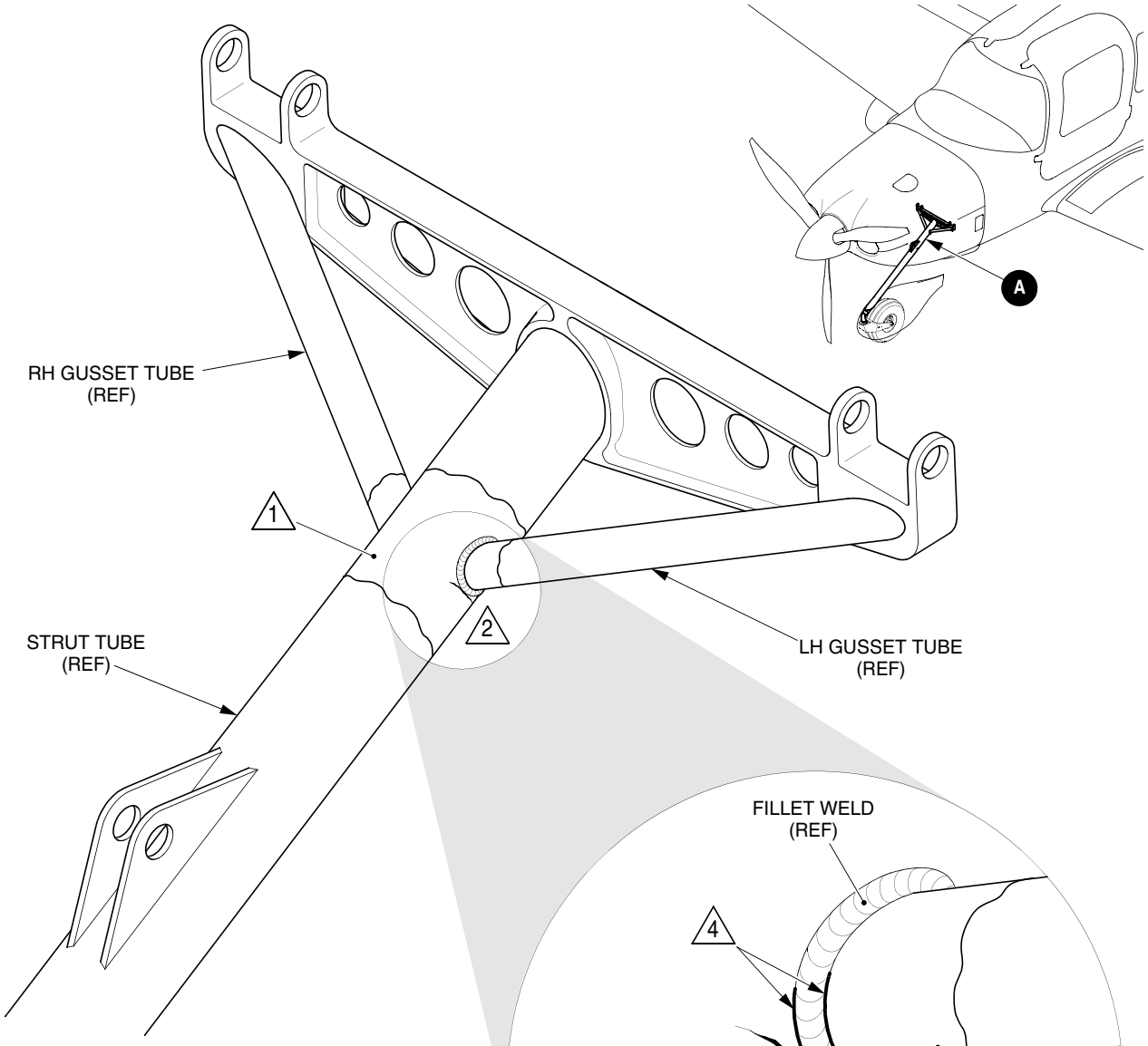
7 If cracking is identified in metal on or around surface of fillet welds, contact Cirrus for disposition.

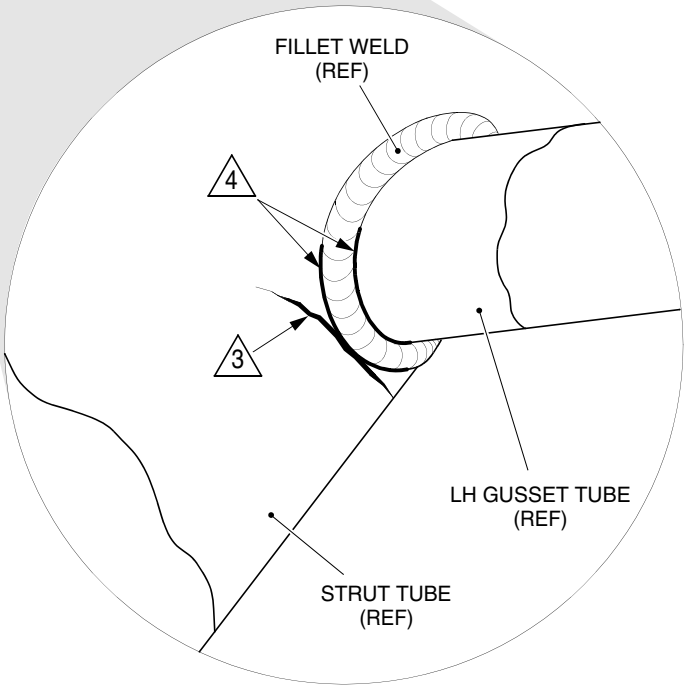
(g) Apply rust inhibitor to inspection area.

(h) Remove masking tape.

(i) Install nose gear fairing. (Refer to 32-20)

(j) Install engine cowling. (Refer to 71-10)





NOTE

1. Ensure paint removal of the inspection area extends 1 - 1.5 inches (2.5 - 4 cm) from welds around the circumference of the strut and both gusset tubes.

2. Using flashlight, inspection mirror, and 10X magnifier, verify there is no evidence of cracking on or around surface of fillet welds between the strut tube and the LH and RH gusset tubes.

3. Typical crack formation is at the bottom edge of fillet welds for the LH and RH gussets. As the condition worsens, the cracking continues around the circumference of the nose strut tube.

4. A false positive dye penetrant inspection result that is not a crack (such as a weld under-cut) will show an indication of a crack along the inner or outer edge of gusset fillet weld.

DETAIL A

SR20_MM32_5452B

Figure 32-209
Nose Landing Gear Strut Assembly Inspection

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WHEELS AND BRAKES

1. GENERAL

This chapter describes that portion of the landing gear system which provides for rolling and stopping of the airplane while on the ground.

Chapter 32-41 contains maintenance practices pertinent to the wheels, tires, and tubes. (Refer to 32-41)

Chapter 32-42 contains maintenance practices pertinent to the brake system. (Refer to 32-42)

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WHEELS

1. DESCRIPTION

A. Main Wheels

Serials 1005 thru 2240 before SB2X-32-21: The main wheels are of aluminum construction and designed to be used with tires and tubes. The 15 x 6.00 x 6 wheels use 6-ply-rated tube tires and rotate on two bearings protected against contamination by grease seals. The wheel is secured to the axle with a nut, and cotter pin.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: The main wheels are of aluminum construction and designed to be used with tires. The 15 x 6.00 x 6 wheels use 10-ply-rated tires and rotate on two sealed bearings. The wheel is secured to the axle with a nut, and cotter pin.

For disassembly/assembly of main wheels refer to the manufacturer's approved Instructions For Continued Airworthiness.

B. Nose Wheel

Serials 1005 thru 2240 before SB2X-32-21: The nose wheel is of aluminum construction and designed to be used with tires and tubes. The 5.00 x 5 wheels use a 6-ply-rated tube tire and rotate on two bearings protected against contamination by grease seals. The wheel is free castering on an independent axle and is used to steer the airplane on the ground by means differential brake application.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: The nose wheel is of aluminum construction and designed to be used with tires. The 5.00 x 5 wheels use a 10-ply-rated tire and rotate on two sealed bearings. The wheel is free castering on an independent axle and is used to steer the airplane on the ground by means differential brake application.

For disassembly/assembly of nose wheel refer to the manufacturer's approved Instructions For Continued Airworthiness.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Cracked or distorted wheel or wheel half.	Hitting rocks or other hard objects during landing or takeoff.	Inspect wheel using Zyglo to determine condition. Replace wheel or wheel half. **CAUTION:** Do not attempt to weld or repair cracks in wheel halves.
	Use of sharp objects to break tire bead.	Replace wheel or wheel half.
	Landing with flat tire or abnormally hard landing.	Replace wheel or wheel half.
	Landing in crabbing position in crosswind causing excessive side force.	Replace wheel or wheel half.
	Normal fatigue failure when used beyond expected wheel life.	Replace wheel or wheel half.
Damaged bearing cone.	Misalignment of bearings.	Replace bearing cone being sure it is properly seated in bearing bore.
	Axle nut improperly torqued.	Replace and torque axle nut.
	Serials 1005 thru 2240 before SB2X-32-21: Foreign matter in bearing grease.	Check grease seals for damage. Replace seals and be sure bearing grease is free from foreign matter.
	Serials 1005 thru 2240 before SB2X-32-21: Lack of bearing grease.	Replace bearings and repack with grease per manufacturer's instructions. (Refer to 05-10)
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: Rapid decrease of tire pressure (10 PSI per day)	Improper tire mounting and/or damaged seal.	Disassemble and replace seals.
	Leak at valve core.	Replace valve core.
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: Medium decrease of tire pressure (10 PSI per week)	Improper tire.	Use only tubeless tires.
	Scratches on sealing faces.	Replace damaged parts.
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: Slow decrease of tire pressure (10 PSI per month)	Defective valve core.	Replace valve core.
	Standard decrease of pressure with some tubeless tires.	Inflate tire to appropriate pressure. Check inflation pressure every month.

3. MAINTENANCE PRACTICES

A. Servicing Tires and Tubes (Refer to 12-10)

B. Main Wheel, Tire, and Tube - *Serials 1005 thru 2240 before SB2X-32-21* (See Figure 32-411)

(1) Removal - Main Wheel, Tire, and Tube

(a) Remove main gear fairings. (Refer to 32-10)

(b) Raise airplane on jacks. (Refer to 07-10)

(c) Remove brake assembly. (Refer to 32-42)

(d) Deflate tire and tube completely.

WARNING: **Do not attempt to remove valve core until tire has been completely deflated. The valve core will be ejected at high velocities if unscrewed before air pressure has been released.**

(e) Remove valve core.

(f) Remove cotter pin from axle and remove axle nut

(g) Remove wheel/tire assembly from axle.

(2) Installation - Main Wheel, Tire, and Tube

CAUTION: Do not use degreaser, abrasive cleaner, or pressure washer.

(a) Clean and inspect wheel bearings per manufacturer's instructions. (Refer to 05-10) If damage is present, contact Cirrus for disposition.

(b) Lightly lubricate wheel bearings and seals with Mobil SHC-100 or Aeroshell 22 grease per manufacturer's instructions. (Refer to 05-10)

(c) Carefully slide wheel/tire assembly onto axle making sure inboard bearing is seated.

(d) While rotating wheel/tire assembly, install axle nut and torque to 200 in-lb (22.6 Nm) to seat bearing.

(e) Back off axle nut to zero torque.

Note: Wheel to spin 1 - 2 rotations when spun by hand. Additional washers may be required to meet torque and fit-up requirements.

(f) While rotating wheel, retorque to 100 - 150 in-lb (11.3 - 17.0 Nm).

(g) Rotate axle nut to nearest slot and cotter pin hole, and install cotter pin.

(h) Install brake assembly. (Refer to 32-42)

(i) Inflate tires. (Refer to 12-10)

(j) Remove airplane from jacks. (Refer to 07-10)

(k) Install main gear fairings. (Refer to 32-10)

C. Main Wheel and Tire - *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs* **(See Figure 32-411)**

(1) Removal - Main Wheel and Tire

(a) Remove main gear fairings. (Refer to 32-10)

(b) Raise airplane on jacks. (Refer to 07-10)

(c) Remove cotter pin from axle and remove axle nut

(d) Remove wheel/tire assembly from axle.

(2) Installation - Main Wheel and Tire

(a) Carefully slide wheel/tire assembly onto axle making sure inboard bearing is seated.

(b) Torque to 350 in-lb (39.5 Nm).

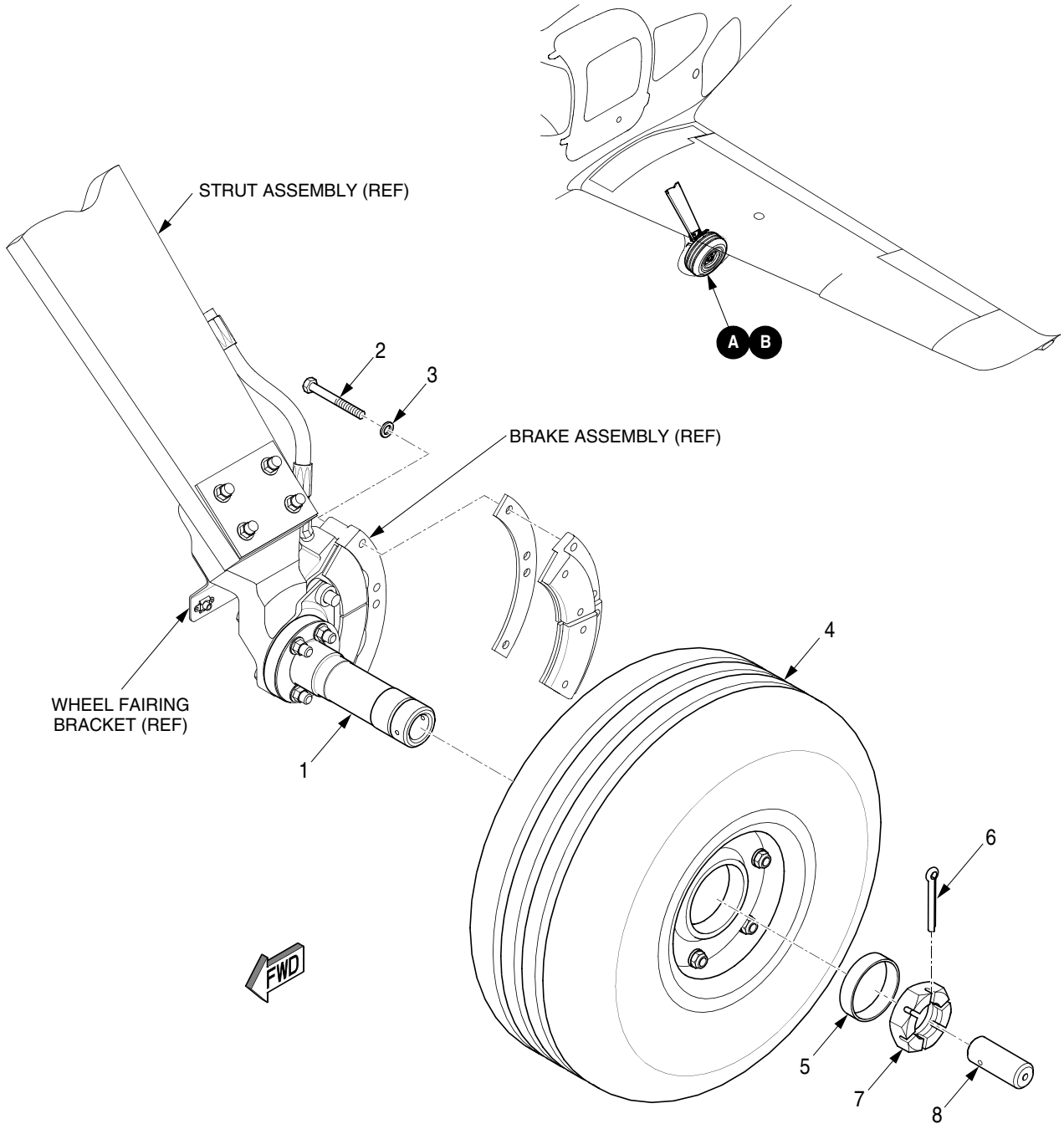
(c) Rotate axle nut to nearest slot and cotter pin hole, and install cotter pin.

(d) Check main wheel pressure. (Refer to 12-10)

(e) Remove airplane from jacks. (Refer to 07-10)

(f) Install main gear fairings. (Refer to 32-10)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs



DETAIL A

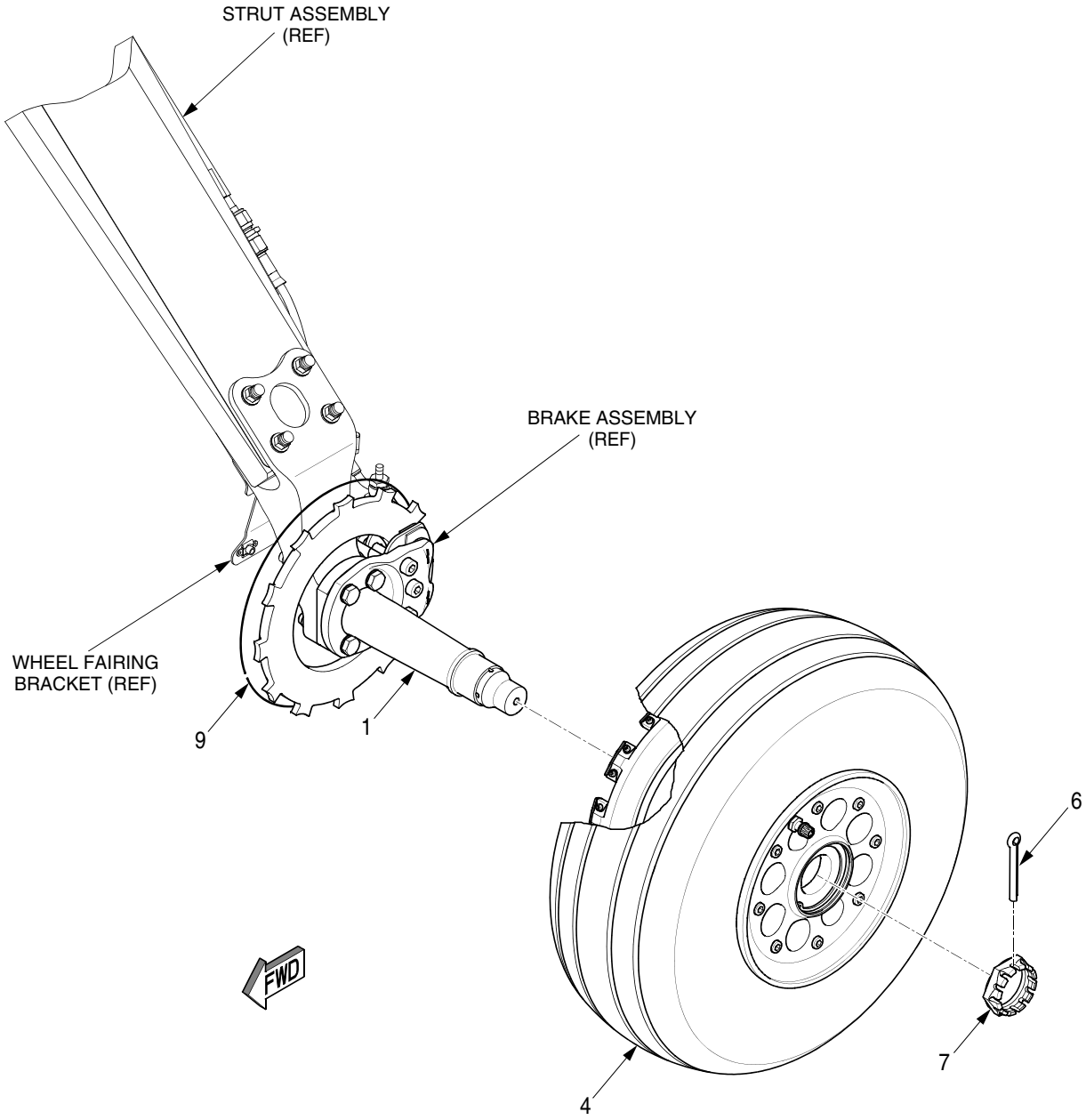
Serials 1005 thru 2240 before SB2X-32-21.

LEGEND

1. Axle
2. Bolt
3. Washer
4. Wheel Assembly
5. Axle Spacer
6. Cotter Pin
7. Axle Nut
8. Wheel Fairing Mount

SR20_MM32_1043C

Figure 32-411
Main Wheel Installation - Serials 1005 thru 2240 before SB2X-32-21 (Sheet 1 of 2)



LEGEND
1. Axle
4. Wheel Assembly
6. Cotter Pin
7. Axle Nut
9. Safety Wire

DETAIL B

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs.

SR20_MM32_3617

Figure 32-411
Main Wheel Installation - Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

D. Nose Wheel, Tire, and Tube - *Serials 1005 thru 2240 before SB2X-32-21* (See Figure 32-412)

(1) Removal - Nose Wheel, Tire, and Tube

(a) Remove nose gear fairings. (Refer to 32-20)

(b) Raise airplane on jacks. (Refer to 07-10)

(c) Deflate tire completely.

WARNING: **Do not attempt to remove valve core until tire has been completely deflated. Valve core will be ejected at high velocities if unscrewed before air pressure has been released.**

(d) Remove valve core.

(e) While supporting wheel/tire assembly, remove axle plugs, cotter pin, axle nut, washers, and withdraw bolt from axle.

(f) Pull tire, axle, and wheel from fork.

Note: Label bearings with position from which it was removed for proper reinstallation.

(g) Remove and store spacers and axle before disassembling wheel.

(2) Installation - Nose Wheel, Tire, and Tube

CAUTION: Do not use degreaser, abrasive cleaner, or pressure washer.

(a) Clean and inspect wheel bearings per manufacturer's instructions. (Refer to 05-10) If damage is present, contact Cirrus for disposition.

(b) Lightly lubricate wheel bearings and seals with Mobil SHC-100 or Aeroshell 22 grease per manufacturer's instructions. (Refer to 05-10)

(c) Insert axle and spacers into wheel and tire.

(d) Position wheel into fork so that valve stem is on left side of airplane and install washers, axle bolt, and nut.

(e) Torque axle nut to 200 in-lb (22.6 Nm) to seat bearing.

(f) Back off axle nut to zero torque.

(g) Retorque axle nut to 20 - 150 in-lb (2.3 - 17 Nm) and install cotter pin.

Note: Wheel to spin 1 - 2 rotations when spun by hand. Additional washers may be required to meet torque and fit-up requirements.

(h) Inflate tire. (Refer to 12-10)

(i) Remove airplane from jacks. (Refer to 07-10)

(j) Install nose gear fairing. (Refer to 32-20)

E. Nose Wheel and Tire - *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs* **(See Figure 32-412)**

(1) Removal - Nose Wheel and Tire

(a) Remove nose gear fairings. (Refer to 32-20)

(b) Raise airplane on jacks. (Refer to 07-10)

(c) While supporting wheel/tire assembly, remove cotter pin, axle nut, washers, and withdraw bolt from axle.

(d) Pull wheel, axle, and axle spacer from fork.

(e) Remove and store spacer and axle before disassembling wheel per manufacturer's instructions.

(2) Installation - Nose Wheel and Tire

(a) Insert bearing spacer into wheel.

(b) Position wheel into fork so that valve stem is on LH side of airplane and install washers, axle bolt, and nut so that nut is on LH side of airplane.

(c) Torque axle nut to 150 in-lb (17 Nm), then further torque as required to align nut with first available cotter pin slot and install cotter pin.

(d) Check nose wheel pressure. (Refer to 12-10)

(e) Remove airplane from jacks (Refer to 07-10)

(f) Install nose gear fairing. (Refer to 32-20)

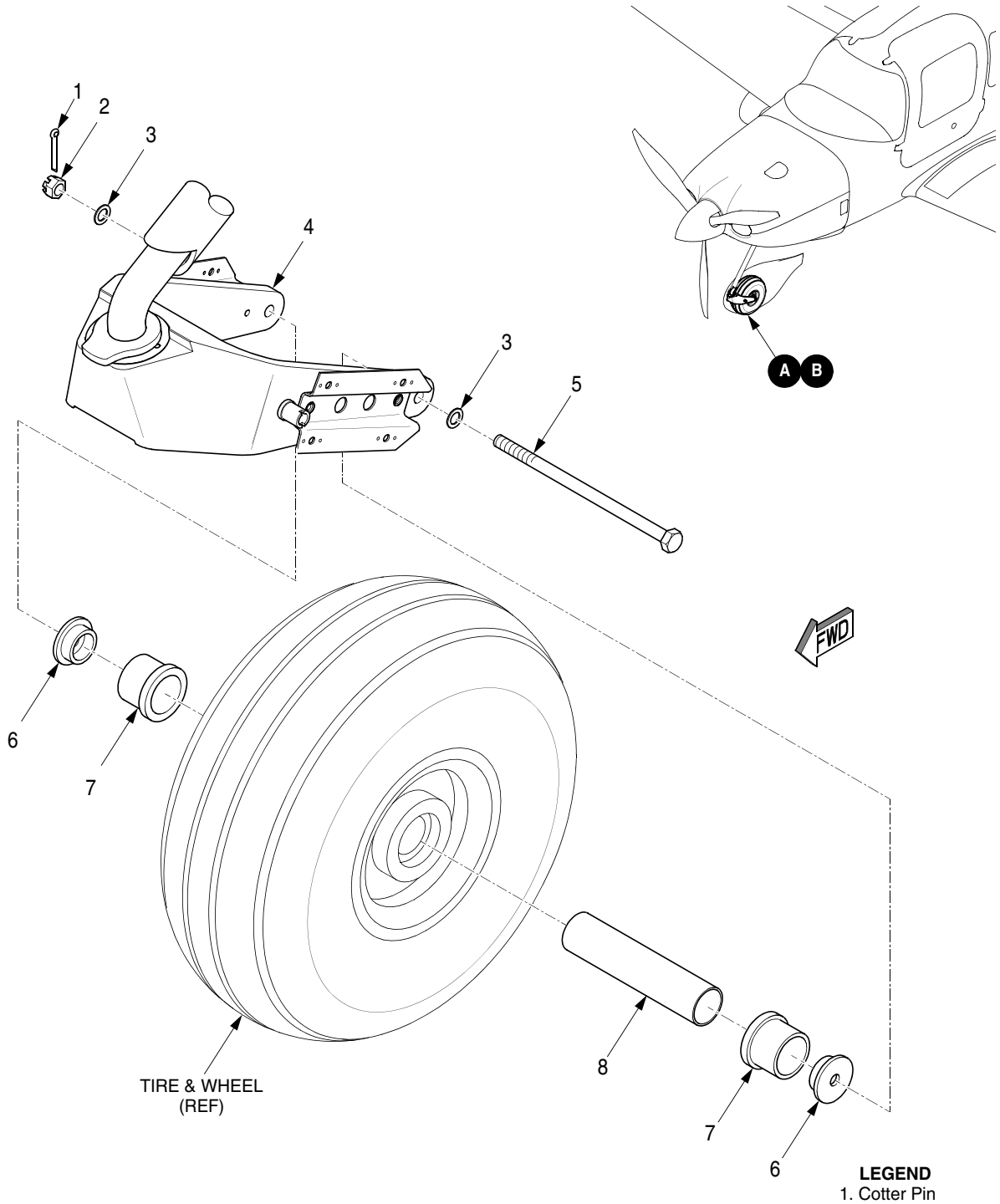


Figure 32-412
Nose Wheel Installation - Serials 1005 thru 2240 before SB2X-32-21 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 2240 before SB2X-32-21

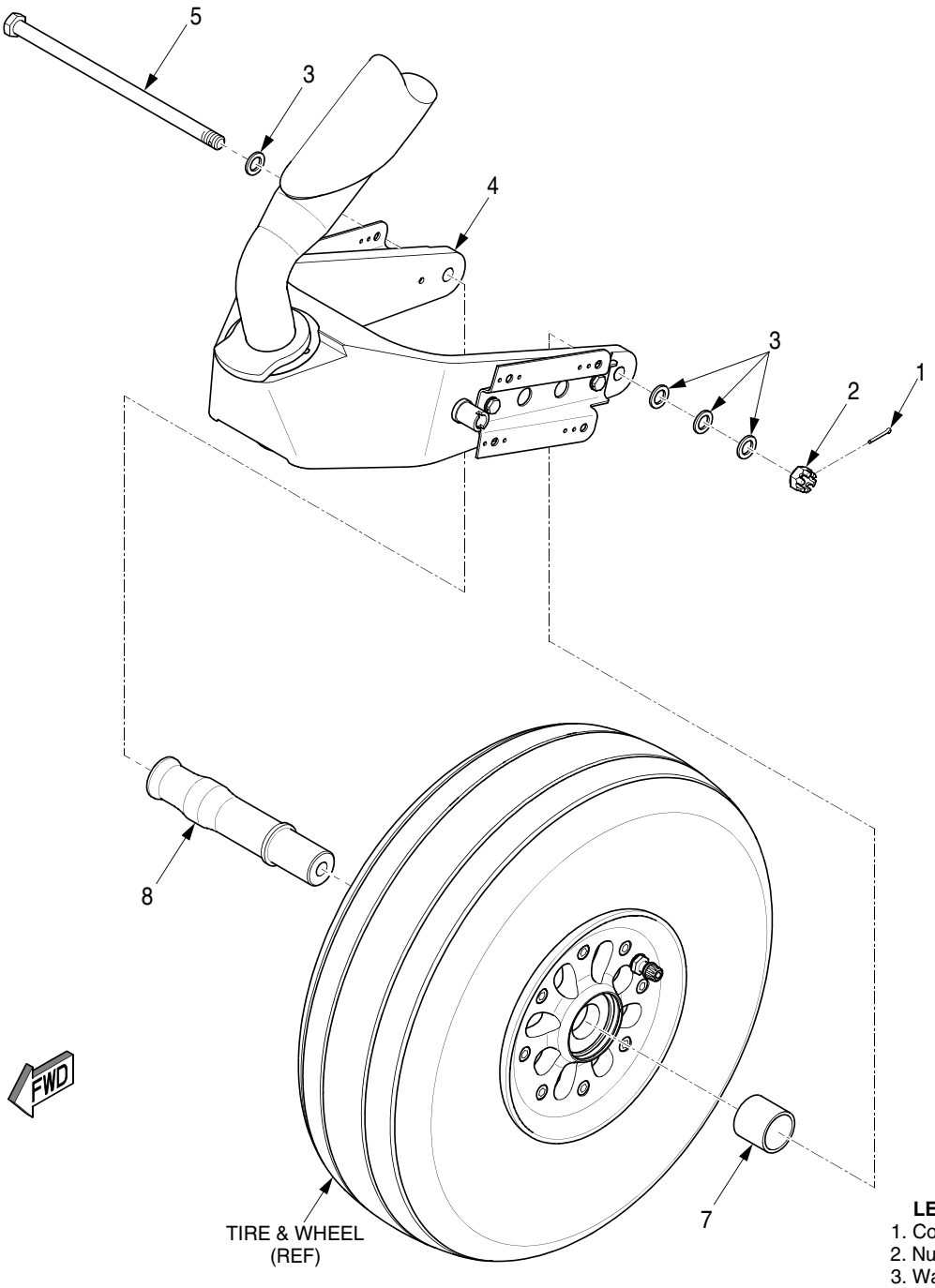


Figure 32-412
Nose Wheel Installation - Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

BRAKES

1. DESCRIPTION

The brake system consists of single disc brake assembly on each main landing gear wheel, master cylinder for each rudder pedal, hydraulic fluid reservoir, parking brake, and associated hydraulic plumbing.

Serials 1593 & subs, 1005 thru 1592 after SB2X-32-14: A brake temperature indicator is installed on each brake caliper piston housing. The indicator turns black if overheating occurs.

Serials 2016 & subs w/ Perspective Avionics: A brake temperature sensor is installed on each brake assembly. Brake temperature annunciations are displayed on the MFD. A caution annunciation occurs when brake temperature is between 270°F (132°C) and 293° F (145°C). A warning annunciation occurs when brake temperature exceeds 293°F (145°C). 28 VDC is supplied through the ENG INST circuit breaker on the Main Bus 2.

The hydraulically operated brakes are individually activated by floor mounted toe pedals located at both pilot stations. The master cylinders are located forward of the pilot's rudder pedals. The hydraulic fluid reservoir is located in the engine compartment on the upper RH side of the firewall.

Serials 1005 thru 2240 before SB2X-32-21: The reservoir is serviced with MIL-H-5606 hydraulic fluid.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: The reservoir is serviced with MIL-PRF-87257 hydraulic fluid.

For disassembly/assembly of brake master cylinder refer to the manufacturer's approved Instructions For Continued Airworthiness.

A parking brake mechanism holds induced hydraulic pressure on the disc brakes for parking. The parking brake system consists of a parking brake valve, control cable with knob, and associated hydraulic plumbing. The parking brake valve is mounted adjacent to the firewall on the LH side of the outboard console rib.

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: The parking brake control cable knob is mounted to the LH side of the mid console, adjacent to the alternate air controls.

Serials 2016 & subs w/ Perspective Avionics: The parking brake control cable handle is mounted to the LH kick plate. A position sensor, mounted adjacent to the parking brake valve actuation arm, sends position data to the MFD via the GEA 71 engine airframe unit. An alert indicates in the CAS window of the MFD when the parking brake is engaged.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Brake drag.	Piston cocked in cylinder, resulting in overheating brake and/or excessive lining wear.	Remove and repair cylinder or piston. Replace brake assembly. (Refer to 32-42)
	Foreign matter wedged in brakes.	Locate and remove foreign matter.
	Back pressure due to malfunction of master cylinder.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Repair or replace master cylinder. (Refer to 32-42)
	Back pressure due to malfunction of parking brake valve.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Replace parking brake valve. (Refer to 32-42)
	Wrong brake fluid has caused blocking of pistons.	Change all seals of the brake system. Use correct brake fluid. (Refer to 12-10)
	Water or ice in hydraulic system.	Thaw ice and flush system. Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Excessive bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder and follow manufacturer's recommended torque value.
	Piston does not retract.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Remove piston and inspect for damage. (Refer to 32-42)
	Warped pressure plate.	Replace pressure plate or flatten to within 0.100 inch (0.254 mm). (Refer to 32-42)
	Corroded anchor bolts and/or torque plate bushings.	Clean and lubricate or replace.
	Cocked anchor bolts and/or torque plate bushings.	Replace anchor bolts and/or torque plate bushings. (Refer to 32-42)
	Bent or cracked torque plate.	Replace torque plate. (Refer to 32-42)
	Restriction in hydraulic line.	Isolate and remove restriction.

Trouble	Probable Cause	Remedy
Brake drag. (continued)	Lining out of position or stuck.	Repair or replace lining. (Refer to 32-42)
	Warped brake disk/disc.	Inspect brake disk/disc by laying a straightedge across brake disk face. Replace brake disk/disc. (Refer to 32-42)
	Lining not seated flush against pressure plate or back plate.	Deburr rivet hole on surface adjacent to lining.
	Parking brake control cable stop incorrectly adjusted.	Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)
Brakes inoperative.	Brake fluid level low.	Replenish brake fluid. (Refer to 12-10)
	Air in brake system.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Defective master cylinder.	Replace master cylinder. (Refer to 32-42)
	Defective caliper.	Replace caliper. (Refer to 32-42)
	Worn brake linings.	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace O-rings. (Refer to 32-42)
		Replace brake linings. (Refer to 32-42)
	Leaky brake line connections	Tighten or replace connectors.
Parking brake inoperative.	Parking brake valve defective.	Replace parking brake valve. (Refer to 32-42)
Parking brake will not release.	Control cable stop incorrectly adjusted.	Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)
	Defective control cable.	Replace control cable. (Refer to 32-42)
Brake overheating.	Improper and/or aggressive braking practices.	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace O-rings. (Refer to 32-42)
		Replace brake linings. (Refer to 32-42)

Trouble	Probable Cause	Remedy
Rapid brake disk/disc and lining wear.	Improper adjustment of master cylinder rod length restricting the development of maximum stroke.	Adjust cylinder rod length. (Refer to 32-42)
	Improper conditioning of brake linings.	Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)
	Excessive rusting, scoring, or pitting of brake disk/disc.	Clean or replace brake disk/disc.
	Excessive back plate deflection caused by bent bolts or over torquing bolts.	Replace bolts. Torque bolts to proper value.
Unable to obtain sufficient hydraulic brake pressure, excessive toe pedal travel, or spongy pedal.	Air in hydraulic system.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Vent in master cylinder reservoir clogged.	Clean vent or overboard drain.
	Leak in hydraulic system.	Locate leak and repair.
	Defective master cylinder.	Replace or repair master cylinder. (Refer to 32-42)
	Back plate bolts loose or not properly torqued, causing excessive brake deflection.	Torque bolts to proper value.
	Excess bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder.
	Defective brake line (ballooning).	Replace brake line.

Trouble	Probable Cause	Remedy
Brakes won't hold.	Contaminated brake lining.	Replace brake lining. (Refer to 32-42)
	Improper conditioning of brake linings.	Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)
	Wrong brake fluid has caused blocking of pistons.	Change all seals of the brake system. Use correct brake fluid. (Refer to 12-10)
	Brake linings worn below minimum wear limits.	Perform Inspection/Check - Brake Linings. (Refer to 32-42)
	Brake disk/disc worn below minimum wear limits.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Brake lining carbonized (overheated).	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace brake lining. (Refer to 32-42)
	Pressure plate contacting torque plate assembly.	Check for correct torque plate and wheel installation.
	New brake linings not seated in wear track of old brake disk/disc, resulting in partial contact with brake disk/disc.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Brake fluid leaking.	O-rings damaged.	Replace O-rings. (Refer to 32-42)
	Connections or hoses leaking.	Locate leak and repair.
	Cylinder scored/deteriorated or obstructed by debris.	Clean cylinder.
		Replace cylinder.

3. MAINTENANCE PRACTICES

A. Brake System Replenishing (Refer to 12-10)

B. Brake Assembly - *Serials 1005 thru 2240 before SB2X-32-21* (See Figure 32-421)

(1) Removal - Brake Assembly

WARNING: **Verify parking brake is in off position and wheels are blocked.**

(a) Remove main gear fairings. (Refer to 32-10)
(b) Remove and cap hydraulic line attached to brake. Cap brake inlet fitting.
(c) *Serials 1005 thru 1600 before SB2X-32-13:* Remove bolts and washers securing back plate to cylinder assembly. Remove back plate.
(d) *Serials 1601 thru 2015, 2016 & subs w/o Perspective Avionics, 1005 thru 1600 after SB2X-32-13:* Remove bolts and washers securing back plate and shim to cylinder assembly. Remove back plate and shim.
(e) *Serials 2016 & subs w/ Perspective Avionics:* Remove bolts and washers securing back plate, shim, and temperature sensor to cylinder assembly. Remove back plate, shim, and temperature sensor.
(f) Carefully slide anchor bolts secured to cylinder assembly off torque plate.
(g) If torque plate removal is required:
1 Remove wheel/tire. (Refer to 32-41)
2 Remove bolts, nuts, and washers securing torque plate to axle flange. Remove torque plate.

(2) Disassembly - Brake Assembly

(a) Slide pressure plate over and off anchor bolts secured to cylinder assembly.
(b) Remove piston(s) by injecting air into ports (15-20 psi) [103 to 138 kPa] maximum pressure.

CAUTION: Care should be used in handling O-ring(s) to prevent damage.

(c) Remove O-ring(s) from piston(s).
(d) *Serials 1601 thru 2240, 1005 thru 1600 after SB2X-32-13:* Remove friction springs from pistons.
(e) Remove bleeder seat, screw, cap, and inlet fitting.
(f) Remove anchor bolts secured to cylinder assembly, if necessary.
(g) Remove brake linings, if necessary. (Refer to 32-42)
(h) *Serials 1593 thru 2240, 1005 thru 1592 after SB2X-32-14:* Remove brake temperature indicator. (Refer to 32-42)

(3) Reassembly - Brake Assembly

Note: Thoroughly clean parts before assembling.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Arbor Press	-	Any Source	Install anchor bolts.

Description	P/N or Spec.	Supplier	Purpose
O-Ring Lubricant	Dow Corning 55 O-Ring Lubricant	Dow Chemical Co. Midland, Michigan 48674 989-636-1000	Lubrication.
Silicon Spray	-	Any Source	Lubrication.
Mallet (plastic or wooden)	-	Any Source	Piston installation.

(b) If removed, install brake lining. (Refer to 32-42)

(c) If anchor bolts were removed, install anchor bolts using arbor press and a holding fixture. Install washers and nuts. Torque nuts to 90 in-lb (10 Nm).

(d) Install inlet fitting and torque to 40 - 50 in-lb (4.5 - 5.6 Nm).

Note: Cap fittings if brake is not being immediately installed on the airplane.

(e) Install bleeder seat, screw, and cap. Torque to 40 - 50 in-lb (4.5 - 5.6 Nm).

(f) *Serials 1601 thru 2240, 1005 thru 1600 after SB2X-32-13:* Install friction springs on pistons.

(g) Install O-ring(s) on piston(s) and lubricate.

(h) Place piston(s) in cylinder bore(s) and verify piston(s) and O-ring(s) are in proper alignment

(i) Press piston(s) into cylinder bore(s) by hand. If required, tap the piston(s) squarely with a wooden or plastic mallet while rotating piston(s).

CAUTION: Care should be exercised to prevent over tightening the inlet fitting which could result in cracking of cylinder casting. Finger tighten the inlet fitting, rotate one to two turns to obtain proper installation orientation, and torque to specified value.

(j) Install pressure plate lining facing away from piston(s) by sliding over anchor bolts. Verify pressure plate slides freely over anchor bolts.

(k) *Serials 1593 thru 2240, 1005 thru 1592 after SB2X-32-14:* Install brake temperature indicator. (Refer to 32-42)

(4) Installation - Brake Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Silicon Spray	-	Any Source	Lubrication.

(b) If torque plate installation is required:

1 Orient and install torque plate on axle flange with bolts, nuts, and washers. Torque to 160 - 190 in-lb (18 - 21 Nm).

2 Install wheel assembly. (Refer to 32-41)

Note: Dry film lubricants such as silicone spray should be applied to anchor bolts and torque plate bushings to assist sliding motion. Exercise care to verify that linings do not become contaminated with fluid or lubricant. For best service life, cylinders must slide freely in torque plate.

(c) Carefully slide anchor bolts secured to cylinder assembly into torque plate bushings.

(d) Position back plate(s) between brake disk and wheel.

(e) *Serials 1005 thru 1600 before SB2X-32-13:* Install bolts and washers securing back plates to cylinder assembly. Torque to 75 - 80 in-lb (8.5 - 9.1 Nm).

(f) *Serials 1601 thru 2015, 2016 & subs w/o Perspective Avionics, 1005 thru 1600 after SB 2X-32-13:* Install bolts and washers securing back plates and shim to cylinder assembly. Torque to 90 in-lb (10.2 Nm).

(g) *Serials 2016 & subs w/ Perspective Avionics:* Install bolts and washers securing back plates, shim, and temperature sensor to cylinder assembly. Torque to 90 in-lb (10.2 Nm).

(h) Uncap and attach hydraulic line to cylinder inlet fitting.

(i) Bleed the system. (Refer to 32-42)

(j) Install main gear fairings. (Refer to 32-10)

(k) Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)

(5) Inspection/Check - Brake Assembly

(a) *Serials 1005 thru 2030 before SB2X-05-01:* Inspect brake assembly.

1 Disassemble brake assembly. (Refer to 32-42)

2 Perform Inspection/Check - Brake Linings. (Refer to 32-42)

3 Inspect brake cylinder bores for evidence of scoring and deterioration. If scored, replace brake caliper assembly.

4 Using new O-rings, reassemble brake assembly. (Refer to 32-42)

(b) *Serials 2031 thru 2240, 1005 thru 2030 after SB2X-05-01:* Inspect brake assembly.

1 Perform Inspection/Check - Brake Linings. (Refer to 32-42)

2 Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)

C. Brake Assembly - *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs* **(See Figure 32-421)**

(1) Removal - Brake Assembly

CAUTION: Verify parking brake is in off position and wheels are blocked.

(a) Remove main gear fairings. (Refer to 32-10)
(b) Raise airplane on jacks. (Refer to 07-10)
(c) Remove cotter pin from axle and remove axle nut. (Refer to 32-41)
(d) Cut and remove safety wire around brake disc.
(e) Remove wheel/tire. (Refer to 32-41)
(f) *Serials w/ Perspective Avionics*: Remove brake temperature sensor. (Refer to 32-42)
(g) Remove inlet fitting, washers, and hydraulic line from brake cylinder. Cap hydraulic line and inlet on brake cylinder.
(h) Remove bolts and washers securing brake assembly to axle.

(2) Disassembly - Brake Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Dental Pick	-	Any Source	Remove O-rings.
Compressed Air Supply	-	Any Source	Facilitate piston removal and cleaning.
Dry Cleaning Solvent	-	Any Source	Clean seal grooves.
Cotton Cloth (clean and lint free)	-	Any Source	Clean parts.

(b) Remove screws securing back plate to brake cylinder.
(c) Separate cylinder, brake pads, brake disc, and back plate.

WARNING: **Pistons will be ejected at high velocities.**

CAUTION: Care should be used in handling O-rings to prevent damage.

Do not use metal tools to remove O-rings from pistons. Metal tools will scratch the seal groove and cause fluid leakage.

Note: Air pressure can be used to remove pistons. Replace caliper back plate and blow air pressure into inlet on brake cylinder.

(d) Remove O-rings from pistons with a plastic dental pick.
(e) Remove bleeder screw from brake cylinder.
(f) Remove cotter pins securing back stops to brake pads. Remove back stops.
(g) Clean brake assembly.

WARNING: **Dry cleaning solvents are toxic and volatile. Use a well-ventilated room and avoid contact with skin and clothing. Do not inhale vapor.**

CAUTION: Do not use basic or acidic cleaning agents on wheel halves. Anodizing can be removed if exposed to basic agents. Do not damage ball bearing seal or expose to solvents.

1 Clean all metal parts using water with soap and wipe dry with a clean cloth.

CAUTION: Use dry cleaning solvent only on seal grooves.

2 Clean seal grooves with a soft plastic brush and dry-cleaning solvent.

CAUTION: Do not use oily solvent or oily air pressure on internal threads because threadlocker will not properly lock screws if exposed to oil.

Ensure that no dust remains inside seal grooves.

3 Apply air pressure to dry internal threads and seal grooves.

(h) Remove brake temperature indicator. (Refer to 32-42)

(3) Reassembly - Brake Assembly

Note: Thoroughly clean parts before assembling.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
O-Ring Lubricant	Dow Corning 55 O-Ring Lubricant	Dow Chemical Co. Midland, Michigan 48674 989-636-1000	Lubrication.
Silicone Grease, Thick (-50°C to 200°C)	Compliant w/ FDA CFR 178.3570	Any Source	Lubrication.
Loctite® Threadlocker, Medium	242 or 243	Any Source	Secure screws.

(b) Perform Inspection/Check - Brake Assembly. (Refer to 32-42)

CAUTION: Do not use silicone spray (liquid) in place of thick silicone grease where specified.

Do not use tools to manually insert seals or pistons into cylinder bores.

Never re-use a piston seal that has been removed from a cylinder bore groove.

(c) Lubricate new seals with a thin coat of thick silicone grease.
(d) Lubricate cylinder bores with a thin coat of thick silicone grease.
(e) Insert seals into cylinder bore grooves by hand only.
(f) Lubricate piston cylinder with a thin coat of thick silicone grease.
(g) Insert pistons into cylinder bores by hand only.
(h) Verify pistons and O-rings are in proper alignment.

CAUTION: If piston does not slide into cylinder bores with pressure of only one or two fingers, it is sticking which can lead to brake damage and overheating. Do not attempt to sand or polish pistons. If pistons are sticking, they must be replaced.

Copper seals must be changed at each removal of the hydraulic fitting.

(i) Insert new bleeder screw and change copper seals.
(j) Using thick silicone grease, lubricate contact area between back stops and back plate.
(k) Insert new cotter pins to secure back stops.
(l) Install new brake pads.
(m) Apply medium threadlocker to new screws used to secure back plate to cylinder.
(n) Install screws securing brake pads in place. Torque to 220 in-lb (25 Nm).
(o) Re-torque all screws to 220 in-lb (25 Nm).
(p) Ensure brake pads slide without effort.
(q) Position brake disc between brake pads.
(r) Install brake temperature indicator. (Refer to 32-42)

(4) Installation - Brake Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire, Stainless Steel	0.041" diameter wire (grade 302)	Any Source	Safetying brake disc to wheel.

(b) Orient and install brake assembly on axle flange with bolts, nuts, and washers. Torque to 350 in-lb (39.5 Nm).
(c) Position wheel/tire onto axle while placing brake disc into wheel slots.
(d) Install wheel/tire. (Refer to 32-41)
(e) Install safety wire securing brake disc to wheel. (Refer to 20-50)
(f) Uncap hydraulic line and inlet on brake cylinder.
(g) Install washers, hydraulic line, and inlet fitting to brake cylinder. Torque to 220 in-lb (24.86 Nm).
(h) *Serials w/ Perspective Avionics*: Install brake temperature sensor. (Refer to 32-42)
(i) Bleed the system. (Refer to 32-42)
(j) Remove jacks and lower airplane. (Refer to 07-10)
(k) Install main gear fairings. (Refer to 32-10)

(5) Inspection/Check - Brake Assembly

(a) Visually inspect brake cylinder and back plate for cracks, nicks, corrosion, or other damage.

(b) Ensure none of the following conditions exist.

CAUTION: If damage is identified during inspection, brake cylinder and/or back plate must be replaced.

1 Signs of deep corrosion,
2 Anodizing color removed on more than 15% of external surface,
3 Heavy nicks,
4 Anodizing removed on internal piston bore,
5 Scratched piston bore, and
6 Scratched or damaged seal groove.

CAUTION: Anodizing coating must not be painted.

Do not use sandpaper on any parts. Sandpaper will remove anodizing coating.

Do not try to sand or polish internal piston bore, it will remove anodizing coating.

(c) Verify brake disc wear limits are not exceeded. Refer to the manufacturer's approved Instructions For Continued Airworthiness for more information.

(d) Perform Inspection/Check - Brake Pads. (Refer to 32-42)

(e) Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

D. Brake Linings - *Serials 1005 thru 2240 before SB2X-32-21* (See Figure 32-421)

(1) Removal - Brake Linings

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill Bit - *Serials 1005 thru 1600 before SB2X-32-13*	1/8-inch	Any Source	Rivet removal.

(b) Remove brake assembly. (Refer to 32-42)

(c) Slide pressure plate over and off anchor pins secured to cylinder assembly.

(d) Serials 1005 thru 1600 before SB2X-32-13: Remove rivets.

CAUTION: Do not damage pressure plate during rivet removal.

1 Using 1/8-inch drill bit, remove rivets attaching lining to pressure plate.

2 Using 1/8-inch drill bit, remove rivets attaching lining to back plates.

(e) Separate linings from pressure plate and back plates.

(f) Clean pressure plate and back plate surfaces of dirt and grease.

(2) Installation - Brake Linings

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Arbor Press - *Serials 1005 thru 1600 before SB2X-32-13*	-	Any Source	Rivet installation.
Silicon Spray	-	Any Source	Lubrication.

(b) Inspect pressure plate and back plate(s) for excessive corrosion, visible damage, or excessive warping.

Note: Pressure plates should not be used if warped in excess of 0.010 inch (0.254 mm) flatness. Excessive warping can result in brake drag especially when new disk and linings are installed.

(c) Align new lining on pressure plate and back plates.

(d) *Serials 1005 thru 1600 before SB2X-32-13:* Install rivets.

1 Using arbor press, secure lining to pressure plate.

2 Using arbor press, secure lining to back plates.

3 Verify linings are tight and movement free with no distortion of parts.

(e) Clean dirt, grease, etc. from cylinder, pressure plate, and portions of piston(s) extending beyond cylinder face. Push piston(s) back into cylinder.

Note: Dry film lubricants such as silicone spray should be applied to anchor bolts and torque plate bushings to assist sliding motion. Exercise care to verify that linings do not become contaminated with fluid or lubricant. For best service life, cylinders must slide freely in torque plate.

(f) Install pressure plate with new lining(s) facing away from piston(s) by sliding over anchor bolts. Verify pressure plate slides freely over anchor bolts.

(g) Install brake assembly. (Refer to 32-42)

(3) Adjustment/Test - Conditioning Procedure for Brake Linings

This conditioning procedure will generate sufficient heat to create a thin layer of glazed material at the lining friction surface. Normal brake usage should generate enough heat to maintain the glaze throughout the life of the lining. Light brake usage can cause the glaze to wear off, resulting in reduced brake performance. In such cases, the lining may be conditioned again following the instructions below.

(a) For organic brake linings:

1 Taxi airplane for 1500 feet with engine at 1700 RPM applying brake pedal force as needed to develop a 5-10 MPH taxi speed.

(b) Allow brakes to cool for 10-15 minutes.

(c) Apply brakes and check to see if a high throttle static run up may be held with normal pedal force. If so, conditioning is completed.

(d) If static run up cannot be held, repeat previous steps as needed to successfully complete test.

(4) Inspection/Check - Brake Linings

(a) Remove main gear fairing. (Refer to 32-10)

(b) *Serials 1005 thru 1600 before SB2X-32-13:* Check brake lining for deterioration and maximum permissible wear. Replace lining when worn to 0.100 inch (2.54 mm).

(c) *Serials 1005 thru 1600 after SB2X-32-13, 1601 thru 2240:* Check brake lining for deterioration and maximum permissible wear. Replace lining when worn to 0.030 inch (0.76 mm).

(d) Install main gear fairing. (Refer to 32-10)

E. Brake Pads - *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs* **(See Figure 32-421)**

(1) Removal - Brake Pads

CAUTION: Verify parking brake is in off position and wheels are blocked.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean and lint free)	-	Any Source	Clean parts.

(b) Remove main gear fairings. (Refer to 32-10)
(c) Raise airplane on jacks. (Refer to 07-10)
(d) Remove cotter pin from axle and remove axle nut. (Refer to 32-41)
(e) Cut and remove safety wire around brake disc.
(f) Remove wheel/tire. (Refer to 32-41)

CAUTION: While back plate is separated from cylinder, do not apply brake pressure.

Note: Do not remove caliper back plate from axle.

Do not disconnect hydraulic fitting.

Do not remove brake disc. Retain brake disc in place.

(g) Remove screws securing back plate to brake cylinder.
(h) Remove and discard brake pads.
(i) Perform Inspection/Check - Brake Assembly. (Refer to 32-42)

CAUTION: Do not use solvent to clean pistons and surrounding area. Solvent will penetrate to and damage piston seals. Use only a dry cloth.

(j) Clean around pistons with a dry cloth to remove dirt and dust.

(2) Installation - Brake Pads

Note: Thoroughly clean parts before assembling.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite® Threadlocker, Medium	242 or 243	Any Source	Secure screws.
Safety Wire, Stainless Steel	0.041” diameter wire (grade 302)	Any Source	Safetying brake disc to wheel.

CAUTION: If pushing back pistons by hand is difficult, pistons and seals are sticking or may be blocked. Brake maintenance is required with change of seals and eventual change of other parts.

(b) Push pistons back by hand.

CAUTION: Never intermingle old and new brake pads. All four brake pads (two left and two right) must be replaced at the same time. Brake pad insulator and grid are part of new brake pads and should not be re-used.

(c) Install new brake pads.
(d) Apply medium threadlocker to screws used to secure back plate to cylinder.
(e) Install screws securing brake pads in place. Torque to 220 in-lb (25 Nm).
(f) Re-torque all screws to 220 in-lb (25 Nm).
(g) Ensure brake pads slide without effort.
(h) Position brake disc between brake pads.
(i) Position wheel/tire onto axle while placing brake disc into wheel slots.
(j) Install wheel/tire. (Refer to 32-41)
(k) Install safety wire securing brake disc to wheel. (Refer to 20-50)
(l) Apply brake pressure 5-10 times anch check brake fluid level in the reservoir.

CAUTION: When brakes are released, wheel should turn freely.

(m) Verify brake efficiency and residual drag on the wheel.
(n) Remove jacks and lower airplane. (Refer to 07-10)
(o) Install main gear fairings. (Refer to 32-10)

(3) Adjustment/Test - Conditioning Procedure for Brake Pads

This conditioning procedure will wear off high spots and prepare brake pads and disc friction surfaces. A visual inspection of the brake disc will indicate the brake pads condition: a smooth surface with light and regular grooves indicates that brake pads and disc are properly conditioned. If rough surfaces on brake disc exist and/or reduced brake performance is noted, the brake pads and disc may be conditioned again following the instructions below.

(a) Taxi airplane for 1500 feet (500 m) with light brake effort.
(b) Perform two (2) consecutive stop braking applications from 30 – 35 knots down to 5 knots. Apply light brake effort during these two stops; do not try to apply full brake effort.
(c) Allow brakes to cool for 10 to 15 minutes.
(d) Apply brakes and verify that high throttle static run up may be held with normal pedal force. If brakes hold, conditioning is completed.
(e) If high throttle static run up cannot be held, repeat Adjustment/Test - Conditioning Procedure for Brake Pads as necessary to successfully complete test.

CAUTION: Improper conditioning may affect braking performance and increase wear of brake pads and disc.

Note: Rough surfaces (deep grooves and isolated bumps) on brake disc indicates that an excessive brake effort has been applied during conditioning. If rough surfaces exist, sand surface irregularities and repeat Adjustment/Test - Conditioning Procedure for Brake Pads.

(4) Inspection/Check - Brake Pads

(a) Remove main gear fairing. (Refer to 32-10)
(b) Check brake pads for deterioration and maximum permissible wear. Replace brake pads when friction material is worn to 0.040 inch (1 mm).
(c) Install main gear fairing. (Refer to 32-10)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

F. Brake Temperature Indicator - *Serials 1005 thru 1592 after SB2X-32-14, 1593 & subs* (See Figure 32-421)

(1) Removal - Brake Temperature Indicator

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove indicator.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Using plastic scraper, remove temperature indicator from brake caliper and discard.

(d) Using isopropyl alcohol, remove any remaining adhesive residue from brake caliper piston housing. (Refer to 20-30)

(2) Installation - Brake Temperature Indicator

(a) Clean dirt and oil from brake caliper piston housing.

(b) Using isopropyl alcohol, solvent clean installation location on brake caliper piston housing and surrounding area. (Refer to 20-30)

(c) Remove paper backing from temperature indicator, then press indicator firmly to installation location on brake caliper assembly.

(d) Install main gear fairing. (Refer to 32-10)

(3) Inspection/Check - Brake Temperature Indicator

To provide a means of monitoring possible brake assembly overheating, one or more Brake Temperature Indicators are installed to the brake caliper piston housings.

Serials 1005 thru 1592 after SB2X-32-14, 1593 thru 1600 before SB2X-32-13, SB2X-32-21: The blue indicator activates at 330°F and is inspected during each Preflight Inspection and Annually.

Serials 1005 thru 1592 after SB2X-32-13, SB2X-32-14, and before SB2X-32-21, 1593 thru 1600 after SB2X-32-13 and before SB2X-32-21, 1601 thru 2240 before SB2X-32-21: The bottom, blue indicator activates at 330°F and is inspected during each Preflight Inspection.

Serials 1005 thru 2030 after SB2X-32-13 and SB2X-05-01, and before SB2X-32-21, 2031 thru 2240 before SB2X-32-21: The top, yellow indicator activates at 300°F and is inspected Annually.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs: The red indicator activates at 450°F and is inspected during each Preflight Inspection and Annually.

If one or more temperature indicators are black, the brake assembly has overheated and O-ring(s) must be replaced.

(a) Remove main gear fairing. (Refer to 32-10)

(b) Wipe off any debris from brake caliper assembly that may obstruct inspection.

(c) Locate temperature indicator(s) installed on brake caliper assembly.

(d) If indicator(s) are white, brake assembly has not overheated. O-ring replacement is not necessary.

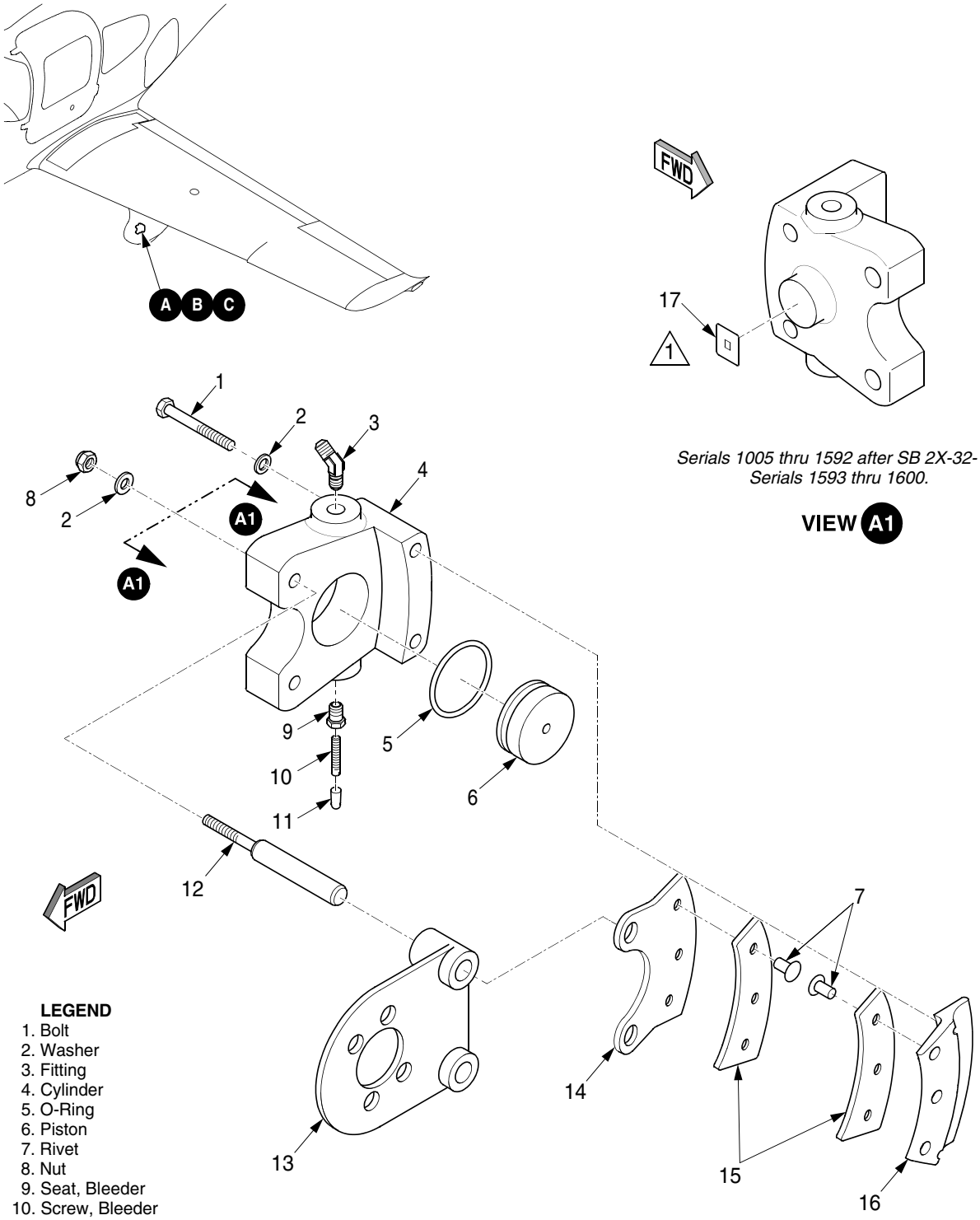
1 Verify temperature indicator(s) are firmly adhered to piston housing.

(e) If indicator(s) are black, brake assembly has overheated and O-ring(s) must be replaced.

1 Disassemble brake assembly. Remove and discard O-rings and temperature indicator. (Refer to 32-42)

2 Perform Inspection/Check - Brake Linings. (Refer to 32-42)

3 Reassemble brake assembly with new O-rings and temperature indicator. (Refer to 32-42)



Serials 1005 thru 1592 after SB 2X-32-14, Serials 1593 thru 1600.

VIEW A1

LEGEND

1. Bolt
2. Washer
3. Fitting
4. Cylinder
5. O-Ring
6. Piston
7. Rivet
8. Nut
9. Seat, Bleeder
10. Screw, Bleeder
11. Cap, Bleeder
12. Anchor Bolt
13. Torque Plate
14. Pressure Plate
15. Lining
16. Back Plate
17. Temperature Indicator (330°F/Blue)

DETAIL A

Serials 1005 thru 1600 before SB2X-32-13 and before SB2X-32-21.

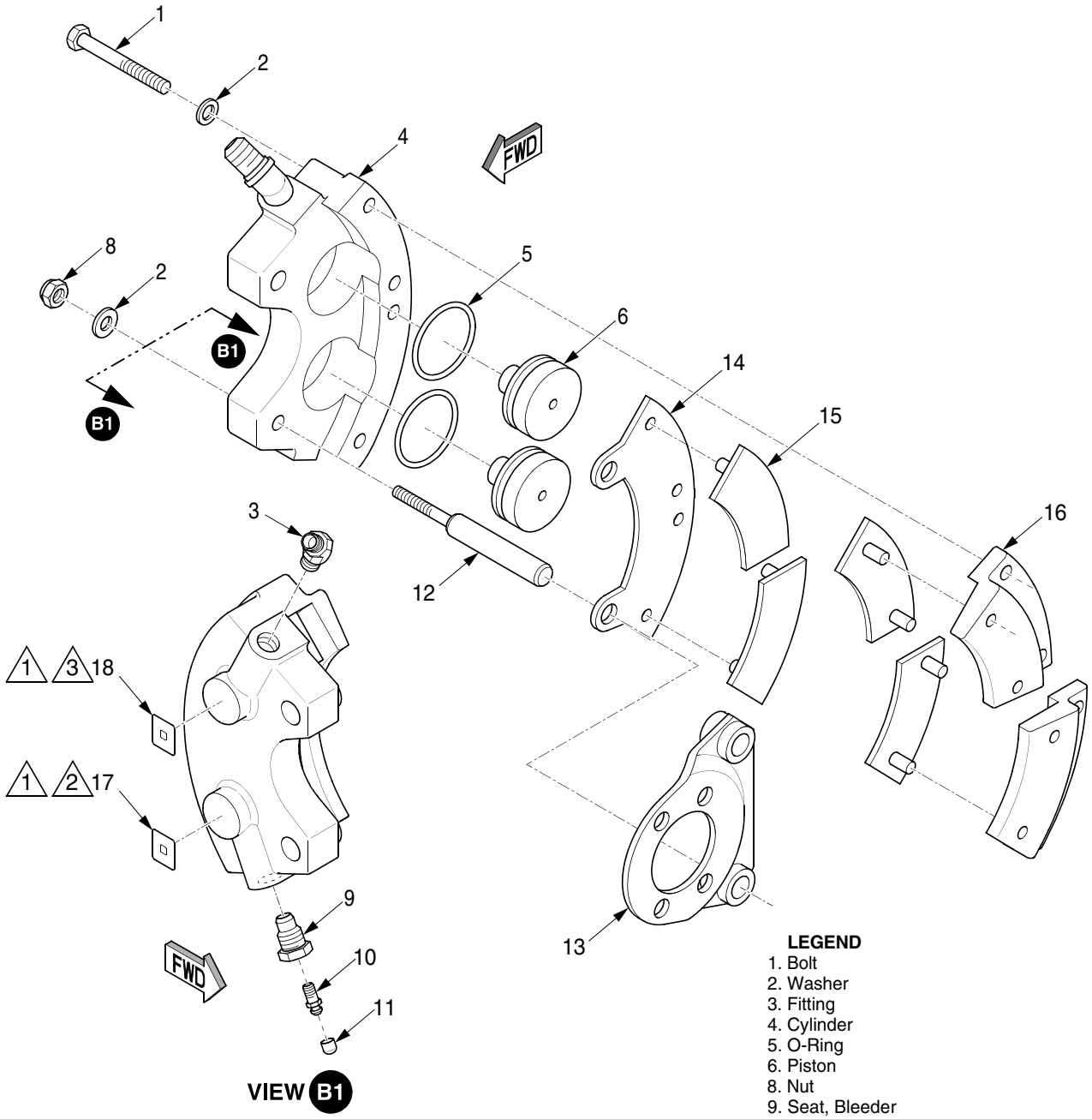
NOTE

1. If temperature indicator is black and/or shows signs of adhesion loss, replace the temperature indicator.

SR20_MM32_1044H

Figure 32-421
Brake Assembly - Serials 1005 thru 1600 before SB2X-32-13 and before SB2X-32-21 (1 of 3)

EFFECTIVITY:
Serials 1005 thru 1600 before SB2X-32-13 and before SB2X-32-21



LEGEND

1. Bolt
2. Washer
3. Fitting
4. Cylinder
5. O-Ring
6. Piston
8. Nut
9. Seat, Bleeder
10. Screw, Bleeder
11. Cap, Bleeder
12. Anchor Bolt
13. Torque Plate
14. Pressure Plate
15. Lining
16. Back Plate
17. Temperature Indicator (330°F/Blue)
18. Temperature Indicator (300°F/Yellow)

NOTE

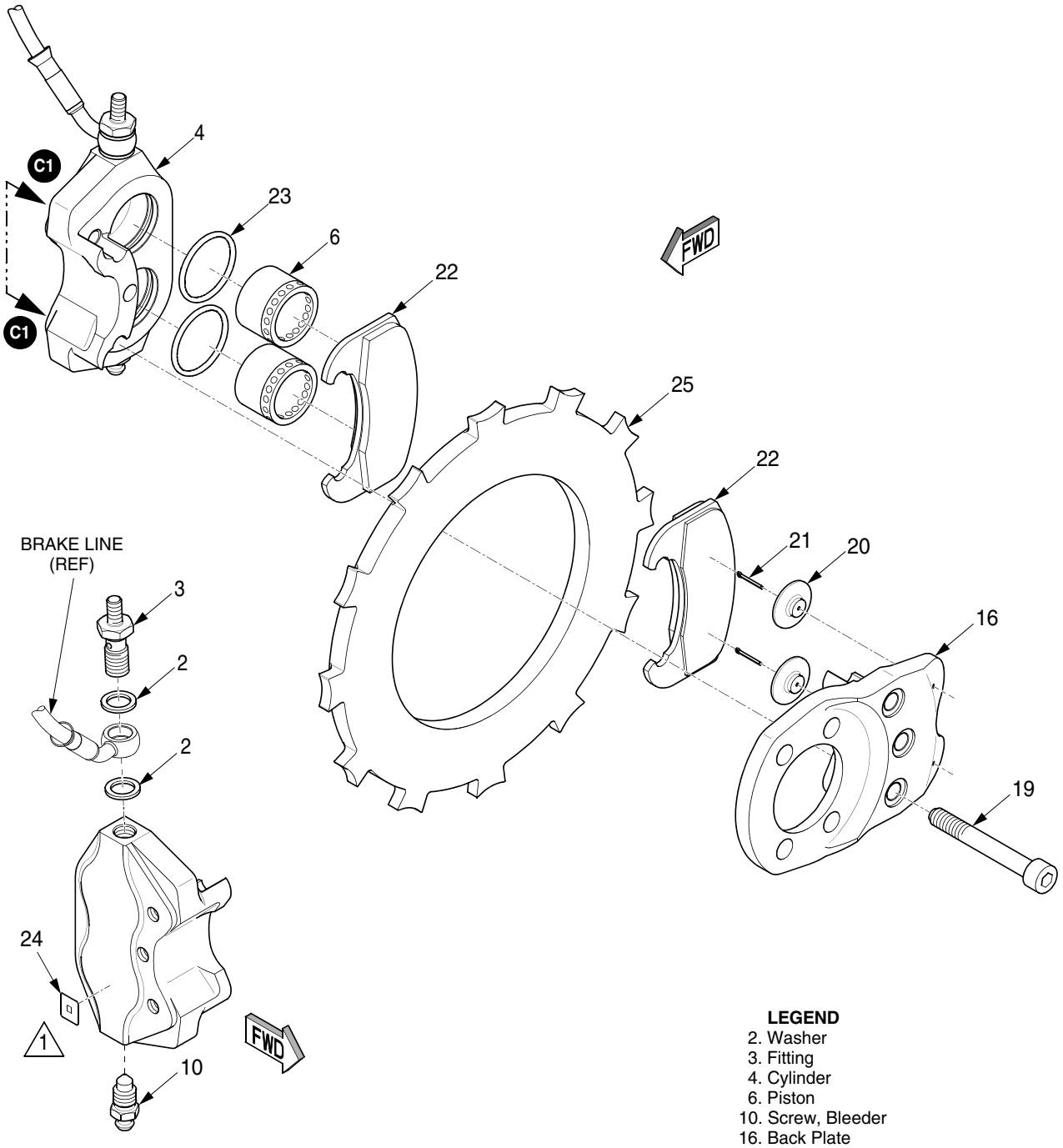
1. If temperature indicator is black and/or shows signs of adhesion loss, replace the temperature indicator.
2. *Serials 1005 thru 1592 after SB 2X-32-14, Serials 1593 thru 2240.*
3. *Serials 1005 thru 2030 after SB 2X-05-01, Serials 2031 thru 2240.*

Serials 1005 thru 1600 after SB2X-32-13 and before SB2X-32-21, Serials 1601 thru 2240 before SB2X-32-21.

SR20_MM32_2298E

Figure 32-421

Brake Assembly - Serials 1005 - 1600 after SB2X-32-13 and before SB2X-32-21, Serials 1601 - 2240 before SB2X-32-21 (2 of 3)



LEGEND

2. Washer
3. Fitting
4. Cylinder
6. Piston
10. Screw, Bleeder
16. Back Plate
19. Screw
20. Back Stop
21. Cotter Pin
22. Brake Pad
23. Seal
24. Temperature Indicator (450° Red)
25. Brake Disc

NOTE

1. If temperature indicator is black and/or shows signs of adhesion loss, replace the temperature indicator.

Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs.

SR20_MM32_3622

Figure 32-421
Brake Assembly - Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs (3 of 3)

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

G. Brake Temperature Sensor - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 32-422)**

(1) Removal - Brake Temperature Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENG INST circuit breaker.

(c) Remove main gear fairing. (Refer to 32-10)

(d) Remove cable tie securing sensor connector to landing gear strut.

(e) Disconnect electrical connector from sensor.

(f) *Serials 2016 thru 2240 before SB2X-32-21:* Remove bolt and washers securing sensor to brake assembly.

(g) *Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs:* Remove nut and washer securing sensor to brake assembly.

(2) Installation - Brake Temperature Sensor

(a) *Serials 2016 thru 2240 before SB2X-32-21:* Position sensor to brake assembly and secure with bolt and washers. Torque bolts 85 to 95 in-lb (9.6 to 10.7 Nm).

(b) *Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs:* Position sensor to brake assembly and secure with nut and washer. Torque nut 50 to 70 in-lb (5.6 to 7.9 Nm).

(c) Connect electrical connector to sensor.

(d) Install cable tie securing sensor connector to landing gear strut.

(e) Install main gear fairing. (Refer to 32-10)

(f) Reset ENG INST circuit breaker.

(3) Inspection/Check – Brake Temperature Sensor

(a) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

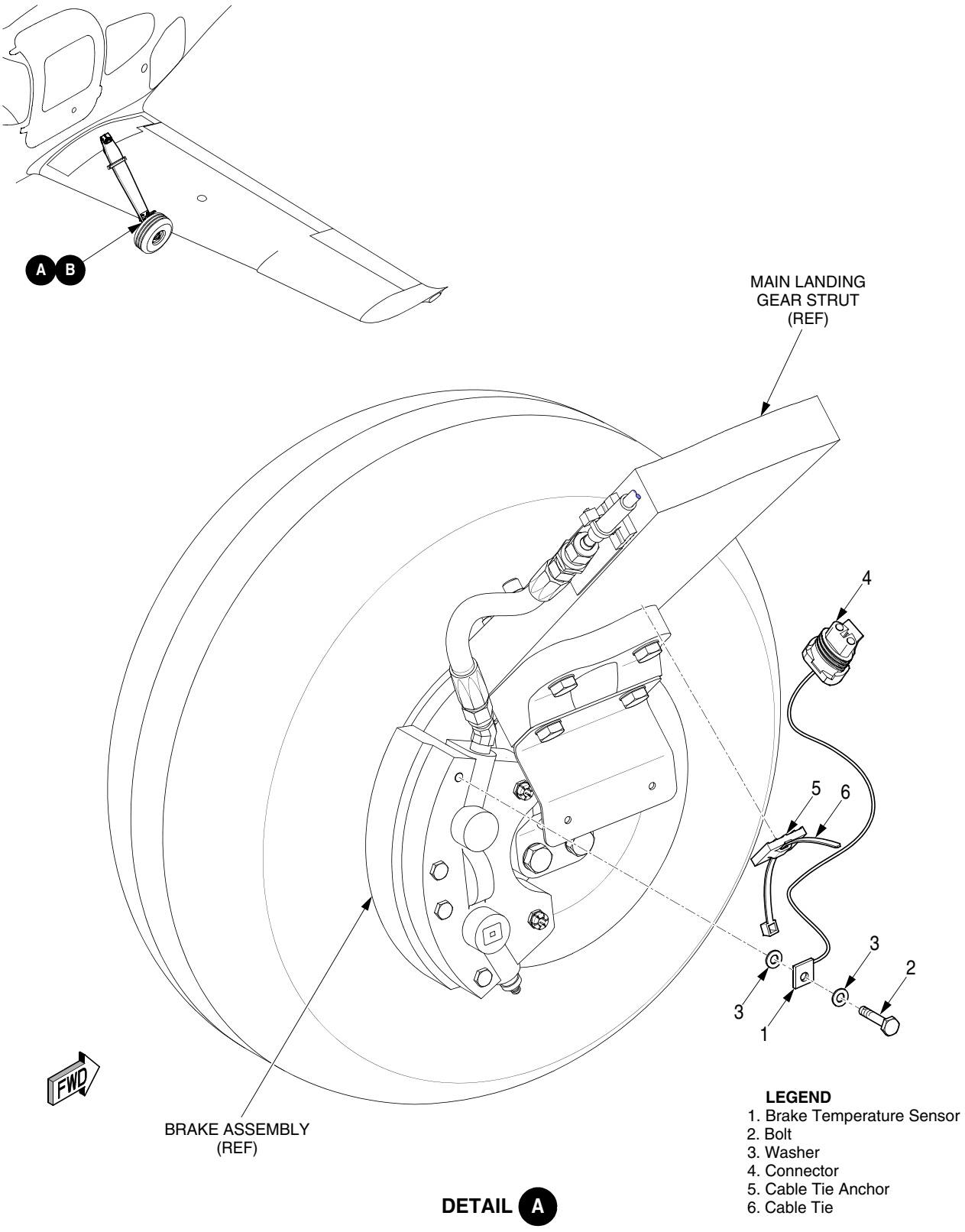
2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

(b) On PFD, use outer [FMS] knob to select GEA page.

(c) On PFD, use inner [FMS] knob to select GEA STATUS page.

(d) Press [ANLG IN] softkey.

(e) Verify brake temp left and brake temp right status boxes are green.

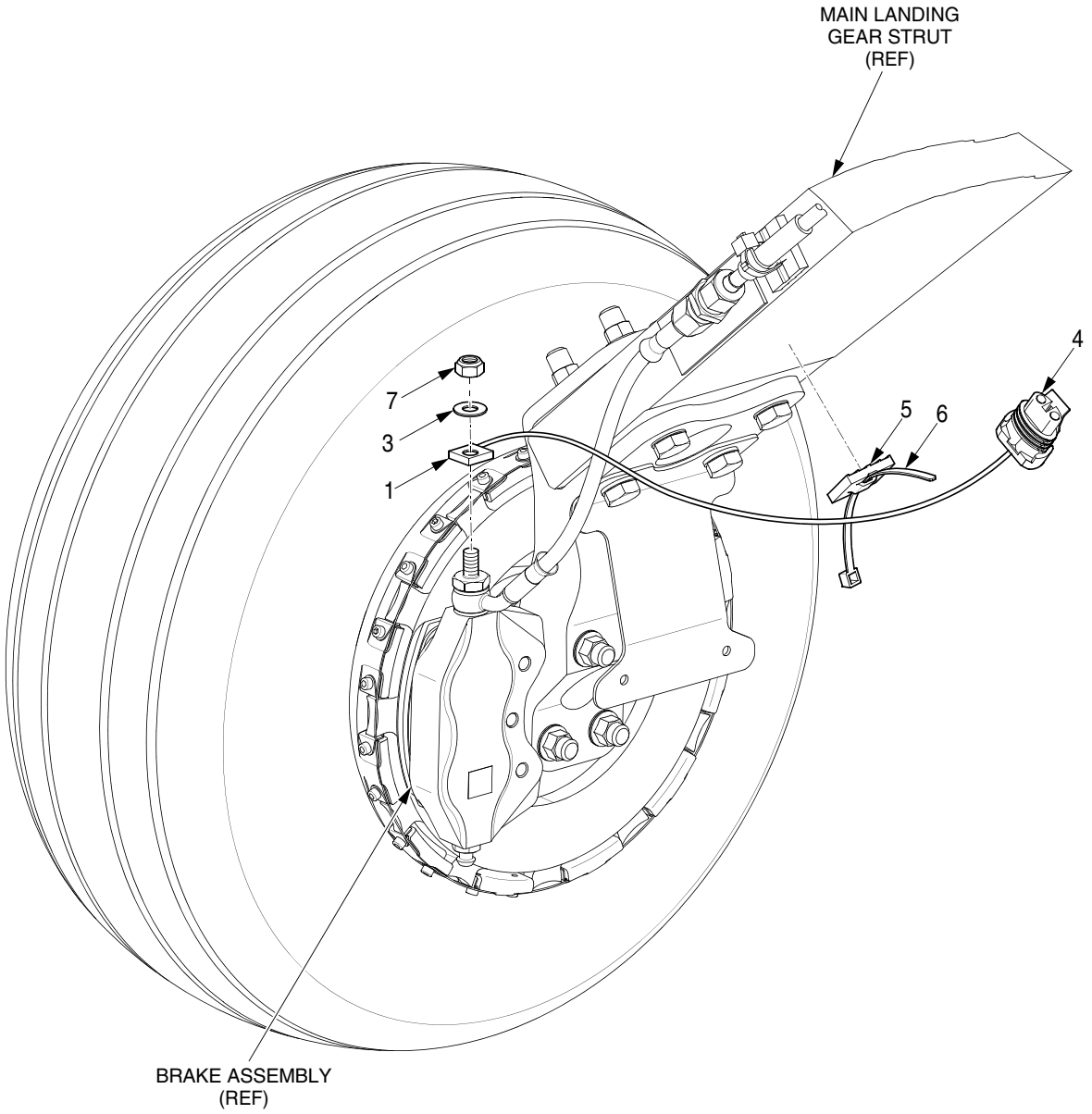


Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21.

SR20_MM32_2710B

Figure 32-422
Brake Temperature Sensor - Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21 (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21



LEGEND
1. Brake Temperature Sensor
3. Washer
4. Connector
5. Cable Tie Anchor
6. Cable Tie
7. Nut

DETAIL B

Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs.

SR20_MM32_3620

Figure 32-422
Brake Temperature Sensor - Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs

H. Strut Assembly Brake Line - *Serials 1005 thru 1885* (See Figure 32-423)

(1) Removal - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Dead Blow Hammer	60515A4	McMaster Carr	Strut removal.
Plastic Wedge	5868A91	McMaster Carr	Strut removal.
Heat Gun	-	Any Source	Epoxy removal.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Cut and remove tie down securing brake line to lower strut.

(e) Loosen breeze clamp securing braided grounding strap to brake line.

(f) Disconnect and cap flexible brake line at upper end of strut.

(g) Disconnect brake line fitting from support bracket at upper end of strut.

(h) Disconnect flexible brake line at lower end of strut.

(i) Remove nuts and washers securing strut clamp to canted rib.

(j) Using the dead blow hammer, squarely strike upper side of strut near clamp fitting to move strut down and away from clamp fitting.

(k) Insert and drive plastic wedge into gap between clamp and fitting to free strut from clamp.

(l) Slide grommet down strut to brake assembly.

WARNING: **Verify no fuel leaks or fuel residue are present before applying heat to strut.**

CAUTION: The adhesive securing the brake line to the strut does not require a high degree of heat to disbond. Heat the adhesive to the point where it is slightly hot to the touch. Do not exceed 150° F (66° C).

CAUTION: To protect the composite wing skin from heat damage, place a barrier on the wing skin such as a welding blanket, high temperature mat, or damp cloth before applying heat to the upper section of the strut near the wing skin.

(m) Apply heat to epoxy bonding brake line to strut channel. As epoxy heats and softens, pull brake line free from strut channel. Discard brake line.

(2) Installation - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Epoxy removal.
Sandpaper	80 Grit	Any Source	Remove epoxy.
5 Minute® Epoxy	-	Any Source	Secure brake line.

CAUTION: Do not use power tools to remove epoxy.

Do not cut or gouge strut laminate when removing epoxy.

(b) Using a putty knife and sandpaper, remove epoxy from strut channel.

(c) Mark the position where the lower fitting on the newly installed brake line should be positioned:

1 At bottom, aft edge of strut, measure 8.9 inches (22.6 cm) up and make a perpendicular reference line across strut face with pencil.

(d) Test fit new brake line:

1 Place new brake line into upper support bracket and position to strut assembly.

2 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.

3 Verify flare on lower section of brake line aligns with reference mark on strut.

(e) Solvent clean strut channel with isopropyl alcohol.

(f) Solvent clean brake line with isopropyl alcohol.

(g) Mix approximately 12.5 grams of epoxy.

CAUTION: Place a drop cloth over wheel assembly to protect assembly from dripping epoxy.

(h) Using wooden applicator, fill strut channel with epoxy until epoxy is flush with top of strut channel.

(i) Install new brake line:

1 Position brake line into upper support bracket, insert brake line into strut channel, and position brake line so flare on lower section of brake line aligns with reference mark on strut.

2 Firmly press brake line into strut channel.

3 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), seat brake line completely into strut channel so that top radius of brake line is flush with top of strut channel. Use a wooden applicator to spread epoxy over brake line

4 Where brake line enters and exits strut channel, use a wooden applicator to spread epoxy over and around brake line.

5 Wet a clean, lint free cotton cloth in isopropyl alcohol and clean up epoxy. Leave a thin coat of epoxy over top of brake line.

6 Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line. (See Figure 01, Note 3)

7 Allow epoxy to cure for 2 hours.

(j) Slide grommet up strut to canted rib strut fitting.

(k) Move strut assembly up and towards strut fitting.

(l) Position clamp fitting over grommet and install washers and nuts securing clamp fitting to canted rib fitting. Torque to 150.0 in-lb (16.9 Nm).

(m) Connect flexible brake line at lower end of strut.

(n) Connect brake line fitting to support bracket at upper end of strut.

(o) Connect flexible brake line at upper end of strut.

(p) Position breeze clamp around braided grounding strap and fasten to brake line.

(q) Install tie down securing brake line to lower strut.

(r) Remove jacks and lower airplane. (Refer to 07-10)

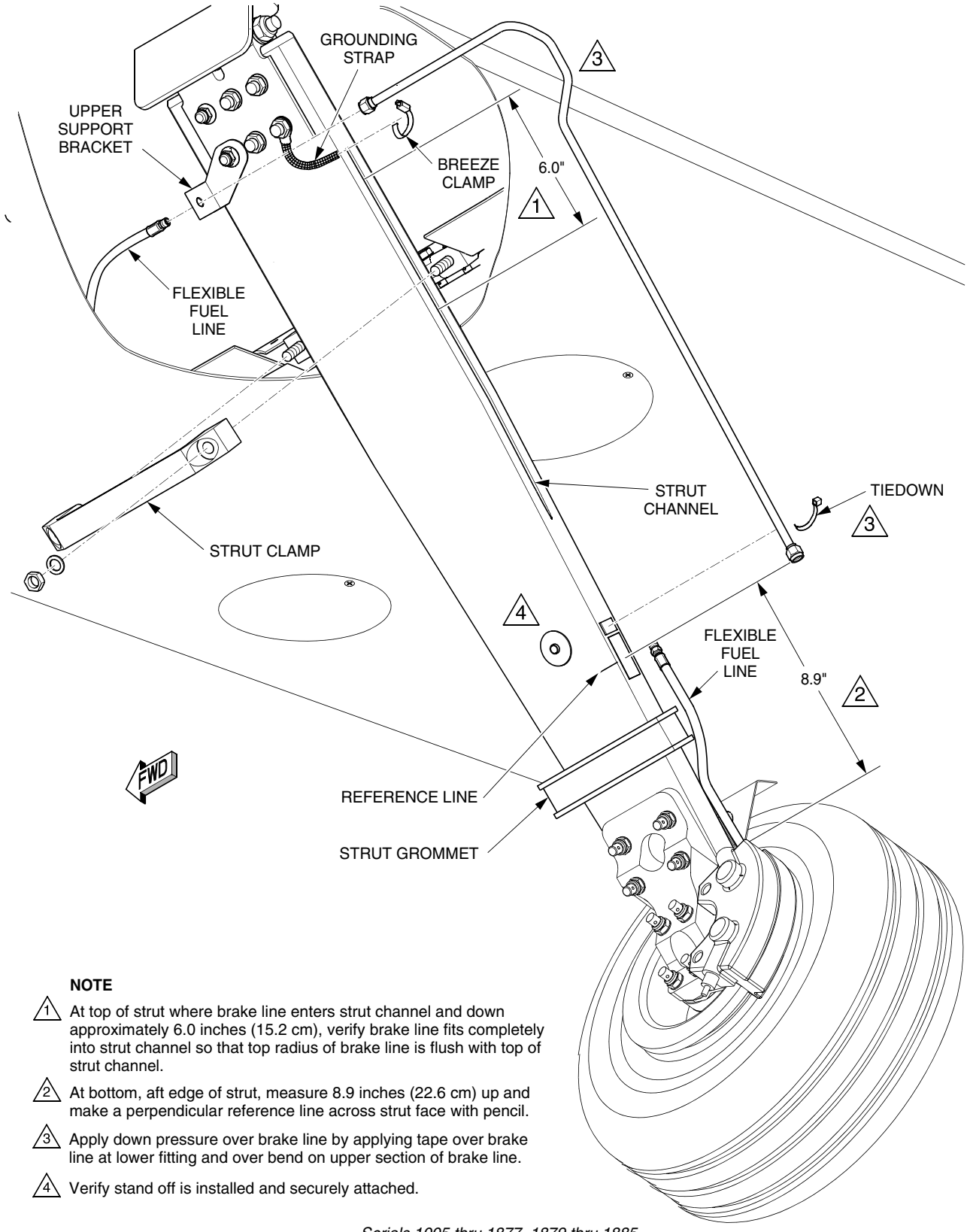
(s) Final torque bolts securing strut(s) to canted rib(s) to 160.0-190.0 in-lb (18.1- 21.5 Nm)

(t) Fill brake system. (Refer to 12-10)

(u) Bleed brake system. (Refer to 32-42)

(v) Verify strut stand-off used to secure lower strut fairing to strut is installed and securely attached.

(w) Install main gear fairings. (Refer to 32-10)



NOTE

1. At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.
2. At bottom, aft edge of strut, measure 8.9 inches (22.6 cm) up and make a perpendicular reference line across strut face with pencil.
3. Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line.
4. Verify stand off is installed and securely attached.

Serials 1005 thru 1877, 1879 thru 1885.

SR20_MM32_1864A

Figure 32-423
Strut Assembly Brake Line - Serials 1005 thru 1885

I. Strut Assembly Brake Line - *Serials 1886 & subs* **(See Figure 32-424)**

(1) Removal - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Dead Blow Hammer	60515A4	McMaster Carr	Strut removal.
Plastic Wedge	5868A91	McMaster Carr	Strut removal.
Heat Gun	-	Any Source	Epoxy removal.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Remove tie down securing brake line to lower strut.

(e) Remove tie down securing braided grounding strap to brake line.

(f) Remove bolt, washers, and nut securing lightning protection wire to lateral wing rib.

(g) Disconnect and cap brake line at strut upper end.

(h) At strut upper end, remove bolt, washer, and clamp securing brake line to bracket.

(i) Disconnect and cap brake line at strut lower end.

(j) Remove nuts, washers, bolts, and clamp securing strut assembly to lower attach fitting.

CAUTION: When removing strut from lower attach bracket, use caution to prevent damaging upper strut fitting and upper attach bracket.

(k) If necessary, gently tap upper side of strut with a dead blow hammer to move strut away from lower attach fitting.

(l) Slide grommet down strut to brake assembly.

WARNING: **Verify no fuel leaks or fuel residue are present before applying heat to strut.**

CAUTION: The adhesive securing the brake line to the strut does not require a high degree of heat to dis-bond. Heat the adhesive to the point where it is slightly hot to the touch. Do not exceed 150° F (66° C).

CAUTION: To protect the composite wing skin from heat damage, place a barrier on the wing skin such as a welding blanket, high temperature mat, or damp cloth before applying heat to the upper section of the strut near the wing skin.

(m) Apply heat to epoxy bonding brake line to strut channel. As epoxy heats and softens, pull brake line free from strut channel. Discard brake line.

(2) Installation - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Epoxy removal.
Sandpaper	80 Grit	Any Source	Remove epoxy.
5 Minute® Epoxy	-	Any Source	Secure brake line.

EFFECTIVITY:
Serials 1886 & subs

CAUTION: Do not use power tools to remove epoxy.

Do not cut or gouge strut laminate when removing epoxy.

(b) Using a putty knife and sandpaper, remove epoxy from strut channel.

(c) Mark position where lower fitting on newly installed brake line should be positioned.

1 At bottom, aft edge of strut, measure 8.6 inches (21.8 cm) up and make a perpendicular reference line across strut face with pencil.

(d) Test fit new brake line.

1 Align flare on lower section of brake line with reference mark on strut.

2 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.

(e) Solvent clean strut channel with isopropyl alcohol.

(f) Solvent clean brake line with isopropyl alcohol.

(g) Mix approximately 12.5 grams of epoxy.

CAUTION: Place a drop cloth over wheel assembly to protect assembly from dripping epoxy.

(h) Using wooden applicator, fill strut channel with epoxy until epoxy is flush with top of strut channel.

(i) Install new brake line.

1 Insert brake line into strut channel, and position brake line so flare on lower section of brake line aligns with reference mark on strut.

2 Firmly press brake line into strut channel.

3 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), seat brake line completely into strut channel so that top radius of brake line is flush with top of strut channel. Use a wooden applicator to spread epoxy over brake line.

4 Where brake line enters and exits strut channel, use a wooden applicator to spread epoxy over and around brake line.

5 Wet a clean, lint free cotton cloth in isopropyl alcohol and clean up epoxy. Leave a thin coat of epoxy over top of brake line.

6 Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line. (See Figure 01, Note 3)

7 Allow epoxy to cure for 2 hours.

(j) Slide grommet up strut to lower attach fitting.

(k) Move strut assembly up and towards lower attach fitting.

(l) Position clamp to lower attach fitting and secure with bolts, washers, and nuts.

(m) Connect brake line at strut lower end.

(n) At strut upper end, position brake line to bracket and secure with bolt, washer, and clamp.

(o) Connect brake line at strut upper end.

(p) Position lightning protection wire to lateral wing rib and secure with bolt, washers, and nut.

(q) Position braided grounding strap to brake line and secure with cable tie.

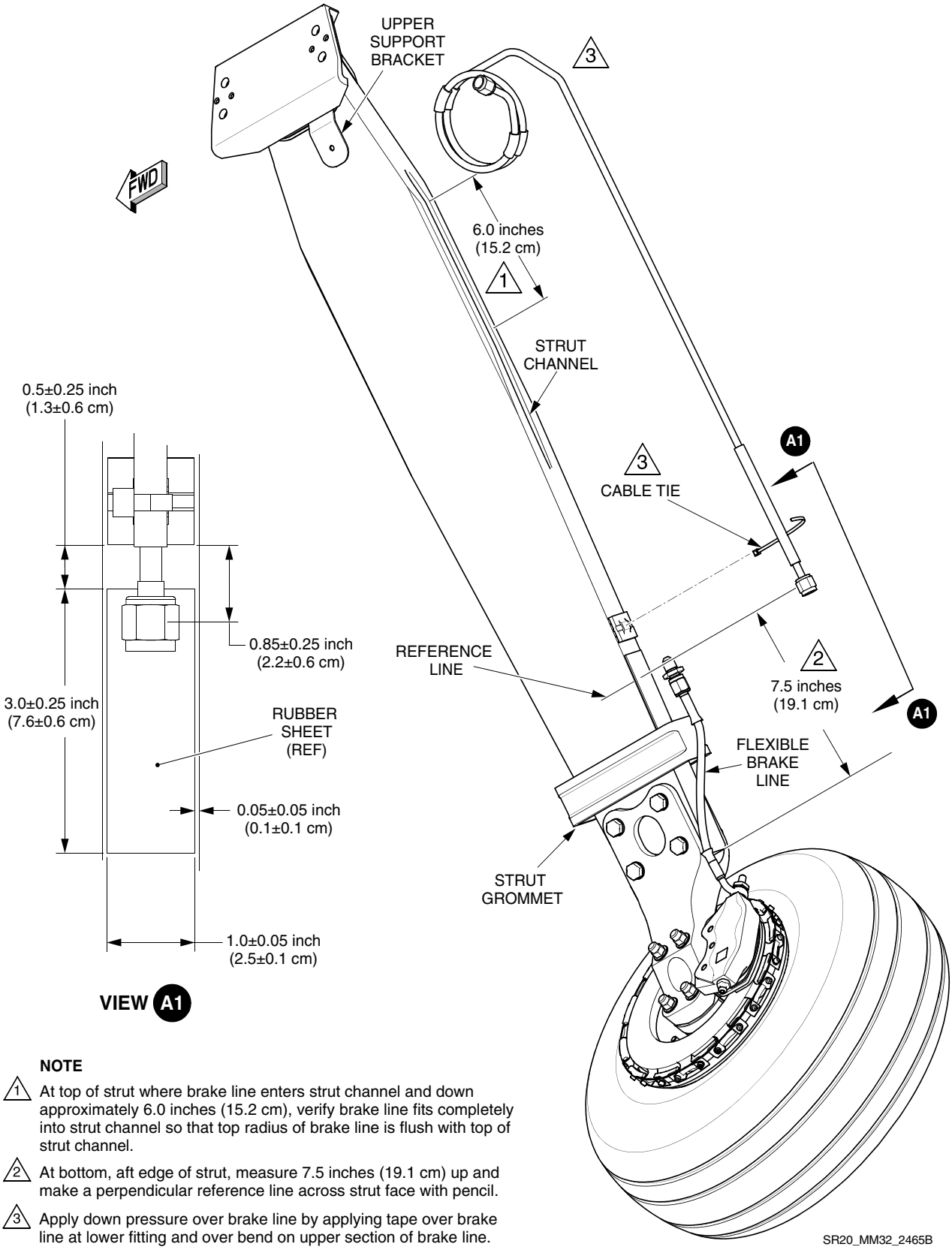
(r) Install cable tie securing brake line to lower strut.

(s) Remove jacks and lower airplane. (Refer to 07-10)

(t) Fill brake system. (Refer to 12-10)

(u) Bleed brake system. (Refer to 32-42)

(v) Install main gear fairings. (Refer to 32-10)



NOTE

1. At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.
2. At bottom, aft edge of strut, measure 7.5 inches (19.1 cm) up and make a perpendicular reference line across strut face with pencil.
3. Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line.

Figure 32-424
Strut Assembly Brake Line - Serials 1886 & subs

EFFECTIVITY:
Serials 1886 & subs

J. Brake Master Cylinder (See Figure 32-425)

(1) Removal - Brake Master Cylinder

(a) Drain hydraulic fluid from brake system.

(b) Remove cotter pins and washers from rudder pedal pivot tubes.

(c) Slide rudder pedal pivot tube from bearing.

(d) Detach rudder pedals from torque tube weldment.

(e) *Serials 1005 thru 2240 before SB2X-32-21:* Disconnect hoses from master cylinders. Cap or plug ports and hoses.

(f) *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs:* Remove bolts and washers securing brake line hoses from master cylinders. Cap or plug ports and hoses.

(g) Remove cotter pins, washers, and clevis pins from upper connection at rudder pedals of each master cylinder.

(h) Pull rudder pedal aft and remove cotter pins, washers, spacers (if installed), and clevis pins at floorboard mounting points and remove master cylinder.

(2) Installation - Brake Master Cylinder

(a) Place master cylinders on floorboard mounting points, install clevis pins, and secure with washers, spacers (if installed), and cotter pins.

(b) *Serials 1005 thru 2240 before SB2X-32-21:* Connect brake hoses to master cylinders. Upper port is inlet, lower port is outlet.

(c) *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs:* Install bolts and new washers securing brake hoses to master cylinders. Upper port is inlet, lower port is outlet. Torque to 148 in-lb (16.7 Nm).

(d) Connect piston rod clevis to upper connection at rudder pedals and install washers, clevis pins, and cotter pins.

(e) Place rudder pedals in proper alignment with torque tube weldment and install rudder pedal pivot tubes, washers, and cotter pins.

K. Parking Brake Valve (See Figure 32-426)

(1) Removal - Parking Brake Valve

(a) With parking brake knob in OFF position, drain hydraulic fluid from brake system.

(b) Remove LH crew seat. (Refer to 25-10)

(c) Remove LH kick plate. (Refer to 25-10)

(d) *Serials 1005 thru 2240 before SB2X-32-21:* Disconnect brake lines and hoses from parking brake valve. Cap or plug ports, lines, and hoses.

(e) *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs:* Disconnect brake lines and hoses.

1 Disconnect brake lines from parking brake valve. Cap or plug ports and lines.

2 Remove bolts and washers securing master cylinder hoses from parking brake valve. Cap or plug ports and hoses.

(f) Remove cotter pin, washers, and clevis pin securing control cable to parking brake valve actuation arm.

(g) Remove bolts, washers, and nuts securing parking brake valve to outboard console rib. Remove parking brake valve from airplane.

(2) Installation - Parking Brake Valve

(a) Position parking brake valve to outboard console rib with actuation arm adjacent to firewall and brake line fittings oriented towards fuselage floor. Secure with bolts, washers, and nuts.

(b) Remove caps from ports, lines, and hoses.

(c) Connect LH brake line to forward inlet on parking brake valve.

(d) Connect RH brake line to aft inlet on parking brake valve.

CAUTION: Do not cross LH and RH brake hoses.

(e) *Serials 1005 thru 2240 before SB2X-32-21:* Connect master cylinder brake hoses.

1 Connect brake hose from LH master cylinders to forward outlet on parking brake valve.

2 Connect brake hose from RH master cylinders to aft outlet on parking brake valve.

(f) *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs:* Connect master cylinder brake hoses.

1 Install bolts and new washers securing LH master cylinders brake hose to forward outlet on parking brake valve. Torque to 148 in-lb (16.7 Nm).

2 Install bolts and new washers securing RH master cylinders brake hose to aft outlet on parking brake valve. Torque to 148 in-lb (16.7 Nm).

(g) Install clevis pin, washers, and cotter pin securing control cable to parking brake valve actuation arm.

(h) Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)

(i) Perform Adjustment/Test - Bleeding the Brake System.(Refer to 32-42)

(j) Install LH kick plate. (Refer to 25-10)

(k) Install LH crew seat. (Refer to 25-10)

L. Parking Brake Control Cable (See Figure 32-426)

(1) Removal - Parking Brake Control Cable

(a) Remove LH crew seat. (Refer to 25-10)

(b) Remove LH kickplate. (Refer to 25-10)

(c) Remove cotter pin, washers, and clevis pin securing control cable to parking brake actuation arm.

(d) Remove bolt, washer, and clamp securing control cable to firewall.

(e) Remove cable ties securing control cable to firewall.

(f) *Serials 1005 thru 1422:* Remove screw, clamp, washer, and nut securing control cable to support bracket on inboard console rib.

(g) *Serials 1423 thru 2015, 2016 & subs w/o Perspective Avionics:* Remove screw, clamp, washer, and nut securing control cable to inboard console rib.

(h) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Remove nut and washer securing control cable knob to mid-console mounting bracket.

(i) *Serials 2016 & subs w/ Perspective Avionics:* Remove nut and washer securing control cable handle to bolster panel mounting bracket.

CAUTION: Remove control cable carefully, ensuring cable does not interfere with any flight controls, brake hoses, or wiring.

Note: Note routing of control cable prior to removal to facilitate reinstallation.

(j) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Pull control cable through installation hole in mid-console mounting bracket and remove from airplane.

(k) *Serials 2016 & subs w/ Perspective Avionics:* Pull control cable through installation hole in bolster panel mounting bracket. Remove control cable from airplane.

(2) Installation - Parking Brake Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Cable stop installation.

(b) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Route control cable through installation hole in mid-console mounting bracket and secure with washer and nut.

(c) *Serials 2016 & subs w/ Perspective Avionics:* Route control cable through installation hole in bolster panel mounting bracket and secure with washer and nut.

CAUTION: Verify control cable does not interfere with or rub against any flight controls, brake hoses, or wiring.

(d) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Route control cable through inboard console rib, across firewall, over outboard console rib, and down to parking brake valve.

(e) *Serials 2016 & subs w/ Perspective Avionics:* Route control cable across firewall, over outboard console rib, and down to parking brake valve.

(f) Install clevis pin and washers through parking brake valve actuation arm.

(g) Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

(h) Install cotter pin securing control cable to parking brake valve actuation arm.

(i) Install cable stop.

1 Place parking brake valve actuation arm in OFF position.

2 Apply Loctite to threads of cable stop installation screw.

3 *Serials 1005 thru 1885:* Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop and 0.2 inch (0.5 cm) of cable wire is visible between bottom of cable stop and top of actuation arm. (See Figure 32-426)

4 *Serials 1886 & subs:* Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop. (See Figure 32-426)

5 Install screw securing cable stop to control cable wire.

(j) Install bolt, washer, and clamp securing control cable to firewall. Do not tighten bolt.

(k) With parking brake control knob in OFF position, push cable sheath down so that parking brake valve is in OFF position. Tighten bolt securing control cable and clamp to firewall.

(l) *Serials 1005 thru 1422:* Install screw, clamp, washer, and nut securing control cable to support bracket on inboard console rib.

(m) *Serials 1423 thru 2015, 2016 & subs w/o Perspective Avionics:* Install screw, clamp, washer, and nut securing control cable to inboard console rib.

(n) Install cable tie(s) securing control cable to firewall.

(o) Install LH kickplate. (Refer to 25-10)

(p) Install LH crew seat. (Refer to 25-10)

(3) Adjustment/Test - Parking Brake Control Cable

(a) Remove bolt, washer, and clamp securing control cable to firewall.

(b) Remove cotter pin, washers, and clevis pin securing control cable to parking brake actuation arm.

(c) Cut coils securing control cable to clevis pin.

(d) Install clevis pin and washers through parking brake valve actuation arm.

(e) Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

(f) Install cotter pin securing control cable to parking brake valve actuation arm.

(g) Adjust and secure cable stop.

1 Place parking brake valve actuation arm in OFF position.

2 Apply Loctite to threads of cable stop installation screw.

3 *Serials 1005 thru 1885:* Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop and 0.2 inch (0.5 cm) of cable wire is visible between bottom of cable stop and top of actuation arm. (See Figure 32-426)

4 *Serials 1886 & subs:* Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop. (See Figure 32-426)

5 Install screw securing cable stop to control cable wire.

(h) Install bolt, washer, and clamp securing control cable to firewall. Do not tighten bolt.

(i) With parking brake control knob in OFF position, push cable sheath down so that parking brake valve is in OFF position. Tighten bolt securing control cable and clamp to firewall.

(4) Inspection/Check - Parking Brake Control Cable

(a) Remove LH crew seat. (Refer to 25-10)

(b) Remove LH kickplate. (Refer to 25-10)

(c) *Serials 1005 thru 1885:* Verify length of control cable wire between parking brake valve actuation arm and cable stop is equal to 0.5 inch (1.3 cm) or less.

1 If control cable wire meets tolerance, the control cable is rigged correctly.

2 If length of control cable wire between actuation arm and cable stop exceeds 0.5 inch (1.3 cm), perform Adjustment/Test - Parking Brake Control Cable. (Refer to 32-42)

(d) *Serials 2438 & subs:* Verify length of control cable wire between end of cable sheath and top of cable stop is equal to 1.8 inch (4.6 cm).

1 If control cable wire meets tolerance, the control cable is adjusted correctly.

2 If length of control cable wire end of cable sheath and top of cable stop exceeds 1.8 inch (4.6 cm), perform Adjustment/Test - Parking Brake Control Cable. (Refer to 32-42)

(e) Install LH kickplate. (Refer to 25-10)

(f) Install LH crew seat. (Refer to 25-10)

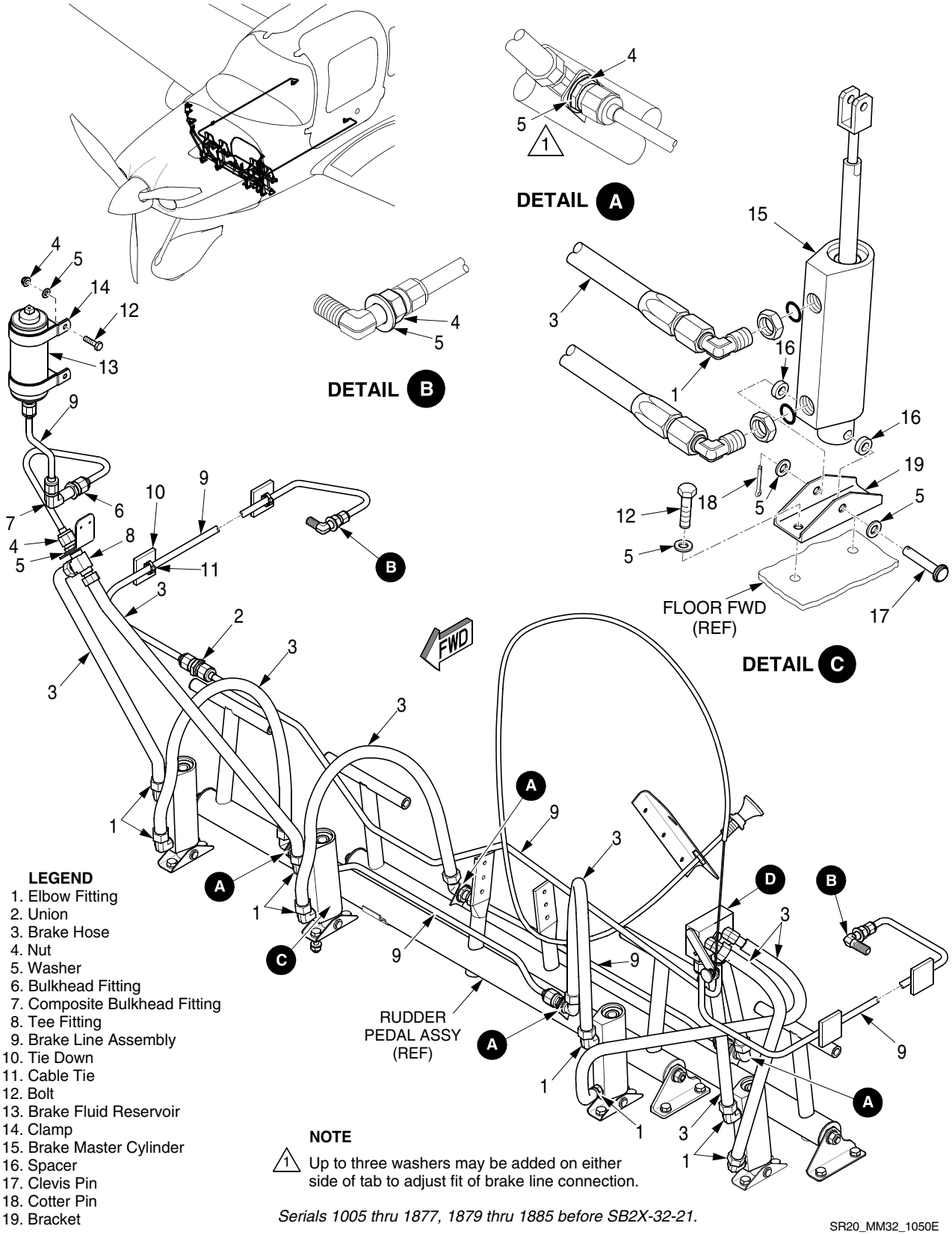
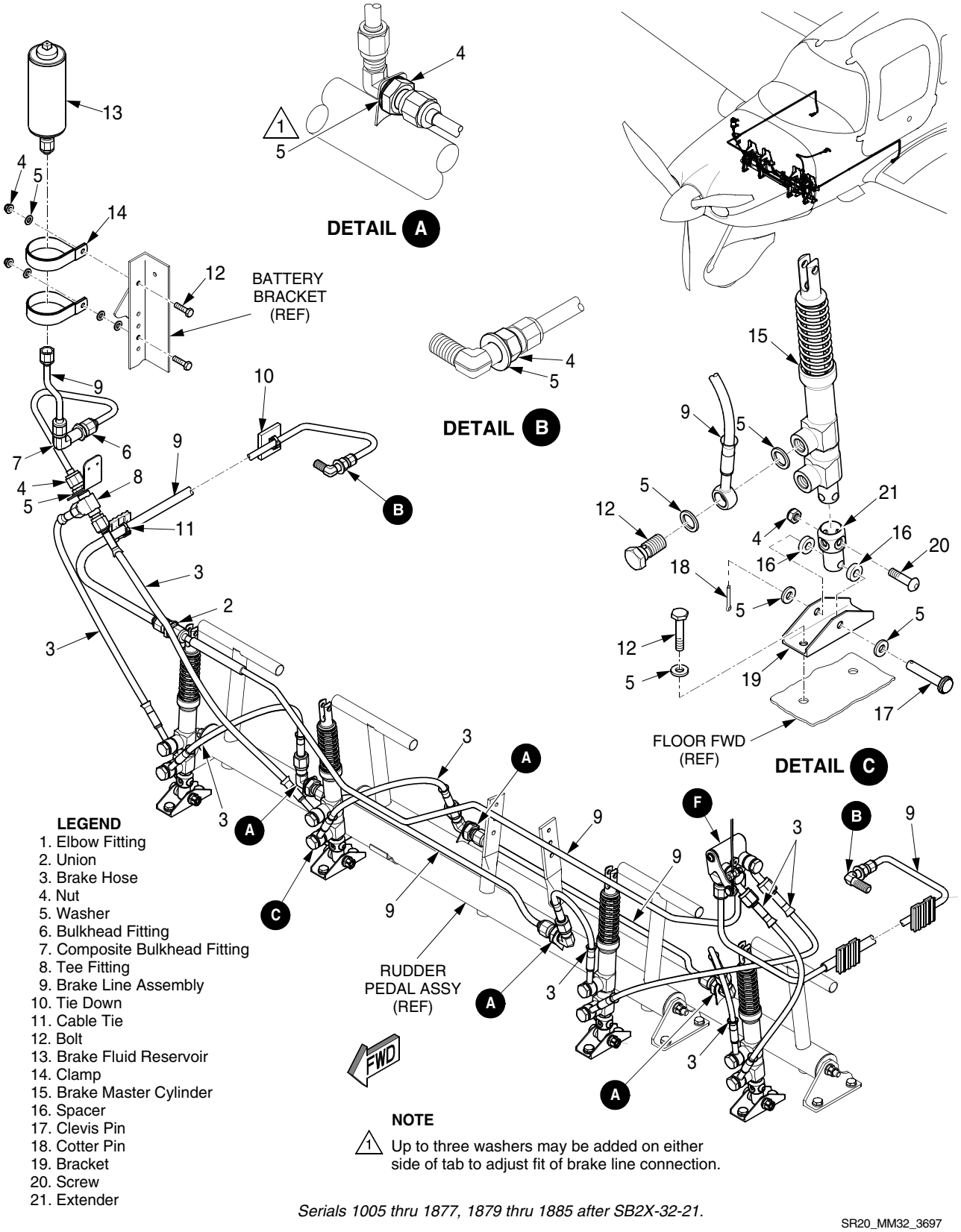


Figure 32-425
Cabin Brake System - Serials 1005 thru 1885 before SB2X-32-21 (Sheet 1 of 8)

EFFECTIVITY:
Serials 1005 thru 1885 before SB2X-32-21



Serials 1005 thru 1877, 1879 thru 1885 after SB2X-32-21.

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Figure 32-426
Cabin Brake System - Serials 1005 thru 1885 after SB2X-32-21 (Sheet 2 of 8)

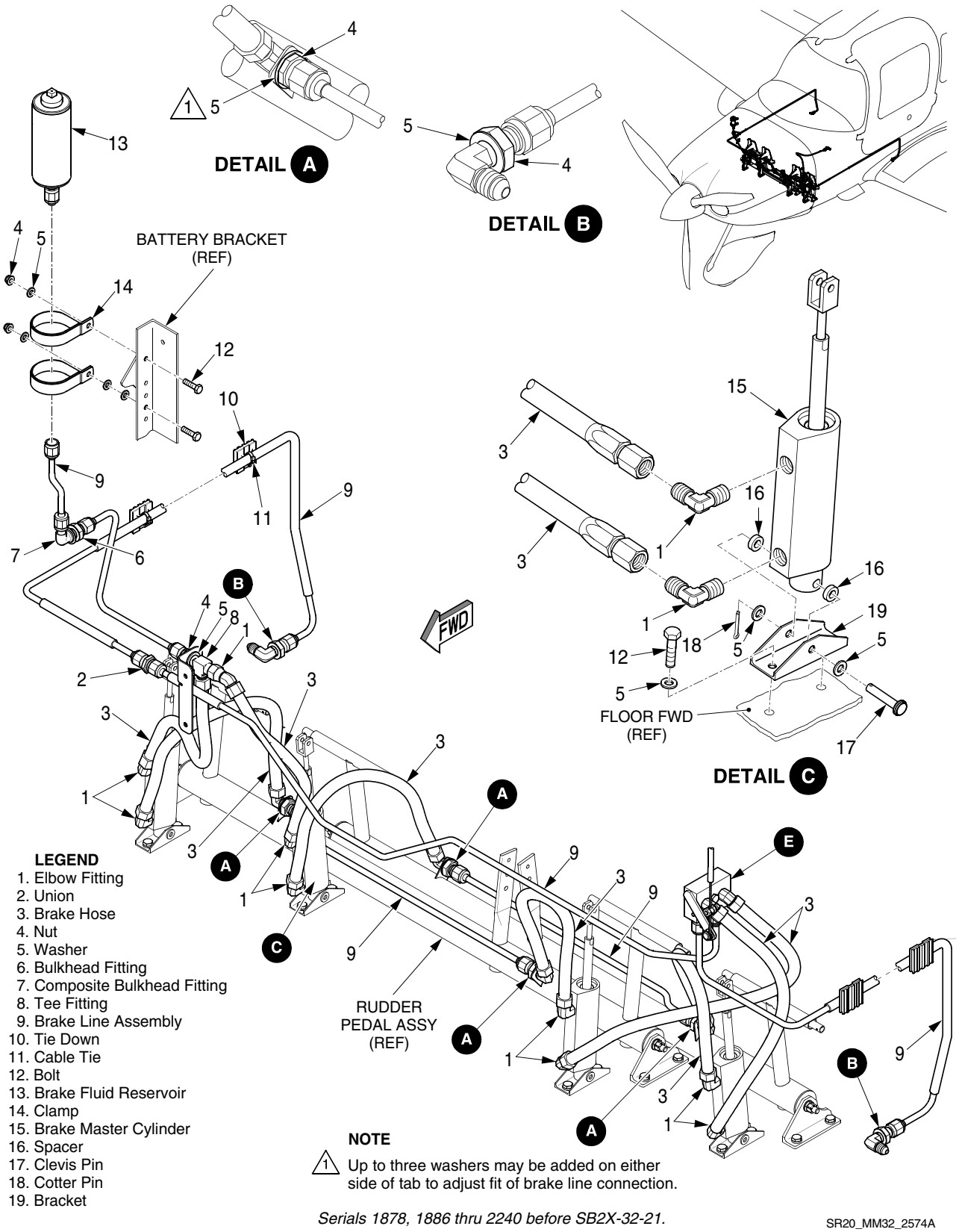


Figure 32-426
Cabin Brake System - Serials 1886 thru 2240 before SB2X-32-21 (Sheet 3 of 8)

EFFECTIVITY:
Serials 1886 thru 2240 before SB2X-32-21

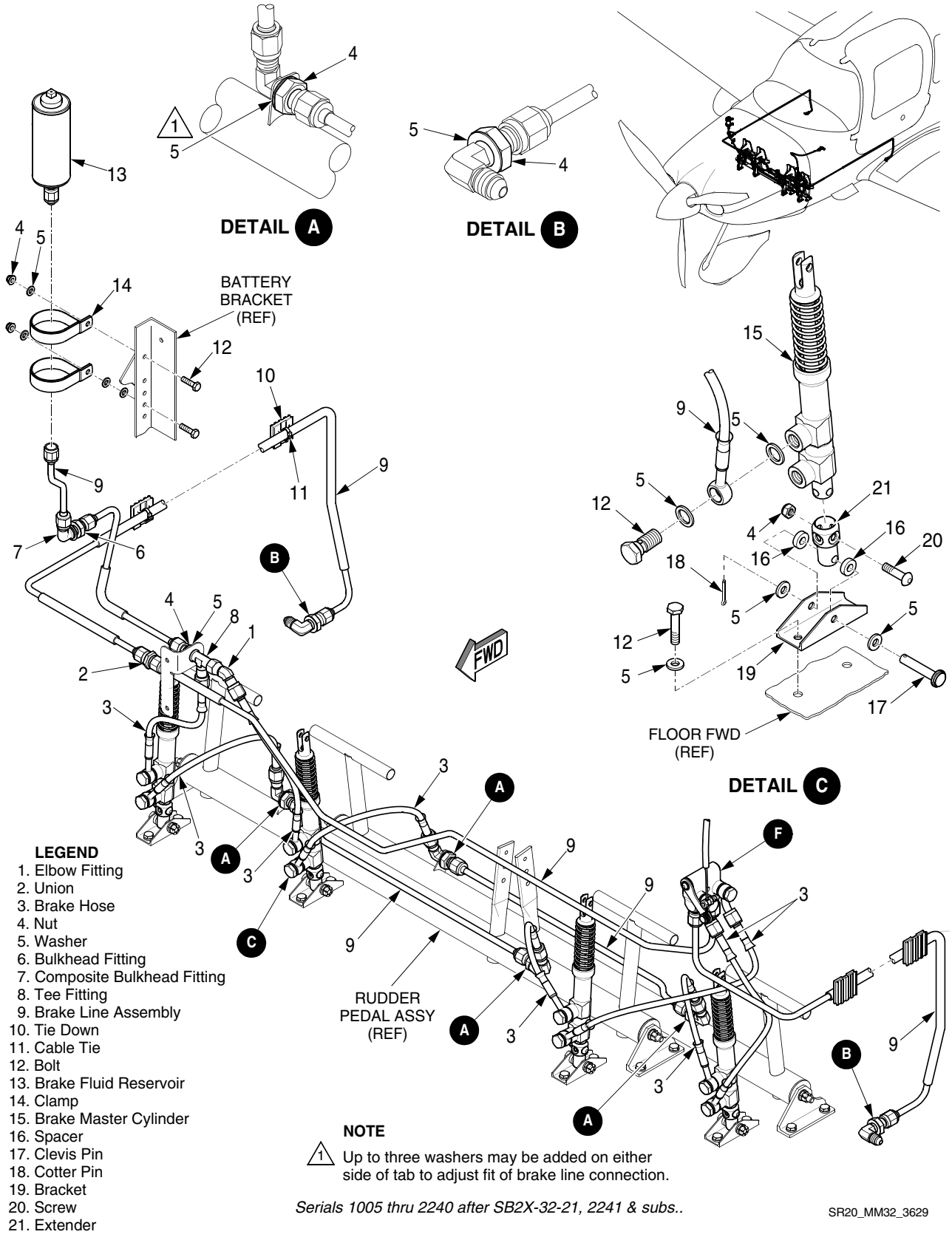
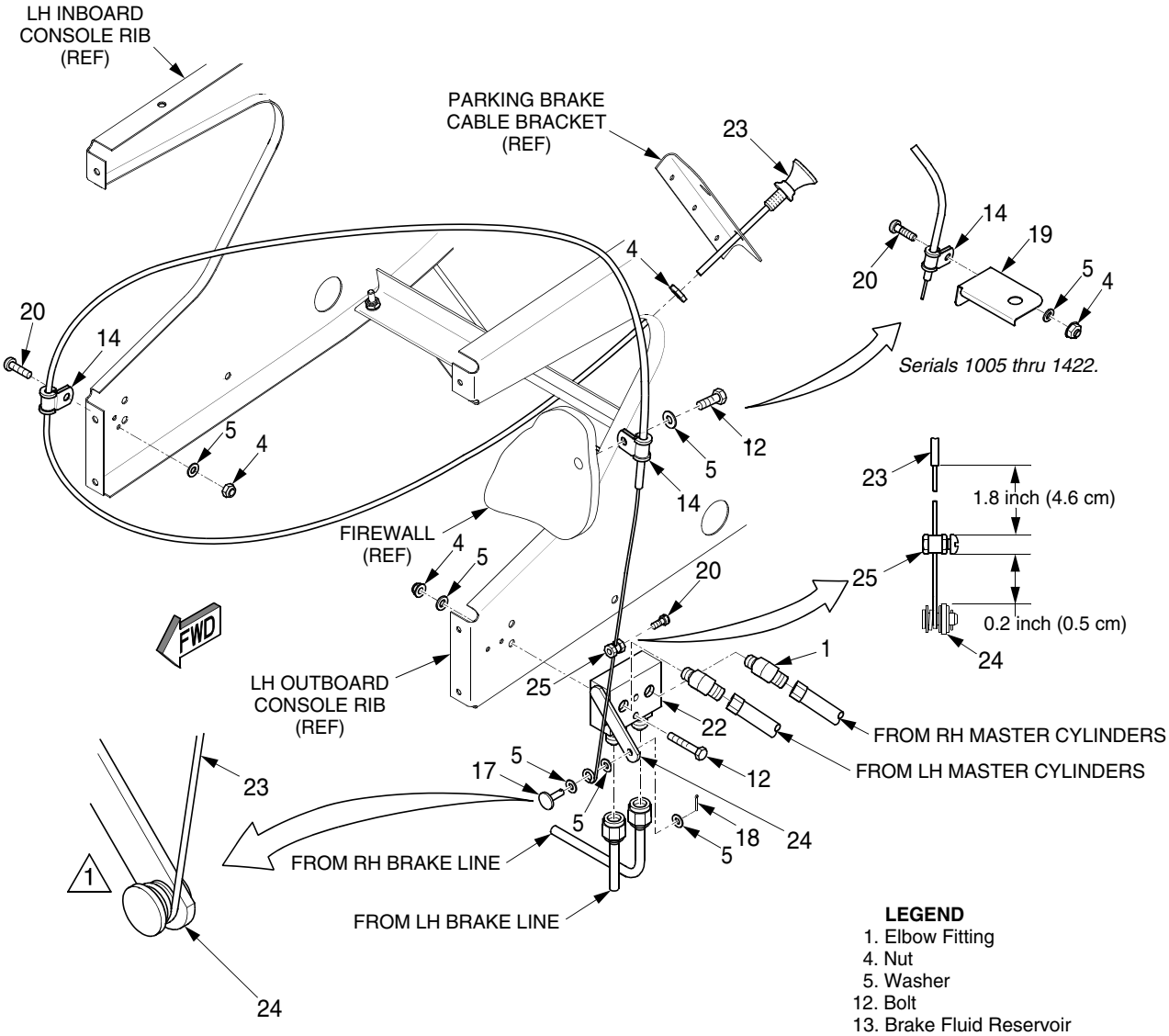


Figure 32-426
Cabin Brake System - Serials 1886 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 4 of 8)



LEGEND

1. Elbow Fitting
4. Nut
5. Washer
12. Bolt
13. Brake Fluid Reservoir
14. Clamp
15. Brake Master Cylinder
16. Spacer
17. Clevis Pin
18. Cotter Pin
19. Bracket
20. Screw
22. Parking Brake Valve
23. Parking Brake Cable Assembly
24. Actuation Arm
25. Cable Stop

NOTE

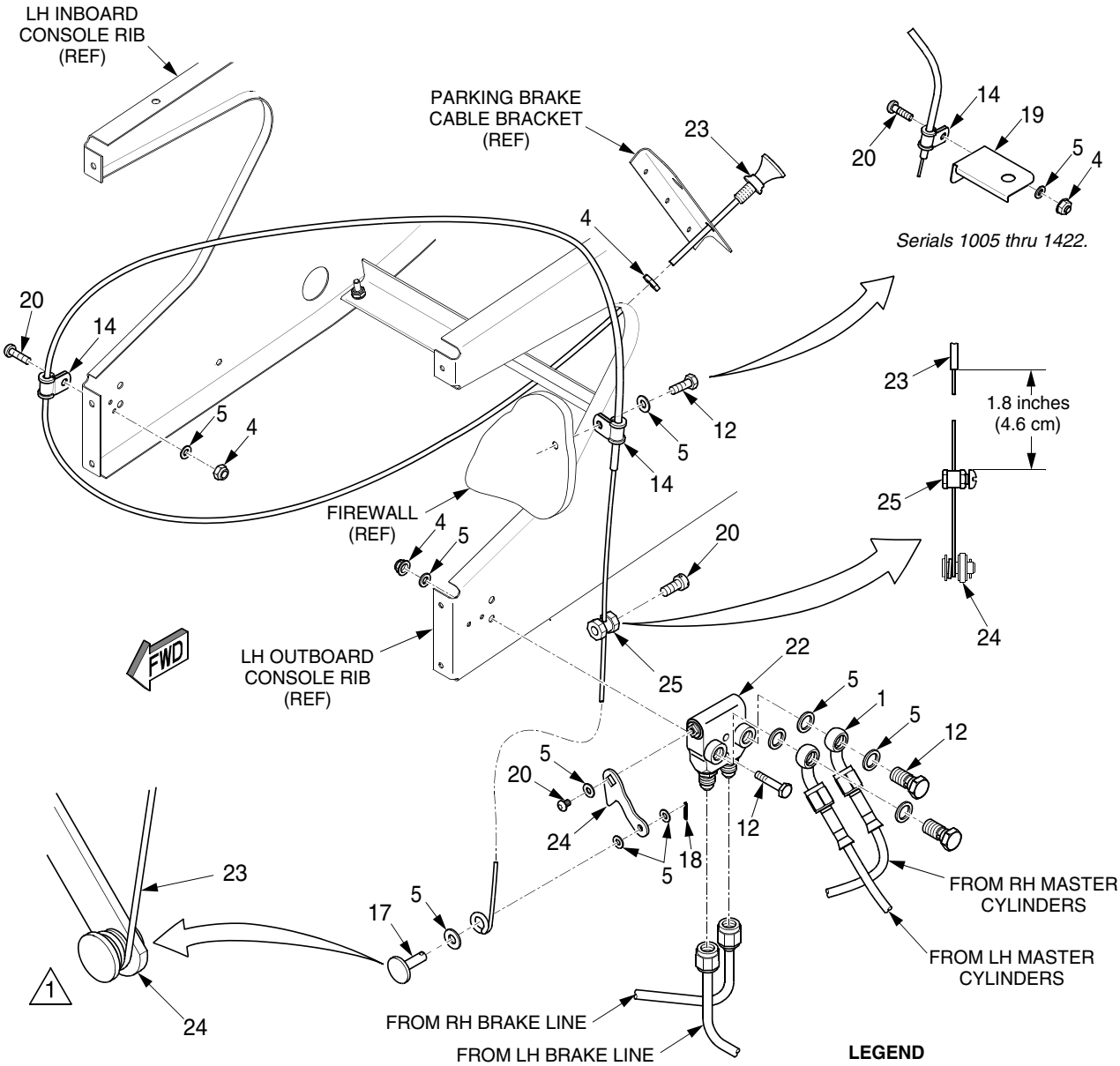
1. Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

Serials 1005 & subs w/o Perspective Avionics before SB2X-32-21.

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Figure 32-426
Cabin Brake System - Serials w/o Perspective Avionics before SB2X-32-21 (Sheet 5 of 8)

EFFECTIVITY:
Serials w/o Perspective Avionics before SB2X-32-21



DETAIL D

Serials 1005 & subs w/o Perspective Avionics after SB2X-32-21.

NOTE

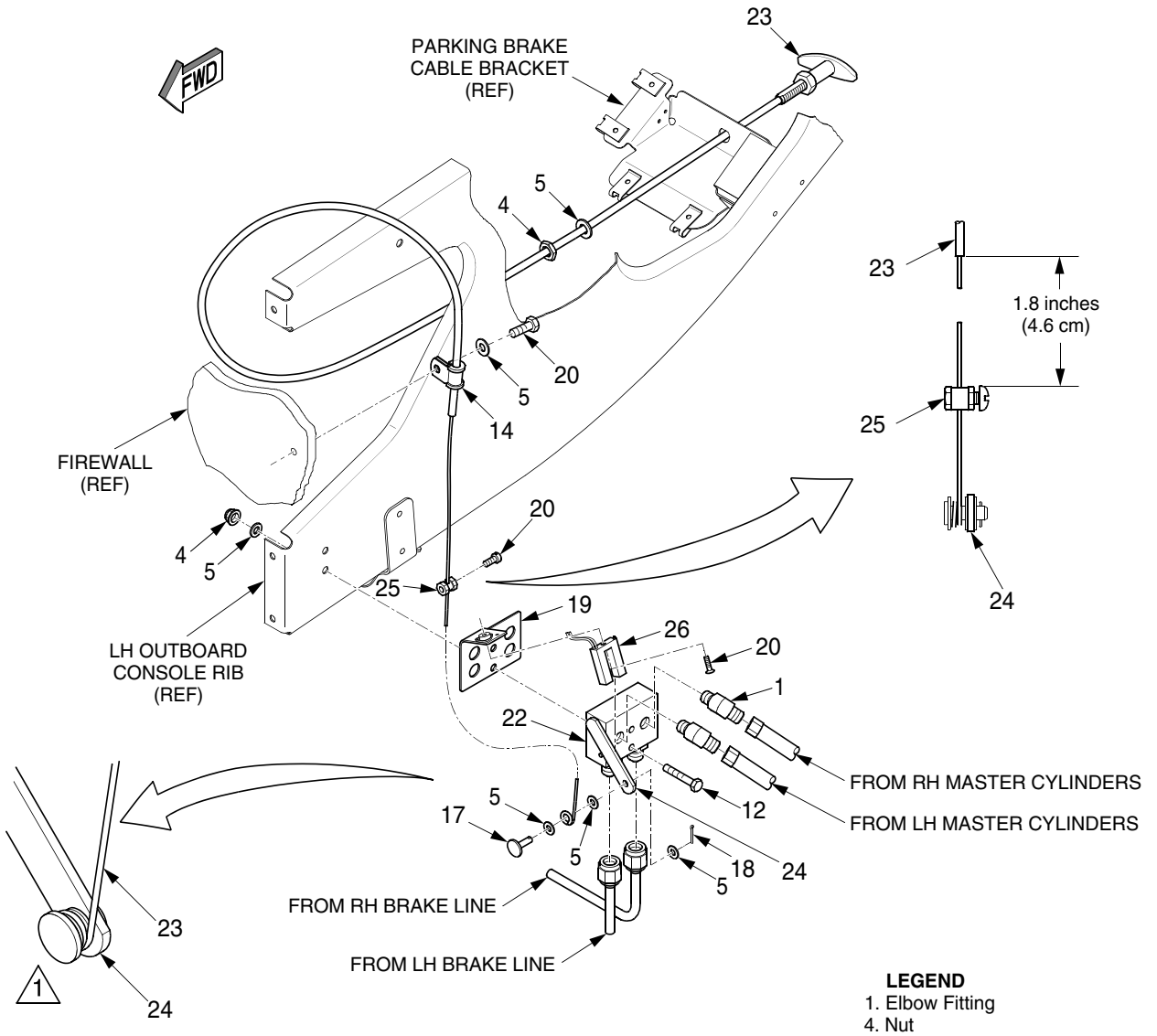
1 Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

LEGEND

1. Elbow Fitting
4. Nut
5. Washer
12. Bolt
13. Brake Fluid Reservoir
14. Clamp
15. Brake Master Cylinder
16. Spacer
17. Clevis Pin
18. Cotter Pin
19. Bracket
20. Screw
22. Parking Brake Valve
23. Parking Brake Cable Assembly
24. Actuation Arm
25. Cable Stop

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Figure 32-426
Cabin Brake System - Serials w/o Perspective Avionics after SB2X-32-21 (Sheet 6 of 8)



DETAIL E

Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21.

LEGEND

1. Elbow Fitting
4. Nut
5. Washer
12. Bolt
14. Clamp
17. Clevis Pin
18. Cotter Pin
19. Bracket
20. Screw
22. Parking Brake Valve
23. Parking Brake Cable Assembly
24. Actuation Arm
25. Cable Stop
26. Position Sensor

NOTE

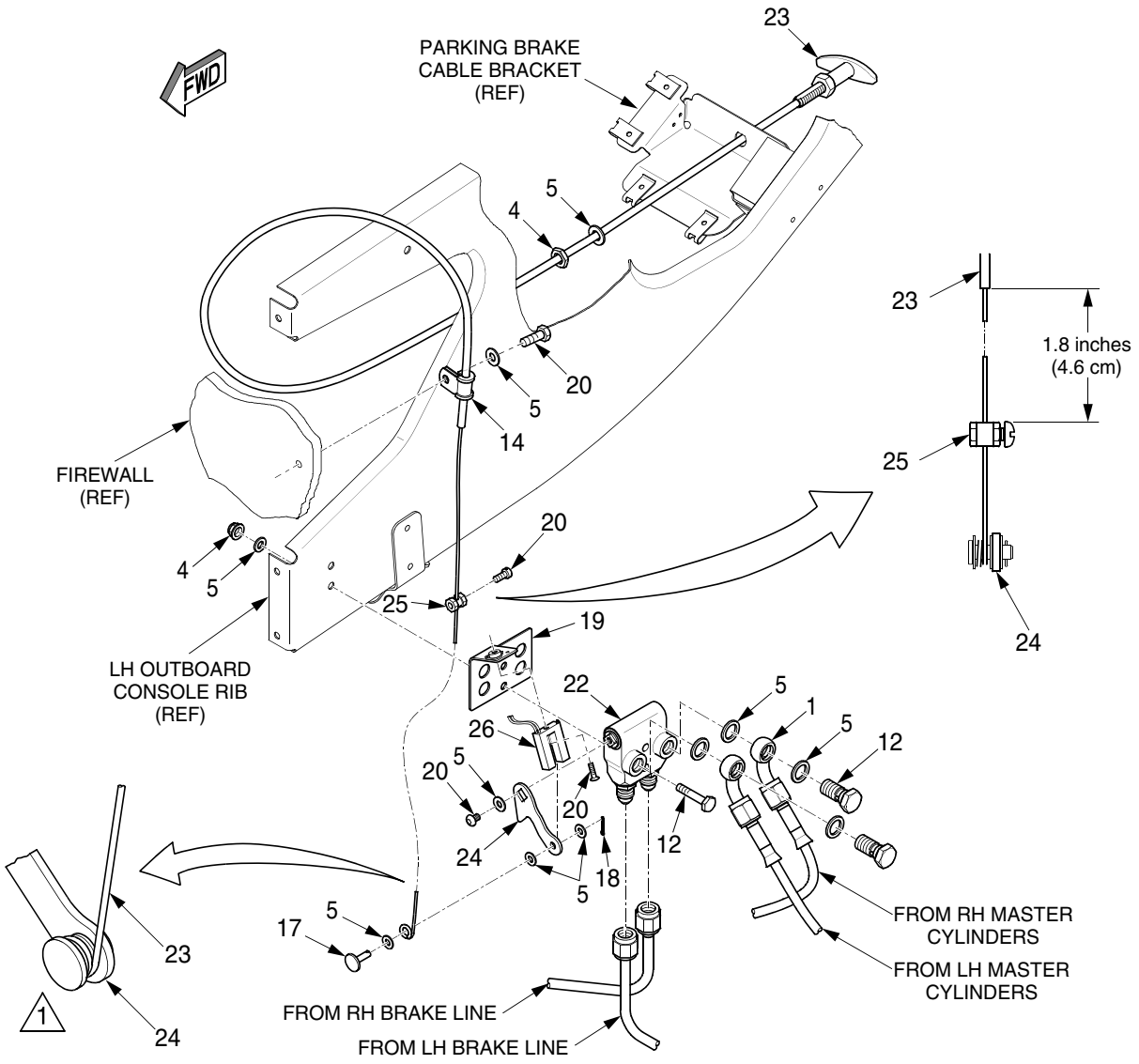
1 Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

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Figure 32-426

Cabin Brake System - Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21 (Sheet 7 of 8)

EFFECTIVITY:
Serials 2016 thru 2240 w/ Perspective Avionics before SB2X-32-21



DETAIL F

Serials 2241 & subs.

LEGEND

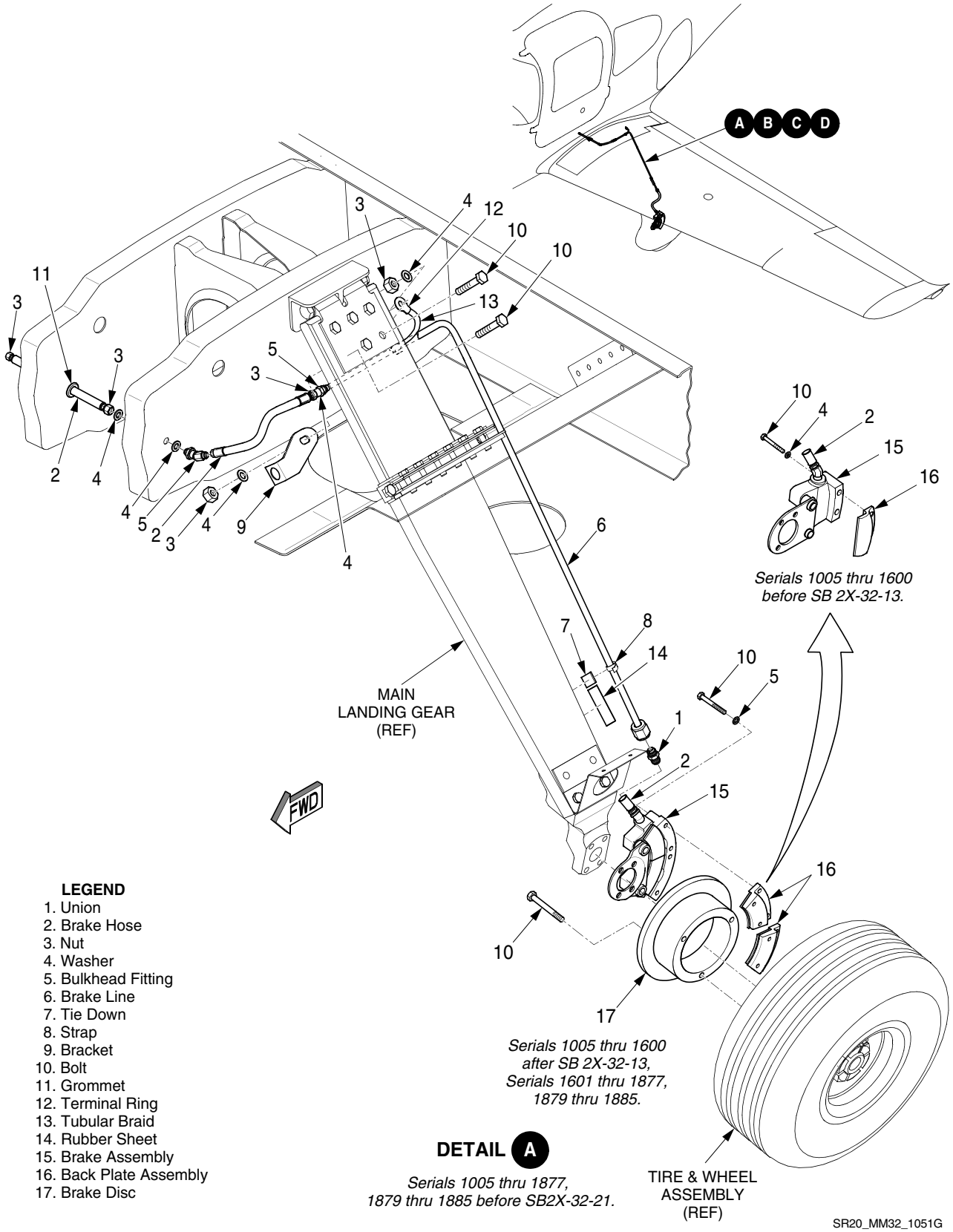
1. Elbow Fitting
4. Nut
5. Washer
12. Bolt
13. Brake Fluid Reservoir
14. Clamp
15. Brake Master Cylinder
16. Spacer
17. Clevis Pin
18. Cotter Pin
19. Bracket
20. Screw
22. Parking Brake Valve
23. Parking Brake Cable Assembly
24. Actuation Arm
25. Cable Stop
26. Position Sensor

NOTE

1. Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

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Figure 32-426
Cabin Brake System - Serials 2016 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 8 of 8)

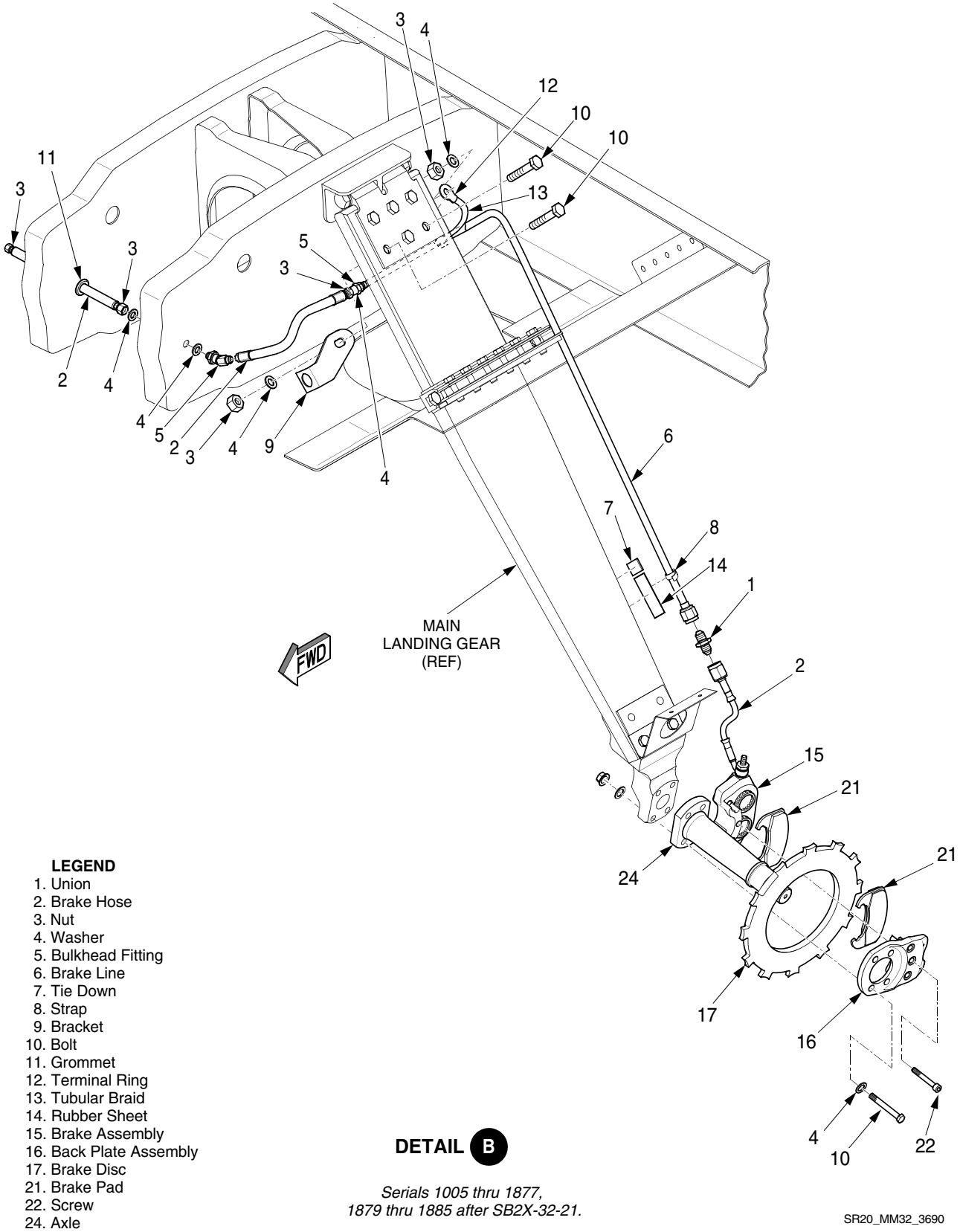


LEGEND

1. Union
2. Brake Hose
3. Nut
4. Washer
5. Bulkhead Fitting
6. Brake Line
7. Tie Down
8. Strap
9. Bracket
10. Bolt
11. Grommet
12. Terminal Ring
13. Tubular Braid
14. Rubber Sheet
15. Brake Assembly
16. Back Plate Assembly
17. Brake Disc

Figure 32-427
Landing Gear Brake System - Serials 1005 thru 1885 before SB2X-32-21 (Sheet 1 of 4)

EFFECTIVITY:
Serials 1005 thru 1885 before SB2X-32-21



LEGEND

1. Union
2. Brake Hose
3. Nut
4. Washer
5. Bulkhead Fitting
6. Brake Line
7. Tie Down
8. Strap
9. Bracket
10. Bolt
11. Grommet
12. Terminal Ring
13. Tubular Braid
14. Rubber Sheet
15. Brake Assembly
16. Back Plate Assembly
17. Brake Disc
21. Brake Pad
22. Screw
24. Axle

Figure 32-428
Landing Gear Brake System - Serials 1005 thru 1885 after SB2X-32-21 (Sheet 2 of 4)

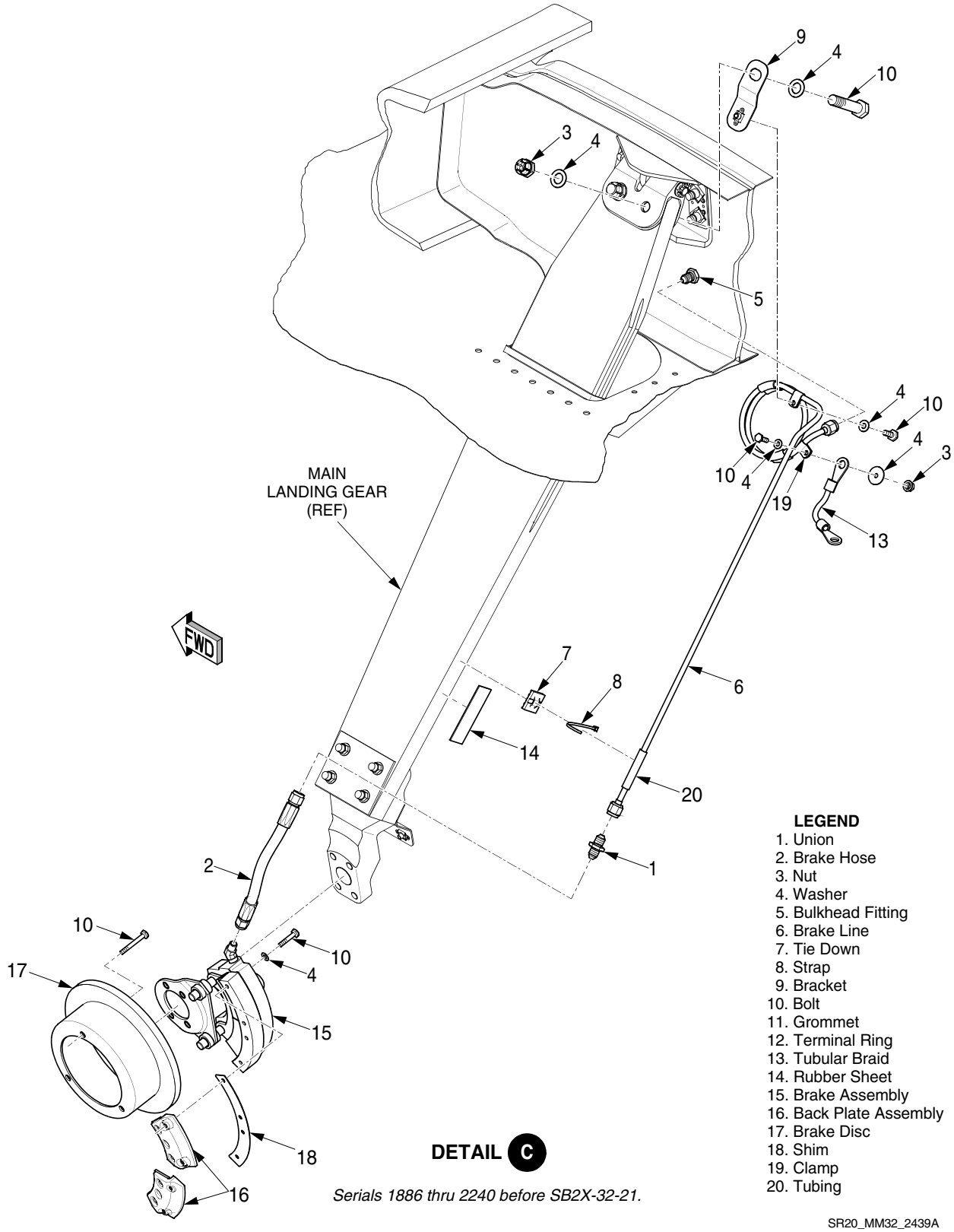
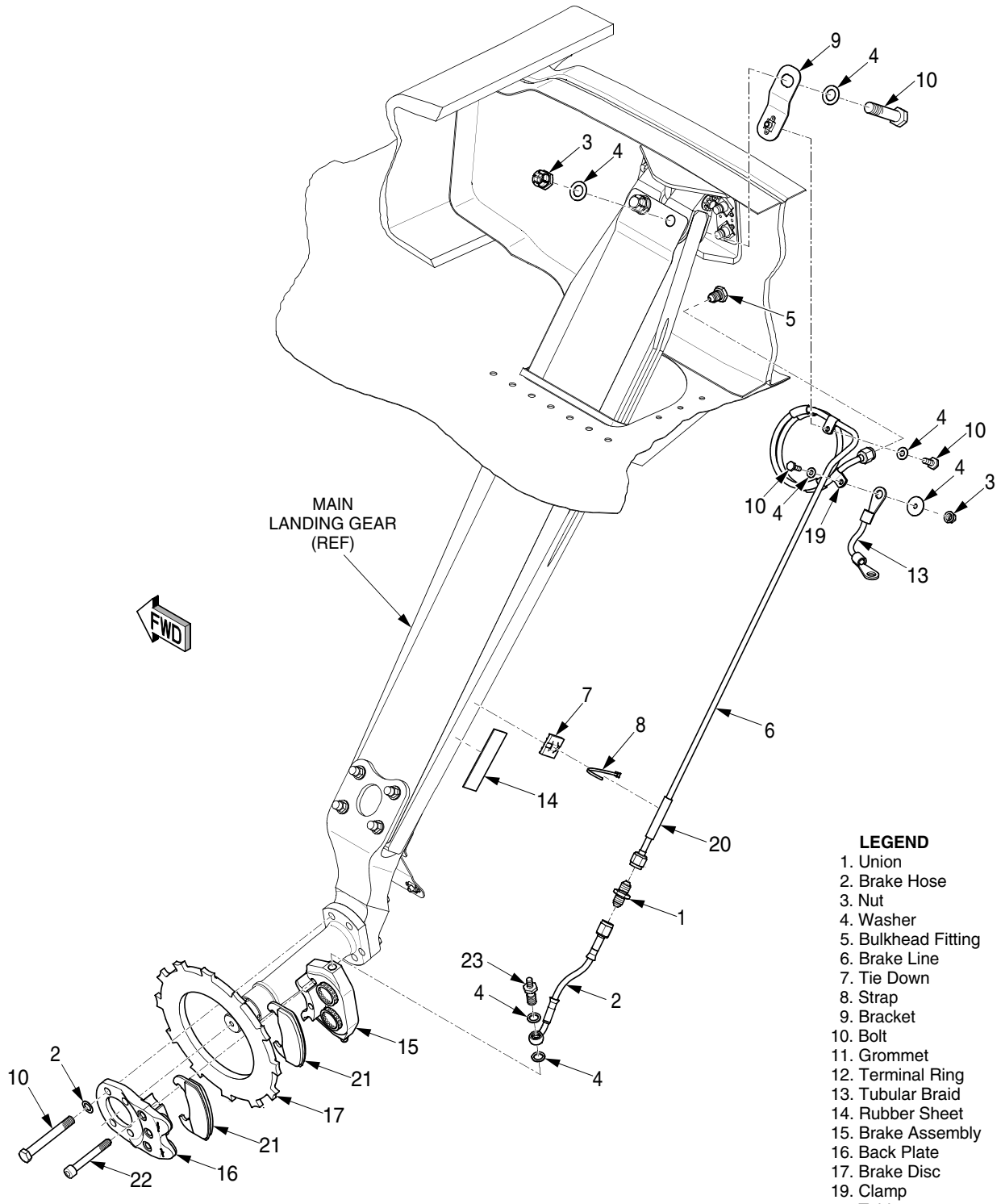


Figure 32-428
Landing Gear Brake System - Serials 1886 thru 2240 before SB2X-32-21 (Sheet 3 of 4)

EFFECTIVITY:
Serials 1886 thru 2240 before SB2X-32-21



Serials 1886 thru 2240 after SB2X-32-21, 2241 & subs.

SR20_MM32_3624

Figure 32-428
Landing Gear Brake System - Serials 1886 thru 2240 after SB2X-32-21, 2241 & subs (Sheet 4 of 4)

M. Bleeding the Brake System - *Serials 1005 thru 2240 before SB2X-32-21* **(See Figure 32-429)**

If a brake line has been disconnected or the brake pedal has a “spongy” feel, there is a strong likelihood that air has entered the brake system. To ensure proper braking, all trapped air must be removed from the brake system.

(1) Adjustment/Test - Bleeding the Brake System

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Hydraulic Fluid	MIL-H-5606	Any Source	Replenish brake system.
Pressurized Brake Bleeder	7300 (or equivalent)	Ammco Tools La Vergne, TN 37086 615-641-7533	Pressurize brake system.
Tubing	-	Any Source	Drain brake fluid.
Fitting	AN816-4D	Any Source	Connect overflow tubing to brake fluid reservoir.
Hose Clamps	-	Any Source	Secure tubing to fittings.

(b) Remove main gear fairings. (Refer to 32-10)

(c) Place wheel chocks into position.

(d) Disengage parking brake.

(e) Fill brake bleeder with approved hydraulic fluid.

(f) Remove plug from top of brake fluid reservoir.

(g) Install attach fitting to top of brake fluid reservoir, connect overflow tubing, and position end of tubing into empty one gallon container.

(h) Remove cap from brake caliper bleeder valve.

(i) Loosen brake caliper bleeder valve.

(j) Connect tubing from brake bleeder to fittings on bottom of brake caliper. Secure tubing with hose clamps.

(k) Connect air source to brake bleeder and slowly pressurize tank until pressure reaches approximately 15 psi.

(l) Open feed valve on brake bleeder to check brake system and tubing for leaks.

(m) Raise pressure to approximately 30 psi.

(n) Using a rubber mallet, lightly tap on caliper to release air from inside caliper.

Note: Pumping the brake pedals is not necessary when bleeding brakes with pressurized system.

(o) Slightly “jiggle” rudder pedals to release air from inside the master cylinders.

(p) Continue to “jiggle” rudder pedals and tap on caliper until brake system is free of air and no bubbles are present in overflow tubing.

(q) Close feed valve on brake bleeder, and depressurize tank by removing air source.

(r) Remove hose clamps securing tubing from brake bleeder to fittings on caliper. Cap off tubing to prevent contamination.

(s) Torque brake bleeder valve to 40 - 50 in-lb (4.5 - 5.6 Nm). Install cap over bleeder valve.

(t) Repeat procedure for opposite side.

EFFECTIVITY:
Serials 1005 thru 2240 before SB2X-32-21

(u) Remove overflow tubing from brake fluid reservoir. Cap off tubing to prevent contamination.

(v) After filling brake fluid reservoir, use a syringe to remove 7 ml of fluid to prevent overflow.

(w) Install plug into top of brake fluid reservoir.

(x) Install main gear fairings. (Refer to 32-10)

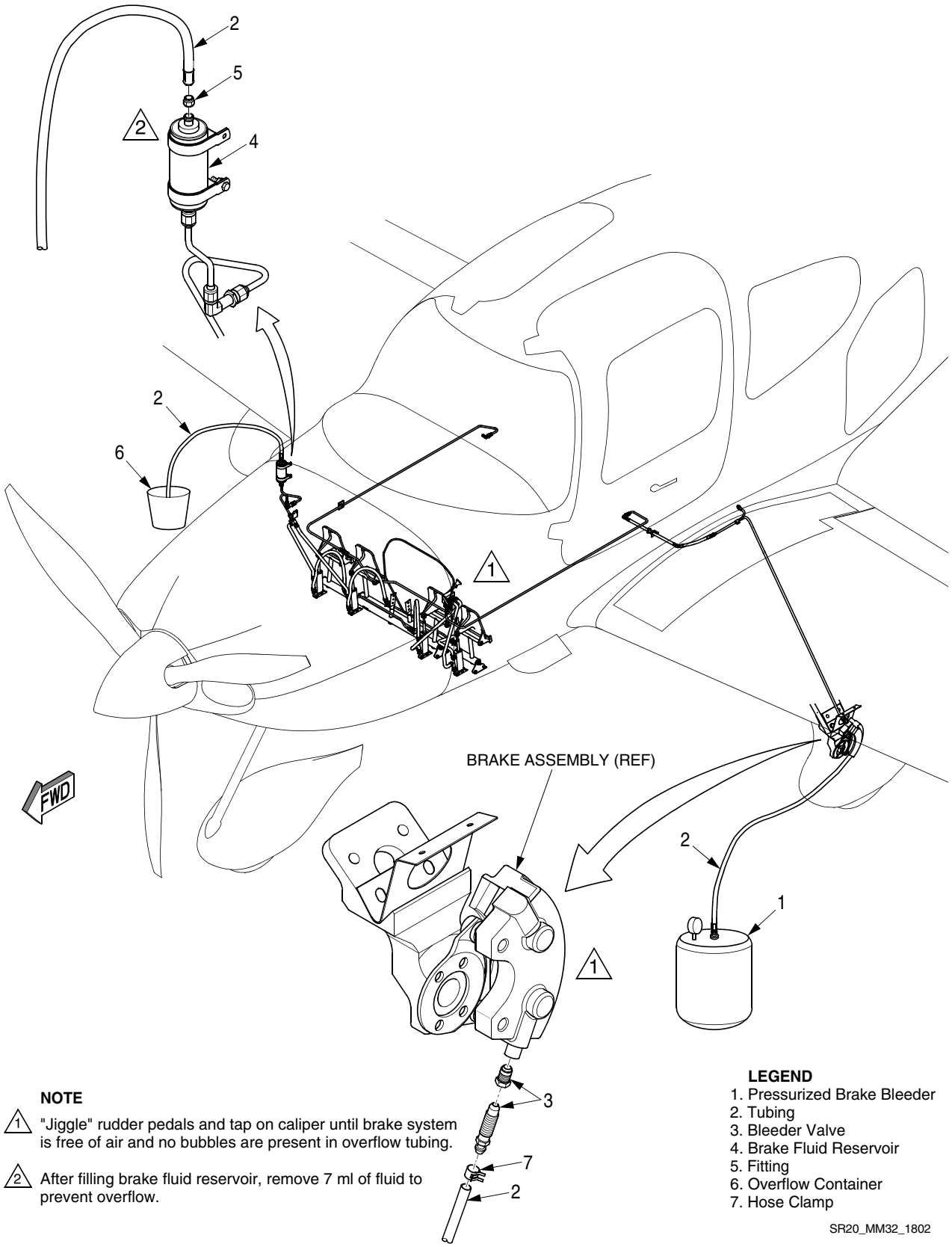


Figure 32-429
Bleeding the Brake System - Serials 1005 thru 2240 before SB2X-32-21

EFFECTIVITY:
Serials 1005 thru 2240 before SB2X-32-21

N. Bleeding the Brake System - *Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs* (See Figure 32-4210)

If a brake line has been disconnected or the brake pedal has a “spongy” feel, there is a strong likelihood that air has entered the brake system. To ensure proper braking, all trapped air must be removed from the brake system.

(1) Adjustment/Test - Bleeding the Brake System

CAUTION: Any spilled brake fluid must be removed immediately.

If brake fluid contacts the brake disc, the disc must be completely cleaned with solvent.

If brake fluid contacts the brake pads, the pads must be replaced. The pads are porous and cannot be cleaned with solvent.

To prevent damage to brake caliper seals, do not apply solvent directly to brake calipers.

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Hydraulic Fluid	MIL-PRF-87257	Any Source	Replenish brake system.
Pressurized Brake Bleeder	7300 (or equivalent)	Ammco Tools La Vergne, TN 37086 615-641-7533	Pressurize brake system.
Air Pressure Regulator	-	Any Source	Connect compressed air supply to brake bleeder.
Tubing	-	Any Source	Drain brake fluid.
Fitting	AN816-4D	Any Source	Connect overflow tubing to brake fluid reservoir.
Hose Clamps	-	Any Source	Secure tubing to fittings.

(b) Remove main gear fairings. (Refer to 32-10)
(c) Place wheel chocks into position.
(d) Disengage parking brake.

CAUTION: Verify air pressure regulator and brake bleeder gage read zero before opening brake bleeder. Residual pressure in brake bleeder may cause hydraulic fluid to be expelled.

(e) Fill brake bleeder with MIL-PRF-87257 hydraulic fluid.
(f) Close feed valve on brake bleeder.
(g) Adjust pressure regulator to zero by turning knob counterclockwise.
(h) Connect air source to brake bleeder.
(i) Adjust pressure regulator slowly to 10 psi (69 kPa).
(j) Position end of tubing from brake bleeder into empty one gallon container.
(k) Open feed valve and allow fluid to flow until no air bubbles are present in tubing.

(l) Close feed valve.

(m) Remove plug from top of brake fluid reservoir.

(n) Install attach fitting to top of brake fluid reservoir, connect tubing from brake bleeder.

(o) Connect overflow tubing to bleeder valves on LH and RH brake calipers, secure tubing with hose clamps, and position ends of tubing into empty one gallon containers.

(p) Loosen LH and RH brake caliper bleeder valves one turn.

(q) Adjust pressure regulator slowly until pressure regulator and brake bleeder gage read 25 - 30 psi (172 - 207 kPa).

(r) Open feed valve on brake bleeder to check brake system and tubing for leaks.

(s) Allow to flow until fluid flows out of the overflow tubing on LH and RH brake calipers (1 - 2 minutes).

(t) Over tightening bleeder valve may damage brake caliper.

(u) Tighten bleeder valve on LH brake caliper.

(v) Depress pedals to move air through brake system using RH pedals on pilot and copilot sides.

1 Fully depress, then rapidly release RH pedal on pilot side three times.

2 Fully depress, then rapidly release RH pedal on co-pilot side three times.

3 Fully depress and hold the RH pedal on pilot side. While holding pedal, fully depress, then rapidly release RH pedal on co-pilot side five times.

4 Release RH pedals on pilot and co-pilot sides and allow fluid to flow for 15 seconds.

5 Repeat above steps a minimum of five times.

(w) Verify no air bubbles are present in overflow tubing on RH brake caliper before continuing. Repeat above steps as required.

CAUTION: Over tightening bleeder valve may damage brake caliper.

(x) Tighten bleeder valve on RH brake caliper.

(y) Loosen bleeder valve on LH brake caliper one turn.

(z) Depress pedals to move air through brake system using LH pedals on pilot and copilot sides.

1 Fully depress, then rapidly release LH pedal on pilot side three times.

2 Fully depress, then rapidly release LH pedal on co-pilot side three times.

3 Fully depress and hold the LH pedal on pilot side. While holding pedal, fully depress, then rapidly release LH pedal on co-pilot side five times.

4 Release LH pedals on pilot and co-pilot sides and allow fluid to flow for 15 seconds.

5 Repeat above steps a minimum of five times.

(aa) Verify no air bubbles are present in overflow tubing on LH brake caliper before continuing. Repeat above steps as required.

CAUTION: Over tightening bleeder valve may damage brake caliper.

(ab) Tighten bleeder valve on LH brake caliper.

(ac) Close feed valve on brake bleeder, and depressurize tank by removing air source.

(ad) Remove tubing and attach fitting from brake fluid reservoir. Cap off tubing to prevent contamination or spillage.

(ae) Remove overflow tubing from LH and RH brake calipers. Cap off tubing to prevent contamination or spillage.

(af) Remove filler cap and add MIL-PRF-87257 hydraulic brake fluid to brake fluid reservoir until full.

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

(ag) Use syringe to remove approximately 0.24 oz (7 ml) of hydraulic fluid from brake fluid reservoir to prevent overflow.

(ah) Install filler cap.

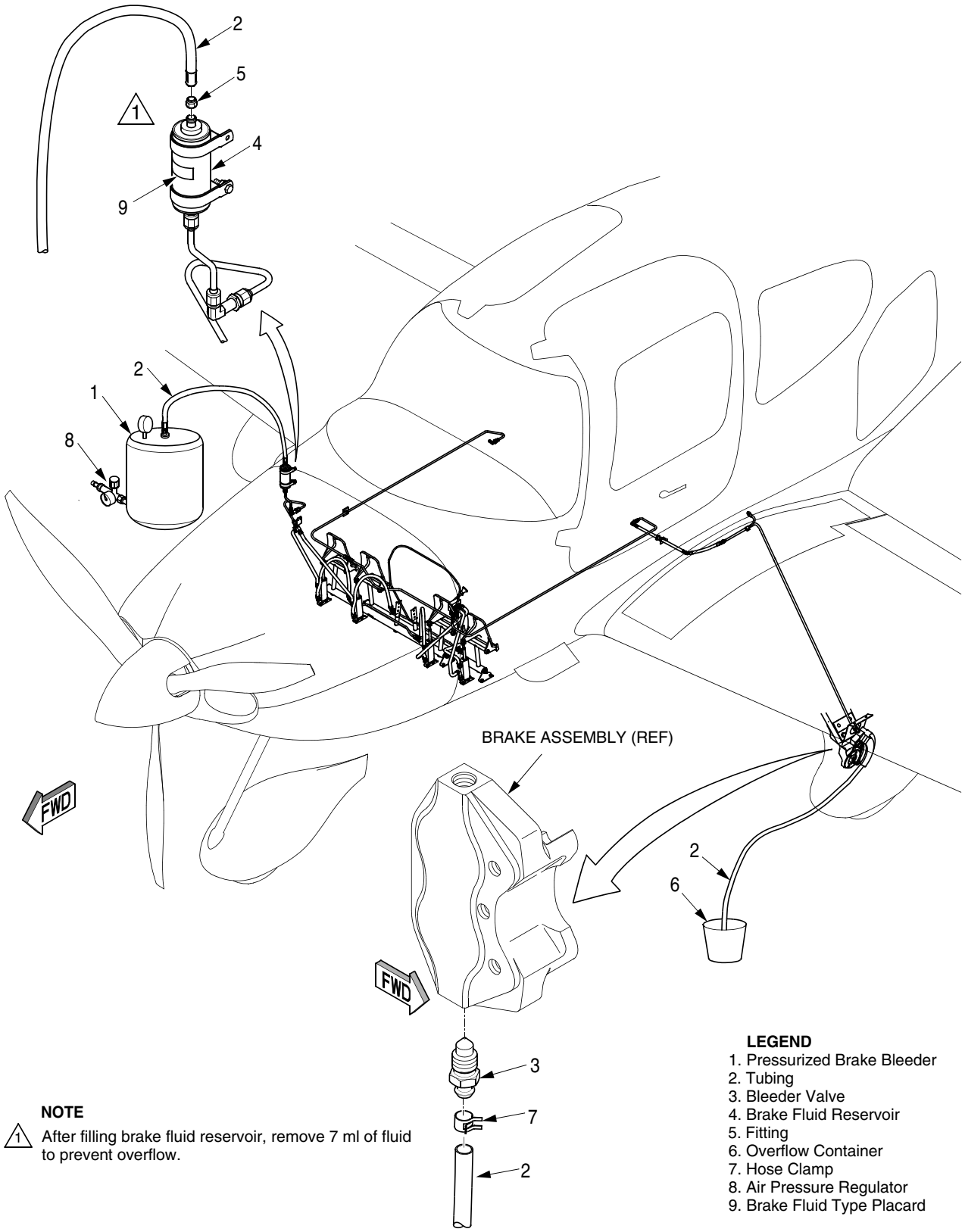
(ai) Inspect entire brake system for leakage or problems.

(aj) Test brake system.

1 Depress each pedal and verify pedal does not feel spongy.

2 If any brake pedal feels spongy, repeat Adjustment/Test - Bleeding the Brake System as required until desired result is obtained.

(ak) Install main gear fairings. (Refer to 32-10)



NOTE

1 After filling brake fluid reservoir, remove 7 ml of fluid to prevent overflow.

LEGEND

1. Pressurized Brake Bleeder
2. Tubing
3. Bleeder Valve
4. Brake Fluid Reservoir
5. Fitting
6. Overflow Container
7. Hose Clamp
8. Air Pressure Regulator
9. Brake Fluid Type Placard

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Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs.

Figure 32-4210
Bleeding the Brake System - Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

EFFECTIVITY:
Serials 1005 thru 2240 after SB2X-32-21, 2241 & subs

CHAPTER 33

LIGHTS

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CHAPTER 33 - LIGHTS
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33-TOC	4	04 SEP 2018
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33-40	27	01 FEB 2013
33-40	28	15 DEC 2014
33-40	29	01 FEB 2013
33-40	30	15 DEC 2014
33-40	31	01 FEB 2013
33-40	32	01 FEB 2013
33-40	33	01 FEB 2013
33-40	34	01 JAN 2016
33-40	35	01 JAN 2016
33-40	36	01 JAN 2016

EFFECTIVITY:
All

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LIGHTS

1. GENERAL

This chapter contains information for troubleshooting, removal, installation and adjustments of the interior and exterior lighting systems used on the airplane.

A. Exterior Lighting

Exterior lighting consists of standard wing tip navigation lights with integral anti-collision strobe lights and position lights. A single landing light is mounted in the left engine air inlet.

Serials 1886 & subs: A white recognition light is installed on the leading edge of each wing tip.

Serials 2078 & subs: Ice detection lights are installed in the fuselage skin just forward of the wings.

B. Interior Lighting

Interior lighting consists of separately controlled incandescent (*Serials 1005 thru 2302*) or LED (*Serials 2303 & subs*) overhead lights for general cabin lighting, incandescent (*Serials 1005 thru 2302*) or LED (*Serials 2303 & subs*) individual map lights for the pilots and passengers, and dimmable panel flood lights. The flight instruments and avionics equipment are integrally lighted and are controlled by a single dimming circuit.

Serials 2303 & subs w/o Convenience Lighting: LED lights in the LH and RH kick plates, LH and RH rear cabin side trim panels, aft console rear cover, cabin headliner above the baggage compartment, and entry steps are installed, but not functional.

C. Convenience Lighting - *Serials 2303 & subs w/ Convenience Lighting*

The LED cabin dome light, interior footwell lights, entry step lights, and baggage lights provide convenience lighting when aircraft power is off. A three-position cabin light switch labeled ON-AUTO-OFF is located on the cabin headliner and controls the LEDs via the convenience system controller installed on the fuselage skin below the RH passenger seat.

In the ON position:

- The cabin dome light and interior footwell lights turn on.
- The entry step lights turn on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turn off when both doors are closed or the doors are locked via the wireless keyfob.
- The baggage lights turn on when the baggage door is opened and turn off when the baggage door is closed.

In the AUTO position:

- The cabin dome light, interior footwell lights, and entry step lights turn on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turn off when both doors are closed or the doors are locked via the wireless keyfob.
- The baggage lights turn on when the baggage door is opened and turn off when the baggage door is closed.

In the OFF position:

- The cabin dome light, interior footwell lights, step lights, and baggage light turn off.

Regardless of switch position, all convenience lighting will turn off after several minutes of illumination with aircraft power off.

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FLIGHT COMPARTMENT

1. DESCRIPTION

Flight compartment interior lighting consists of instrument lights, glareshield flood lights, overhead dome light, individual reading lights, pilot control lights, CAPS handle light, alternate air control light, circuit breaker panel lights, and interior footwell lights. (See Figure 33-101)

A. Instrument Lighting

Instrument lighting for the airplane consists of dimmable incandescent lights in the instrument bezels. The lights are controlled through the INSTRUMENT control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The lights are powered by 28 VDC supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

B. Glareshield Light Strip

A string of dimmable LEDs mounted under the instrument panel glareshield provide flood lighting for the instrument panel. The LEDs are controlled through the PANEL control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

C. Cabin Dome Light

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: General cabin lighting is provided by a dimmable dome light located in the headliner at the approximate center of the cabin. The light is controlled through the OVERHEAD control knob on the bolster switch panel. Rotating the knob clockwise energizes the light and increases brightness. The light is powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

Serials 2016 & subs w/ Perspective Avionics and w/o Convenience Lighting: General cabin lighting is provided by a dome light located in the headliner at the approximate center of the cabin. The light is controlled by a ceiling-mounted switch and is powered by 28 VDC supplied through the 5-amp CABIN LIGHTS circuit breaker on Main Bus 1.

Serials 2303 & subs w/ Convenience Lighting: General cabin lighting is provided by a dome light located in the headliner at the approximate center of the cabin. The light is part of the convenience lighting system and is controlled via wireless keyfob or cabin light switch located on the cabin headliner. When the switch is in the AUTO position, the cabin dome light turns on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turns off when both doors are closed or the doors are locked via the wireless keyfob. 28 VDC for cabin dome light operation is supplied through the 3-amp CONV LIGHTS circuit breaker on the CONS Bus.

For maintenance practices related to passenger compartment convenience lighting, see Passenger Compartment section of Lights. (Refer to 33-20)

For maintenance practices related to entry step convenience lighting, see Exterior Lighting section of Lights. (Refer to 33-40)

For maintenance practices related to the convenience system controller, see Electrical Load Distribution section of Electrical Power. (Refer to 24-50)

D. Cabin Eyeball Lights

Individual eyeball-type reading lights are installed in the headliner above each passenger position. Each light is aimed by positioning the lens in the socket and is controlled by a push-button switch located next to the light. The pilot and copilot reading lights are dimmable through the PANEL control knob on the bolster switch panel. Rotating the knob clockwise increases brightness.

Serials 1005 & subs w/o Perspective Avionics: The lights are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

Serials 2016 & subs w/ Perspective Avionics: The lights are powered by 28 VDC supplied through the 5-amp CABIN LIGHTS circuit breaker on Main Bus 1.

E. Pilot Control Lights

Pilot control lights are installed in the headliner aft of the magnetic compass and provide light for the control yoke, environmental controls and engine control quadrant. Lighting is provided by two dimmable super-bright LEDs. The LEDs are controlled through the OVERHEAD control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

F. CAPS Handle Lighting

Serials 1005 thru 1422: CAPS handle lighting is provided by two super-bright LEDs. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

Serials 1423 & subs: CAPS handle lighting is provided by two super-bright LEDs. Light strip diffusers are connected to the LEDs to provide Illumination around the CAPS handle. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

G. Alternate Air Control Light

Alternate air control lighting is provided by one dimmable super-bright LED. The LED is controlled through the INSTRUMENT control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The LED is powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

H. Circuit Breaker Panel Lighting

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: Circuit breaker panel lighting is provided by six dimmable super bright LEDs. The LEDs are controlled through the INSTRUMENT control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

Serials 2016 & subs w/ Perspective Avionics: Circuit breaker panel lighting is provided by four dimmable super bright LEDs. Light strip diffusers are connected to the LEDs to provide Illumination at the circuit breaker panel. The LEDs are controlled through the INSTRUMENT control knob on the bolster switch panel. Rotating the knob clockwise energizes the lights and increases brightness. The LEDs are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

I. Interior Footwell Lighting - *Serials 2303 & subs w/ Convenience Lighting*

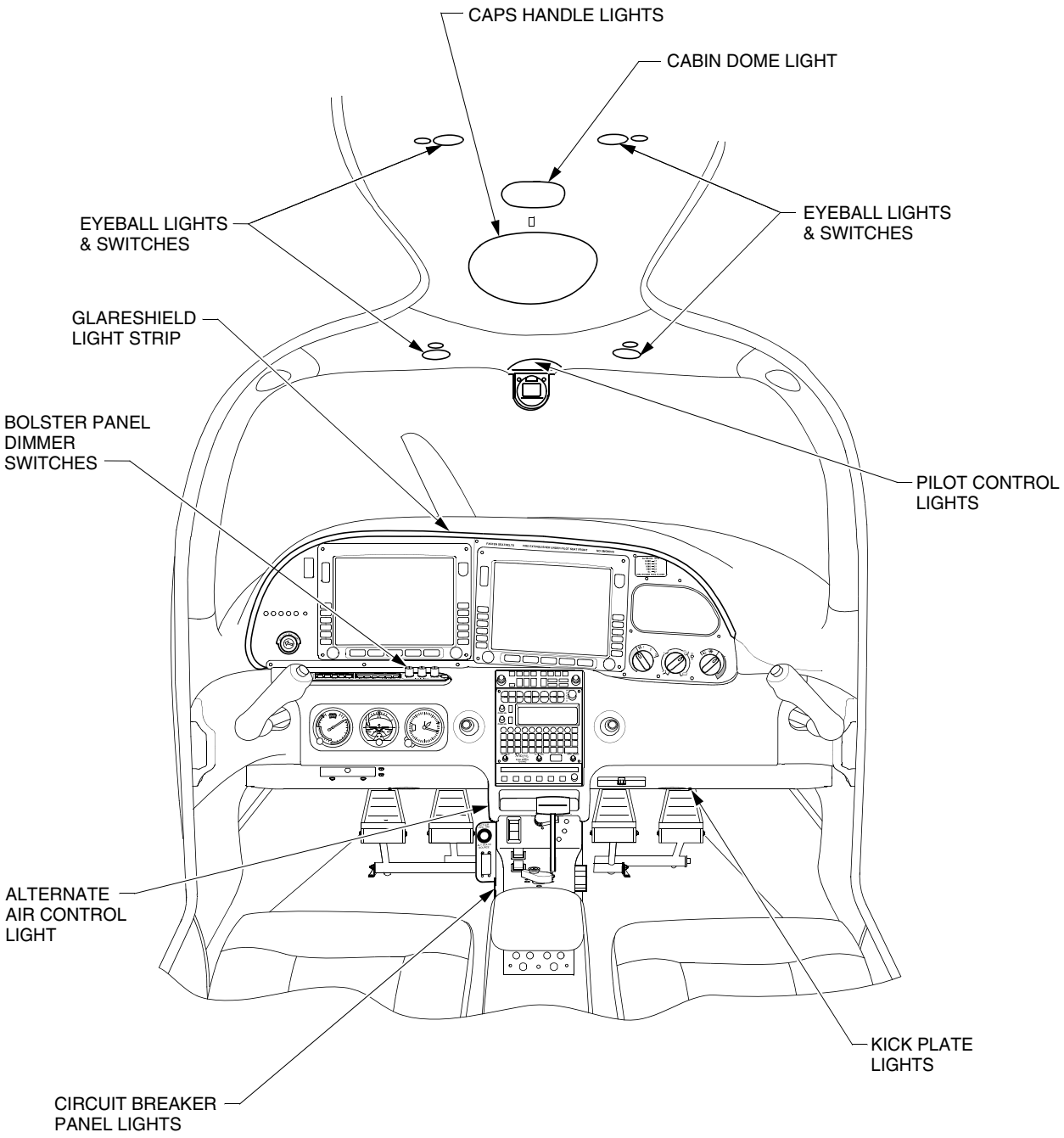
LED light assemblies are installed in the LH and right RH kick plates and are controlled via wireless keyfob or cabin light switch located on the cabin headliner. When the switch is in the AUTO position, the interior footwell lights turn on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turn off when both doors are closed or the doors are locked via the wireless keyfob. 28 VDC for convenience light operation is supplied through the 3-amp CONV LIGHTS circuit breaker on the CONS Bus.

For maintenance practices related to passenger compartment convenience lighting, see Passenger Compartment section of Lights. (Refer to 33-20)

For maintenance practices related to entry step convenience lighting, see Exterior Lighting section of Lights. (Refer to 33-40)

For maintenance practices related to the convenience system controller, see Electrical Load Distribution section of Electrical Power. (Refer to 24-50)

The LEDs used for interior lighting are either red (*Serials 1005 thru 1885*) or orange (*Serials 1886 & subs*).



SR20_MM33_1093C

Figure 33-101
Cabin Light Location

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Eyeball lights inoperative.	BAT 1 switch in OFF position.	Set BAT 1 switch to ON position.
	Dimmer switch in OFF position.	Set dimmer switch to ON position.
	Defective bulb.	Replace bulb.
	Circuit breaker or switch tripped.	Reset circuit breaker. Inspect for short circuit.
	Circuit breaker switch defective.	Check switch for continuity. Replace if defective.
	Loose electrical connection.	Tighten electrical connection.
	Defective power supply.	Replace power supply.
	Battery defective.	Replace battery.
Cabin dome light inoperative.	BAT 1 switch in OFF position.	Set BAT 1 switch to ON position.
	Dimmer switch in OFF position.	Set dimmer switch to ON position.
	Defective bulb.	Replace bulb.
	Circuit breaker or switch tripped.	Reset circuit breaker. Inspect for short circuit.
	Circuit breaker switch defective.	Check switch for continuity. Replace if defective.
	Loose electrical connection.	Tighten electrical connection.
	Defective power supply.	Replace power supply.
	Battery defective.	Replace battery.

3. MAINTENANCE PRACTICES

A. Cabin Lights (See Figure 33-102)

(1) Removal - Glareshield Light Strip
- (a) Pull CABIN LIGHTS circuit breaker.
- (b) Remove glareshield. (Refer to 25-10)
- (c) Remove light strip from retaining clips.
- (d) Remove screws securing clips to glareshield.

(2) Installation - Glareshield Light Strip
- (a) Position clips to glareshield and secure with screws.
- (b) Position light strip to glareshield and secure with clips.
- (c) Install glareshield. (Refer to 25-10)
- (d) Reset CABIN LIGHTS circuit breaker.
- (e) Verify proper operation of lights.

(3) Removal - Cabin Eyeball Light and Switch
- (a) Pull CABIN LIGHTS circuit breaker.
- (b) Remove cabin headliner. (Refer to 25-10)
- (c) Identify and disconnect cabin eyeball light and switch wire harnesses.
- (d) Depress mounting tabs and remove eyeball light and switch from headliner.

(4) Installation - Cabin Eyeball Light and Switch
- (a) Depress mounting tabs and install eyeball light and switch to headliner.
- (b) Connect eyeball light and switch wire harnesses.
- (c) Install cabin headliner. (Refer to 25-10)
- (d) Reset CABIN LIGHTS circuit breaker.
- (e) Verify proper operation of light and switch.

(5) Removal - Cabin Dome Light
- (a) *Serials 1005 & subs w/o Convenience Lighting:* Pull CABIN LIGHTS circuit breaker.
- (b) *Serials 2303 & subs w/ Convenience Lighting:* Pull CONV Lights circuit breaker.
- (c) Gently pry lens off of light base.
- (d) Remove cabin headliner. (Refer to 25-10)
- (e) Identify and disconnect cabin dome light wire harness.
- (f) Remove screws and nuts securing dome light to cabin headliner.

(6) Installation - Cabin Dome Light
- (a) Position dome light to headliner and secure with screws and nuts.
- (b) Connect dome light wire harness.
- (c) Install cabin headliner. (Refer to 25-10)
- (d) Secure lens to dome light.
- (e) *Serials 1005 & subs w/o Convenience Lighting:* Reset CABIN LIGHTS circuit breaker.
- (f) *Serials 2303 & subs w/ Convenience Lighting:* Reset CONV LIGHTS circuit breaker.
- (g) Verify proper operation of light.

(7) Removal - CAPS Handle Lighting
- (a) Pull CABIN LIGHTS circuit breaker.
- (b) Remove CAPS handle cover.
- (c) Verify CAPS handle safety pin is installed to prevent accidental discharge of CAPS rocket.
- (d) Remove cabin headliner. (Refer to 25-10)
- (e) Disconnect LED light assembly from wire harness.
- (f) *Serials 1005 thru 1422:* Remove epoxy securing LEDs to cabin headliner.
- (g) *Serials 1423 & subs:* Disconnect light strip diffusers from LED light assembly.

(h) Remove LED light assembly from cabin headliner.

(8) Installation - CAPS Handle Lighting

(a) *Serials 1005 thru 1422:* Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Epoxy Adhesive	5 Minute Epoxy	Devcon	Secure LEDs.

(b) *Serials 1005 thru 1422:* Position LEDs to cabin headliner and secure with 5 minute epoxy.

(c) *Serials 1423 & subs:* Connect light strip diffusers to LED light assembly.

(d) Connect LED light assembly to wire harness.

(e) Install cabin headliner. (Refer to 25-10)

(f) Install CAPS handle cover.

(g) Reset CABIN LIGHTS circuit breaker.

(h) Verify proper operation of lights.

(9) Removal - Circuit Breaker Panel Lighting - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

(a) Pull CABIN LIGHTS circuit breaker.

(b) Remove left mid console circuit breaker trim. (Refer to 25-10)

(c) Remove epoxy securing LEDs to mounting brackets.

(d) Disconnect LED light assembly from wire harness.

(e) Remove LED light assembly from airplane.

(10) Installation - Circuit Breaker Panel Lighting - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Epoxy Adhesive	5 Minute Epoxy	Devcon	Secure LEDs.

(b) Position LEDs to mounting brackets and secure with 5 minute epoxy.

(c) Push each of the six LEDs into the circuit breaker panel lighting brackets.

(d) Connect LED light assembly to wire harness.

(e) Install left mid console circuit breaker trim. (Refer to 25-10)

(f) Reset CABIN LIGHTS circuit breaker.

(g) Verify proper operation of lights.

(11) Removal - Circuit Breaker Panel Lighting - *Serials 2016 & subs w/ Perspective Avionics*

(a) Pull CABIN LIGHTS circuit breaker.

(b) Disconnect light strip diffusers from LED light assembly.

(c) To disconnect LED diode, use a solder gun and remove solder from each diode lead.

(12) Installation - Circuit Breaker Panel Lighting - *Serials 2016 & subs w/ Perspective Avionics*

(a) Identify corresponding wires and place heat shrink tubing into position. Solder each wire to corresponding lead on LED diode.

(b) Apply heat to heat shrink tubing.

(c) Connect light strip diffusers to LED light assembly.

(d) Reset CABIN LIGHTS circuit breaker.

(e) Verify proper operation of lights.

(13) Removal - Alternate Air Control Light

(a) Remove left bolster trim. (Refer to 25-10)

(b) Disconnect LED light assembly from wire harness.

(c) Remove epoxy securing LED light assembly to bolster trim. Remove LED light assembly from airplane.

(14) Installation - Alternate Air Control Light

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Epoxy Adhesive	5 Minute Epoxy	Devcon	Secure LED.

(b) Position LED to left bolster trim and secure with 5 minute epoxy.

(c) Connect LED light assembly to wire harness.

(d) Install left bolster trim. (Refer to 25-10)

(e) Verify proper operation of light.

(15) Removal - Pilot Control Lights

(a) Pull CABIN LIGHTS circuit breaker.

(b) Remove cabin headliner. (Refer to 25-10)

(c) Disconnect LED light assembly from wire harness.

(d) Remove epoxy securing LEDs to cabin headliner. Remove LED light assembly from airplane.

(16) Installation - Pilot Control Lights

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Epoxy Adhesive	5 Minute Epoxy	Devcon	Secure LEDs.

(b) Position LED to cabin headliner and secure with 5 minute epoxy.

(c) Connect LED light assembly to wire harness.

(d) Install cabin headliner. (Refer to 25-10)

(e) Reset CABIN LIGHTS circuit breaker.

(f) Verify proper operation of lights.

(17) Removal - Interior Footwell Lighting - *Serials 2303 & subs w/ Convenience Lighting*

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Remove kick plate. (Refer to 25-10)

(d) Remove nut securing LED lampholder to kick plate.

(e) Unscrew LED from LED lampholder and remove from airplane.

(18) Installation - Interior Footwell Lighting - *Serials 2303 & subs w/ Convenience Lighting*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	LED assembly installation.

(b) Apply Loctite® to threads of LED lampholder.

(c) Secure LED lampholder to kick plate with nut.

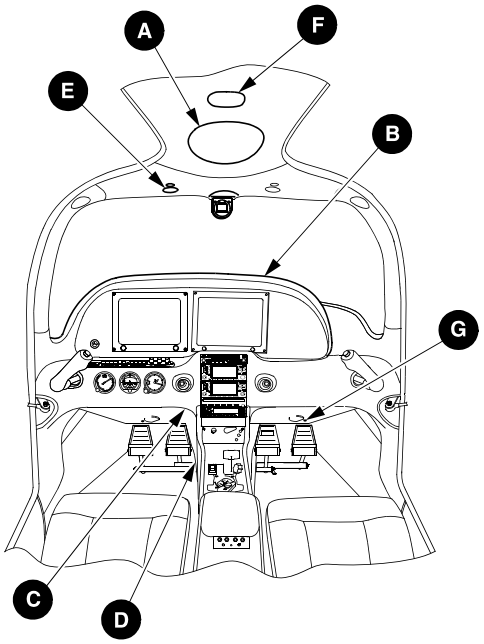
(d) Apply Loctite® to threads of LED.

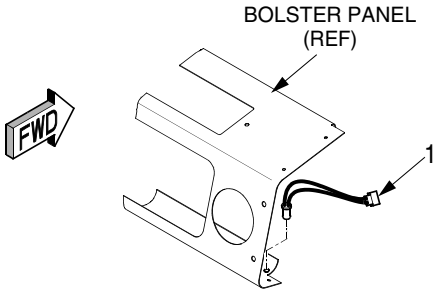
(e) Screw LED into LED lampholder.

(f) Install kick plate. (Refer to 25-10)

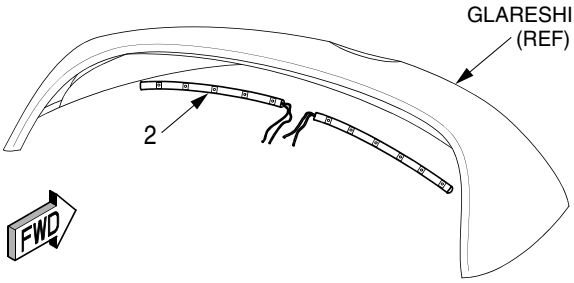
(g) Reset CONV lights circuit breaker.

(h) Verify proper operation of light.

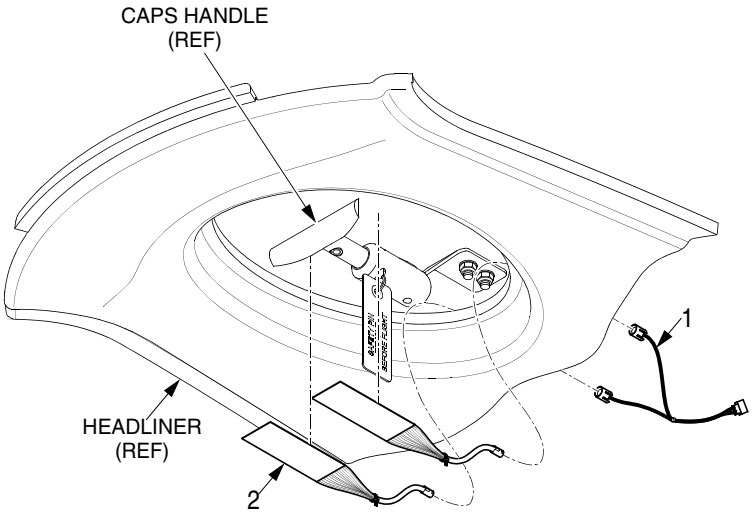




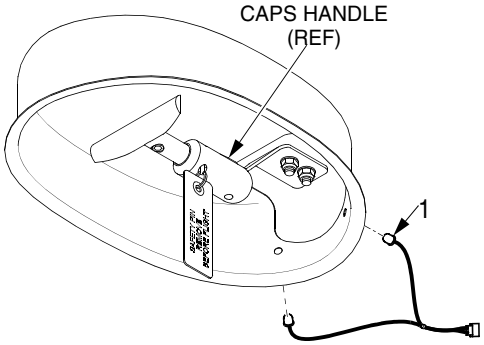
DETAIL C



DETAIL B



Serials 1423 & subs.



Serials 1005 thru 1422.

LEGEND
1. Wire Harness
2. Light Strip Diffuser

DETAIL A

SR20_MM33_1799B

Figure 33-102
Cabin Lights (Sheet 1 of 3)

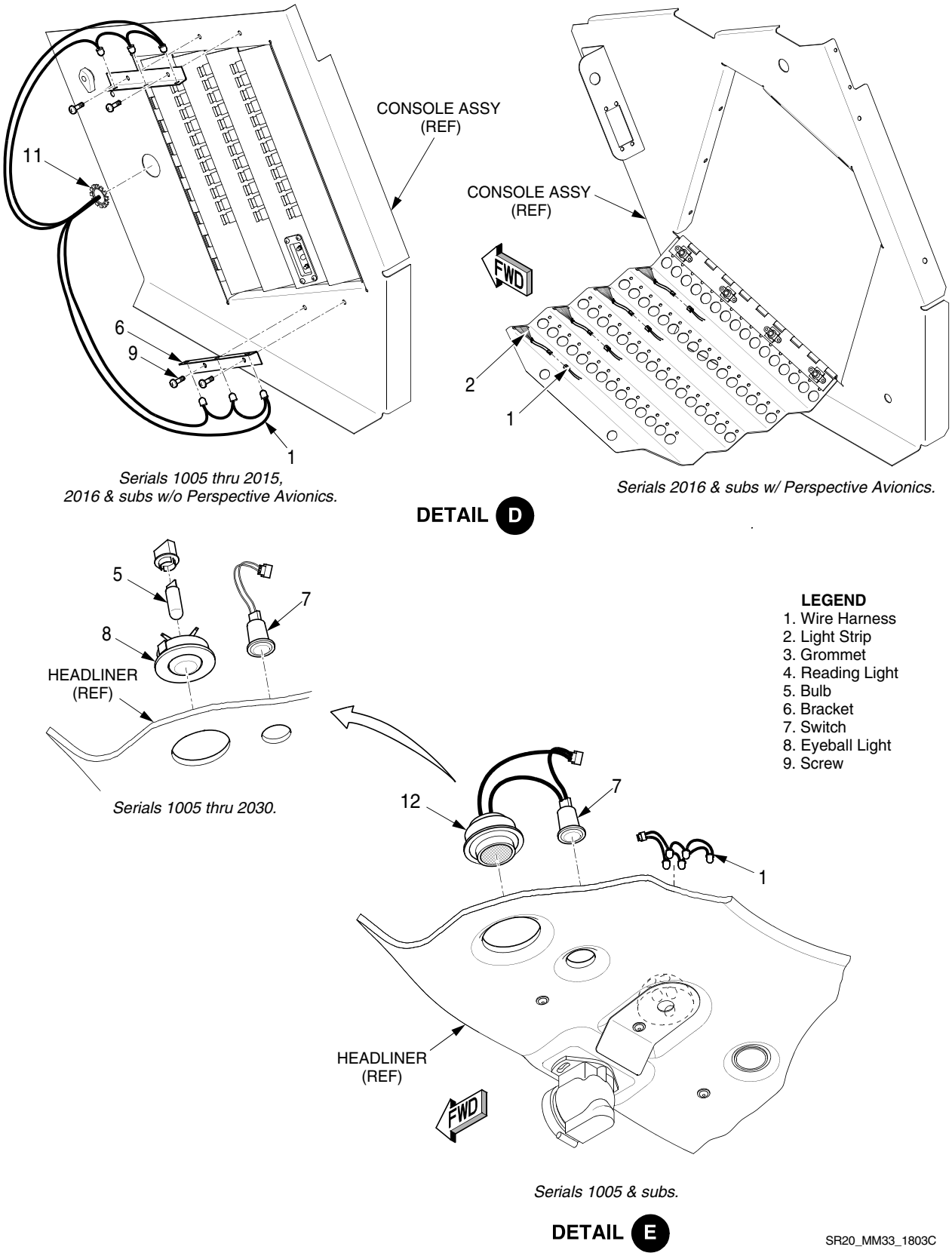
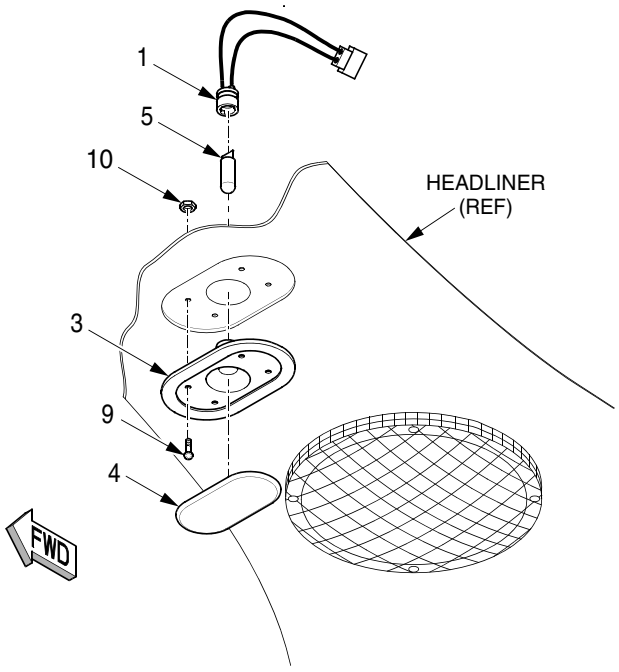
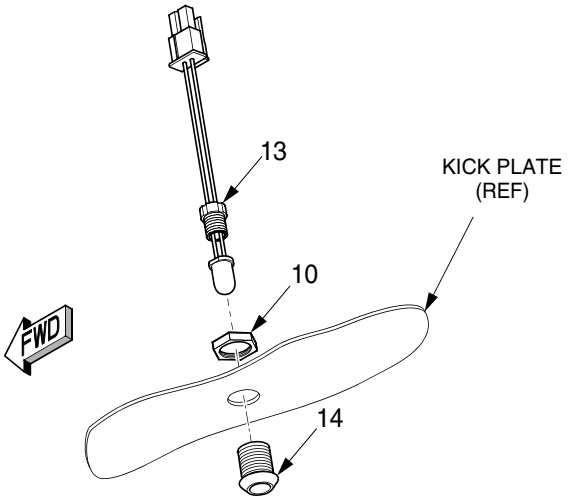


Figure 33-102
Cabin Lights (Sheet 2 of 3)



DETAIL F



DETAIL G

Serials 2303 & subs.

LEGEND
1. Wire Harness
5. Bulb
9. Screw
10. Nut
12. Reading Light
13. LED Light Assembly
14. Lampholder
15. Lens
16. Cabin Dome Light

SR20_MM33_4245

Figure 33-103
Cabin Lights (Sheet 3 of 3)

B. Dimmer Switch

(1) Removal - Dimmer Switch
- (a) Remove LH kick plate. (Refer to 25-10)
- (b) Remove left bolster trim. (Refer to 25-10)
- (c) Identify each wire to the switch and desolder wires.
- (d) Remove nut and washer securing switch to bolster panel.
- (e) Remove switch from bolster panel.

(2) Installation - Dimmer Switch
- (a) Position switch to bolster panel and secure with washer and nut.
- (b) Solder wires to corresponding switch terminals.
- (c) Install left bolster trim. (Refer to 25-10)
- (d) Install LH kick plate. (Refer to 25-10)
- (e) Verify proper operation of switch.

(3) Removal - Dimmer Circuit Card (See Figure 33-104)
- (a) Remove LH crew seat. (Refer to 25-10)
- (b) Remove LH kick plate. (Refer to 25-10)
- (c) Disconnect wiring harness from dimmer circuit card.
- (d) Remove screws securing dimmer circuit card to console rib. Remove dimmer circuit card from airplane.

(4) Installation - Dimmer Circuit Card
- (a) Position dimmer circuit card to console rib and secure with screws.
- (b) Connect wiring harness to dimmer circuit card.
- (c) Install LH kick plate. (Refer to 25-10)
- (d) Install LH crew seat. (Refer to 25-10)

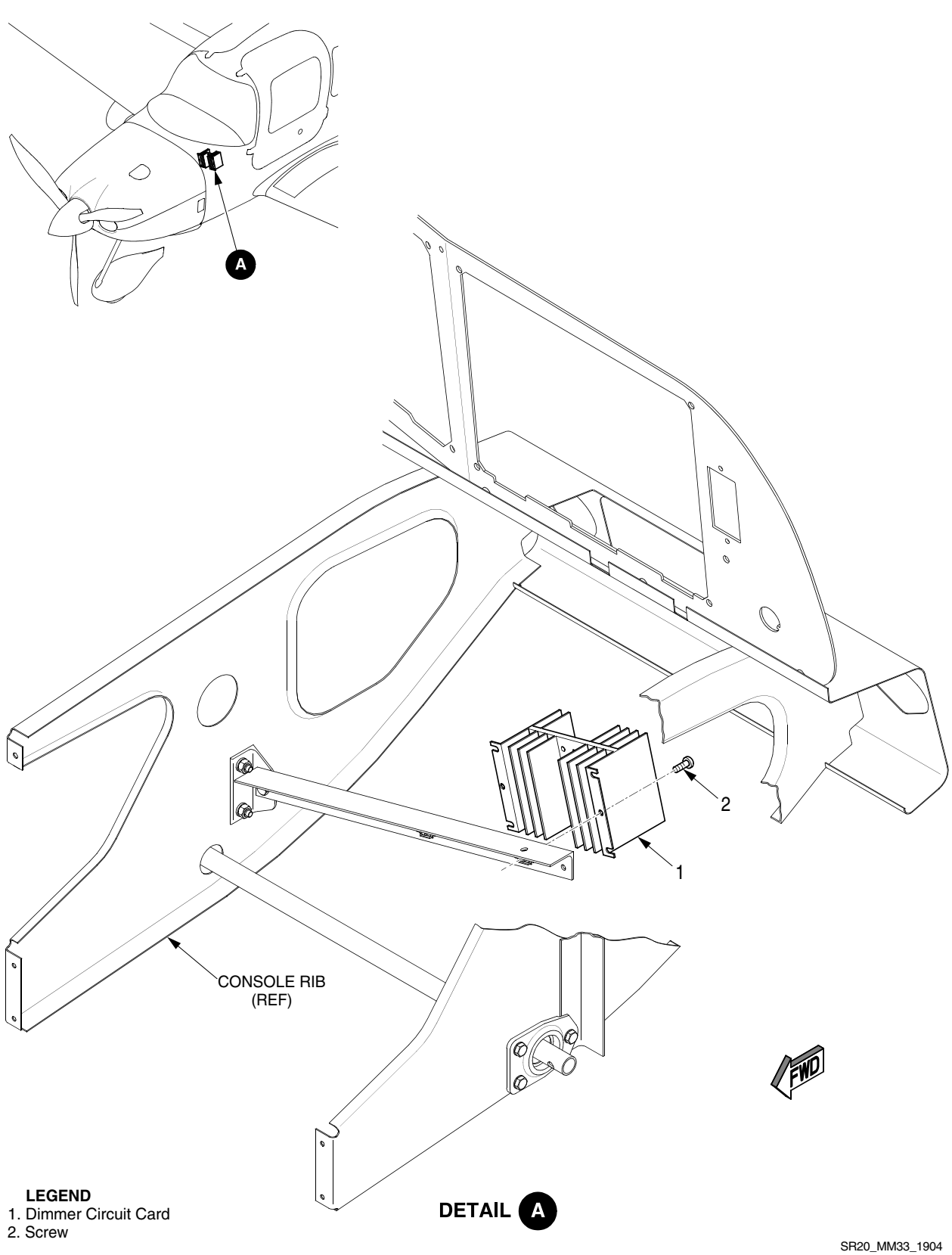


Figure 33-104
Dimmer Circuit Card Installation

C. Bulb Replacement (See Figure 33-105)

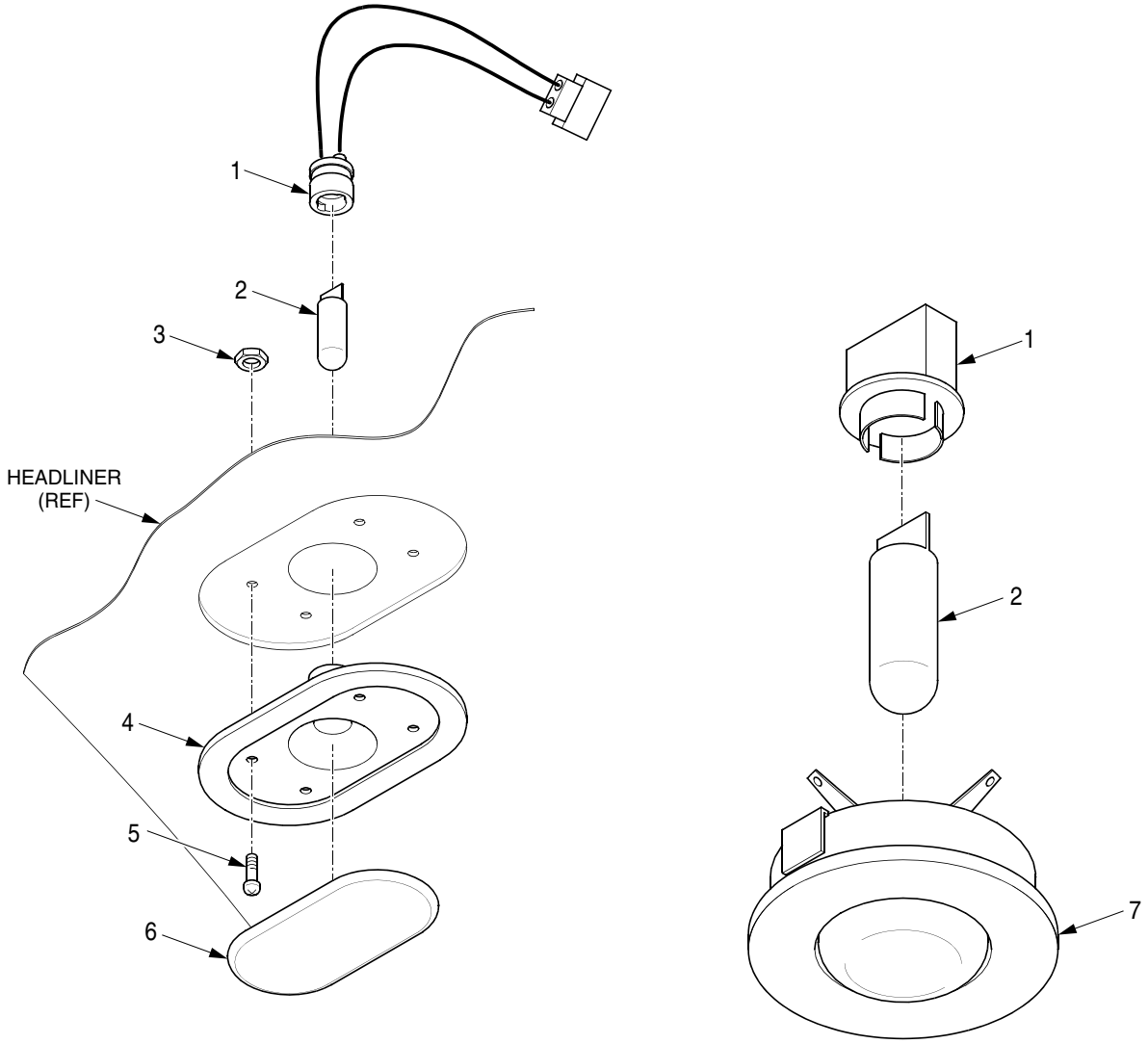
CAUTION: Always wear clean cotton gloves when working with bulbs. Never allow glass portion of bulb to come into contact with exposed skin. Oils from the exposed skin will cause premature bulb failure.

(1) Removal - Cabin Eyeball Light Bulb
  (a) Pull CABIN LIGHTS circuit breaker.
  (b) Remove cabin headliner. (Refer to 25-10)
  (c) Rotate bulb and pull to remove bulb from socket.

(2) Installation - Cabin Eyeball Light Bulb
  (a) Position bulb to socket and rotate to secure.
  (b) Install cabin headliner. (Refer to 25-10)
  (c) Reset CABIN LIGHTS circuit breaker.
  (d) Verify proper operation of light.

(3) Removal - Cabin Dome Light Bulb
  (a) *Serials 1005 & subs w/o Convenience Lighting:* Pull CABIN LIGHTS circuit breaker.
  (b) *Serials 2303 & subs w/ Convenience Lighting:* Pull CONV Lights circuit breaker.
  (c) Remove lens from dome light.
  (d) Remove bulb from socket.

(4) Installation - Cabin Dome Light Bulb
  (a) Position bulb to socket and push to secure.
  (b) Secure lens to dome light.
  (c) *Serials 1005 & subs w/o Convenience Lighting:* Reset CABIN LIGHTS circuit breaker.
  (d) *Serials 2303 & subs w/ Convenience Lighting:* Reset CONV LIGHTS circuit breaker.
  (e) Verify proper operation of light.



LEGEND
1. Connector
2. Bulb
3. Nut
4. Cabin Dome Light
5. Screw
6. Lens
7. Eyeball Light

SR20_MM33_1076B

Figure 33-105
Interior Bulb Replacement

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PASSENGER COMPARTMENT

1. DESCRIPTION

This section covers the passenger compartment lighting.

A. Passenger Eyeball Lights

Individual eyeball-type reading lights are installed in the headliner above each passenger position. Each light is aimed by positioning the lens in the socket and is controlled by a push-button switch located next to the light.

Serials 1005 & subs w/o Perspective Avionics: The lights are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

Serials 2016 & subs w/ Perspective Avionics: The lights are powered by 28 VDC supplied through the 5-amp CABIN LIGHTS circuit breaker on Main Bus 1.

B. Interior Footwell Lighting - *Serials 2303 & subs w/ Convenience Lighting*

LED light assemblies are installed in the LH and RH rear cabin side trim panels and the aft console rear cover and are controlled via wireless keyfob or cabin light switch located on the cabin headliner. When the switch is in the AUTO position, the interior footwell lighting turns on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turns off when both doors are closed or the doors are locked via the wireless keyfob. 28 VDC for the convenience light operation is supplied through the 3-amp CONV LIGHTS circuit breaker on the CONS Bus.

For maintenance practices related to flight compartment convenience lighting, see Flight Compartment section of Lights. (Refer to 33-10)

For maintenance practices related to entry step convenience lighting, see Exterior Lighting section of Lights. (Refer to 33-40)

For maintenance practices related to the convenience system controller, see Electrical Load Distribution section of Electrical Power. (Refer to 24-50)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Reading lights inoperative.	BAT 1 switch in OFF position.	Set BAT 1 switch to ON position.
	Dimmer switch in OFF position.	Set dimmer switch to ON position.
	Defective bulb.	Replace bulb.
	Circuit breaker or switch tripped.	Reset circuit breaker. Inspect for short circuit.
	Circuit breaker switch defective.	Check switch for continuity. Replace if defective.
	Loose electrical connection.	Tighten electrical connection.
	Defective power supply.	Replace power supply.
	Battery defective.	Replace battery.

3. MAINTENANCE PRACTICES

A. Passenger Eyeball Lights

(1) Removal - Passenger Eyeball Light and Switch

(a) Pull CABIN LIGHTS circuit breaker.

(b) Remove cabin headliner. (Refer to 25-10)

(c) Disconnect eyeball light and switch wire harnesses.

(d) Depress mounting tabs and remove eyeball light and switch from headliner.

(2) Installation - Passenger Eyeball Light and Switch

(a) Depress mounting tabs and install eyeball light and switch to headliner.

(b) Connect eyeball light and switch wire harnesses.

(c) Install cabin headliner. (Refer to 25-10)

(d) Reset CABIN LIGHTS circuit breaker.

(e) Verify proper operation of light and switch.

B. Bulb Replacement

CAUTION: Always wear clean cotton gloves when working with bulbs. Never allow glass portion of bulb to come into contact with exposed skin. Oils from the exposed skin will cause premature bulb failure.

(1) Removal - Passenger Eyeball Light Bulb
  (a) Pull CABIN LIGHTS circuit breaker.
  (b) Remove cabin headliner. (Refer to 25-10)
  (c) Rotate bulb and pull to remove bulb from socket.

(2) Installation - Passenger Eyeball Light Bulb
  (a) Position bulb to socket and rotate to secure.
  (b) Install cabin headliner. (Refer to 25-10)
  (c) Reset the CABIN LIGHTS circuit breaker.
  (d) Verify proper operation of light.

C. Interior Footwell Lighting - *Serials 2303 & subs w/ Convenience Lighting* **(See Figure 33-201)**

(1) Removal - Interior Footwell Lighting - Rear Cabin Side Trim

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Remove rear cabin side trim. (Refer to 25-10)

(d) Remove nut securing LED lampholder to rear cabin side trim.

(e) Unscrew LED from LED lampholder and remove from airplane.

(2) Installation - Interior Footwell Lighting - Rear Cabin Side Trim

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source.	LED assembly installation.

(b) Apply Loctite® to threads of LED lampholder.

(c) Secure LED lampholder to rear cabin side trim with nut.

(d) Apply Loctite® to threads of LED.

(e) Screw LED into LED lampholder.

(f) Install rear cabin side trim. (Refer to 25-10)

(g) Reset CONV lights circuit breaker.

(h) Verify proper operation of light.

(3) Removal - Interior Footwell Lighting - Aft Console Rear Cover

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Open center console armrest and remove glove box. (Refer to 25-10)

(d) Disconnect LED light assembly from wire harness.

(e) Remove nut securing LED lampholder to aft console rear cover.

(f) Unscrew LED from LED lampholder and remove from airplane.

(4) Installation - Interior Footwell Lighting - Aft Console Rear Cover

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source.	LED assembly installation.

(b) Apply Loctite® to threads of LED lampholder.

(c) Secure LED lampholder to aft console rear cover with nut.

(d) Apply Loctite® to threads of LED.

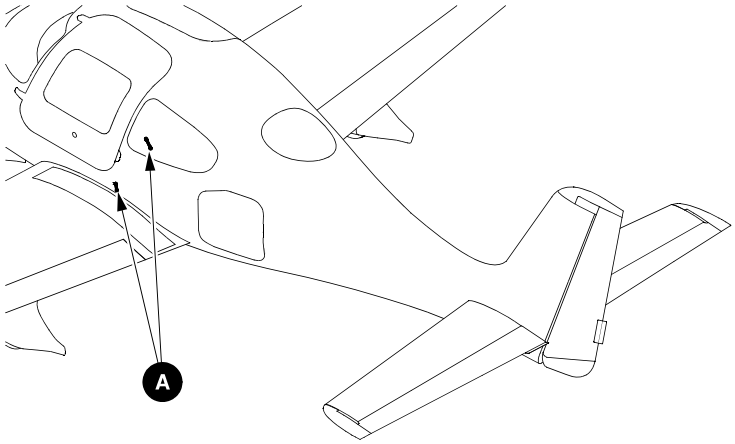
(e) Screw LED into LED lampholder.

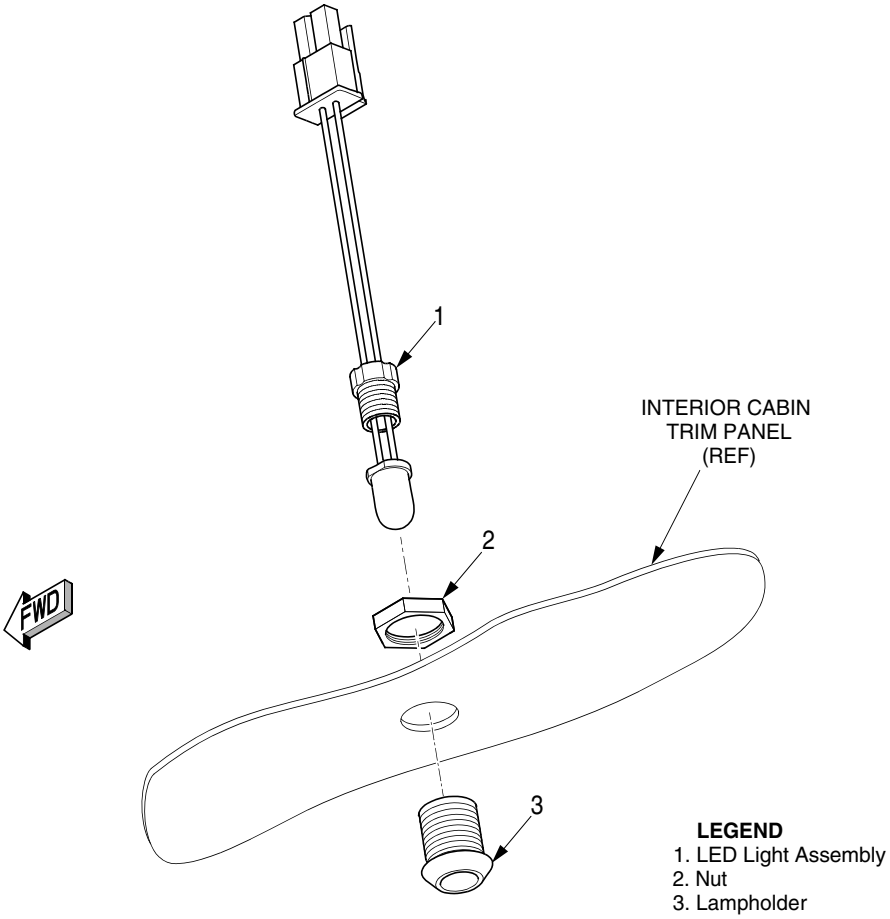
(f) Connect LED light assembly to wire harness.

(g) Install glove box. (Refer to 25-10)

(h) Reset CONV lights circuit breaker.

(i) Verify proper operation of light.





DETAIL A

Serials 2303 & subs.

SR20_MM33_4242

Figure 33-201
Interior Footwell Lighting Installation - Serials 2303 & subs w/ Convenience Lighting

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

CARGO COMPARTMENT

1. GENERAL

This section covers cargo compartment lighting.

A. Baggage Lights - *Serials 2303 & subs w/ Convenience Lighting*

LED light assemblies are installed in the headliner above the baggage compartment and are controlled via wireless keyfob or cabin light switch located on the cabin headliner. When the switch is in the ON or AUTO position, the baggage lights turn on when the baggage door is opened and turn off when the baggage door is closed. 28 VDC for convenience light operation is supplied through the 3-amp CONV LIGHTS circuit breaker on the CONS Bus.

For maintenance practices related to passenger compartment convenience lighting, see Passenger Compartment section of Lights. (Refer to 33-20)

For maintenance practices related to entry step convenience lighting, see Exterior Lighting section of Lights. (Refer to 33-40)

For maintenance practices related to the convenience system controller, see Electrical Load Distribution section of Electrical Power. (Refer to 24-50)

2. MAINTENANCE PRACTICES

A. Baggage Lights - *Serials 2303 & subs w/ Convenience Lighting* (See Figure 33-301)

(1) Removal - Baggage Lights

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Remove garment bracket. (Refer to 25-10)

(d) Remove B-pillar trim. (Refer to 25-10)

(e) Remove rear headliner trim. (Refer to 25-10)

(f) Remove four screws and washers securing aft end of cabin headliner to standoffs.

(g) Disconnect baggage light from wire harness.

(h) Remove nut securing baggage light to headliner and remove from airplane.

(2) Installation - Baggage Lights

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	Baggage light installation.

(b) Apply Loctite® to threads of baggage light.

(c) Secure baggage light to headliner with nut.

(d) Connect baggage light to wire harness.

(e) Install four screws and washers securing aft end of cabin headliner to standoffs.

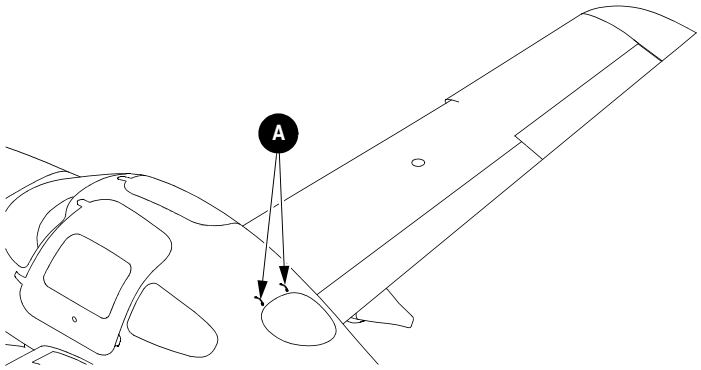
(f) Install rear headliner trim. (Refer to 25-10)

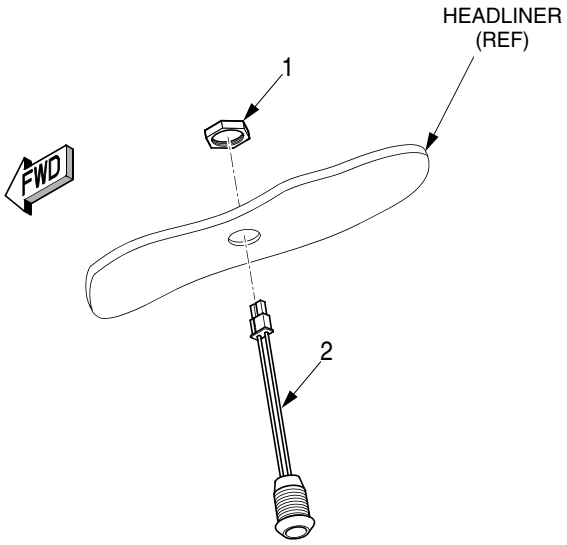
(g) Install B-pillar trim. (Refer to 25-10)

(h) Install garment bracket. (Refer to 25-10)

(i) Reset CONV LIGHTS circuit breaker.

(j) Verify proper operation of light.





LEGEND
1. Nut
2. LED Light Assembly

DETAIL A

Serials 2303 & subs w/ Convenience Lighting

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Figure 33-301
Baggage Lights - Serials 2303 & subs w/ Convenience Lighting

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

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EXTERIOR LIGHTING

1. DESCRIPTION

This section covers that portion of the system which provides illumination outside of the aircraft. This includes the landing light, anti-collision strobe light, recognition light, and ice light.

A. Landing Light

(1) Halogen Light - *Serials 1005 thru 1422*

A 28-volt, 250-watt, 150,000-candle power halogen landing light is installed in the left air inlet of the engine cowling *(Serials 1005 thru 1147 before SB 20-71-03)*, or the lower engine cowling *(Serials 1148 thru 1422, 1005 thru 1147 after SB 20-71-03)*.

Serials 1005 thru 1147 before SB 20-71-03: The light is spring mounted to the engine baffling and is ground adjustable by three mounting screws *(Serials 1005 thru 1147 before SB 20-33-01)* or the light is mounted with two springs and a vibration mount and is ground adjustable by two mounting screws *(Serials 1005 thru 1147 after SB 20-33-01)*.

Serials 1148 thru 1422, Serials 1005 thru 1147 after SB 20-71-03: The light is mounted with a spring and two vibration mounts and is ground adjustable by the upper mounting screw.

The landing light is controlled through the LANDING light switch on the instrument panel bolster. The switch energizes a control relay in the MCU that completes a 28 VDC circuit from the airplane main distribution bus to the landing light. A 30-amp breaker *(Serials 1005 thru 1267)* or 15-amp breaker *(Serials 1268 thru 1422)* on the MCU main distribution bus protects the circuit.

(2) HID Light - *Serials 1148 & subs*

A 24-volt High Intensity Discharge (HID) landing light is installed in the lower engine cowling *(Serials 1148 thru 1422, Serials 1005 thru 1147 after SB 20-71-03)*, or the lower LH engine cowl *(Serials 1423 & subs)*.

Serials 1148 thru 1422, Serials 1005 thru 1147 after SB 20-71-03 w/ HID Bulb: The landing light is installed in the lower engine cowling. The light is mounted with a spring and two vibration mounts and is ground adjustable by the upper mounting screw.

Serials 1423 & subs: The landing light is installed in the lower LH engine cowl. The light is rubber-mounted to the cowl and is ground adjustable by mounting screws.

The landing light is controlled through the LAND light switch on the instrument panel bolster. The switch energizes a control relay in the MCU that completes a 28 VDC circuit from the airplane main distribution bus to the landing light ballast. The ballast, located on the firewall *(Serials 1148 thru 1422, 2016 thru 2043 w/ Perspective Avionics),* the MCU cover *(Serials 1423 thru 2043 w/o Perspective Avionics)*, or cowling *(Serials 2043 & subs)* provides boosted voltage to illuminate the HID lamp. A 30-amp breaker *(Serials 1005 thru 1267)* or 15-amp breaker *(Serials 1268 & subs)* on the MCU main distribution bus protects the circuit.

(3) LED Light - *Serials 1005 thru 1267 after SB2X-33-07, 1268 and subs*

A self-contained all LED landing light is installed in the lower engine cowl. The light is shock-mounted to the cowl and is ground adjustable by mounting screws. The landing light is controlled through the LAND light switch on the instrument panel bolster. The switch energizes a control relay in the MCU that completes a 28 VDC circuit from the airplane Main Distribution Bus to the landing light. A 15-amp breaker on the MCU Main Distribution Bus protects the circuit.

B. Anti-collision Strobe Light Assembly

The airplane is equipped with an anti-collision strobe light assembly mounted to outboard surface of each wing tip. The light assembly includes a red (LH wing) or green (RH wing) navigation light in forward position, an anti-collision strobe light in middle position, and a white position light in rear position.

(1) Bulb/Flash Tube Strobe - *Serials 1005 thru 2016 before SB 2X-33-03*

The anti-collision strobe light utilizes bulbs for both the forward and rear position lights, and flash tube for the anti-collision light.

(2) LED/Flash Tube Strobe - *Serials 1005 thru 2016 after SB 2X-33-03, 2017 & subs*

The anti-collision strobe light utilizes LEDs for both the forward (three LEDs) and rear position lights (two LEDs), and flash tube for the anti-collision light.

(3) LED Strobe - *Serials 2127 & subs*

The anti-collision strobe light is a self-contained all LED assembly utilizing LEDs for anti-collision (thirty-six LEDs), forward (five red LEDs for LH wing or four green LEDs for RH wing), and rear position lights (two LEDs).

The navigation and position lights are controlled through the NAV light switch on the instrument panel bolster. 28 VDC for navigation light operation is supplied through the 5-amp NAV LIGHTS circuit breaker on non-essential bus.

Each anti-collision strobe light is flashed by a separate power supply. The strobe power supplies are controlled through the STROBE light switch on the instrument panel bolster. 28 VDC for strobe light and control circuits is supplied through the 5-amp STROBE LIGHTS circuit breaker on non-essential bus.

C. Recognition Light Assembly - *Serials 1886 & subs*

A white recognition light assembly is installed on the leading edge of each wing tip. Each recognition light assembly consists of three LEDs and a power supply. The LEDs illuminate in a constant ON configuration and are controlled through the LAND light switch on the instrument panel bolster.

Serials w/o Perspective Avionics: 28 VDC for recognition light operation is supplied through the 5-amp REC/INST LTS circuit breaker on Main Bus 1.

Serials w/ Perspective Avionics: 28 VDC for recognition light operation is supplied through the 5-amp RECOG LIGHTS circuit breaker on the Non-Essential Bus (*Serials 2016 thru 2240*) or Main Bus 3 (*Serials 2241 & subs*).

D. Ice Detection Light Assembly - *Serials 2078 & subs*

Two white Ice Detection Light assemblies are installed in the fuselage skin just forward of the wings to illuminate the wing and horizontal leading edges to provide visual verification of icing conditions. Each Ice Detection Light consists of three LEDs. The LEDs illuminate in a constant ON configuration and are controlled through the ICE LIGHT switch on the bolster panel. 28 VDC for the Ice Detection Light operation is supplied through the 5-amp ICE LIGHTS circuit breaker on Main Bus 1.

E. Entry Step Lights - *Serials 2303 & subs w/ Convenience Lighting*

LED light assemblies are installed in LH and RH step assemblies and are controlled via wireless keyfob or cabin light switch located on the cabin headliner. When the switch is in the ON or AUTO position, the entry step lights turn on when either cabin door is opened or the doors are unlocked via the wireless keyfob and turn off when both doors are closed or the doors are locked via the wireless keyfob. 28 VDC for the convenience light operation is supplied through the 3-amp CONV LIGHTS circuit breaker on the CONS Bus.

For maintenance practices related to flight compartment convenience lighting, see Flight Compartment section of Lights. (Refer to 33-10)

For maintenance practices related to passenger compartment convenience lighting, see Passenger Compartment section of Lights. (Refer to 33-20)

For maintenance practices related to the convenience system controller, see Electrical Load Distribution section of Electrical Power. (Refer to 24-50)

2. MAINTENANCE PRACTICES

A. Landing Light - *Serials 1005 thru 1147* (See Figure 33-401)

(1) Removal - Landing Light

(a) Place landing light switch in OFF position.

(b) Ensure BATTERY and AVIONICS master switches are in OFF position.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect the battery. (Refer to 24-30)

(e) Identify and note routing of landing light wires.

(f) Remove screw from ring clamp assembly.

(g) Remove screws and washers connecting wires to landing light.

Note: Record the number of turns required to remove the upper adjustment/mounting screw. Tighten screw the same amount during installation.

(h) Remove upper mounting hardware.

1 *Serials 1005 thru 1147 before SB 20-33-01:* Remove upper adjustment/mounting screw, washers, and spring.

2 *Serials 1005 thru 1147 after SB 20-33-01*: Remove upper nut, washers, and vibration mount.

(i) Remove lamp and gasket from ring clamp assembly.

(2) Installation - Landing Light

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean lamp surface.
Tin Plated Copper Tape	50379-002	Cirrus Design	Diffuse light.
Silicone Sealant	RTV 736	Dow Corning	Prevent corrosion.

(b) Install lamp and gasket into ring clamp assembly.

(c) Install screw into ring clamp assembly.

Note: Tighten screw to the number of turns noted during removal.

(d) Install upper mounting hardware.

1 *Serials 1005 thru 1147 before SB 20-33-01:* Install upper adjustment/mounting screw, washers, and spring.

2 *Serials 1005 thru 1147 after SB 20-33-01:* Install upper nut, washers, and vibration mount.

(e) Install screws and washers connecting wires to landing light.

(f) Apply sealant to each landing light connection.

(g) Clean bulb surface with isopropyl alcohol and allow to air dry.

Note: The lamp should be covered with copper tape from the 10 o'clock position to the 2 o'clock position to prevent glare (halation) off the aft side of the propeller.

(h) Apply copper tape to upper portion of lamp.

(i) Connect battery. (Refer to 24-30)

(j) Install engine cowling. (Refer to 71-10)

(3) Adjustment/Test - Landing Light

Note: The airplane must be on a level and flat surface prior to adjusting landing light aim. There must be a vertical wall or door in front of the landing light.

(a) Check and adjust tire pressure if necessary. (Refer to 12-10)

Note: Measurement will be taken from the center of landing light to center of the illuminated pattern on the wall.

(b) Position airplane 112 inches away from a vertical wall or door.

(c) Place wheel chocks in position.

(d) Place a small piece of tape on the vertical wall or door 40 inches high and directly in line of the landing light lens.

(e) Turn on landing light. Verify tape is centrally located in beam. The landing light beam should be centrally illuminating the tape placed on the wall or door.

(f) If the beam is too high, tighten the bottom adjuster screws. If necessary, loosen the top adjuster screw.

B. Landing Light - *Serials 1148 thru 1422, Serials 1005 thru 1147 after SB 20-71-03* (See Figure 33-401)

(1) Removal - Landing Light

(a) Place landing light switch in OFF position.

(b) Ensure BATTERY and AVIONICS master switches are in OFF position.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect the battery. (Refer to 24-30)

(e) *Serials w/ HID Bulb:* Bulb Only:

1 Remove screws securing back plate to lamp assembly.

2 Slide back plate from lamp assembly. Remove bulb.

(f) Lamp Assembly:

1 Identify and note routing of landing light wires.

2 Remove screw from ring clamp assembly.

3 *Serials w/ Halogen Bulb:* Remove screws and washers connecting wires to landing light.

4 *Serials w/ HID Bulb:* Unplug connector securing wires to landing light.

Note: Record the number of turns required to remove the upper adjustment/mounting screw. Tighten screw the same amount during installation.

5 Remove upper adjustment/mounting screw, washers, and spring.

6 Remove lamp and gasket from ring clamp assembly.

(2) Installation - Landing Light

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean lamp surface.
Silicone Sealant	RTV 736	Dow Corning	Prevent corrosion.

(b) Lamp Assembly:

1 Install lamp and gasket into ring clamp assembly.

2 Install screw into ring clamp assembly.

Note: Tighten screw to the number of turns noted during removal.

3 Install upper adjustment/mounting screw, washers, and spring.

4 *Serials w/ Halogen Bulb:* Install screws and washers connecting wires to landing light.

5 *Serials w/ HID Bulb:* Plug in connector securing wires to landing light.

(c) *Serials w/ HID Bulb:* Bulb Only:

1 Install bulb to lamp assembly.

2 Position and secure back plate to lamp assembly with screws.

(d) *Serials w/ Halogen Bulb:* Apply sealant to each landing light connection.

(e) Clean bulb surface with isopropyl alcohol and allow to air dry.

(f) Connect battery. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

(3) Adjustment/Test - Landing Light

Note: The airplane must be on a level and flat surface prior to adjusting landing light aim. There must be a vertical wall or door in front of the landing light lens.

(a) Check and adjust tire pressure if necessary. (Refer to 12-10)

Note: Measurement will be taken from the center of landing light lens to center of the illuminated pattern on the wall.

(b) Position airplane 112 inches away from a vertical wall or door.

(c) Place wheel chocks in position.

(d) Place a small piece of tape on the vertical wall or door 32 inches high and directly in line of the landing light lens.

(e) Turn on landing light. Verify tape is centrally located in beam. The landing light beam should be centrally illuminating the tape placed on the wall or door.

Note: Up to two additional washers may be placed between lamp and vibration mount to adjust landing light position.

(f) If necessary, adjust landing light position with top adjuster screw and by adding washers between lamp and vibration mount.

C. Landing Light - *Serials 1423 & subs* **(See Figure 33-401)**

(1) Removal - Landing Light

(a) Set landing light switch to OFF position.

(b) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect battery 1. (Refer to 24-30)

(e) Identify and note routing of landing light wires.

(f) Disconnect wire harness from landing light.

(g) Remove screws and washers securing landing light lens to lower cowl.

Note: Record the number of turns required to remove the adjustment/mounting screws. Tighten screws the same amount during installation.

(h) Remove screws and rubber mounts securing lamp assembly to lower cowl.

(i) Remove lamp lens (if installed) and lamp from lower cowl.

(2) Disassembly - Landing Light w/ LED

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Remove screws securing bumper to landing light. Retain screws.

(c) Carefully pry bumper from landing light.

(d) Remove residue from landing light installation areas using scraper and cleaner.

(e) Solvent clean installation areas. (Refer to 20-30)

(3) Assembly - Landing Light w/ LED

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Silicone Adhesive	Dow Corning 736	Any Source	Install bumper.

(b) Clean landing light housing surface with isopropyl alcohol. (Refer to 20-30)

(c) Apply silicone adhesive to bottom surface of bumper.

CAUTION: Do not over tighten screws.

(d) Pass screws through radius portion of bumper and seat against inner surface of center hole and install.

(4) Installation - Landing Light

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean lamp surface.

(b) Position lamp and lamp lens (if installed) into lower cowl.

Note: Tighten screws to the number of turns noted during removal.

(c) Install rubber mounts and screws securing lamp assembly to lower cowl.

Note: Rubber mounts may be compressed between 0.5 - 0.6 inch (12.7 - 15.2 mm). Uncompressed height of rubber mounts is approximately 0.75 inch (19 mm).

(d) Connect wire harness to landing light.

(e) Clean lamp surface with isopropyl alcohol and allow to air dry.

(f) Connect battery 1. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

(5) Adjustment/Test - Landing Light

Note: The airplane must be on a level and flat surface prior to adjusting landing light aim. There must be a vertical wall or door in front of the landing light lens.

(a) Check and adjust tire pressure if necessary. (Refer to 12-10)

Note: Measurement will be taken from the center of landing light lens to center of the illuminated pattern on the wall.

(b) Position airplane 112 inches away from a vertical wall or door.

(c) Place wheel chocks in position.

(d) Place a small piece of tape on the vertical wall or door 32 inches high and directly in line of the landing light lens.

(e) Turn on landing light. Verify tape is centrally located in beam. The landing light beam should be centrally illuminating the tape placed on the wall or door.

(f) If necessary, adjust the screws securing the lamp lens and lamp to the lower cowl to adjust landing light position.

(g) Install washers and screws securing landing light lens to lower cowl.

D. HID Landing Light Ballast - *Serials 1148 & subs* (See Figure 33-401)

(1) Removal - Landing Light Ballast

(a) Set landing light switch to OFF position.

(b) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect battery 1. (Refer to 24-30)

(e) Disconnect wire harness connectors from ballast.

(f) *Serials 1148 thru 1422:* Remove screws and washers securing ballast assembly to firewall.

(g) *Serials 1423 thru 2016 w/o Perspective Avionics before SB2X-33-04, 1423 thru 2043 w/o Perspective Avionics after SB2X-33-04:* Remove nuts and washers securing ballast assembly to MCU.

(h) *Serials 2017 thru 2043 w/o Perspective Avionics before SB2X-33-04:* Remove nuts, washers, and spacer securing ballast assembly to MCU.

(i) *Serial 2016 w/ Perspective Avionics before SB2X-33-04, 2016 thru 2043 w/ Perspective Avionics after SB2X-33-04:* Remove bolts and washers securing ballast assembly to firewall.

(j) *Serials 2017 thru 2043 w/ Perspective Avionics before SB2X-33-04:* Remove bolts, washers, and spacer securing ballast assembly to firewall.

(k) *Serials 2044 & subs:* Remove nuts and spacers securing ballast assembly to cowling.

(l) Remove ballast assembly from airplane.

(2) Disassembly - Landing Light Ballast - *Serials 1148 thru 2043 after SB 2X-33-04*

(a) Remove nuts, washers, and spacers securing ballast to mounting adapter.

(3) Assembly - Landing Light Ballast - *Serials 1148 thru 2043 after SB 2X-33-04*

(a) Position ballast to mounting adapter and secure with nuts, washers, and spacers.

(4) Installation - Landing Light Ballast

(a) *Serials 1148 thru 1422:* Position ballast assembly to firewall and secure with screws and washers.

(b) *Serials 1423 thru 2016 w/o Perspective Avionics before SB2X-33-04, 1423 thru 2043 w/o Perspective Avionics after SB2X-33-04:* Position ballast assembly to MCU and secure with washers and nuts.

(c) *Serials 2017 thru 2043 w/o Perspective Avionics before SB2X-33-04:* Install nuts, washers, and spacer securing ballast assembly to MCU.

(d) *Serial 2016 w/ Perspective Avionics before SB2X-33-04, 2016 thru 2043 w/ Perspective Avionics after SB2X-33-04:* Position ballast assembly to firewall and secure with bolts and washers.

(e) *Serials 2017 thru 2043 w/ Perspective Avionics before SB2X-33-04:* Position ballast assembly to firewall and secure with bolts, washers, and spacer.

(f) *Serials 2044 & subs:* Position ballast assembly to cowling and secure with nuts and spacers.

(g) Connect ballast wire harness to landing light.

(h) Connect battery 1. (Refer to 24-30)

(i) Install engine cowling. (Refer to 71-10)

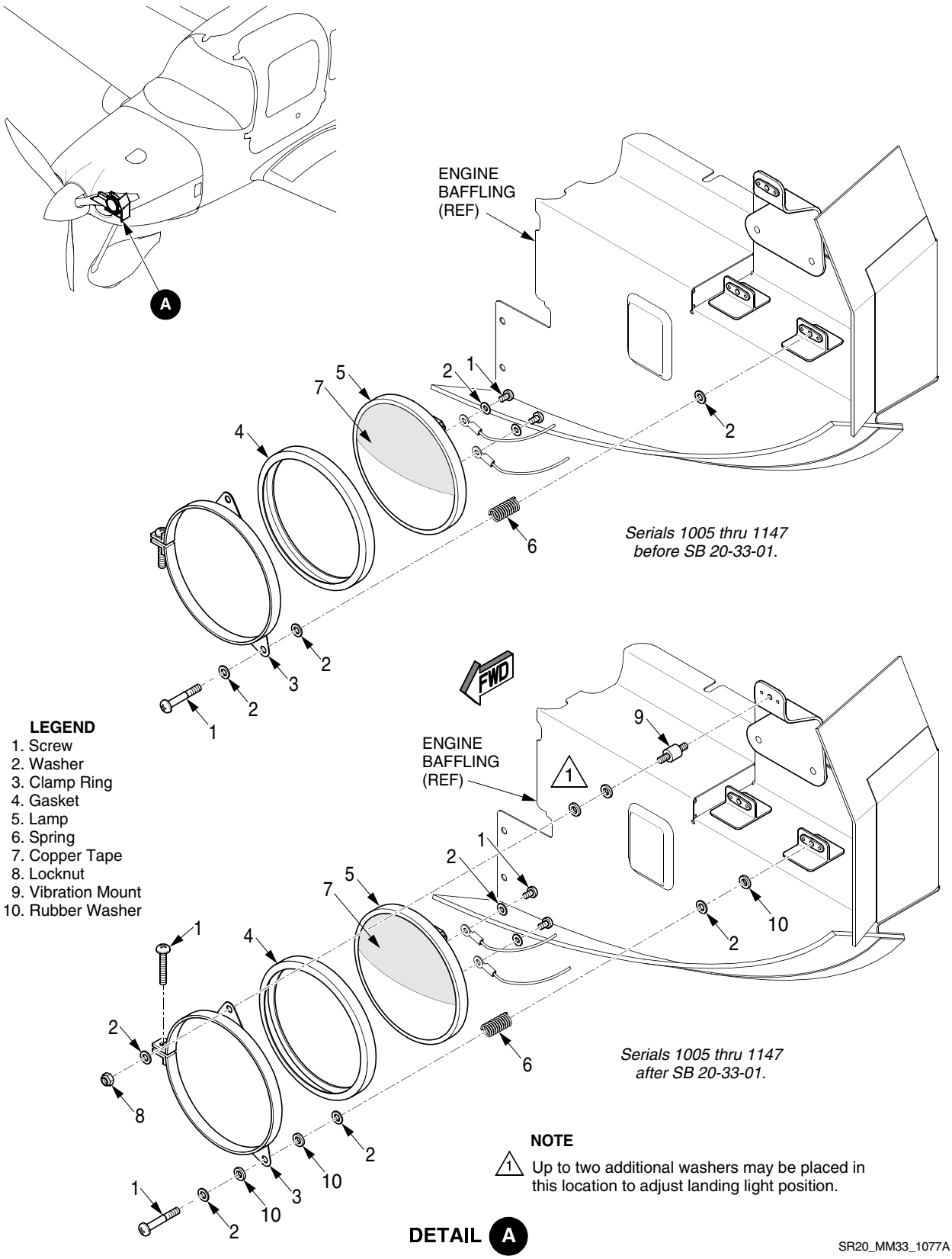


Figure 33-401
Landing Light Installation - Serials 1005 thru 1147 (Sheet 1 of 5)

EFFECTIVITY:
Serials 1005 thru 1147

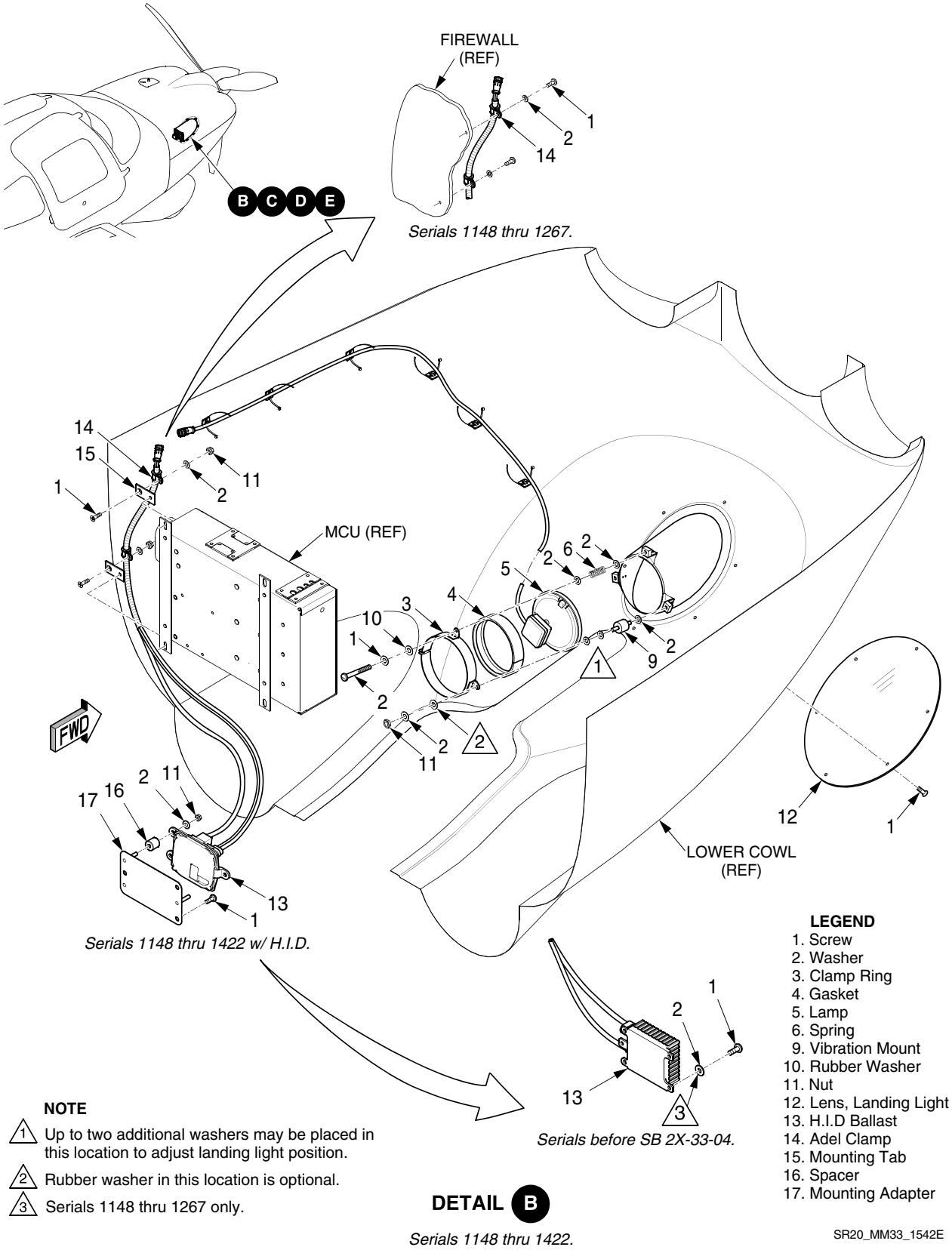
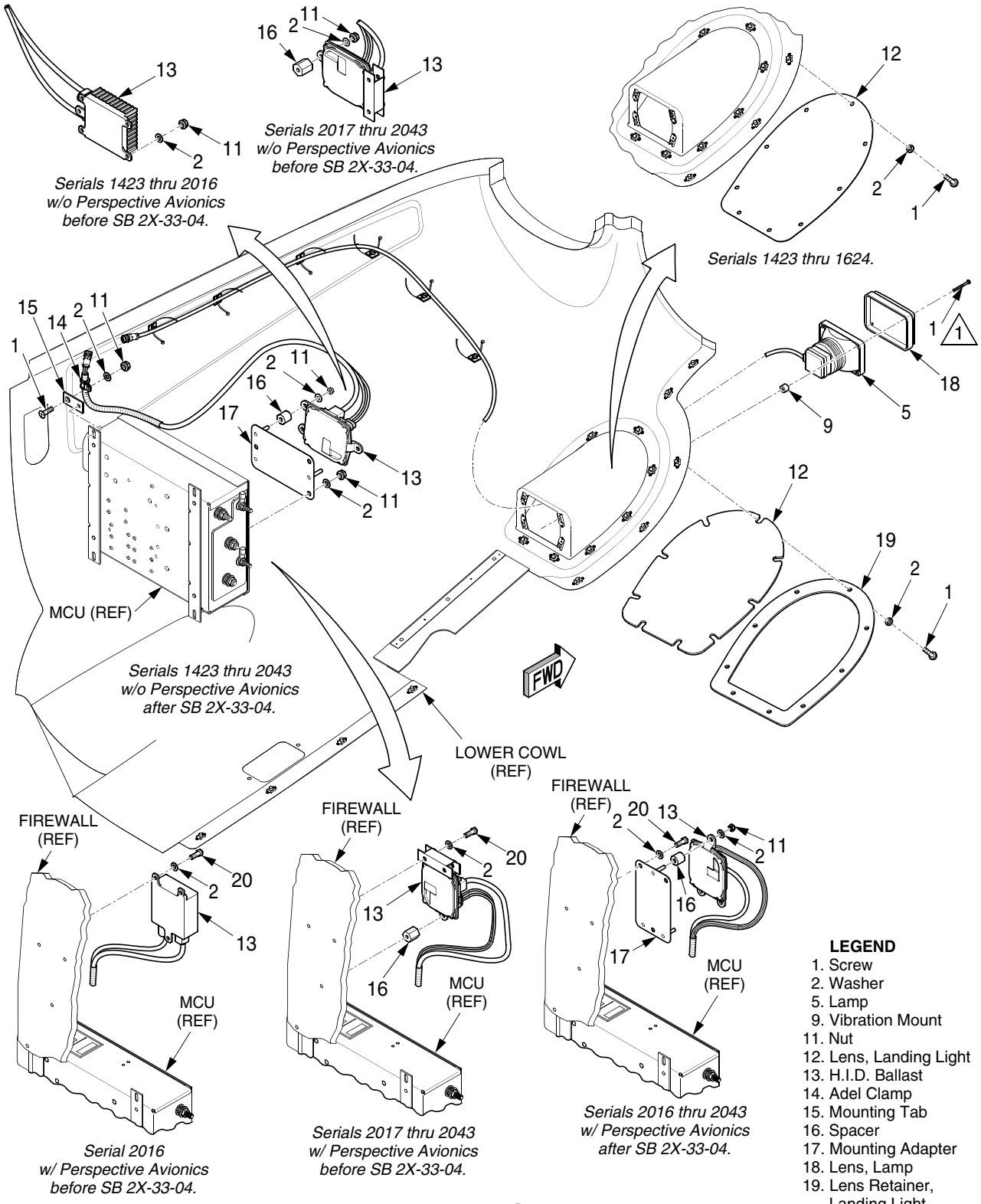


Figure 33-401
Landing Light Installation - Serials 1148 thru 1422 (Sheet 2 of 5)



LEGEND

1. Screw
2. Washer
5. Lamp
9. Vibration Mount
11. Nut
12. Lens, Landing Light
13. H.I.D. Ballast
14. Adel Clamp
15. Mounting Tab
16. Spacer
17. Mounting Adapter
18. Lens, Lamp
19. Lens Retainer, Landing Light
20. Bolt

NOTE

1. Adjust the compression of the vibration mount to set landing light position.

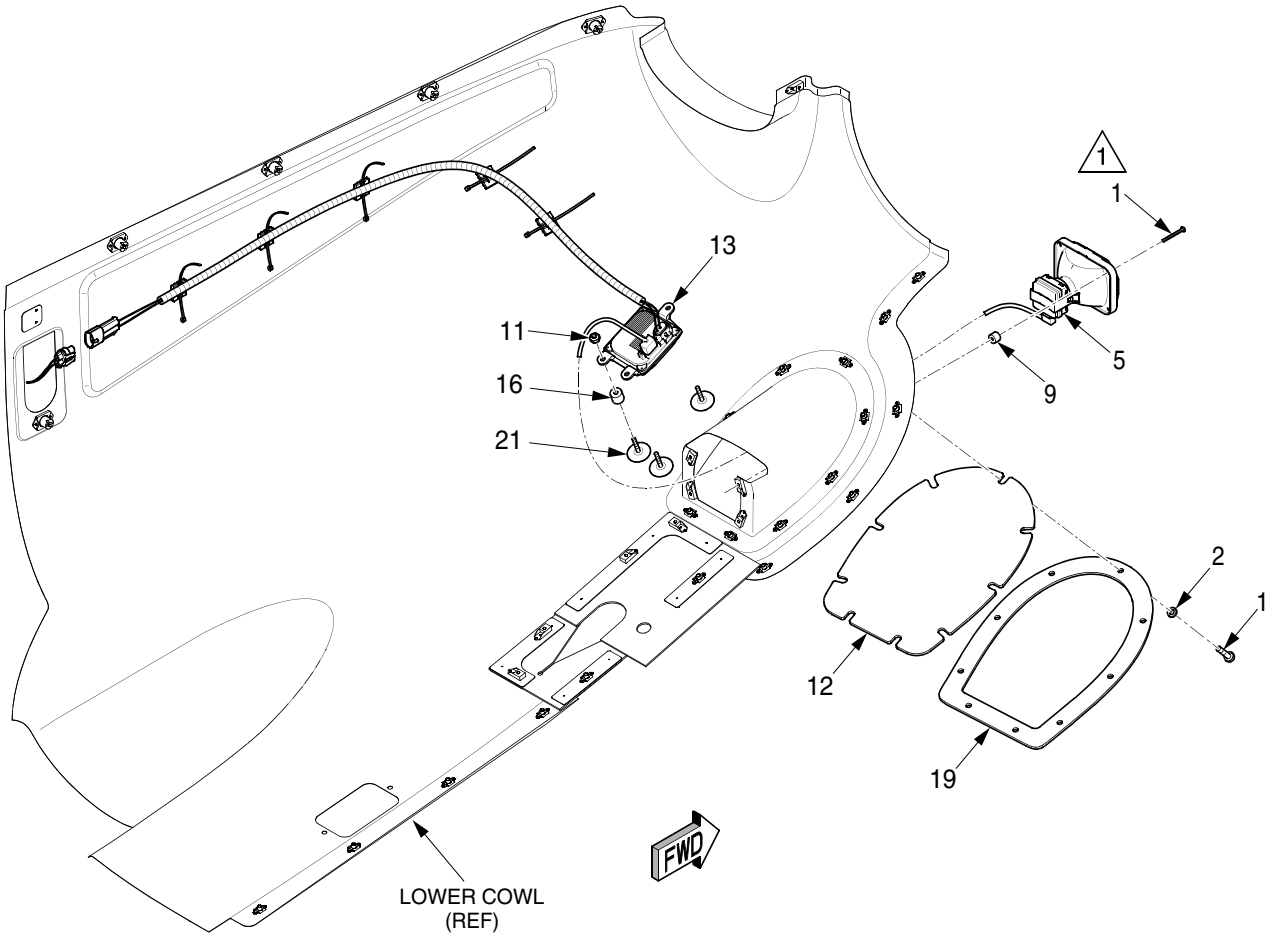
DETAIL C

Serials 1423 thru 2043.

SR20_MM33_1808D

Figure 33-401
Landing Light Installation - Serials 1423 thru 2043 (Sheet 3 of 5)

EFFECTIVITY:
Serials 1423 thru 2043



LEGEND

1. Screw
2. Washer
5. Lamp
9. Vibration Mount
11. Nut
12. Lens, Landing Light
13. H.I.D. Ballast
19. Lens Retainer, Landing Light
16. Spacer
21. Stud

NOTE

1 Adjust vibration mount compression to set landing light position.

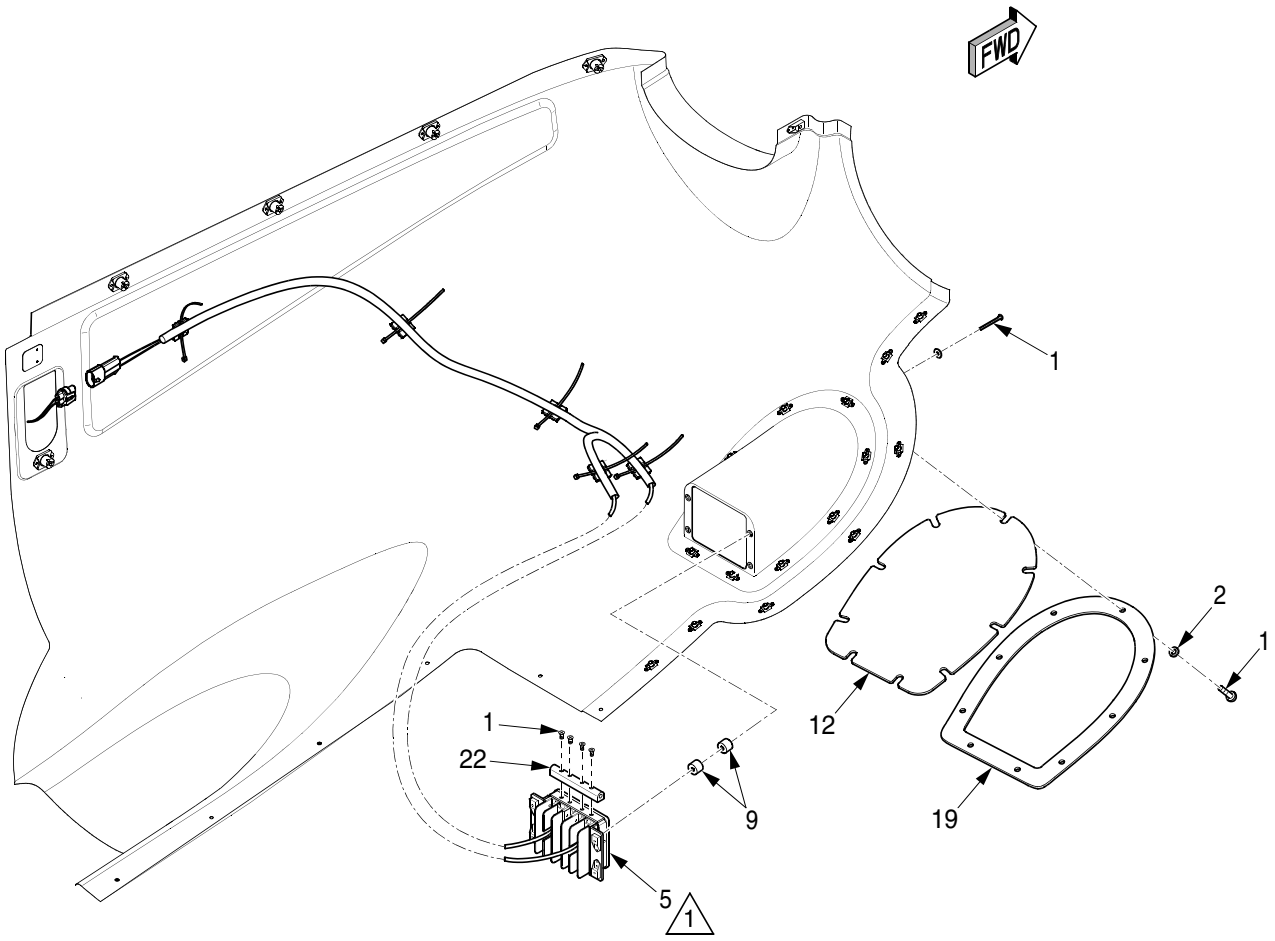
DETAIL D

Serials 2044 & subs w/ HID.

SR20_MM33_3157C

Figure 33-401
Landing Light Installation w/ HID - Serials 2044 & subs (Sheet 4 of 5)

EFFECTIVITY:
Serials 2044 & subs



LEGEND

1. Screw
2. Washer
5. Lamp
9. Vibration Mount
12. Lens, Landing Light
19. Lens Retainer, Landing Light
22. Bumper

DETAIL E

Serials 1005 thru 1267 after SB2X-33-07, 1268 & subs w/ LED.

NOTE

1 Adjust vibration mount compression to set landing light position.

SR20_MM33_3447A

Figure 33-401
Landing Light Installation w/ LED - Serials 1005 thru 1267 after SB2X-33-07, 1268 & subs (Sheet 5 of 5)

EFFECTIVITY:
Serials 1005 thru 1267 after SB2X-33-07, 1268 & subs

E. Anti-Collision Strobe Light Assembly (See Figure 33-402)

(1) Removal - Anti-Collision Strobe Light Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials w/o Perspective Avionics:* Pull NAV LIGHTS, STROBE LIGHTS, and REC/INST LTS circuit breakers.

(c) *Serials w/ Perspective Avionics:* Pull NAV LIGHTS, STROBE LIGHTS, and RECOG LIGHTS circuit breakers.

Note: Place a pad between wing tip and top of wing to avoid damaging paint.

(d) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.

(e) Remove cable tie(s) securing light assembly wire harness to wing tip.

(f) *Serials 1005 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe:* Remove braided ground strap.

1 Remove clamp securing braided ground straps to wire harness conduit in wing.

2 *Serials 1005 thru 2016 before SB 2X-33-03:* Remove clamp securing braided ground strap to light assembly.

3 Remove cable ties securing braided ground strap around light assembly wire harness.

(g) Disconnect light assembly connector.

(h) Disconnect output connector from strobe light power supply.

(i) Disconnect terminal rings.

1 *Serials 1005 thru 1592:* Remove strobe light power supply screw securing light assembly terminal rings.

2 *Serials 1593 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe:* Disconnect light assembly terminal ring connectors.

3 *Serials 2127 & subs w/ LED Strobe:* Remove strobe light power supply screw securing light assembly terminal ring.

(j) *Serials 1005 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe:* Remove screws securing lens retainer to light assembly base plate.

CAUTION: *Serials 2127 & subs w/ LED Strobe:* Strobe light lens is loose under retainers. Hold lens in position while removing retainers.

(k) *Serials 2127 & subs w/ LED Strobe:* Remove screws securing lens retainers and gasket to light assembly base plate and gasket (if installed).

(l) Remove screws securing light assembly base plate and terminal rings (if installed) to wing. Remove light assembly from airplane.

(2) Installation - Anti-Collision Strobe Light Assembly

WARNING: Install anti-collision strobe light assembly with green lens in RH wing tip and anti-collision strobe light assembly with red lens in LH wing tip.

(a) Route light assembly wire harness through holes in wing tip.

(b) Position light assembly base plate and terminal rings (if installed) to wing tip and secure with screws.

(c) *Serials 2127 & subs w/ LED Strobe:* Position and hold gasket and lens to light assembly base plate and gasket (if installed).

(d) Position lens retainer to light assembly base plate and secure with screws.

(e) Connect terminal rings.

1 *Serials 1005 thru 1592:* Position light assembly terminal rings to strobe light power supply and secure with screw.

2 *Serials 1593 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe:* Connect light assembly terminal ring connectors.

3 *Serials 2127 & subs w/ LED Strobe:* Position light assembly terminal ring to strobe light power supply and secure with screw.

(f) Connect output connector to strobe light power supply.

(g) Connect light assembly connector.

(h) *Serials 1005 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe:* Install braided ground strap.

1 *Serials 1005 thru 2016 before SB 2X-33-03:* Position braided ground strap to light assembly and secure with clamp.

2 Wrap braided ground cable around light assembly wire harness and secure with cable ties.

3 Burnish wing conduit to ensure proper contact between braided ground strap and conduit.

Note: Fold over ends of braided ground straps to prevent fraying.

4 Position braided ground straps to wing conduit and secure with clamp.

5 Install cable tie securing braided ground straps at minimum of 3.0 inches (7.6 cm) from end of wing conduit.

6 Verify resistance from light assembly to airplane ground is less than 4 ohms. If resistance is greater than 4 ohms, remove braided ground strap and repeat conduit burnishing.

(i) Position light assembly wire harness to wing tip and secure with cable tie(s).

(j) *Serials 1005 thru 1885:* Position wing tip to wing and ensure wing tip shear pin fully engages receiving hole on wing.

(k) *Serials 1886 & subs:* Position wing tip to wing and ensure wing tip fully engages mounting clips on wing.

(l) Install screws securing wing tip to wing.

(m) *Serials w/o Perspective Avionics:* Reset NAV LIGHTS, STROBE LIGHTS, and REC/INST LTS circuit breakers.

(n) *Serials w/ Perspective Avionics:* Reset NAV LIGHTS, STROBE LIGHTS, and RECOG LIGHTS circuit breakers.

(o) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(3) Operational Test - Anti-Collision Strobe Light Assembly

(a) Set BAT1 switch to ON position.

(b) Set NAV and STROBE switches to ON positions.

(c) Confirm proper operation of nav, strobe and position lights.

(d) Set NAV, STROBE and BAT1 switches to OFF positions.

F. Strobe Light Power Supply (See Figure 33-402)

(1) Removal - Strobe Light Power Supply

(a) Set strobe light and NAV light switches to OFF positions.

(b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

Note: Place a pad between wing tip and top of wing to avoid damaging paint.

(c) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.

(d) Disconnect output connector from power supply.

(e) Disconnect input connector from power supply.

(f) Remove screw securing terminal rings to power supply.

Note: To aid reinstallation, note location of attaching parts and braided ground strap before removing strobe light power supply.

(g) *Serials 1005 thru 1885:* Remove screws, washers, and rubber sheets securing power supply and braided ground strap to wing tip. Remove power supply from airplane.

(h) *Serials 1886 & subs:* Remove screws and washers securing power supply and braided ground strap to wing tip. Remove power supply from airplane.

(2) Installation - Strobe Light Power Supply

Note: Install attaching parts and braided ground strap as noted during removal.

Serials 1005 thru 1885: Install washers as required under one corner of power supply to prevent lower wing skin deformation when tightening screws securing power supply to wing skin.

(a) *Serials 1005 thru 1885:* Position power supply and braided ground strap to wing tip and secure with screws, washers, and rubber sheets.

(b) *Serials 1886 & subs:* Position power supply and braided ground strap to wing tip and secure with screws and washers.

(c) Position terminal rings to power supply and secure with screw.

(d) Connect input connector to power supply.

(e) Connect output connector to power supply.

(f) *Serials 1005 thru 1885:* Position wing tip to wing and ensure wing tip shear pin fully engages receiving hole on wing.

(g) *Serials 1886 & subs:* Position wing tip to wing and ensure wing tip fully engages mounting clips on wing.

(h) Install screws securing wing tip to wing.

(i) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.

(j) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

G. Recognition Light Assembly - *Serials 1886 & subs* (See Figure 33-402), (See Figure 33-403)

(1) Removal - Recognition Light Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials w/o Perspective Avionics:* Pull REC/INST LTS circuit breaker.

(c) *Serials w/ Perspective Avionics:* Pull RECOG LIGHTS circuit breaker.

Note: Place a pad between wing tip and top of wing to avoid damaging paint.

(d) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.

(e) Disconnect recognition light connector.

(f) Remove screws securing recognition light to lens assembly. Remove recognition light from airplane.

(2) Installation - Recognition Light Assembly

(a) Position recognition light to lens assembly and secure with screws.

(b) Connect recognition light connector.

(c) Position wing tip to wing and ensure wing tip fully engages mounting clips on wing.

(d) Install screws securing wing tip to wing.

(e) *Serials w/o Perspective Avionics:* Reset REC/INST LTS circuit breaker.

(f) *Serials w/ Perspective Avionics:* Reset RECOG LIGHTS circuit breaker.

(g) Perform Operational Test - Recognition Light Assembly. (Refer to 33-40)

(3) Removal - Lens/Housing Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic scraper	-	Any Source	Remove sealant.
Plastic Wedge	-	Any Source	Separate.

(b) Remove recognition light assembly. (Refer to 33-40)

(c) At perimeter of lens/housing assembly, use plastic scraper to remove sealant as required.

CAUTION: Use caution when separating lens/housing assembly from wing tip to not cause excessive damage to the composite; especially the wing tip edges. If damage exceeds repair specifications, contact Cirrus Design for disposition.

(d) Using wedge, carefully separate lens/housing assembly from wing tip. Remove lens/housing assembly from wing tip.

(4) Installation - Lens/Housing Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
General Purpose Adhesive Cleaner	08984	3M Company St. Paul, MN 55144 651-737-6501	Remove residue.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Plastic Film Tape	-	Any Source	Restrict working area.
Sealant, Epoxy Cured Polythioether	PR-1829 Class B, 1/2	PRC-Desoto International Indianapolis, IN 46278 317-290-1600	Seal faying surfaces.
Primer	AC-145	Advanced Chemistry and Technology Garden Grove CA 92841 714-373-2837	Promote adhesion.

(b) Remove any remaining residue from lens/housing assembly, and cutout on wing tip using cleaner.
(c) Solvent clean installation area. (Refer to 20-30)
(d) Apply film tape to perimeter of lens to restrict working area of sealant.
(e) Apply adhesion promoter to faying surfaces of lens/housing assembly.
(f) Apply sealant to faying surfaces of lens/housing assembly.
(g) At interior wing tip, position and clamp lens/housing assembly to cutout.

Note: Ensure lens/housing assembly is centered to cutout with a maximum deviation of 0.03 inch (0.76 mm) from center.

Ensure exterior surface of lens/housing assembly is flush to wing tip exterior with a maximum perpendicular deviation of 0.06 inch (1.52 mm).

(h) Apply sealant to perimeter of exterior cutout. Ensure sealant bead is smooth and follows contour of fuselage.
(i) Cure sealant.
(j) Remove any sealant visible from cutout on wing tip.
(k) Remove film tape.
(l) Clean any residue from lens. (Refer to 20-30)
(m) Install recognition light assembly. (Refer to 33-40)

(5) Operational Test - Recognition Light Assembly.
(a) Set BAT1 switch to ON position.
(b) Set LAND switch to ON position.
(c) Confirm proper operation of recognition lights.
(d) Set LAND and BAT1 switches to OFF positions.

H. Bulb Replacement - *Serials 1005 thru 2016 before SB 2X-33-03* **(See Figure 33-402)**

CAUTION: Always wear clean cotton gloves when replacing light bulbs. Never allow glass portion of bulb to come into contact with exposed skin. Oils from exposed skin will cause premature bulb failure.

(1) Removal - Navigation Light Bulb
  (a) Set strobe light and NAV light switches to OFF positions.
  (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.
  (c) Remove screws securing lens retainer to base plate.
  (d) Push navigation light bulb in and rotate counterclockwise to remove.

(2) Installation - Navigation Light Bulb
  (a) Position bulb to socket with flat portion of bulb facing lens retainer mounting bracket.
  (b) Push bulb into socket and rotate clockwise to install.
  (c) Position lens retainer to base plate and secure with screws.
  (d) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
  (e) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(3) Removal - Position Light Bulb
  (a) Set strobe light and NAV light switches to OFF positions.
  (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.
  (c) Remove screws securing lens retainer to base plate.
  (d) Pull position light bulb straight out from socket and remove.

(4) Installation - Position Light Bulb
  (a) Push position light bulb straight into socket to install.
  (b) Position lens retainer to base plate and secure with screws.
  (c) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
  (d) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(5) Removal - Strobe Light Bulb
  (a) Set strobe light and NAV light switches to OFF positions.
  (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

  Note: Place a pad between wing tip and top of wing to avoid damaging paint.

  (c) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.
  (d) Remove cable tie securing anti-collision strobe light assembly wire harness to wing tip.
  (e) Remove cable ties securing braided ground strap around strobe light wire harness.
  (f) At connector, depin wires from strobe light bulb.
  (g) Disconnect output connector from strobe light power supply.
  (h) Remove screw securing strobe light connector terminal ring.
  (i) Remove screws securing lens retainer to base plate.
  (j) Remove strobe light bulb and wire harness from airplane.

(6) Installation - Strobe Light Bulb
  (a) Route strobe light wire harness through base plate.
  (b) Repin strobe light bulb wires to connector.
  (c) Position strobe light connector terminal ring to strobe light power supply and secure with screw.
  (d) Connect output connector to strobe light power supply.
  (e) Wrap braided ground strap around strobe light wire harness and secure with cable ties.

EFFECTIVITY:
Serials 1005 thru 2016 before SB 2X-33-03

(f) Install cable tie securing strobe light wire harness to wing tip.

(g) Position lens retainer to base plate and secure with screws.

(h) Position wing tip to wing and ensure wing tip shear pin fully engages receiving hole on wing.

(i) Install screws securing wing tip to wing.

(j) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.

(k) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

I. Bulb Replacement - *Serials 2017 & subs, Serials 1005 thru 2016 after SB 2X-33-03*

CAUTION: Always wear clean cotton gloves when working with bulbs. Never allow glass portion of bulb to come into contact with exposed skin. Oils from exposed skin will cause premature bulb failure.

(1) Removal - Navigation Light LED
   (a) Set STROBE and NAV switches to OFF position.
   (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

CAUTION: Strobe, Nav and Position light lenses are loose under retainer. Hold lenses in position while removing retainer.

   (c) Remove screws securing lens retainer to base plate.
   (d) Remove retainer, lenses and seals.
   (e) Remove screws securing nav LED board to base plate.
   (f) Replace defective LED.

(2) Installation - Navigation Light LED
   (a) Secure LED board to base plate with screws.
   (b) Place seals and lenses for strobe, nav and position lights over LED boards and Strobe bulb.
   (c) Position retainer over lenses and secure with screws.
   (d) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
   (e) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(3) Removal - Position Light LED
   (a) Set STROBE and NAV switches to OFF position.
   (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

CAUTION: Strobe, nav and position light lenses are loose under retainer. Hold lenses in position while removing retainer.

   (c) Remove screws securing lens retainer to base plate.
   (d) Remove retainer, lenses and seals.
   (e) Remove screws securing Position LED board to base plate.
   (f) Replace defective LED.

(4) Installation - Position Light LED
   (a) Secure LED board to base plate with screws.
   (b) Place seals and lenses for strobe, nav and position lights over LED boards and Strobe light bulb.
   (c) Position retainer over lenses and secure with screws.
   (d) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
   (e) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(5) Removal - Strobe Light Bulb - *Serials 1005 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe*
   (a) Set STROBE and NAV switches to OFF position.
   (b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

CAUTION: Strobe, nav and position light lenses are loose under retainer. Hold lenses in position while removing retainer.

   (c) Remove screws securing lens retainer to base plate.

EFFECTIVITY:
Serials 2017 & subs, Serials 1005 thru 2016 after SB 2X-33-03

(d) Remove retainer, lenses and seals.
(e) Remove screws securing base plate to wing tip.
(f) Pull strobe light bulb and base plate out to reveal wire harness connector.
(g) Unplug connector and remove strobe light bulb from base plate.

(6) Installation - Strobe Light Bulb - *Serials 1005 & subs w/ Bulb/Flash Tube or LED/Flash Tube Strobe*
(a) Push connector for strobe light bulb through base plate and plug into connector in wing tip.
(b) Install seal to base of strobe light bulb. Position bulb and base plate onto wing tip and secure with screws.
(c) Place seals and lenses for strobe, nav and position lights over LED boards and strobe light bulb.
(d) Position retainer over lenses and secure with screws.
(e) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
(f) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

(7) Removal - Strobe Light LED - *Serials 2127 & subs w/ LED Strobe*
(a) Set STROBE and NAV light switches to OFF position.
(b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.
(c) Remove anti-collision strobe light assembly. (Refer to 33-40)
(d) Remove aft screw securing strobe LED assembly to base plate.

CAUTION: Reflector is loose without forward screw. Hold reflector in position while removing forward screw.

(e) Hold reflector in position and remove forward screw securing strobe LED assembly to base plate.
(f) Remove strobe LED assembly and reflector from base plate.
(g) Replace defective LED.

(8) Installation - Strobe Light LED - *Serials 2127 & subs w/ LED Strobe*
(a) Route connector harness for strobe LED assembly through base plate.
(b) Install aft screw securing strobe LED assembly to base plate.
(c) Position reflector to strobe LED assembly at forward screw installation hole.
(d) Install forward screw securing strobe LED assembly and reflector to base plate.
(e) Install anti-collision strobe light assembly. (Refer to 33-40)
(f) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.
(g) Perform Operational Test - Anti-Collision Strobe Light Assembly. (Refer to 33-40)

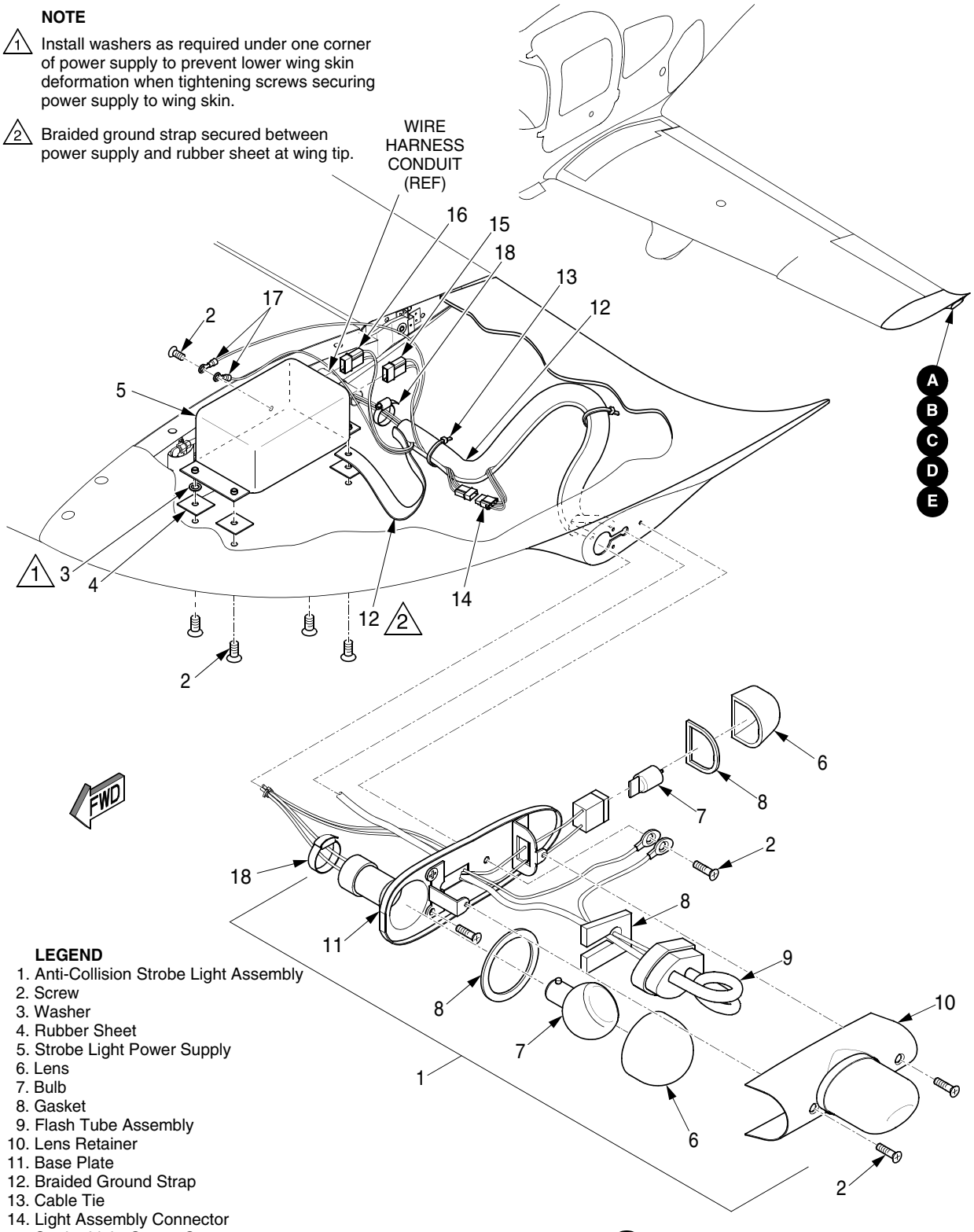
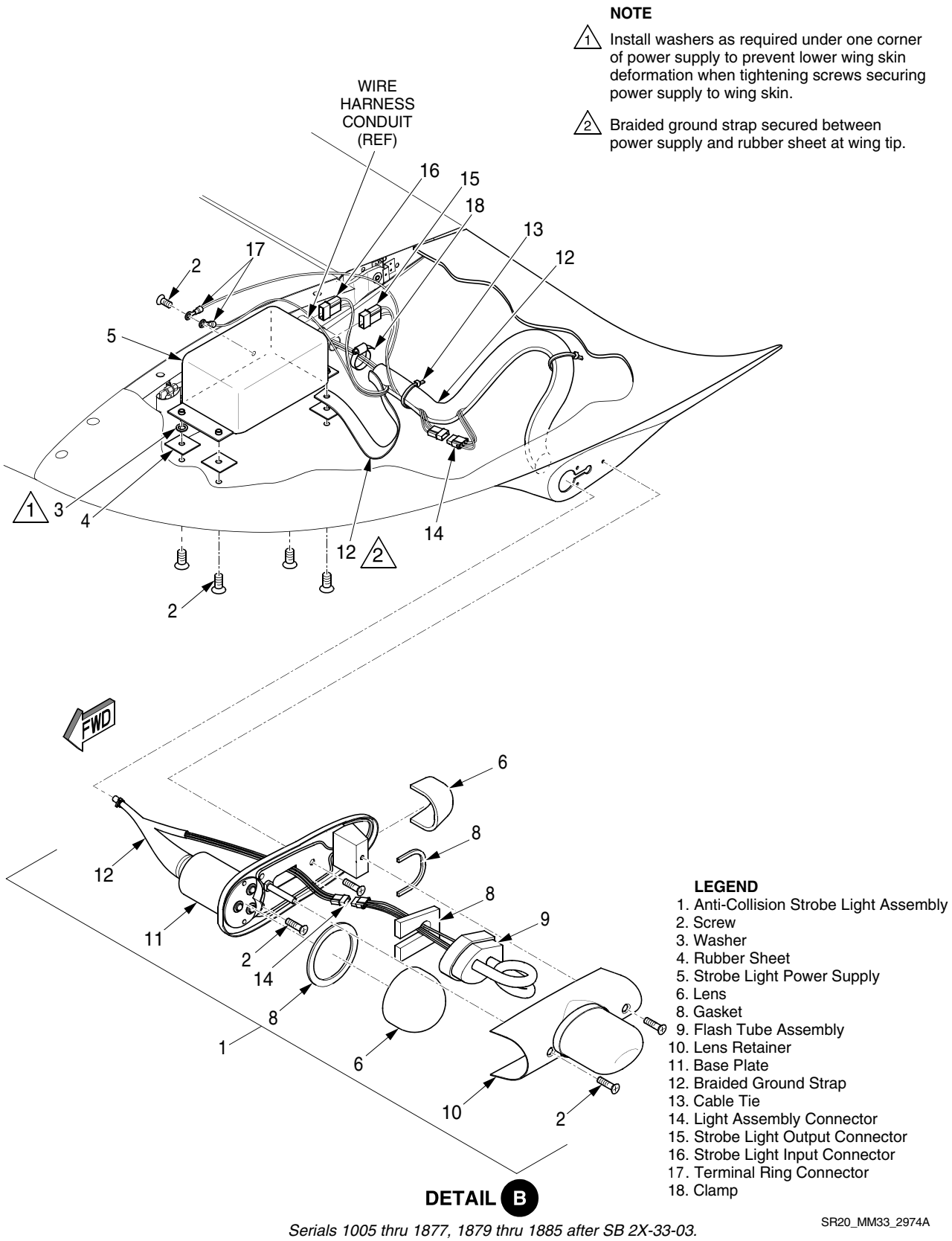


Figure 33-402
Anti-Collision Light - Serials 1005 thru 1885 before SB 2X-33-03 (Sheet 1 of 5)

EFFECTIVITY:
Serials 1005 thru 1885 before SB 2X-33-03



Serials 1005 thru 1877, 1879 thru 1885 after SB 2X-33-03.

Figure 33-402
Anti-Collision Light - Serials 1005 thru 1885 after SB 2X-33-03 (Sheet 2 of 5)

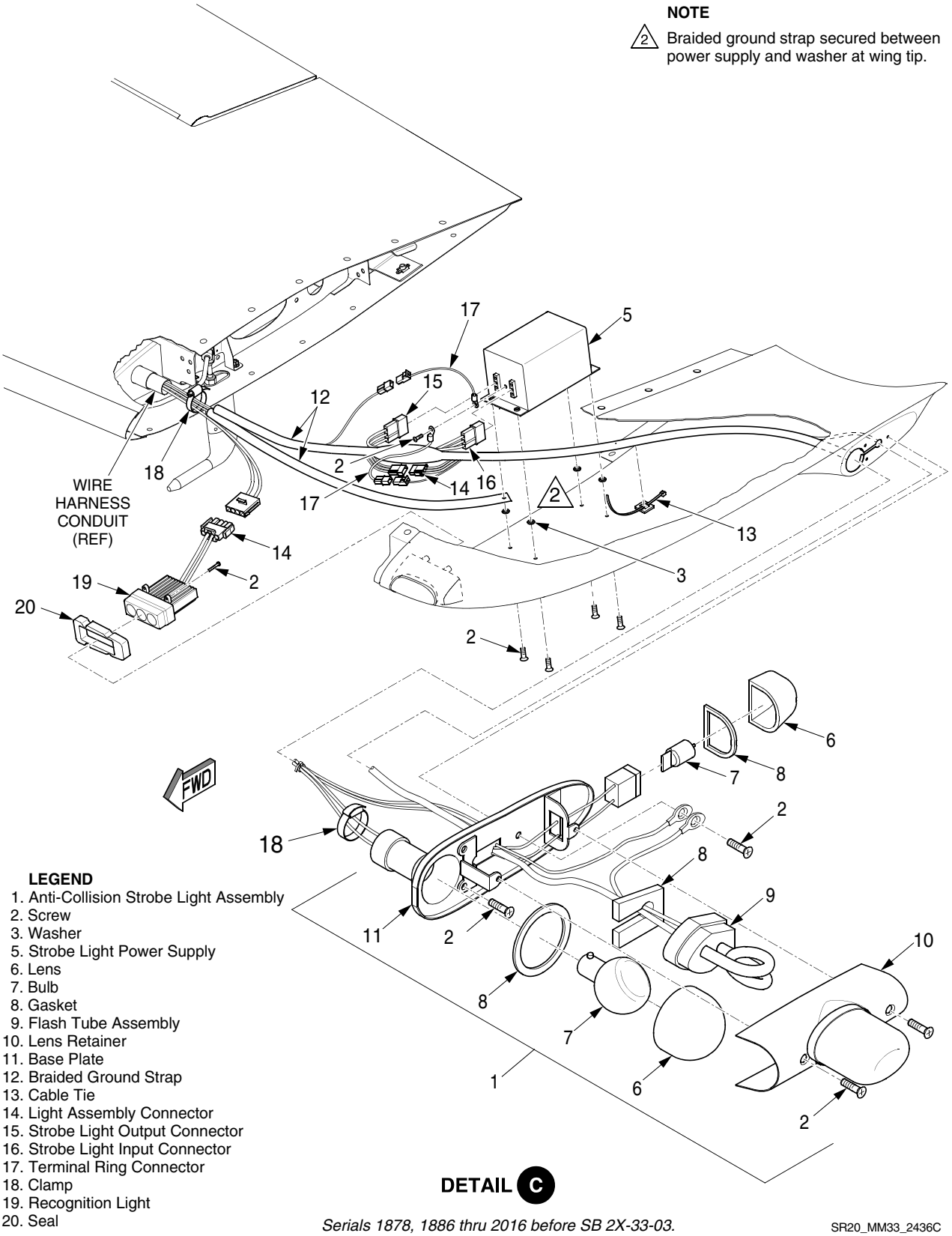
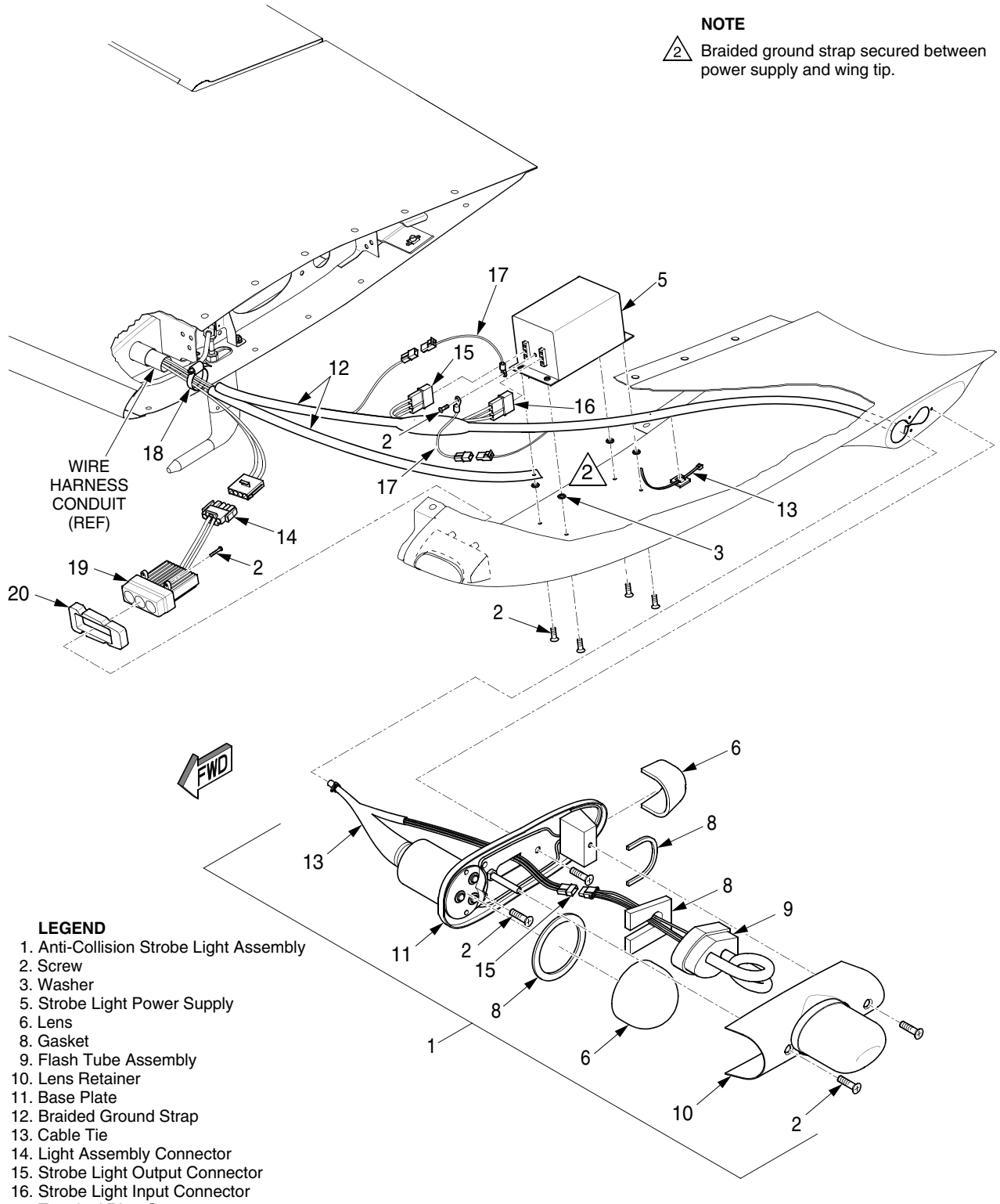


Figure 33-402
Anti-Collision & Recognition Light - Serials 1886 thru 2016 before SB 2X-33-03 (Sheet 3 of 5)

EFFECTIVITY:
Serials 1886 thru 2016 before SB 2X-33-03



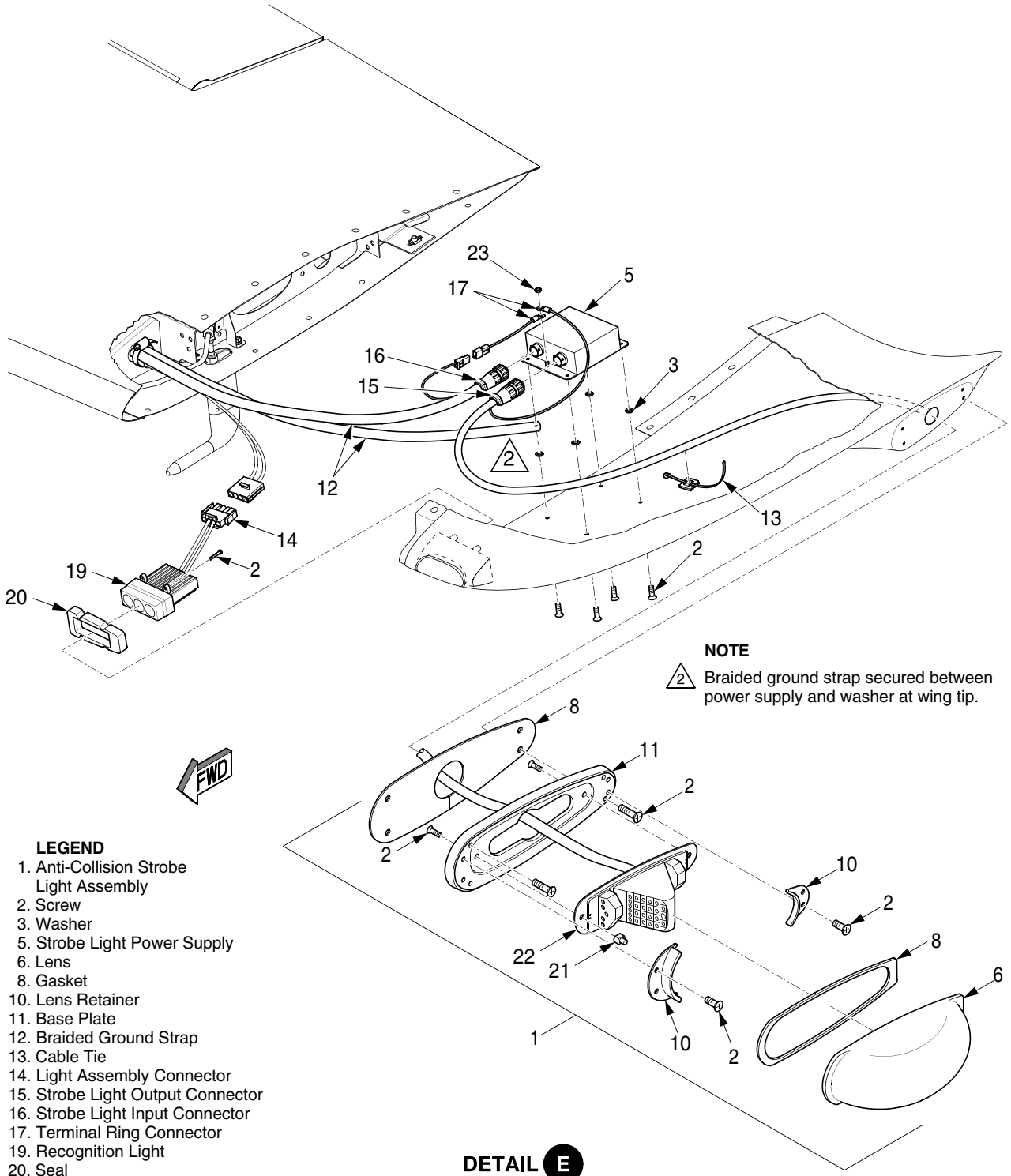
LEGEND

1. Anti-Collision Strobe Light Assembly
2. Screw
3. Washer
5. Strobe Light Power Supply
6. Lens
8. Gasket
9. Flash Tube Assembly
10. Lens Retainer
11. Base Plate
12. Braided Ground Strap
13. Cable Tie
14. Light Assembly Connector
15. Strobe Light Output Connector
16. Strobe Light Input Connector
17. Terminal Ring Connector
18. Clamp
19. Recognition Light
20. Seal

Serials 1878, 1886 thru 2016 after SB 2X-33-03,
Serials 2017 & subs w/ LED/Flash Tube Strobe.

SR20_MM33_2976B

Figure 33-402
Anti-Collision & Recognition Light - Serials w/ LED/Flash Tube Strobe (Sheet 4 of 5)



LEGEND

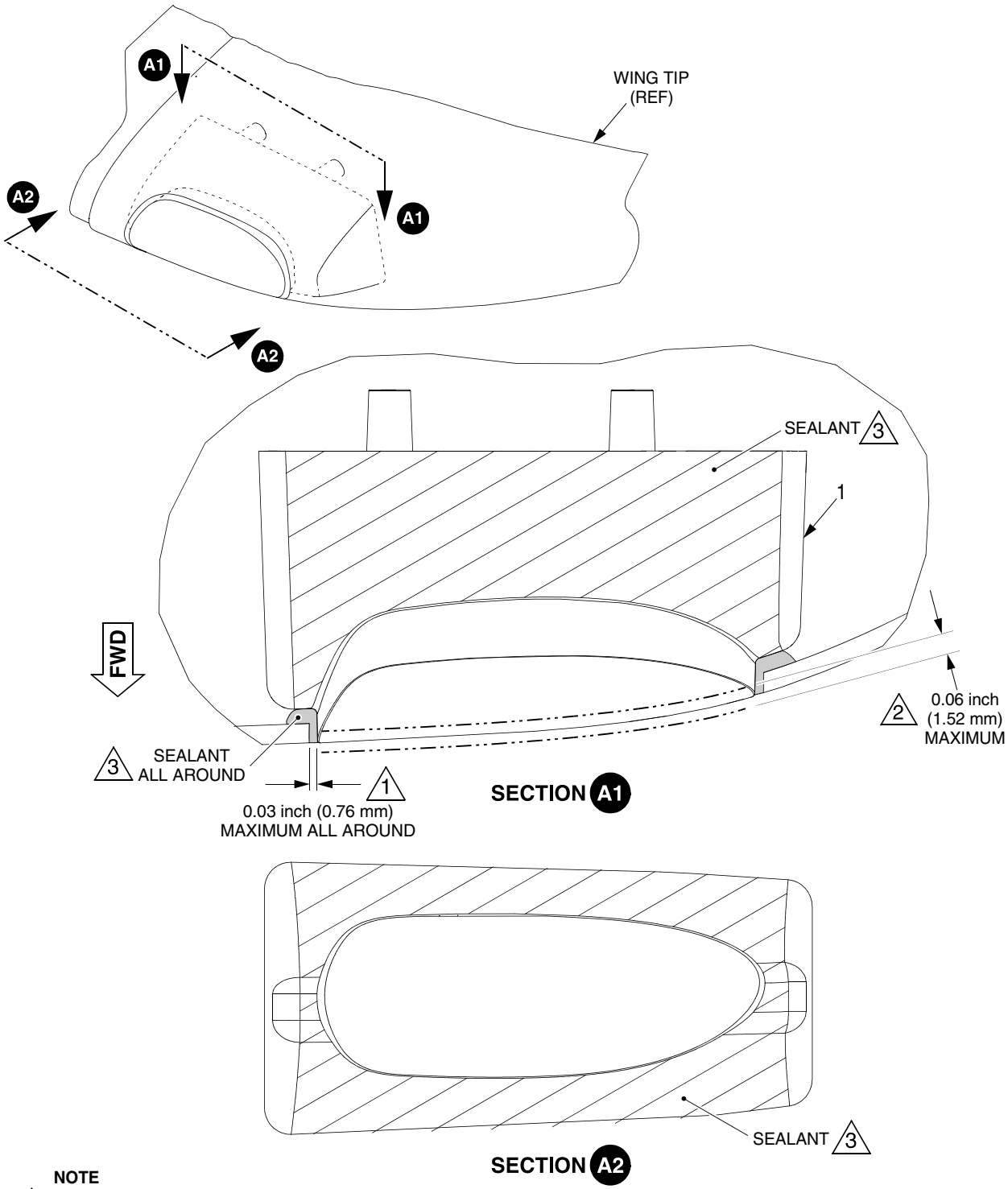
1. Anti-Collision Strobe Light Assembly
2. Screw
3. Washer
5. Strobe Light Power Supply
6. Lens
8. Gasket
10. Lens Retainer
11. Base Plate
12. Braided Ground Strap
13. Cable Tie
14. Light Assembly Connector
15. Strobe Light Output Connector
16. Strobe Light Input Connector
17. Terminal Ring Connector
19. Recognition Light
20. Seal
21. Reflector
22. Strobe LED Assembly
23. Nut

Serials 2127 & subs w/ LED Strobe.

SR20_MM33_3449B

Figure 33-402
Anti-Collision & Recognition Light - Serials w/ LED Strobe (Sheet 5 of 5)

EFFECTIVITY:
Serials w/ LED Strobe



NOTE

1. Ensure lens/housing assembly is centered to cutout with a maximum deviation of 0.03 inch (0.76 mm) from center.
2. Ensure exterior surface of lens/housing assembly is flush to wing tip exterior with a maximum perpendicular deviation of 0.06 inch (1.52 mm).
3. Apply sealant to perimeter of exterior cutout. Ensure sealant bead is smooth and follows contour of wing tip. No through porosity is allowed.

LEGEND

1. Recognition Light Lens/Housing

SR20_MM33_3582

Figure 33-403
Recognition Light Lens/Housing Installation - Serials 22-2438 & subs, 22T-0001 & subs

J. Ice Detection Light - *Serials 2078 & subs*

(1) Removal - LED Ice Light **(See Figure 33-404)**

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ICE LIGHTS circuit breaker.

(c) Remove kick plate. (Refer to 25-10)

(d) Remove sidewall air duct trim. (Refer to 25-10)

(e) Disconnect ice light connector.

(f) Remove screws securing LED ice light to housing. Remove LED ice light from airplane.

(2) Installation - LED Ice Light

(a) Position LED ice light to housing and secure with screws.

(b) Connect ice light connector.

(c) Reset ICE LIGHTS circuit breaker.

(d) Perform Operational Test - Ice Detection Light. (Refer to 33-40)

(e) Install sidewall air duct trim. (Refer to 25-10)

(f) Install kick plate. (Refer to 25-10)

(3) Removal - Lens/Housing Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove sealant.
Plastic Wedge	-	Any Source	Separate.

(b) Remove LED ice light. (Refer to 33-40)

(c) At perimeter of lens/housing assembly, use plastic scraper to remove sealant as required.

CAUTION: Use caution when separating lens/housing assembly from fuselage to not cause excessive damage to the composite. If damage exceeds repair specifications, contact Cirrus Design for disposition.

(d) Using wedge, carefully separate lens/housing assembly from fuselage interior. Remove lens/housing assembly from airplane.

(4) Installation - Lens/Housing Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
General Purpose Adhesive Cleaner	08984	3M Company St. Paul, MN 55144 651-737-6501	Remove residue.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Plastic Film Tape	-	Any Source	Restrict working area.

Description	P/N or Spec.	Supplier	Purpose
Sealant, Epoxy Cured Polythioether	PR-1829 Class B, 1/2	PRC-Desoto International Indianapolis, IN 46278 317-290-1600	Seal faying surfaces.
Primer	AC-145	Advanced Chemistry and Technology Garden Grove CA 92841 714-373-2837	Promote adhesion.

(b) Remove any remaining residue from lens/housing assembly, and cutout on fuselage using cleaner.

(c) Solvent clean installation area. (Refer to 20-30)

(d) Apply film tape to perimeter of lens to restrict working area of sealant.

(e) Apply adhesion promoter to faying surfaces of lens/housing assembly.

(f) Apply sealant to faying surfaces of lens/housing assembly.

(g) At interior fuselage, position and clamp lens/housing assembly to cutout.

Note: Ensure lens/housing assembly is centered to cutout with a maximum deviation of 0.03 inch (0.76 mm) from center.

Ensure exterior surface of lens/housing assembly is flush to fuselage exterior with a maximum perpendicular deviation of 0.03 inch (0.76 mm).

(h) Apply sealant to perimeter of exterior cutout. Ensure sealant bead is smooth and follows contour of fuselage.

(i) Cure sealant.

(j) Remove any sealant visible from cutout on fuselage.

(k) Remove film tape.

(l) Clean any residue from lens. (Refer to 20-30)

(m) Install LED ice light. (Refer to 33-40)

(5) Operational Test - Ice Detection Light

(a) To assist with visual confirmation of illumination area, position airplane in darkened hangar.

Note: To facilitate visual confirmation of illuminated area, ensure low lighting conditions exist in hangar.

(b) Set BAT1 switch to ON position.

(c) Set ICE LIGHT switch to ON position.

(d) Verify Ice Detection Lights illuminate the entire wing leading edge and outboard two feet of the horizontal stabilizer leading edge.

(e) Set ICE LIGHT and BAT1 switches to OFF positions.

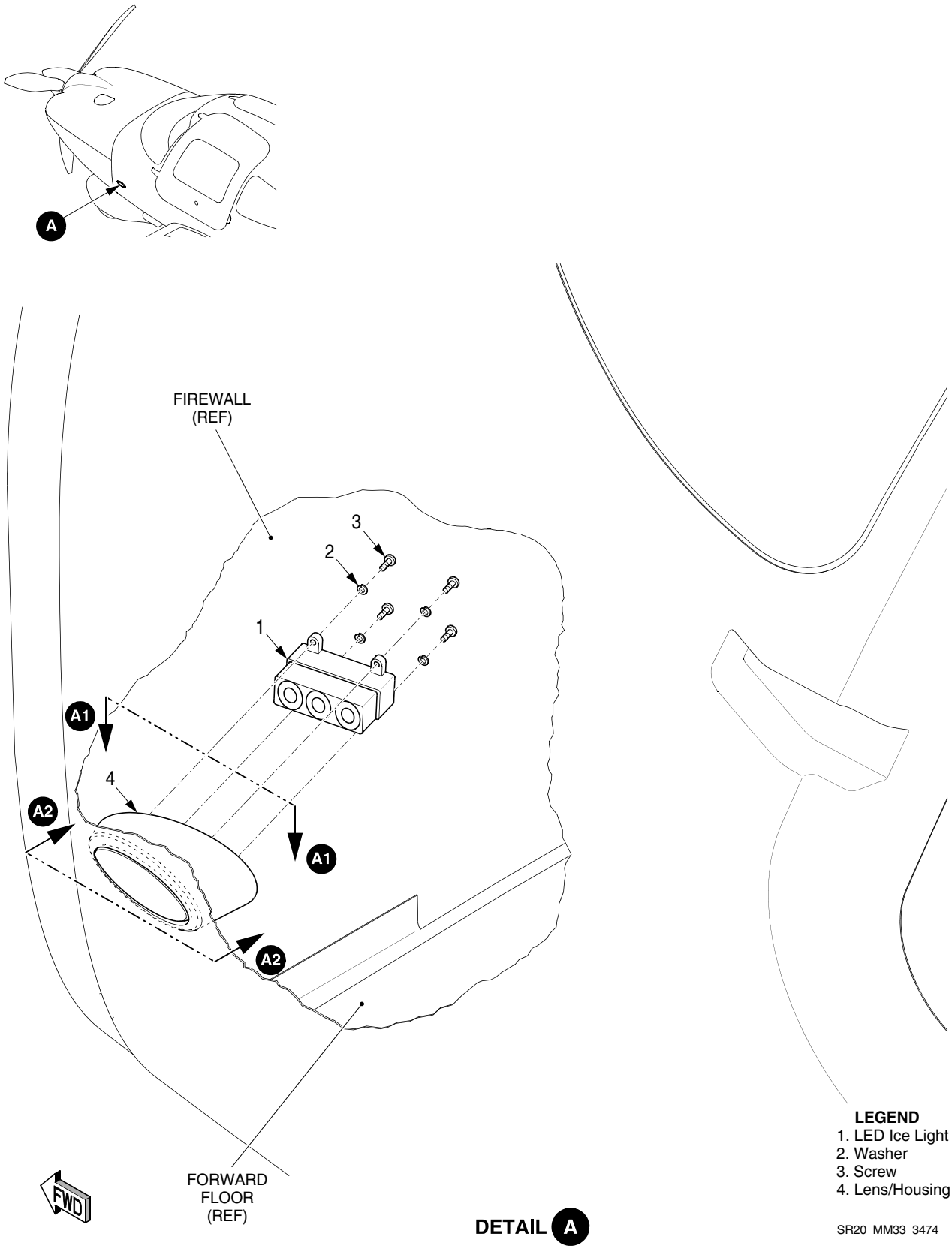
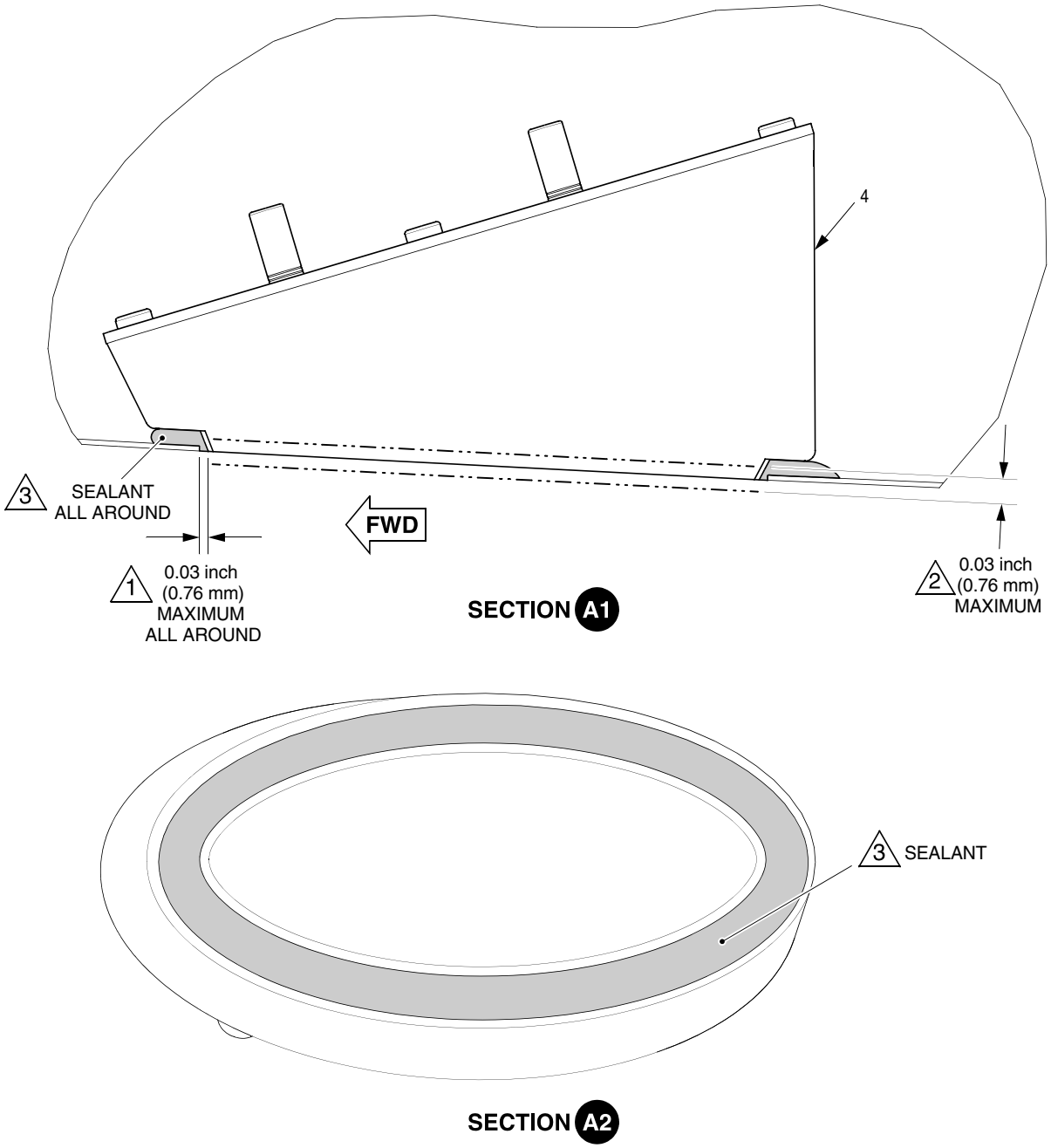


Figure 33-404
Ice Detection Light Installation - Serials 2078 & subs (Sheet 1 of 2)

EFFECTIVITY:
Serials 2078 & subs



NOTE

1. Ensure lens/housing assembly is centered to cutout with a maximum deviation of 0.03 inch (0.76 mm) from center.
2. Ensure exterior surface of lens/housing assembly is flush to fuselage exterior with a maximum perpendicular deviation of 0.03 inch (0.76 mm).
3. Apply sealant to perimeter of exterior cutout. Ensure sealant bead is smooth and follows contour of fuselage. No through porosity is allowed.

LEGEND

4. Lens/Housing

SR20_MM33_3475

Figure 33-404
Ice Detection Light Installation - Serials 2078 & subs (Sheet 2 of 2)

K. Entry Step Light - *Serials 2303 & subs w/ Convenience Lighting* (See Figure 33-405)

(1) Removal - Entry Step Light

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull CONV LIGHTS circuit breaker.

(c) Remove access panel CF5. (Refer to 06-00)

(d) Disconnect LED light assembly from wire harness.

(e) Remove nut securing LED lampholder to step assembly.

(f) Unscrew LED from LED lampholder and remove from airplane.

(2) Installation - Entry Step Light

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source.	LED assembly installation.

(b) Apply Loctite® to threads of LED lampholder.

(c) Secure LED lampholder to entry step with nut.

(d) Apply Loctite® to threads of LED.

(e) Screw LED into LED lampholder.

(f) Connect connector to LED assembly.

(g) Install access panel CF5. (Refer to 06-00)

(h) Reset CONV lights circuit breaker.

(i) Verify proper operation of light.

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

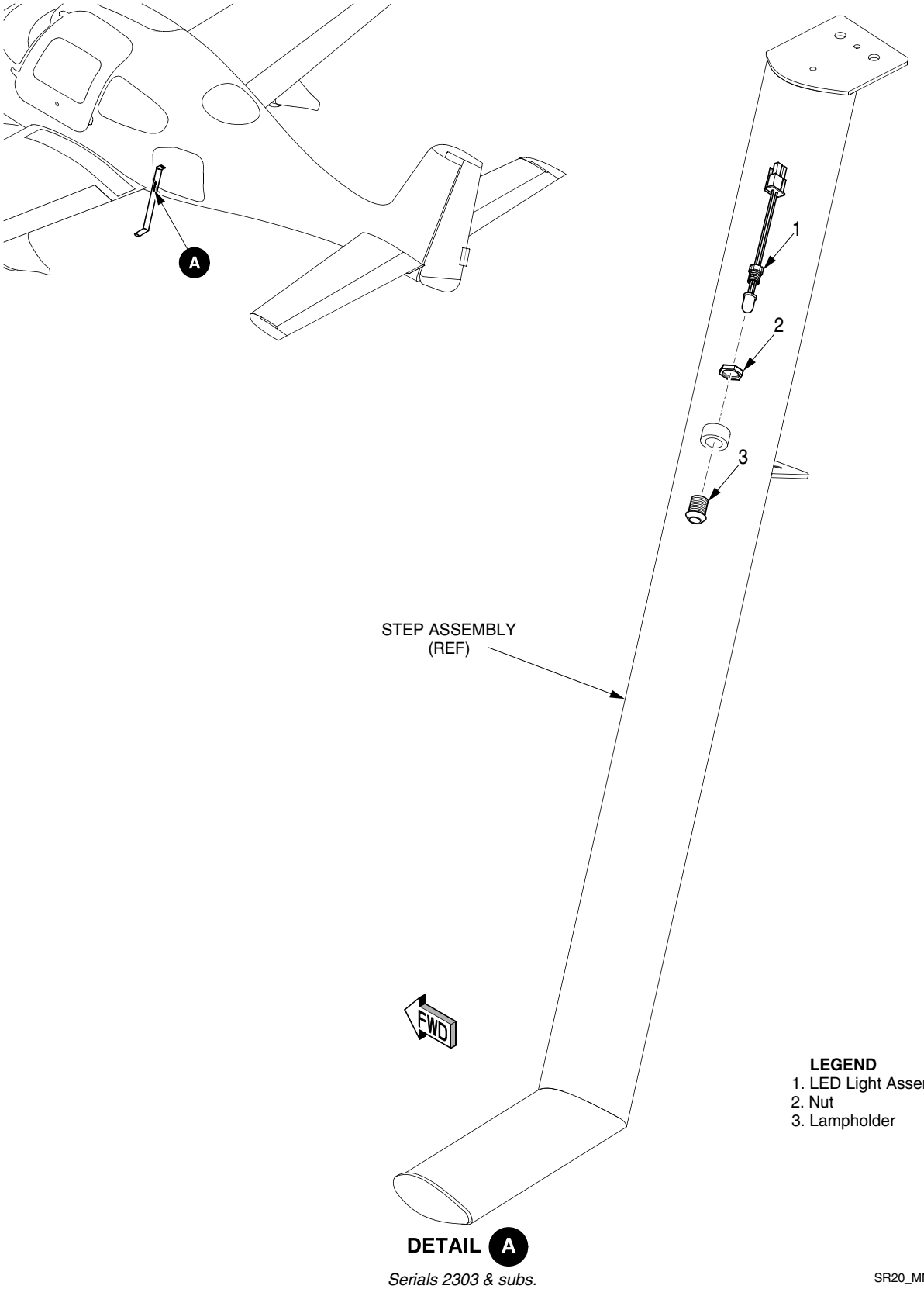


Figure 33-405
Entry Step Light - Serials 2303 & subs w/ Convenience Lighting

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

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CHAPTER

34

NAVIGATION AND PITOT STATIC

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NAVIGATION AND PITOT-STATIC SYSTEMS

1. GENERAL

This chapter describes the navigation systems, units, and components which provide airplane navigational information. Included are pitot-static, gyros, compass, landing aids, global positioning system (GPS), and indicators. The subjects to be covered in this chapter are as follows:

The Flight Environmental Data/Pitot Static Section describes systems which sense environmental conditions and use the data to influence navigation of the airplane. This includes components that depend on the pitot-static system such as vertical speed indicator, airspeed indicator, altimeter, air data computer and MD302 Standby Attitude Module. (Refer to 34-10)

The Attitude and Direction Section describes systems which use magnetic, gyroscopic and inertia forces. This includes gyros, magnetic compass, turn coordinator, attitude indicator, magnetometer, and GRS77 attitude and heading reference system. (Refer to 34-20)

The Landing and Taxiing Aids Section describes systems which provide guidance during approach, landing, and taxiing. This includes components such as the glideslope and marker beacon systems. (Refer to 34-30)

The Independent Position Determining Section describes systems which provide information to determine position from sources which are mainly independent of ground installations. This includes the optional Stormscope, SkyWatch, and Terrain Awareness and Warning Systems. (Refer to 34-40)

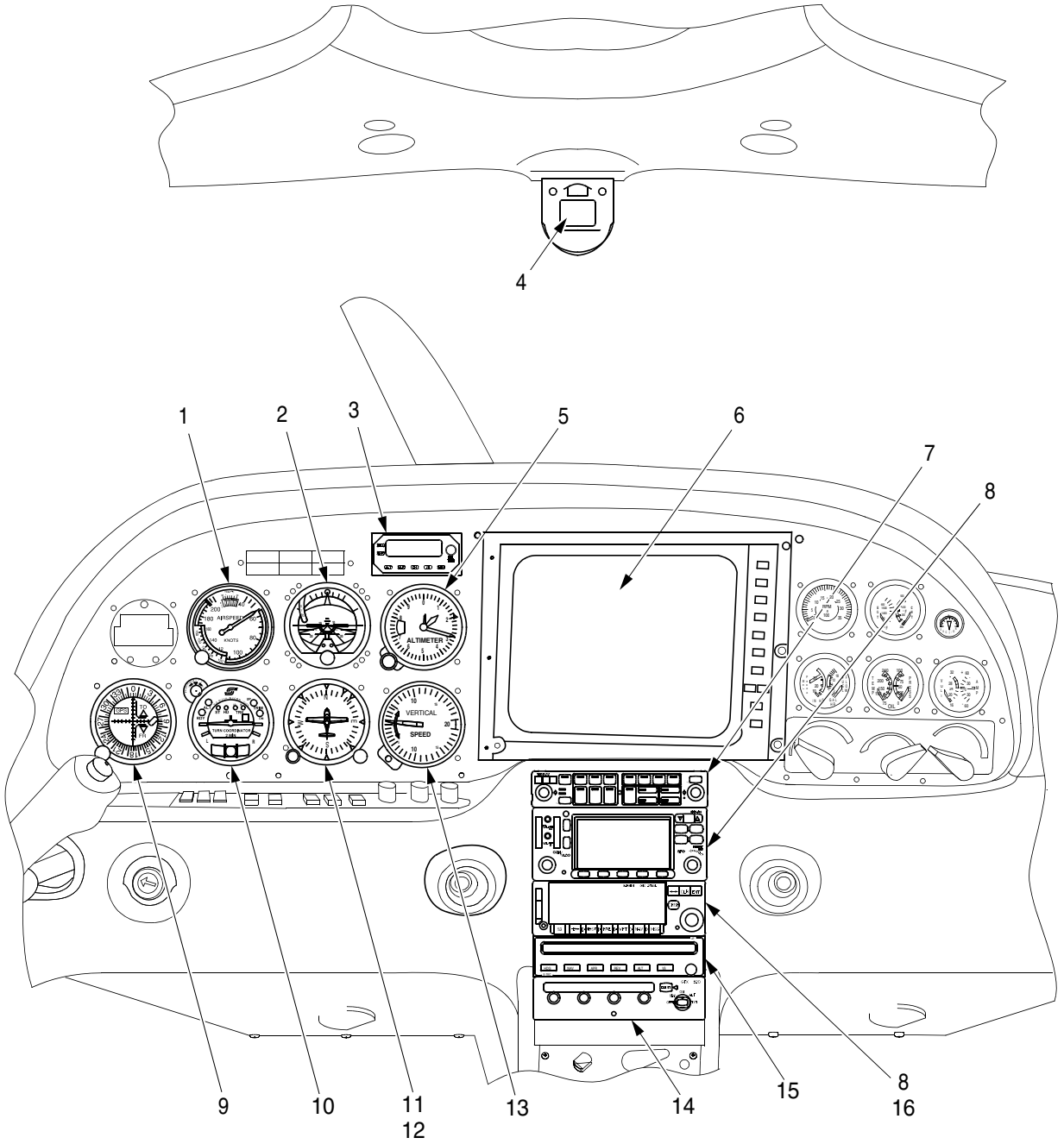
The Dependent Position Determining Section describes systems which provide information to determine position from sources which are mainly dependent on ground installations. This includes the global positioning system (GPS), transponder, course deviation indicator, horizontal situation indicator, XM Weather system, automatic direction finder (ADF) receiver, distance measuring equipment (DME) receiver, and radio navigational aids. (Refer to 34-50)

The Flight Management Computing Section describes systems which combine navigational data to compute or manage the aircraft's geographical position or theoretical flight path. This includes the GCU 478 Flight Management System (FMS) keyboard/controller. (Refer to 34-60)

Navigational system instrument layout: (See Figure 34-001)

Pitot-Static system schematic: (See Figure 34-002)

Note: This chapter does not address specific instrument repair. Federal Aviation Regulations require malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to the manufacturer for servicing.



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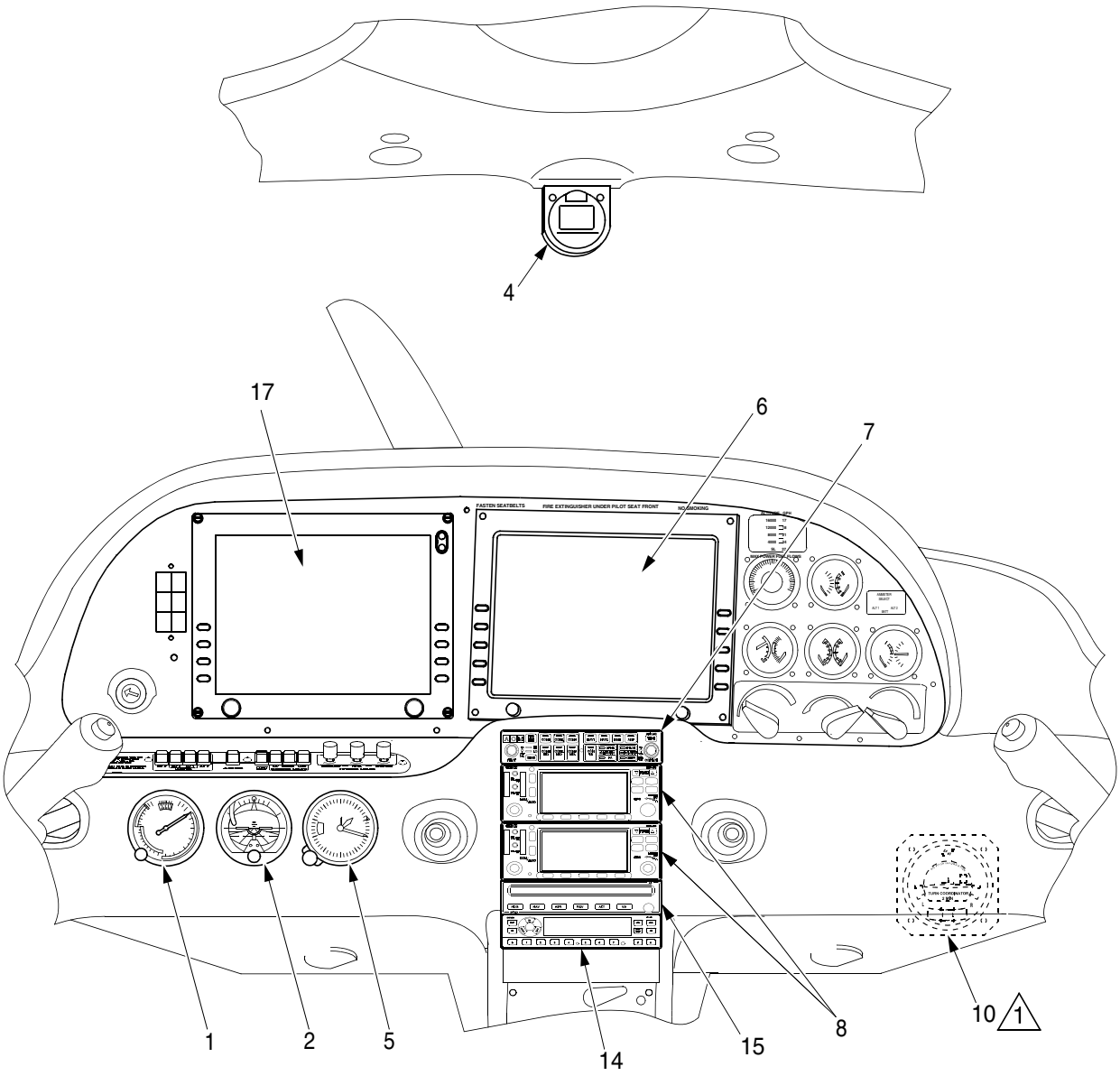
1. Airspeed Indicator (34-10)
2. Attitude Indicator (34-20)
3. Altitude Selector/Alerter (22-12)
4. Magnetic Compass (34-20)
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14. Transponder (34-50)
15. System 55X Autopilot (22-12)
16. GPS/COM Receiver (34-40)

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

SR20_MM34_1080D

Figure 34-001
Navigation and Pitot-Static System - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 8)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



LEGEND

1. Airspeed Indicator (34-10)
2. Attitude Indicator (34-20)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (34-40)
7. Audio Panel w/ Marker Beacon (34-30)
8. GPS/COM/NAV Receiver (34-40)
10. Turn Coordinator (34-20)
14. Transponder (34-50)
15. System 55X Autopilot (22-12)
17. Primary Flight Display (34-15)

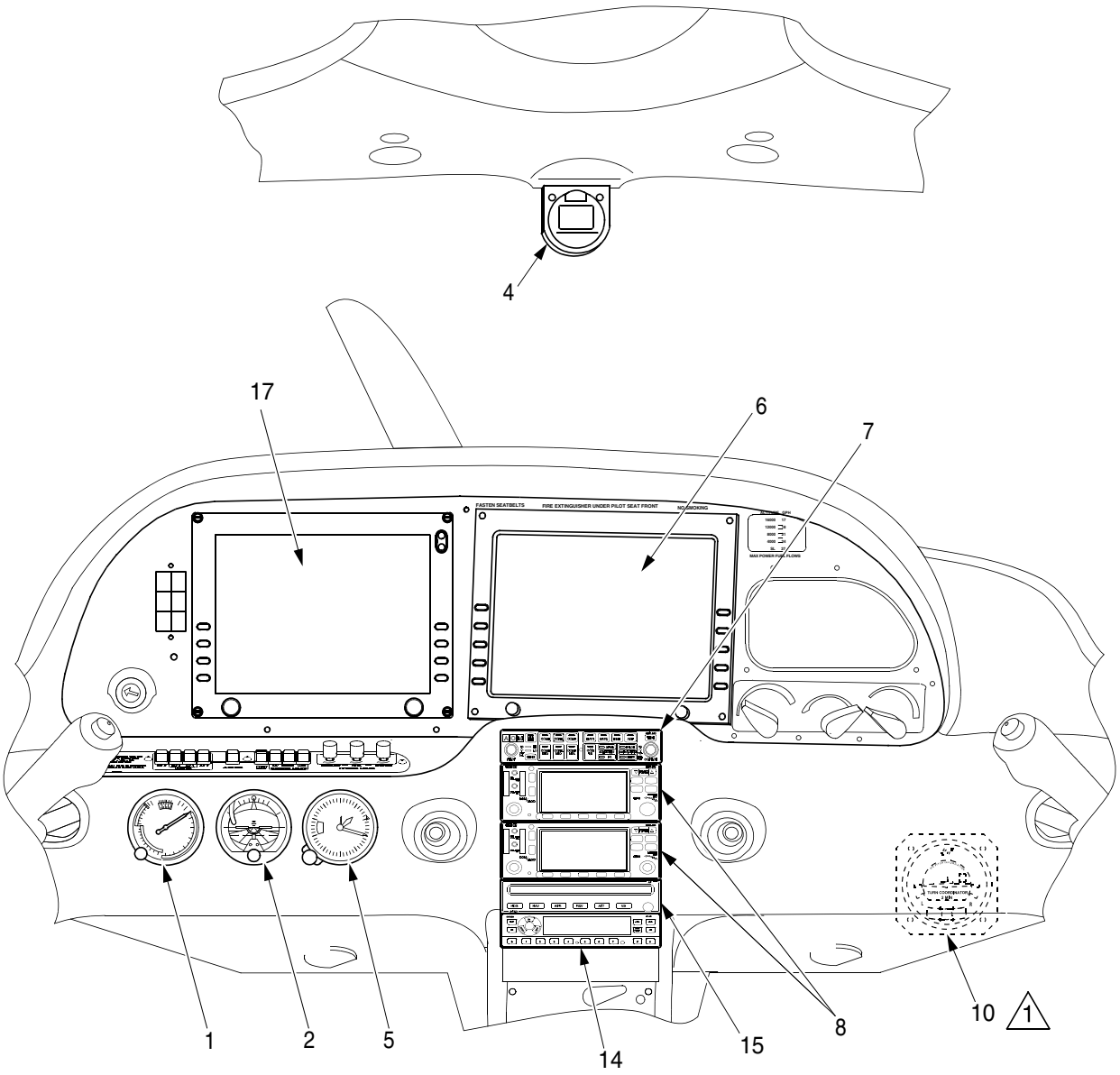
NOTE

1 Mounted behind RH bolster.

Serials 1337 thru 1581 w/ PFD, w/o SRV.

SR20_MM34_1699C

Figure 34-001
Navigation and Pitot-Static System - Serials 1337 thru 1581 w/ PFD, w/o SRV (Sheet 2 of 8)



LEGEND

1. Airspeed Indicator (34-10)
2. Attitude Indicator (34-20)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (34-40)
7. Audio Panel w/ Marker Beacon (34-30)
8. GPS/COM/NAV Receiver (34-40)
10. Turn Coordinator (34-20)
14. Transponder (34-50)
15. System 55X Autopilot (22-12)
17. Primary Flight Display (34-15)

NOTE

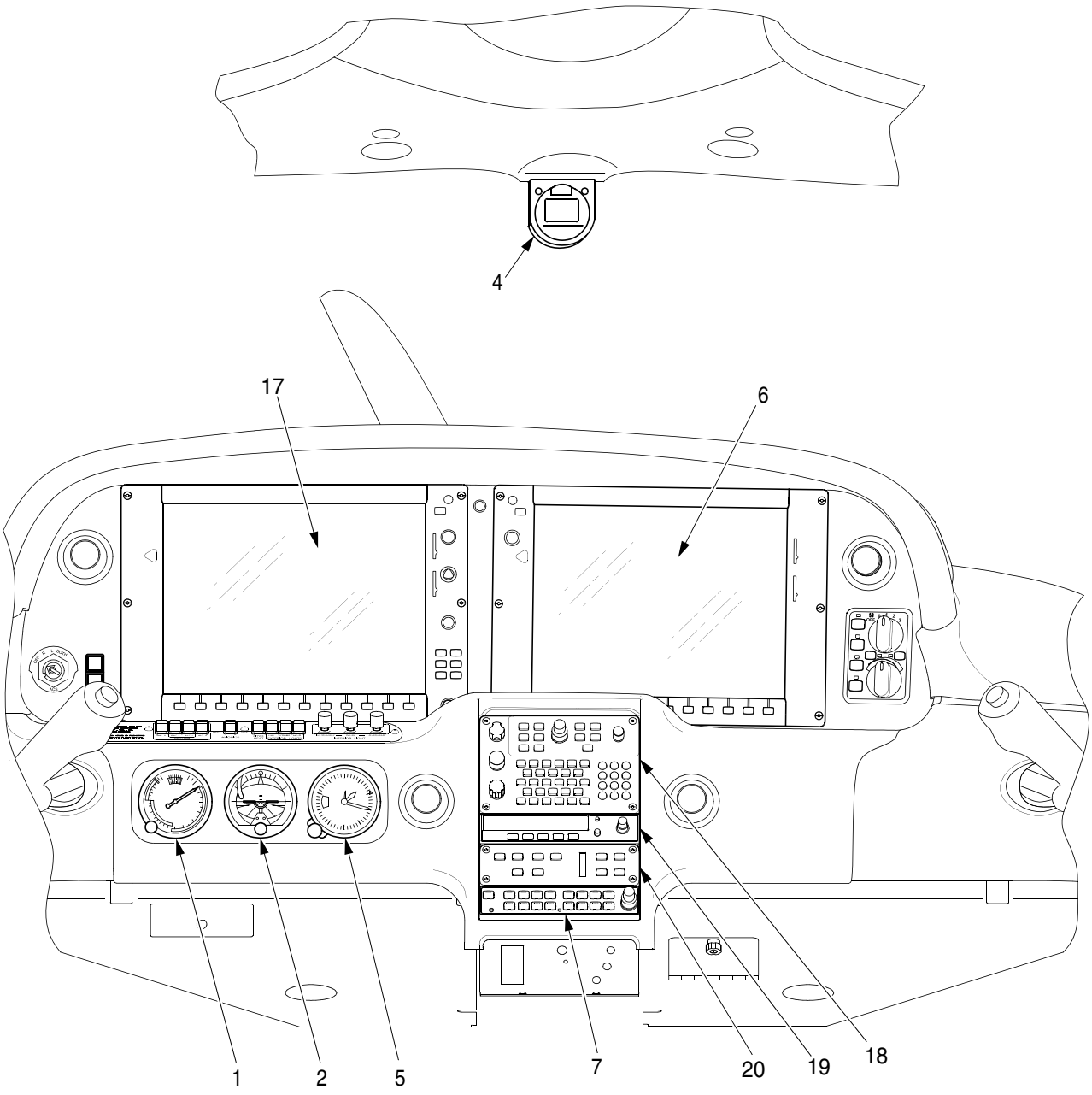
1 Mounted behind RH bolster.

SR20_MM34_2197A

Figure 34-001

Navigation and Pitot-Static - Serials 1582 thru 2015 w/o SRV, 2016 & subs w/o Perspective, w/o SRV (Sheet 3 of 8)

EFFECTIVITY:
Serials 1582 thru 2015 w/o SRV, 2016 & subs w/o Perspective, w/o SRV

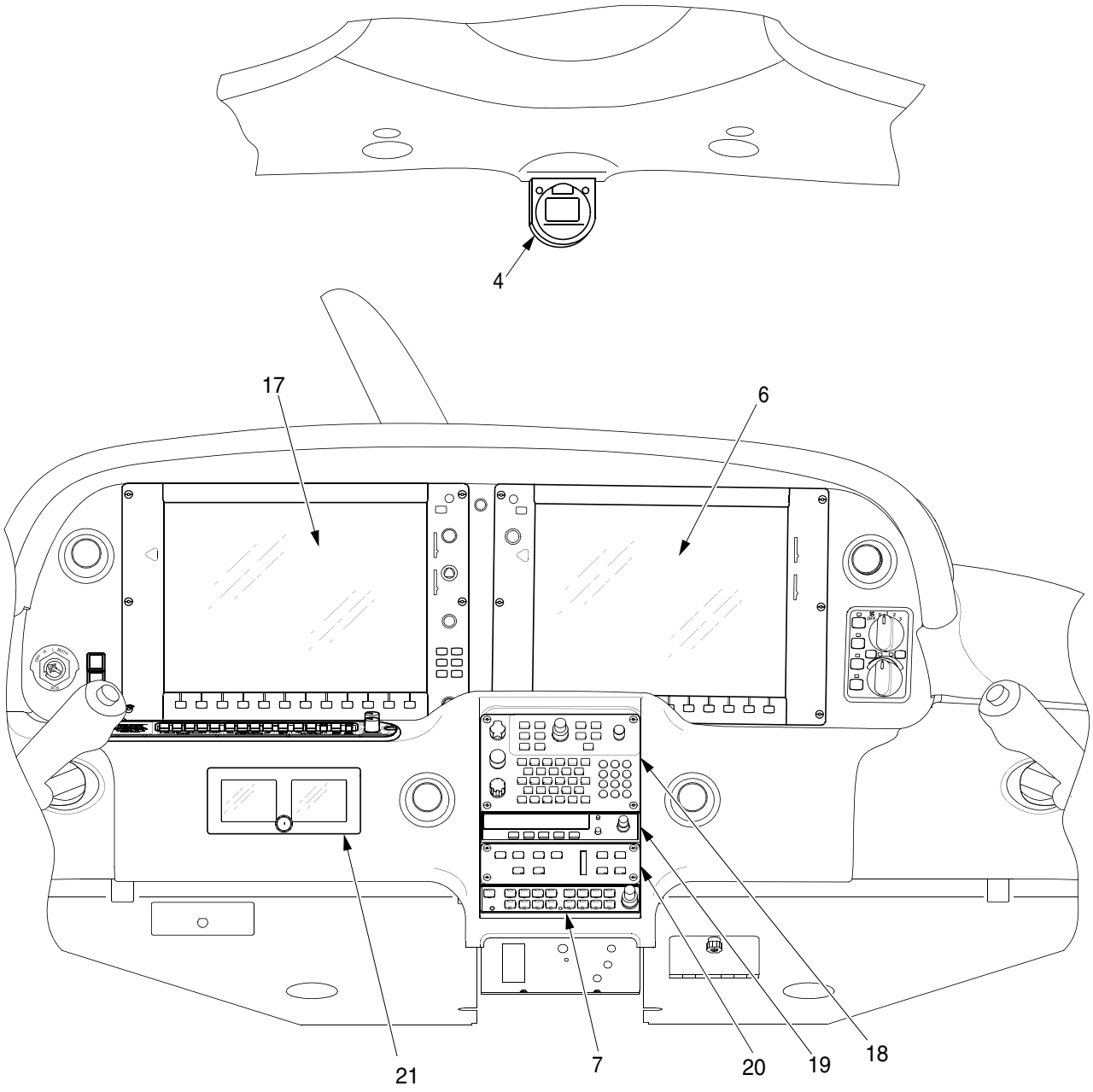


LEGEND

1. Airspeed Indicator (34-10)
2. Attitude Indicator (34-20)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (31-60)
7. Audio Panel w/ Marker Beacon (34-30)
17. Primary Flight Display (31-60)
18. Flight Management System Controller (34-60)
19. Automatic Direction Finder (34-50)
20. GFC 700 Autopilot (22-12)

SR20_MM34_2714A

Figure 34-001
Navigation and Pitot-Static System - Serials 2016 & subs w/ Perspective Avionics & GFC 700 (Sheet 4 of 8)



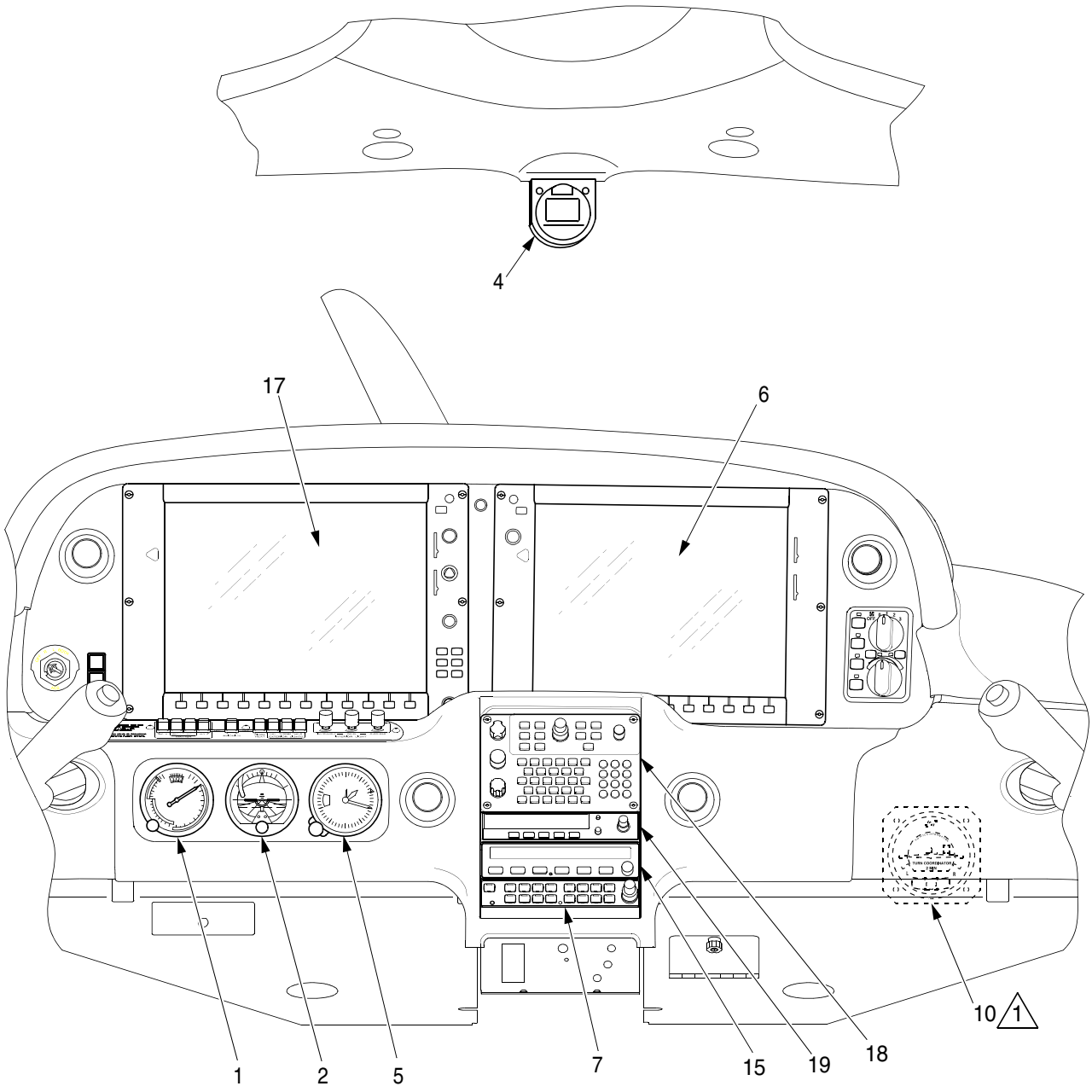
LEGEND

4. Magnetic Compass (34-20)
6. Multi-Function Display (31-60)
7. Audio Panel w/ Marker Beacon (34-30)
17. Primary Flight Display (31-60)
18. Flight Management System Controller (34-60)
19. Automatic Direction Finder (34-50)
20. GFC 700 Autopilot (22-12)
21. MD302 Standby Attitude Module (34-10)

SR20_MM34_3671

Figure 34-001
Navigation and Pitot-Static System - Serials 2273 & subs w/ MD302 (Sheet 5 of 8)

EFFECTIVITY:
Serials 2273 & subs w/ MD302



LEGEND

1. Airspeed Indicator (34-10)
2. Attitude Indicator (34-20)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (31-60)
7. Audio Panel w/ Marker Beacon (34-30)
10. Turn Coordinator (34-20)
15. System 55X Autopilot (22-12)
17. Primary Flight Display (31-60)
18. Flight Management System Controller (34-60)
19. Automatic Direction Finder (34-50)

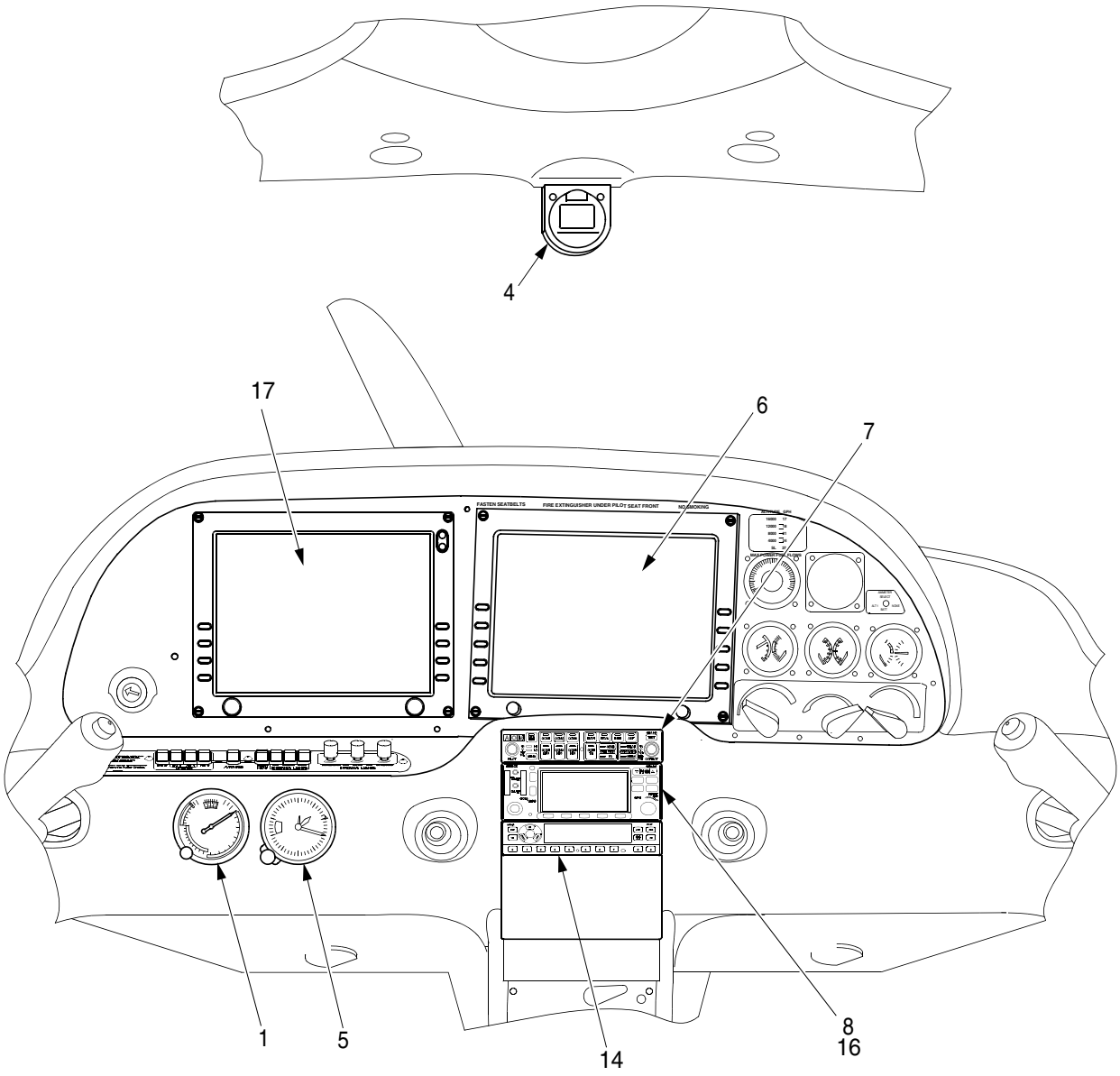
NOTE

1 Mounted behind RH bolster.

SR20_MM34_3032A

Figure 34-001

Navigation and Pitot-Static System - Serials 2016 & subs w/ Perspective Avionics & System 55X (Sheet 6 of 8)



LEGEND

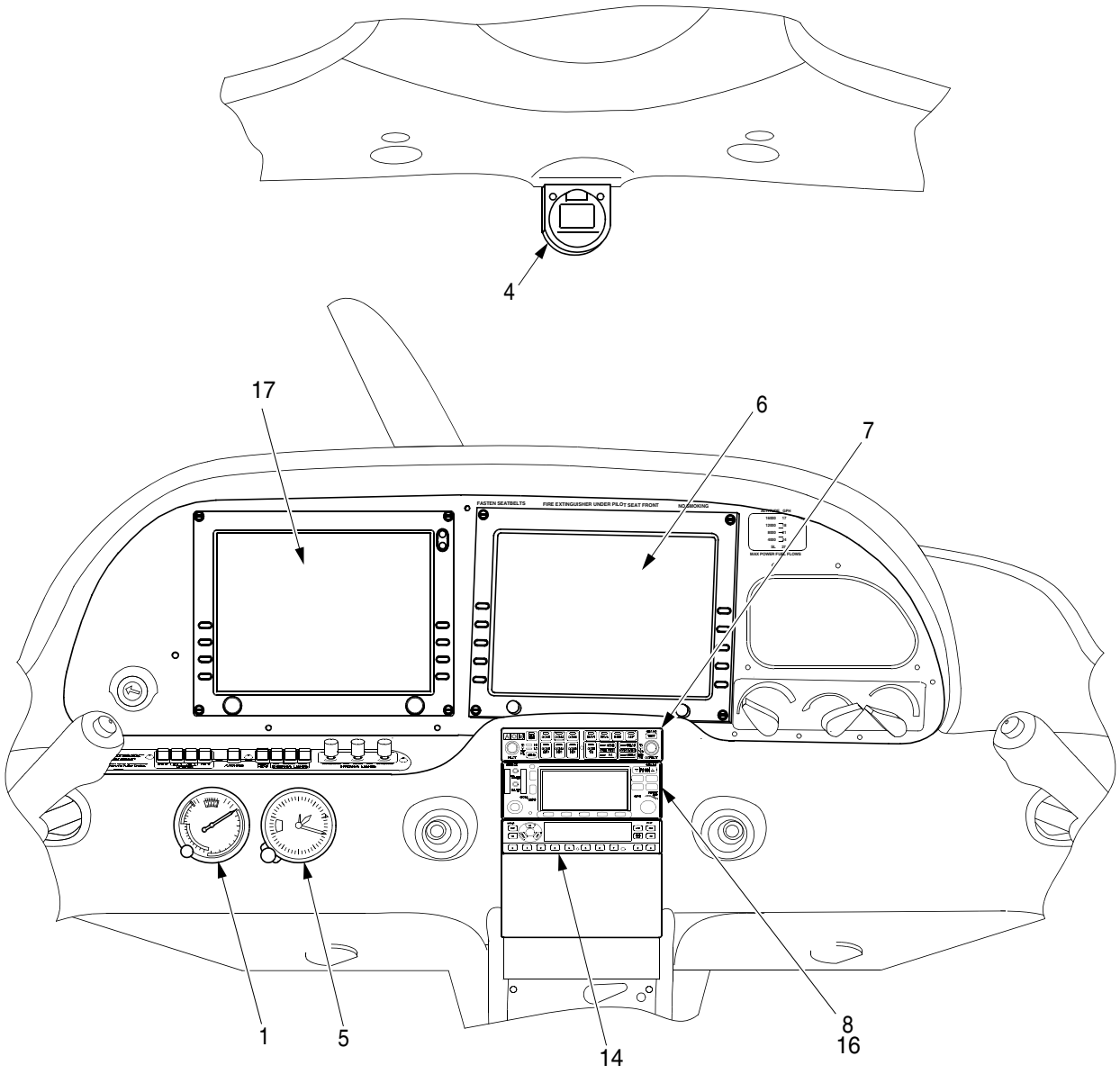
1. Airspeed Indicator (34-10)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (34-40)
7. Audio Panel w/ Marker Beacon (34-30)
8. GPS/COM/NAV Receiver (34-40)
14. Transponder (34-50)
16. GPS/COM Receiver (34-40)
17. Primary Flight Display (34-15)

Serials 1337 thru 1581 w/ SRV.

SR20_MM34_1736B

Figure 34-001
Navigation and Pitot-Static System - Serials 1337 thru 1581 w/ SRV (Sheet 7 of 8)

EFFECTIVITY:
Serials 1337 thru 1581 w/ SRV



LEGEND

1. Airspeed Indicator (34-10)
4. Magnetic Compass (34-20)
5. Altimeter (34-10)
6. Multi-Function Display (34-40)
7. Audio Panel w/ Marker Beacon (34-30)
8. GPS/COM/NAV Receiver (34-40)
14. Transponder (34-50)
16. GPS/COM Receiver (34-40)
17. Primary Flight Display (34-15)

SR20_MM34_2200A

Figure 34-001
Navigation and Pitot-Static System - Serials 1582 & subs w/ SRV (Sheet 8 of 8)

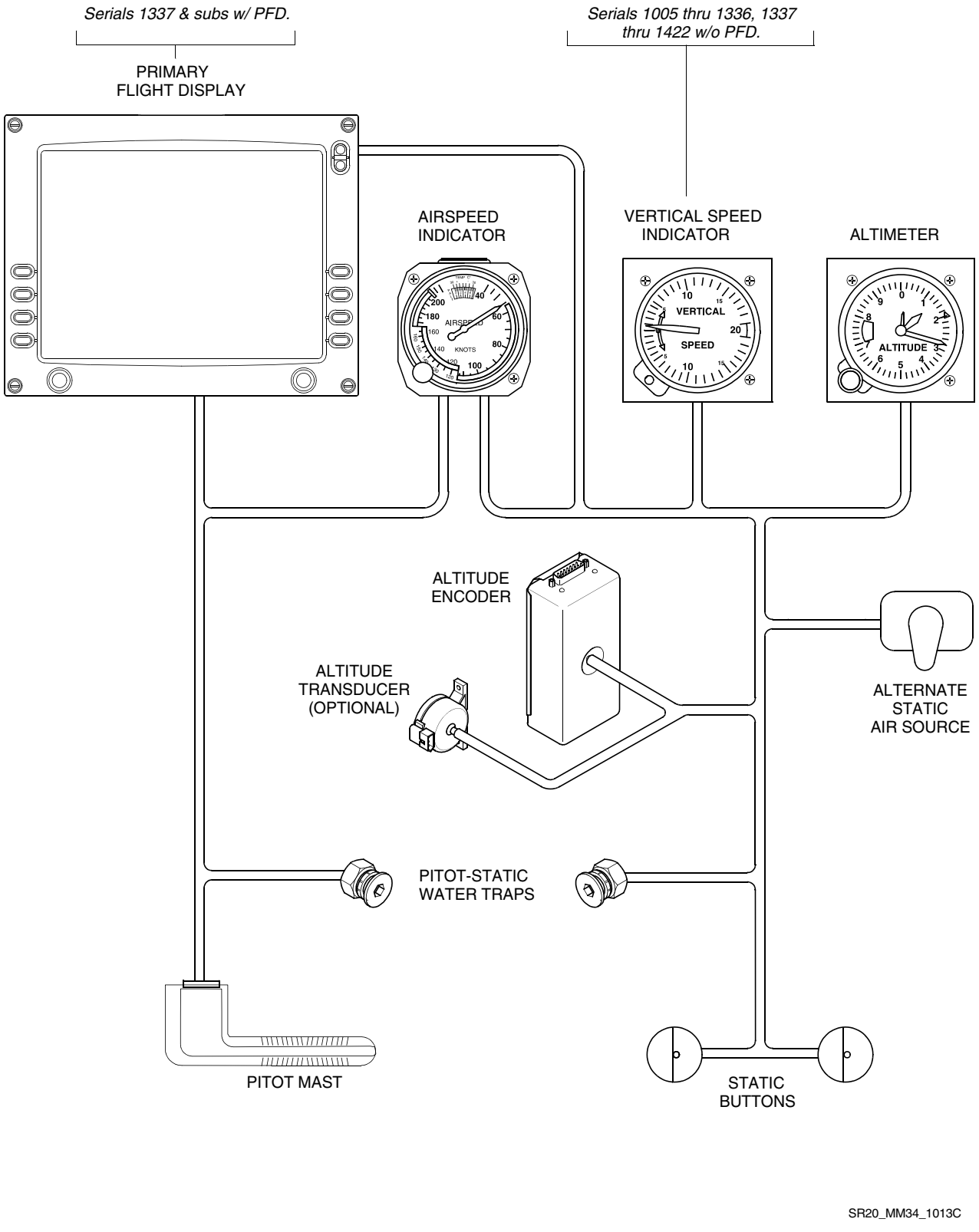


Figure 34-002
Pitot-Static System Schematic - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

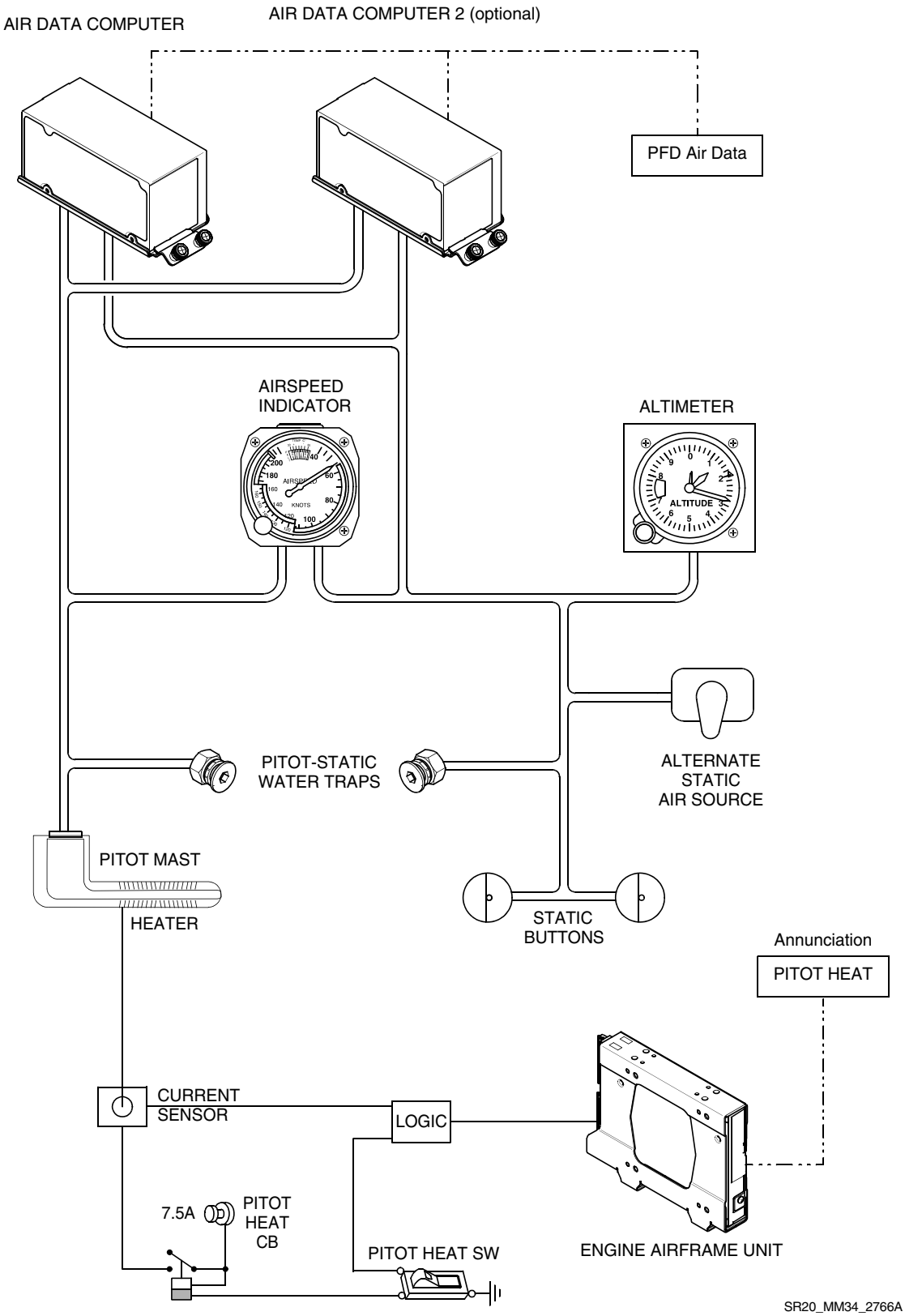


Figure 34-002
Pitot-Static System Schematic - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 3)

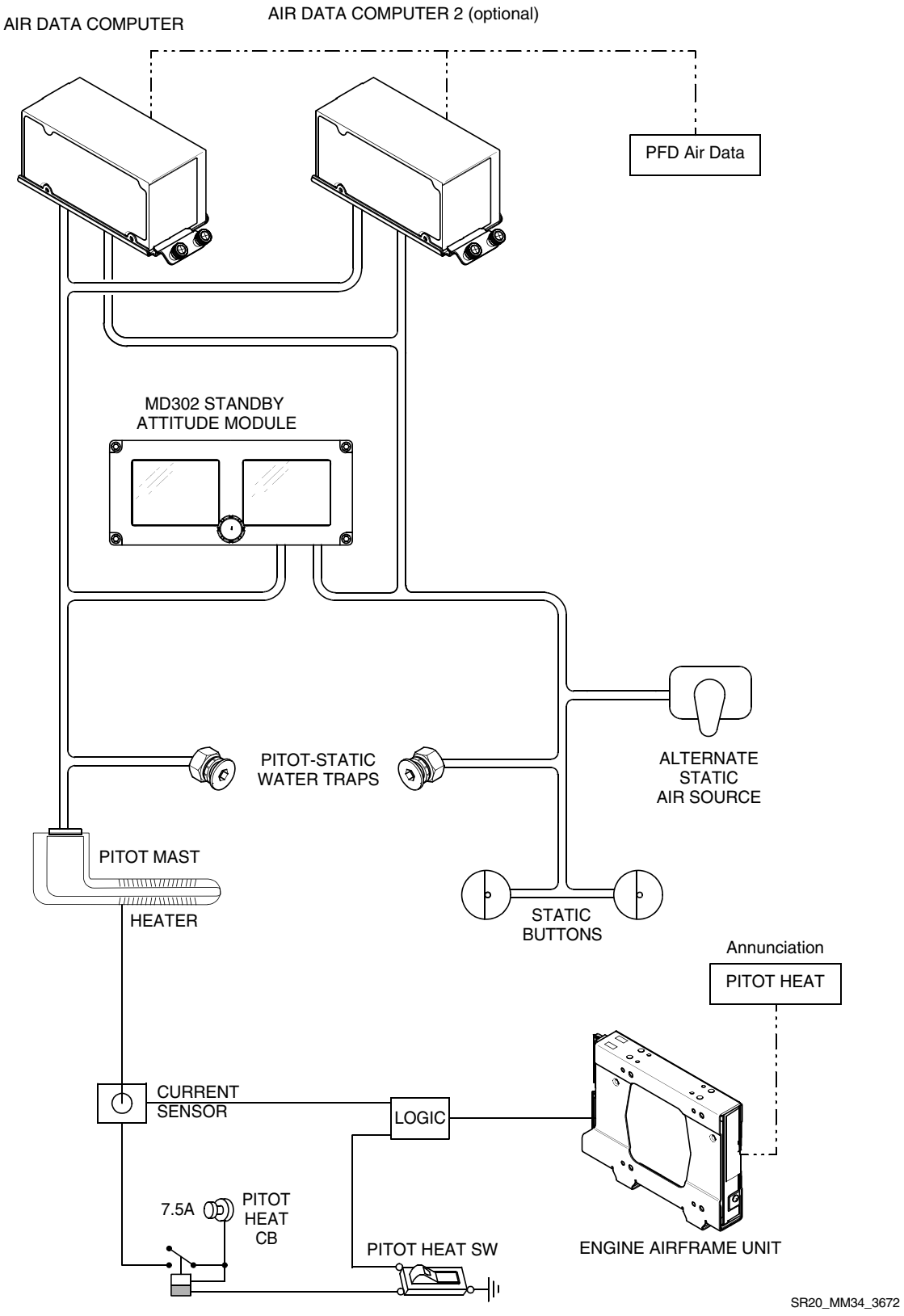


Figure 34-002
Pitot-Static System Schematic - Serials 2273 & subs w/ MD302 (Sheet 3 of 3)

EFFECTIVITY:
Serials 2273 & subs w/ MD302

FLIGHT ENVIRONMENTAL SYSTEMS

1. DESCRIPTION

This section covers that portion of the system which senses environmental conditions and uses the data to influence navigation of the airplane. This includes pitot-static, outside air temperature gage/clock and sensors, vertical speed indicator, altimeter, airspeed indicator, air data computers and MD302 Standby Attitude Module. (See Figure 34-001)

A. Pitot-Static - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The pitot system utilizes an “L” shaped mast with integral pitot tube and heater located on the LH wing just inboard of the wing tip to sense impact or ram air pressure. The pitot mast utilizes an electrical heating element to prevent ice from blocking ram air. Pitot heat is controlled by a switch located in the center of the bolster switch panel. An amber PITOT HEAT light on the annunciation panel will illuminate if the PITOT HEAT switch is set to ON position and the pitot heater is not using power.

The pitot heat system operates on 28 VDC supplied through the 7.5-amp PITOT HEAT/COOLING FAN circuit breaker on the Non-Essential Bus. The PITOT HEAT warning light operates on 28 VDC supplied through the 2-amp ANNUN circuit breaker on the Essential Bus.

The normal static system utilizes two ports, a static source water trap, an alternate static source selector valve, and the necessary plumbing to provide static air pressure sensing for the airspeed indicator, vertical speed indicator, altimeter, altitude encoder, and altitude transducer.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: The primary flight display (PFD) receives static air pressure data through the static system.

The normal static ports are located on the LH and RH sides of the fuselage behind the aft cabin bulkhead. The static line runs from these ports to a tee connector mounted on the aft cabin bulkhead to a water trap located under access panel CF3L. (Refer to 06-00)

Serials 1706 & subs, Serials 1005 thru 1705 after SB 2X-34-22: A static line sump mounted directly to the ports provides increased resistance against forced water intrusion.

The alternate static source valve, located on the lower LH side of the console, provides an alternate source of static air pressure from inside the cabin in the event the normal static sources are plugged.

Note: The alternate static source is to be used when the normal system is inoperative or malfunctioning. When alternate static air is used, instrument readings will vary from normal readings due to static air being obtained from the cabin. Refer to the Pilot’s Operating Handbook for flight operation using alternate static air.

B. Pitot-Static - *Serials 2016 & subs w/ Perspective Avionics*

The pitot system utilizes an “L” shaped mast with integral pitot tube and heater located on the LH wing just inboard of the wing tip to sense impact or ram air pressure. The pitot mast utilizes an electrical heating element to prevent ice from blocking ram air. Pitot heat is controlled by a switch located in the center of the bolster switch panel. The Crew Alerting System (CAS) displays a PITOT HEAT caution on the MFD if the PITOT HEAT switch is set to ON position and the pitot heater is not using power. A CAS PITOT HT RQD caution displays if the outside air temperature is less than or equal to 5° C. The pitot heat system operates on 28 VDC supplied through the 7.5-amp PITOT HEAT circuit breaker on the Non-Essential Bus.

The normal static system utilizes two ports, a static source water trap, an alternate static source selector valve, and the necessary plumbing to provide static air pressure sensing for the air data computer, airspeed indicator, altimeter, and altitude transducer (if equipped with the System 55X autopilot).

Serials 2273 & subs w/ MD302 Standby Attitude Module: The optional MD302 Standby Attitude Module is a combined standby airspeed indicator, standby altimeter, and standby attitude indicator. The

normal static system provides the necessary plumbing to provide static air pressure sensing for the unit.

The normal static ports are located on the LH and RH sides of the fuselage behind the aft cabin bulkhead. The static line runs from these ports to a tee connector mounted on the aft cabin bulkhead to a water trap located under access panel CF2L. (Refer to 06-00)

A static line sump mounted directly to the ports provides increased resistance against forced water intrusion.

The alternate static source valve, located on the lower LH side of the console, provides an alternate source of static air pressure from inside the cabin in the event the normal static sources are plugged.

Note: The alternate static source is to be used when the normal system is inoperative or malfunctioning. When alternate static air is used, instrument readings will vary from normal readings due to static air being obtained from the cabin. Refer to the Pilot's Operating Handbook for flight operation using alternate static air.

C. Outside Air Temperature Gage/Clock and Sensors

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The Outside Air Temperature (OAT) gage/clock is located in the upper LH portion of the pilot's instrument panel. The OAT gage is integral to the clock. The clock provides Universal Time (UT), Local Time (LT), Flight Time (FT) with alarm, Elapsed Time (ET), Outside Air Temperature in °C or °F, and Voltmeter functions. All features and functions are selectable from control buttons on the clock face. The clock receives the OAT signal from a temperature sensor installed immediately forward of the pilots door. The clock operates on 28 VDC supplied through a 5-amp fuse connected to the airplane primary bus in the Master Control Unit (MCU). A replaceable AA battery is installed to provide up to three years battery back up.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: The PFD receives an OAT signal from a temperature sensor integral to the magnetometer installed in the RH wing.

Serials 1005 thru 1581 w/ EMax Engine Monitoring: The Multi-Function Display (MFD) receives an OAT signal from a temperature sensor installed immediately forward of the co-pilot's door.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: The MFD receives an OAT signal from a temperature sensor integral to the magnetometer installed in the RH wing.

Serials 2016 & subs w/ Perspective Avionics: The air data computer receives OAT signals from a temperature sensor installed in the RH wing.

D. Vertical Speed Indicator

The Vertical Speed Indicator (VSI) measures the rate of change in static pressure when the airplane is climbing or descending. By means of a pointer, it indicates the rate of descent or ascent of the airplane in feet per minute.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The VSI is located in the lower RH portion of the pilot's instrument panel. A zero adjust screw is located on the front of the VSI in the lower LH corner to allow for pointer adjustment.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: The PFD processes and displays vertical speed data.

Serials 2016 & subs w/ Perspective Avionics: The GDC 74A air data computer processes vertical speed data for display on the PFD.

E. Airspeed Indicator

(1) Airspeed Indicator - *Serials w/o MD302 Standby Attitude Module*

The airspeed indicator is a differential air pressure gage which measures the difference between ram air pressure and static air pressure to indicate the speed of the airplane. An adjustment

knob allows the pilot to correlate outside air temperature with pressure altitude, thereby allowing the airspeed indicator to show both true and indicated airspeeds. A moveable pointer and a fixed dial with the 0 index at the 12 o'clock position indicates airspeed. Range of the instrument is 0 to 220 knots.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The airspeed indicator is located in the upper LH portion of the pilot's instrument panel.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: The PFD processes and displays airspeed data. A standby airspeed indicator is located in the LH bolster panel.

Serials 2016 & subs w/ Perspective Avionics: The GDC 74A air data computer processes airspeed data for display on the PFD. A standby airspeed indicator is located in the LH bolster panel.

(2) Airspeed Indicator - *Serials 2273 & subs w/ MD302 Standby Attitude Module*

The optional MD302 Standby Attitude Module is a combined standby airspeed indicator, standby altimeter, and standby attitude indicator. The airspeed indicator is a differential air pressure gage which measures the difference between ram air pressure and static air pressure to indicate the speed of the airplane. A fixed pointer in the airspeed window indicates current airspeed on a scrolling airspeed tape. Range of the instrument is 20 to 500 knots.The GDC 74A air data computer processes airspeed data for display on the PFD. The MD302 Standby Attitude Module is located in the LH bolster panel.

F. Altimeter

(1) Altimeter - *Serials w/o MD302 Standby Attitude Module*

The altimeter converts static pressure into a visual indication of airplane altitude above sea level. Pointers on the instrument dial indicate altitude in increments of 100, 1000, and 10,000 feet, with a range of -1000 to 20,000 feet.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The altimeter is located in the upper mid portion of the instrument panel.

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics: The PFD processes and displays altitude data. A standby altimeter is located in the LH bolster panel.

Serials 2016 & subs w/ Perspective Avionics: The GDC 74A air data computer processes altitude data for display on the PFD. A standby altimeter is located in the LH bolster panel.

(2) Altimeter - *Serials 2273 & subs w/ MD302 Standby Attitude Module*

The optional MD302 Standby Attitude Module is a combined standby airspeed indicator, standby altimeter, and standby attitude indicator. The altimeter converts static pressure into a visual indication of airplane altitude above sea level. A fixed pointer in the altitude window indicates altitude in increments of 20, 100, 1,000 and 10,000 feet on a scrolling altitude tape. The range of the instrument is -1,500 to 55,000 feet. The GDC 74A air data computer processes altitude data for display on the PFD. The MD302 Standby Attitude Module is located in the LH bolster panel.

G. Air Data Computer - *Serials 2016 & subs w/ Perspective Avionics*

The GDC 74A air data computer, located behind the RH instrument panel, processes data from the pitot-static system and outside air temperature (OAT) sensors to provide pressure altitude, airspeed, vertical speed, and OAT information to the Perspective Avionics system. 28 VDC for the standard air data computer is supplied through the 5-amp ADC 1 circuit breaker on Essential Bus 1.

The GDC 74A air data computer is integral to the Perspective Avionics Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. TROUBLESHOOTING

Trouble - Pitot-Static	Probable Cause	Remedy
Erroneous altimeter or vertical speed indication.	Leaks in static and/or pitot line.	Check lines for leaks. Perform System Test - Static System Plumbing. (Refer to 34-10)
		Check lines for leaks. Perform System Test - Pitot System Plumbing. (Refer to 34-10)
Incorrect or sluggish response on all three pitot-static instruments.	Leaks or obstruction in static line.	Repair or replace line. Remove obstruction.
Pitot tube does not heat or melt ice.	PITOT HEAT switch is set to OFF position.	Set PITOT HEAT switch to ON position.
Pitot tube does not heat or melt ice. Pitot Light ON.	Circuit breaker out.	Reset circuit breaker.
	Break in wiring.	Test and repair wiring.
	Insufficient current.	Check current drain of element.
	Heating element burned out.	Replace Pitot Mast (Refer to 34-10).
Low or sluggish airspeed indication. Normal altimeter and vertical speed indication.	Pitot tube deformed. Leak or obstruction in pitot line.	Check pitot mast for condition. Perform Inspection/Check - Pitot Mast. (Refer to 34-10)
		Repair or replace damaged component.

Trouble - Vertical Speed Ind.	Probable Cause	Remedy
Pointer indicates erroneous data.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing. (Refer to 34-10)
Pointer does not set on zero.	Leaking or ruptured diaphragm.	Substitute known-good indicator and check reading. Replace or repair instrument.
Pointer fails to respond.	Obstruction in static line.	Check line for obstruction. Blow out lines. (Refer to 34-10)
Pointer oscillates or fails to respond.	Leaks in static line.	Check line for obstruction. Blow out lines. (Refer to 34-10)
	Defective instrument.	Replace or repair instrument.
	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.

Trouble - Altimeter	Probable Cause	Remedy
Pointer indicates erroneous data.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing. (Refer to 34-10)
Cracked or loose cover glass.	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
High reading.	Static system leak.	Inspect static system. (Refer to 34-10)
Excess scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation.	Defective instrument.	Replace or repair instrument.
Difficult to turn setting knob.	Wrong or lack of lubrication.	Replace or repair instrument.

Trouble - Airspeed Indicator	Probable Cause	Remedy
Pointer fails to respond or indicates improperly.	Leak in instrument case.	Replace or repair instrument.
	Obstruction in pitot line.	Check line for obstruction. Blow out lines. (Refer to 34-10)
Incorrect indication or pointer oscillates.	Alternate static source valve open.	Close for normal operation.
	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing. (Refer to 34-10)
	Leak in pitot or static lines.	Repair or replace damaged lines. Tighten connections.
	Leaking or ruptured diaphragm.	Substitute known-good indicator and check reading. Replace or repair instrument.
Pointer vibrates.	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
	Excessive pitot tube vibration.	Tighten clamps and connections.

Serials 2016 & subs w/ Perspective Avionics:

Trouble	Probable Cause	Remedy
Airspeed, altitude, vertical speed, or ISA not receiving valid data.	Software or configuration error.	Check PFD Alert Window for PFD, MFD or GDC configuration, software or failed data path error messages. Correct any errors before proceeding. Replace GDC 74A configuration module.
	GDC 74A air data computers are offline.	Verify GDCs are online by checking for a green checkmark next to GDC on MFD Aux – System Status page. 1. If GDC is not online (a Red-X will be present instead of a green check mark), check for wiring/ power faults and GDC connector security. 2. Replace GDC 74A air data computer.
	Obstruction in pitot-static system.	Inspect GDC 74A pitot-static ports and plumbing for blockage.
	Faulty OAT sensor.	For TAS failure only, replace OAT sensor.
OAT and TAS not receiving valid data.	Faulty OAT sensor wiring and connectors.	Check OAT sensor wiring and connectors for faults or damage. Replace GDC 74A config module and pigtail harness.
	Faulty OAT sensor.	Replace OAT sensor.
	Faulty GDC 74A air data computer.	Replace GDC 74A air data computer.

Serials w/ MD302 Standby Attitude Module:

Trouble	Probable Cause	Remedy
Altimeter indicates erroneous data.	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing. (Refer to 34-10)

Trouble	Probable Cause	Remedy
Altimeter indicates high reading.	Static system leak.	Inspect static system. (Refer to 34-10)
Altimeter displays excess scale error.	Improper calibration adjustment.	Replace instrument.
Excessive altitude indicator oscillation.	Defective instrument.	Replace or repair instrument.
Difficult to rotate setting knob.	Wrong or lack of lubrication.	Replace or repair instrument.
Airspeed indicator fails to respond or indicates improperly.	Leak in instrument case.	Replace or repair instrument.
	Obstruction in pitot line.	Check line for obstruction. Blow out lines. (Refer to 34-10)
Airspeed indicator oscillates or indicates improperly.	Alternate static source valve open.	Close for normal operation.
	Moisture in static traps and/or sump.	Check traps and sump for moisture. Blow out lines.
	Moisture in static line.	Check lines for moisture. Perform System Test - Static System Plumbing. (Refer to 34-10)
	Leak in pitot or static lines.	Repair or replace damaged lines. Tighten connections.
	Leaking or ruptured diaphragm.	Substitute known-good indicator and check reading. Replace or repair instrument.
	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
	Excessive pitot tube vibration.	Tighten clamps and connections.
Attitude indicator horizon bar vibrates excessively, oscillates, or does not settle.	Defective instrument.	Replace instrument.
	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.

For additional Troubleshooting, refer to the Model MD302 Series SAM Standby Attitude Module Installation Manual and Operating Instructions. (Refer to 05-10)

3. MAINTENANCE PRACTICES

A. Pitot Tube Assembly (See Figure 34-101)

(1) Removal - Pitot Tube Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull PITOT HEAT circuit breaker.

(c) Remove left wing tip. (Refer to 57-20)

(d) Identify and disconnect pitot line at low point on connector projecting from top of pitot bracket. Cap off connector.

(e) Remove screws securing pitot tube assembly to bracket, disconnect pitot heat electrical connector, and remove pitot tube.

(f) *Serials 1005 thru 1885:* Remove screws and washers securing pitot tube bracket to wing rib. Remove bracket from airplane.

(g) *Serials 1886 & subs:* Remove screws, washers, and nuts securing pitot tube bracket to wing skin. Remove bracket from airplane.

(2) Installation - Pitot Tube Assembly

(a) *Serials 1005 thru 1885:* Position pitot tube bracket to wing rib and secure with screws and washers.

(b) *Serials 1886 & subs:* Position pitot tube bracket to wing skin and secure with screws, washers, and nuts.

(c) Slide pitot tube assembly into bracket, connect pitot heat electrical connector, then connect pitot line.

(d) Install screws securing pitot tube to bracket.

(e) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(f) Perform Operational Test - Pitot Heat. (Refer to 34-10)

(g) Install left wing tip. (Refer to 57-20)

(h) Reset PITOT HEAT circuit breaker.

(3) Operational Test - Pitot Heat

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

Note: The pitot tube may utilize an after-market cover.

(b) On lower outboard side of LH wing, remove cover from pitot tube if installed.

(c) Pull PITOT HEAT circuit breaker.

(d) Set PITOT HEAT switch to ON position.

(e) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Verify PITOT HEAT annunciator light is on.

(f) *Serials 2016 & subs w/ Perspective Avionics:* Verify PITOT HEAT caution displays on the PFD.

(g) Reset PITOT HEAT circuit breaker.

(h) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Verify PITOT HEAT annunciator light is off.

(i) *Serials 2016 & subs w/ Perspective Avionics:* Verify PITOT HEAT caution no longer displays on the PFD.

WARNING: Avoid prolonged exposure to heated pitot tube to prevent burns.

(j) Carefully touch pitot tube to verify that it heats up.

(k) Set PITOT HEAT switch to OFF position.

(l) If applicable, allow pitot tube to cool and reinstall cover.

B. Pitot System Plumbing (See Figure 34-101)

(1) System Test - Pitot System Plumbing

Pitot system lines must be kept clear and connections tight. A water trap and plug, located at the low point of the pitot system under access panel CF2L, is used to trap and then drain water from the system. However, moisture may collect at other points of the system. To purge the pitot system, proceed as follows:

(a) *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*: Remove glareshield. (Refer to 25-10)

(b) *Serials 1337 thru 1422 w/ PFD, 1423 & subs:* Remove LH kickplate. (Refer to 25-10)

(c) *Serials w/o MD302 Standby Attitude Module:*

1 Identify and disconnect lower pitot line at airspeed indicator branch tee, then cap off branch tee.

2 Disconnect pitot line at pitot mast.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

3 Blow clean, low-pressure air from disconnected line at airspeed indicator branch tee to disconnected line at pitot mast.

4 Blow clean, low-pressure air through pitot mast.

5 Connect pitot line at pitot mast.

6 Connect pitot line at airspeed indicator branch tee.

(d) *Serials w/ MD302 Standby Attitude Module:*

1 Identify and disconnect lower pitot line at MD302 branch tee, then cap off branch tee.

2 Disconnect pitot line at pitot mast.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

3 Blow clean, low-pressure air from disconnected line at MD302 branch tee to disconnected line at pitot mast.

4 Blow clean, low-pressure air through pitot mast.

5 Connect pitot line at pitot mast.

6 Connect pitot line at MD302 branch tee.

(e) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(f) *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*: Install glareshield. (Refer to 25-10)

(g) *Serials 1337 thru 1422 w/ PFD, 1423 & subs*: Install LH kickplate. (Refer to 25-10)

(2) Functional Test - Pitot System Plumbing

The following procedure outlines inspection and testing of the pitot system. Perform this test any time an instrument, fitting, line, or pitot head is disconnected.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover pitot tube hole during leak test.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Pitot/Static Test Set	Model 6250[a]	Laversab, Inc.	Simulate pitot air pressure.
	DPS1000[a]	Barfield	
	Model 393[a]	Aircraft Instrument Support Services, Inc.	

a. or equivalent

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

Note: Ensure small hole on forward, bottom portion of the pitot tube is covered by the pitot line sleeve or sealant tape.

(d) Connect pitot line from pitot/static test set to pitot mast on airplane.

CAUTION: Verify pump is turned off and plug in tester power cord.

(e) Perform pitot leak test procedure.

1 Close pitot, static and cross feed control valves. Close pitot and static bleed/vent valves.

2 Set vacuum pressure selector to pressure source. Turn pump on.

3 Apply pressure to the pitot system by slowly opening the pitot control valve until the airspeed indicator reads 180 KTS. Close pitot control valve. Turn pump off.

4 Observe airspeed indicator for 1 minute. If leak is present, indicated airspeed will decrease.

5 Slowly release pitot bleed/vent valve and reduce pressure gradually to prevent instrument damage until the indicator returns to zero or its rest position.

6 If test reveals a leak, check all connections for tightness and repair faulty components.

C. Alternate Static Source Valve (See Figure 34-101)

(1) Removal - Alternate Static Source Valve

(a) Open circuit breaker panel to gain access to alternate static source valve.

(b) Identify, disconnect, then cap off line from alternate static source valve.

(c) *Serials 1005 thru 1705 after SB 2X-34-21, 1706 & subs:* From back-side of alternate static source valve knob, press insert out from knob to facilitate access to screw.

(d) Remove set screw attaching knob to alternate static source valve, then pull off knob.

(e) Remove screw securing alternate static source valve to console, then remove valve.

(2) Installation - Alternate Static Source Valve

(a) Position alternate static source valve to console, then install mounting screw.

(b) *Serials 1005 thru 1705 after SB 2X-34-21, 1706 & subs:* Slide insert into knob.

(c) Connect static line to alternate static source valve.

(d) Push knob onto alternate static source valve, then install set screw.

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Close and secure circuit breaker panel.

D. Static System Plumbing (See Figure 34-101)

Static air pressure lines must be kept clear and connections tight. A water trap and plug, located at the low point of the static system under access panel CF3L, is used to trap and then drain water from the system.

Serials 1706 & subs, Serials 1005 thru 1705 after SB 2X-34-21: A second water trap and plug, located forward of the alternate static source valve in the LH center console, is used to trap and then drain water from the system.

Serials 1706 & subs, Serials 1005 thru 1705 after SB 2X-34-22: A static line sump, located aft of bulkhead 222, is used to prevent water from entering the system.

However, moisture may collect at other points of the system. To purge the static system, perform System Test - Static System Plumbing (Refer to 34-10)

(1) System Test - Static System Plumbing - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

(a) Open circuit breaker panel to gain access to altitude encoder.

(b) Identify and disconnect lower static line at altitude encoder branch tee, then cap off branch tee.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

(c) Blow clean, low-pressure air from disconnected line at altitude encoder branch tee to static ports.

(d) Connect lower static line at altitude encoder branch tee.

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Close and secure circuit breaker panel.

(2) System Test - Static System Plumbing - *Serials 2016 & subs w/ Perspective Avionics*

(a) Remove LH kick plate. (Refer to 25-10)

(b) *Serials w/o MD302 Standby Attitude Module:*

1 Identify and disconnect lower static line at airspeed indicator branch tee, then cap off branch tee.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

2 Blow clean, low-pressure air from disconnected line at airspeed indicator branch tee to static ports.

3 Connect lower static line at airspeed indicator branch tee.

(c) *Serials w/ MD302 Standby Attitude Module:*

1 Identify and disconnect lower static line at MD302 branch tee, then cap off branch tee.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

2 Blow clean, low-pressure air from disconnected line at MD302 branch tee to static ports.

3 Connect lower static line at MD302 branch tee.

(d) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(e) Install LH kick plate. (Refer to 25-10)

(3) Functional Test - Static System Plumbing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover static air buttons during leak test.
Calibrated Pitot/Static Test Set	Model 6250[a]	Laversab, Inc.	Simulate static air pressure.
	DPS1000[a]	Barfield	
	Model 393[a]	Aircraft Instrument Support Services, Inc.	

a. or equivalent

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Remove glareshield. (Refer to 25-10)

(e) Remove trim panel from RH side of center console. (Refer to 25-10)

(f) *Serials 1337 thru 1422 w/ PFD, 1423 & subs*: Remove LH kickplate. (Refer to 25-10)

CAUTION: Never apply positive pressure with airspeed indicator, vertical speed indicator, MD302 Standby Attitude Module, PFD, or air data computer connected into static system.

(g) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Disconnect altimeter, airspeed indicator, altitude encoder, and if applicable, vertical speed indicator, altitude transducer, and PFD. Use suitable fittings to re-connect the static pressure lines with no instruments connected into the static pressure system.

(h) *Serials 2016 & subs w/ Perspective Avionics and w/o MD302 Standby Attitude Module:* Disconnect altimeter, airspeed indicator, air data computer, and if applicable, altitude transducer. Use suitable fittings to re-connect the static pressure lines with no instruments connected into the static pressure system.

(i) *Serials w/ MD302 Standby Attitude Module:* Disconnect MD302 Standby Attitude Module and air data computer. Use suitable fittings to re-connect the static pressure lines with no instruments connected into the static pressure system.

(j) Set barometric scale on tester altimeter to 29.92 inHg.

Note: Ensure small hole on forward, bottom portion of the pitot tube is covered by the pitot line sleeve or sealant tape.

(k) Connect pitot line from pitot/static test set to pitot mast on airplane.

(l) Connect static line from pitot/static test set to a static port on airplane.

(m) Apply sealant tape to cover other static port on airplane.

(n) At circuit breaker panel, verify alternate static source valve is in the NORMAL position.

CAUTION: Verify pump is turned off and plug in tester power cord.

(o) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(p) Perform static leak test procedure.

1 Close pitot and static control valves.

2 Close pitot and static bleed/vent valves.

3 Open cross feed valve fully and set source selector to vacuum. Turn pump on.

CAUTION: Do not climb more than 6,000 FPM.

4 Apply vacuum to the static system by slowly opening the static control valve until the altimeter rises to approximately 1,000 feet above the starting altitude.

5 Close static control valve. Turn pump off. Allow the Altimeter to stabilize (approximately one minute).

6 Observe altimeter for one minute. Any decrease in indicated altitude cannot be greater than 20 ft.

CAUTION: Do not descend more than 6,000 FPM during bleed down.

7 Slowly open static bleed/vent valve to increase the static pressure.

8 *Serials 1337 thru 1422 w/ PFD, 1423 & subs*: Install LH kickplate. (Refer to 25-10)

9 Install trim panel to RH side of center console. (Refer to 25-10)

10 Install glareshield. (Refer to 25-10)

E. Altitude Encoder - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 34-101)**

(1) Removal - Altitude Encoder

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENCODER/TRANSPONDER circuit breaker.

(c) Remove trim panel from RH side of center console. (Refer to 25-10)

(d) Disconnect cable from altitude encoder.

(e) Disconnect static line to altitude encoder.

(f) Cut safety wire securing knurled nut.

(g) Loosen knurled nut and remove altitude encoder from mounting tray.

(2) Installation - Altitude Encoder

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire	-	Any Source	Secure.

(b) Position altitude encoder in mounting tray and tighten knurled nut.

(c) Connect cable to altitude encoder.

(d) Connect static line to altitude encoder.

(e) Reset ENCODER/TRANSPONDER circuit breaker.

(f) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(g) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(h) Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)

(i) Safety wire knurled nut to mounting tray.

(j) Install trim panel to RH side of center console. (Refer to 25-10)

(3) Functional Test - Altitude Encoder Calibration

CAUTION: The airplane may not be returned to service until a certified avionics service center has performed altitude encoder calibration.

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover static port.
Calibrated Pitot/Static Test Set	Model 6250[a]	Laversab, Inc.	Simulate altitude.
	DPS1000[a]	Barfield	
	Model 393[a]	Aircraft Instrument Support Services, Inc.	

a. or equivalent

(c) Connect 28 ±1 VDC external power to external power receptacle.

(d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

Note: Calibration must be done with the encoder and altimeter both at ambient temperature within the range of 55° to 95° F (13° to 35° C). Verify external power is applied to aircraft to preserve battery life and system is up to proper operating power.

(e) Turn on encoder and allow to warm up for a minimum period of 10 minutes. If power to the encoder is momentarily interrupted during calibration, wait a minimum of 3 minutes before continuing with the calibration.

(f) Connect pitot line from pitot/static test set to pitot mast on airplane.

(g) Connect static line from pitot/static test set to a static port on airplane.

(h) Apply sealant tape to cover other static port on airplane.

CAUTION: Verify up or down arrow is not displayed on transponder prior to taking any reading.

(i) With calibrated pitot/static test set, simulate altitude ascent through 17950 feet.

(j) Verify transponder transitions to 18000 feet.

CAUTION: Always adjust high altitude before low altitude.

(k) If transponder is out of tolerance, adjust high altitude settings.

Note: Rotate “H” screw clockwise to decrease altitude.

1 Adjust “H” screw until transponder agrees with altimeter.

(l) With calibrated pitot/static test set, simulate altitude descent through 2950 feet.

(m) Verify transponder transitions to 3000 feet.

(n) If transponder is out of tolerance, adjust low altitude settings.

Note: Rotate “L” screw clockwise to increase altitude.

1 Adjust “L” screw until transponder agrees with altimeter.

(o) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(p) Disconnect pitot/static test set from airplane and remove sealant tape.

(q) Disconnect 28 ±1 VDC external power from external power receptacle.

(r) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

F. Pitot Mast (See Figure 34-101)

(1) Removal - Pitot Mast
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ENCODER/TRANSPONDER circuit breaker.
- (c) Remove wing tip. (Refer to 57-20)
- (d) Disconnect pitot mast fitting from pitot tube fitting, then cap off pitot tube.
- (e) Remove screws securing pitot mast to bracket.

(2) Installation - Pitot Mast
- (a) Position pitot mast to bracket and secure with screws.
- (b) Connect pitot mast fitting to pitot tube fitting. Torque to 80 in-lb (9 Nm).
- (c) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)
- (d) Install wing tip. (Refer to 57-20)

(3) Inspection/Check - Pitot Mast (See Figure 34-102)
- (a) Remove wing tip. (Refer to 57-20)
- (b) Disconnect pitot mast fitting from pitot tube fitting, then cap off pitot tube.

CAUTION: Never blow air through the line toward the instruments. To do so will seriously damage the instruments.

- (c) Blow clean, low-pressure air from the pitot mast fitting to the pitot mast entry tip.
- (d) Verify electrical connections are secured, clean, and free of damage.

Note: Cosmetic damage (plating, discoloration and flaking) does not affect pitot mast operation or require pitot mast replacement.

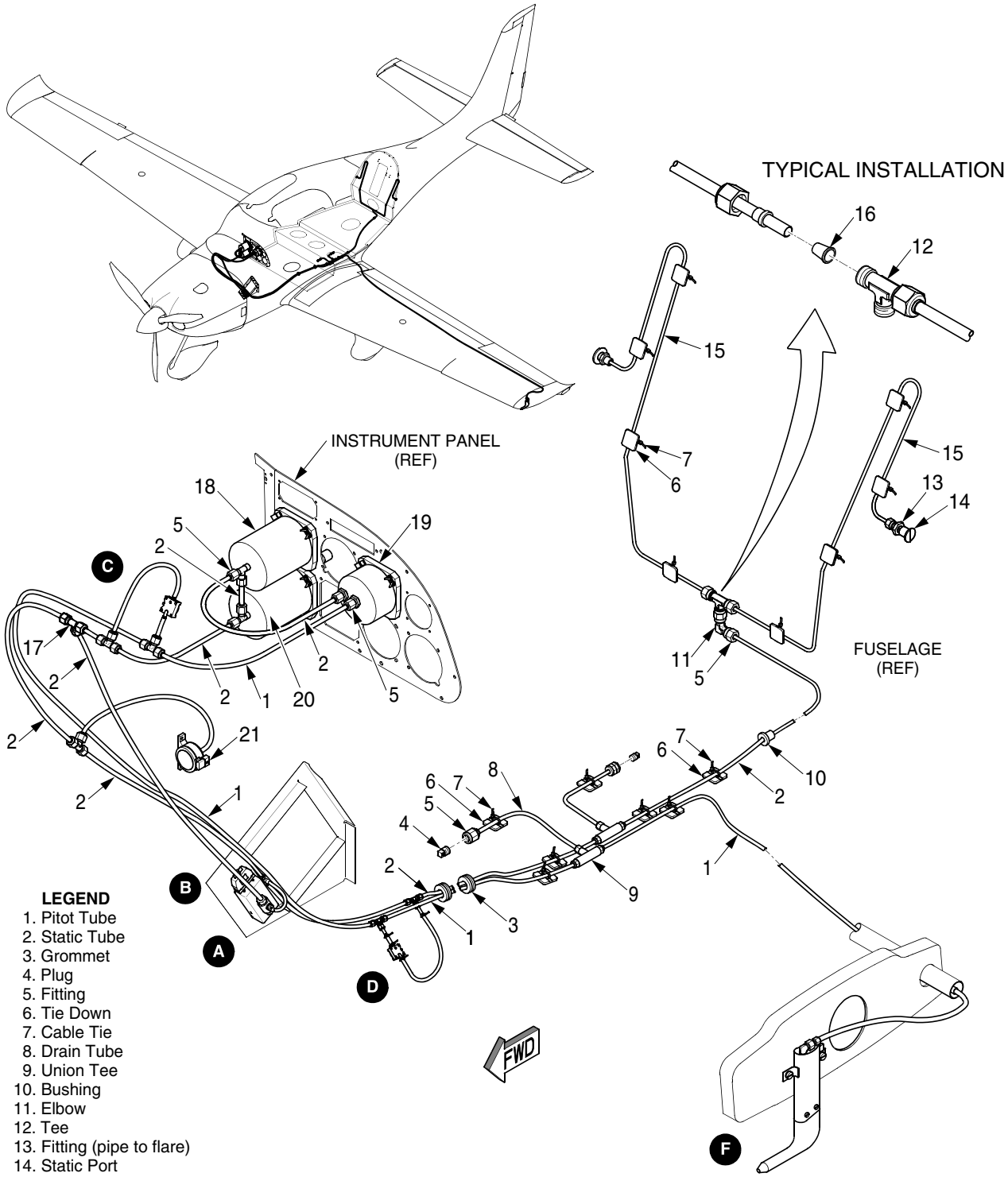
- (e) At pitot mast entry tip, verify any blunting of tip does not exceed 0.03 inch (0.8 mm) at any location, or exceed 0.02 inch (0.5 mm) around entire circumference.
- (f) Identify any damage (chips, gouges, dents, blisters or other defects) on surfaces of pitot mast.
  - 1 At forward 2 inches (51 mm) of pitot mast entry tip, verify damage does not exceed 0.03 inch (0.8 mm) in depth or height and does not exceed 0.06 inch (1.5 mm) in length or width.
  - 2 At aft 1.6 inches (41 mm) of pitot mast entry tip, verify damage does not exceed 0.09 inch (2.3 mm) in depth or height.
  - 3 At remaining sections of pitot mast, verify damage does not exceed 0.15 inch (3.8 mm) in depth or height.
- (g) Verify lower forward drain hole is not eroded beyond 0.05 inch (1.27 mm).
- (h) Verify upper aft drain hole is not eroded beyond 0.09 inch (2.28 mm).

CAUTION: Eroded drain holes may result in pressure loss leading to an airspeed reduction of 0.5 percent.

- (i) In pitot mast housing, verify heater and plug do not show signs of erosion or cracking.

CAUTION: Erosion material in pitot mast housing may cause blockage of drain hole.

- (j) If damage exceeds limitations indicated above, replace pitot mast. (Refer to 34-10)
- (k) Connect pitot mast fitting to pitot tube fitting.
- (l) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)
- (m) Install wing tip. (Refer to 57-20)



LEGEND

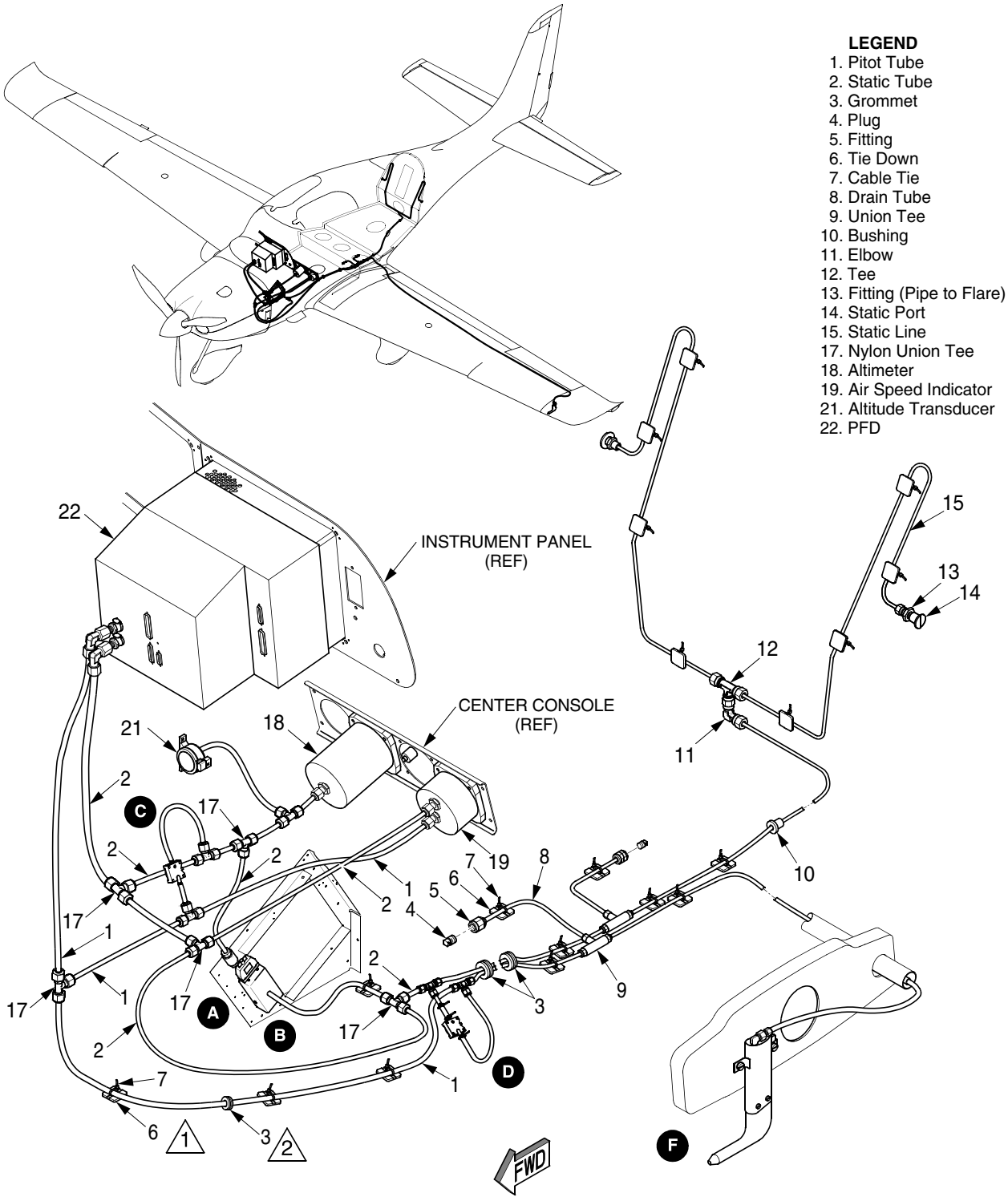
1. Pitot Tube
2. Static Tube
3. Grommet
4. Plug
5. Fitting
6. Tie Down
7. Cable Tie
8. Drain Tube
9. Union Tee
10. Bushing
11. Elbow
12. Tee
13. Fitting (pipe to flare)
14. Static Port
15. Static Line
16. Insert
17. Nylon Union Tee
18. Altimeter
19. Air Speed Indicator
20. Vertical Speed Indicator
21. Altitude Transducer

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD before SB 2X-34-22.

SR20_MM34_1082E

Figure 34-101
Pitot-Static System - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD before SB2X-34-22 (Sheet 1 of 9)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD before SB2X-34-22



NOTE

1 *Serials 1337 thru 1422:*
Tie down on forward location.

2 *Serials 1423 & subs:*
Grommet on forward location.

Serials 1337 thru 1422 w/ PFD, 1423 thru 1632, 1634 thru 1638 before SB 2X-34-22.

SR20_MM34_1701D

Figure 34-101
Pitot-Static System - Serials 1337 thru 1422 w/ PFD, 1423 thru 1638 before SB2X-34-22 (Sheet 2 of 9)

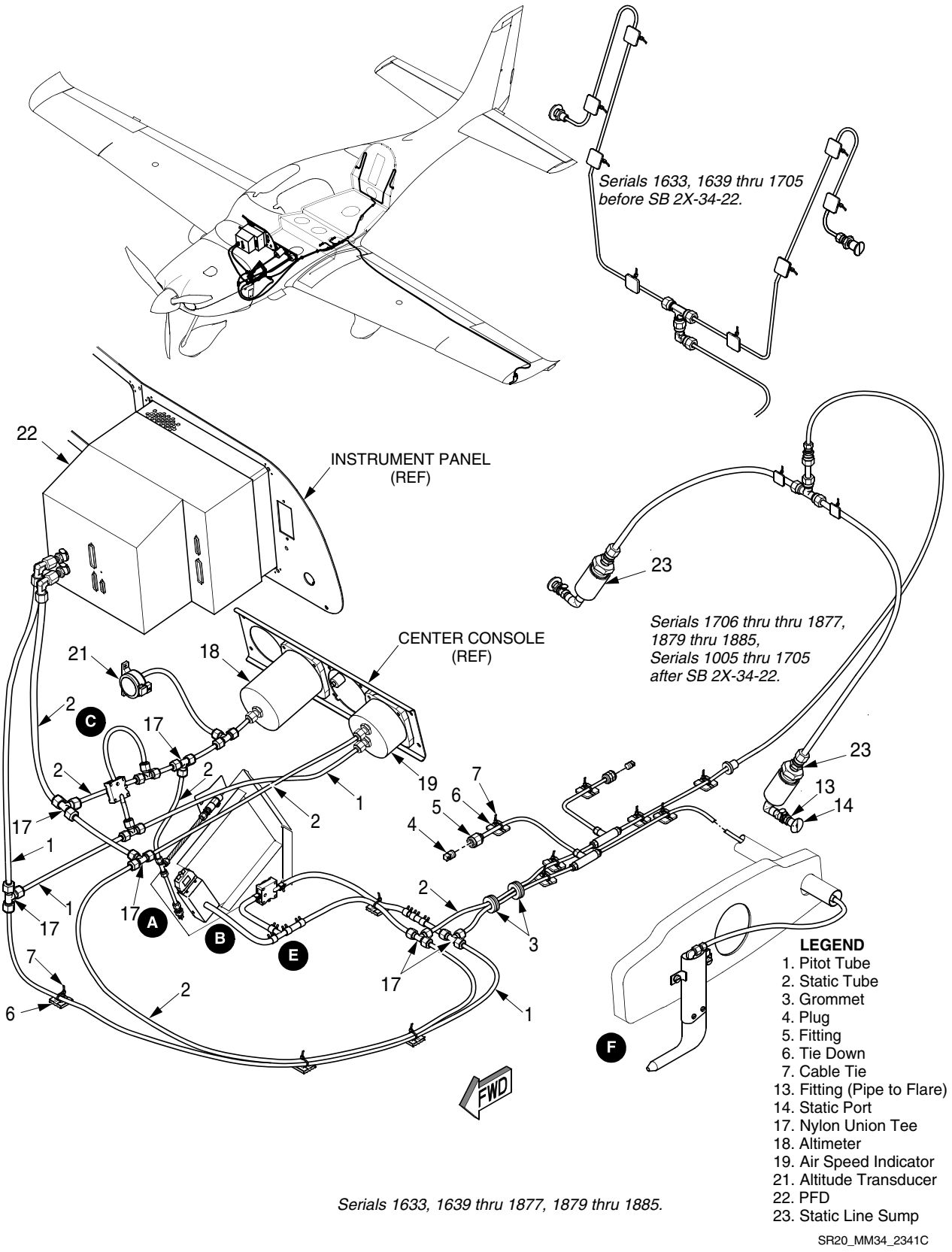
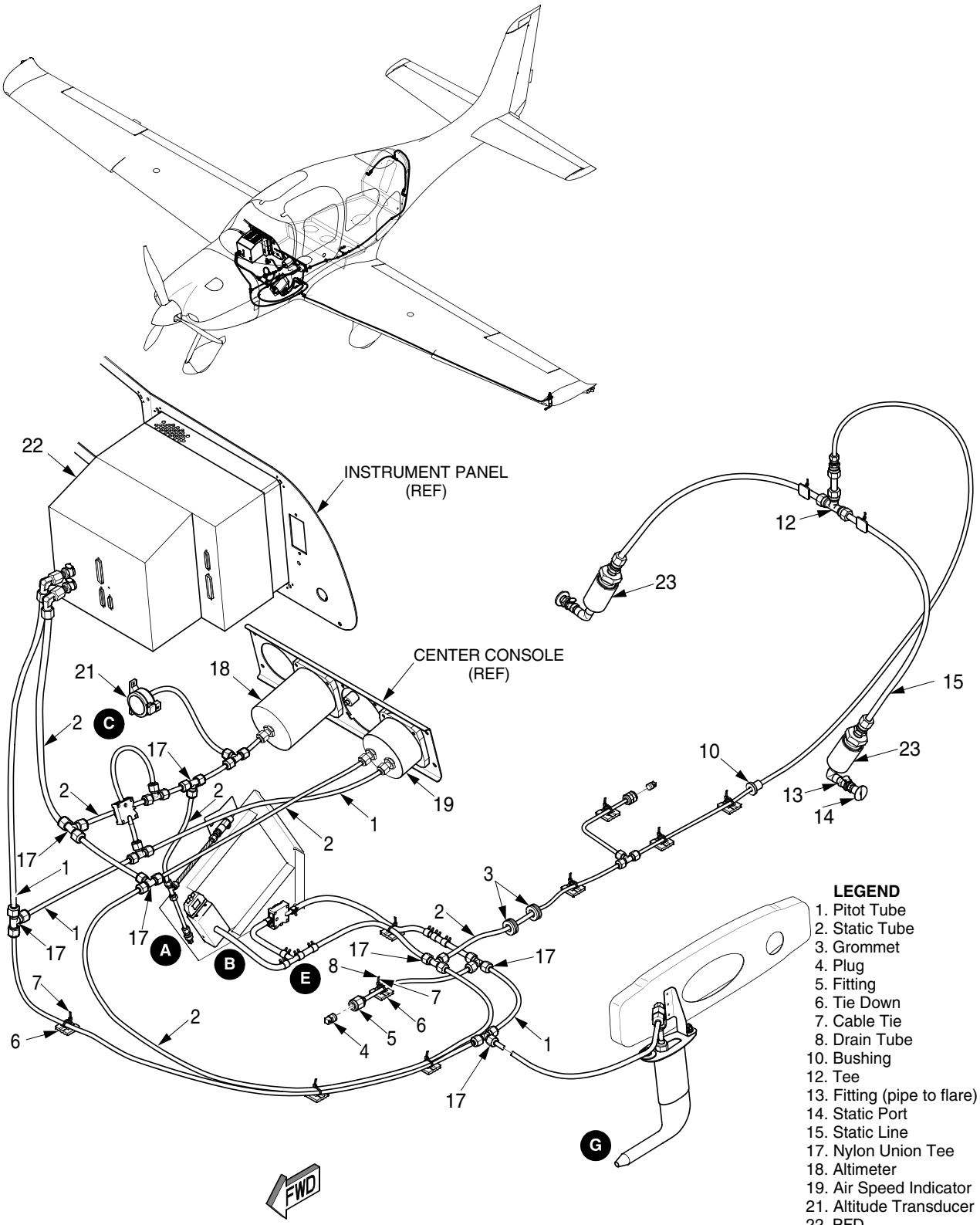


Figure 34-101
Pitot-Static System - Serials 1639 thru 1885 (Sheet 3 of 9)

EFFECTIVITY:
Serials 1639 thru 1885



Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics.

Figure 34-101
Pitot-Static System - Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 4 of 9)

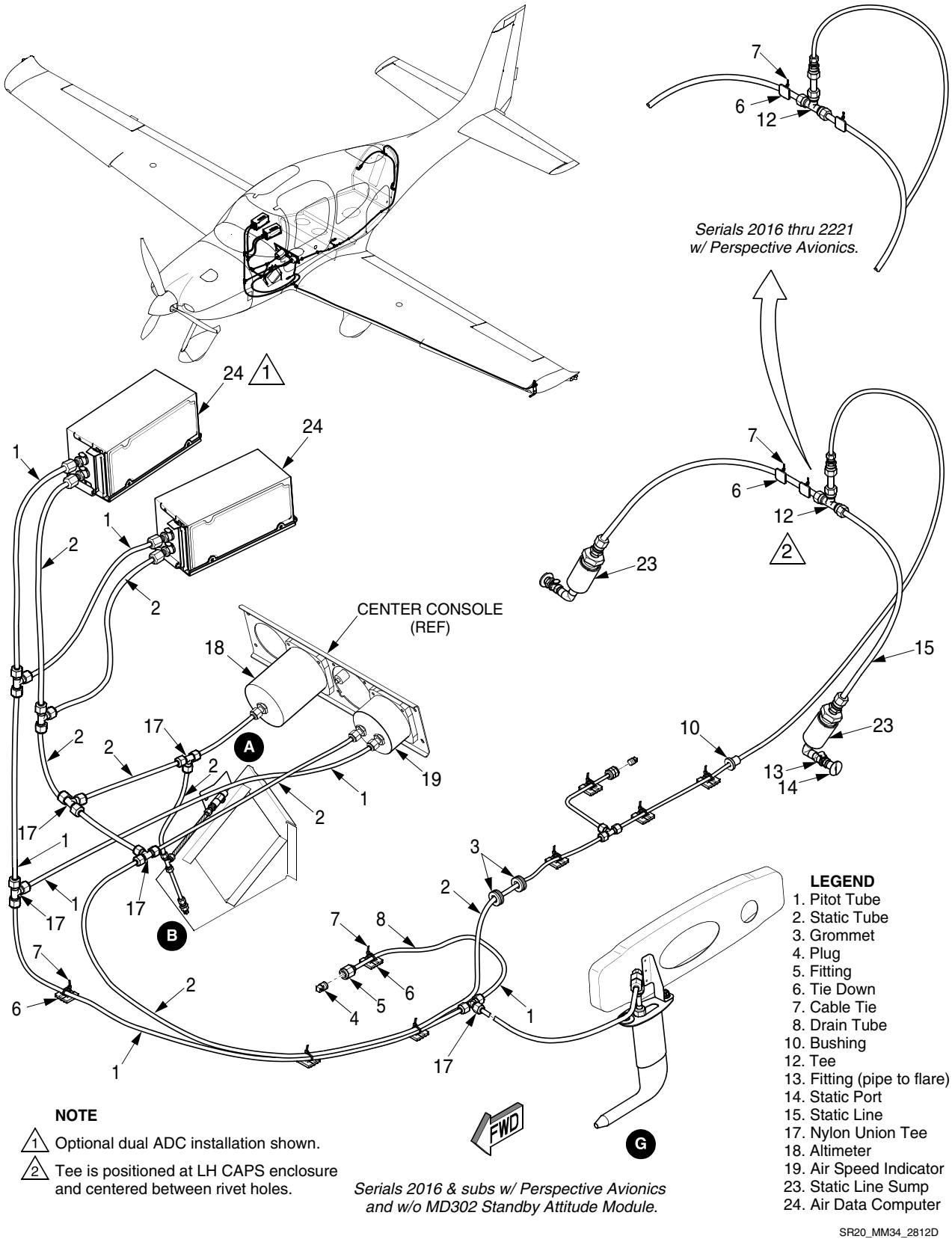
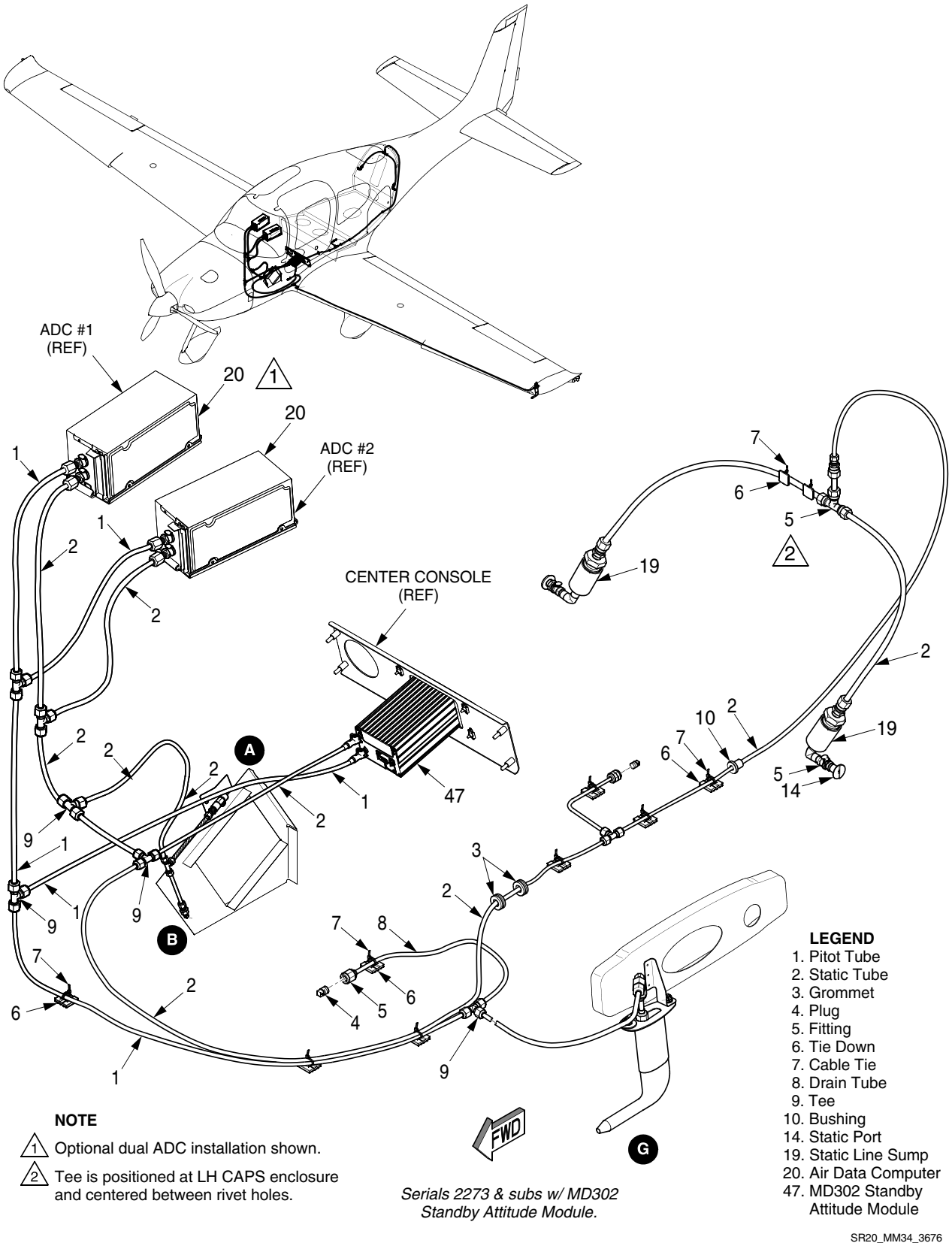


Figure 34-101
Pitot-Static System - Serials 2016 & subs w/ Perspective Avionics and w/o MD302 (Sheet 5 of 9)

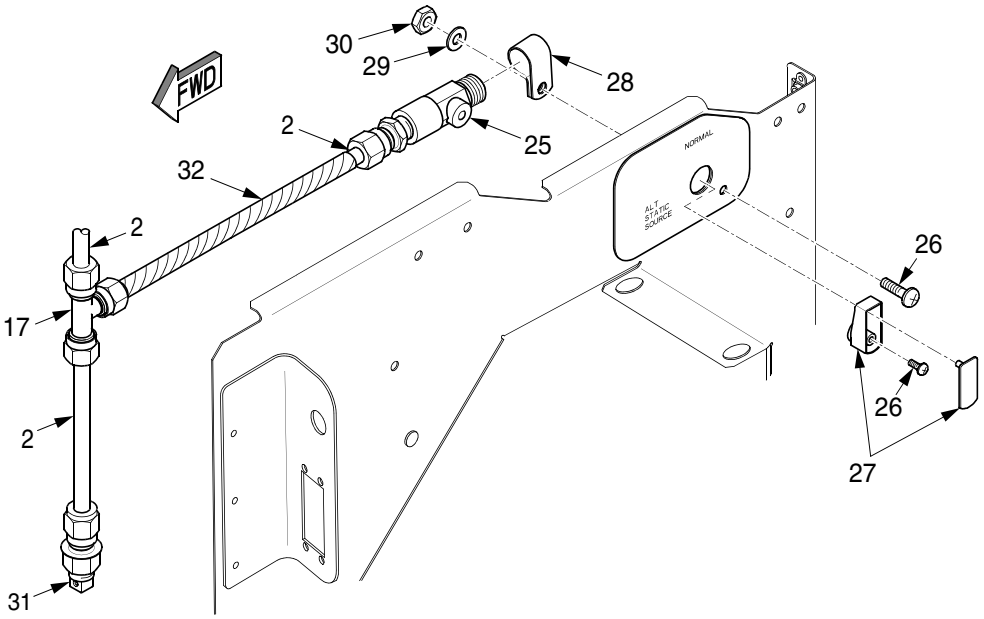
EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics and w/o MD302



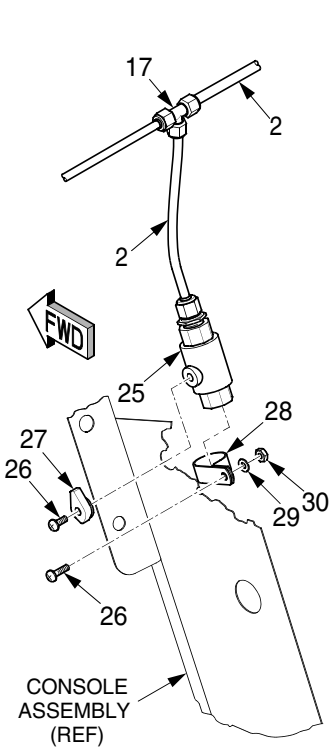
Serials 2273 & subs w/ MD302 Standby Attitude Module.

Figure 34-101
Pitot-Static System - Serials 2273 & subs w/ MD302 Standby Attitude Module (Sheet 6 of 9)

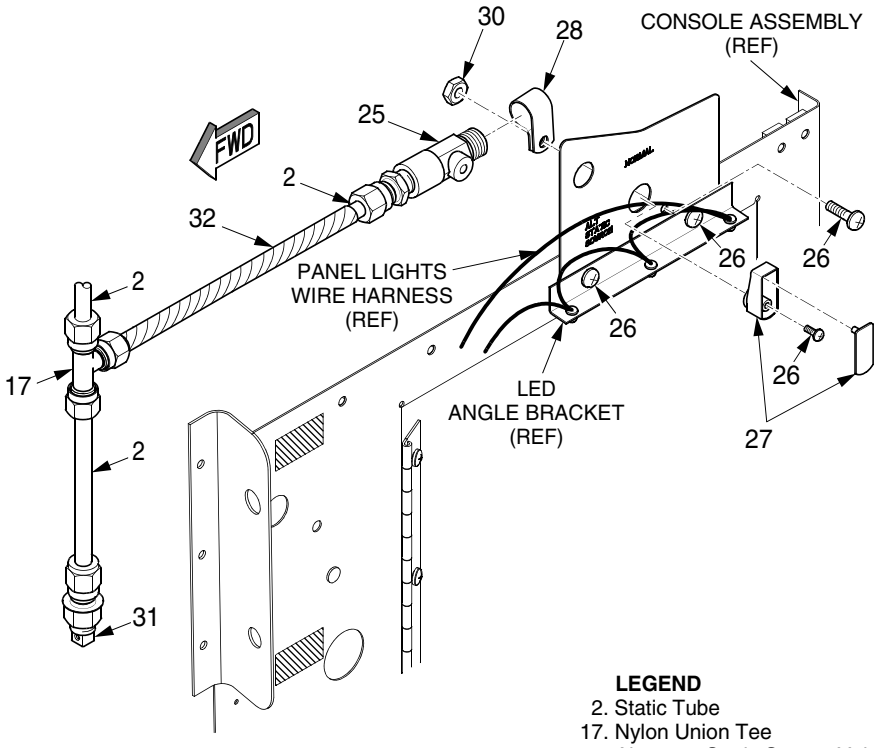
EFFECTIVITY:
Serials 2273 & subs w/ MD302 Standby Attitude Module



Serials 2016 & subs w/ Perspective Avionics.



Serials 1005 thru 1705 before SB 2X-34-21.



Serials 1706 thru 2015, 2016 & subs w/o Perspective Avionics. Serials 1005 thru 1705 after SB 2X-34-21.

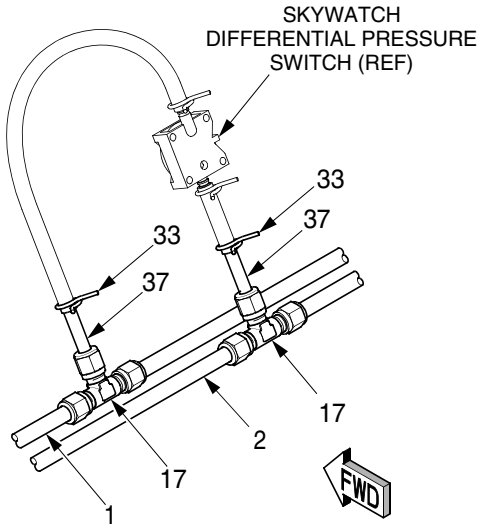
LEGEND

2. Static Tube
17. Nylon Union Tee
25. Alternate Static Source Valve
26. Screw
27. Knob
28. Adel Clamp
29. Washer
30. Nut
31. Plug
32. Spiral Wrap

DETAIL A

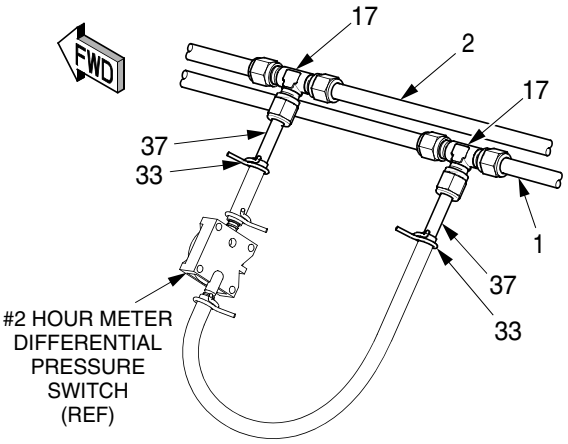
SR20_MM34_1084G

Figure 34-101
Pitot-Static System (Sheet 7 of 9)



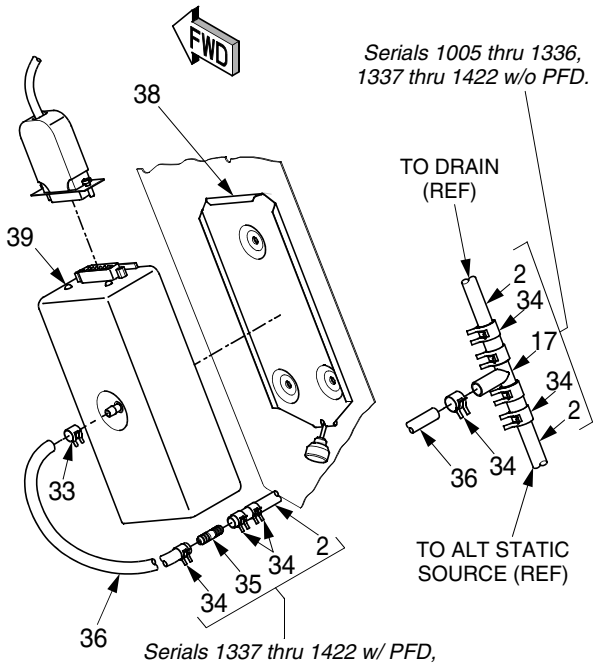
Serials 1005 thru 2015 w/ SKYWATCH,
2016 & subs w/ SKYWATCH, w/o Perspective Avionics.

DETAIL C



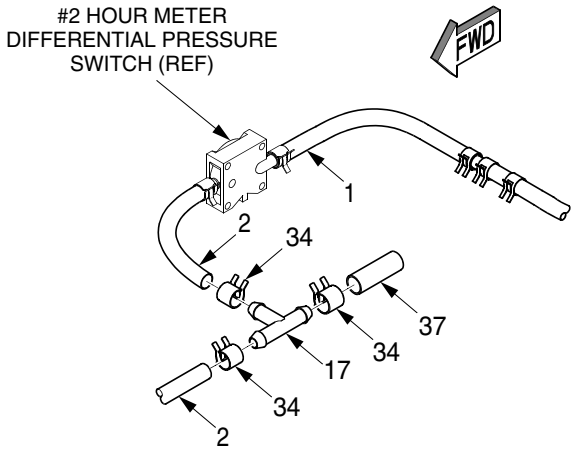
Serials 1005 thru 1632, 1634 thru 1638,
after SB 2X-31-01.

DETAIL D



Serials 1337 thru 1422 w/ PFD,
1423 thru 2015, 2016 & subs
w/o Perspective Avionics.

DETAIL B



Serials 1639 thru 2015,
2016 & subs w/o Perspective Avionics.

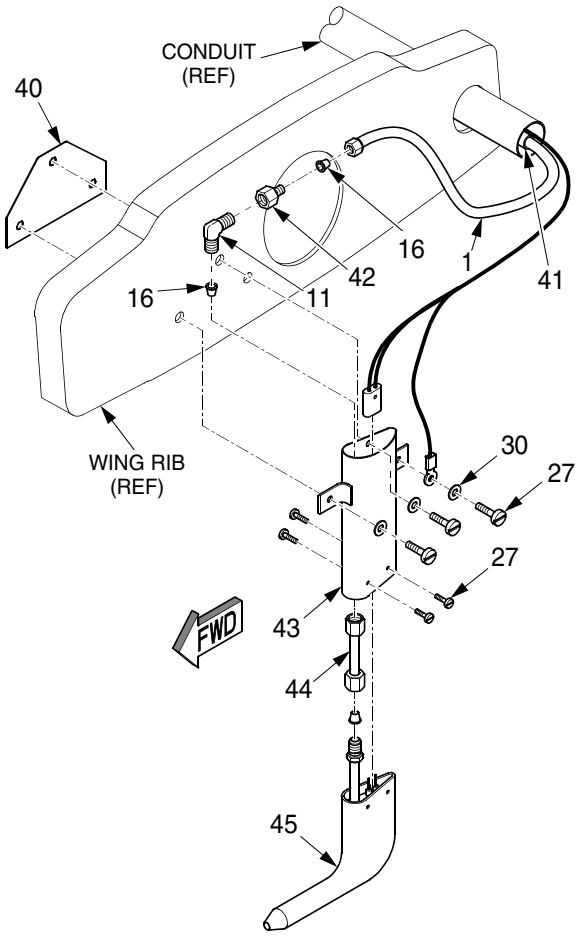
DETAIL E

LEGEND

1. Pitot Line
2. Static Line
17. Nylon Union Tee
33. Spring Clip
34. Hose Clamp
35. Nylon Coupling
36. Tubing
37. Hose
38. Mounting Tray
39. Altitude Encoder

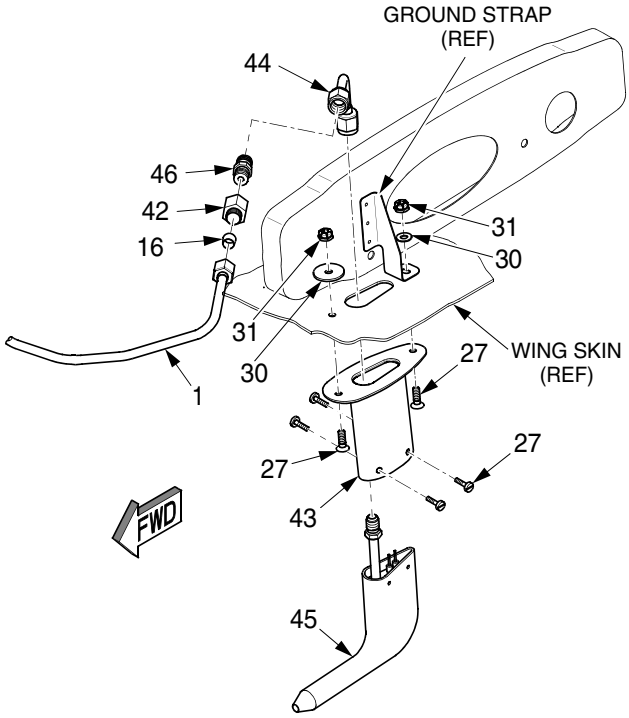
SR20_MM34_1083G

Figure 34-101
Pitot-Static System (Sheet 8 of 9)



Serials 1005 thru 1877, 1879 thru 1885.

DETAIL F



Serials 1878, 1886 & subs.

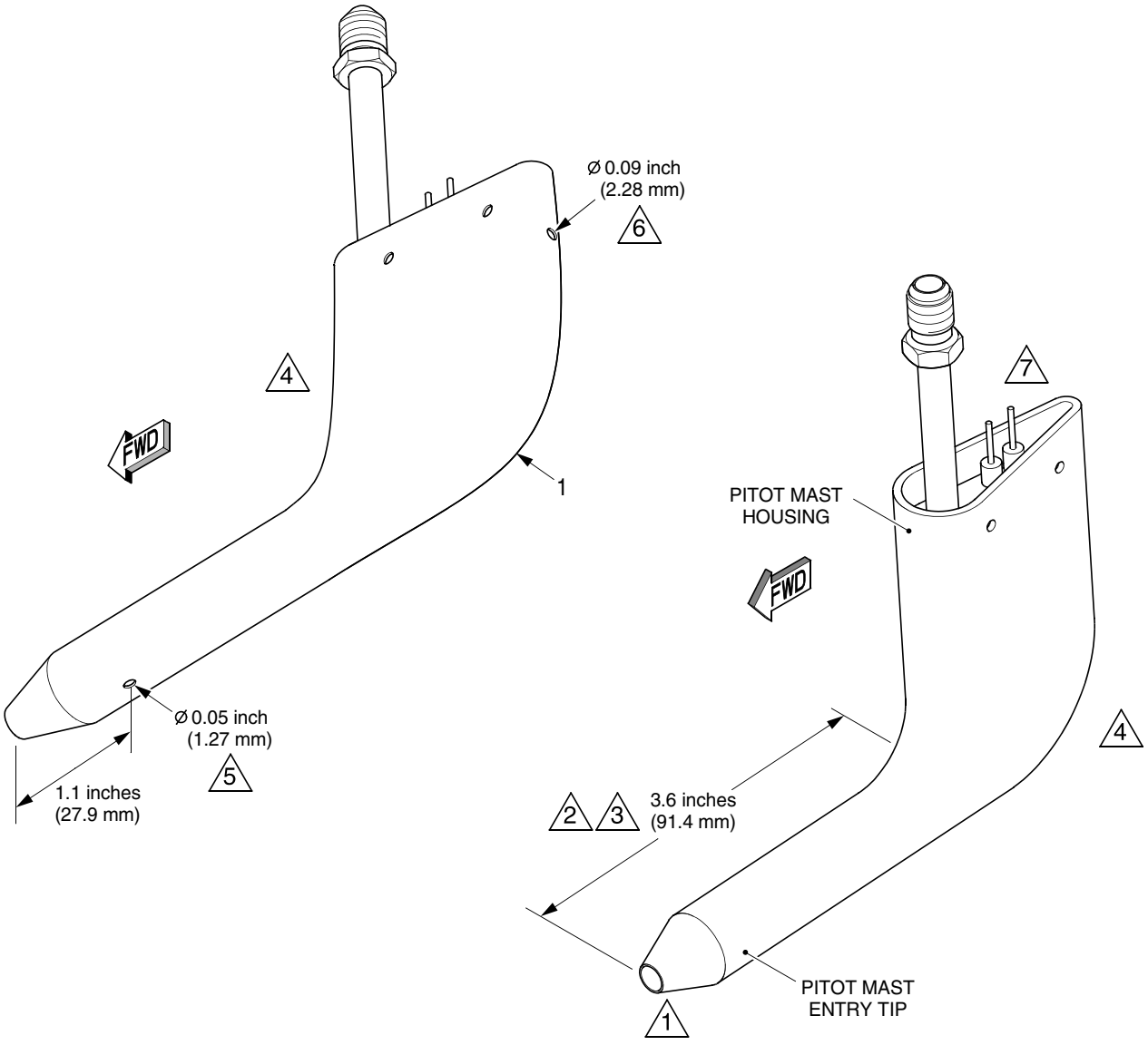
DETAIL G

LEGEND

1. Pitot Line
11. Elbow
16. Nylon Insert
27. Screw
30. Washer
31. Nut
40. Backing Plate
41. Tygon Tubing
42. Female Tube Connector
43. Bracket, Pitot Mast
44. Extension Tube
45. Pitot Mast
46. Pipe to Flare Fitting

SR20_MM34_2748A

Figure 34-101
Pitot-Static System (Sheet 9 of 9)



NOTE

1. At pitot mast entry tip, verify any blunting of tip does not exceed 0.03 inch (0.8 mm) at any location, or exceed 0.02 inch (0.5 mm) around entire circumference.
2. At forward 2 inches (51 mm) of pitot mast entry tip, verify damage does not exceed 0.03 inch (0.8 mm) in depth or height and does not exceed 0.06 inch (1.5 mm) in length or width.
3. At aft 1.6 inches (41 mm) of pitot mast entry tip, verify damage does not exceed 0.09 inch (2.3 mm) in depth or height.
4. At remaining sections of pitot mast, verify damage does not exceed 0.15 inch (3.8 mm) in depth or height.
5. Verify lower forward drain hole is not eroded beyond 0.05 inch (1.27 mm).
6. Verify upper aft drain hole is not eroded beyond 0.09 inch (2.28 mm).
7. In pitot mast housing, verify heater and plug do not show signs of erosion or cracking.

LEGEND
1. Pitot Mast

SR20_MM34_3274

Figure 34-102
Inspection/Check - Pitot Mast

G. Vertical Speed Indicator (VSI) - *Serials 1005 thru 1336, 1337 thru 1422* w/o *PFD* (See Figure 34-103)

(1) Removal - VSI

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Remove and cap off static line.

(e) Disconnect electrical connector.

(f) While supporting VSI, remove screws securing unit to instrument panel.

(g) Cap off fitting on back of VSI, then remove from airplane.

(2) Installation - VSI

(a) Position VSI in instrument panel and attach with screws.

(b) Connect electrical connector.

(c) Attach static line.

(d) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(e) Reset INSTRUMENT LIGHTS circuit breaker.

(f) Perform Functional Test - VSI. (Refer to 34-10)

(g) Install MFD. (Refer to 31-60)

(3) Functional Test - VSI

(a) Set BAT 1 switch to ON position.

(b) For INTERIOR/LIGHTS on the bolster panel, adjust INSTRUMENT knob.

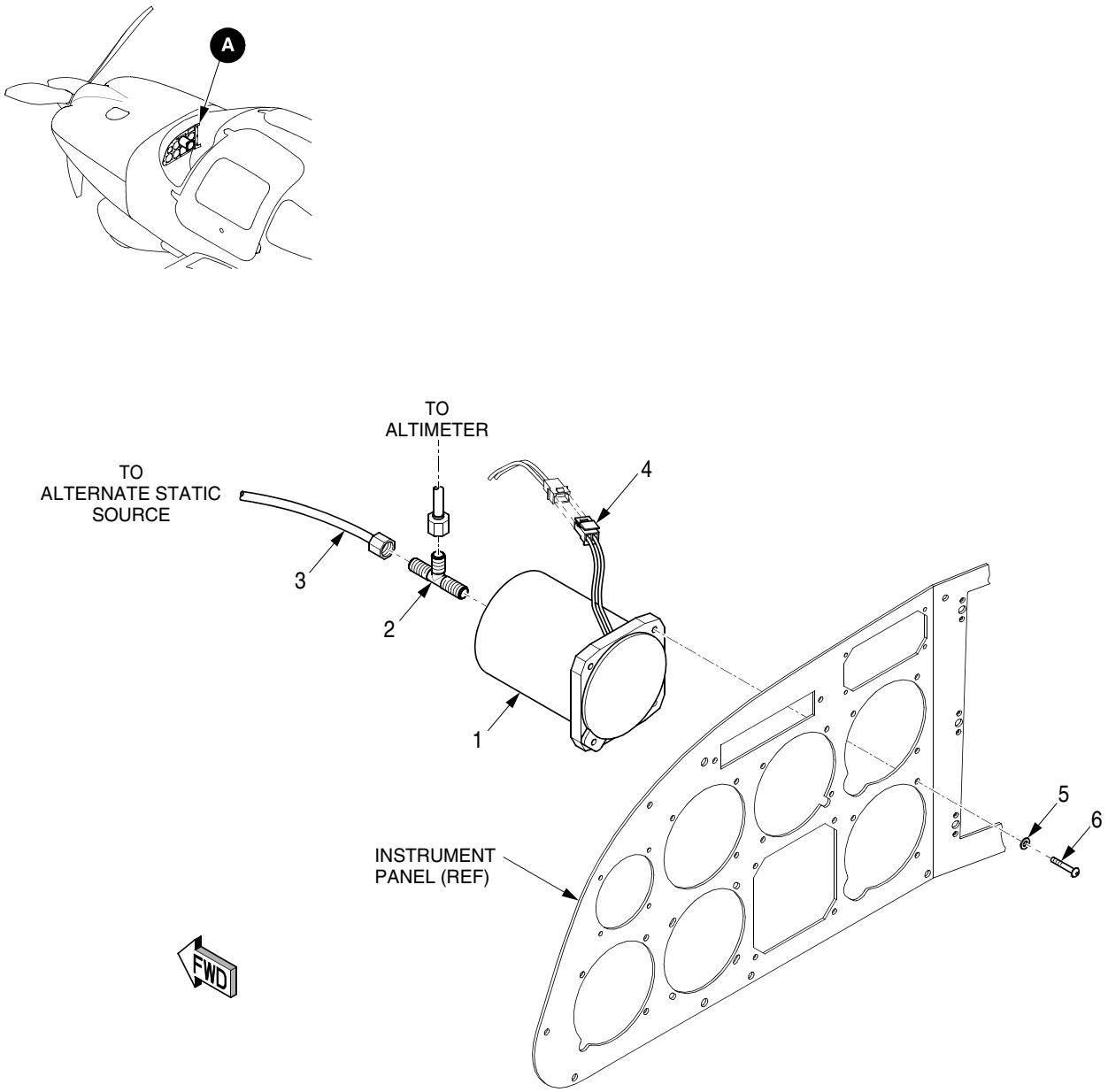
(c) Verify that instrumentation lighting is functioning and that intensity varies with adjustments to INSTRUMENT knob.

(d) Set BAT 1 switch to OFF position.

Note: A zero adjust screw is located on the front, lower LH corner of the VSI to allow for pointer adjustment.

(e) Rotate screw clockwise to deflect the pointer downward as required.

(f) Rotate screw counter-clockwise to deflect the pointer upward as required.



LEGEND
1. Vertical Speed Indicator
2. Tee Connector
3. Static Line
4. Connector
5. Washer
6. Screw

DETAIL A

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

SR20_MM34_1276C

Figure 34-103
VSI Installation - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

H. Altimeter - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-104)**

(1) Removal - Altimeter

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Remove and cap off static line.

(e) Disconnect electrical connector.

(f) While supporting altimeter, remove screws securing unit to instrument panel.

(g) Cap off fitting on back of altimeter to prevent possible contamination, then remove from airplane.

(2) Installation - Altimeter

(a) Position altimeter in instrument panel, then attach with screws.

(b) Connect electrical connector.

(c) Attach static line.

(d) Reset INSTRUMENT LIGHTS circuit breaker.

(e) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(f) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(g) Perform Functional Test - Altimeter. (Refer to 34-10)

(h) Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)

(i) Install MFD. (Refer to 31-60)

(3) Functional Test - Altimeter

(a) Set AVIONICS switch to ON position.

(b) On GNS 430, rotate [C] knob clockwise for COM/GPS 1 power and volume.

(c) Using COM 1, listen to ATIS. Obtain current altimeter barometric pressure setting.

(d) Set barometric pressure in altimeter window.

(e) Verify correct altitude is indicated.

(f) Set AVIONICS switch to OFF position.

(4) Adjustment/Test - Altimeter

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Altimeter Test Set	-	Any Source	Simulate altitude.
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover static port.
14 CFR § 43 Appendix E	-	Any Source	Test.

(b) Set BAT 1 and BAT 2 switches to ON positions.

Note: Calibration must be done with the altimeter at ambient temperature within the range of 55° to 95° F (13° to 35° C). Verify external power is applied to aircraft to preserve battery life and system is up to proper operating power.

(c) Connect 28 ±1 VDC external power to external power receptacle.

(d) Connect pitot line from altimeter test set to pitot mast on airplane.

(e) Connect static line from altimeter test set to a static port on airplane.

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

(f) Apply sealant tape to cover other static port.
(g) Comply with Appendix E of 14 CFR § 43.
(h) Disconnect altimeter test set from airplane and remove sealant tape.
(i) Disconnect 28 ±1 VDC external power from external power receptacle.
(j) Set BAT 1 and BAT 2 switches to OFF positions.

I. Altimeter - *Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 Standby Attitude Module* (See Figure 34-104)

(1) Removal - Altimeter
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull INSTRUMENT LIGHTS circuit breaker.
- (c) Remove LH kickplate. (Refer to 25-10)
- (d) Remove and cap off static line.
- (e) Disconnect electrical connector.
- (f) While supporting altimeter, remove screws securing unit to bolster panel.
- (g) Cap off fitting on back of altimeter to prevent possible contamination, then remove from airplane.

(2) Installation - Altimeter
- (a) Position altimeter in bolster panel and attach with screws.
- (b) Connect electrical connector.
- (c) Attach static line.
- (d) Reset INSTRUMENT LIGHTS circuit breaker.
- (e) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)
- (f) Perform Functional Test - Static System Plumbing. (Refer to 34-10)
- (g) Perform Functional Test - Altimeter. (Refer to 34-10)
- (h) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)
- (i) Install LH kickplate. (Refer to 25-10)

(3) Functional Test - Altimeter
- (a) Set AVIONICS switch to ON position.
- (b) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* On GNS 430, rotate [C] knob clockwise for COM/GPS 1 power and volume.
- (c) *Serials 2016 & subs w/ Perspective Avionics:* On audio control panel, select COM1 audio selector button.
- (d) Using COM 1, listen to ATIS. Obtain current altimeter barometric pressure setting.
- (e) Set barometric pressure in altimeter window.
- (f) Verify correct altitude is indicated.
- (g) Set AVIONICS switch to OFF position.

(4) Adjustment/Test - Altimeter
- (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Altimeter Test Set	-	Any Source	Simulate altitude.
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover static port.
14 CFR § 43 Appendix E	-	Any Source	Test.

- (b) Set BAT 1 and BAT 2 switches to ON positions.

Note: Calibration must be done with the altimeter at ambient temperature within the range of 55° to 95° F (13° to 35° C). Verify external power is applied to aircraft to preserve battery life and system is up to proper operating power.

(c) Connect 28 ±1 VDC external power to external power receptacle.

(d) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Allow PFD to align for approximately 3 minutes, until Air Data Attitude Heading Reference System (ADAHRS) countdown timer expires and gyro warm-up box disappears. Once aligned, allow PFD to remain in aligned state for 10 additional minutes.

(e) *Serials 2016 & subs w/ Perspective Avionics:* Allow system to acquire and display AHRS and air data on the PFD and MFD.

(f) Connect pitot line from altimeter test set to pitot mast on airplane.

(g) Connect static line from altimeter test set to a static port on airplane.

(h) Apply sealant tape to cover other static port.

(i) Comply with Appendix E of 14 CFR § 43 for PFD altimeter and backup altimeter observing the following guidelines:

1 For scale error tests, the first test point entry calls for pressure altitude setting of -1000 feet on test equipment.

If indicated measurement is out-of-range, increase target pressure in calibrated altimeter test set in smallest increment available.

Verify that indicated measurement is in-range. If not, continue to increase pressure altitude value incrementally until indicated measurement is in-range.

If calibrated altimeter test set setting is between -1000 and -950 feet, and digital altitude indication on PFD is between -20 and 0 feet of value shown on calibrated altimeter test set, the test point is passed.

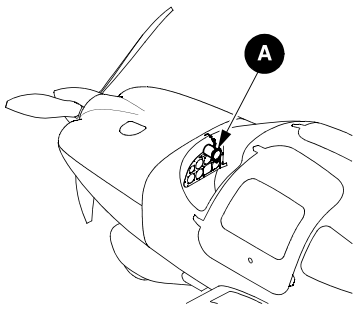
2 For barometric scale error test, set base altitude to +2000 MSL or higher on calibrated altimeter test set. Values indicated as “Altitude difference” in procedure are offset from base altitude.

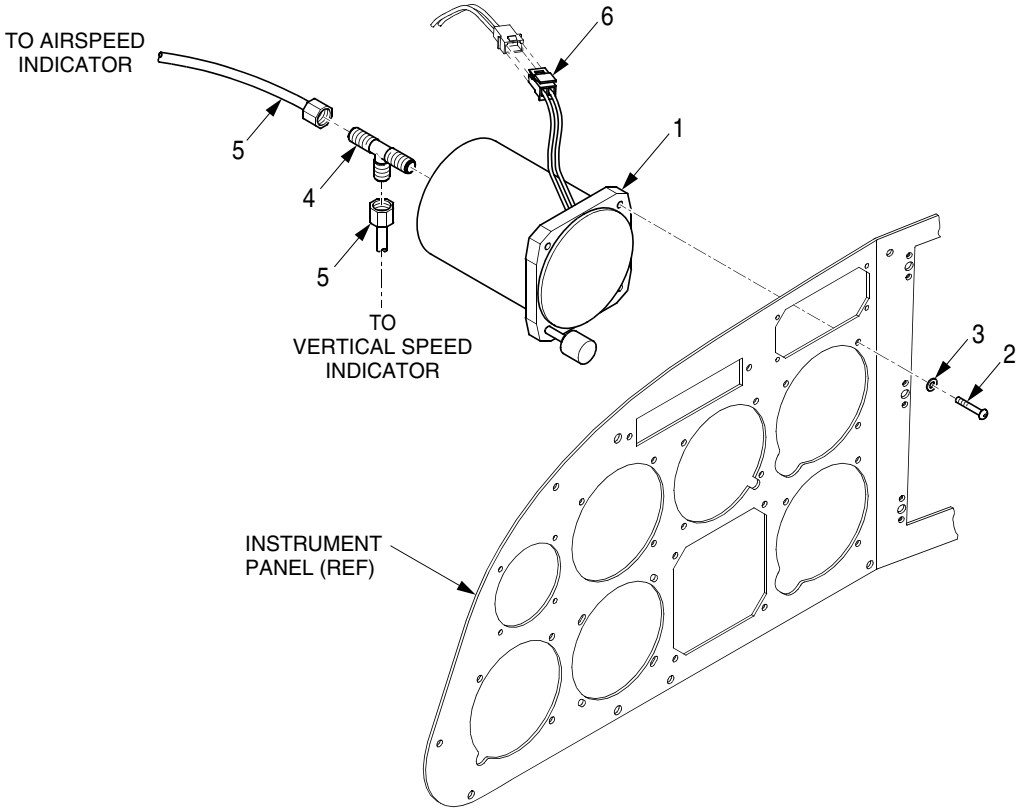
3 Skip friction test. The friction test is intended to evaluate pointer mechanical friction and is not applicable to PFD.

(j) Disconnect altimeter test set from airplane and remove sealant tape.

(k) Disconnect 28 ±1 VDC external power from external power receptacle.

(l) Set BAT 1 and BAT 2 switches to OFF positions.





Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

DETAIL A

LEGEND
1. Altimeter
2. Screw
3. Washer
4. Tee Connector
5. Static Line
6. Connector

SR20_MM34_2201

Figure 34-104
Altimeter Installation - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

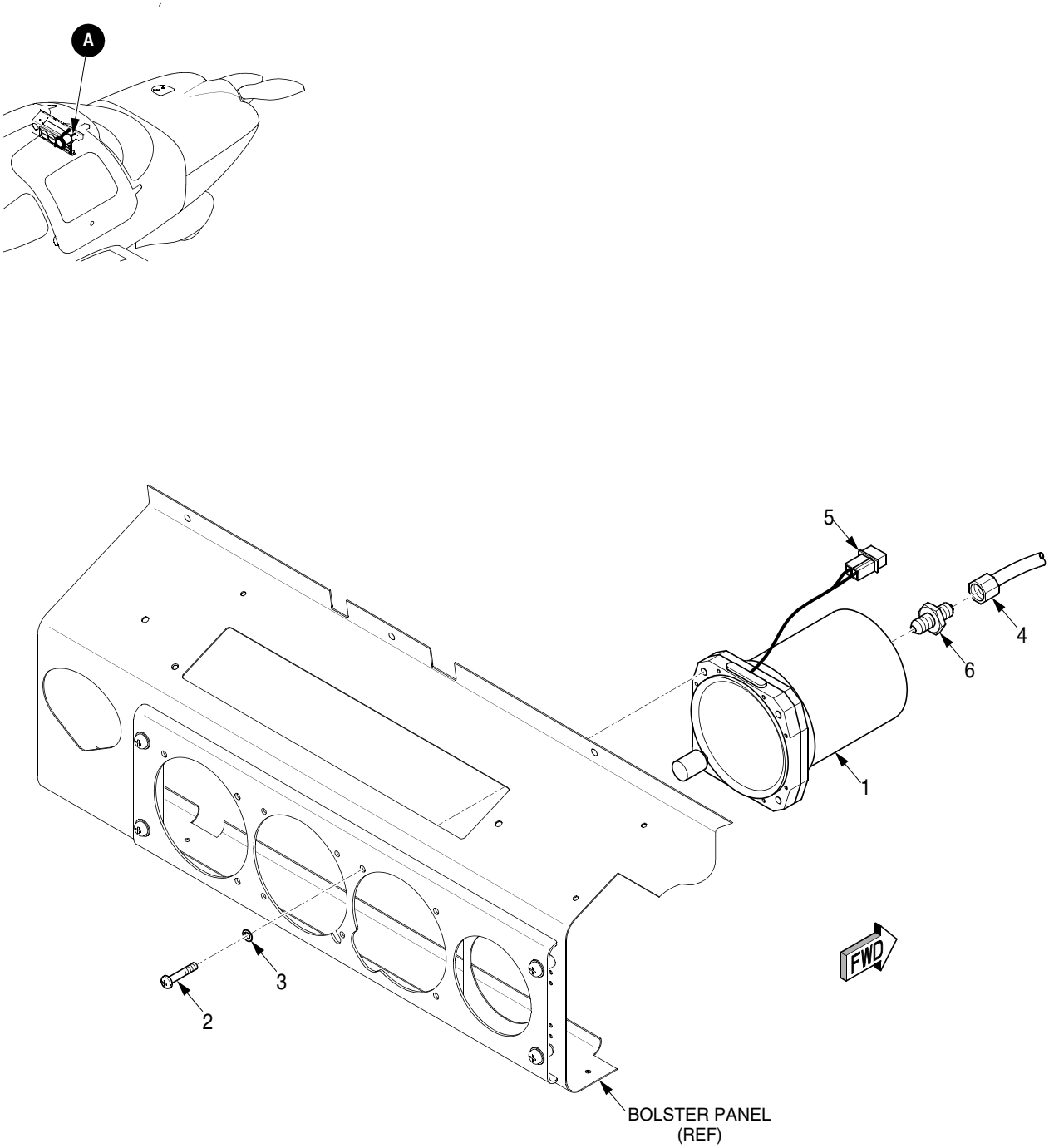
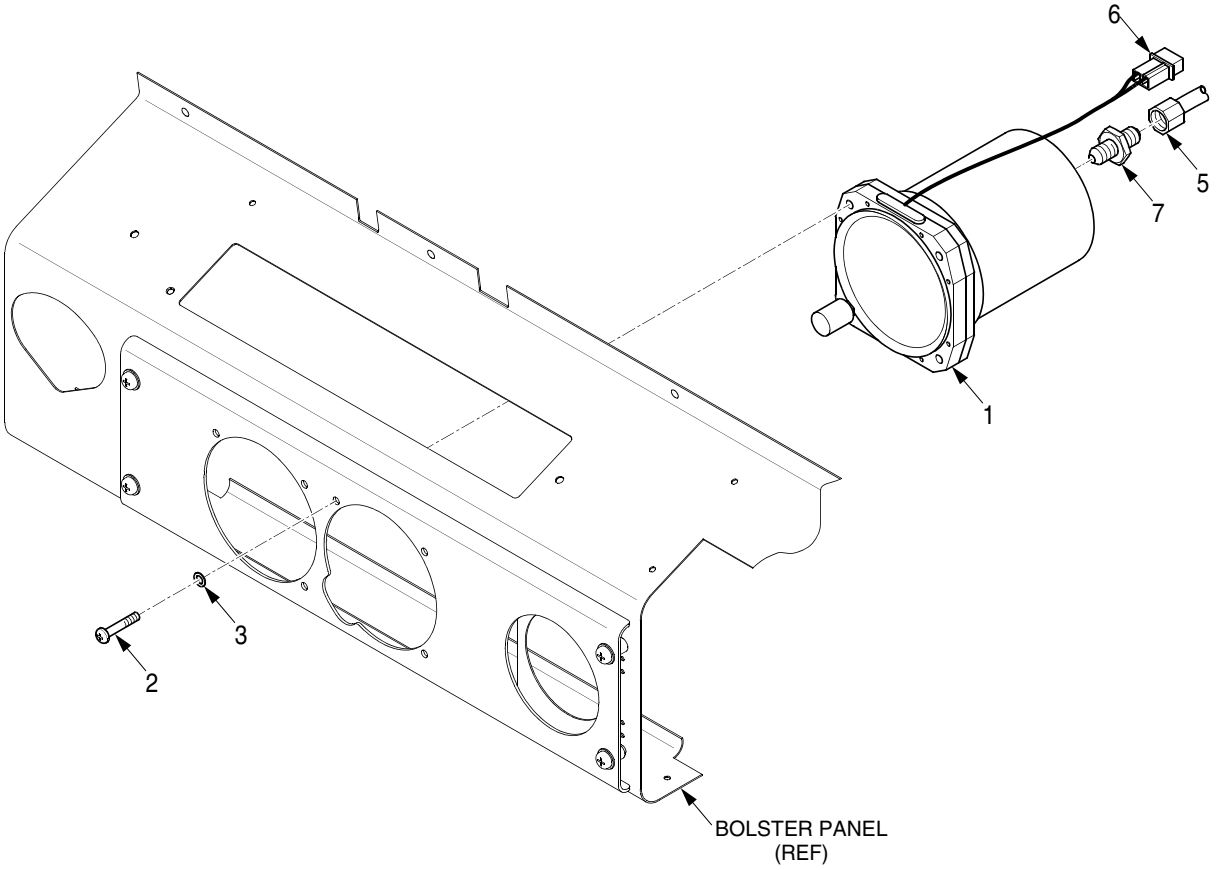


Figure 34-104
Altimeter Installation - Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 (Sheet 2 of 3)



Serials 1337 & subs w/ SRV.

DETAIL C

LEGEND
1. Altimeter
2. Screw
3. Washer
5. Static Line
6. Connector
7. Nylon Fitting

SR20_MM34_1731B

Figure 34-104
Altimeter Installation - Serials 1337 & subs w/ SRV (Sheet 3 of 3)

EFFECTIVITY:
Serials 1337 & subs w/ SRV

J. Airspeed Indicator - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-105)**

(1) Removal - Airspeed Indicator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Remove and cap off static and pitot line.

(e) Disconnect electrical connector.

(f) While supporting airspeed indicator, remove screws securing unit to instrument panel.

(g) Cap off fitting on back of airspeed indicator to prevent possible contamination, then remove from airplane.

(2) Installation - Airspeed Indicator

(a) Position airspeed indicator in instrument panel, then attach with screws.

(b) Connect electrical connector.

(c) Attach static and pitot line.

(d) Reset INSTRUMENT LIGHTS circuit breaker.

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(g) Perform Functional Test - Airspeed Indicator. (Refer to 34-10)

(h) Install glareshield. (Refer to 25-10)

(3) Functional Test - Airspeed Indicator

(a) Verify needle indicates zero (straight up, <40 kts).

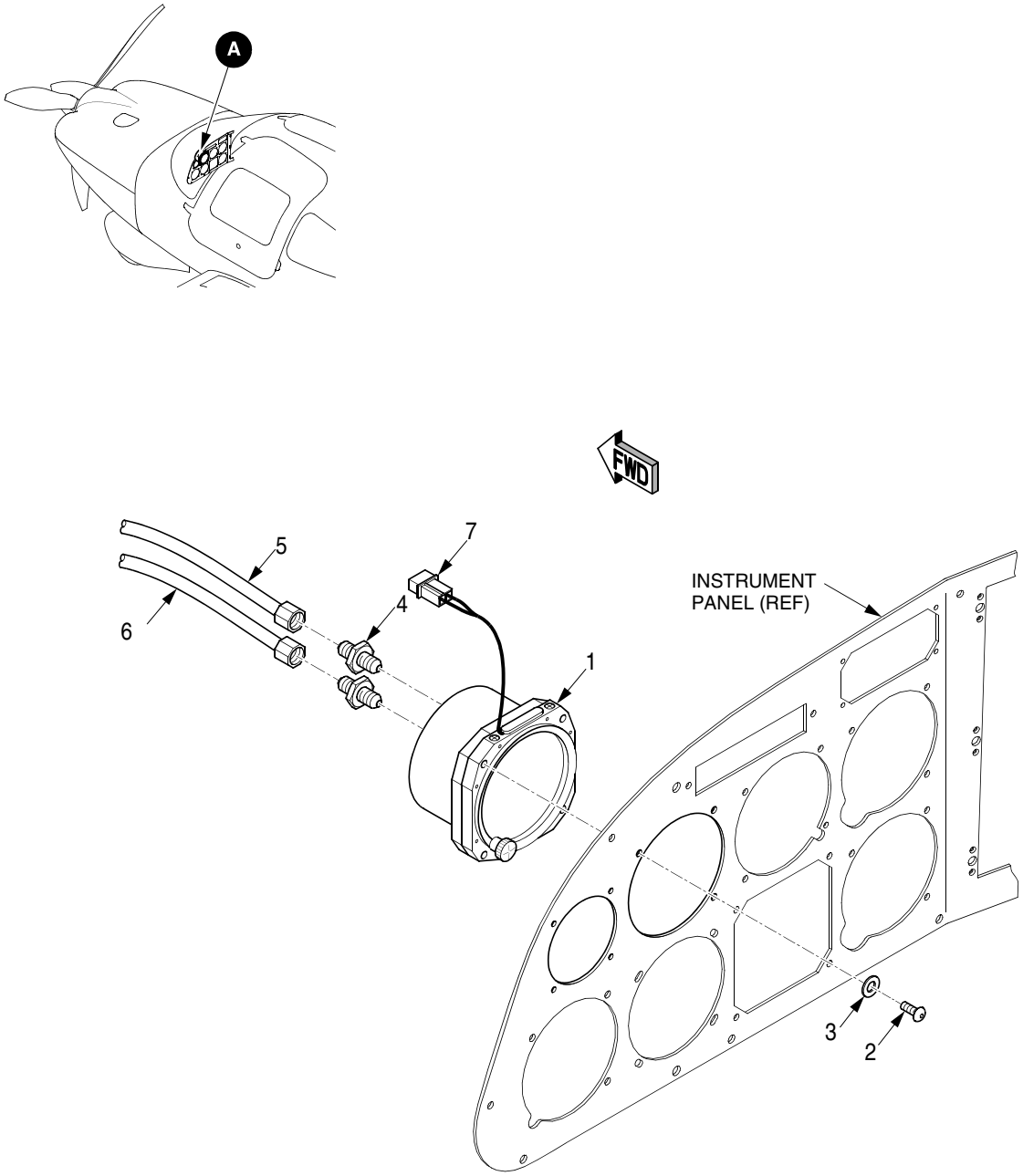
K. Airspeed Indicator - *Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 Standby Attitude Module* (See Figure 34-105)

(1) Removal - Airspeed Indicator
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull INSTRUMENT LIGHTS circuit breaker.
  (c) Remove LH kickplate. (Refer to 25-10)
  (d) Remove and cap off static and pitot line.
  (e) Disconnect electrical connector.
  (f) While supporting airspeed indicator, remove screws securing unit to bolster panel.
  (g) Cap off fitting on back of airspeed indicator to prevent possible contamination, then remove from airplane.

(2) Installation - Airspeed Indicator
  (a) Position airspeed indicator in bolster panel, then attach with screws.
  (b) Connect electrical connector.
  (c) Attach static and pitot line.
  (d) Reset INSTRUMENT LIGHTS circuit breaker.
  (e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)
  (f) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)
  (g) Perform Functional Test - Airspeed Indicator. (Refer to 34-10)
  (h) Install LH kickplate. (Refer to 25-10)

(3) Functional Test - Airspeed Indicator
  (a) Verify needle indicates zero (straight up, <40 kts).

EFFECTIVITY:
Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 Standby Attitude Module



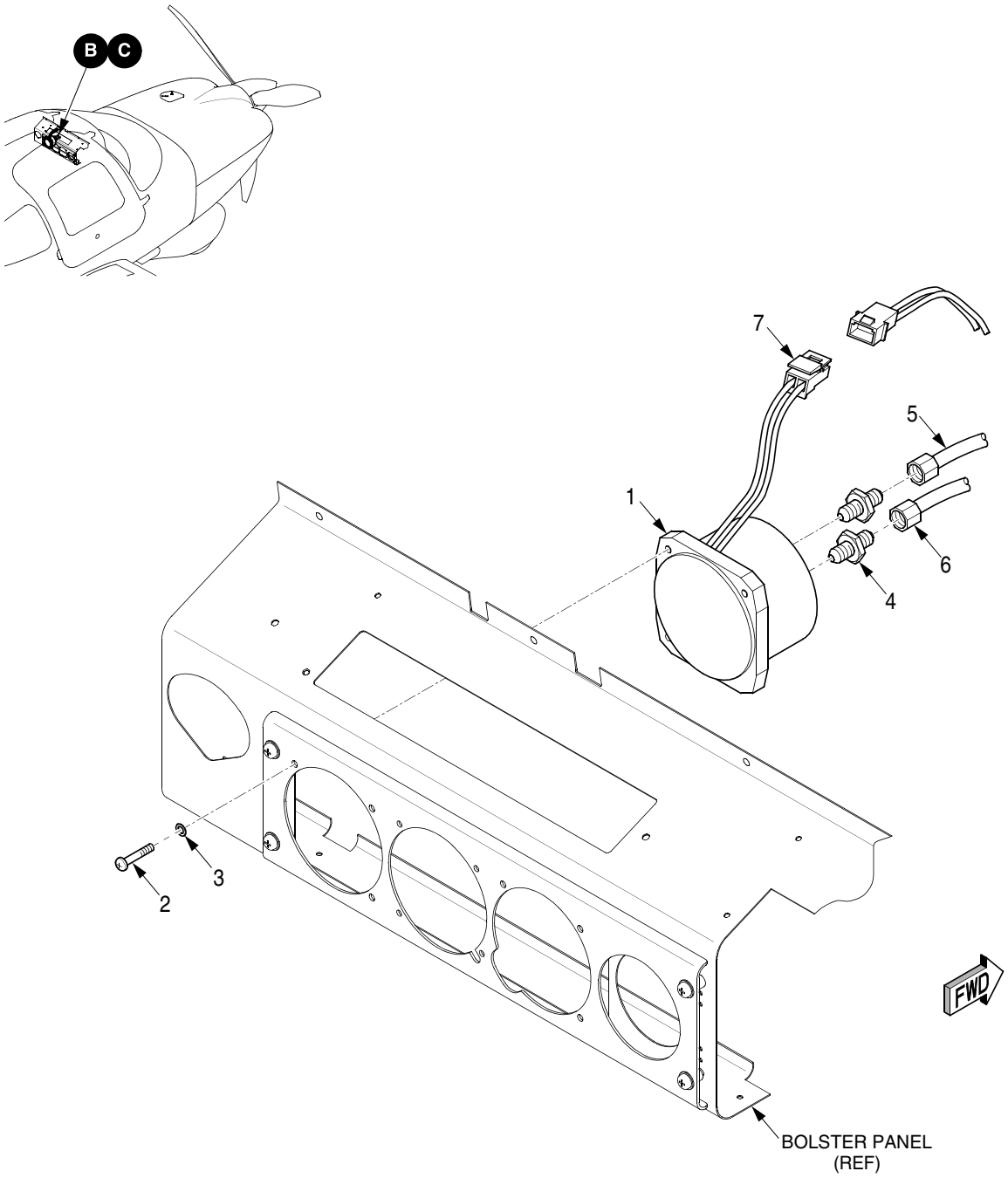
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

DETAIL A

LEGEND
1. Airspeed Indicator
2. Screw
3. Washer
4. Nylon Fitting
5. Static Line
6. Pitot Line
7. Connector

SR20_MM34_2205A

Figure 34-105
Airspeed Indicator Installation - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 3)



DETAIL B

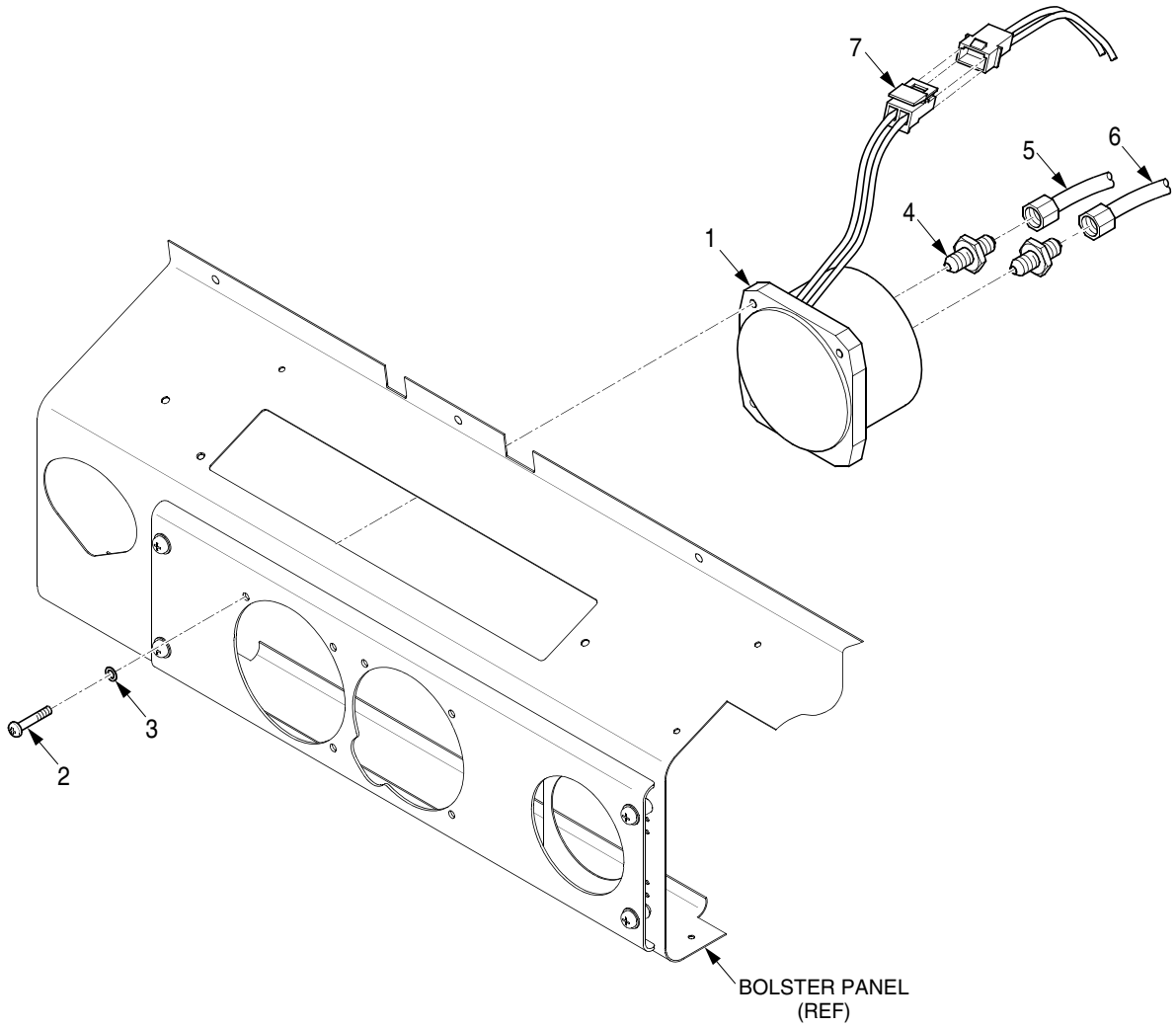
Serials 1337 thru 1422 w/ PFD,
1423 & subs w/o MD302 Standby Attitude Module.

LEGEND
1. Airspeed Indicator
2. Screw
3. Washer
4. Nylon Fitting
5. Static Line
6. Pitot Line
7. Connector

SR20_MM34_2203B

Figure 34-105
Airspeed Indicator Installation - Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302 (Sheet 2 of 3)

EFFECTIVITY:
Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o MD302



Serials 1337 & subs w/SRV.

DETAIL C

LEGEND
1. Airspeed Indicator
2. Screw
3. Washer
4. Nylon Fitting
5. Static Line
6. Pitot Line
7. Connector

SR20_MM34_2209A

Figure 34-105
Airspeed Indicator Installation - Serials 1337 & subs w/ SRV (Sheet 3 of 3)

L. MD302 Standby Attitude Module - *Serials 2273 & subs w/ MD302 Standby Attitude Module* (See Figure 34-106)

(1) Removal - MD302 Standby Attitude Module

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull STDBY ATTD #1, STDBY ATTD #2, and INSTRUMENT LIGHTS circuit breakers.

(c) Remove and discard MD302 overlay.

CAUTION: Do not use heat gun or solvent/cleaning products on MD302. Use caution while using putty knife to avoid scratching or otherwise damaging the unit.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Clean Cloth (white, lint- free)	-	Any Source	Wash.
Plastic Putty Knife	-	Any Source	Remove overlay and residual adhesive.

CAUTION: Exercise caution while cutting slit in overlay to avoid scratching or otherwise damaging the unit.

2 Cut slit in overlay as shown. (See Figure 34-106)

3 Beginning at each side of slit, peel overlay away from surface of unit, using putty knife if necessary.

4 Remove residual adhesive with clean cloth slightly dampened with water and putty knife if necessary.

(d) Remove LH kickplate. (Refer to 25-10)

(e) Remove and cap off static and pitot line.

(f) Disconnect electrical connector.

(g) While supporting MD302 Standby Attitude Module, remove screws securing unit to bolster panel.

(h) Cap off fittings on back of MD302 Standby Attitude Module to prevent possible contamination, then remove from airplane.

(2) Installation - MD302 Standby Attitude Module

(a) Position MD302 Standby Attitude Module in bolster panel and secure with screws.

(b) Connect electrical connector.

(c) Attach static and pitot line.

(d) Reset STDBY ATTD #1, STDBY ATTD #2, and INSTRUMENT LIGHTS circuit breakers.

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(g) Perform Functional Test - MD302 Standby Attitude Module. (Refer to 34-10)

(h) Install LH kickplate. (Refer to 25-10)

(i) Install MD302 overlay.

EFFECTIVITY:
Serials 2273 & subs w/ MD302 Standby Attitude Module

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Clean Cloth (white, lint- free)	-	Any Source	Wash.
Rubber Roller	-	Any Source	Install overlay.

2 Slightly dampen clean cloth with water and wash overlay installation area.

3 Cut slit in overlay as shown. (See Figure 34-106)

4 Remove protective backing from top half of overlay using care not to contaminate adhesive surface.

Note: Ensure slit is positioned downwards.

5 Align overlay half with protective backing still in place on unit and press exposed overlay half onto unit.

6 Bend overlay back and peel remaining protective backing from overlay.

7 Carefully work overlay toward bottom of unit, using slit in overlay to wrap around unit knob.

8 Press bubbles and wrinkles out with rubber roller. Ensure all edges are firmly adhered.

(3) Functional Test - MD302 Standby Attitude Module

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) Unit will display Introduction page for approximately 5 seconds, followed by the Flight Mode page.

(c) Check function of altimeter.

1 On audio control panel, select COM 1 audio selector button.

2 Using COM 1, listen to ATIS. Obtain current altimeter barometric pressure setting.

3 Set barometric pressure in altimeter window.

4 Verify correct altitude is indicated.

(d) Check function of airspeed indicator.

1 Verify airspeed tape indicates zero.

(e) Check function of attitude indicator.

1 Verify attitude indicator is stabilized with artificial horizon resting horizontally and slip indicator ball is centered.

(4) Adjustment/Test - MD302 Standby Attitude Module

(a) Perform Adjustment/Test - Altimeter. (Refer to 34-10)

(5) Adjustment/Test - MD302 Standby Attitude Module Software Loading

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
MidContinent Software Loader USB Flash Drive[a]	-	MidContinent Instruments and Avionics Wichita, Kansas 67226 800-821-1212	Upload software.

a. It is also permissible to download the approved software file to the root directory of a standard FAT-formatted USB flash drive from www.flySAM.com/software-updates.

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Pull STARTER and FUEL PUMP circuit breakers.

(d) Ensure unit is powered off.

(e) Remove LH kick plate. (Refer to 25-10)

Note: It is not necessary to remove unit from bolster panel when loading software.

(f) Perform Adjustment/Test - MD302 Standby Attitude Module Configuration Loading. (Refer to 34-10)

(g) Install LH kick plate. (Refer to 25-10)

(h) Reset STARTER and FUEL PUMP circuit breakers.

(i) Disconnect 28 ±1 VDC external power from external power receptacle.

(6) Adjustment/Test - MD302 Standby Attitude Module Configuration Loading

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

(c) Ensure unit is powered off.

Note: It is not necessary to remove unit from bolster panel when loading software.

(d) Program the unit by holding down knob when applying aircraft power at BAT 1 switch. After 6 seconds, the message "CONTINUTE HOLDING TO ENTER CONFIG MODE" will appear. Continue holding the knob until the CONFIGURE MENU appears. Use the control knob to set the following values.

1 CONFIGURE AIRCRAFT:

PANEL TILT	14.0
PANEL ROLL	0.0 (nominal, ±1.0)[a]
RANGE MMO	0.00
RANGE MARKING	
FULL, WHITE	61-104
HALF, GREEN	69-104
FULL, GREEN	104-163
FULL, YELLOW	163-200

EFFECTIVITY:
Serials 2273 & subs w/ MD302 Standby Attitude Module

FULL, RED	200-999
FULL, RED	0-61
VNE TABLE	
ALT/KNOTS 1	0, 200
ALT/KNOTS 2-7	(unused, 0)

a. Panel Roll allowable ±1.0 to account for installation tolerances.

2 CONFIGURE ARINC:

ARINC_SPEED	HIGH

3 CONFIGURE DIMMING:

DIMMING CONTROL	EXT_28V
DIMMING CURVE	8, 8, 9, 10, 14, 25, 11

4 CONFIGURE DISPLAY:

ROLL DISPLAY	FIXED_POINTER
AIRSPEED UNITS	KNOTS
AIRSPEED MINIMUM	20_KNOTS
DISPLAY ORIENTATION	HORIZONTAL
HORIZON DISPLAY	FLAT

5 CONFIGURE HEADING:

CONFIGURE HEADING	DISPLAY OFF

6 Select "ACCEPT CHANGES" to save configuration selections into MD302 memory and to the configuration module in the aircraft harness.

(e) Cycle power at BAT 1 switch to reboot the MD302. After power on is complete (approximately 20 seconds) verify instrument shows no red Xs for airspeed, altimeter or attitude indicator.

(f) Verify settings by holding the control knob when unit is powered on until the menu appears.

(g) Select the menu item "INFO >".

(h) Scroll through the settings to verify correct settings per tables above.

(i) Verify airspeed indicator reads 0.

(j) Ensure slip indicator ball matches indication on PFD.

(k) Turn on the audio panel. Select the COM 1 audio selector button.

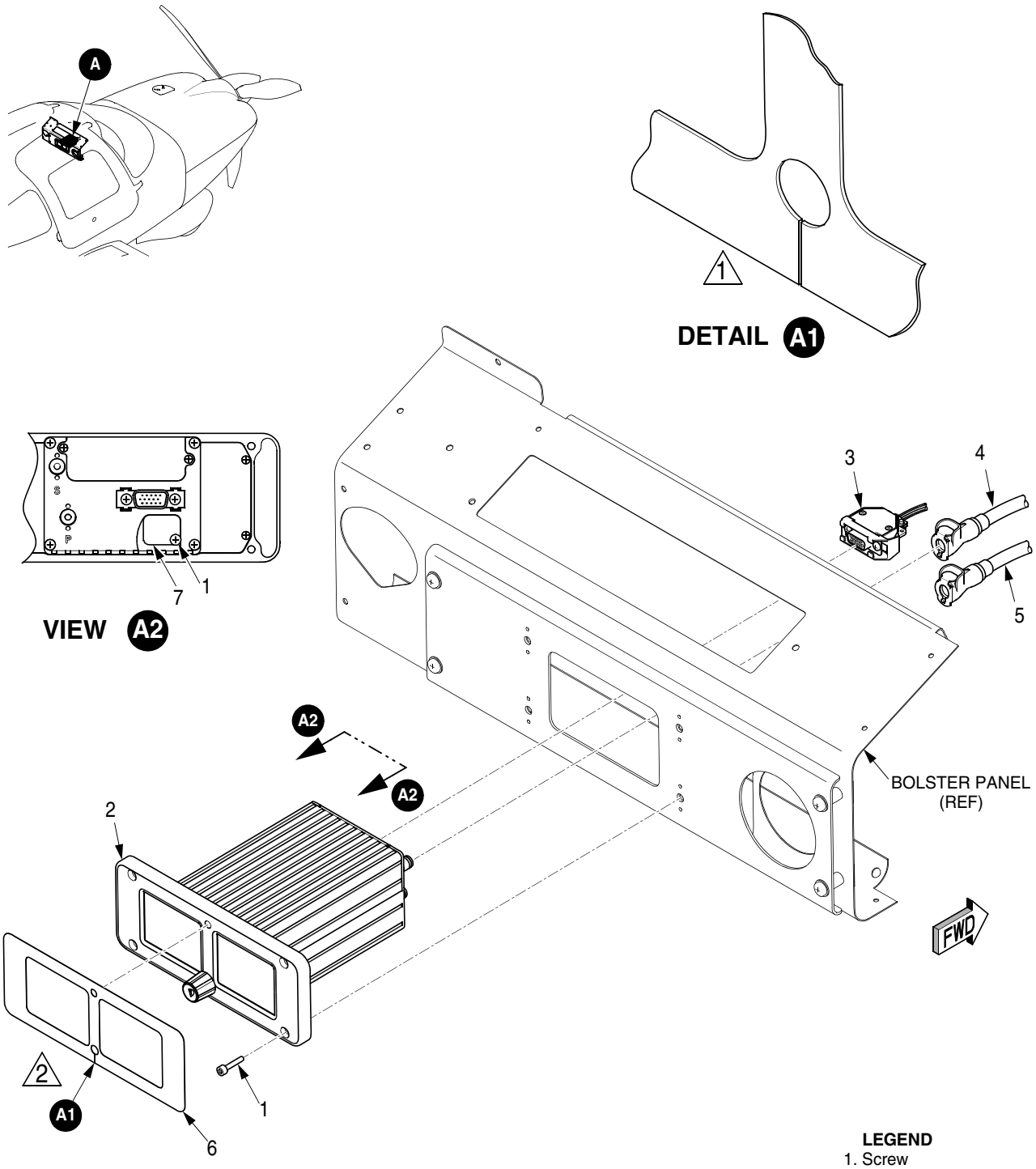
(l) Using COM 1, listen to local weather and obtain current altimeter barometric pressure setting.

(m) Set barometric pressure in altimeter window.

(n) Verify altitude indicates local elevation ±75 ft.

(o) Reset STARTER and FUEL PUMP circuit breakers.

(p) Disconnect 28 ±1 VDC external power from external power receptacle.



NOTE

1. Cut slit in overlay as shown.
2. Ensure slit is positioned downwards.

LEGEND

1. Screw
2. MD302 Standby Attitude Module
3. Connector
4. Static Line
5. Pitot Line
6. MD302 Overlay
7. USB Access Door

Serials 2273 & subs w/ MD302 Standby Attitude Module.

SR20_MM34_3683

Figure 34-106
MD302 Standby Attitude Module Installation

M. Outside Air Temperature (OAT) Gage/Clock - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* (See Figure 34-107)

(1) Removal - OAT Gage/Clock
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull INSTRUMENT LIGHTS circuit breaker.
- (c) Remove glareshield. (Refer to 25-10)
- (d) Disconnect electrical connector.
- (e) Remove screws securing OAT gage/clock to instrument panel, then remove from airplane.

(2) Installation - OAT Gage/Clock
- (a) Position OAT gage/clock in instrument panel, then attach with screws.
- (b) Connect electrical connector.
- (c) Reset INSTRUMENT LIGHTS circuit breaker.
- (d) Perform Functional Test - OAT Gage/Clock. (Refer to 34-10)
- (e) Install glareshield. (Refer to 25-10)

(3) Functional Test - OAT Gage/Clock
- (a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
- (b) Set BAT 1 switch to ON position.
- (c) Press [OAT/VOLTS] to display voltage.
- (d) Verify display indicates approximately “24.0E” ±2 for ship voltage.
- (e) Press [OAT/VOLTS] to display ambient air temperature in fahrenheit.
- (f) Press [OAT/VOLTS] to display ambient air temperature in celsius.
- (g) Set Universal Time.
  1. Press [SELECT] to select Universal Time (UT).
  2. Press simultaneously both [SELECT] and [CONTROL].
     The tens of hours digit flashes.
  3. Press [CONTROL] to change digit.
  4. Press [SELECT] to advance to the next digit.
  5. On the last editable digit, press [SELECT] to exit.
- (h) Set Local Time.
  1. Press [SELECT] to select Local Time (LT).
  2. Press simultaneously both [SELECT] and [CONTROL].
     The tens of hours digit flashes.

     Note: Only the hours can be set for Local Time. The minutes are set under Universal Time.

  3. Press [CONTROL] to change digit.
  4. Press [SELECT] to exit.
- (i) Set BAT 1 switch to OFF position.
- (j) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

N. Outside Air Temperature (OAT) Gage/Clock Battery - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* (See Figure 34-107)

(1) Removal - OAT Gage/Clock Battery

The OAT gage/clock battery must be inspected every 24 months. Upon replacement, the battery must have a date stamp to indicate battery expiration date.

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Remove battery from OAT gage/clock.

CAUTION: Do not use abrasive cleaners or materials to clean battery contacts.

(e) Examine battery contacts for dirt or corrosion, then clean contacts as necessary.

(2) Installation - OAT Gage/Clock Battery

(a) Record the battery replacement date of new cell in Airplane Log Book.

(b) Install new battery as indicated by battery polarity signs marked on cell holder.

(c) Perform Functional Test - OAT Gage/Clock. (Refer to 34-10)

(d) Install glareshield. (Refer to 25-10)

O. Outside Air Temperature (OAT) Gage/Clock Sensor - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* (See Figure 34-107)

(1) Removal - OAT Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Disconnect electrical connector.

(d) Remove nut and washer securing OAT sensor to fuselage.

(2) Installation - OAT Sensor

(a) Position OAT sensor to fuselage and secure with washer and nut.

(b) Connect electrical connector.

(c) Install glareshield. (Refer to 25-10)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

P. Outside Air Temperature (OAT) Sensor - *Serials 1005 thru 1581 w/ EMax Engine Monitoring* (See Figure 34-107)

(1) Removal - OAT Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Disconnect electrical connector.

(d) Remove nut and washer securing OAT sensor to fuselage.

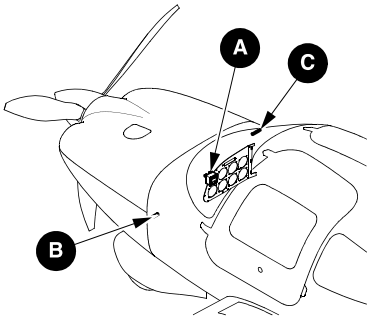
(2) Installation - OAT Sensor

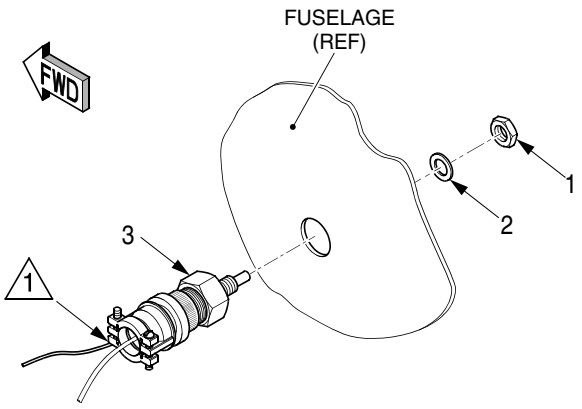
(a) Position OAT sensor to fuselage and secure with washer and nut.

(b) Connect electrical connector. Ensure backshell is secured tightly to sensor assembly.

(c) Verify resistance from OAT sensor case to airplane ground is less than 2.0 ohms. If resistance is greater than 2.0 ohms, burnish OAT sensor backshell contact as required.

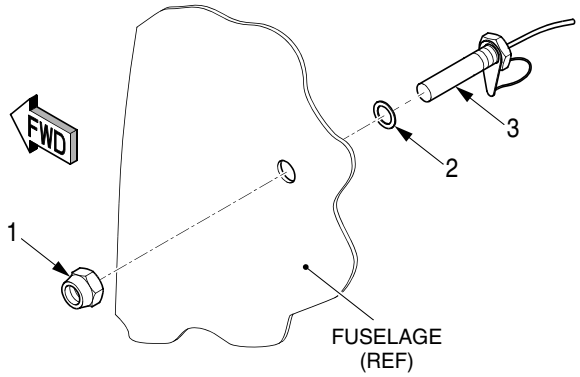
(d) Install glareshield. (Refer to 25-10)





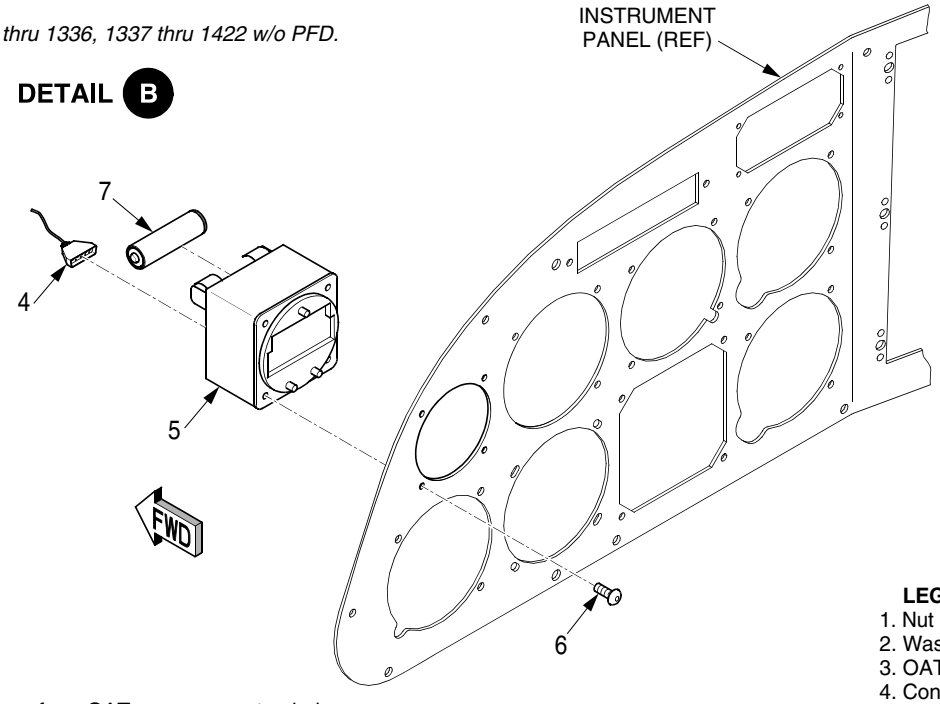
Serials 1233 thru 1581, w/ EMax Engine Monitoring, Serials 1005 thru 1232 after SB 20-77-01.

DETAIL C



Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

DETAIL B



DETAIL A

NOTE

1. Verify resistance from OAT sensor case to airplane ground is less than 2.0 ohms. If resistance is greater than 2.0 ohms, burnish OAT sensor backshell contact as required.

LEGEND

1. Nut
2. Washer
3. OAT Sensor
4. Connector
5. OAT/Clock Gage
6. Screw
7. Battery

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD, 1233 thru 1581 w/ EMax.

SR20_MM34_1249E

Figure 34-107
OAT Gage/Clock and OAT Sensor Installation - Serials 1005 thru 1581 w/ EMax Engine Monitoring

EFFECTIVITY:
Serials 1005 thru 1581 w/ EMax Engine Monitoring

Q. Outside Air Temperature (OAT) Sensor - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-108)

(1) Removal - OAT Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove wing access panel RW12. (Refer to 06-00)

(c) Disconnect electrical connector.

(d) Remove nut and washer securing OAT sensor to access panel.

(2) Installation - OAT Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	OAT sensor installation.

(b) Apply Loctite® to OAT sensor threads.

(c) Position OAT sensor to access panel and secure with washer and nut. Torque nut to 50-100 in-lb (5.6-11.3 Nm).

(d) Connect electrical connector.

(e) Install wing access panel RW12. (Refer to 06-00)

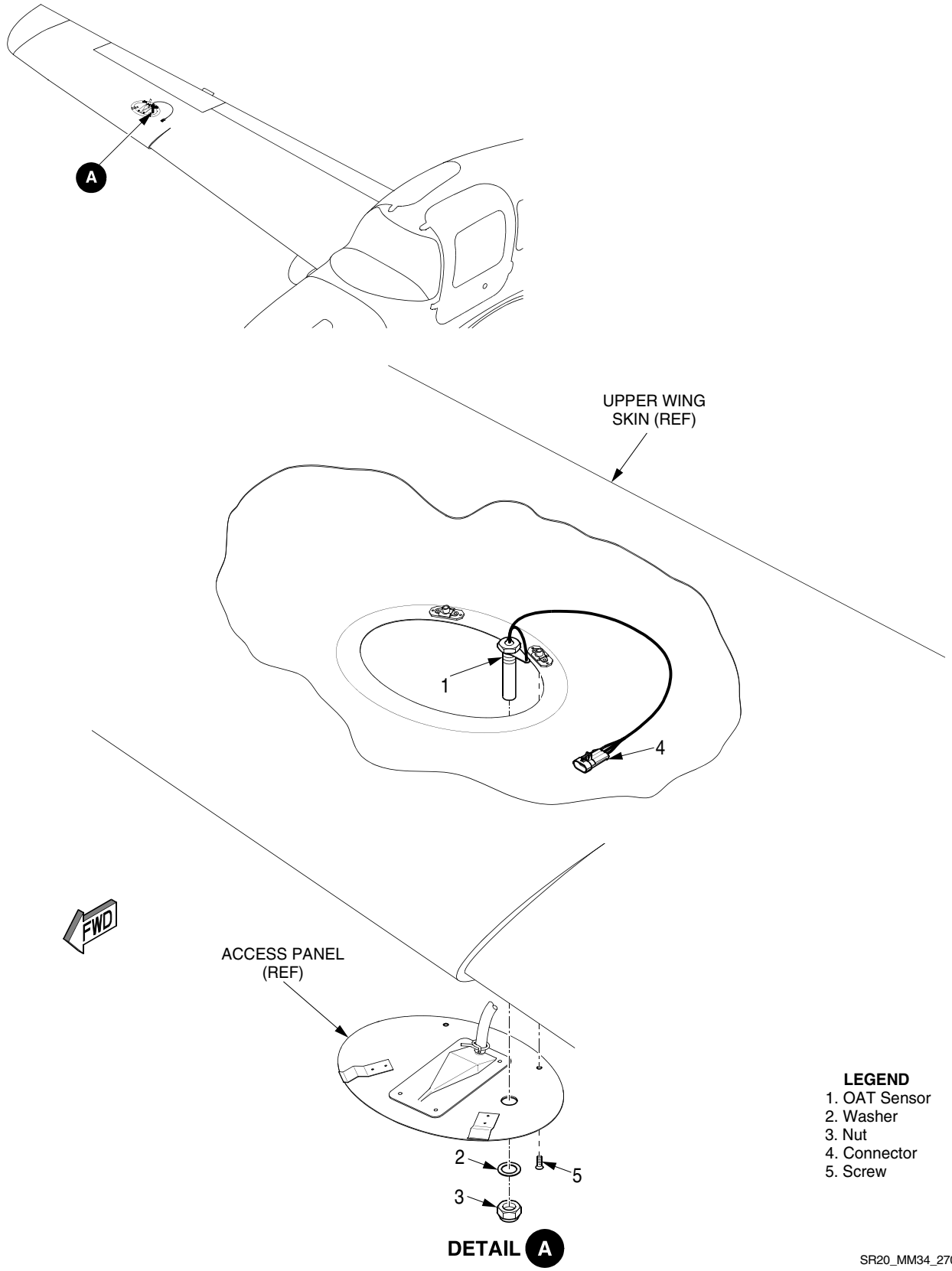


Figure 34-108
OAT Sensor Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

R. GDC 74A Air Data Computer - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-109)**

(1) Removal - GDC 74A Air Data Computer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *For single ADC installation:* Pull ADC 1 circuit breaker.

(c) *For dual ADC installation:* Pull ADC 1 and ADC 2 circuit breakers.

(d) Remove MFD. (Refer to 31-60)

(e) Disconnect electrical connector from air data computer.

(f) Disconnect and cap pitot line from air data computer.

(g) Disconnect and cap static line from air data computer.

(h) Cap pitot and static fittings on air data computer.

(i) Loosen screws securing air data computer to mounting rack. Remove air data computer from airplane.

(2) Installation - GDC 74A Air Data Computer

(a) Position air data computer to mounting rack and secure with screws.

(b) Remove caps from pitot and static fittings on air data computer.

(c) Remove cap and connect pitot line to air data computer.

(d) Remove cap and connect static line to air data computer.

(e) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(f) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

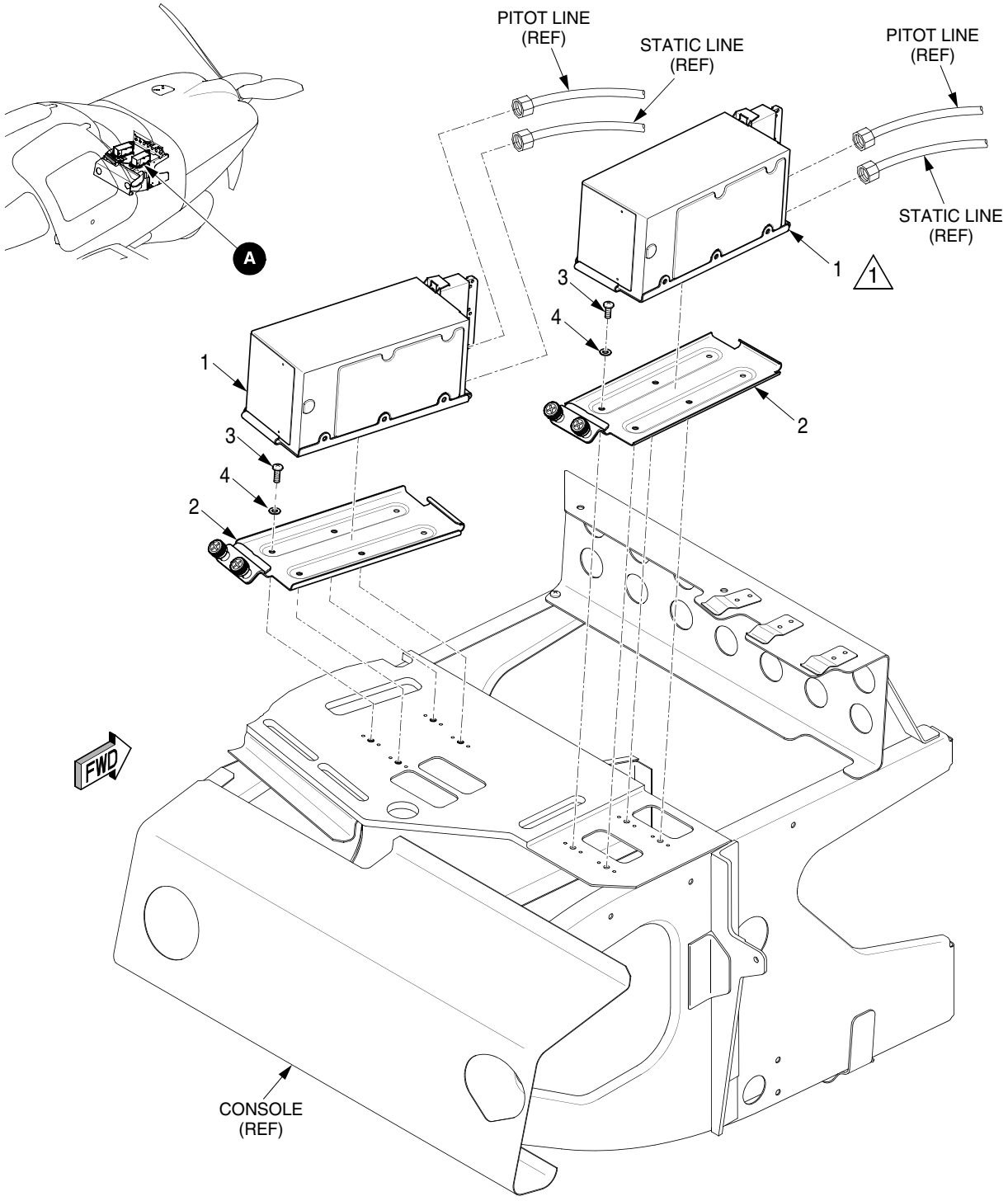
(g) Connect electrical connector to air data computer.

(h) Install MFD. (Refer to 31-60)

(i) *For single ADC installation:* Reset ADC 1 circuit breaker.

(j) *For dual ADC installation:* Reset ADC 1 and ADC 2 circuit breakers.

(k) If GDC 74A has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)



LEGEND
1. Air Data Computer
2. Rack
3. Screw
4. Washer

NOTE

1 Optional dual ADC installation shown.

DETAIL A

SR20_MM34_2712A

Figure 34-109
GDC 74A Air Data Computer Installation - Serials 2016 & subs w/ Perspective Avionics

ATTITUDE AND DIRECTION

1. DESCRIPTION

This section contains information pertaining to those portions of the system which use magnetic, gyroscopic, and inertia forces. Included is the magnetic compass, turn coordinator, attitude indicator, directional gyro, magnetometer, and GRS 77 attitude reference and heading system. (See Figure 34-001)

For information pertaining to the horizontal situation indicator (HSI), see Dependent Position Determining. (Refer to 34-50)

A. Magnetic Compass

The magnetic compass, mounted to the fuselage above the windshield, contains a circular compass card, visible through the compass case window, suspended in alcohol solution. The compass is equipped with compensating magnets and has two adjusting set screws, one for North-South adjustment and one for East-West adjustment. These set screws are located behind the access plate on the compass face. Light is integral and controlled by the instrument light rheostat on the bolster switch panel.

B. Turn Coordinator

Serials 1005 thru 1422 w/ System Twenty or System Thirty Autopilot: The turn coordinator is integrated with the autopilot roll computer. This electrically driven turn coordinator/roll computer displays roll information to the pilot and provides roll axis data to the autopilot system. The turn coordinator is mounted in the instrument panel to the left of the HSI. 28 VDC for roll rate gyro operation is supplied through the 2-amp TURN COORD #1 circuit breaker on the Essential Bus and the 2-amp TURN COORD #2 circuit breaker on the Main Bus 2. (Refer to 22-10)

Serials 1148 thru 1422 w/ System 55 Autopilot, 1423 & subs: An electric turn coordinator is installed which provides roll information to the pilot and roll axis data to the autopilot system. The turn coordinator is mounted either in the instrument panel to the left of the HSI (*Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*) or behind the RH bolster panel (*Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/ System 55X Autopilot)*. 28 VDC for roll rate gyro operation is supplied through the 2-amp TURN COORD #1 circuit breaker on the Essential Bus and the 2-amp TURN COORD #2 circuit breaker on the Main Bus 2.

C. Attitude Indicator

Serials 1005 thru 1267: The attitude indicator is a vacuum-driven gyro that displays a pictorial horizon and provides the pilot with a visual indication of the airplane's pitch and roll attitude by sensing pitching and rolling movements about the airplane's lateral and longitudinal axis. The attitude indicator is mounted in the instrument panel directly in front of the pilot. For additional maintenance practices on the vacuum system, see Vacuum. (Refer to 37-00)

Serials 1268 thru 1336, 1337 & subs w/o SRV and w/o MD302 Standby Attitude Module: The attitude indicator is an electrically driven gyro that displays a pictorial horizon and provides the pilot with a visual indication of the airplane's pitch and roll attitude by sensing pitching and rolling movements about the airplane's lateral and longitudinal axis. The attitude indicator is mounted either in the instrument panel directly in front of the pilot (*Serials 1268 thru 1336, 1337 thru 1422 w/o PFD)* or on the LH bolster panel *(Serials 1337 thru 1422 w/ PFD, w/o SRV, 1423 & subs w/o SRV).* 28 VDC for attitude gyro operation is supplied through the 3-amp ATTITUDE #1 circuit breaker on the Essential Bus and the 3-amp ATTITUDE #2 circuit breaker on the Main Bus 2.

Serials 1359 & subs w/ SRV: There is no attitude indicator installed on these airplanes.

Serials 2273 & subs w/ MD302 Standby Attitude Module: The optional MD302 Standby Attitude Module is a combined standby airspeed indicator, standby altimeter, and standby attitude indicator located in the LH bolster panel. The unit uses electronic sensors to provide attitude information. The attitude indicator displays a pictorial horizon and provides the pilot with a visual indication of the airplane's pitch and roll attitude by sensing pitching and rolling movements about the airplane's lateral and longitudinal

axis. 28 VDC for MD302 Standby Attitude Module operation is supplied through the 3-amp STDBY ATTD #1 circuit breaker on the Essential Bus and the 3-amp STDBY ATTD #2 circuit breaker on the Main Bus 2.

For additional maintenance practices on the MD302 Standby Attitude Module, see Flight Environmental Systems. (Refer to 34-10)

D. Directional Gyro

Serials 1005 thru 1267: On airplanes equipped with a single alternator, the directional gyro, located in the instrument panel directly below the attitude indicator, is a vacuum-driven instrument which senses yaw movement of the airplane about the vertical axis. When properly set, the directional gyro displays a stable indication of the airplane heading to the pilot. 28 VDC for lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus #1. For additional maintenance practices on the vacuum system, see Vacuum. (Refer to 37-00)

E. Magnetometer

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: A magnetometer assembly provides three axis magnetic field vector measurements and outside air temperature (OAT) data. The magnetometer assembly is mounted outboard in the wing. 28 VDC for the redundant power circuits is supplied through the 5-amp PFD#1 circuit breaker on the Essential Bus and 5-amp PFD#2 circuit breaker on Main Bus 2.

Serials 2016 & subs w/ Perspective Avionics: A GMU 44 magnetometer, mounted outboard in the wing, provides three axis magnetic field vector measurements and interfaces with the GRS77 AHRS. A second magnetometer, located adjacent to the first, may be installed by option. 28 VDC for the standard magnetometer is supplied through the 5-amp PFD#1 circuit breaker on Essential Bus 1. 28 VDC for the optional magnetometer is supplied through the 5-amp PFD#2 circuit breaker on Main Bus 2.

The GMU 44 magnetometer is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

F. GRS77 Attitude and Heading Reference System (AHRS)

Serials 2016 & subs w/ Perspective Avionics: The GRS 77 AHRS, located behind the LH instrument panel, provides aircraft attitude and heading information to the PFD and primary GIA 63 integrated avionics unit. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the magnetometer to obtain magnetic field information, air data computer to obtain air data, and both GIA 63 integrated avionics unit to obtain GPS information. A second AHRS, located behind the LH instrument panel, may be installed by option. 28 VDC for the standard AHRS is supplied through the 5-amp AHRS 1 circuit breaker on Essential Bus 1. 28 VDC for the optional AHRS is supplied through the 5-amp AHRS 2 circuit breaker on Main Bus 2.

The GRS 77 AHRS is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. TROUBLESHOOTING

Trouble - Magnetic Compass	Probable Cause	Remedy
Excessive card error.	Compass not properly compensated.	Compensate instrument.
	External magnetic interference.	Locate magnetic interference and eliminate if possible.
Excessive card oscillation.	Insufficient fluid.	Replace instrument.
Card sluggish.	Weak card magnet.	Replace instrument.
	Excessive pivot friction or broken jewel.	Replace instrument.
Liquid leakage.	Loose bezel screws.	Replace instrument.
	Broken cover glass.	Replace instrument.
	Defective sealing gaskets.	Replace instrument.
Defective light.	Burned out lamp or broken circuit.	Check lamp or continuity of wiring.
Card sticks.	Altitude compensating diaphragm collapsed.	Replace instrument.
Card does not move when compensating screws are turned.	Gears that turn compensating magnets stripped.	Replace instrument.
Compass swings erratically when radio transmitter is keyed.	Normal.	-
Excessive drift in either direction.	Excessive vibration.	Tighten mounting screws.

Trouble - Turn Coordinator	Probable Cause	Remedy
Turn coordinator incorrect sensitivity.	Out of calibration.	Replace instrument.
Turn coordinator/roll computer ball not centered when airplane is correctly trimmed.	Instrument not level in panel.	Level instrument.
Noisy gyro.	High voltage.	Check system voltage at connector.
	Loose or defective rotor bearings.	Replace instrument.
In cold temperatures, turn coordinator/roll computer wing pointer fails to respond or is sluggish.	Oil in indicator too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check system voltage at connector.

Trouble - Attitude Indicator	Probable Cause	Remedy
Horizon bar does not respond.	Dirty vacuum regulator garter filter (high vacuum indication).	Clean or replace filter. (Refer to 37-10)
	Defective vacuum regulator.	Replace regulator.
	Vacuum line kinked or leaking.	Examine and repair line.
Horizon bar does not settle.	Vacuum regulator valve improperly adjusted.	Adjust valve.
	Vacuum line kinked or leaking.	Examine and repair line.
	Defective instrument.	Replace instrument.
	Excessive vibration.	Tighten mounting screws.
Horizon bar oscillates or vibrates excessively.	Dirty vacuum regulator garter filter.	Clean or replace filter. (Refer to 37-10)
	Defective vacuum regulator.	Replace regulator.
	Excessive vibration.	Tighten mounting screws.

Trouble - Directional Gyro	Probable Cause	Remedy
Excessive drift in either direction.	Dirty vacuum regulator garter filter (high vacuum indication).	Clean or replace filter. (Refer to 37-10)
	Vacuum line kinked or leaking.	Examine and repair line.
	Defective vacuum regulator.	Replace regulator.
	Defective instrument.	Replace instrument.

Serials 2016 & subs w/ Perspective Avionics:

Trouble	Probable Cause	Remedy
HDG FAIL annunciation.	Interference from nearby metal objects.	Ensure metal objects (tool boxes, power carts, etc.) are not interfering with the magnetometer and aircraft is not in hangar, near other buildings, parked over metal drainage culverts or on hard surfaces that may contain steel reinforcements. Cycle power after moving aircraft away from metal objects to determine if metal objects were the source of the interference. Allow up to five minutes for the heading to reinitialize.
	Interference from cell phone.	Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin.
	Aircraft not stationary.	Ensure the aircraft is stationary if GPS is not available. Aircraft movement (rocking the wings or moving the tail) may cause the heading to fail if it believes the aircraft is in motion without GPS input.
	Interference from onboard electrical components.	Perform a Magnetometer Interference Test to check for interference from onboard electrical system components (e.g. NAV lights). Pay particular attention to any new electrical devices that have been installed since the aircraft was new. Correct any discrepancies that do not allow this test to pass before continuing.
	Faulty connection between GRS 77 and GMU 44.	Check the wiring and any inline connectors between the GRS and GMU for faults.
	GMU 44 requires calibration.	Perform Adjustment/Test - GMU 44 Magnetometer Calibration. (Refer to 34-20)
	Faulty GMU 44.	Replace GMU 44. (Refer to 34-20)
	Faulty GRS 77.	Replace GRS 77. (Refer to 34-20)

Trouble	Probable Cause	Remedy
ATTITUDE FAIL annunciation.	Interference from cell phone.	Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin.
	Software or configuration error.	Check PFD Alert Window for PFD, MFD or GRS configuration, software, or failed data path error messages. Correct any errors before proceeding.
	Aircraft not stationary.	Ensure the aircraft is stationary if GPS is not available. Aircraft movement (rocking the wings or moving the tail) may cause the heading to fail if it believes the aircraft is in motion without GPS input. Check if GPS has acquired at least four satellites, has a 3D navigation solution, and a DOP of less than 5.0.
	Interference from nearby metal objects.	Check for metal objects (tool boxes, power carts, nearby large steel structures, etc.) around aircraft that could be interfering with magnetometer.
	Faulty connector or wiring.	Check GRS 77 connector for security and that proper wire harness strain relief is provided.
	GRS 77 not secured properly.	Verify GRS 77 is secured tightly to mounting rack and that mounting rack is not loose. (CAUTION - do not loosen mounting rack hardware to airframe shelf or aircraft will need to be re-leveled and the PITCH/ROLL OFFSET procedure performed). Perform Engine Run-Up Test to check if engine vibration is causing GRS 77 to go offline.
	Faulty GRS 77.	Replace GRS 77.
	Faulty configuration module.	Replace configuration module.

3. MAINTENANCE PRACTICES

A. Magnetic Compass - *Serials 1005 thru 1422* (See Figure 34-201)

WARNING: When performing Operational Test - Magnetic Compass Calibration, use a non-magnetic or plastic screwdriver.

(1) Removal - Magnetic Compass
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull INSTRUMENT LIGHTS circuit breaker.
  (c) While supporting compass assembly, remove screws and nuts securing compass to compass bracket.
  (d) While supporting compass, loosen forward headliner. (Refer to 25-10)
  (e) Disconnect electrical connector, then remove compass assembly from airplane.

(2) Installation - Magnetic Compass
  (a) Connect electrical connector.
  (b) While supporting compass, install forward headliner. (Refer to 25-10)
  (c) Install screws and nuts securing compass to compass bracket.
  (d) Reset INSTRUMENT LIGHTS circuit breaker.
  (e) Perform Operational Test - Magnetic Compass Calibration. (Refer to 34-20)

(3) Removal - Magnetic Compass Bracket
  (a) Perform Removal - Magnetic Compass Assembly. (Refer to 34-20)
  (b) Remove velcro used for securing calibration card to headliner, exposing screw.
  (c) Remove screws securing compass bracket to cabin ceiling, then remove compass bracket from airplane.

(4) Installation - Magnetic Compass Bracket
  (a) Position compass bracket over mounting holes on roll cage structure and cover with forward headliner.
  (b) Install screws securing compass bracket to cabin ceiling.
  (c) Secure velcro to headliner, then attach calibration card.
  (d) Perform Installation - Magnetic Compass Assembly. (Refer to 34-20)

(5) Operational Test - Magnetic Compass Calibration
  (a) Place the airplane in as realistic flight environment as possible.
  (b) Verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.
  (c) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.
  (d) Set all other cockpit controlled electrical switches should be in OFF positions.

WARNING: When performing Operational Test - Magnetic Compass Calibration, use a non-magnetic or plastic screwdriver.

  (e) Remove screws securing access plate to compass housing to reveal adjustment screws.
  (f) Set adjustment screws of compensator on zero. Zero position is indicated when dot of screw is aligned with dot on compass frame.
  (g) Taxi airplane to compass rose.
  (h) Align centerline of airplane on magnetic North heading. Adjust N-S set screw until compass reads North.
  (i) Align centerline of airplane on magnetic East heading. Adjust E-W set screw until compass reads East.

(j) Align centerline of airplane on magnetic South heading, then note resulting South error. Adjust N-S set screw until one-half of error is removed.

(k) Align centerline of airplane on magnetic West heading, then note resulting West error. Adjust E-W set screw until one-half of error is removed.

(l) Align centerline of airplane in successive magnetic 30-degree headings and record compass readings on appropriate deviation card. Deviations must not exceed 10 degrees on any heading.

(m) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to OFF positions.

B. Magnetic Compass - *Serials 1423 & subs* (See Figure 34-201)

WARNING: When performing Operational Test - Magnetic Compass Calibration, use a non-magnetic or plastic screwdriver.

(1) Removal - Magnetic Compass
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull INSTRUMENT LIGHTS circuit breaker.
  (c) While supporting compass, loosen forward headliner. (Refer to 25-10)
  (d) While supporting compass assembly, remove screws, washers, and nuts securing compass to forward headliner.
  (e) Disconnect electrical connector, then remove compass assembly from airplane.

(2) Installation - Magnetic Compass
  (a) Connect electrical connector.
  (b) Install screws, washers, and nuts securing compass to forward headliner.
  (c) While supporting compass, install forward headliner. (Refer to 25-10)
  (d) Reset INSTRUMENT LIGHTS circuit breaker.
  (e) Perform Operational Test - Magnetic Compass Calibration. (Refer to 34-20)

(3) Removal - Magnetic Compass Bracket
  (a) Remove screw and washer securing compass bracket to cabin ceiling, then remove compass bracket from airplane.

(4) Installation - Magnetic Compass Bracket
  (a) Position compass bracket over mounting hole in forward headliner.
  (b) Install screw and washer securing compass bracket to cabin ceiling.

(5) Operational Test - Magnetic Compass Calibration
  (a) Place the airplane in as realistic flight environment as possible.
  (b) Verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.
  (c) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.
  (d) Set all other cockpit controlled electrical switches should be in OFF positions.

WARNING: When performing Operational Test - Magnetic Compass Calibration, use plastic adjustment tool included with new compass.

  (e) Adjust compass for zero magnetic corrections. The level of magnetic correction is indicated on top of the compass. Zero correction is indicated when spindle markings align with markings on top of compass to form a line.
  (f) Taxi airplane to compass rose.
  (g) Align centerline of airplane on magnetic North heading. Adjust N-S set screw until compass reads North.
  (h) Align centerline of airplane on magnetic East heading. Adjust E-W set screw until compass reads East.
  (i) Align centerline of airplane on magnetic South heading, then note resulting South error. Adjust N-S set screw until one-half of error is removed.
  (j) Align centerline of airplane on magnetic West heading, then note resulting West error. Adjust E-W set screw until one-half of error is removed.
  (k) Align centerline of airplane in successive magnetic 30-degree headings and record compass readings on appropriate deviation card. Deviations must not exceed 10 degrees on any heading.
  (l) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to OFF positions.

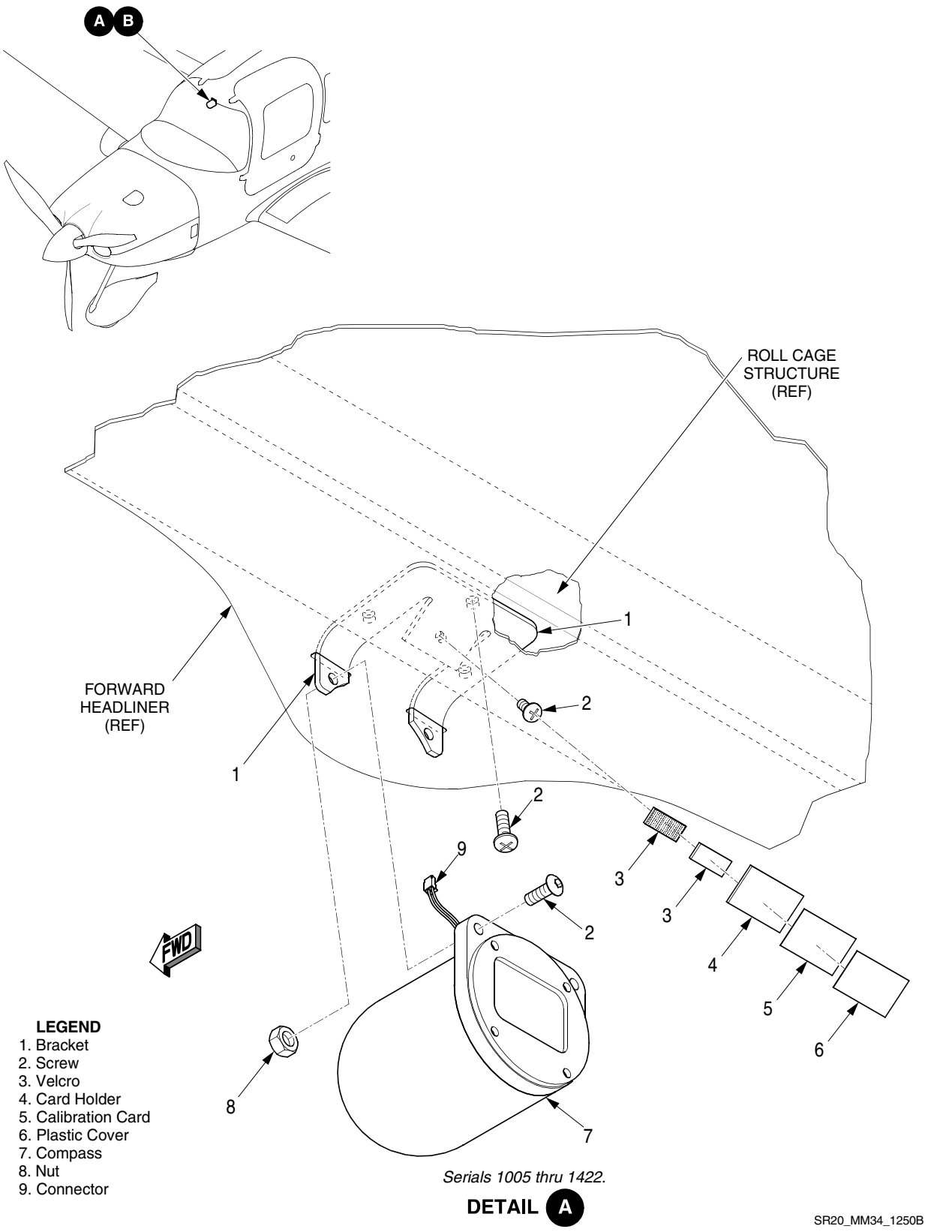
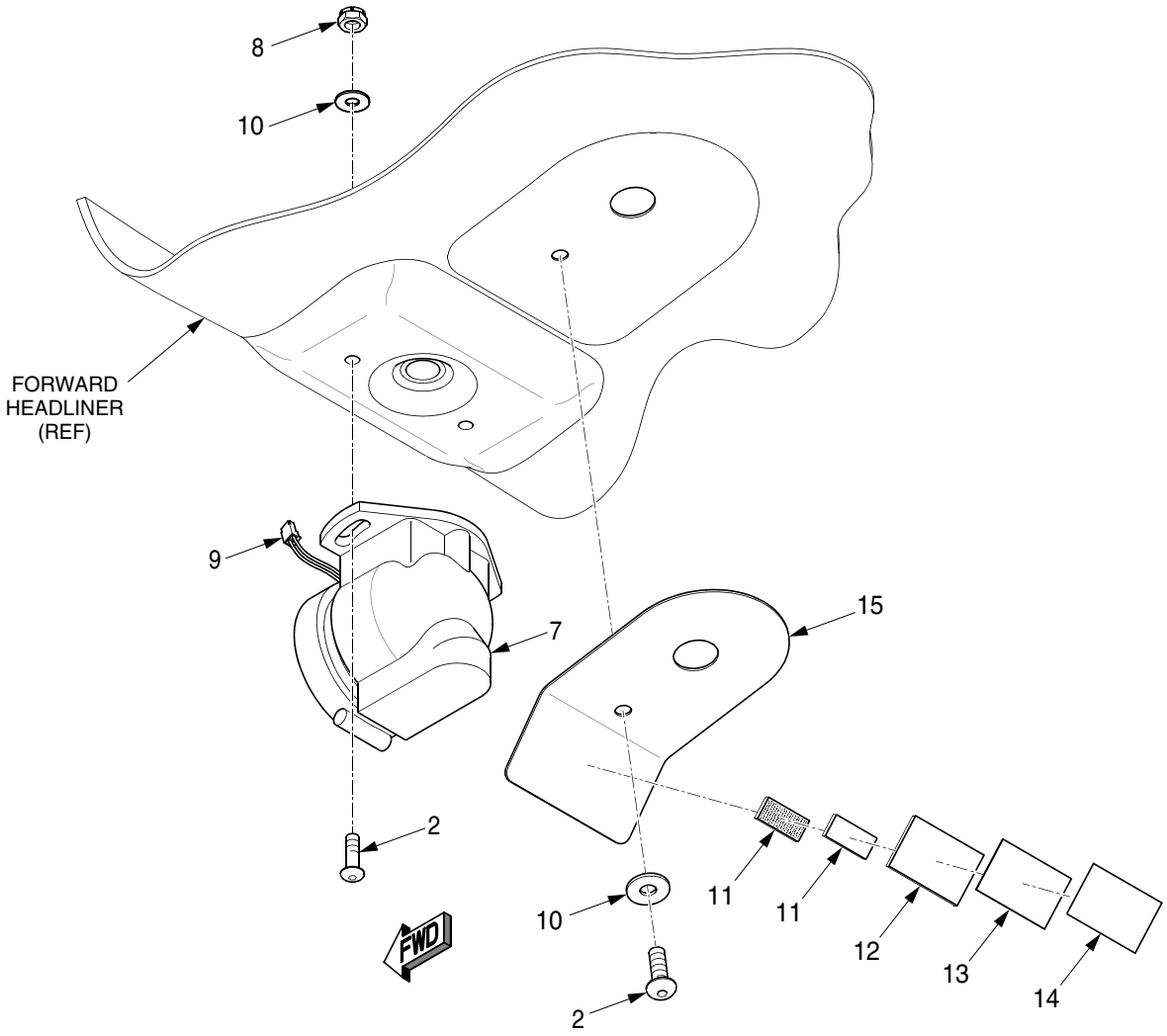


Figure 34-201
Magnetic Compass Installation - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422



LEGEND

2. Screw
7. Compass
8. Nut
9. Connector
10. Washer
11. Velcro
12. Card Holder
13. Calibration Card
14. Plastic Cover
15. Bracket

SR20_MM34_1936A

Serials 1423 & subs.

DETAIL B

Figure 34-201
Magnetic Compass Installation - Serials 1423 & subs (Sheet 2 of 2)

C. Turn Coordinator - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-202)**

(1) Removal - Turn Coordinator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull TURN COORDINATOR circuit breaker.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect instrument light connector and cable assembly from back of turn coordinator.

(e) While supporting turn coordinator, remove screws and washers securing unit to instrument panel.

(f) Remove turn coordinator from airplane.

(2) Installation - Turn Coordinator

(a) Position turn coordinator in instrument panel, then install screws and washers.

(b) Connect connector and cable assembly.

(c) Reset TURN COORDINATOR circuit breaker.

(d) Perform Operational Test - Turn Coordinator. (Refer to 34-20)

(e) Install LH kick plate. (Refer to 25-10)

(3) Operational Test - Turn Coordinator

(a) Set BAT 1 switch to ON position.

(b) Verify failure warning flag is out of view.

(c) When gyro reaches operational speed, verify airplane indicator is positioned horizontally and slip indicator ball is centered.

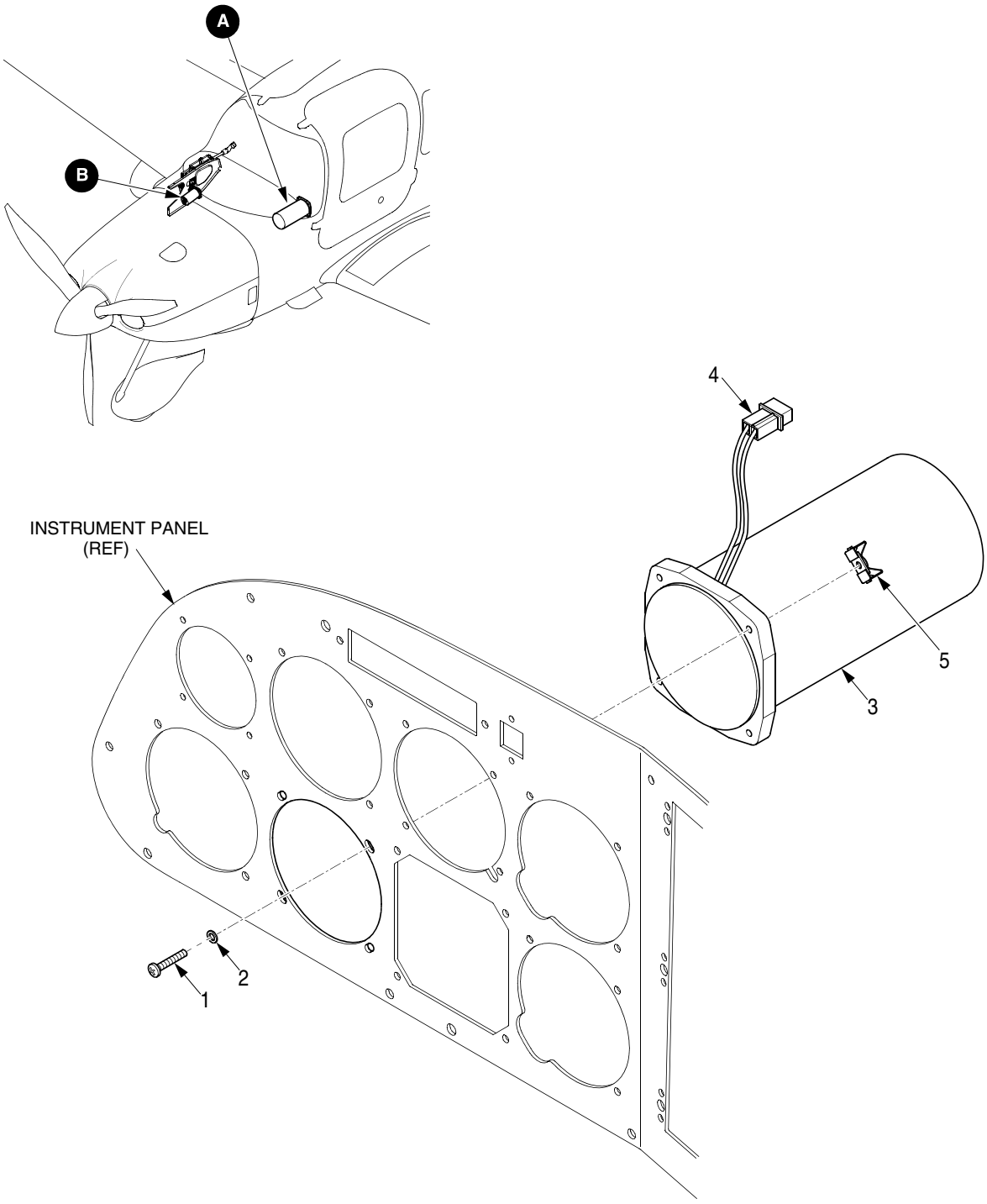
(d) Set BAT 1 switch to OFF position.

D. Turn Coordinator - *Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/ System 55X or 55SR Autopilot, 1359 & subs w/ SRV and System 55X or 55SR Autopilot* (See Figure 34-202)

(1) Removal - Turn Coordinator
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull TURN COORDINATOR circuit breaker.
- (c) Remove RH kick plate. (Refer to 25-10)
- (d) Disconnect instrument light connector and cable assembly from back of turn coordinator.
- (e) While supporting turn coordinator, remove screws and washers securing unit to bracket.
- (f) Remove turn coordinator from airplane.

(2) Installation - Turn Coordinator
- (a) Position turn coordinator in bracket, then install screws and washers.
- (b) Connect connector and cable assembly.
- (c) Reset TURN COORDINATOR circuit breaker.
- (d) Perform Operational Test - Turn Coordinator. (Refer to 34-20)
- (e) Install RH kick plate. (Refer to 25-10)

(3) Operational Test - Turn Coordinator
- (a) Set BAT 1 switch to ON position.
- (b) Verify failure warning flag is out of view.
- (c) Set BAT 1 switch to OFF position.



Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

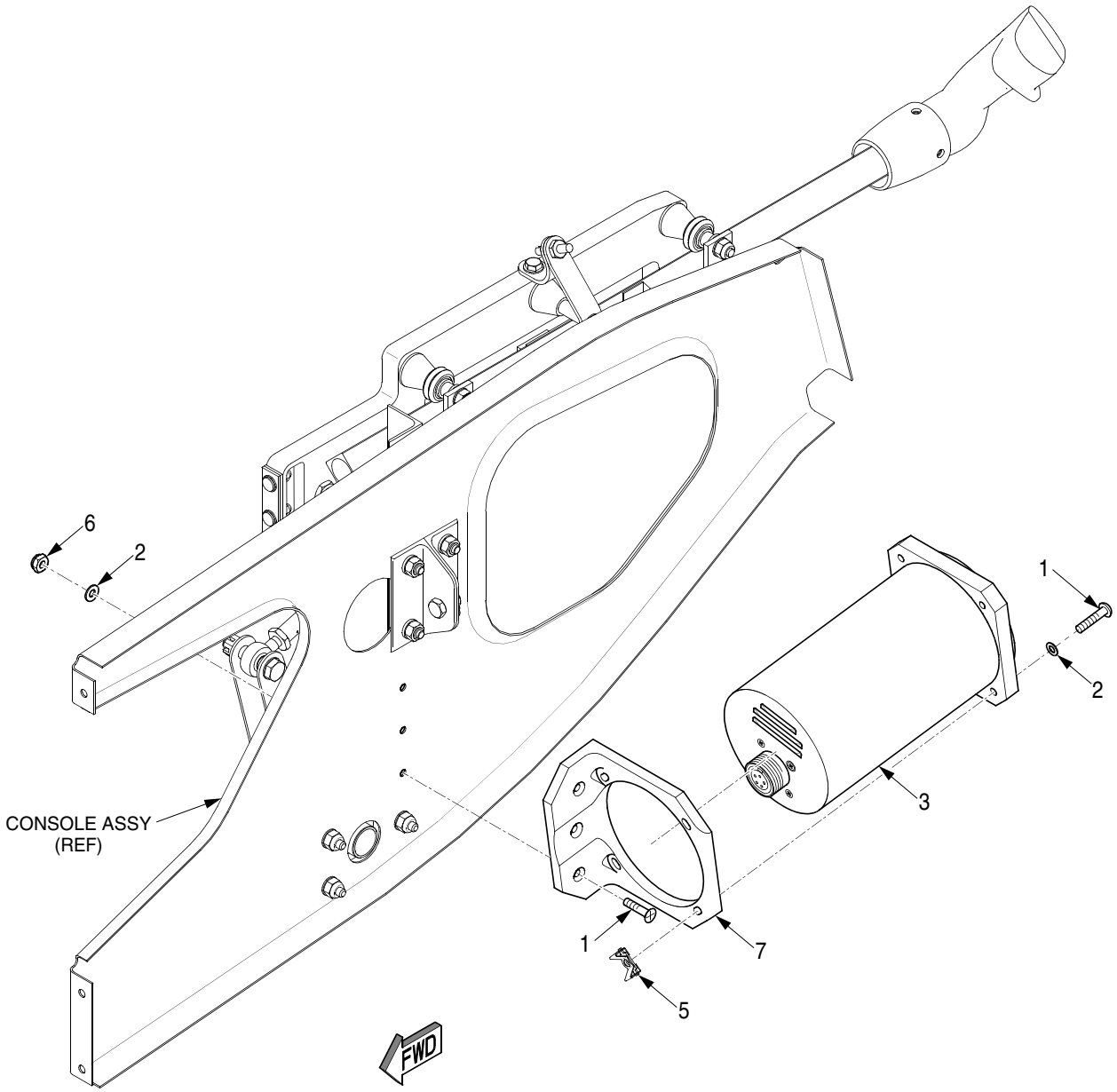
DETAIL A

LEGEND
1. Screw
2. Washer
3. Turn Coordinator
4. Connector, (lighting)
5. Nut Clip

SR20_MM34_1591B

Figure 34-202
Turn Coordinator - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



DETAIL B

Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/ System 55X or 55SR Autopilot, 1359 & subs w/ SRV and System 55X or 55SR Autopilot.

LEGEND
1. Screw
2. Washer
3. Turn Coordinator
5. Nutclip
6. Nut
7. Bracket

SR20_MM34_1703B

Figure 34-202
Turn Coordinator - Serials 1337-1422 w/ PFD, 1423-2015, 2016 & subs w/ System 55X or 55SR (Sheet 2 of 2)

EFFECTIVITY:
Serials 1337-1422 w/ PFD, 1423-2015, 2016 & subs w/ System 55X or 55SR

E. Attitude Indicator - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-203)**

(1) Removal - Attitude Indicator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) *Serials 1005 thru 1267:* Disconnect vacuum and vent hoses and cap.

(e) Disconnect electrical connector.

(f) While supporting attitude indicator, remove screws and washers securing unit to instrument panel.

(g) Cap off fittings on back of attitude indicator to prevent possible contamination and remove attitude indicator from airplane.

(2) Installation - Attitude Indicator

(a) Position attitude indicator in instrument panel and secure with screws and washers.

(b) Connect electrical connector.

(c) *Serials 1005 thru 1267:* Attach vacuum and vent hoses.

(d) Reset INSTRUMENT LIGHTS circuit breaker.

(e) Perform Operational Test - Attitude Indicator. (Refer to 34-20)

(f) Install glareshield. (Refer to 25-10)

(3) Operational Test - Attitude Indicator

(a) Set BAT 1 switch to ON position.

(b) Verify gyro flag is out of view.

(c) As gyro speeds up, the attitude indicator will stabilize.

(d) After 2-3 minutes, pull PULL TO CAGE knob on attitude indicator.

(e) Verify attitude indicator is stabilized with artificial horizon resting horizontally.

(f) Set BAT 1 switch to OFF position.

F. Attitude Indicator - *Serials 1337 thru 1422 w/ PFD & w/o SRV, 1423 & subs w/o SRV & w/o MD302 Standby Attitude Module* (See Figure 34-203)

(1) Removal - Attitude Indicator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect electrical connector.

(e) While supporting attitude indicator, remove screws and washers securing unit to bolster panel.

(f) Cap off fittings on back of attitude indicator to prevent possible contamination and remove attitude indicator from airplane.

(2) Installation - Attitude Indicator

(a) Position attitude indicator in bolster panel and secure with screws and washers.

(b) Connect electrical connector.

(c) Reset INSTRUMENT LIGHTS circuit breaker.

(d) Perform Operational Test - Attitude Indicator. (Refer to 34-20)

(e) Install LH kick plate. (Refer to 25-10)

(3) Operational Test - Attitude Indicator

(a) Set BAT 1 switch to ON position.

(b) Verify gyro flag is out of view.

(c) As gyro speeds up, the attitude indicator will stabilize.

(d) After 2-3 minutes, pull PULL TO CAGE knob on attitude indicator.

(e) Verify attitude indicator is stabilized with artificial horizon resting horizontally and slip indicator ball is centered.

(f) Set BAT 1 switch to OFF position.

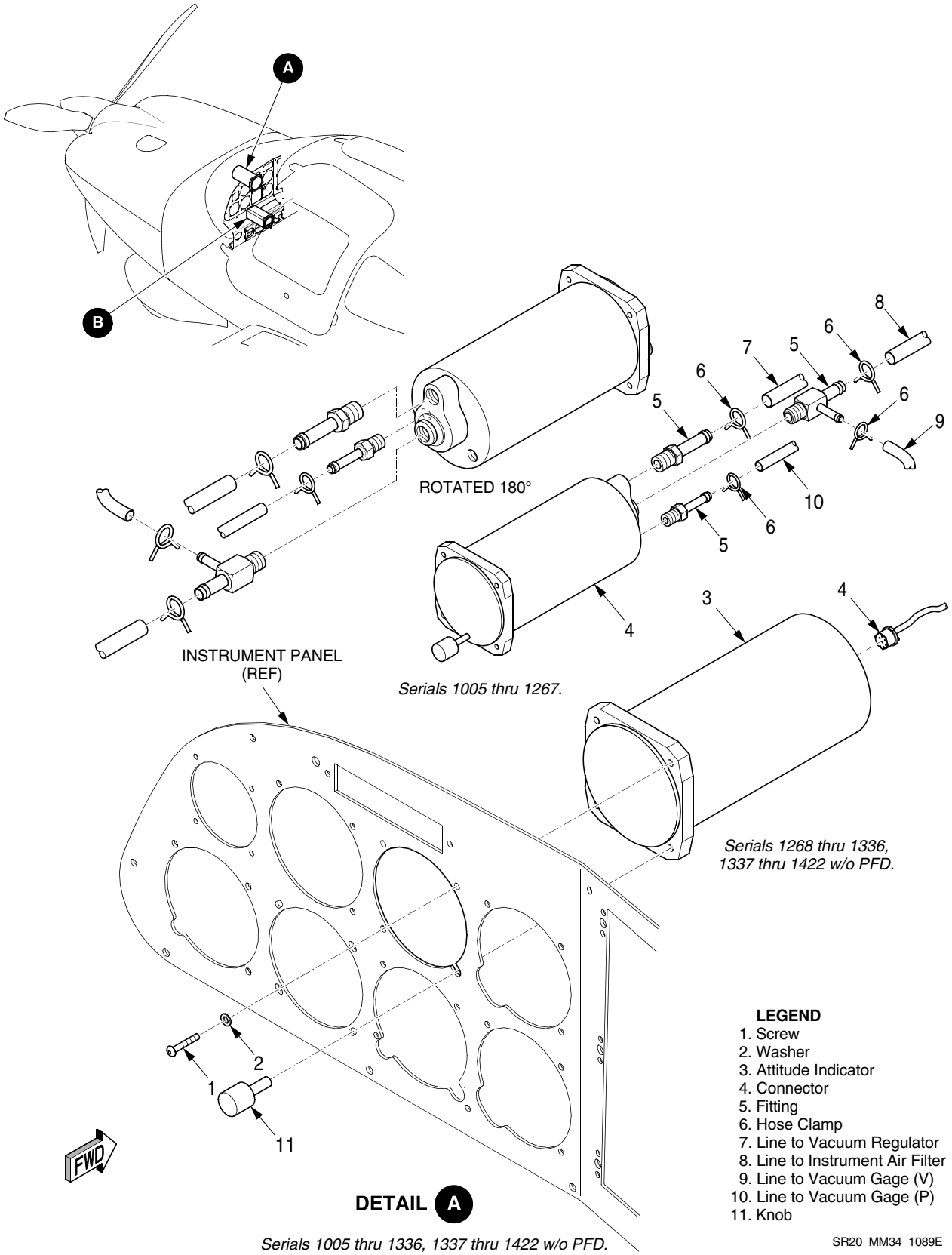
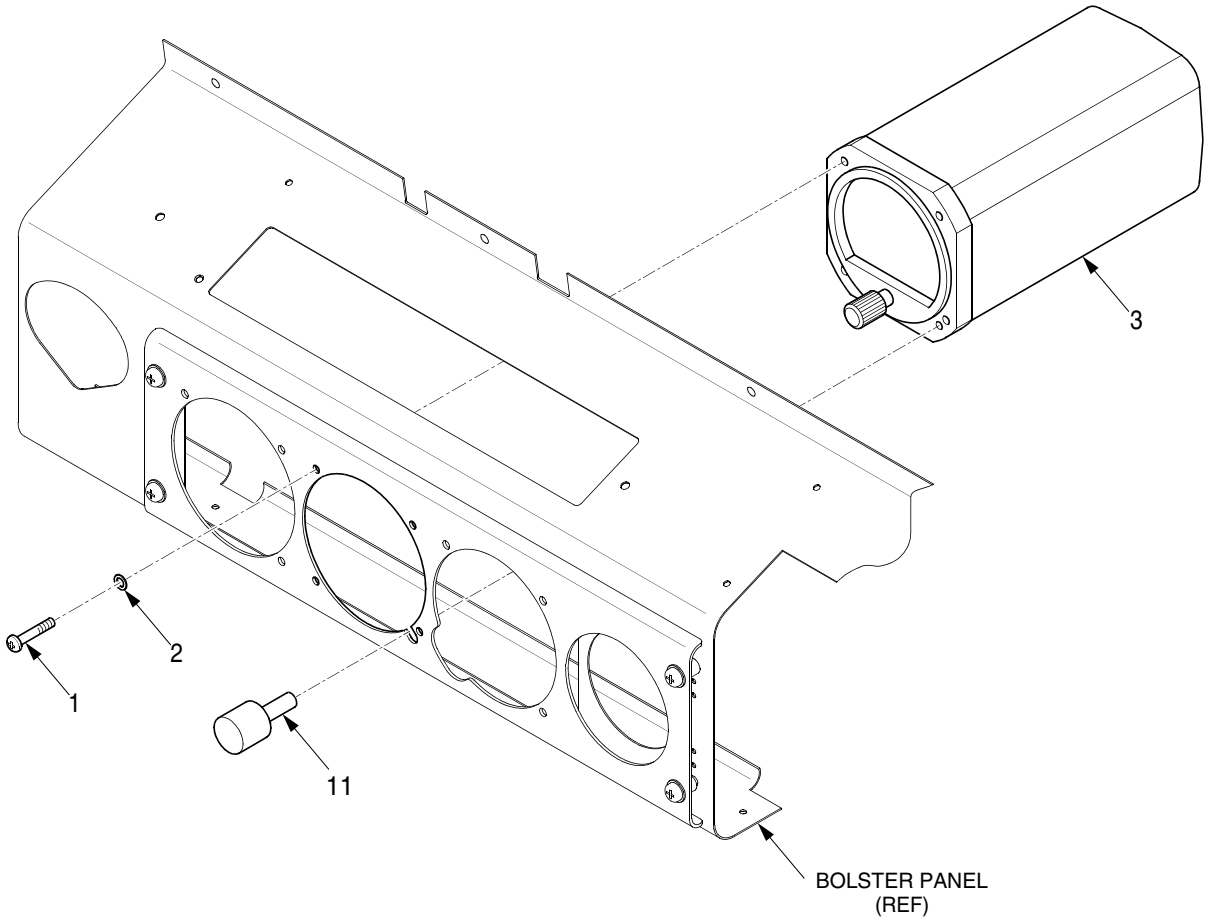


Figure 34-203
Attitude Indicator - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



LEGEND
1. Screw
2. Washer
3. Attitude Indicator
11. Knob

DETAIL B

Serials 1337 thru 1422 w/ PFD & w/o SRV,
1423 & subs w/o SRV & w/o MD302 Standby Attitude Module.

SR20_MM34_1704C

Figure 34-203
Attitude Indicator - Serials 1337 thru 1422 w/ PFD & w/o SRV, 1423 & subs w/o SRV & w/o MD302 (Sheet 2 of 2)

G. Directional Gyro - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* (See Figure 34-204)

(1) Removal - Directional Gyro

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect vacuum and vent hoses and cap.

(e) Disconnect electrical connector.

(f) While supporting directional gyro, remove screws securing unit gyro to instrument panel.

(g) Cap off fittings on back of directional gyro to prevent possible contamination and remove directional gyro from airplane.

(2) Installation - Directional Gyro

(a) Position directional gyro in instrument panel and attach with screws.

(b) Connect electrical connector.

(c) Attach vacuum and vent hoses.

(d) Reset INSTRUMENT LIGHTS circuit breaker.

(e) Perform Operational Test - Directional Gyro. (Refer to 34-20)

(f) Install LH kick plate. (Refer to 25-10)

(3) Operational Test - Directional Gyro

(a) Set BAT 1 switch to ON position.

(b) When gyro reaches operational speed, verify directional gyro is stabilized.

(c) Set BAT 1 switch to OFF position.

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

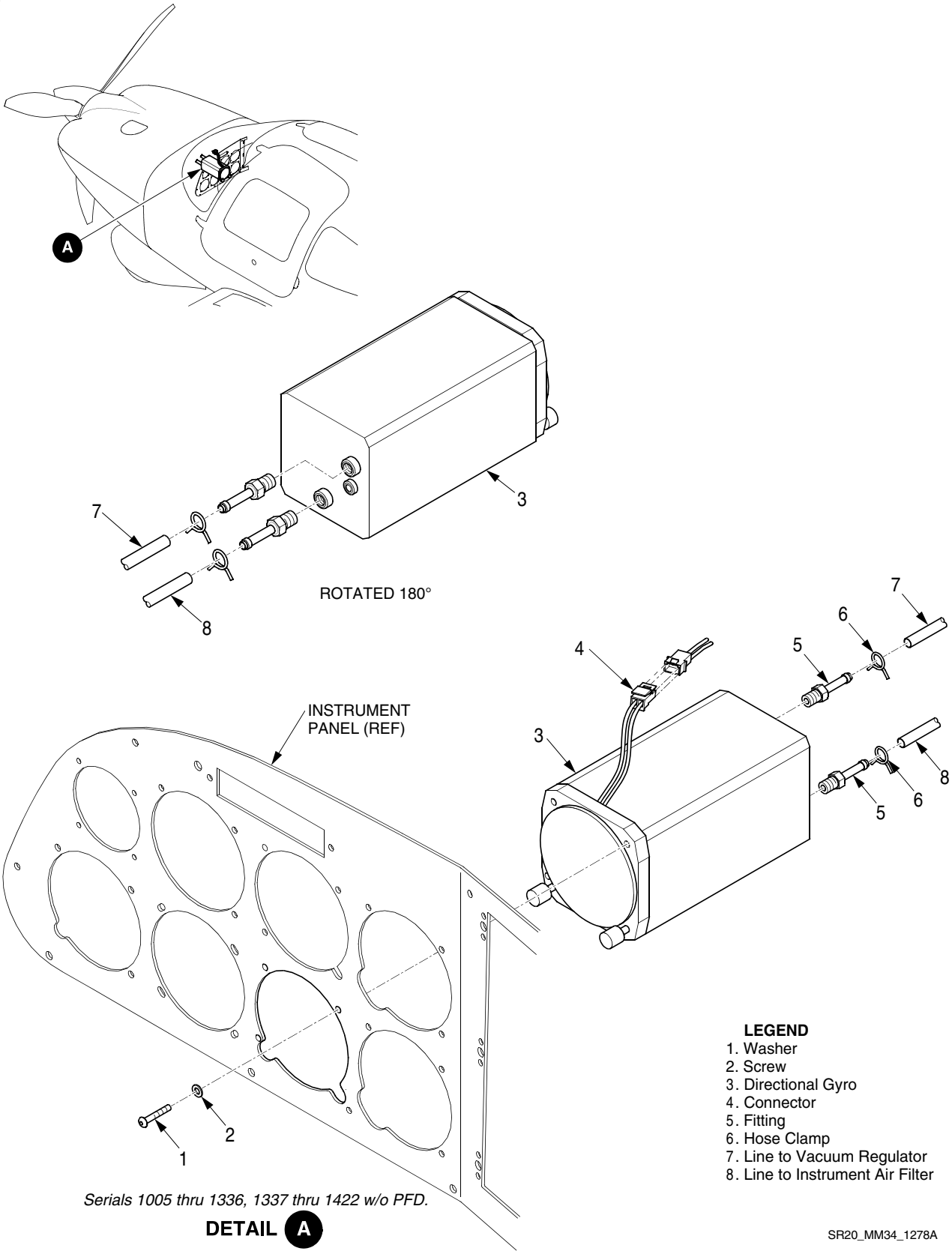


Figure 34-204
Directional Gyro - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

H. Magnetometer/OAT Sensor - *Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 34-205)**

CAUTION: When performing maintenance practices on the magnetometer/OAT sensor, use a non-magnetic screwdriver. Use brass screws and washers to secure the magnetometer.

(1) Removal - Magnetometer/OAT Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 1005 thru 1885:* Remove wing access panel RW14. (Refer to 06-00)

(c) *Serials 1886 & subs:* Remove wing access panel RW12. (Refer to 06-00)

(d) Remove nut and washer securing OAT sensor to access panel.

(e) Cut cable tie securing J734 connector to tie down.

(f) Disconnect J734 connector from P734 connector on wire harness.

(g) Remove screws and washers securing magnetometer to standoffs. Remove magnetometer/OAT sensor from airplane.

(2) Installation - Magnetometer/OAT Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	OAT sensor installation.

(b) Position magnetometer to standoffs with arrow pointing forward. Secure with screws and washers.

(c) Apply Loctite® to OAT sensor threads.

(d) Position OAT sensor to access panel and secure with washer and nut. Torque nut to 50-100 in-lb (5.6-11.3 Nm).

(e) Connect J734 connector to P734 connector on wire harness.

(f) Install cable tie securing J734 connector to tie down.

(g) *Serials 1005 thru 1885:* Install wing access panel RW14. (Refer to 06-00)

(h) *Serials 1886 & subs:* Install wing access panel RW12. (Refer to 06-00)

(i) Perform Functional Test - Magnetometer Calibration. (Refer to 34-20)

(3) Functional Test - Magnetometer Calibration

Note: The following procedure must be used to recalibrate the magnetometer. The magnetometer must be recalibrated whenever it is loosened, removed, replaced, whenever the PFD is replaced, and any time an IRU calibration is performed.

Prior to calibrating magnetometer, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Calibrate magnetometer.

Note: Using the boresight compass for calibration requires two technicians

(b) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(c) Set all other cockpit controlled electrical switches to OFF positions.

(d) Place airplane in as realistic flight environment as possible.

(e) *Serials w/ PFD software 530-00159-000 Rev 01 or lower:* Perform Functional Test - IRU Calibration (Refer to 31-60)

(f) Continue powering PFD to keep it aligned.

(g) Taxi airplane to compass rose, if available.

(h) If using compass rose for calibration:

1 Align centerline of airplane on magnetic North heading (±1°).

(i) If using boresight compass for calibration:

WARNING: Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(j) On PFD, simultaneously press and hold top left, and 3rd down from top left keys until countdown timer in lower left corner of display indicates zero.

(k) After System Setup page appears, press [Perform Mag Cal].

(l) Press [Calibrate Heading] and wait until DONE is displayed.

(m) As indicated by boresight compass or compass rose, align centerline of airplane on each consecutive 30° heading (±1°) and continue to press [Calibrate Heading] after holding this position for each heading, waiting until DONE is displayed after each step of calibration procedure.

After last heading calibration point (330°) is completed, MAG CAL COMPLETE: RETURN TO PFD is displayed.

Note: On last heading calibration point (330°) it may take up to a minute for DONE to be displayed. Do not allow airplane to move from the 330° position until DONE is displayed.

(n) Press [Back To PFD] when complete.

CAUTION: PFD unit must be powered off and then powered up to retain these calibration settings.

(o) To retain calibration settings, power down PFD unit and then power PFD unit back up until initial countdown timer goes to zero. Calibrated PFD screen will be displayed at this point.

(p) Align centerline of airplane with consecutive 90° headings starting with North heading as indicated on boresight compass or compass rose and verify the accuracy of PFD heading display is within ±4° of boresight compass or compass rose.

(q) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to OFF positions.

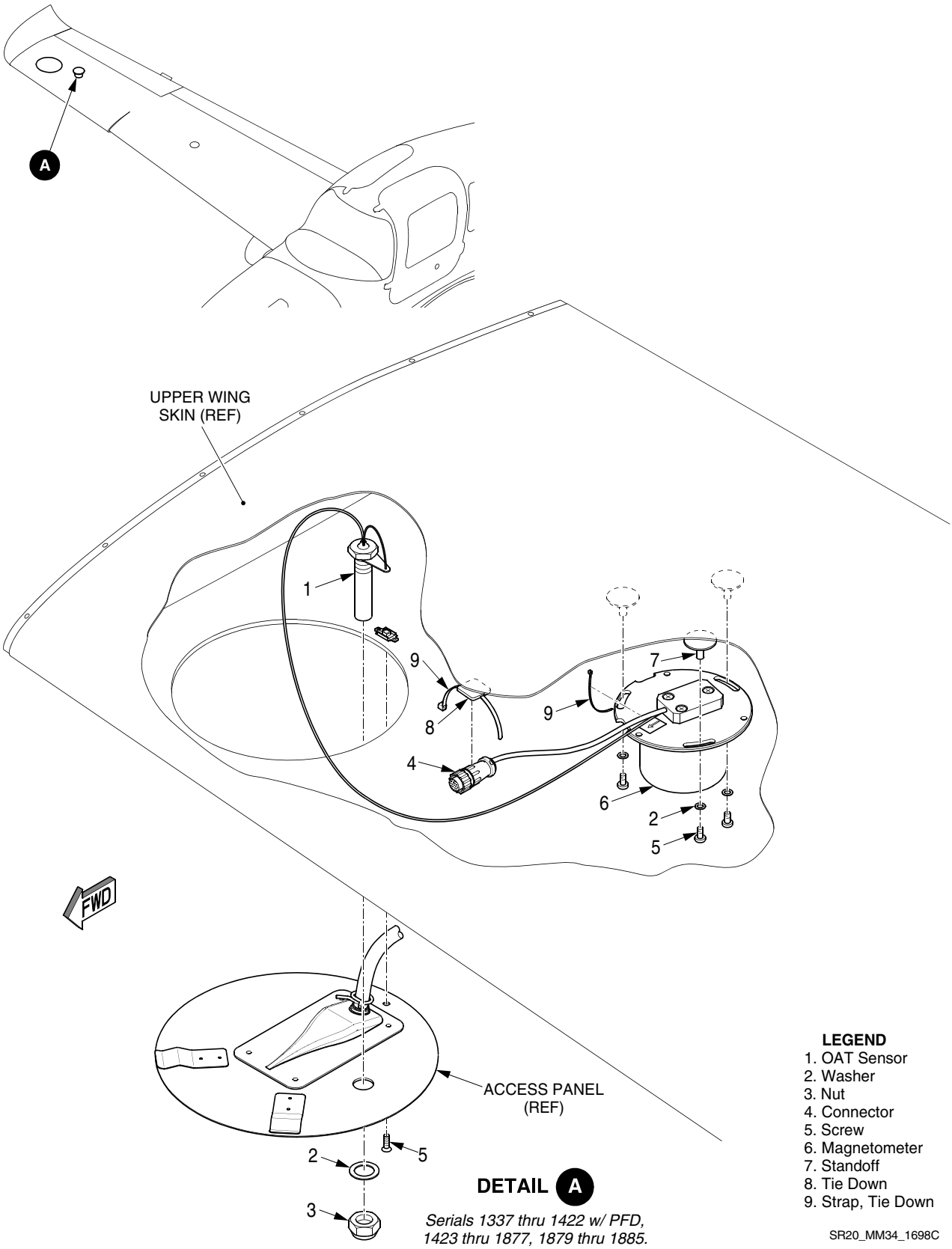


Figure 34-205
Magnetometer/OAT Sensor Installation - Serials 1337 thru 1422 w/ PFD, 1423 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1337 thru 1422 w/ PFD, 1423 thru 1885

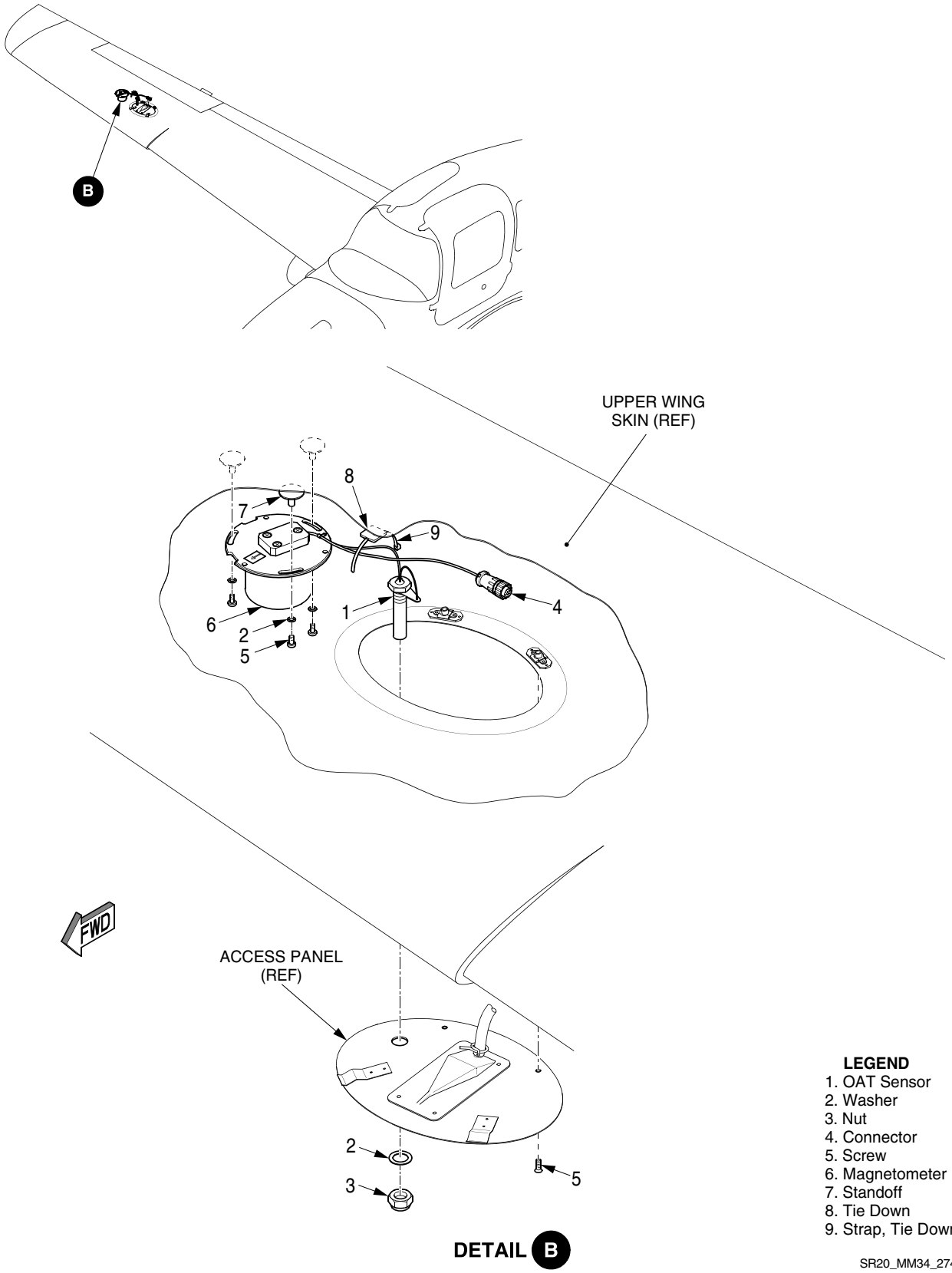


Figure 34-206
Magnetometer/OAT Sensor Instl - Serials 1886 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 2)

I. GMU 44 Magnetometer - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-207)

CAUTION: When performing maintenance practices on the magnetometer, use a non-magnetic screwdriver. Use brass screws and washers to secure the magnetometer.

(1) Removal - GMU 44 Magnetometer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove wing access panel RW12. (Refer to 06-00)

(c) Remove cable tie securing magnetometer connectors to wing.

(d) Disconnect magnetometers from wire harness.

(e) Remove screws securing magnetometer mounting plate to wing.

(f) Remove screws, washers, and nuts securing magnetometer to mounting plate. Remove magnetometer from airplane.

(2) Installation - GMU 44 Magnetometer

(a) Position magnetometer to mounting plate so that arrow will point forward when installed in wing. Secure with screws, washers, and nuts.

Note: Ensure arrow on magnetometer is pointing forward in airplane and non-magnetic hardware is used to secure magnetometer to mounting plate.

(b) Position magnetometer mounting plate to wing and secure with screws.

(c) Connect magnetometers to wire harness.

(d) Install cable tie securing magnetometer connectors to wing.

(e) Install wing access panel RW12. (Refer to 06-00)

(f) If GMU 44 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(g) Perform Adjustment/Test - GMU 44 Magnetometer Calibration. (Refer to 34-20)

(3) Adjustment/Test - GMU 44 Magnetometer Calibration

Note: The following procedure must be used to recalibrate the magnetometer. The magnetometer must be recalibrated whenever it is loosened, removed, or replaced.

Prior to calibrating magnetometer, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Calibrate magnetometer.

Note: Using the boresight compass for calibration requires two technicians

(b) Align aircraft to a heading of magnetic north (+/-5°) at a magnetically clean calibration site.

(c) Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

(d) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

(e) Using [FMS] knobs, select GRS page group on PFD and MFD.

(f) On MFD and PFD, Select GRS/GMU Calibration page.

Note: This page requires a keystroke password to complete the procedure.

(g) On MFD and PFD, press the following softkeys in sequence: 9, 10, 11, 12 (right-most softkey).

(h) On PFD, select GRS77 #1 in SELECT GPS UNIT window.

(i) On MFD, select GRS77 #2 in SELECT GPS UNIT window.

(j) Complete the following procedure concurrently on both displays:

1 Select MAGNETOMETER in the SELECT PROCEDURE window, then press [ENT] key.

2 In the BEFORE CALIBRATION window, follow displayed checklist items and press [ENT] key as each item is completed or confirmed.

3 When CALIBRATE field is blinking, press [ENT] key to begin procedure.

(k) Follow the instructions on the flight displays. Alternate between turning aircraft to the right (approximately 30° at a time) and holding current heading when directed to HOLD POSITION.

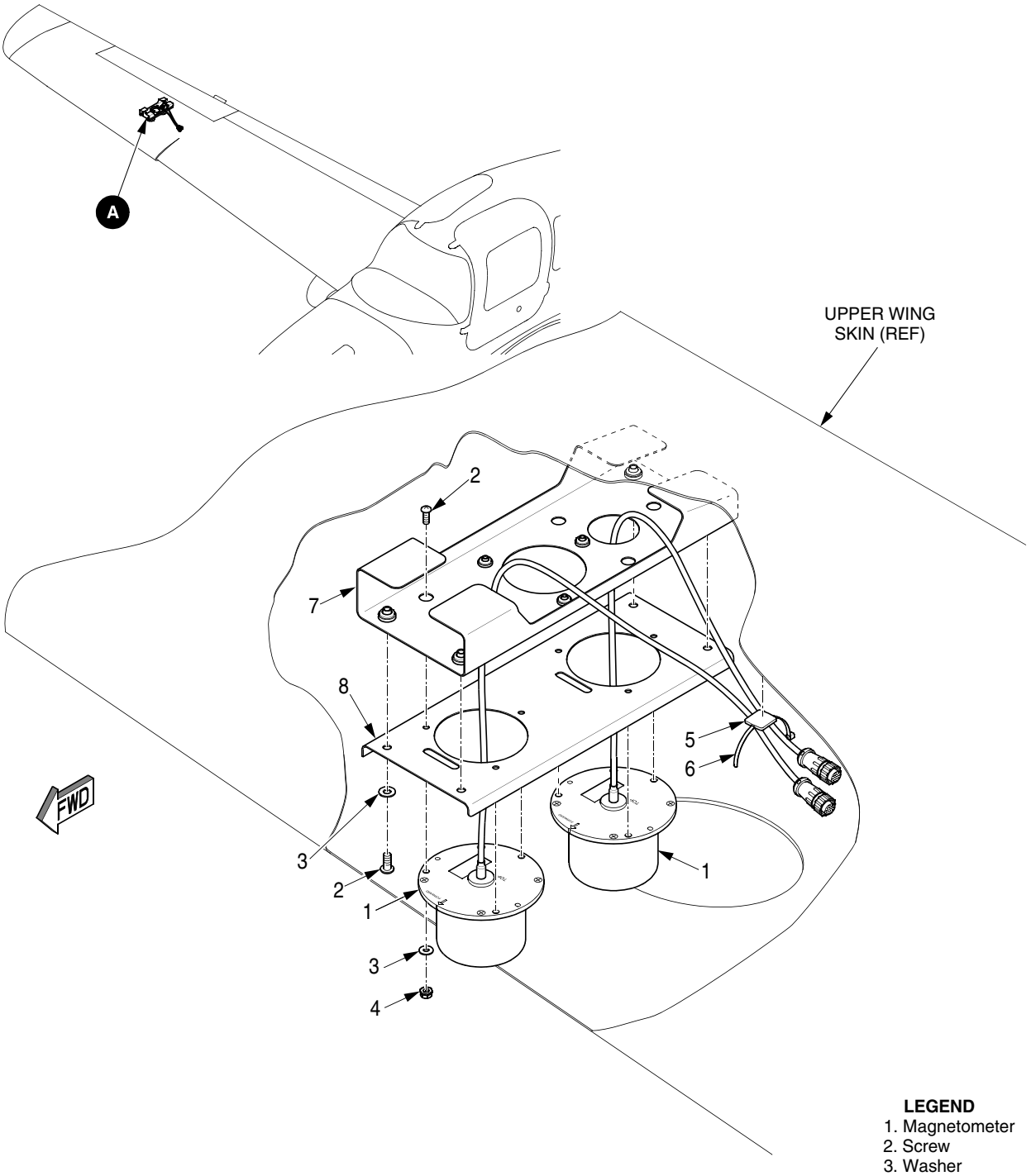
(l) Repeat turn and hold procedure until both PFD and MFD have displayed that either the calibration has passed successfully or failed. In the event of a failed calibration, repeat calibration procedure.

(m) When both PFD and MFD display CALIBRATION SUCCESSFUL, press [ENT] key on each display.

(n) Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

(o) Reset PFD and MFD circuit breakers to restart displays in normal operating mode.

(p) Press reversionary mode switch. Verify MFD and PFD both display valid AHRS information.



LEGEND
1. Magnetometer
2. Screw
3. Washer
4. Nut
5. Tie Down
6. Strap, Tie Down
7. Standoff
8. Mounting Plate

DETAIL A

SR20_MM34_2480

Figure 34-207
GMU 44 Magnetometer Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

J. GRS 77 AHRS 1 / GRS 77 AHRS 2 - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-208)

(1) Removal - GRS 77 AHRS 1 / GRS 77 AHRS 2

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull AHRS 1 or AHRS 2 circuit breaker.

(c) Remove PFD. (Refer to 31-60)

(d) Disconnect electrical connectors from AHRS.

(e) Loosen screws securing AHRS to rack. Remove AHRS from airplane.

(2) Installation - GRS 77 AHRS 1 / GRS 77 AHRS 2

(a) Position AHRS to rack and secure one end with screws, leaving opposite end unsecured. Torque screws to 22 to 25 in-lb (2.49 to 2.82 Nm).

(b) Using a feeler gage at the unsecured end, verify gap between AHRS and rack equals 0.01 to 0.07 inch (0.25 to 1.78 mm). If gap is within tolerance, secure loose end with screws. Torque screws to 22 to 25 in-lb (2.49 to 2.82 Nm).

(c) Connect electrical connectors to AHRS.

(d) Install PFD. (Refer to 31-60)

(e) Reset AHRS 1 or AHRS 2 circuit breaker.

(f) If GRS 77 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(g) If rack was loosened during procedure:

1 Perform Adjustment/Test - GRS 77 AHRS Pitch/Roll Offset Calibration. (Refer to 34-20)

2 Perform Adjustment/Test - GMU 44 Magnetometer Calibration. (Refer to 34-20)

3 Perform Adjustment/Test - GRS 77 Engine Run-Up Vibration Test. (Refer to 34-20)

(3) Adjustment/Test - GRS 77 AHRS Pitch/Roll Offset Calibration

(a) Level aircraft to within 0.25° of zero pitch and zero roll.

(b) From level position, tilt aircraft nose up 1.2° ± 0.05°.

(c) Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

(d) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

(e) On MFD and PFD, use [FMS] knobs to select GRS page group.

(f) On MFD and PFD, select GRS/GMU Calibration page.

Note: This page requires a keystroke password to complete the procedure.

(g) On MFD and PFD, press the following softkeys in sequence: 9, 10, 11, 12 (right-most softkey).

(h) On PFD, select GRS77 #1 in the SELECT GPS UNIT window.

(i) On MFD, select GRS77 #2 in the SELECT GPS UNIT window.

(j) Complete the following procedure concurrently on both displays:

1 Select PITCH/ROLL OFFSET in the SELECT PROCEDURE window, then press [ENT] key.

2 Follow displayed checklist items and press [ENT] key as each item is completed or confirmed.

3 When CALIBRATE field is blinking, press [ENT] key to begin procedure.

4 After several seconds, a new checklist appears in lower half of display. Press [ENT] key as each item is confirmed.

5 When CONFIRM AIRCRAFT IS LEVEL field is blinking, press [ENT] key to continue.

6 Verify CALIBRATION SUCCESSFUL is highlighted on bottom of display, then press [ENT] key.

(k) Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

(l) Reset PFD and MFD circuit breakers to restart displays in normal operating mode.

(4) Adjustment/Test - GRS 77 Engine Run-Up Vibration Test

Note: Perform this procedure to verify AHRS mounting is sufficiently rigid and insensitive to vibration.

(a) Start the engine in accordance with Pilot's Operating Handbook procedures.

Note: If needed, advise the Control Tower or Ground Control you may temporarily not be able to receive or transmit on your COM radios during this procedure before restarting the system in config mode.

(b) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When "INITIALIZING SYSTEM" appears in upper left corner of displays, release softkeys.

Note: Engine instruments may be monitored on this page during this procedure.

(c) On PFD, use inner [FMS] knob to select GRS/GMU Calibration page.

(d) On MFD and PFD, press the following softkeys in sequence: 9, 10, 11, 12 (right-most softkey).

(e) In SELECT GRS UNIT window, use [FMS] knob and [ENT] key to select the GRS 77 to be tested.

(f) Move cursor to SELECT PROCEDURE window and use [FMS] knob and [ENT] key to select ENGINE RUN-UP TEST.

(g) Follow checklist items displayed on PFD, and press [ENT] key as each one is completed or confirmed.

(h) When CALIBRATE field is blinking, press [ENT] key to begin test.

(i) Gradually increase power from idle to full throttle and back to idle over a period of 1 to 2 minutes.

(j) Once engine is returned to an idle setting, press [ENT] key to indicate engine run-up is complete. The TEST COMPLETE field will stop blinking.

(k) On PFD, verify GRS 77 installation has passed engine run-up vibration test. If test fails:

1 Verify security of GRS77 and/or GMU44 mounting hardware.

2 Verify electrical connector is firmly attached to GRS 77.

3 Repeat engine-run-up vibration test.

(l)

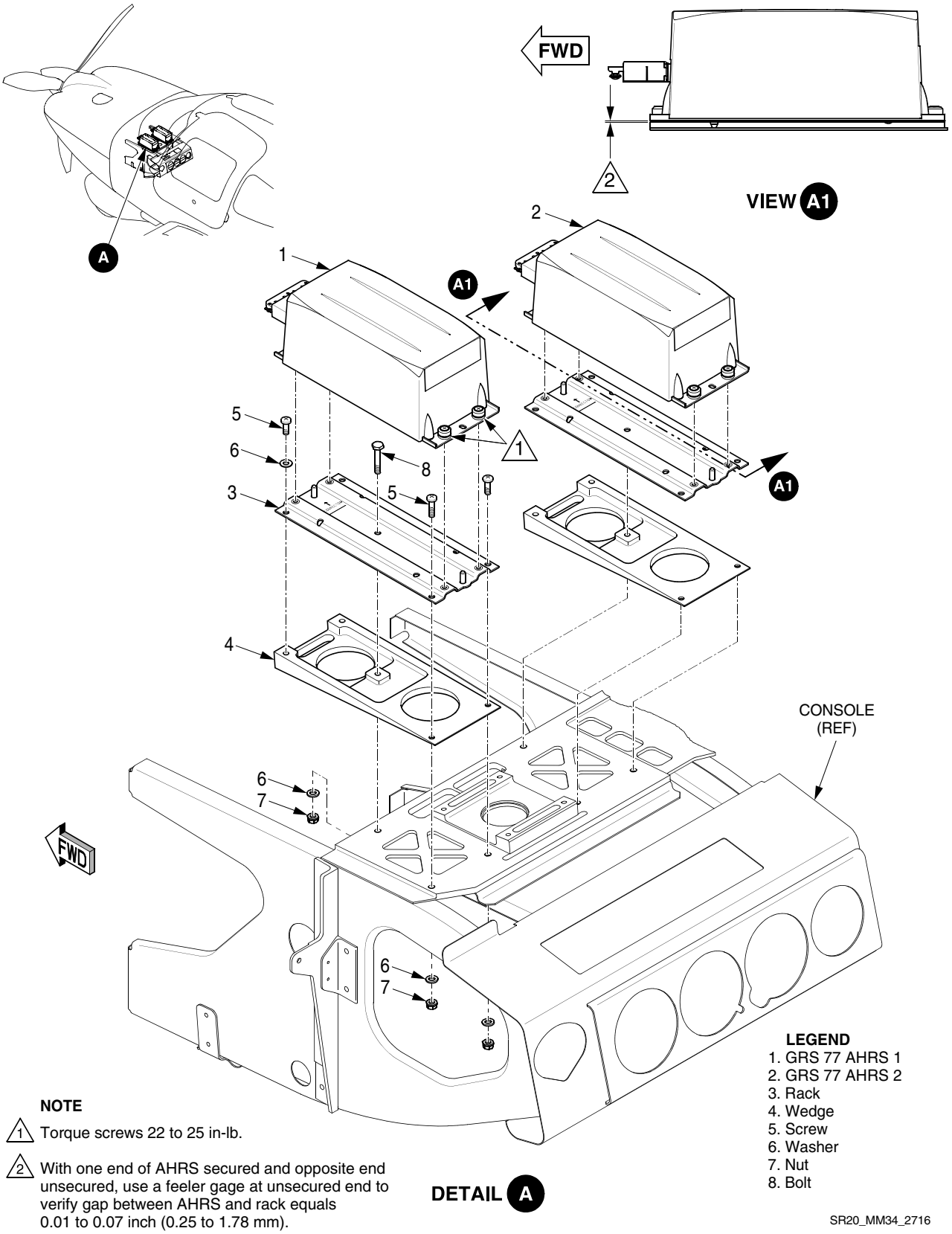


Figure 34-208
GRS 77 AHRS Installation - Serials 2016 & subs w/ Perspective Avionics

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LANDING AIDS

1. DESCRIPTION

This section covers that portion of the system which provides guidance during approach, landing, and taxiing. This includes glideslope and marker beacon systems. (See Figure 34-001)

2. MAINTENANCE PRACTICES

A. Garmin GNS 430 GPS/COM/NAV - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

The GNS 430 is an IFR certified VHF communications transceiver and Navigation Management System (NMS). The NMS includes GPS sensor, VOR/Localizer and Glideslope receivers. The GNS 430 includes two removable data cards, one with a Jeppesen data base, and second being a custom data card. GPS signals are received by Garmin's low-profile GA 56 antenna. For installation and removal procedures refer to Chapter 34, Dependent Position Determining. (Refer to 34-50)

B. Garmin GIA 63W Integrated Avionics Unit - *Serials 2016 & subs w/ Perspective Avionics*

The GIA 63W features an IFR certified VHF communications transceiver and Navigation Management System (NMS). The NMS includes a WAAS certified GPS receiver, VOR/ILS localizer receiver, and ILS glidescope receiver. For installation and removal procedures refer to Chapter 31, Central Computers. (Refer to 31-40)

C. Marker Beacon

The marker beacon, integrated into the audio panel located in the avionics console, provides annunciation and audio indications necessary for ILS approach. See Chapter 23 for audio control panel maintenance practices. (Refer to 23-50)

The marker beacon antenna is mounted inside the fuselage, under either the RH baggage compartment floor *(Serials 1005 & subs w/o Air Conditioning)* or the LH baggage compartment floor *(Serials 2065 & subs w/ Air Conditioning).*

D. Marker Beacon Antenna (See Figure 34-301)

(1) Removal - Marker Beacon Antenna

(a) Remove access panel CF5. (Refer to 06-00)

(b) Disconnect antenna cable from antenna.

(c) While supporting antenna, remove screws securing antenna bracket to fuselage floor.

(d) Remove screws and washers securing antenna and gasket to bracket.

(e) Remove antenna and gasket from airplane.

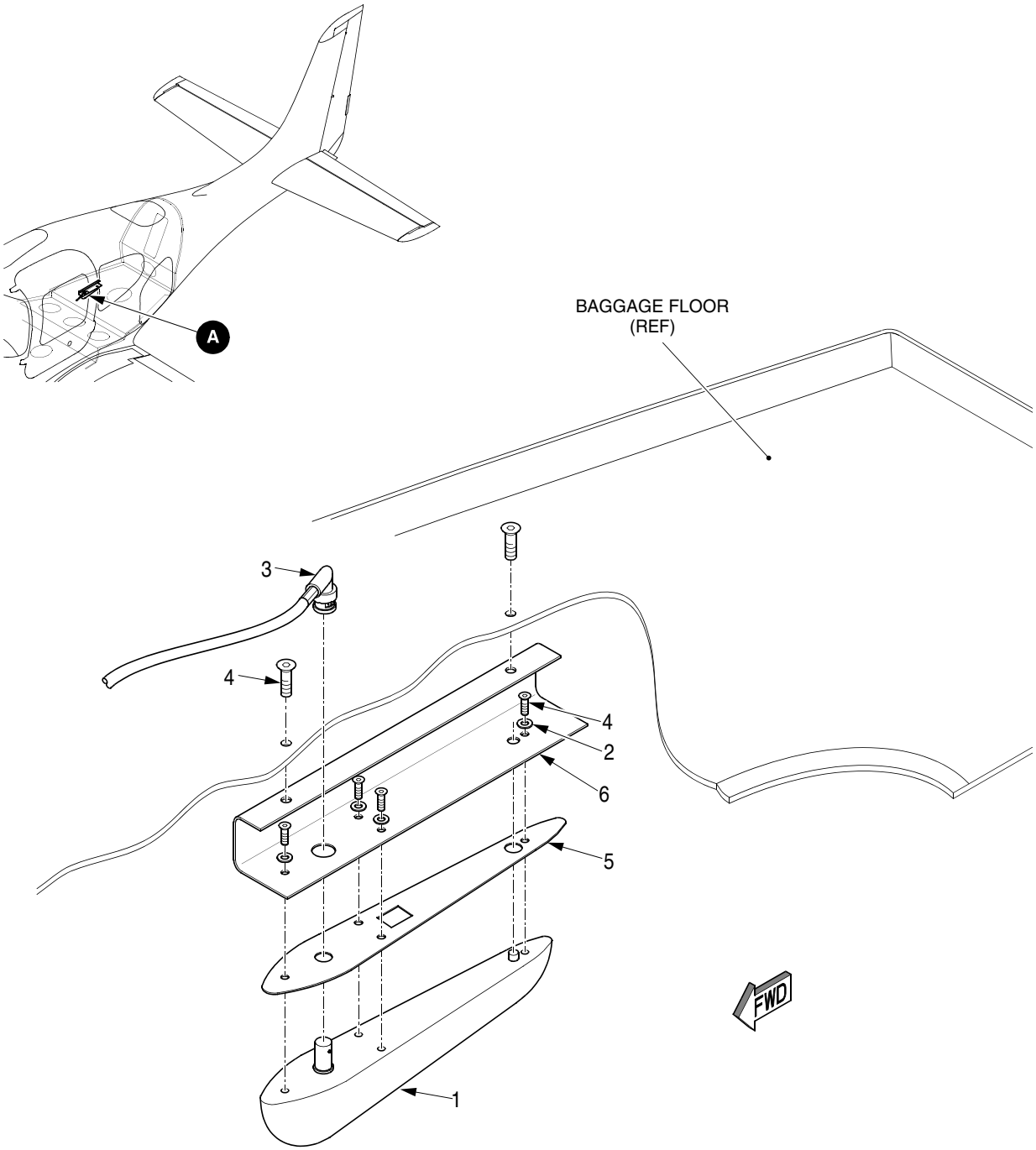
(2) Installation - Marker Beacon Antenna

(a) Position antenna and gasket to bracket and secure with screws and washers.

(b) Position antenna bracket to fuselage floor and secure with screws.

(c) Connect antenna cable to antenna.

(d) Install access panel CF5. (Refer to 06-00)



LEGEND
1. Marker Beacon Antenna
2. Washer
3. Antenna Cable
4. Screw
5. Gasket
6. Bracket

DETAIL A

Serials 1005 thru 2064.

SR20_MM34_1092C

Figure 34-301
Marker Beacon Antenna Installation - Serials 1005 thru 2064 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 2064

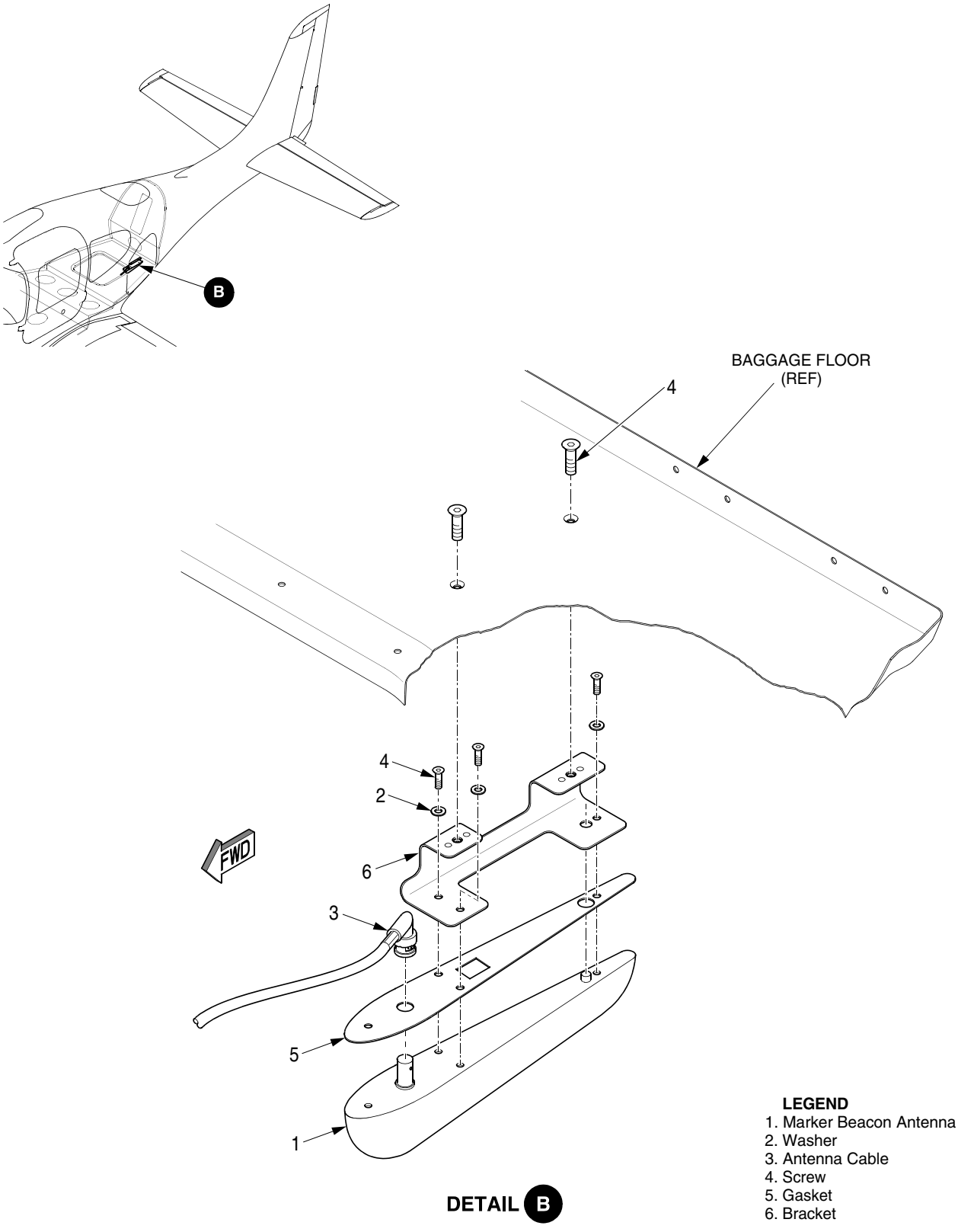


Figure 34-301
Marker Beacon Antenna Installation - Serials 2065 & subs (Sheet 2 of 2)

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INDEPENDENT POSITION DETERMINING

1. DESCRIPTION

This section covers that portion of the system which provides information to determine position from sources which are mainly independent of ground installations. This includes the Stormscope, SkyWatch, Terrain Awareness and Warning System (TAWS), Synthetic Vision System, and Garmin Traffic System (GTS 800).

A. Stormscope System

The Stormscope system consists of an antenna located on top of the fuselage and a processor unit mounted under the aft baggage floor. The antenna detects the electrical and magnetic fields generated by intra-cloud, inter-cloud, or cloud to ground electrical discharges occurring within 200 nm of the airplane and sends the “discharge” data to the processor. The processor digitizes, analyzes, and converts the “discharge” signals into range and bearing data and communicates the data to the MFD every two seconds.

Serials 1005 thru 1455: The Stormscope system is powered by 28 VDC through the 3-amp STORMSCOPETORMSCOPE circuit breaker on the Avionics Non-Essential Bus.

Serials 1456 thru 2015, 2016 & subs w/o Perspective Avionics: The Stormscope system is powered by 28 VDC through 3-amp WEATHER/STORMSCOPE circuit breaker on the Avionics Non-Essential Bus.

Serials 2016 & subs w/ Perspective Avionics: The Stormscope system is powered by 28 VDC through the 3-amp WEATHER circuit breaker on the Avionics Bus.

For additional information on the Stormscope system, refer to the Stormscope WX-500 User’s Guide. (Refer to 05-10)

B. SkyWatch System

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: The SkyWatch system consists of an antenna located on top of the fuselage and a Transmitter Receiver Computer (TRC) box installed below either the RH (*Serials 1005 thru 1638*) or LH cabin seat (*Serials 1639 & subs*). SkyWatch is an airborne Traffic Advisory System (TAS) that monitors airspace by interrogating transponder-equipped aircraft in the area and determining if a collision threat exists. Traffic advisories are indicated on the MFD and GNS 430 displays. Aural “Traffic, Traffic” warnings are announced in the headphones and cabin speaker.

Serials 1582 & subs, Serials 1005 thru 1581 after SB 2X-34-18: To minimize distractions during critical phases of flight, the SkyWatch aural warnings are inhibited and system sensitivity is decreased when the flap switch is set to either the 50% or 100% positions. For maintenance practices pertinent to the flap switch, see Flaps. (Refer to 27-50)

Serials 1005 thru 1440: The SkyWatch system is powered by 28 VDC through the 5-amp SKYWATCH circuit breaker on the Avionics Non-Essential Bus.

Serials 1441 & subs: The SkyWatch system is powered by 28 VDC through the 5-amp SKYWATCH/TAWS circuit breaker on the Avionics Non-Essential Bus.

Serials 2016 thru 2046 w/ Perspective Avionics: The L-3 Skywatch HP system consists of an antenna located on top of the fuselage and a Transmitter Receiver Computer (TRC) box installed below the LH cabin seat. Skywatch is an airborne Traffic Advisory System (TAS) that advises the pilot of transponder-equipped aircraft that may pose a collision threat. Traffic advisory information is displayed on the MFD and indicates the relative range, bearing, and altitude of intruder aircraft. The system utilizes inputs from the secondary Integrated Avionics Units via the primary Air Data Computer and is controlled via the MFD or Flight Management System Keyboard. The SkyWatch system is powered by 28 VDC through the 5-amp TRAFFIC circuit breaker on the Avionics Bus.

For additional information on the SkyWatch system, refer to the SkyWatch SKY497 Installation Manual and the SkyWatch SKY497 Pilot’s Guide. (Refer to 05-10)

C. Terrain Awareness and Warning System (TAWS)

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: The Honeywell KGP 560 Terrain Awareness and Warning System (TAWS) consists of the TAWS Processor mounted on the underside of the pilot-side kickplate, a Terrain/Obstacle Database integral to the processor, the Configuration Module integral to the system's wire harness, and the TAWS annunciation LEDs and control switches mounted on the lower LH portion of the instrument panel. The system compares GPS information from the Garmin Navigator to the integrated Terrain/Obstacle Database to produce a real-time model of the surrounding terrain. To enhance the situational awareness to the pilot, color-coded terrain display is overlayed on the MFD and aural alerts are communicated to the pilot via the Garmin GMA 340 Audio System.

The TAWS Processor is powered by 28 VDC through the 5-amp SKYWATCH/TAWS circuit breaker on the Avionics Non-Essential Bus. For additional information on the TAWS system, refer to the KGP 560 & 860 EGPWS Pilot's Guide. (Refer to 05-10)

Serials 2016 & subs w/ Perspective Avionics: The Terrain Awareness/Warning System receives data from the GPS receiver to determine horizontal position and altitude and compares this information to the onboard terrain and obstacle databases to calculate and "predict" the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS provides advanced alerts of predicted dangerous terrain conditions via aural alerts communicated thru the pilot's headset and color-coded terrain annunciations displayed on the PFD.

D. Synthetic Vision System

Serials 2016 & subs w/ Perspective Avionics: The Synthetic Vision System (SVS) is intended to provide the pilot with enhance situational awareness by placing a three dimensional depiction of terrain, obstacles, traffic, and the desired flight path on the PFD so that proximity and location is more easily understood during instrument scanning. The SVS database is created from a digital elevation model with a 9 arc-sec (approx. 885 ft (270m)) horizontal resolution.

The synthetic vision system is not intended to be used independently of traditional attitude instrumentation. Consequently, SVS is disabled when traditional attitude instrumentation is not available. Otherwise, the traditional attitude instrumentation will always be visible in the foreground with SVS features in the background. The PFD with SVS installed includes:

- Perspective depiction of surrounding terrain,
- Zero pitch line,
- Perspective depiction of runways,
- Perspective depiction of large bodies of water,
- Perspective depiction of obstacles,
- Flight path marker,
- Terrain warning system,
- Field of view depiction on the MFD Navigation Page.

E. Garmin Traffic System (GTS 800)

Serials 2047 & subs w/ Perspective Avionics: The Garmin Traffic System (GTS 800) consists of an antenna located on top and bottom of the fuselage and a Line Replaceable Unit (LRU) box installed below the LH cabin seat.

GTS 800 is an airborne Traffic Advisory System (TAS) that advises the pilot of transponder-equipped aircraft that may pose a collision threat. Traffic advisory information is displayed on the PFD and indicates the relative range, bearing, and altitude of intruder aircraft. The system utilizes inputs from the secondary Integrated Avionics Units via the primary Air Data Computer and is controlled via the MFD or Flight Management System Keyboard. The GTS 800 system is powered by 28 VDC through the 5-amp TRAFFIC circuit breaker on the Avionics Bus.

For additional information on the GTS 800 system, refer to the Cirrus Perspective Integrated Avionics System Pilot's Guide. (Refer to 05-10)

2. MAINTENANCE PRACTICES

Serials w/ Garmin Traffic System (GTS 800)

Trouble	Probable Cause	Remedy
Unit does not power up - Data failed message.	Improper wiring; circuit breaker open.	Ensure power is properly wired to the GTS 8XX and the circuit breaker is closed.
	Improper configuration.	Verify using the USB Install Tool that the GTS 8XX is configured correctly for the desired display.[a]
GTS 8XX Install Tool won 't display any pages.[a]	Improper wiring; circuit breaker open.	Ensure USB is properly wired to the GTS 8XX and the circuit breaker is closed.
No Audio alerts.	Improper wiring; Volume not set correctly.	Ensure the audio is properly wired from the GTS 8XX and volume is not set too low.
Configuration Fault.	Both internal and external configuration checks failed.	Verify the configuration via the GTS 8XX Install Tool.[a]
		Verify wiring to the configuration module and replace if necessary.
FPGA Fault.	Internal Fault.	Return to Garmin for service.
ROM Fault.	Internal Fault.	Return to Garmin for service.
Execution Fault.	Internal Fault.	Return to Garmin for service.
Electrical Fault.	Internal Fault.	Return to Garmin for service.
Whisper Shout Fault.	Internal Fault.	Return to Garmin for service.
Transmit Power Fault.	Internal voltages are out of tolerance.	Verify input voltage and if it continues return to Garmin for service.
1030 MHz Fault.	Internal Fault.	Return to Garmin for service.
1090 MHz Fault.	Internal Fault.	Return to Garmin for service.
Receiver Fault.	Antenna connections or internal fault.	Ensure all antenna connections are correct otherwise return to Garmin for Service.
Transmitter Fault.	Antenna connections or internal fault.	Ensure all antenna connections are correct otherwise return to Garmin for Service.
Baro Altitude Fault.	Baro Altimeter is not powered on or improper wiring.	Verify that the baro altimeter has power and is properly wired.
	Improper configuration settings.	Verify the configuration is set correctly using the GTS 8XX Install Tool.[a]

Trouble	Probable Cause	Remedy
Temperature Fault.	Fan is not operating, Poor ventilation at the mounting location.	Verify the fan is running and the unit is getting adequate ventilation
Red 'X' on a data port on the configuration page.	Improper wiring; wrong port or speed selected.	Ensure the port is properly wired to the GTS 8XX and the correct settings are selected on the configuration page.

a. Call Cirrus Design for information on obtain the GTS 8XX Install Tool.

A. Stormscope Processor and Tray (See Figure 34-401)

(1) Removal - Stormscope Processor and Tray

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove processor.

1 Remove baggage compartment access panel CF5. (Refer to 06-00)

2 Remove safety wire securing knurled nut to mounting tray, then loosen and swing knurled nut away from clasp.

3 Pull processor straight out of mounting tray and remove from airplane.

(d) *Serials 1005 thru 1336, 1337 & subs w/o PFD:* Remove processor tray.

1 Remove cabin headliner. (Refer to 25-10)

2 Remove LH rear headliner trim. (Refer to 25-10)

3 Remove LH baggage trim. (Refer to 25-10)

4 Remove cable ties securing antenna cable to fuselage wall.

5 Disconnect antenna cable from antenna and remove cable from access panel CF5.

6 Remove carpet and access panels CF4C, CF3C, and CF2R. (Refer to 06-00)

7 Remove cable ties securing heading input cable to fuselage floor.

8 Disconnect heading input cable from HSI slave amplifier and remove cable through access panel CF5.

9 Remove fasteners securing tray to baggage floor and remove from airplane.

(e) *Serials 1337 & subs w/ PFD:* Remove processor tray.

1 Remove cabin headliner. (Refer to 25-10)

2 Remove LH rear headliner trim. (Refer to 25-10)

3 Remove LH baggage trim. (Refer to 25-10)

4 Remove cable ties securing antenna cable to fuselage wall.

5 Disconnect antenna cable from antenna and remove cable from access panel CF5.

6 Remove fasteners securing tray to baggage floor and remove from airplane.

(2) Installation - Stormscope Processor and Tray

(a) *Serials 1005 thru 1336, 1337 & subs w/o PFD:* Install processor tray.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite	-	Loctite Corp.	Lock threads.

2 Position mounting tray washers over floor mounting holes, then secure washers to underside of the floor with masking tape.

3 Position mounting tray assembly against the taped washers, then secure with Loctite and fasteners. Remove tape. (Refer to 20-40)

4 At access panel CF5, route heading input cable beneath cabin floor and connect cable to HSI slave amplifier. Secure cable with cable ties as required.

5 At access panel CF5, route antenna cable along cabin wall and connect cable to antenna. Secure cable with cable ties as required.

6 Install access panels CF4C, CF3C, CF2R, and carpet. (Refer to 06-00)

7 Install cabin headliner. (Refer to 25-10)

8 Install LH rear headliner trim. (Refer to 25-10)

9 Install LH baggage trim. (Refer to 25-10)

(b) *Serials 1005 thru 1336, 1337 & subs w/o PFD:* Install processor tray.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite	-	Loctite Corp.	Lock threads.

2 Position mounting tray washers over floor mounting holes, then secure washers to underside of the floor with masking tape.

3 Position mounting tray assembly against the taped washers, then secure with Loctite and fasteners. Remove tape. (Refer to 20-40)

4 At access panel CF5, route antenna cable along cabin wall and connect cable to antenna. Secure cable with cable ties as required.

5 Install cabin headliner. (Refer to 25-10)

6 Install LH rear headliner trim. (Refer to 25-10)

7 Install LH baggage trim. (Refer to 25-10)

(c) Install processor.

1 With medium pressure, push processor into mounting tray to engage connectors, then secure with knurled nut.

2 Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

3 Perform Functional Test - Stormscope System. (Refer to 34-40)

4 Perform Functional Test - Engine Run-Up with Stormscope System. (Refer to 34-40)

5 Safety wire knurled nut to processor handle.

6 Install access panel CF5 and baggage floor carpet. (Refer to 06-00)

(3) Functional Test - Stormscope System

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) *Serials 1005 & subs w/ ARNAV MFD:* Perform Self-Test procedure.

1 Press [Self-Test], then wait approximately 10 seconds.

2 Verify TEST COMPLETE and PASSED is displayed.

3 Press RH top button.

4 Press [Noise Monitor].

5 A small number of triggers and/or random noise points inside display ring is acceptable. Call Cirrus Design Customer Service if electrical noise indications are persistent.

6 While monitoring MFD for electrical noise, toggle NAV, STROBE, LANDING LIGHT, and PITOT HEAT switches to ON and OFF positions.

7 Deploy FLAPS to full deflection, then retract.

8 Operate ROLL and PITCH TRIM.

9 Press [Exit].

(d) *Serials 1005 & subs w/ ARNAV MFD:* Perform Strike Test procedure.

1 Press [Strike Test].

2 During Strike Test, a strike should display and clear inside of box every 2-3 seconds. Call Cirrus Design Customer Service if the Strike Test fails.

3 Verify test strikes are inside of box. A strike should be displayed and cleared inside of box every 2-3 seconds.

4 Press [Exit].

5 Press [End].

6 Press [Mapping], then verify that software exits to the Main Map page.

(e) *Serials 1005 & subs w/ Avidyne MFD:* Perform Lightning Self-Test procedure.

1 Confirm selected ranges:

MFD	30NM
SANDEL	30NM
GNC 420 or GNS 430	35NM

2 On MFD, rotate left knob to select Setup page.

3 Press [Lightning Self Test].

For Avidyne MFD, a strike should be displayed every 2-3 seconds, in the 2 o'clock position-relative to aircraft heading.

For PFD, heading must be available with ADAHRS operational.

For Sandel, STST should flash on the display indicating Stormscope is in test mode.

For GNS 430 or GNC 420 on 2nd Nav page, strikes should be displayed in the 2 o'clock position-relative to aircraft heading.

4 When test is complete, verify LIGHTNING SENSOR IS OPERATING NORMALLY is displayed at bottom of MFD display.

(f) *Serials 2016 & subs w/ Garmin MFD:* Perform Self-Test and Strike Test procedures.

1 Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

2 While holding far right softkey on PFD and MFD, restore power to displays by resetting PFD and MFD circuit breakers.

3 When the words INITIALIZING SYSTEM appear in the upper left corner of the displays, release the softkeys.

4 On PFD, use [FMS] knob to select Other page group.

5 On Stormscope page, use [FMS] knob to activate cursor and move to the MODE field (default to Weather) in the test window.

Note: If processor has been repaired or is a new or different unit from originally installed unit, the words ANTENNA ON TOP? YES OR NO may appear. Select YES to proceed with test.

6 Select SELF TEST and press [ENT] to initiate a SELF TEST. Verify test passes.

7 Select STRIKE TEST and press [ENT] to initiate a STRIKE TEST. Verify test passes.

8 Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

9 Reset PFD and MFD circuit breakers to restart displays in normal operating m

(g) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(h) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(4) Functional Test - Engine Run-Up with Stormscope System

Note: The Engine Run-up Test must be performed when thunderstorms are not present within 200 nautical miles.

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) With the airplane secured outdoors, start engine.

(c) Set ALT 1 and ALT 2 switches to ON positions.

(d) *Serials 1005 & subs w/ ARNAV MFD:* Select range.

1 Press [LT OFF] to select “Strike mode”.

2 Press [120] to select “360°”.

3 Press [25 Nautical Mile] repeatedly to select “200 Nautical Mile”.

(e) *Serials 1005 & subs w/ Avidyne MFD:* Select range.

1 Set [Range] knob to select “200”.

(f) *Serials 2016 & subs w/ Garmin MFD:* Select range.

1 Set [Range] knob to select “200”.

(g) Run engine up to 1,500 RPMs, with one or both alternators operating, then verify MFD display is free from erroneous strikes.

Note: Call Cirrus Design Customer Service if test fails.

(h) Stop engine, then set all switches to OFF positions.

B. Stormscope Antenna (See Figure 34-401)

(1) Removal - Stormscope Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect antenna cable from antenna.

(e) Remove nuts and washers securing antenna to fuselage.

(f) Remove antenna and gasket from top of fuselage.

(g) Peel off remaining sealant from fuselage.

(2) Installation - Stormscope Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position antenna gasket and antenna over installation holes, then insert washers and screws.

(c) Loosely install the antenna with washers and nuts.

(d) Route antenna cable up through installation hole, then connect cable to antenna connector.

(e) Place the antenna ground wire terminal ring on the forward mounting screw, then secure both antenna-mounting screws.

(f) Install center headliner. (Refer to 25-10)

(g) Fillet seal antenna perimeter. (Refer to 20-10)

(h) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(i) Perform Functional Test - Stormscope System. (Refer to 34-40)

(j) Perform Functional Test - Engine Run-Up with Stormscope System. (Refer to 34-40)

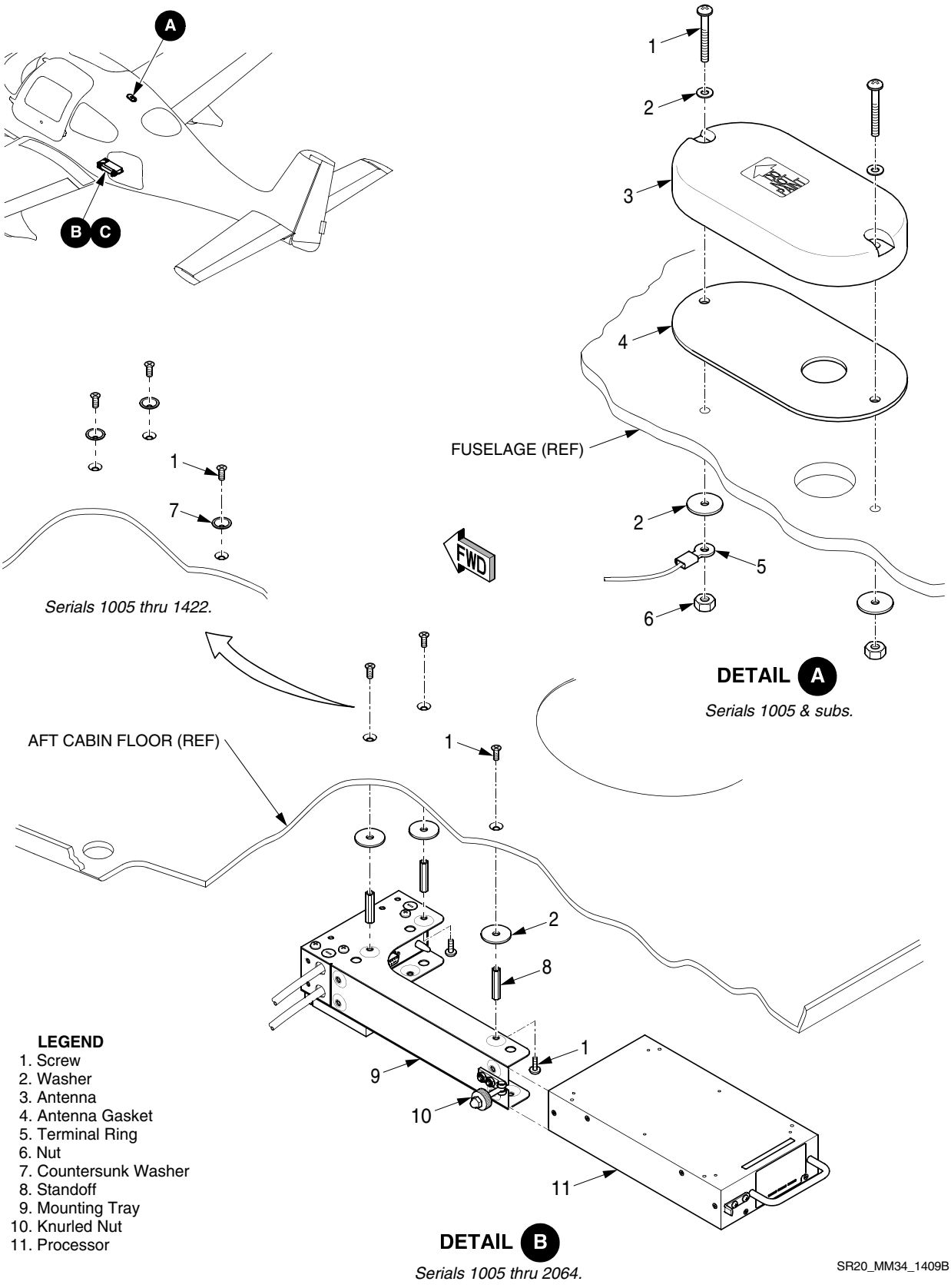
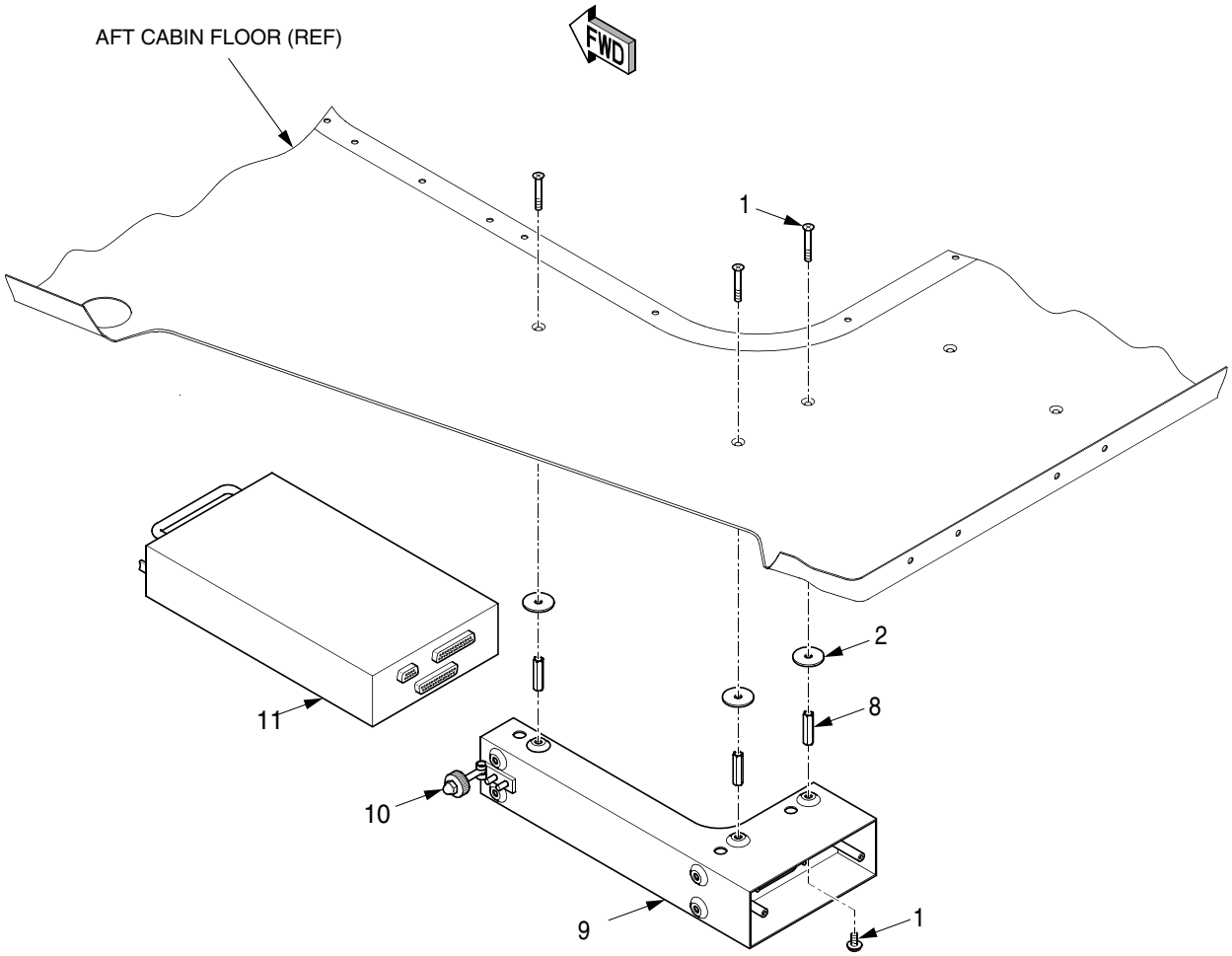


Figure 34-401
Stormscope Installation (Sheet 1 of 2)



LEGEND
1. Screw
2. Washer
8. Standoff
9. Mounting Tray
10. Knurled Nut
11. Processor

DETAIL C

SR20_MM34_3370

Figure 34-401
Stormscope Installation (Sheet 2 of 2)

C. SkyWatch Transmitter Receiver Computer (TRC) (See Figure 34-402)

(1) Removal - SkyWatch Transmitter Receiver Computer (TRC)

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove upper engine cowling. (Refer to 71-10)

(d) Disconnect battery 1. (Refer to 24-30)

(e) *Serials 1005 thru 1632, 1634 thru 1638:* Remove RH crew seat. (Refer to 25-10)

(f) *Serials 1633, 1639 & subs:* Remove LH crew seat. (Refer to 25-10)

(g) Remove screws securing cover panel and lanyard assembly to fuselage floor.

Note: Nutplate may be secured to cabin floor surface with 5-minute epoxy.

(h) *Serials 1005 thru 1422:* Remove screw, spacer, and nutplate securing retainer bracket to fuselage floor.

(i) *Serials 1423 & subs:* Remove screws and nutplate securing retainer bracket to fuselage floor.

(j) Disconnect cables and wiring from TRC.

(k) Slide TRC off tapered mounting pins and remove from airplane.

(2) Installation - SkyWatch Transmitter Receiver Computer (TRC)

(a) Slide TRC onto tapered mounting pins.

(b) Connect cables and wiring to TRC.

Note: Nutplate may be secured to cabin floor surface with 5-minute epoxy.

(c) *Serials 1005 thru 1422:* Position TRC to fuselage floor and secure with retainer bracket, spacer, nutplate, and screw.

(d) *Serials 1423 & subs:* Position TRC to fuselage floor and secure with retainer bracket, nutplate, and screws.

(e) Position cover panel and lanyard assembly to fuselage floor and secure with screws.

(f) Connect battery 1. (Refer to 24-30)

(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(h) Perform Functional Test - SkyWatch System. (Refer to 34-40)

(i) *Serials 1005 thru 1632, 1634 thru 1638:* Install RH crew seat. (Refer to 25-10)

(j) *Serials 1633, 1639 & subs:* Install LH crew seat. (Refer to 25-10)

(k) Install upper engine cowling. (Refer to 71-10)

(3) Functional Test - SkyWatch System - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

CAUTION: SkyWatch Ground Test should be performed using BFGoodrich Model TT391 Flightline Tester. SkyWatch Ground Test must be performed outside and as far away as possible from buildings and other obstructions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flightline Tester	TT391	BFGoodrich	Perform SkyWatch ground test.
Laptop Computer (IBM Compatible)	HyperTerminal Software	Any Source	Setup and Calibrate SkyWatch Installation.
Serial Communication Cable	-	Any Source	Calibrate SkyWatch.
Calibrated Pitot/Static Test Set	Model 6250[a]	Laversab, Inc.	Simulate static air pressure.
	DPS1000[a]	Barfield	
	Model 393[a]	Aircraft Instrument Support Services, Inc.	
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover pitot tube.

a. or equivalent

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(e) Connect serial communication cable to COM 1 port of laptop computer and SkyWatch setup port on front of SkyWatch box.

(f) Turn on computer, then select "Programs/Accessories/Communications/HyperTerminal" from the [Start] menu.

(g) Set your HyperTerminal connection as follows:

Connecting Using	COM1
Bits Per Second	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	X on/X off

Computer should connect to SkyWatch box automatically using HyperTerminal.

(h) When prompt appears, type "?", then press [Enter] on keyboard for a list of commands.

(i) Type "config", then press [Enter] on keyboard.

(j) Verify configuration as follows:

SKY497 CONFIGURATION STRAPS:

HDG. (XYZ/STEP/429) *- Serials 1005 thru 1337, 1338 thru 1422 w/o PFD*	XYZ
HDG. (XYZ/STEP/429) *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	429
P1-70	GND
P1-69 *- Serials 1005 thru 1337, 1338 thru 1422 w/o PFD*	OPEN
P1-69 *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	GND
HEADING FLAG SENSE *- Serials 1005 thru 1337, 1338 thru 1422 w/o PFD*	HIGH
HEADING FLAG SENSE *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	LOW
P1-68 *- Serials 1005 thru 1337, 1338 thru 1422 w/o PFD*	GND
P1-68 *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	OPEN
DR/ALT.422 (DR/422)	DR
P1-67	OPEN
ANT. POS. (TOP/BOT)	TOP
P1-100	OPEN
ANTENNA NY (164/156)	NY164
P1-99	OPEN
AIRFRAME (FIX/ROT)	FIX
P1-98	OPEN
Ext Audio (EN/DIS) **-** *Serials 1005 thru 1885*	DIS
P1-94 **-** *Serials 1005 thru 1885*	OPEN
Ext Audio (EN/DIS) *- Serials 1886 & subs*	EN
P1-94 *- Serials 1886 & subs*	GND

ALTERNATE DISPLAY TYPE	ARINC735 Type 1
P1-80	GND
P1-79	OPEN
P1-78	OPEN
P1-77	OPEN
STP_CONFIG4P1-97	OPEN
STP_CONFIG5P1-96	OPEN
STP_CONFIG6P1-95	OPEN

STP SOFT SWITCHES:

Ext Audio (ON/OFF) *- Serials 1582 & subs, Serials 1005 thru 1581 after SB 2X-34-18*	OFF
P1-86 *- Serials 1582 & subs, Serials 1005 thru 1581 after SB 2X-34-18*	OPEN
Ext Audio (ON/OFF) *- Serials 1886 & subs*	ON
P1-86 *- Serials 1886 & subs*	GND

IOP SOFT SWITCHES:

SQUAT (ON GND/FLY)	ON GND
P1-88	GND
GEAR (UP/DOWN) *- Serials 1005 thru 1581 before SB 2X-34-18*	UP
GEAR (UP/DOWN) *- Serials 1582 & subs, Serials 1005 thru 1581 after SB 2X-34-18*	DOWN
P1-87 *- Serials 1005 thru 1581 before SB 2X-34-18*	OPEN
P1-87 *- Serials 1582 & subs, Serials 1005 thru 1581 after SB 2X-34-18*	GND
GPWS (ACT/INACT)	INACT
P1-32	OPEN

BAROMETRIC ENCODED ALTITUDE:

D4	0
C4C2C1	0 1 0

B4B2B1	0 1 1
A4A2A1	0 0 0
ALTITUDE	#### feet (Altitude should be field elevation ±300 ft and agree with transponder)

(k) Serials 1582 & subs, 1005 thru 1581 after SB 2X-34-18: Verify flap switch audio inhibit feature functions properly.

1 Set flap switch to "UP" position.

Note: Ensure small hole on forward, bottom portion of the pitot tube is covered by the pitot line sleeve or sealant tape.

2 Connect pitot line from pitot/static test set to pitot mast on airplane.

CAUTION: Verify pump is turned off before connecting test set to electrical outlet.

3 Connect test set to electrical outlet.
4 Close pitot, static and cross feed control valves.
5 Close pitot and static bleed/vent valves.
6 Set vacuum pressure selector to pressure source.
7 Set pump power switch to ON position.
8 Slowly open pitot control valve until airspeed indicator displays greater than 40kts and SkyWatch speed switch opens.
9 Type "config", then press [Enter] on keyboard.
10 Verify configuration as follows:

IOP SOFT SWITCHES:	
Squat (ON GND/FLY)	FLYING
P1-88	OPEN
Gear (UP/DOWN)	UP
P1-87	OPEN

11 Maintaining simulated speed of greater than 40kts, set flap switch to "50%" position.
12 Type "config", then press [Enter] on keyboard.
13 Verify configuration as follows:

IOP SOFT SWITCHES:	
Squat (ON GND/FLY)	FLYING
P1-88	OPEN
Gear (UP/DOWN)	DOWN
P1-87	GND

14 Maintaining simulated speed of greater than 40kts, set flap switch to "100%" position.

15 Type "config", then press [Enter] on keyboard.

16 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	FLYING
P1-88	OPEN
Gear (UP/DOWN)	DOWN
P1-87	GND

17 Close pitot control valve to allow speed switch to close and simulated airspeed to return to 0kts.

18 Type "config", then press [Enter] on keyboard.

19 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN
P1-87	GND

20 Set flap switch to "50%" position.

21 Type "config", then press [Enter] on keyboard.

22 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN
P1-87	GND

23 Set flap switch to "UP" position.

24 Type "config", then press [Enter] on keyboard.

25 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN

P1-87	GND

26 Set pump power switch to OFF position.

27 Disconnect test set from electrical outlet.

28 Disconnect test set pitot line from pitot mast.

(l) Type "cal", then press [Enter] on keyboard. Verify the following information is displayed:

ASKING FOR CURRENT CALIBRATION VALUE.

STARTING CALIBRATION. PLEASE WAIT…

RE-CALIBRATION SUCCESSFUL!

OLD CAL VALUE: XXX DEGREES

NEW CAL VALUE: XXX DEGREES

(m) Type "save", then press [Enter] on keyboard. Verify the following information is displayed:

SAVING SKY497 CONFIG STRAPS:

Configuration P1-70	Heading	set to Ground
Configuration P1-69 *- Serials 1005 thru 1422 w/o PFD*	Heading	set to Open
Configuration P1-69 *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	Heading	set to Ground
Configuration P1-68 *- Serials 1005 thru 1422 w/o PFD*	HeadFlgSen	set to High
Configuration P1-68 *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	HeadFlgSen	set to Low
Configuration P1-67	DR/Alt.422	set to Data Rec.
Configuration P1-100	Ant.Pos	set to Top
Configuration P1-99	Ant.Type	set to NY-164
Configuration P1-98	Airframe	set to Fixed Wing
Configuration P1-80	AltDispType	set to Ground
Configuration P1-79	AltDispType	set to Open
Configuration P1-78	AltDispType	set to Open
Configuration P1-77	AltDispType	set to Open

(n) Type "sensors", then press [Enter] on keyboard. Verify the following information is displayed:

HEADING SOURCE *- Serials 1005 thru 1422 w/o PFD*	Synchro XYZ

HEADING SOURCE *- Serials 1337 thru 1422 w/ PFD, 1423 & subs*	ARINC 429
HEADING IS VALID	## degrees (Heading should be ±2° of PFD heading)
BAROMETRIC ALTITUDE SOURCE	Encoded Inputs
BAROMETRIC ALTITUDE IS VALID	#### feet (Altitude should be field elevation ±300 ft and agree with transponder)
RADIO ALTITUDE SOURCE	ARINC 429
RADIO ALTITUDE	Invalid

(o) Type "say 4", then press [Enter] on keyboard.
"Traffic, Traffic" should be heard in the headsets and over the speaker.

(p) If Flightline Tester is available, perform Ground Test.

1 Type "ground test", then press [Enter] on keyboard.

2 Verify the following information is displayed:

SYSTEM IN GROUND TEST MODE

SIMULATING BAROMETRIC ALTITUDE: 50,000 FT.

SIMULATING RADAR ALTIMETER: 2,500 FT.

SIMULATING HEADING: 0 DEG

GEAR AND SQUAT SWITCH OVERRIDE IN EFFECT

3 Set Flightline Tester power switches to ON positions. If LOW indicator is displayed, replace internal batteries or plug tester into AC power.

4 Set SELF-TEST switch to 1030 position, then verify 1030 indicator blinks on for about a half second every 5 seconds.

5 Set SELF-TEST switch to 1090 position, then verify 1090 indicator blinks on for about a half second every 5 seconds.

6 Set SELF-TEST switch to OFF position.

7 Separate Flightline Tester cover (antenna) from tester chassis.

8 Connect Flightline Tester coax cable to J3 on Antenna and J1 in chassis.

9 Move to a position approximately 30-40 feet in front of airplane at bearing 0°.

10 With antenna about 4 feet above ground level, point antenna towards airplane.

Note: Both targets will be displayed in level flight at same aircraft altitude; "00" displayed above traffic symbol.

11 Verify GNS 430/GNC 420 and Avidyne MFD (if installed) display direction (±30°) of Flightline Tester and two target information as follows:

SYMBOL	INFORMATION
solid circle	A Traffic Advisory at ¼ nm
open diamond	Other Traffic at 4.5 nm

12 Set Flightline Tester power switches to OFF positions or position antenna away from aircraft.

13 Perform test at 30° intervals: 0°, 30°, 60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 300°, and 330°.

14 Set Flightline Tester power switches to OFF positions.

15 To exit Ground Test mode and return SKYWATCH to normal operating mode, type "ground off", then press [Enter] on keyboard.

(q) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(r) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(s) Disconnect 28 ±1 VDC external power from external power receptacle.

(4) Adjustment/Test - SkyWatch System - *Serials 2016 & subs w/ Perspective Avionics*

CAUTION: SkyWatch Ground Test should be performed using BFGoodrich Model TT391 Flightline Tester. SkyWatch Ground Test must be performed outside and as far away as possible from buildings and other obstructions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flightline Tester	TT391	BFGoodrich	Perform ground test.
Laptop Computer (IBM Compatible)	HyperTerminal Software	Any Source	Setup and Calibrate SkyWatch Installation.
Serial Communication Cable	-	Any Source	Calibrate SkyWatch.
Calibrated Pitot/Static Test Set	Model 6250[a]	Laversab, Inc.	Simulate static air pressure.
	DPS1000[a]	Barfield	
	Model 393[a]	Aircraft Instrument Support Services, Inc.	
Sealant Tape	GS 100	General Sealants Industry, CA 91745 800-762-1144	Cover pitot tube.

a. or equivalent

(b) Connect 28 ±1 VDC external power to external power receptacle.

(c) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(d) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(e) Connect serial communication cable to COM 1 port of laptop computer and SkyWatch setup port on front of SkyWatch box.

(f) Turn on computer, then select "Programs/Accessories/Communications/HyperTerminal" from the [Start] menu.

(g) Set your HyperTerminal connection as follows:

Connecting Using COM1

Bits Per Second	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	X on/X off

Computer should connect to SkyWatch box automatically using HyperTerminal.

(h) When prompt appears, type "?", then press [Enter] on keyboard for a list of commands.

(i) Type "config", then press [Enter] on keyboard.

(j) Verify configuration as follows:

SKY497 CONFIGURATION STRAPS:

HDG. (XYZ/STEP/429)	429
P1-70	GND
P1-69	GND
HEADING FLAG SENSE	LOW
P1-68	OPEN
DR/ALT.422 (DR/422)	DR
P1-67	OPEN
ANT. POS. (TOP/BOT)	TOP
P1-100	OPEN
ANTENNA NY (164/156)	NY164
P1-99	OPEN
AIRFRAME (FIX/ROT)	FIX
P1-98	OPEN
Ext Audio (EN/DIS)	EN
P1-94	GND
ALTERNATE DISPLAY TYPE	ARINC735 Type 1
P1-80	GND
P1-79	OPEN
P1-78	OPEN
P1-77	OPEN
STP_CONFIG4P1-97	OPEN
STP_CONFIG5P1-96	OPEN
STP_CONFIG6P1-95	OPEN

	STP SOFT SWITCHES:
Ext Audio (ON/OFF)	ON
P1-86	GND
	IOP SOFT SWITCHES:
SQUAT (ON GND/FLY)	ON GND
P1-88	GND
GEAR (UP/DOWN)	DOWN
P1-87	GND
GPWS (ACT/INACT)	INACT
P1-32	OPEN
	BAROMETRIC ENCODED ALTITUDE:
D4	0
C4C2C1	0 0 0
B4B2B1	0 0 0
A4A2A1	0 0 0
ALTITUDE	#### feet (Altitude should be field elevation ±300 feet and agree with transponder)

(k) Verify flap switch audio inhibit feature functions properly.

1 Set flap switch to "UP" position.

Note: Ensure small hole on forward, bottom portion of the pitot tube is covered by the pitot line sleeve or sealant tape.

2 Connect pitot line from pitot/static test set to pitot mast on airplane.

CAUTION: Verify pump is turned off before connecting test set to electrical outlet.

3 Connect test set to electrical outlet.

4 Close pitot, static and cross feed control valves.

5 Close pitot and static bleed/vent valves.

6 Set vacuum pressure selector to pressure source.

7 Set pump power switch to ON position.

8 Slowly open pitot control valve until airspeed indicator displays greater than 50kts and SkyWatch speed switch opens.

9 Type "config", then press [Enter] on keyboard.

10 Verify configuration as follows:

	IOP SOFT SWITCHES:
Squat (ON GND/FLY)	FLYING

P1-88	OPEN
Gear (UP/DOWN)	UP
P1-87	OPEN

11 Maintaining simulated speed of greater than 50kts, set flap switch to "50%" position.
12 Type "config", then press [Enter] on keyboard.
13 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	FLYING
P1-88	OPEN
Gear (UP/DOWN)	DOWN
P1-87	GND

14 Maintaining simulated speed of greater than 50kts, set flap switch to "100%" position.
15 Type "config", then press [Enter] on keyboard.
16 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	FLYING
P1-88	OPEN
Gear (UP/DOWN)	DOWN
P1-87	GND

17 Close pitot control valve to allow speed switch to close and simulated airspeed to return to 0kts.
18 Type "config", then press [Enter] on keyboard.
19 Verify configuration as follows:

IOP SOFT SWITCHES:

Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN
P1-87	GND

20 Set flap switch to "50%" position.
21 Type "config", then press [Enter] on keyboard.

22 Verify configuration as follows:

IOP SOFT SWITCHES:	
Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN
P1-87	GND

23 Set flap switch to "UP" position.

24 Type "config", then press [Enter] on keyboard.

25 Verify configuration as follows:

IOP SOFT SWITCHES:	
Squat (ON GND/FLY)	ON GND
P1-88	GND
Gear (UP/DOWN)	DOWN
P1-87	GND

26 Set pump power switch to OFF position.

27 Disconnect test set from electrical outlet.

28 Disconnect test set pitot line from pitot mast.

(l) Type "cal", then press [Enter] on keyboard. Verify the following information is displayed:
ASKING FOR CURRENT CALIBRATION VALUE.

STARTING CALIBRATION. PLEASE WAIT…

RE-CALIBRATION SUCCESSFUL!

OLD CAL VALUE: XXX DEGREES

NEW CAL VALUE: XXX DEGREES

(m) Type "save", then press [Enter] on keyboard. Verify the following information is displayed:

SAVING SKY497 CONFIG STRAPS:

Configuration P1-70	Heading	set to Ground
Configuration P1-69	Heading	set to Ground
Configuration P1-68	HeadFlgSen	set to Low
Configuration P1-67	DR/Alt.422	set to Data Rec.
Configuration P1-100	Ant.Pos	set to Top
Configuration P1-99	Ant.Type	set to NY-164
Configuration P1-98	Airframe	set to Fixed Wing
Configuration P1-94	ExtAudioCfg	set to Ext Audio

Configuration P1-80	AltDispType	set to Ground
Configuration P1-79	AltDispType	set to Open
Configuration P1-78	AltDispType	set to Open
Configuration P1-77	AltDispType	set to Open

(n) Type "sensors", then press [Enter] on keyboard. Verify the following information is displayed:

HEADING SOURCE	ARINC 429
HEADING IS VALID	## degrees (Heading should be ±2° of PFD heading)
BAROMETRIC ALTITUDE SOURCE	ARINC 429
BAROMETRIC ALTITUDE IS VALID	#### feet (Altitude should be field elevation ±300 ft and agree with transponder)
RADIO ALTITUDE SOURCE	ARINC 429
RADIO ALTITUDE	Invalid

(o) Type "say 4", then press [Enter] on keyboard.
1 “Traffic, Traffic” should be heard in the headsets and over the speaker.

(p) Perform system test.
1 On MFD, select Traffic Map page.
2 On MFD, verify the following softkeys are available: [STANDBY], [OPERATE], [TEST] (only when in standby mode), and [ALT MODE].
3 Verify that a TAS mode (not TAS FAIL) is displayed in upper left corner of traffic map.
4 On MFD, verify that “NO DATA” is not displayed.
5 Press [OPERATE] softkey and verify that OPERATING is displayed in upper left corner of traffic map.
6 Press [STANDBY] softkey and verify that STANDBY is displayed in upper left corner of traffic map.
7 Press [TEST] softkey and verify that TEST is displayed in upper left corner of traffic map and a traffic test pattern is displayed. Upon completion of the test, verify that "SKYWATCH SYSTEM TEST PASSED" is heard over cockpit speaker.
8 Pull TRAFFIC circuit breaker.
9 On MFD, verify that NO DATA is displayed in yellow after several seconds.
10 Reset TRAFFIC circuit breaker.
11 On MFD, verify that NO DATA is removed after several seconds.

(q) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(r) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(s) Disconnect 28 ±1 VDC external power from external power receptacle.

D. SkyWatch Antenna (See Figure 34-402)

(1) Removal - SkyWatch Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect antenna cables from antenna.

(e) Remove screws, washers, and nuts securing antenna to fuselage.

(f) Remove antenna and gasket from top of fuselage.

(g) Remove remaining sealant from fuselage.

(2) Installation - SkyWatch Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.
Utility Knife	-	Any Source	Trim gasket.

(b) To improve cosmetic appearance of gasket installation, use utility knife to remove 0.2 inch (0.5 cm) from perimeter of new gasket.

(c) With arrow on antenna facing forward, place antenna and gasket into position.

(d) Secure antenna using screws, washers, and nuts. Tighten each screw until gasket material starts to squeeze out evenly from all sides of antenna.

(e) Apply a continuous bead of sealant around perimeter of antenna and fuselage mating surfaces.

(f) Using sealant, fill screw recesses flush to top surface.

(g) Connect cables to antenna.

1 Connect blue tagged antenna cable to blue colored forward antenna connector.

2 Connect black tagged antenna cable to black colored middle antenna connector.

3 Connect red tagged antenna cable to red colored aft antenna connector.

(h) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(i) Perform Functional Test - SkyWatch System. (Refer to 34-40)

(j) Install cabin headliner. (Refer to 25-10)

E. SkyWatch Differential Pressure Switch (See Figure 34-402)

(1) Removal - SkyWatch Differential Pressure Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect electrical terminals from switch.

(e) Remove spring clip securing pitot line to switch.

(f) Remove spring clip securing static line to switch.

(g) Remove switch from airplane.

(2) Installation - SkyWatch Differential Pressure Switch

(a) Position pitot line to switch and secure with spring clip.

(b) Position static line to switch and secure with spring clip.

(c) Connect electrical terminals to switch.

(d) Perform Functional Test - Pitot System Plumbing. (Refer to 34-10)

(e) Perform Functional Test - Static System Plumbing. (Refer to 34-10)

(f) Install LH kick plate. (Refer to 25-10)

(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

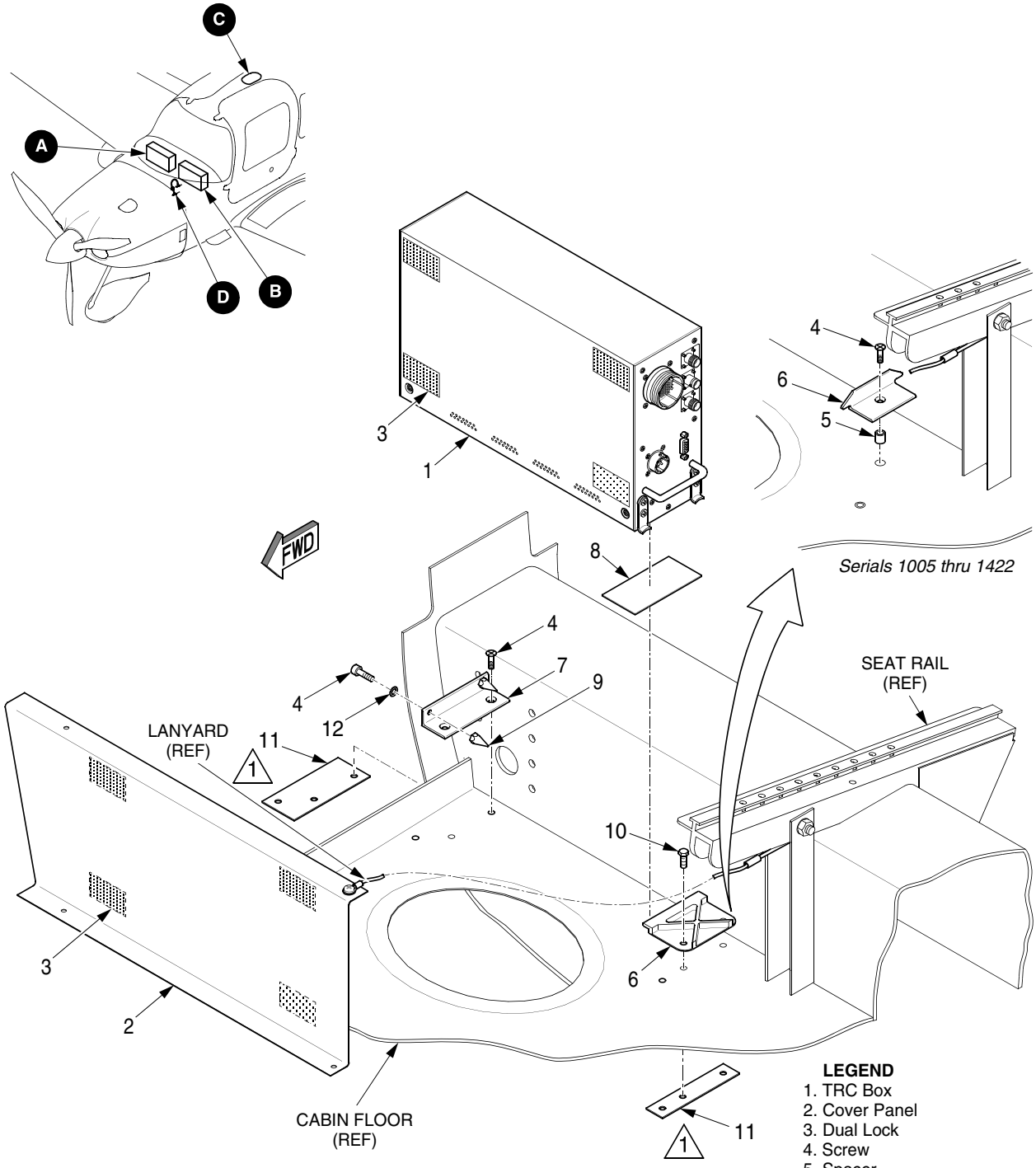
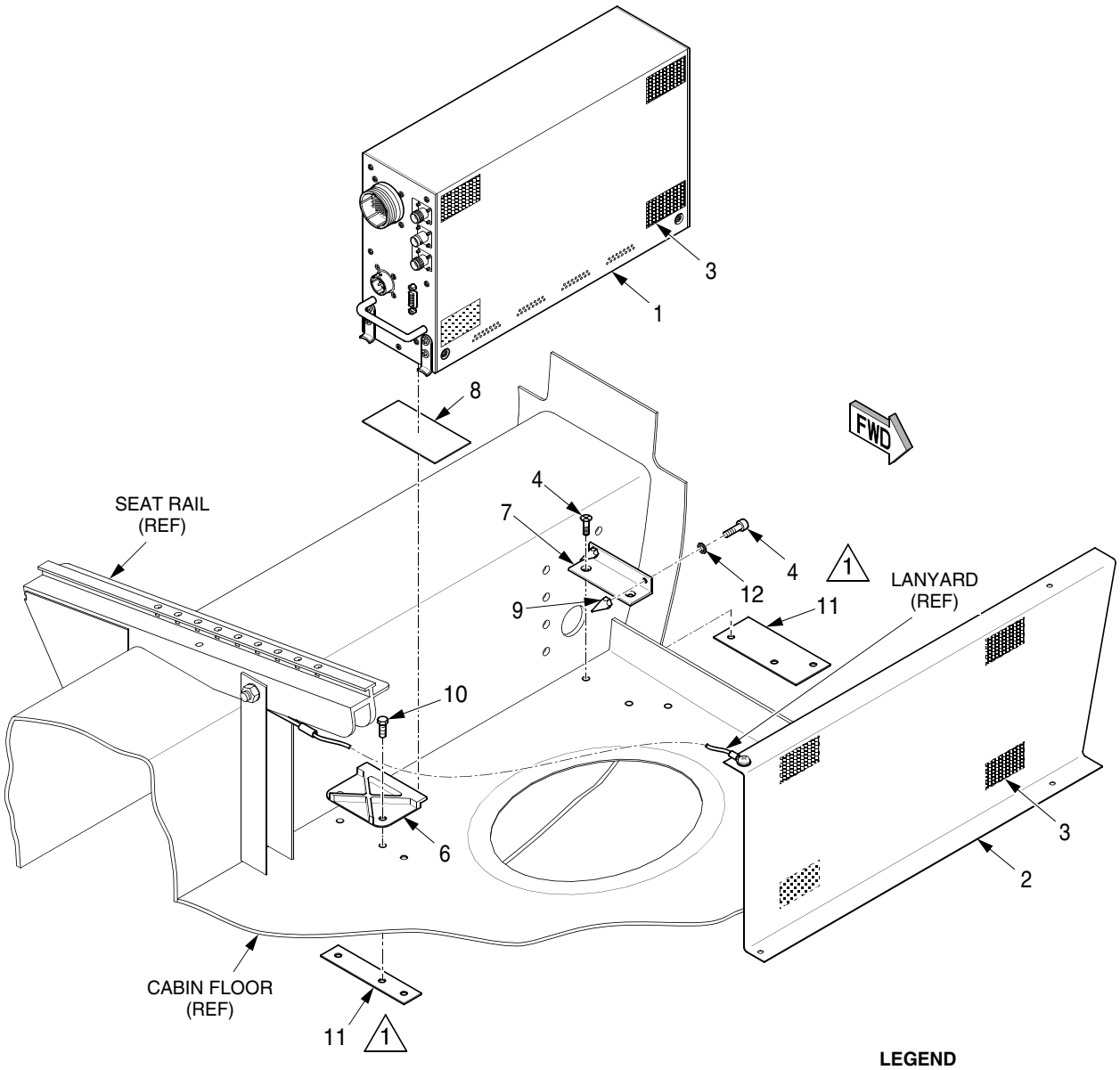


Figure 34-402
SkyWatch System - Serials 1005 thru 1638 (Sheet 1 of 3)



DETAIL B

Serials 1633, 1639 & subs.

LEGEND

1. TRC Box
2. Cover Panel
3. Dual Lock
4. Screw
6. Inboard Retainer Bracket
7. Outboard Retainer Bracket
8. Rubber Spacer
9. Tapered Mounting Pin
10. Bolt
11. Nutplate
12. Washer

NOTE

1 May be secured to cabin floor surface with 5-minute epoxy.

SR20_MM34_2326A

Figure 34-402
SkyWatch System - Serials 1639 & subs (Sheet 2 of 3)

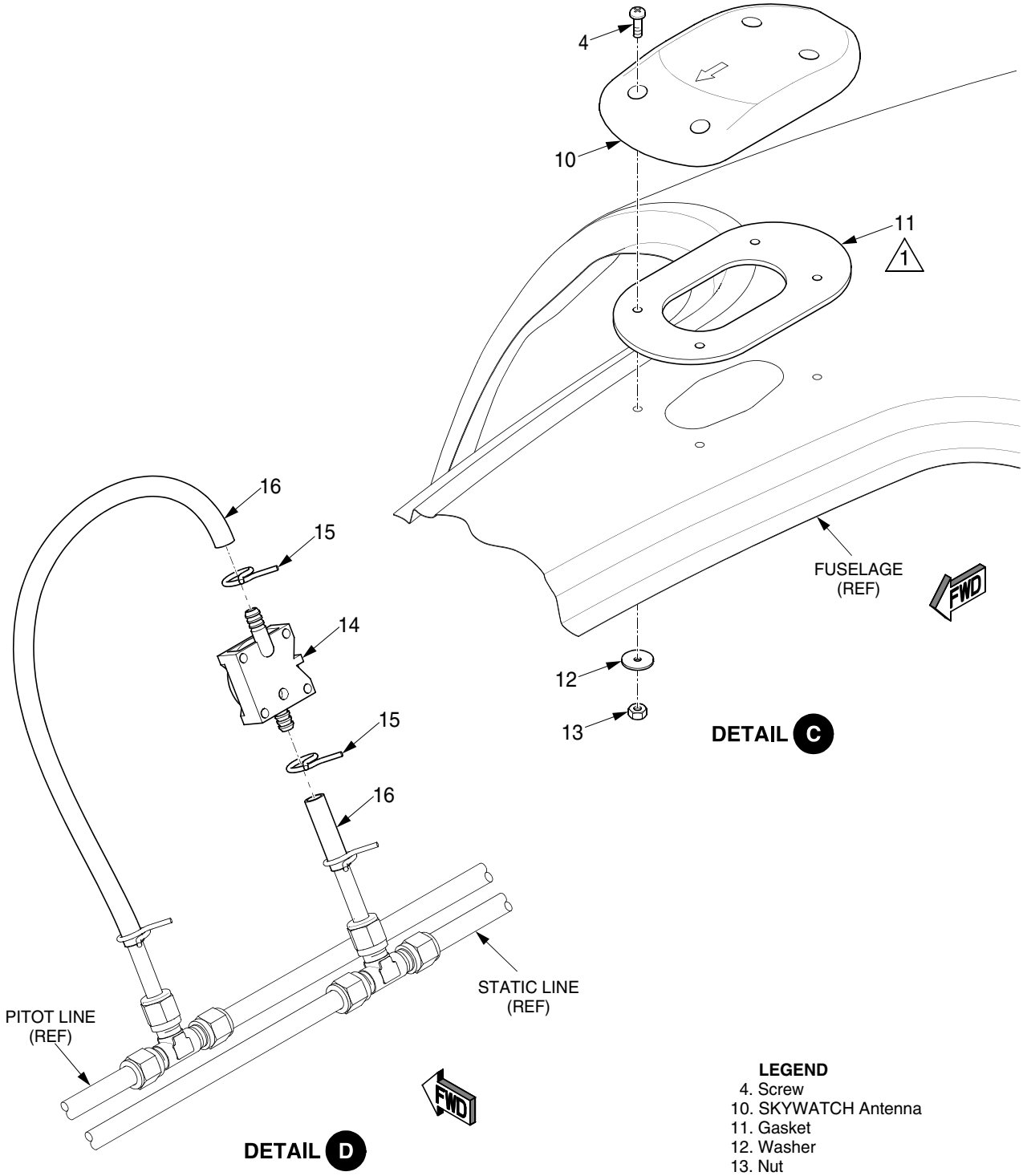


Figure 34-402
SkyWatch System (Sheet 3 of 3)

F. Terrain Awareness & Warning (TAWS) Processor - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-403)

(1) Removal - Terrain Awareness & Warning (TAWS) Processor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove LH Kick Plate. (Refer to 25-10)

(d) Disconnect electrical connector from TAWS processor.

(e) Remove screws, washers, and nuts securing TAWS processor to kick plate.

(2) Installation - Terrain Awareness & Warning (TAWS) Processor

Note: Install terminal ring under aft RH screw head.

(a) Position TAWS processor to kick plate, then secure with screws, washers, and nuts.

(b) Connect electrical connector to TAWS processor.

(c) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(d) Perform Functional Test - TAWS Processor Setup. (Refer to 34-40)

(e) Perform Operational Test - TAWS Processor. (Refer to 34-40)

(f) Install LH Kick Plate. (Refer to 25-10)

(3) Functional Test - Terrain Awareness & Warning (TAWS) Processor Setup

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Laptop Computer (IBM Compatible)	-	Any Source	Setup TAWS Processor.
Honeywell WinViews Software	998-2846-500	Honeywell Phoenix, AZ	Setup TAWS Processor.
Serial Communication Cable	-	Any Source	Setup TAWS Processor.

(b) Connect serial communication cable to COM 1 port on computer and P715 connector stowed next to TAWS processor.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Turn on computer, then launch WinViews software.

(e) Select "COM1", then "Connect" on the WinViews Connect dialog box.

(f) Hold [Ctrl] and press [Z] for prompt.

(g) Type "PS", then press [Enter] for Present Status.

(h) Press [Y].

(i) If configuration module is not initialized, verify that one of the messages read CONFIGURATION MODULE NOT INITIALIZED.

(j) At WinViews prompt, type "CFG", then press [Enter].

Note: Place a space after each category and after each number if there is no separator.

(k) Type in pre-configured STRING as follows: CUW 0/11 1 14 1 0 0 0 0 0 0 4 2/

(l) Press [Enter].

(m) Press [Y].

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

(n) After system comes back up, hold [Ctrl] and press [Z] for prompt.

(o) Type "PS", then press [Enter] for Present Status.

(p) Press [Y].

(q) Verify CUW code to confirm configuration input is correct.

(r) Exit WinViews software and shut down computer.

(s) Disconnect serial communication cable from COM 1 port on computer and P715 connector stowed next to TAWS processor.

(4) Operational Test - Terrain Awareness & Warning (TAWS) Processor

(a) Perform Level 1 Self-Test.

1 Verify TERR INHIBIT push-button switch is not engaged and TERR INOP light on instrument panel is not illuminated.

2 *Serials w/ SkyWatch:* Initiate the SkyWatch Self-Test by selecting "Traffic Self Test" on the MFD Setup page.

3 *Serials w/ SkyWatch:* When test is complete, "Traffic advisory system test-passed" is heard over the headset and speaker.

Note: *Serials w/ SkyWatch:* Verify TAWS Self-Test audio over-rides SkyWatch Self-Test audio during the "Traffic advisory…" message.

4 Press and hold SELF TEST push-button switch for less than 2 seconds to initiate Level 1 Self-Test.

5 Select TAWS display screen on MFD.

6 Initiate Level 1 Self-Test to verify the following sequences:

The yellow TERR INOP light illuminates.

The red TERR WARN light illuminates.

An aural "EGPWS SYSTEM OK" message is heard over the headset and speaker.

The red TERR WARN light extinguishes.

A terrain self-test pattern appears on MFD.

The yellow TERR CAUT & TERR INOP lights extinguish when test is complete.

Note: Terrain display may remain on for approximately 10 seconds after the lights extinguish.

The terrain self-test pattern disappears after several sweeps.

(b) Perform Level 2 Self-Test.

Note: The TERR INOP light will be illuminated throughout this test.

If TAWS processor or system faults exist, the faults will be annunciated as EGPWS internal faults and/or EGPWS external faults. The aural message will provide a description of the faults. Any faults that are annunciated must be cleared prior to continuing the tests.

1 Press and hold SELF TEST push-button switch for less than 2 seconds to initiate Level 1 Self-Test.

2 Once Level 1 audio sequence begins, press and hold SELF TEST push-button switch for less than 2 seconds to initiate Level 2 Self-Test.

3 Verify the following aural messages are enunciated:

"Current Faults"

"No Faults"

"Press to Continue"

(c) Perform Level 3 Self-Test.

Note: The TERR INOP light will be illuminated throughout this test.

"X" denotes a number, letter, the word "point" or no annunciation. Any of these annunciations are acceptable where "X" is listed below. (For example, the serial number may be enunciated as "Serial Number 316")

1 Press and hold SELF TEST push-button switch for less than 2 seconds to initiate Level 1 Self-Test.

2 Once Level 1 audio sequence begins, press and hold SELF TEST push-button switch for less than 2 seconds to initiate Level 2 Self-Test.

3 Within 3 seconds after "Press to Continue" message is enunciated at end of Level 2 Self-Test, press and hold the SELF TEST push-button switch for less than 2 seconds to initiate Level 3 Self-Test.

4 Verify the following aural messages are correct and enunciated:

"System Configuration"

"Part Number 965-1198-XXX"

"Mod Status X"

"Serial Number XXXX"

"Application Software Version XXX"

"Terrain Database Version XXXX"

"Boot Code Version XXXX"

"Aircraft Type 1"

"Air Data Type 14"

"Position Input Type 1"

"Terrain Display Type 0"

"I/O Discrete Type 0"

"Audio Menu 0"

"Volume Select 0"

"Altitude Monitor Type 0"

"Options Select 0"

"Attitude Heading Type 4"

"Display Option Type 2"

"Press to Continue"

(d) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

G. TAWS Annunciation LEDS - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-403)

(1) Removal - TAWS Annunciation LEDS

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ANNUNCIATOR PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect P725 connector from J725 connector.

(e) Disconnect J703 connector from wire harness.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

(f) At J703 connector, depin wires at pin locations 1 and 5.

(g) Remove nuts and LED sleeves securing LEDs to instrument panel.

(2) Installation - TAWS Annunciation LEDS

(a) Position LEDs to instrument panel and secure with LED sleeves and nuts.

(b) At J703 connector, repin wires at pin locations 1 and 5.

(c) Connect J703 connector to wire harness.

(d) Connect P725 connector to J725 connector.

(e) Reset ANNUNCIATOR PANEL circuit breaker.

(f) Perform Functional Test - Annunciator Indication. (Refer to 31-50)

(g) Install glareshield. (Refer to 25-10)

H. TAWS Control Switches - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-403)

(1) Removal - TAWS Control Switches

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ANNUNCIATOR PANEL circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect P725 connector from J725 connector.

(e) Disconnect J703 connector from wire harness.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

(f) At J703 connector, depin wires at pin locations 1 and 5.

(g) At J725 connector, depin wires at pin locations 1, 2, and 3.

(h) Remove nuts securing TAWS control switches to instrument panel. Pull switches through front of instrument panel and remove from airplane.

(2) Installation - TAWS Control Switches

(a) Position switches to instrument panel and secure with nuts.

(b) At J703 connector, repin wires at pin locations 1 and 5.

(c) At J725 connector, repin wires at pin locations 1, 2, and 3.

(d) Connect J703 connector to wire harness.

(e) Connect P725 connector to J725 connector.

(f) Reset ANNUNCIATOR PANEL circuit breaker.

(g) Perform Operational Test - TAWS Processor. (Refer to 34-40)

(h) Install glareshield. (Refer to 25-10)

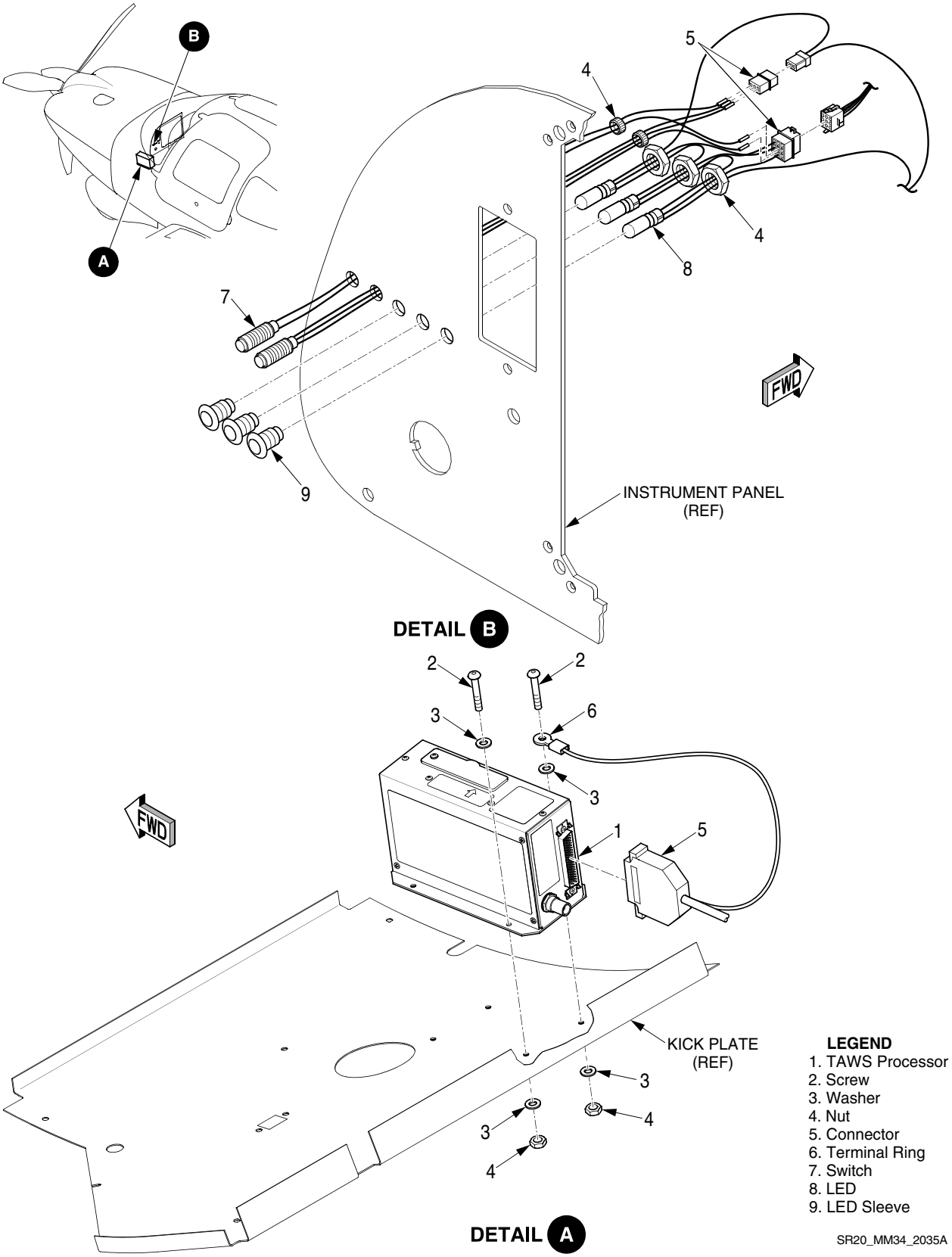


Figure 34-403
TAWS System Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

I. Garmin GTS 800 Line Replaceable Unit (LRU) - Serials 2047 & subs w/ Perspective Avionics (See Figure 34-404)

(1) Removal - Garmin GTS 800 Line Replaceable Unit (LRU)
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.
- (c) Remove LH crew seat. (Refer to 25-10)
- (d) Remove screws securing cover panel and lanyard assembly to fuselage floor.
- (e) Disconnect cables and wiring from LRU.
- (f) If reinstalling existing LRU, maintain QMA termination plug installations on J2 BTM, J3 BTM, and J4 BTM connectors.
- (g) If installing new LRU, remove and retain QMA termination plugs from J2 BTM, J3 BTM, and J4 BTM connectors.
- (h) Loosen knurled nut on LRU rack to detach LRU and remove from airplane.

(2) Installation - Garmin GTS 800 Line Replaceable Unit (LRU)
- (a) Slide LRU onto LRU rack and hand tighten knurled nut.
- (b) Connect wiring harnesses to LRU.
- (c) Connect upper antenna cables to LRU.
  - 1 Connect yellow tagged upper antenna cable to yellow colored J1 TOP LRU connector.
  - 2 Connect black tagged upper antenna cable to black colored J2 TOP LRU connector.
  - 3 Connect blue tagged upper antenna cable to blue colored J3 TOP LRU connector.
  - 4 Connect red tagged upper antenna cable to red colored J4 TOP LRU connector.
- (d) Connect lower antenna cable/QMA termination plugs to LRU.
  - 1 Connect yellow tagged lower antenna cable to yellow colored J1 BTM LRU connector.
  - 2 If not already installed, connect QMA termination plug to black colored J2 BTM LRU connector.
  - 3 If not already installed, connect QMA termination plug to blue colored J3 BTM LRU connector.
  - 4 If not already installed, connect QMA termination plug to red colored J4 BTM LRU connector.
- (e) Position cover panel and lanyard assembly to fuselage floor and secure with screws.
- (f) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.
- (g) If LRU is a different unit from the originally installed LRU:
  - 1 Perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)
  - 2 Perform Functional Test - Garmin GTS 800 System. (Refer to 34-40)
- (h) If LRU is the same unit as the originally installed LRU:
  - 1 Perform Functional Test - Garmin GTS 800 System. (Refer to 34-40)
- (i) Install LH crew seat. (Refer to 25-10)

(3) Functional Test - Garmin GTS 800 System
- (a) Perform GTS 800 TAS Testing according to Cirrus Perspective Line Maintenance Manual.

J. Garmin GTS 800 Line Replaceable Unit (LRU) Rack - Serials 2047 & subs w/ Perspective Avionics (See Figure 34-404)

(1) Removal - GTS 800 Line Replaceable Unit (LRU) Rack

(a) Remove Garmin GTS 800 LRU. (Refer to 34-40)

(b) *Serials w/ GDL 88:* Remove GDL 88 UAT/ADS-B Transceiver LRU. (Refer to 23-20)

Note: Nutplates may be secured to cabin floor surface with 5-minute epoxy.

(c) Remove washers and bolts securing mounting brackets to nutplates and cabin floor.

(d) Remove screws securing LRU rack to mounting brackets.

(e) Remove retainer plates from slots in rack. Remove rack from airplane.

(2) Installation - GTS 800 Line Replaceable Unit (LRU) Rack

(a) Install retainer plates into slots in rack.

(b) Position mounting brackets to LRU rack and secure with screws.

Note: Nutplates may be secured to cabin floor surface with 5-minute epoxy.

(c) Position nutplates to installation area below cabin floor surface.

(d) Install bolts and washers securing mounting brackets to nutplates and cabin floor.

(e) *Serials w/ GDL 88:* Install GDL 88 UAT/ADS-B Transceiver LRU. (Refer to 23-20)

(f) Install GTS 800 LRU. (Refer to 34-40)

K. Garmin GTS 800 Upper Antenna - Serials 2047 & subs w/ Perspective Avionics (See Figure 34-404)

(1) Removal - Garmin GTS 800 Upper Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect antenna cables from antenna.

(e) Remove screws, washers, and nuts securing antenna to fuselage.

(f) Remove antenna and gasket from top of fuselage.

(g) Remove remaining sealant from fuselage.

(2) Installation - Garmin GTS 800 Upper Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.
Utility Knife	-	Any Source	Trim gasket.

(b) To improve cosmetic appearance of gasket installation, use utility knife to remove 0.2 inch (0.5 cm) from perimeter of new gasket.

(c) With arrow on antenna facing forward, place antenna and gasket into position.

Note: Install longer screws on RH side of upper antenna.

(d) Secure antenna using screws, washers, and nuts. Tighten each screw until gasket material is evenly compressed on all sides of antenna.

(e) Apply a continuous bead of sealant around perimeter of antenna and fuselage mating surfaces.

(f) Using sealant, fill screw recesses flush to top surface.

(g) Connect cables to antenna.

1 Connect blue tagged antenna cable to blue colored aft antenna connector (J3).

2 Connect black tagged antenna cable to black colored aft antenna connector (J2).

3 Connect red tagged antenna cable to red colored forward antenna connector (J4).

4 Connect yellow tagged antenna cable to yellow colored forward antenna connector (J1).

(h) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(i) Perform Functional Test - Garmin GTS 800 System. (Refer to 34-40)

(j) Install cabin headliner. (Refer to 25-10)

L. Garmin GTS 800 Lower Antenna - Serials 2047 & subs w/ Perspective Avionics (See Figure 34-404)

(1) Removal - Garmin GTS 800 Lower Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove aft passenger seats. (Refer to 25-10)

(d) Remove cabin floor covering. (Refer to 25-10)

(e) Remove access panel CF4C. (Refer to 06-00)

(f) Disconnect antenna cable from antenna.

(g) Remove washers and nuts securing antenna to fuselage.

(h) Remove antenna and gasket from bottom of fuselage.

(i) Remove remaining sealant from fuselage.

(2) Installation - Garmin GTS 800 Lower Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.
Utility Knife	-	Any Source	Trim gasket.

(b) To improve cosmetic appearance of gasket installation, use utility knife to remove 0.2 inch (0.5 cm) from perimeter of new gasket.

(c) With arrow on antenna facing forward, place antenna and gasket into position.

(d) Secure antenna using washers and nuts. Tighten each nut until gasket material is evenly compressed on all sides of antenna.

(e) Apply a continuous bead of sealant around perimeter of antenna and fuselage mating surfaces.

(f) Connect cable to antenna.

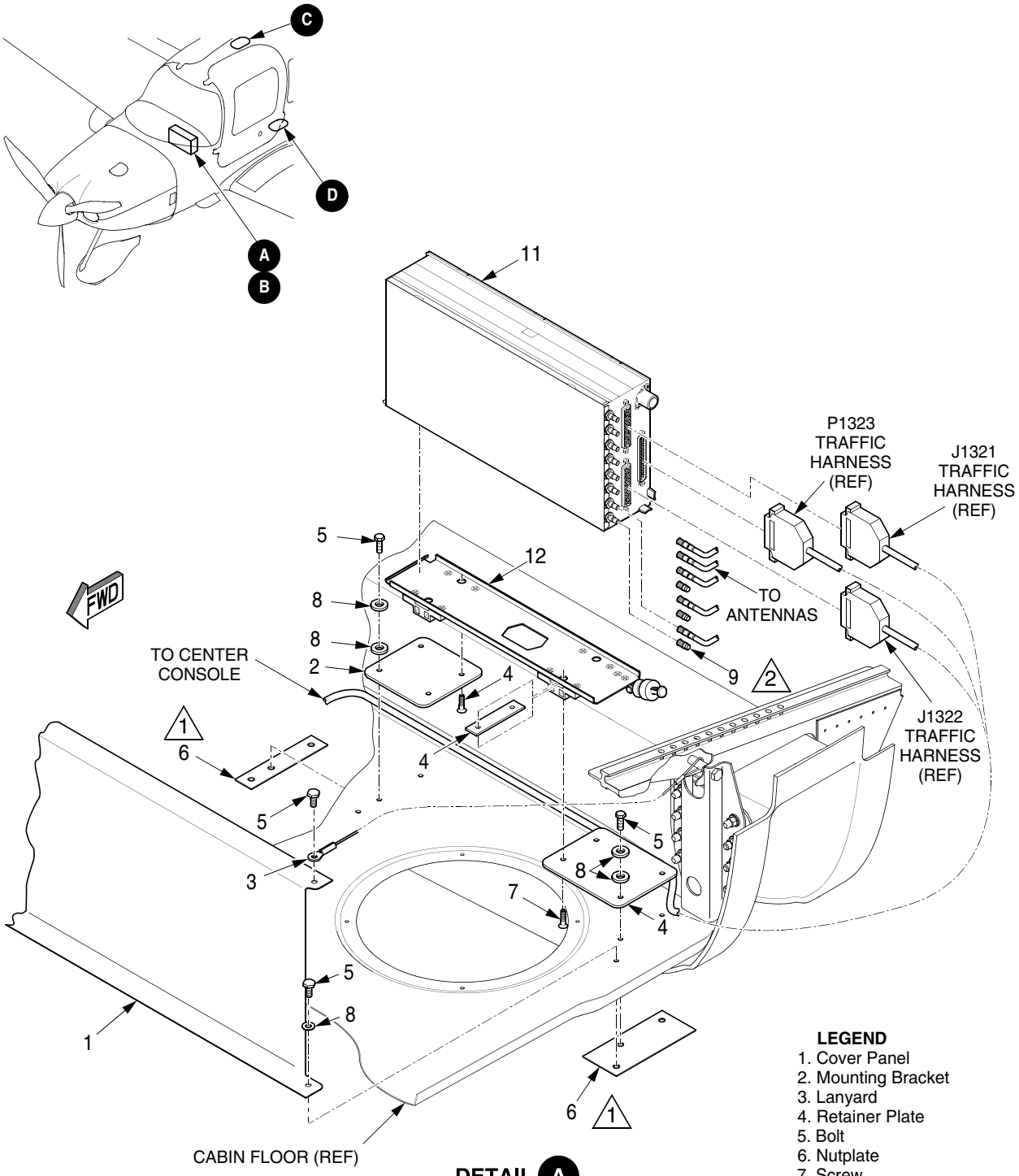
(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(h) Perform Functional Test - Garmin GTS 800 System. (Refer to 34-40)

(i) Install access panel CF4C. (Refer to 06-00)

(j) Install cabin floor covering. (Refer to 25-10)

(k) Install aft passenger seats. (Refer to 25-10)



DETAIL A

Serials 2047 & subs
w/ Perspective Avionics & w/o GDL 88.

LEGEND

1. Cover Panel
2. Mounting Bracket
3. Lanyard
4. Retainer Plate
5. Bolt
6. Nutplate
7. Screw
8. Washer
9. QMA Termination Plugs
10. GTS 800 LRU
11. GTS 800 LRU Rack

NOTE

1 May be secured to cabin floor surface with 5-minute epoxy.

2 QMA termination plugs installed at J2 BTM, J3 BTM, and J4 BTM.

SR20_MM34_3311B

Figure 34-404
Garmin GTS 800 System - Serials 2047 & subs w/ Perspective Avionics (Sheet 1 of 3)

EFFECTIVITY:
Serials 2047 & subs w/ Perspective Avionics

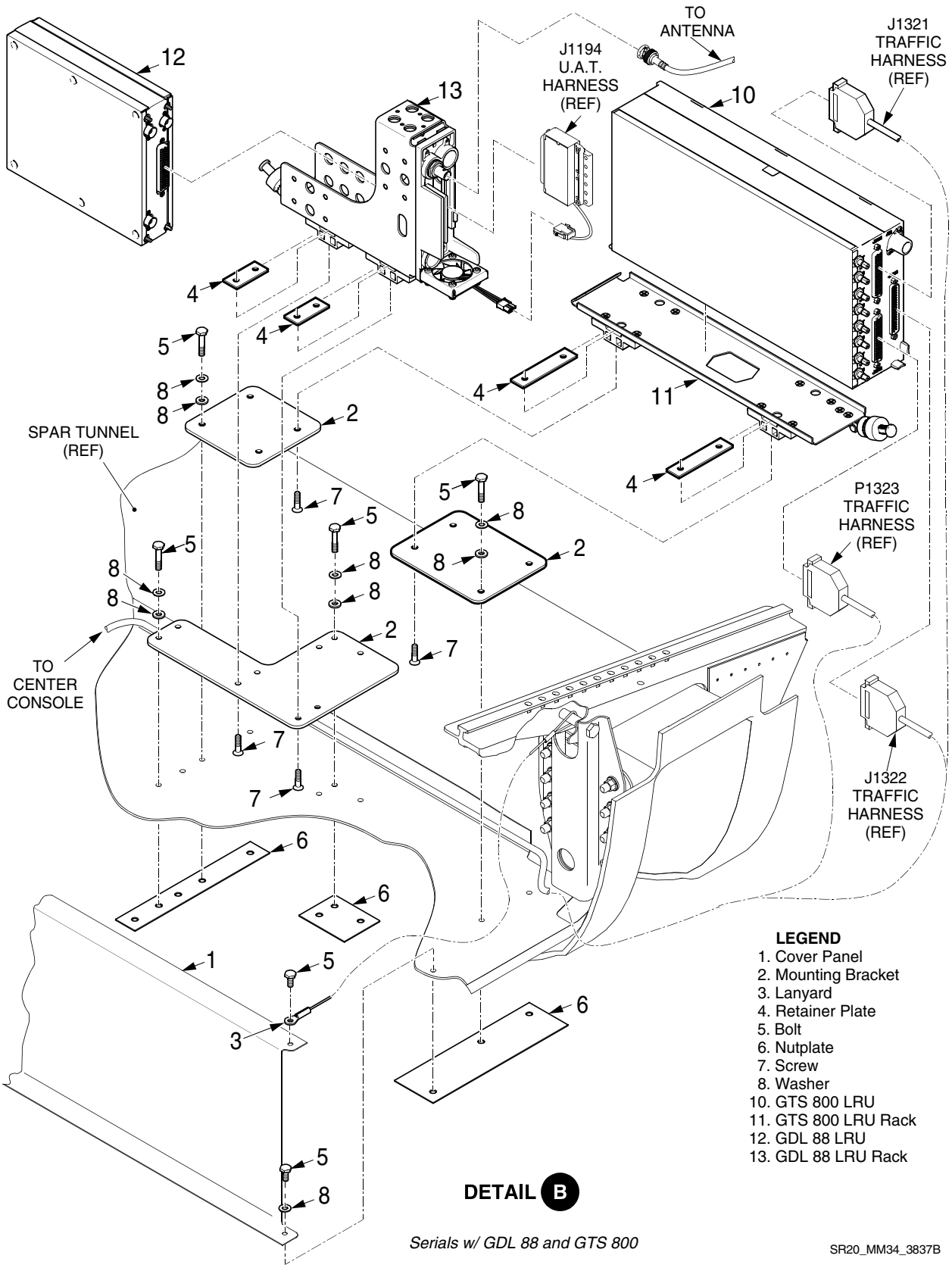
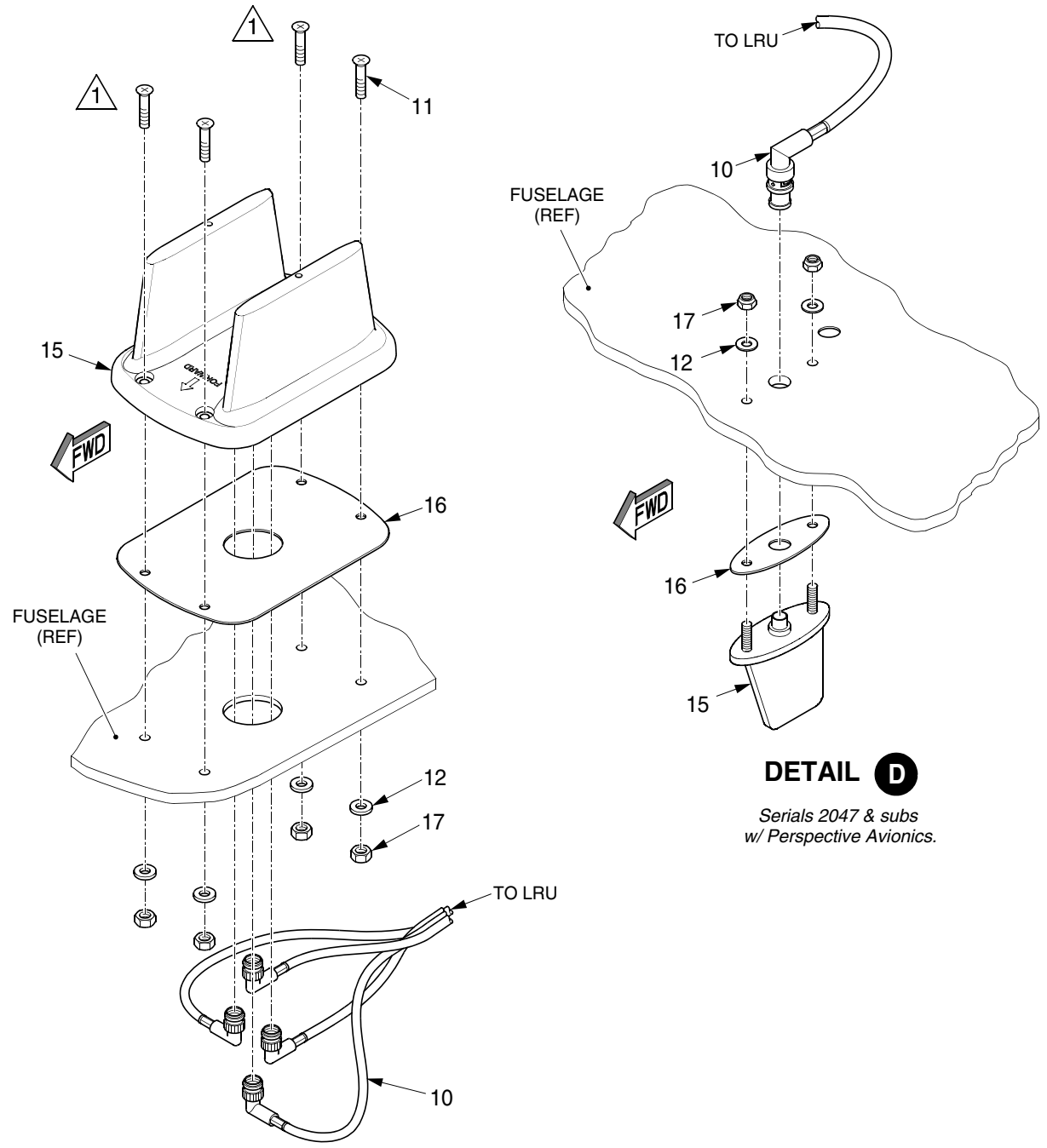


Figure 34-404
Garmin GTS 800 System - Serials w/ GDL 88 (Sheet 2 of 3)



LEGEND

10. Antenna Cable
11. Screw
12. Washer
15. Antenna
16. Gasket
17. Nut

NOTE

1 Install longer screws on RH side of upper antenna.

SR20_MM34_3313A

Figure 34-404
Garmin GTS 800 System - Serials 2047 & subs w/ Perspective Avionics (Sheet 3 of 3)

DEPENDENT POSITION DETERMINING

1. DESCRIPTION

This section covers that portion of the system which provides information to determine position from sources which are mainly dependent on ground installations. This includes the GPS Navigator transceivers, GPS / WAAS GPS antennas, transponder, course deviation indicator (CDI), VOR/LOC antenna, HSI components, XM Weather system, Iridium Weather system, Automatic Direction Finder (ADF), and Distance Measuring Equipment (DME) receiver and antenna.

A. GPS Navigator Transceivers

One or two VHF communications (COM) transceivers are installed to provide VHF communication. The transceivers and integrated controls are mounted in a single GNC 420(W) unit, single GNS 430(W) unit, GNS 430(W)/GNC 250XL units, GNS 430(W)/GNC 420(W) units, or dual GNS 430(W) units.

The transceivers receive all narrow- and wide-band VHF communication transmissions transmitted within range of the selected frequency. The antennas pick up the signals and route the communication signals to the transceivers, which digitize the audible communication signal. The digitized audio is then routed to the audio control unit for distribution to the speakers or headphones.

The Garmin GNC 250XL is an VFR certified VHF communications transceiver and GPS sensor. The GNC 250XL includes a removable data card.

The Garmin GNC 420 is an IFR certified VHF communications transceiver and GPS sensor. The transceiver incorporates a GPS sensor and includes two removable data cards, one with a Jeppesen data base, and the second being a custom data card.

The Garmin GNC 420W is an IFR certified, WAAS capable VHF communications transceiver and GPS sensor. The transceiver incorporates a GPS sensor and includes two removable data cards, one with a Jeppesen data base, and the second being a custom data card. WAAS guidance functionality is available to provide additional instrument approach options.

The Garmin GNS 430 is an IFR certified VHF communications transceiver and Navigation Management System (NMS). The NMS includes GPS sensor, VOR/Localizer and Glideslope receivers. The GNS 430 includes two removable data cards, one with a Jeppesen data base, and the second being a custom data card.

The Garmin GNS 430W is an IFR certified, WAAS capable VHF communications transceiver and Navigation Management System (NMS). The NMS includes GPS sensor, VOR/Localizer and Glideslope receivers. The GNS 430W includes two removable data cards, one with a Jeppesen data base, and the second being a custom data card. WAAS guidance functionality is available to provide additional instrument approach options.

Serials 1005 thru 1422 before SB 2X-34-06: GPS signals are received by an antenna mounted inside the fuselage under the forward headliner and by an antenna mounted inside the fuselage under the instrument console.

Serials 1423 thru 1801, 1803 thru 1815, Serials 1005 thru 1422 after SB 2X-34-06: GPS signals are received by antennas mounted inside the fuselage under the instrument console.

Serials 1802, 1816 & subs, Serials 1005 thru 1422 after SB 2X-34-23, Serials 1337 thru 1801, 1803 thru 1815 after SB 2X-34-24: WAAS GPS signals are received by antennas mounted externally to top of fuselage.

Note: *Serials w/ Garmin GNC 250XL GPS2:* WAAS capability for GPS2 is not supported.

Serials w/ single GNC 420(W) unit: For single GNC 420(W) designated as COM1, 28 VDC is supplied through the 5-amp GPS1 and 7.5-amp COM1 circuit breakers on the Avionics Non-Essential Bus.

Serials w/ single GNS 430(W) unit: For single GNS 430(W) designated as COM1, 28 VDC is supplied through the 5-amp GPS1 and 7.5-amp COM1 circuit breakers on the Avionics Essential Bus.

Serials w/ GNS 430(W)/GNC 250 XL units: For upper GNS 430(W) designated as COM1, 28 VDC is supplied through the 5-amp GPS1 and 7.5-amp COM1 circuit breakers on the Avionics Essential Bus. For lower GNC 250XL designated as COM2, 28 VDC is supplied through the 5-amp GPS2 and 7.5-amp COM2 circuit breakers on the Avionics Non-Essential Bus.

Serials w/ GNS 430(W)/GNC 420(W) units: For upper GNS 430(W) designated as COM1, 28 VDC is supplied through the 5-amp GPS1 and 7.5-amp COM1 circuit breakers on the Avionics Essential Bus. For lower GNC 420 designated as COM2, 28 VDC is supplied through the 5-amp GPS2 and 7.5-amp COM2 circuit breakers on the Avionics Non-Essential Bus.

Serials w/ dual GNS 430(W) units: For upper GNS 430(W) designated as COM1, 28 VDC is supplied through the 5-amp GPS1 and 7.5-amp COM1 circuit breakers on the Avionics Essential Bus. For lower GNS 430(W) designated as COM2, 28 VDC is supplied through the 5-amp GPS2 and 7.5-amp COM2 circuit breakers on the Avionics Essential Bus.

For additional information on the GPS navigator transceivers, see the Garmin 400 Series Installation Manual. (Refer to 05-10)

B. Transponder

Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics: The Garmin GTX 320 *(Serials 1005 thru 1099)*, Garmin GTX 327 *(Serials 1100 & subs w/o Mode S),* or Garmin GTX 330 *(Serials 1425 & subs w/ Mode S, Serials 1337 & subs after SB 2X-34-09)* transponder is mounted in the center console.

The transponder receives interrogations from a ground-based secondary radar transmitter and transmits the airplane's identification to the Air Traffic Control Center via Mode A transmissions and altitude information via Mode C. In addition, the GTX 330 transponder and Becker Mode S also send a unique aircraft address via Mode S to enhance the tracking capabilities of ATC and other Mode S transponder-equipped aircraft. 28 VDC for receiver, transmitter, and altitude encoder operation is supplied through the 2-amp ENCODER/XPONDER circuit breaker on the Avionics Non-Essential Bus.

For additional information on the Garmin transponders, see the GTX 327 Transponder Installation and Operation Manual and the GTX 330 Pilot's Guide. (Refer to 05-10)

Serials 2016 & subs w/ Perspective Avionics: The Garmin GTX 32 or GTX 33 transponder is located behind the aft cabin bulkhead in the empennage avionics compartment.

The GTX 32 transponder provides Modes A and C interrogation/reply capabilities. The GTX 33 Mode S solid-state transponder provides Modes A, C, and S interrogation/reply capabilities. The transponder communicates with the primary Integrated Avionics Unit and is controlled via the PFD or Flight Management System Keyboard. 28 VDC for transponder operation is supplied through the 2-amp XPONDER circuit breaker on the Avionics Bus.

Refer to the Perspective Integrated Avionics System Pilot's Guide for a complete description of the system, its operating modes, and additional detailed operating procedures. (Refer to 05-10)

The GTX 32 and GTX 33 transponders are integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

C. Course Deviation Indicator (CDI)

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The Garmin GI-102(A) and GI-106(A) are panel-mounted Course Deviation Indicators (CDI's) with rectilinear meter movements and integral GPS, NAV, and VLOC mode annunciators. Both units provide a VOR/LOC/GPS needle, TO/FROM indicator, NAV warning flag, and an integral resolver for OBS feedback. The GI-106A also provides a GS needle and flag. 28 VDC for lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

D. Horizontal Situation Indicator (HSI/EHSI)

Serials 1005 thru 1267: The NSD-360A HSI, located directly below the attitude indicator, has an vacuum driven gyro slaved to a flux detector mounted in the right wing and an amplifier mounted under the copilot floor for continuous compass card correction. The HSI mode switch is mounted directly beneath the HSI to allow the pilot to select either SLAVE or FREE GYRO mode. The HSI displays a stable indication of the airplane heading to the pilot. 28 VDC is supplied through the 5-amp HSI#1 circuit breaker on the Essential Bus and 5-amp HSI#2 circuit breaker on Main Bus 2.

Serials 1005 thru 1336, 1337 thru 1422 w/o PFD: The NSD-1000 HSI, located directly below the attitude indicator, has an electrically driven gyro slaved to a flux detector mounted in the right wing and an amplifier mounted under the copilot floor for continuous compass card correction. The HSI mode switch is mounted directly beneath the HSI to allow the pilot to select either SLAVE or FREE GYRO mode. The HSI displays a stable indication of the airplane heading to the pilot. 28 VDC for the redundant power circuits is supplied through the 5-amp HSI#1 circuit breaker on the Essential Bus and 5-amp HSI#2 circuit breaker on Main Bus 2.

Serials 1148 thru 1336, 1337 thru 1422 w/o PFD: The SN3308 EHSI is located directly below the attitude indicator and performs the functions of a standard HSI combined with a two-pointer RMI. The instrument also displays a moving map, marker beacon, WX500 stormscope data, and GPS data. The EHSI system includes a remote gyro located under the RH passenger seat which is slaved to a flux detector mounted in the right wing. 28 VDC for the redundant power circuits is supplied through the 5-amp HSI#1 circuit breaker on the Essential Bus and 5-amp HSI#2 circuit breaker on Main Bus 2.

E. XM Weather System - *Serials w/o Perspective Avionics*

Serials 1005 thru 1797: The Avidyne XM Weather system consists of the XM Weather Receiver mounted behind the RH bolster panel, XM Weather antenna (standalone, XM/COM1, or XM/WAAS) mounted externally to top of fuselage, and system wire harness.

Serials 1798 & subs: The Avidyne XM Weather system consists of the XM Weather Receiver mounted in the RH aft fuselage, XM Weather antenna (standalone, XM/COM1, or XM/WAAS) mounted externally to top of fuselage, and system wire harness.

The XMD076A Data Link Satellite Receiver receives and transmits real-time weather information to the MFD and PFD. The receiver also provides digital XM audio entertainment to the cabin audio system controlled by the XMC050 Remote Control.

The XM Weather system utilizes continuous satellite broadcasts to display real time, location-specific graphical weather information on the MFD. To enhance the situational awareness to the pilot, the MFD will display NEXRAD Radar, METARs, SIGMETs, AIRMETs, TFRs, and Lightning Strikes from the National Lightning Detection Network. XM Radio is optionally integrated into the XM Weather system. (Refer to 23-30)

The XM Weather system is powered by 28 VDC through the 3-amp WEATHER/STORMSCOPE circuit breaker on the Avionics Non-Essential Bus. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

F. XM Weather System - *Serials w/ Perspective Avionics*

The XM Weather system consists of the XM Weather Receiver mounted in the empennage avionics compartment, XM Weather/WAAS Combo Antenna mounted externally to top of fuselage, and system wire harness.

The GDL 69/69A Data Link Satellite Receiver receives and transmits real-time weather information to the MFD and PFD.

- *Serials w/o Flight Stream 210:* If GDL 69A option is installed, this unit also provides digital XM audio entertainment to the cabin audio system via the audio panel. It is controlled by the MFD or the GRT 10 XM Remote Transceiver with GRC 10 Remote Control.

- *Serials w/ Flight Stream 210:* If GDL 69A option is installed, this unit also provides digital XM audio entertainment to the cabin audio system via the audio panel. It is controlled by MFD or the Flight Stream 210 Bluetooth™ Transceiver with compatible mobile devices. For maintenance practices related to the Flight Stream 210, see the Passenger Address and Entertainment section of Communications. (Refer to 23-30)

The XM Weather system utilizes continuous satellite broadcasts to display real time, location-specific graphical weather information on the MFD. To enhance the situational awareness to the pilot, the MFD will display NEXRAD Radar, METARs, SIGMETs, AIRMETs, TFRs, and Lightning Strikes from the National Lightning Detection Network. XM Radio is optionally integrated into the XM Weather system. (Refer to 23-30)

Serials 2016 thru 2126: The XM Weather system is powered by 28 VDC through the 3-amp WEATHER circuit breaker on the Avionics Non-Essential Bus.

Serials 2127 & subs: The XM Weather system is powered by 28 VDC through the 5-amp WEATHER/DATALINK circuit breaker on the Avionics Non-Essential Bus.

The GDL 69/69A Data Link Satellite Receiver is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

Note: *Serials 2127 & subs:* The XM Weather System is available as an optional installation with or without the Iridium Weather System.

G. Iridium Weather System - *2016 & subs w/ Perspective Avionics*

The Iridium Weather system consists of the GSR 56 Iridium Transceiver installed immediately behind the aft cabin bulkhead, the GPS/Iridium Combo Antenna mounted externally to top of fuselage, and system wire harness.

The GSR 56 Transceiver receives and transmits real-time weather information to the MFD and PFD. If the Iridium subscription-based voice and data service is active, satellite telephone/voice communications and text messaging (SMS) are provided. The dialing interface is provided through the MFD and incoming call messages are prioritized with other aural messages.

The Iridium Weather system utilizes continuous satellite broadcasts to display real time, worldwide graphical weather information on the MFD. To enhance the situational awareness to the pilot, the MFD will display NEXRAD Radar, METARs, Winds Aloft, Temps Aloft, NOTAMs, SIGMETs, AIRMETs, TFRs, PIREP, and Lightning Strikes from the National Lightning Detection Network. In addition, radar and satellite imagery are available for the United States, Southern Canada and Western Europe.

The Iridium Weather system is powered by 28 VDC through the 5-amp WEATHER/DATALINK circuit breaker on the Avionics Non-Essential Bus.

The GSR 56 Transceiver is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

Note: The Iridium Weather System is available as an optional installation with or without the XM Weather System.

2. TROUBLESHOOTING

Serials 2016 & subs w/ Perspective Avionics:

Trouble	Probable Cause	Remedy
Transponder not receiving valid data.	Software or configuration error.	Check PFD Alert Window for GIA1, GIA2, and GTX 32/33 configuration, software, or failed data path error messages. Correct any errors before proceeding. Perform a SET>ACTV configuration reset on GTX Transponder Configuration page for each installed GTX. For GTX 33 transponders, verify aircraft registration is entered in GTX Transponder Configuration page.
	Faulty connector.	Check GIA and GTX racks for connector pin faults (push-back or bent) on the RS-232 interconnect lines.
	Faulty transponder.	Replace transponder.

Serials 2127 & subs w/ Iridium Weather System:

Trouble	Probable Cause	Remedy
No communication with GSR 56.	Disconnected or faulty wiring.	Check power wiring and pin out.
	Incorrect settings.	Verify correct communication port setting on display/control device.
No or low-quality signal.	Antenna interference.	Ensure the Iridium antenna has an unobstructed view of satellite constellation.
	Disconnected or faulty wiring.	Check the antenna cable and connectors.
	Compromised ground plane.	Verify antenna ground plane is adequate.
No audio output.	Disconnected or faulty wiring.	Check wiring from GSR 56 to audio panel.
	No subscription with Garmin Iridium Services.	Verify subscription with Garmin Iridium Services.

Trouble	Probable Cause	Remedy
Unable to make a phone call.	No subscription with Garmin Iridium Services.	Verify subscription with Garmin Iridium Services.
	No call signal.	Verify signal quality is adequate.
	Disconnected or faulty wiring.	Verify communication between GSR 56 and the display/control device..

3. MAINTENANCE PRACTICES

A. Garmin 400 Series GPS Navigator - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-501)

(1) Removal - Garmin 400 Series GPS Navigator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Insert 3/32-inch hex wrench into front panel bolt hole and engage hex bolt.

(d) Rotate locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out 0.25 inch (0.64 cm) and disengage from the electrical connectors.

CAUTION: For dual GNS or GNS/GNC configurations, note positions for GPS1 and GPS2 when originally installed transceivers will be replaced.

(e) Pull transceiver from mounting tray.

(2) Installation - Garmin 400 Series GPS Navigator

CAUTION: When mounting the transceivers, do not press on display window as damage may result.

For dual GNS or GNS/GNC configurations, verify when replacing originally installed transceivers that GPS1 and GPS2 positions are retained.

(a) With light to medium pressure, push transceiver into mounting tray to engage electrical connectors.

(b) Insert 3/32-inch hex wrench into front panel bolt hole and engage hex bolt.

(c) Rotate bolt clockwise to tighten locking cam.

(d) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(e) If transceiver is a different unit from the originally installed transceiver:

1 Perform Functional Test - Garmin 400 Series GPS Navigator Setup. (Refer to 34-50)

2 Perform Functional Test - Garmin 400 Series GPS Navigator Clock Setup. (Refer to 34-50)

3 *Serials w/ Dual GNS:* Perform Functional Test - Dual Garmin 400 Series GPS Navigator Crossfill Setup. (Refer to 34-50)

4 Perform Operational Test - Garmin 400 Series GPS Navigator VHF COM Check. (Refer to 34-50)

(f) If transceiver is the same unit as the originally installed transceiver:

1 *Serials w/ Dual GNS:* Perform Functional Test - Dual Garmin 400 Series GPS Navigator Crossfill Setup. (Refer to 34-50)

2 Perform Operational Test - Garmin 400 Series GPS Navigator VHF COM Check. (Refer to 34-50)

(3) Operational Test - Garmin 400 Series GPS Navigator VHF COM Check

A flight test is recommended after the installation to verify satisfactory performance. To check the communications transceiver:

(a) Maintain an appropriate altitude and contact a ground station facility at a range of at least 50 nautical miles.

(b) Contact a close ground station.

(c) Press the squelch disable button to defeat the automatic squelch feature and listen for any unusual electrical noise which would increase the squelch threshold.

(d) If possible, confirm communications capability on both high and low ends of the VHF COM band.

(4) Functional Test - Garmin 400 Series GPS Navigator Setup

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(c) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(d) On transceiver(s), rotate [C] knobs for COM power counter-clockwise to OFF positions.

Note: Right data card slot contains blank card.

(e) On transceiver(s), verify data cards are installed for GPS1 and, if applicable, GPS2 in left data card slot.

(f) While holding [ENT], rotate [C] knobs for COM power clockwise to ON positions. Release [ENT] after display is on.

(g) After power-up, the Self Test pages will display, followed by the Database page.

(h) On dual GNS or GNS/GNC units, verify GPS1 and GPS2 have the same MAIN SOFTWARE VERSION, GPS SOFTWARE VERSION, and CYCLE numbers displayed.

(i) On the Database page, press [ENT].

(j) On the Instrument Panel Self-Test page, press [ENT].

(k) Navigate subsequent pages by use of transceiver controls.

Note: Only the GPS indicated by the NAV selection on the PFD will be displayed. Not all parameters are editable.

To turn on cursor, press inner dial of [CRSR] knob.

To move between data fields, rotate outer dial of [CRSR] knob.

To change a field that cursor is on, rotate inner dial of [CRSR] knob.

To accept entry of current selection, press [ENT].

To turn off cursor before switching pages, press inner dial of [CRSR] knob.

To switch between pages, rotate inner dial of [CRSR] knob.

1 Set parameters for the Main ARINC 429 Config page for GPS1.

	SPEED	**DATA**
IN 1 - *Serials 1005 thru 1422 w/ Century HSI*	Low	Off
IN 1 - *Serials 1005 thru 1422 w/ Sandel EHSI, Serials 1337 thru 1422 w/ PFD, 1423 & subs*	Low	Sandel EHSI
IN 2 - *Serials 1005 & subs w/o SkyWatch and w/ GNC 420W/GNS 430W*	Low	Off
IN 2 - *Serials 1005 & subs w/ SkyWatch and w/o GNC 420W/GNS 430W*	Low	Traffic Advisory
IN 2 - *Serials 1005 & subs w/ SkyWatch and w/ GNC 420W/GNS 430W*	High	Traffic Advisory
OUT	Low	GAMA 429 grph w/int
SDI	LNAV 1	
VNAV - *Serials w/ PFD S/W Rel. 6.2.2 or lower*	Disable Labels	

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

VNAV - *Serials w/ PFD S/W Rel. 7.0 or higher*	Enable Labels

2 Set parameters for the Main ARINC 429 Config page for GPS2.

	SPEED	DATA
IN 1 - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*	Low	Off
IN 1 - *Serials 1337 thru 1422 w/ PFD, 1423 thru 2015, 2016 & subs w/o Perspective Avionics*	Low	Sandel EHSI
IN 2 - *Serials 1005 & subs w/o SkyWatch and w/ GNC 420W/GNS 430W*	Low	Off
IN 2 - *Serials 1005 & subs w/ SkyWatch and w/o GNC 420W/GNS 430W*	Low	Traffic Advisory
IN 2 - *Serials 1005 & subs w/ SkyWatch and w/ GNC 420W/GNS 430W*	High	Traffic Advisory
OUT	Low	GAMA 429 grph w/int
SDI	LNAV 2	
VNAV - *Serials w/ PFD S/W Rel. 6.2.2 or lower*	Disable Labels	
VNAV - *Serials w/ PFD S/W Rel. 7.0 or higher*	Enable Labels	

3 Set parameters for the Main RS232 Config page for GPS1 and GPS2.

	INPUT	OUTPUT
CHAN 1	Icarus-alt	Aviation
CHAN 2 - *Serials 1005 & subs w/o TAWS*	Off	Off
CHAN 2 - *Serials 1005 & subs w/ TAWS*	Off	HW EGPWS
CHAN 3	Crossfill	Crossfill
CHAN 4 - *Serials 1005 & subs w/o Stormscope and GNC/GNS Main S/W Rel. 2.0 or lower*	Off	Off
CHAN 4 - *Serials 1005 & subs w/ Stormscope and GNC/GNS Main S/W Rel. 3.0 or higher*	WX 500	Off
FUEL TYPE	AV gas	

4 The Main Inputs 1 page is not used.

5 The Main Inputs 2 page is not used.

6 Set parameters for the Instrument Panel Self-Test page.

LCDI	Half Left
LFLG	Out of View
TO/FRM	To
RMI	135°
DTK	150°

7 For the Main Lighting page, cover photocell and observe that display slowly dims and lighting values decrease.

Note: Main Lighting page values may differ from those below due to your unique lighting environment.

8 Set parameters for the Main Lighting page.

	DISPLAY	**KEY**
LIGHTING	0-9999	0-9999
SOURCE	PHOTO	28VDC
RESP TIME/MIN	4 080	4 40
SLOPE/OFFSET	50 50	50 50

9 Set parameters for the Date/Time Setup page.

10 Set parameters for the Main Discrete Inputs page.

GRAY CODE	00000000000
DECODED ALTITUDE	_ _ _ _ _ _ ft
RMT CDI	unchecked
RMT OBS	unchecked

11 The Main Discrete Outputs page is not used.

12 *Serials 1005 thru 1422 w/ Century HSI:* Set parameters for the Main CDI/ OBS Config page.

	CDI	**NAV FLAG**	**TO-FROM**
LAT	Center	Hidden	Hidden
VERT	Center	Hidden	
SELECTED COURSE	148° Calibrate to 150°?		
CDI	GPS		
OBI SOURCE	Track CDI		
VERT	Flag Center		

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

13 *Serials 1005 thru 1422 w/ Century HSI:* Toggle settings to verify outputs display correctly for the corresponding indicators.

	CDI	NAV FLAG	TO-FROM
LAT	Max Left Full Left Center Full Right Max Right	Hidden In View	From Hidden To
VERT	Max Up Full Up Center Full Down Max Down	Hidden In View	

14 *Serials 1005 thru 1422 w/ Century HSI:* Set OBS dial on HSI to "150°".

15 *Serials 1005 thru 1422 w/ Century HSI:* Select "Calibrate To 150°?", then press [ENT].

16 *Serials 1005 thru 1422 w/ Century HSI:* Set OBS to other headings around dial to verify correct readings.

17 *Serials 1005 thru 1422 w/ Sandel EHSI, 1337 thru 1422 w/ PFD, 1423 & subs:* The Main CDI / OBS Config page is not used.

18 Set parameters for the COM Setup page for COM1 and COM2.

FREQ	136.975
SPACING	25.0 KHz
S 250	10
S 833	08
SIDE	07
MIC	44

19 The VOR Discrete Inputs page is not used.

Note: Set DME CGNL MODE only. Do not adjust any other settings.

20 Set parameters for the VOR/LOC/GS CDI page.

	CDI	FLAG	S-FLG	TO-FR
LAT	Center	Hide	Hide	From
VERT	Center	Hide	Hide	
SELECTED COURSE	No input			
DME CGNL MODE	Parallel 2x5			

21 Set parameters for the VOR / LOC / GS ARINC 429 Config page for GPS1.

	RX	TX
SPEED	Low	Low
SDI	VOR / ILS 1	
DME MODE	Directed freq 1	

22 Set parameters for the VOR / LOC / GS ARINC 429 Config page for GPS2.

	RX	TX
SPEED	Low	Low
SDI	VOR / ILS 2	
DME MODE	Directed freq 2	

23 *Serials w/ GNC 420W or GNS 430W:* Set parameters for the GPS Vertical Offset page.

GPS ANTENNA HEIGHT ABV GND 6.0ft

24 *Serials w/ GNC 420 or GNS 430 and GNC/GNS Main S/W Rel. 5.01 or higher:* On the Main System Config page, set parameters for GPS1 and GPS2.

CONFIGURE	Terrain
TERRAIN TYPE	Terrain
TEST CARD	Untested
HW CONFIG	Terrain

25 *Serials w/ GNC 420 or GNS 430 and GNC/GNS Main S/W Rel. 5.01 or higher:* Highlight the TEST CARD field, then press [ENT]. Verify the TEST CARD field indicates “Pass”.

(l) When setup is completed, on transceiver(s), rotate [C] knobs for COM power counterclockwise to OFF positions.

(m) Allow display to blank completely.

(n) On transceiver(s), rotate [C] knobs for COM power clockwise to ON positions.
The Self-Test pages will be displayed followed by the Database page.

(o) On the Database page, press [ENT].

(p) Set parameters on the Instrument Panel Self-Test page.

LCDI	Half Left
LFLG	Out of View
VCDI	Half Up
VFLG	Out of View

CAP	56gl
FOB	0gl
FF	0.0gl
TO/FRM	To
RMI	135°
OBS	150°
ANNUN	On
DTK	150°

(q) Verify parameters for self-test data output by GNS 430(W) on the displays indicated.

Display	**Parameter**	**Self-Test**
VOR and HSI/PFD	Course Deviation	½ scale left deviation, TO flag, NAV flag pulled
VOR and HSI **-** *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*	Glidescope/ Vertical Deviation	½ scale up deviation, GS flag pulled
MFD and EHSI/PFD	Active Waypoint (WPT)	"GARMN"
MFD and EHSI/PFD	Distance To Go (DIS)	10.0 nautical miles
MFD and EHSI/PFD	Desired Track (DTK)	150°
MFD and EHSI/PFD	Bearing to Wpt (BRG)	135°
MFD and EHSI/PFD	Groundspeed (GS)	150 knots
MFD and EHSI **-** *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD*	Track (TRK)	135°
MFD and EHSI/PFD	Time to Go (ETE)	4 minutes

(r) On transceiver(s), press [ENT]. Upon approval of the Database page, the Satellite Status page will be displayed.

(s) *Serials w/ GNC 420W or GNS 430W:* Verify continuous GPS reception during COM transmissions for GPS1 and GPS2.

1 Using large outer RH knob, select NAV group.

2 Rotate small RH knob to select Satellite Status page.

3 On audio panel, select “COM1”.

4 Set COM1 to each of the following frequencies and verify that the reception of GPS1 and GPS2 is not lost during a COM transmission.

121.150 MHz	121.225 MHz	131.225 MHz	131.300 MHz
121.175 MHz	121.250 MHz	131.250 MHz	131.325 MHz
121.200 MHz	131.200 MHz	131.275 MHz	131.350 MHz

5 On audio panel, select “COM2”.

6 Set COM2 to each of the following frequencies and verify that the reception of GPS1 and GPS2 is not lost during a COM transmission.

121.150 MHz	121.225 MHz	131.225 MHz	131.300 MHz
121.175 MHz	121.250 MHz	131.250 MHz	131.325 MHz
121.200 MHz	131.200 MHz	131.275 MHz	131.350 MHz

(t) *Serials 1337 thru 1422 w/ PFD, 1423 & subs:* Verify coupling between PFD and COM/NAVs:

1 On PFD, press [Nav1] to select "GPS1".
2 Verify Nav1 selection on PFD matches CDI setting of "GPS" on GNS 430(W).
3 On PFD, press [Nav1] to select "VLOC1".
4 Verify CDI setting on GNS 430(W) changes to "VLOC".
5 On GNS 430(W), press [CDI] to select "GPS".
6 On PFD, verify Nav1 selection changes back to "GPS1".
7 If applicable, repeat coupling procedure for the lower GNS 430(W) or GNC 420(W).

(u) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.
(v) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(w) Disconnect 28 ±1 VDC external power from external power receptacle.

(5) Functional Test - Garmin 400 Series GPS Navigator Clock Setup
(a) Set BAT 1 and AVIONICS switches to ON positions.
(b) On GNS unit, rotate [C] knob for COM power clockwise to ON position.
(c) After power-up, the Self Test pages will display, followed by the Database page.
(d) On the Database page, press [ENT].
(e) On the Instrument Panel Self-Test page, press [ENT].
(f) Rotate outer dial of [CRSR] knob to select the first Aux (Flight Planning) page.
(g) Rotate inner dial of [CRSR] knob to select the third Aux (Setup 1) page.
(h) Press inner dial of [CRSR] knob to activate cursor.
(i) Rotate inner dial of [CRSR] knob to select “Date / Time”, then press [ENT].
(j) Rotate inner dial of [CRSR] knob to highlight TIME FORMAT.
(k) Rotate inner dial of [CRSR] knob to select "Local 24hr", then press [ENT].
(l) Rotate inner dial of [CRSR] knob to highlight TIME OFFSET.
(m) Rotate inner dial of [CRSR] knob to select present UTC time, then press [ENT].
(n) Rotate [C] knob for COM power counter-clockwise to OFF position.
(o) Set BAT 1 and AVIONICS switches to OFF positions.

(6) Functional Test - Dual Garmin 400 Series GPS Navigator Crossfill Setup
(a) Set BAT 1 and AVIONICS switches to ON positions.
(b) On GNS unit, rotate [C] knob for COM power clockwise to ON position.
(c) Rotate outer right dial of [CRSR] knob to select the first Aux (Flight Planning) page.
(d) Press inner right dial of [CRSR] knob to highlight the cursor.
(e) Rotate inner right dial of [CRSR] knob to select "Crossfill", then press [ENT].
(f) Verify that status displayed is READY.
(g) Rotate [C] knob for COM power counter-clockwise to OFF position.
(h) Set BAT 1 and AVIONICS switches to OFF positions.

B. Garmin GNC 250XL GPS Navigator (See Figure 34-501)

(1) Removal - Garmin GNC 250XL GPS Navigator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Insert 3/32-inch hex wrench into front panel bolt hole and engage hex bolt.

(d) Rotate locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out 0.25 inch (0.64 cm) and disengage from the electrical connectors.

CAUTION: For dual GNS or GNS/GNC configurations, note positions for GPS1 and GPS2 when originally installed transceivers will be replaced.

(e) Pull transceiver from mounting tray.

(2) Installation - Garmin GNC 250XL GPS Navigator

CAUTION: When mounting the transceivers, do not press on display window as damage may result.

For dual GNS or GNS/GNC configurations, verify when replacing originally installed transceivers that GPS1 and GPS2 positions are retained.

(a) With light to medium pressure, push transceiver into mounting tray to engage electrical connectors.

(b) Insert 3/32-inch hex wrench into front panel bolt hole and engage hex bolt.

(c) Rotate bolt clockwise to tighten locking cam.

(d) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(e) If transceiver is a different unit from the originally installed transceiver:

1 Perform Functional Test - Garmin GNC 250XL GPS Navigator Setup. (Refer to 34-50)

2 Perform Functional Test - Garmin GNC 250XL GPS Navigator Clock Setup. (Refer to 34-50)

3 Perform Operational Test - Garmin GNC 250XL GPS Navigator Check. (Refer to 34-50)

(f) If transceiver is the same unit as the originally installed transceiver:

1 Perform Operational Test - Garmin GNC 250XL GPS Navigator Check. (Refer to 34-50)

(3) Operational Test - Garmin GNC 250XL GPS Navigator Check

A flight test is recommended after the installation to verify satisfactory performance. To check the communications transceiver:

(a) Maintain an appropriate altitude and contact a ground station facility at a range of at least 50 nautical miles.

(b) Contact a close ground station.

(c) Press the squelch disable button to defeat the automatic squelch feature and listen for any unusual electrical noise which would increase the squelch threshold.

(d) If possible, confirm communications capability on both high and low ends of the VHF COM band.

(4) Functional Test - Garmin GNC 250XL GPS Navigator Setup

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(c) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(d) On GNC 250XL, rotate LH power/volume knob counter-clockwise to OFF position.

(e) Remove data card from LH data card slot.

(f) Rotate LH power/volume knob for COM power clockwise to ON position.

(g) When SELECT OPERATING MODE NORMAL OK? is displayed, press [ENT].

(h) When NO JEPPESEN DATABASE RTE/PRX LIMITED TO USER WPTS OK? is displayed, press [ENT].

(i) After the Satellite Status page is displayed for 5 seconds, rotate power/volume knob for COM power counter-clockwise to OFF position.

(j) Install data card to LH data card slot.

(k) While holding [ENT], rotate LH power/volume knob for COM power clockwise to ON position.

(l) When the Display Test page is displayed, release [ENT].

(m) Navigate subsequent pages by use of GNC 250XL controls.

Note: Only the GPS indicated by the NAV selection on the PFD will be displayed. Not all parameters are editable.

To turn on and off cursor, press [CRSR].

To move between pages, rotate outer dial of RH knob.

To move between selections, rotate inner dial of RH knob.

1 Verify cursor is off.

2 Verify for the Display Test page that uniform color is appears on screen as display tests are cycled.

3 Verify for the Key Test page that depressing a key causes the corresponding key on the display to light up.

4 Set parameters for the Lighting page.

SLOPE	20
MIN	50
RESPONSE TIME	6

5 The I/O Channel 1 page is not used.

6 The ARINC 429 page is not used.

7 The CDI Calibration page is not used.

8 Set parameters for the Config Fuel page.

CONFIG FUEL	av gas

9 The Remote Battery page is not used.

10 Set parameters for the Volume page.

VOLUME	39 dB

11 Set parameters for the Signal page.

SVID	16
SNR	0.0

SGNL	~1500
DRFT	19.978
FQ	16367673

12 The OBI Test page is not used.

13 Set parameters for the Altitude Input Test page.

Note: The gray code alt should be approximately 1400 ft ±300 feet.

GRAY CODE ALT	~1400 ft

14 The Communications Loopback Test page is not used.

15 Verify for the External Switch Test page that pressing pilot and co-pilot PTT switches on LH and RH yokes changes fields in display from “off” to “on”.

16 Set parameters for the Annunciator Test page.

PANEL	off
MSG	off
ARRVL	off

17 The CDI and Flag Test page is not used.

18 Set parameters for the Power Test page.

EXTERNAL POWER	14.0
RMT BAT	none
MEM BAT	ok

19 Rotate power/volume knob for COM power counter-clockwise to OFF position, then clockwise to ON position.

20 The Self-Test pages will be displayed followed by the Database page.

21 On the Database page, press [ENT].

22 Verify the Satellite Status page is displayed.

23 Rotate LH power/volume knob for COM power counter-clockwise to OFF position.

(n) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(o) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(p) Disconnect 28 ±1 VDC external power from external power receptacle.

(5) Functional Test - Garmin GNC 250XL GPS Navigator Clock Setup

(a) Set BAT 1 and AVIONICS switches to ON positions.

(b) On GNC unit, rotate LH power/volume knob for COM power clockwise to ON position.

(c) When SELECT OPERATING MODE NORMAL OK? is displayed, press [ENT].

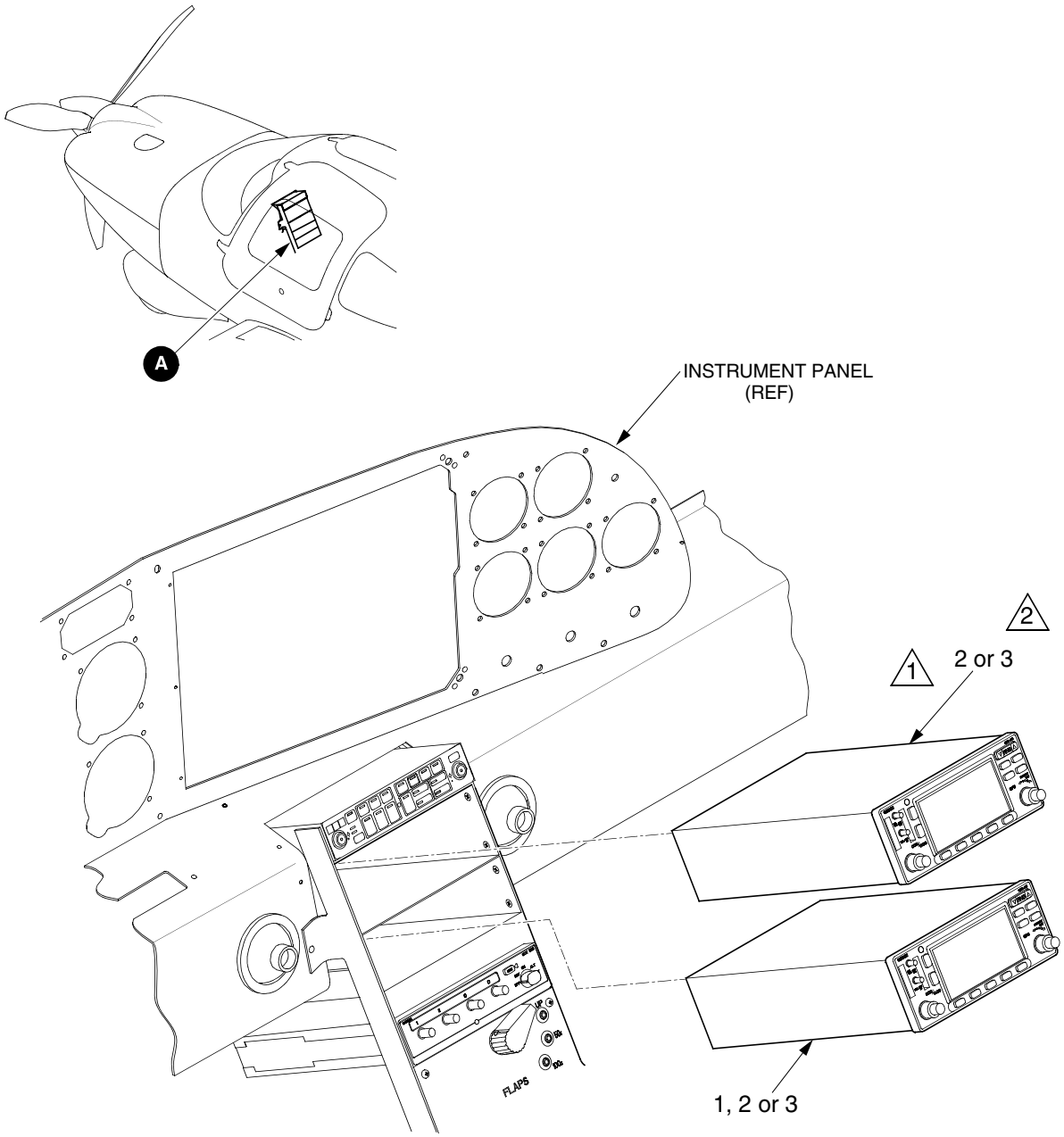
(d) When NO JEPPESEN DATABASE RTE/PRX LIMITED TO USER WPTS OK? is displayed, press [ENT].

(e) After the Satellite Status page is displayed, press [NAV].

(f) Rotate outer dial of RH knob to select the NAV Menu 2 page.

(g) Press [CRSR] twice.

(h) Rotate outer dial of RH knob to select “Clock?”, then press [ENT].
(i) Rotate inner dial of RH knob to select “utc” or “local” for displayed time fields.
(j) Rotate outer dial of RH knob to select local date.
(k) Rotate inner dial of RH knob to set local date, then press [ENT].
(l) Rotate outer dial of RH knob to select local time.
(m) Rotate inner dial of RH knob to set local time, then press [ENT].
(n) Press [CRSR].
(o) Rotate LH power/volume knob for COM power counter-clockwise to OFF position.
(p) Set BAT 1 and AVIONICS switches to OFF positions.



DETAIL A

NOTE

1. Airplanes with GNC 420 GPS in the COM 1 position do not have a GPS configured for the COM 2 position.

2. Airplanes may be equipped with GNS 430 GPS in the COM 1 position with no GPS configured for the COM 2 position.

LEGEND

1. GNC 250XL Transceiver
2. GNC 420 Transceiver
3. GNS 430 Transceiver

SR20_MM34_1091B

Figure 34-501
Transceiver Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

C. GPS1 / GPS2 Antenna - *Serials 1005 thru 1801, 1803 thru 1815* **(See Figure 34-502)**

(1) Removal - GPS1 / GPS2 Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) *Serials 1005 thru 1422:* For GPS1, remove cabin headliner. (Refer to 25-10)

(d) *Serials 1423 thru 1801, 1803 thru 1815:* For GPS1, remove glareshield. (Refer to 25-10)

(e) For GPS2, remove glareshield. (Refer to 25-10)

(f) Disconnect antenna cable from antenna.

(g) Pry antenna from hook and loop fastener securing antenna to installation area.

(h) Remove antenna from airplane.

(2) Installation - GPS1 / GPS2 Antenna

(a) To secure antenna to installation area, firmly press fastener strip on antenna against fastener strip.

(b) Connect antenna cable.

(c) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(d) *Serials 1005 thru 1422:* For GPS1, install cabin headliner. (Refer to 25-10)

(e) *Serials 1423 thru 1801, 1803 thru 1815:* For GPS1, install glareshield. (Refer to 25-10)

(f) For GPS2, install glareshield. (Refer to 25-10)

D. WAAS GPS1 / GPS2 Antenna - *Serials 1802, 1816 & subs* **(See Figure 34-502)**

(1) Removal - WAAS GPS1 / GPS2 Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect GPS cable from antenna.

(e) *Serials w/ XM Weather:* Disconnect XM Weather cable from antenna.

(f) *Serials w/ Iridium Weather:* Disconnect Iridium Weather cable from antenna.

(g) Remove nuts, washers, and screws securing antenna to fuselage.

(h) Remove antenna and gasket from fuselage.

(i) Remove remaining sealant from fuselage.

(2) Installation - WAAS GPS1 / GPS2 Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position gasket and antenna to fuselage and insert screws through mounting holes.

CAUTION: To prevent damage to rubber gasket at screwhead, turn nuts onto screws during installation.

Note: Tighten forward screws prior to tightening aft screws.

(c) Install washers and nuts securing antenna to fuselage. Torque nuts to maximum of 20 - 25 in-lb (2.26 - 2.82 Nm).

(d) Fillet seal antenna perimeter. (Refer to 20-10)

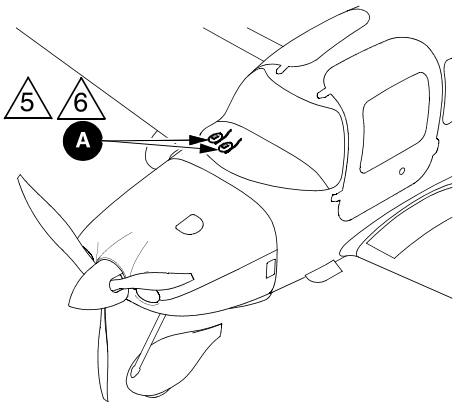
(e) Connect GPS cable to antenna.

(f) *Serials w/ XM Weather:* Connect XM Weather cable to antenna.

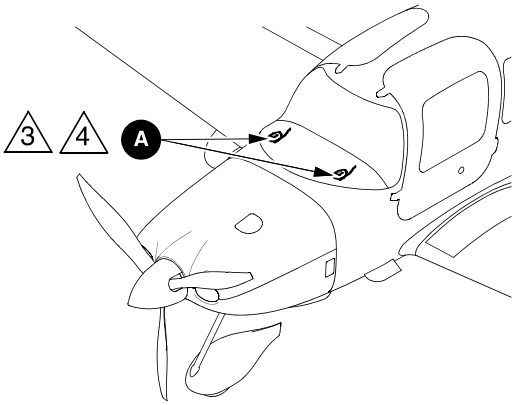
(g) *Serials w/ Iridium Weather:* Connect Iridium Weather cable to antenna.

(h) Install cabin headliner. (Refer to 25-10)

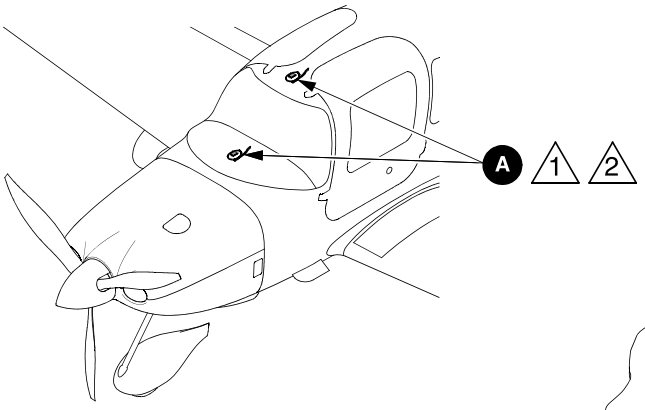
(i) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.



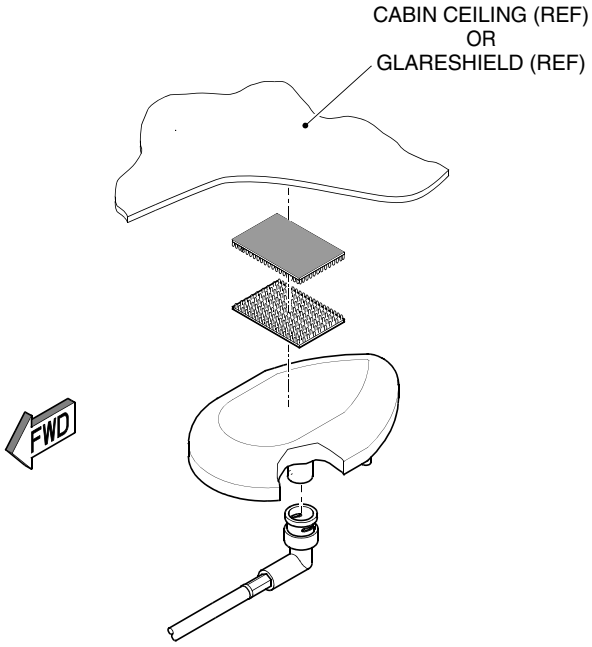
Serials 1005 thru 1422 after SB 2X-34-06.



Serials 1423 thru 1801, 1803 thru 1815.



Serials 1005 thru 1422 before SB 2X-34-06.



DETAIL A

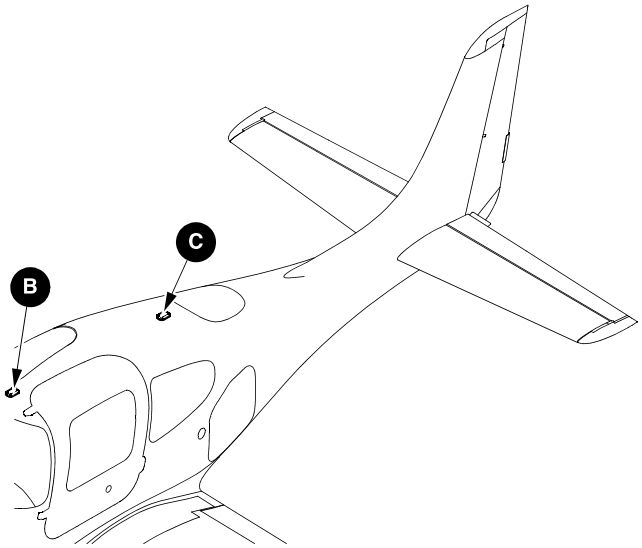
NOTE

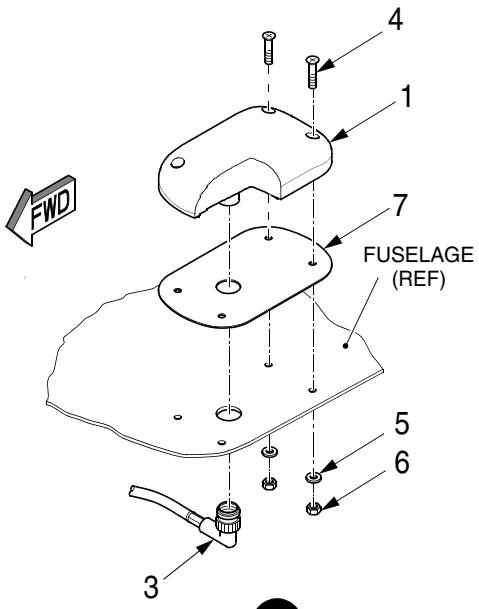
1. GPS 1 installed on cabin ceiling.
2. GPS 2 installed on glareshield.
3. GPS 1 installed on RH glareshield.
4. GPS 2 installed on LH glareshield.
5. GPS 1 installed on RH outboard glareshield.
6. GPS 2 installed on RH inboard glareshield.

SR20_MM34_1090H

Figure 34-502
GPS Antenna Installation - Serials 1005 thru 1801, 1803 thru 1815 (Sheet 1 of 2)

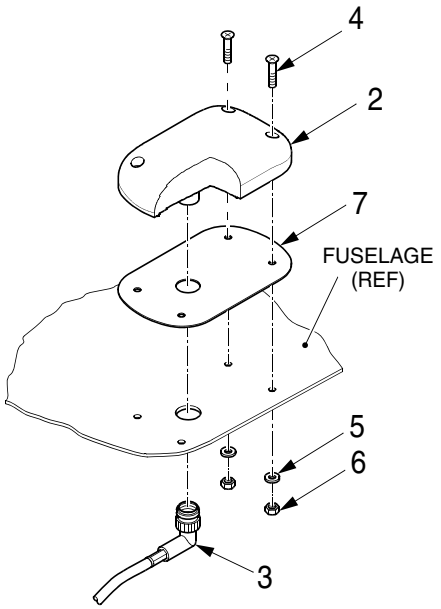
EFFECTIVITY:
Serials 1005 thru 1801, 1803 thru 1815



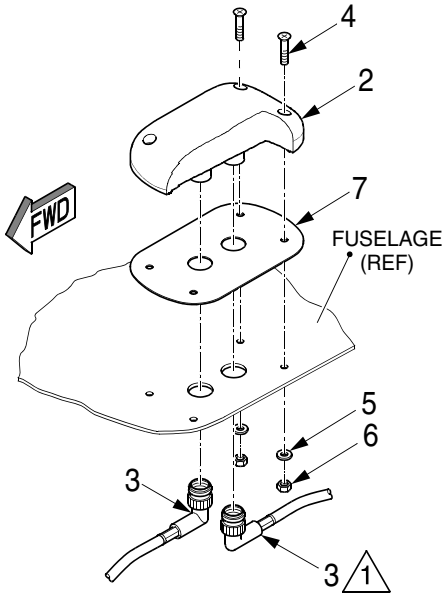


DETAIL B

Serials 1802, 1816 & subs w/ WAAS GPS1 w/o XM Weather,
Serials 1005 thru 1422 after SB 2X-34-23 w/o XM Weather
Serials 1337 thru 1801, 1803 thru 1815 after SB 2X-34-24
w/o XM Weather.



Serials 1802, 1816 & subs w/ WAAS GPS2,
Serials 1005 thru 1422 after SB 2X-34-23,
Serials 1337 thru 1801, 1803 thru 1815
after SB 2X-34-24.



Serials 2127 & subs
w/ WAAS GPS2.

DETAIL C

LEGEND
1. WAAS GPS 1 Antenna
2. WAAS GPS 2 Antenna
3. Antenna Connector
4. Screw
5. Washer
6. Nut
7. Gasket

NOTE

1 Optional Iridium Weather system installation.

SR20_MM34_2564B

Figure 34-502
WAAS GPS Antenna Installation - Serials 1802, 1816 & subs (Sheet 2 of 2)

E. COM1 Antenna - *Serials 1613 & subs, Serials 1005 thru 1612 before SB 2X-34-06 w/ combo antenna in kit, 1005 thru 1612 after SB 2X-34-06 w/o combo antenna in kit* (See Figure 34-503)

(1) Removal - COM1 Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect antenna cable from antenna.

(e) Remove nuts, washers, and screws securing antenna to fuselage.

(f) Remove antenna and gasket from top of fuselage.

(g) Remove remaining sealant from fuselage.

(2) Installation - COM1 Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position gasket and antenna on fuselage roof, then insert screws through mounting holes.

(c) Install washers and nuts securing antenna to fuselage.

(d) Fillet seal antenna perimeter. (Refer to 20-10)

(e) Connect antenna cable.

(f) Install cabin headliner. (Refer to 25-10)

(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

EFFECTIVITY:
Serials 1613 & subs, Serials 1005 thru 1612 before SB 2X-34-06 w/ combo antenna in kit, 1005 thru 1612 after SB 2X-34-06 w/o combo antenna in kit

F. COM1 / XM Weather Antenna - *Serials 1473 thru 1581 w/ factory installed XM Weather, Serials 1005 thru 1612 after SB 2X-34-06 w/* COM1 / XM *antenna in kit* (See Figure 34-503)

(1) Removal - COM1 / XM Weather Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect XM weather cable from antenna.

(e) Disconnect COM1 cable from antenna.

(f) Remove nuts, washers, and screws securing antenna to fuselage.

(g) Remove antenna and gasket from top of fuselage.

(h) Remove remaining sealant from fuselage.

(2) Installation - COM1 / XM Weather Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position gasket and antenna to fuselage and insert screws through mounting holes.

(c) Install washers and nuts securing antenna to fuselage.

(d) Fillet seal antenna perimeter. (Refer to 20-10)

(e) Connect XM Weather cable to antenna.

(f) Connect COM1 cable to antenna.

(g) Install cabin headliner. (Refer to 25-10)

(h) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

G. COM2 Antenna (See Figure 34-503)

(1) Removal - COM2 Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove baggage compartment floor access panel. (Refer to 06-00)

(d) Disconnect antenna cable from antenna.

(e) Remove nuts and washers securing antenna to fuselage.

(f) Remove antenna and gasket from belly of fuselage.

(g) Peel off remaining sealant from fuselage.

(2) Installation - COM2 Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position gasket and antenna on fuselage belly, then insert screws through mounting holes.

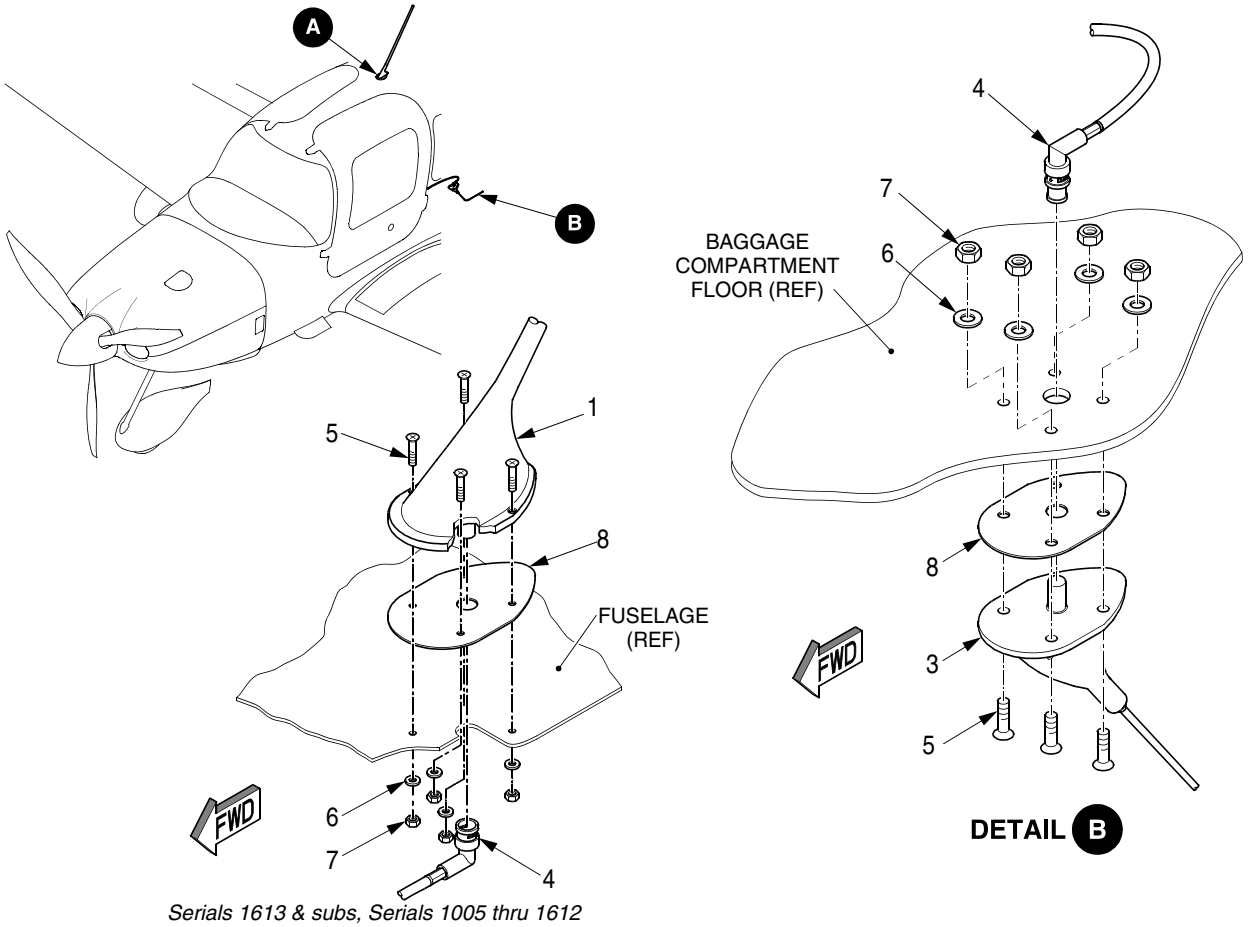
(c) Install washers and nuts securing antenna to fuselage.

(d) Fillet seal antenna perimeter. (Refer to 20-10)

(e) Connect antenna cable.

(f) Install baggage compartment floor access panel. (Refer to 06-00)

(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.



LEGEND

1. COM 1 Antenna
2. COM 1 / XM Weather Antenna
3. COM 2 Antenna
4. Antenna Connector
5. Screw
6. Washer
7. Nut
8. Gasket

SR20_MM34_2472A

Figure 34-503
COM Antenna Installation

H. Garmin GTX Transponder - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 34-504)**

(1) Removal - Garmin GTX Transponder
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ENCODER/TRANSPONDER circuit breaker.
- (c) Insert hex wrench into front panel bolt hole and engage hex bolt.
- (d) Turn locking screw counter-clockwise to loosen locking cam. Locking cam will move the transponder unit out 0.25 inch (0.635 cm) and disengage from the electrical connectors.
- (e) Pull transponder from mounting tray and remove from airplane.

(2) Installation - Garmin GTX Transponder
- (a) With light to medium pressure, push transponder into mounting tray to engage electrical connectors.
- (b) Insert hex wrench into front panel bolt hole and engage hex bolt.
- (c) Turn bolt clockwise to tighten locking cam.
- (d) Reset ENCODER/TRANSPONDER circuit breaker.
- (e) If transponder is a different unit from the originally installed transponder:
  - 1 Serials 1005 thru 1099 w/ GTX 320 Transponder: Perform Functional Test - Garmin GTX 320 Transponder Setup. (Refer to 34-50)
  - 2 *Serials 1100 & subs w/ GTX 327 Transponder:* Perform Functional Test - Garmin GTX 327 Transponder Setup. (Refer to 34-50)
  - 3 *Serials 1337 & subs w/ GTX 330 Transponder:* Perform Functional Test - Garmin GTX 330 Transponder Setup. (Refer to 34-50)
- (f) Perform Functional Test - Altitude Encoder Calibration. (Refer to 34-10)
- (g) Perform Operational Test - Garmin Transponder. (Refer to 34-50)

(3) Operational Test - Garmin Transponder
- (a) Verify transponder operation in accordance with 14 CFR 91.413.

(4) Functional Test - Garmin GTX 320 Transponder Setup
- (a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
- (b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
- (c) On GTX 320, rotate RH function selector switch to SBY position.
- (d) Set code selector switches to “1200”
- (e) Rotate RH function selector switch to TST position.
- (f) Verify reply indicator light is on.
- (g) Rotate RH function selector switch to ON position.
- (h) Verify reply indicator light flashes on and off.
- (i) Rotate SBY selector switch to OFF position.
- (j) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (k) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(5) Functional Test - Garmin GTX 327 Transponder Setup
- (a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.
- (b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
- (c) On GTX 327, press [OFF] key.
- (d) Hold down [FUNC] and press [ON]. Set highlighted parameters as follows:

  To sequence through configuration pages, press [FUNC].

  To highlight selectable fields on each page, press [CRSR].

  When a field is highlighted, numeric data entry is performed with 0-9 keys, and list selections with 8 or 9 keys.

To accept changes, press [CRSR] key. Pressing [FUNC] key moves on to the next configuration page without saving the changes.

1 Set parameters for the Display Mode page.

DISPLAY MODE	AUTO
LEVEL	75

2 Set parameters for the Display Backlight page.

BKLT	AUTO
RSP TIME	4
MIN	08
BKLT SRCE	PHOTO
SLOPE	50
OFFSET	50

3 Set parameters for the Key Lighting page.

KEY	AUTO
RSP TIME	4
MIN	08
KEY SRCE	28V
SLOPE	50
OFFSET	50

4 Set parameters for the Contrast Configuration page.

CONTRAST MODE	AUTO

5 Set parameters for the RS-232 Input/Output page.

	INPUT	**OUTPUT**
CHNL 1	OFF	ICARUS ALT
CHNL 2	GPS	

6 Set parameters for the Operation Configuration page.

VS RATE	0500
FLT TMR	CLEAR
VFR ID	1200

FORMAT	FEET

7 Set parameters for the Squat Switch page.

SQUAT SWITCH?	NO
SENSE	LOW
AUTO STANDBY?	ON
DELAY TIME	10

8 Set parameters for the Aircraft Type page.

AC TYPE	<15.5K lb

9 Set parameters for the RS-232 INPUT VIEW page.

Note: With GPS in self-test mode, GSPD should read 150 kts.

CH1	OFF	+ _ _ _ _ _ _ . _ _ n/a
CH2	GSPD	+ _ _ _ 1 5 0 . 0 0 kts

10 Set parameters for the Gray Code Input page.

GRAY CODE	##########
DECODED ALTITUDE	#### (Field Elevation ±300 ft)

Note: No external switches are used.

11 Set parameters for the External Switch page.

IDENT	unchecked
STANDBY	unchecked
SQUAT	unchecked

12 Set parameters for the Analog Input page.

14/5V LTG	000
PHOTO	000
LCD TEMP	000
28V LTG	000
REPLY	000
UNIT TMP	000

13 Press [OFF] to exit setup.

(e) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(f) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(6) Functional Test - Garmin GTX 330 Transponder Setup

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1, BAT 2, and AVIONICS switches in ON positions.

(c) On GTX 330, press [OFF].

(d) Hold down [FUNC] and press [ON]. Set highlighted parameters as follows:

To sequence through configuration pages, press [FUNC].

To highlight selectable fields on each page, press [CRSR].

When a field is highlighted, numeric data entry is performed with 0-9 keys, and list selections with 8 or 9 keys.

To accept changes, press [CRSR]. Pressing [FUNC] moves on to the next configuration page without saving changes.

Note: The MODE S Address (A/C Reg) page will only be displayed on initial power-up if no address is entered.

1 Set parameters for the MODE S Address (A/C Reg) page.

ADDRESS	US TAIL# NXXX

2 Set parameters for the Configuration Menu page.

JUMP TO	DIAGNOSTICS

3 Set parameters for the Audio Mode pages. Verify audio messages by selecting 2, 3, 4, or 5 for MESSAGE.

VOICE	FEMALE	
MESSAGE	0	
	AUDIO	**PAGE CHANGE**
ALTITUDE MONITOR	MSG	ENABLE
COUNT DOWN TIMER	MSG	

4 Set parameters for the Traffic Information page.

TRAFFIC MESSAGES	TONE

5 Set parameters for the Display Mode page.

DISPLAY MODE	AUTO
LEVEL	75

6 Set parameters for the Display Backlight page.

BKLT	AUTO
RSP TIME	4
MIN	08
BKLT SRCE	PHOTO
SLOPE	50
OFFSET	50

7 Set parameters for the Key Lighting page.

KEY	AUTO
RSP TIME	4
MIN	08
KEY SRCE	28V
SLOPE	50
OFFSET	50

8 Set parameters for the Contrast Configuration page.

CONTRAST MODE	AUTO

9 Set parameters for the ARINC 429 Input pages.

	SPEED	DATA
CHANNEL 1	LOW	GPS
CHANNEL 2	LOW	OFF

	SPEED	**DATA**
CHANNEL 3	LOW	OFF
CHANNEL 4		OFF

10 Set parameters for the ARINC 429 Output page.

CHANNEL 1	OFF
CHANNEL 2	OFF

11 Set parameters for the RS-232 Input/Output page.

	INPUT	**OUTPUT**

CHNL 1	OFF	ICARUS ALT
CHNL 2	OFF	OFF

12 Set parameters for the Operation Configuration page.

VS RATE	0500
FORMAT	FEET
VFR ID	1200
ALT ALRT DEV	200

13 Set parameters for the Squat Switch page.

SQUAT SWITCH?	NO
SENSE	LOW
DELAY TIME	10
AUTO FLT TMR?	CLEAR

14 Set parameters for the Temperature page.

SENSOR INSTALLED	NO

15 Set parameters for the Mode S Address (A/C Reg) page.

ADDRESS	US TAIL# NXXX

16 Set parameters for the Mode S Address (Flight ID) page.

FLT ID	SAME AS TAIL

17 Set parameters for the Mode S Aircraft Type page.

AC TYPE	<15.5K lb
MAX A/S	<=300 kt

18 Set parameters for the Gray Code Input page.

GRAY CODE	##########
DECODED ALTITUDE	#### (Field Elevation ±300 ft)

Note: No external switches are used.

19 Set parameters for the External Switch page.

IDENT	unchecked
STANDBY	unchecked
SQUAT	unchecked

20 Set parameters for the Analog Input page.

14/5V LTG	000
PHOTO	###
LCD TEMP	###
28V LTG	000
REPLY	000
UNIT TMP	###

21 Set parameters for the RS-232 Input page.

CH1	OFF	+ _ _ _ _ _ _ . _ _ n/a
CH2	OFF	+ _ _ _ _ _ _ . _ _ n/a

22 Set parameters for the ARINC 429 Channel pages.

Note: With GPS in self-test mode, GSPD should read 150 kts.

CH1	###	+ _ _ _ 1 5 0 . 0 0 kts
CH2	000	+ _ _ _ _ _ _ . _ _ n/a
CH3	000	+ _ _ _ _ _ _ . _ _ n/a
CH4	000	+ _ _ _ _ _ _ . _ _ n/a

23 Press [OFF] to exit setup.

(e) Set BAT 1, BAT 2, and AVIONICS switches in OFF positions.

(f) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

I. Transponder Antenna - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-504)

(1) Removal - Transponder Antenna

(a) Remove access panel CF8. (Refer to 06-00)

(b) Disconnect antenna cable from antenna.

(c) Verify transponder antenna is supported and remove nut and washers securing antenna to fuselage belly.

(d) Remove antenna from airplane.

(2) Installation - Transponder Antenna

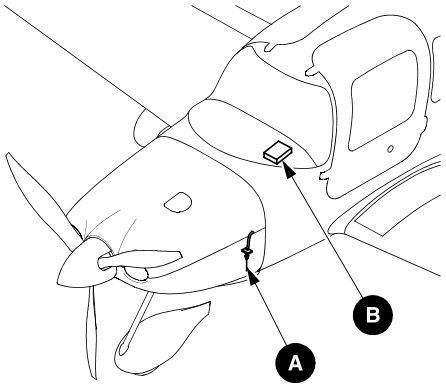
(a) Solvent clean installation area. (Refer to 20-30)

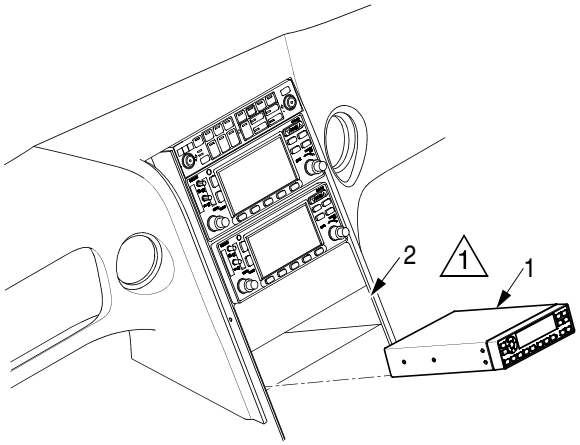
(b) Verify transponder antenna is inserted and supported in antenna mounting hole in fuselage belly by another aircraft technician.

(c) Install washers and nut securing antenna to fuselage belly.

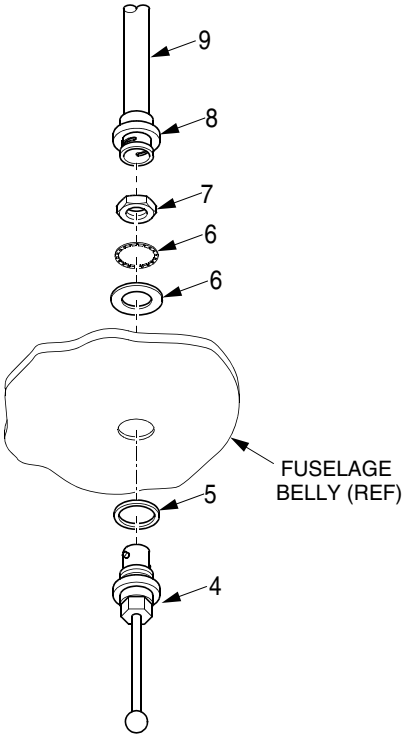
(d) Connect antenna cable to antenna.

(e) Install access cover CF8. (Refer to 06-00)

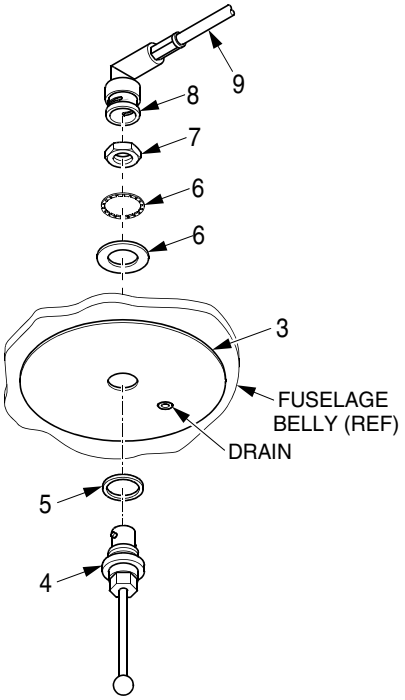




DETAIL B



Serials 1005 thru 1361 before SB 2X-34-05.



Serials 1362 & subs, Serials 1005 thru 1361 after SB 2X-34-05.



LEGEND

1. GTX Transponder
2. Mounting Rack
3. Ground Plane Ring
4. Transponder Antenna
5. Gasket
6. Washer
7. Nut
8. Connector
9. Coaxial Cable

NOTE

1 Typical installation shown.
Avionics stackup may change based on optional equipment installation.

DETAIL A

SR20_MM34_1546C

Figure 34-504
Transponder and Antenna Installation - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

EFFECTIVITY:
Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics

J. Garmin GTX Transponder - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-505)**

(1) Removal - Garmin GTX Transponder

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull XPONDER circuit breaker.

(c) Remove empennage access panel RE3. (Refer to 06-00)

(d) Remove ELT. (Refer to 25-60)

(e) Loosen screw securing handle-lock mechanism to transponder.

(f) Lift handle-lock mechanism to disengage transponder from connectors.

(g) Remove transponder from rack.

(2) Installation - Garmin GTX Transponder

(a) Position transponder to rack, ensuring handle-lock mechanism engages slot on side of rack.

(b) Using handle-lock mechanism, gently push transponder into rack to engage connectors.

(c) Tighten screw securing handle-lock mechanism to transponder.

(d) Reset XPONDER circuit breaker.

(e) If transponder is a different unit from the originally installed transponder, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(f) Perform Adjustment/Test - Garmin GTX Transponder Setup. (Refer to 34-50)

(g) Perform Operational Test - Garmin GTX Transponder. (Refer to 34-50)

(h) Install ELT. (Refer to 25-60)

(i) Install empennage access panel RE3. (Refer to 06-00)

(3) Operational Test - Garmin GTX Transponder

(a) Verify transponder operation in accordance with 14 CFR 91.413.

(4) Adjustment/Test - Garmin GTX Transponder Setup

(a) Power on PFD and MFD in Configuration mode.

1 While holding far right softkey on PFD and MFD, set BAT 1 and AVIONICS switches to ON positions.

2 When “INITIALIZING SYSTEM” appears in upper left corner of displays, release softkeys.

(b) On PFD, use [FMS] knob to select GTX page group.

(c) Select Transponder Configuration page.

(d) Verify 'ADDRESS TYPE' is 'US TAIL' under the 'SET' and 'ACTIVE' columns.

(e) Activate cursor and highlight 'ADDRESS' field. On PFD, use inner and outer [FMS] knobs to enter aircraft registration number.

(f) On PFD, press [ENT] key.

(g) When transponder has successfully configured, press [ENT] key on PFD to accept the message.

(h) Deactivate cursor.

(i) Pull PFD#1, PFD#2, MFD#1, MFD#2 circuit breakers.

(j) Reset PFD and MFD circuit breakers to restart displays in normal operating mode.

K. Transponder Antenna - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-505)**

(1) Removal - Transponder Antenna

(a) Remove empennage access panel RE3. (Refer to 06-00)

(b) Disconnect antenna cable from antenna.

(c) With antenna supported, remove nut and washers securing antenna to empennage. Remove antenna from airplane.

(2) Installation - Transponder Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Solvent clean installation area. (Refer to 20-30)

(c) To ensure electrical contact, sand or burnish EMM where washer contacts empennage skin. (Refer to 51-20)

(d) Position antenna to empennage and secure with washers and nut.

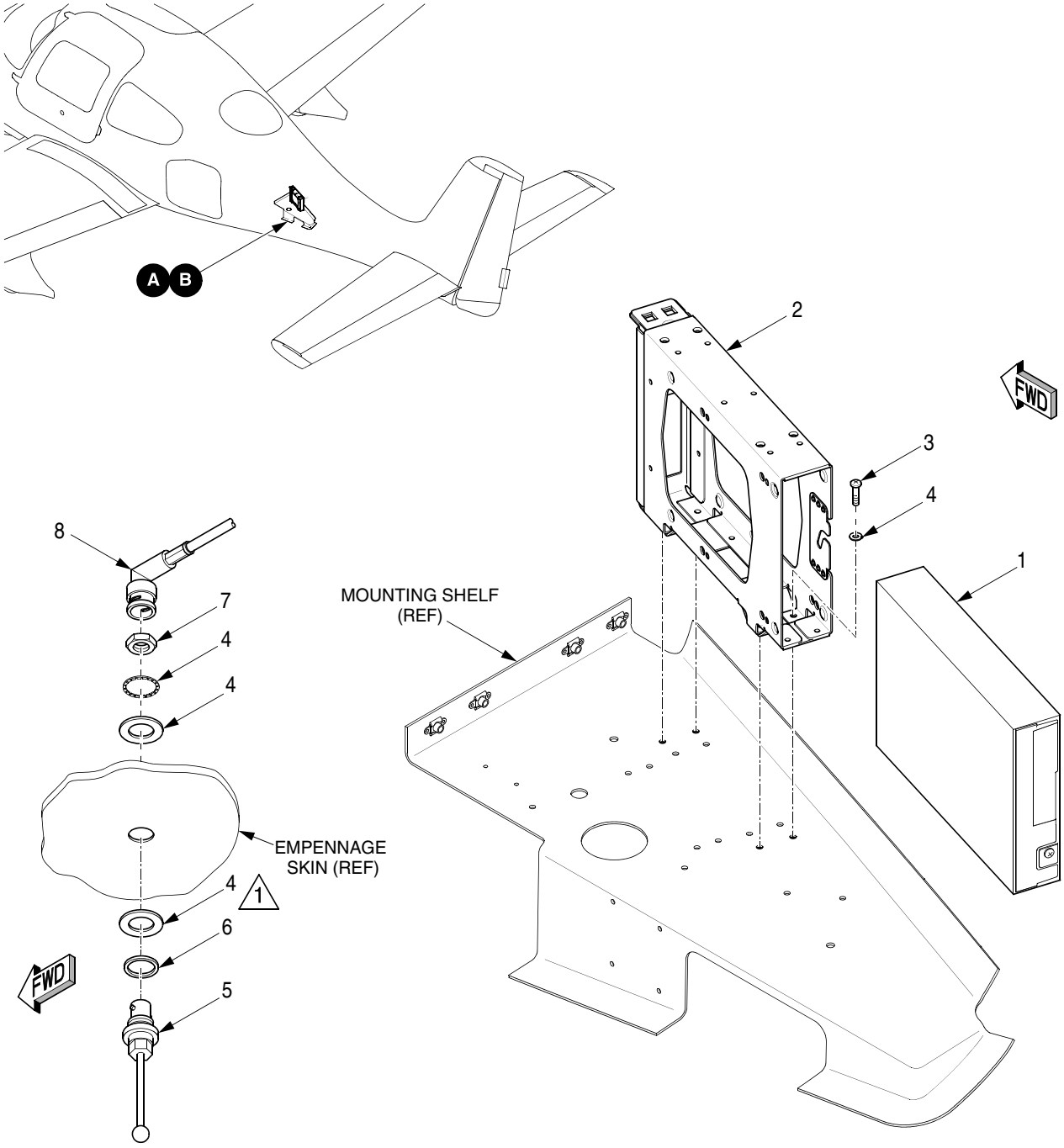
(e) Torque nut as necessary to ensure antenna collar makes electrical contact with washer.

(f) Apply sealant to perimeters of washers and base of antenna.

(g) Connect antenna cable to antenna.

(h) Perform Operational Test - Garmin GTX Transponder. (Refer to 34-50)

(i) Install empennage access cover RE3. (Refer to 06-00)



DETAIL A

DETAIL B

LEGEND
1. GTX Transponder
2. Rack
3. Screw
4. Washer
5. Transponder Antenna
6. Gasket
7. Nut
8. Antenna Cable

SR20_MM34_2724

NOTE

1 To ensure electrical contact, sand or burnish EMM where washer contacts empennage skin.

Figure 34-505
Transponder and Antenna Installation - Serials 2016 & subs w/ Perspective Avionics

L. Course Deviation Indicator - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-506)**

(1) Removal - Course Deviation Indicator

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull INSTRUMENT LIGHTS circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect electrical connector.

(e) While supporting course deviation indicator, remove screws and washers securing unit to instrument panel.

(2) Installation - Course Deviation Indicator

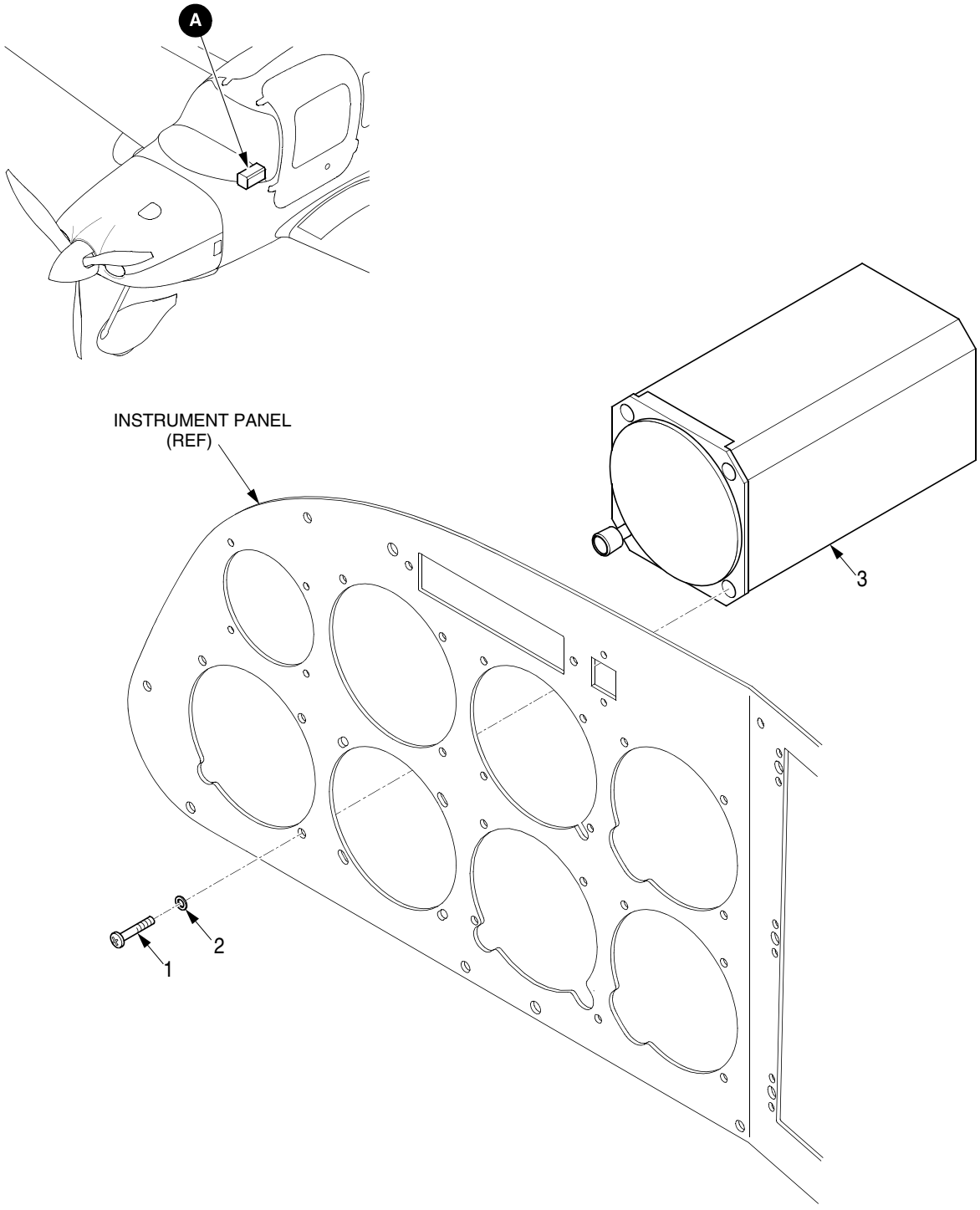
(a) Position course deviation indicator in instrument panel and attach with screws and washers.

(b) Connect electrical connector.

(c) Install glareshield. (Refer to 25-10)

(d) Reset INSTRUMENT LIGHTS circuit breaker.

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

DETAIL A

LEGEND
1. Screw
2. Washer
3. Course Deviation Indicator

SR20_MM34_1605

Figure 34-506
Course Deviation Indicator - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD

M. VOR/LOC Antenna (See Figure 34-507)

(1) Removal - VOR/LOC Antenna

(a) Remove screws securing antenna mounting plate to vertical stabilizer.

(b) Lift antenna mounting plate assembly from vertical stabilizer recess.

(c) Disconnect antenna cable from antenna.

(d) Remove screws securing antenna to mounting plate and remove antenna from airplane.

(2) Installation - VOR/LOC Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Remove old sealant and solvent clean antenna mounting surfaces. (Refer to 20-30)

(c) Install screws securing antenna to antenna mounting plate.

(d) Connect antenna cable to antenna.

(e) Install antenna mounting plate assembly into vertical stabilizer recess.

(f) Install screws securing antenna mounting plate to vertical stabilizer.

(g) Solvent clean mounting plate surface. (Refer to 20-30)

CAUTION: Do not allow tape perimeter to exceed edges of mounting plate.

(h) Apply tape covering screw heads and 0.5 inch (1.27 cm) radius minimum around each screw head.

(i) Apply sealant around perimeter of antenna mounting plate.

N. VOR/LOC Diplexer - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 34-507)**

(1) Removal - VOR/LOC Diplexer

(a) Remove radio module assembly. (Refer to 25-10)

(b) Disconnect G/S 1, G/S 2, VOR 1, VOR 2, and ANT cables from diplexer.

(c) Remove screws and nuts securing diplexer to center console. Remove diplexer from airplane.

(2) Installation - VOR/LOC Diplexer

(a) Position diplexer to center console and secure with screws and nuts.

(b) Connect G/S 1, G/S 2, VOR 1, VOR 2, and ANT cables to diplexer.

(c) Install radio module assembly. (Refer to 25-10)

O. VOR/LOC Diplexer - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-507)**

(1) Removal - VOR/LOC Diplexer

(a) Remove sidewall air duct trim. (Refer to 25-10)

(b) Disconnect G/S 1, G/S 2, VOR 1, VOR 2, and ANT cables from diplexer.

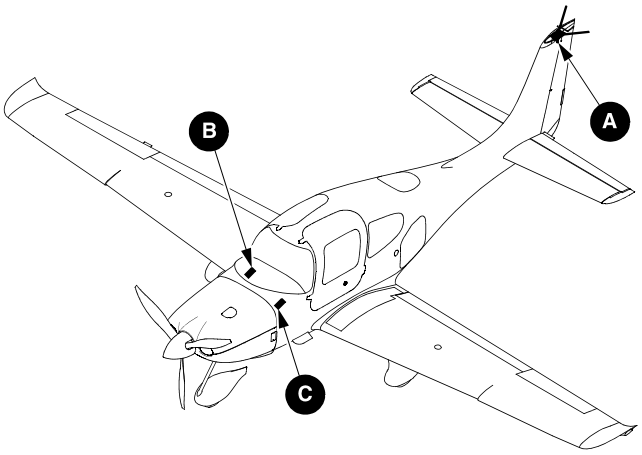
(c) Remove cable ties securing diplexer to fuselage. Remove diplexer from airplane.

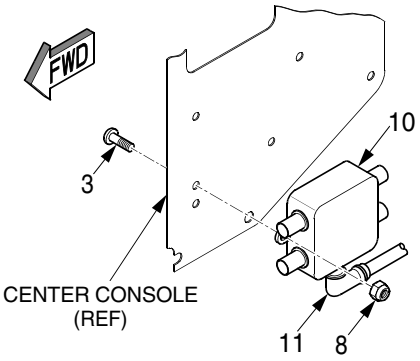
(2) Installation - VOR/LOC Diplexer

(a) Position diplexer to fuselage and secure with cable ties.

(b) Connect G/S 1, G/S 2, VOR 1, VOR 2, and ANT cables to diplexer.

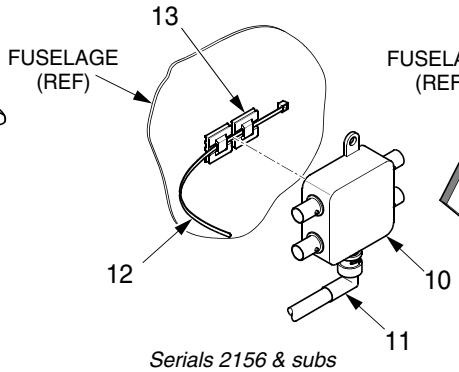
(c) Install sidewall air duct trim. (Refer to 25-10)



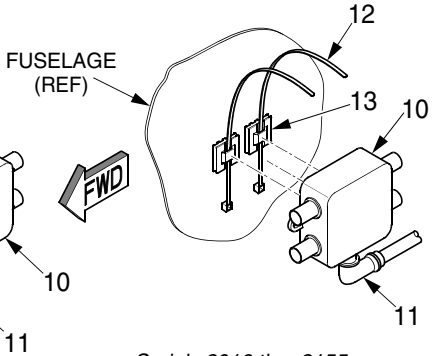


Serials 1005 thru 2015,
2016 & subs w/o Perspective Avionics.

DETAIL C

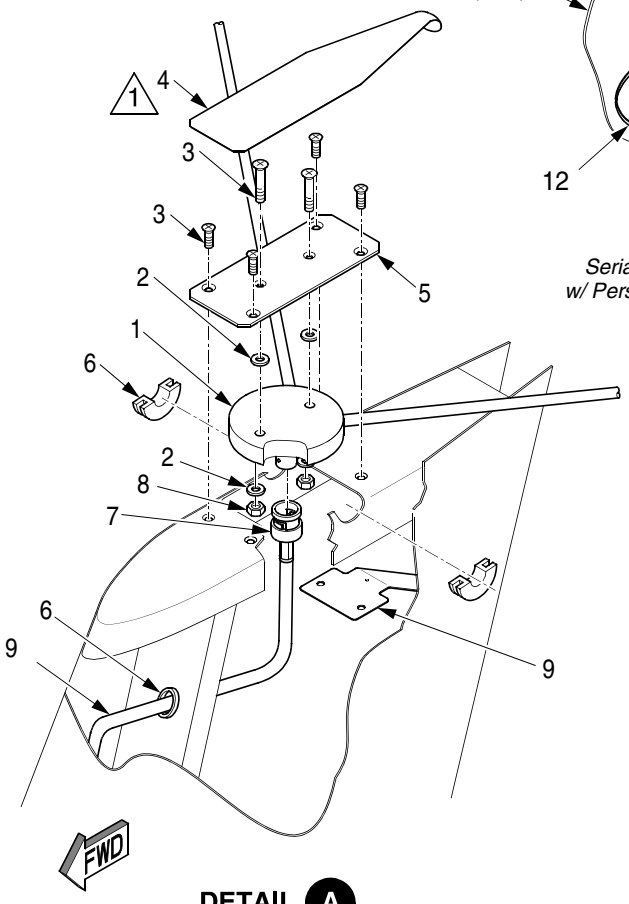


Serials 2156 & subs
w/ Perspective Avionics.



Serials 2016 thru 2155
w/ Perspective Avionics.

DETAIL B



DETAIL A

NOTE

1 Apply tape covering screw heads and 0.50 inch (1.27 cm) minimum radius around each screw head. Do not allow tape to exceed edges of mounting plate, except toward rudder hinge where upper bolts must be contacted.

LEGEND

1. VOR/LOC Antenna
2. Washer
3. Screw
4. Tape
5. Mounting Plate
6. Grommet
7. Connector, Straight
8. Nut
9. Antenna Cable
10. Diplexer Antenna
11. Connector, Right Angle
12. Cable Tie
13. Tie Down

SR20_MM34_1547D

Figure 34-507
VOR/LOC Antenna Installation

P. NSD-360A HSI - *Serials 1005 thru 1267* (See Figure 34-508)

(1) Removal - NSD-360A HSI

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull HSI#1 and HSI#2 circuit breakers.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect vacuum and vent hoses and cap.

(e) Disconnect electrical connector.

(f) While supporting HSI, remove screws securing unit to instrument panel.

(g) Cap off fittings on back of HSI to prevent possible contamination and remove HSI from airplane.

(2) Installation - NSD-360A HSI

(a) Position HSI in instrument panel and secure with screws.

(b) Connect electrical connector.

(c) Attach vacuum and vent hoses.

(d) Install MFD. (Refer to 31-60)

(e) Reset HSI#1 and HSI#2 circuit breakers.

(f) If NSD-360A HSI is a different unit from the originally installed NSD-360A HSI:

1 Perform Functional Test - Flux Detector Calibration with NSD-360A HSI Installed. (Refer to 34-50)

2 Perform Operational Test - NSD-360A HSI Setup. (Refer to 34-50)

(g) If NSD-360A HSI is the same unit as the originally installed NSD-360A HSI:

1 Perform Operational Test - NSD-360A HSI Setup. (Refer to 34-50)

(3) Operational Test - NSD-360A HSI Setup

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

The NSD-360A HSI will begin to spin-up and stabilize when battery power is initially turned on. When the gyro reaches operational speed, the HSI "HDG" flag will retract from view and the compass card will stabilize.

(c) Set HSI switch to SLAVE position.

(d) Rotate compass card to approximate magnetic heading.

Slaving meter will be at 45° when compass card matches heading. Verify slaving meter oscillates back and forth as compass card is rotated back and forth.

(e) Wait 5 minutes and verify the compass card remains on correct heading.

(f) To test HSI navigation, perform Functional Test - Garmin 400 Series GPS Navigator Setup. (Refer to 34-50)

CAUTION: Prior to verifying NSD-360A HSI system, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(g) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Verify NSD-360A HSI system.

(h) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(i) Set all other cockpit controlled electrical switches to OFF positions.

(j) Place airplane in as realistic flight environment as possible.

(k) Taxi airplane to compass rose, if available.

(l) If using compass rose for verification:

1 Align centerline of airplane on magnetic North heading (±1°).

(m) If using boresight compass for verification:

WARNING: Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(n) Align airplane with West and verify NSD-360A HSI system indicates 90° turn.

(o) Align airplane with North and verify NSD-360A HSI system indicates 90° turn.

(p) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(q) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

Q. NSD-1000 HSI - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* (See Figure 34-508)

(1) Removal - NSD-1000 HSI

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull HSI#1 and HSI#2 circuit breakers.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect cable.

(e) While supporting HSI, remove screws securing unit to instrument panel.

(f) Cap off fittings on back of HSI to prevent possible contamination and remove HSI from airplane.

(2) Installation - NSD-1000 HSI

(a) Position HSI in instrument panel and secure with screws.

(b) Connect data cable.

(c) Install MFD. (Refer to 31-60)

(d) Reset HSI#1 and HSI#2 circuit breakers.

(e) If NSD-1000 HSI is a different unit from the originally installed NSD-1000 HSI:

1 Perform Functional Test - Flux Detector Calibration with NSD-1000 HSI Installed. (Refer to 34-50)

2 Perform Operational Test - NSD-1000 HSI Setup. (Refer to 34-50)

(f) If NSD-1000 HSI is the same unit as the originally installed NSD-1000 HSI:

1 Perform Operational Test - NSD-1000 HSI Setup. (Refer to 34-50)

(3) Operational Test - NSD-1000 HSI Setup

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

The NSD-1000 HSI will begin to spin-up and stabilize when battery power is initially turned on. When the gyro reaches operational speed, the HSI "HDG" flag will retract from view and the compass card will stabilize.

(c) Set HSI switch to SLAVE position.

(d) Rotate compass card to approximate magnetic heading.

Slaving meter will be at 45° when compass card matches heading. Verify slaving meter oscillates back and forth as compass card is rotated back and forth.

(e) Wait 5 minutes and verify the compass card remains on correct heading.

(f) To test HSI navigation, perform Functional Test - Garmin 400 Series GPS Navigator Setup. (Refer to 34-50)

CAUTION: Prior to verifying NSD-1000 HSI system, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(g) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Verify NSD-1000 HSI system.

(h) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(i) Set all other cockpit controlled electrical switches to OFF positions.

(j) Place airplane in as realistic flight environment as possible.

(k) Taxi airplane to compass rose, if available.

(l) If using compass rose for verification:

1 Align centerline of airplane on magnetic North heading (±1°).

(m) If using boresight compass for verification:

WARNING: Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(n) Align airplane with West and verify NSD-1000 HSI system indicates 90° turn.

(o) Align airplane with North and verify NSD-1000 HSI system indicates 90° turn.

(p) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(q) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

R. SN3308 EHSI - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-508)**

(1) Removal - SN3308 EHSI

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
7/64-inch Hex Wrench	-	Any Source	EHSI installation and removal.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull HSI#1 and HSI#2 circuit breakers.

(d) Loosen top two screws above EHSI to remove tension from mounting tray.

(e) Remove lower-left screw securing EHSI to mounting tray.

(f) Insert hex wrench into lower-left hole approximately 0.75 inch (1.9 cm) and engage jackscrew.

CAUTION: Do not apply excessive torque on the jackscrew. The jackscrew is used to assist in removing EHSI but cannot extract the unit alone. If EHSI is difficult to remove, verify upper two clamp screws are sufficiently loosened.

(g) To remove EHSI from instrument panel, rotate jackscrew clockwise in 1/2 turn increments while simultaneously pulling on EHSI bezel.

(2) Installation - SN3308 EHSI

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
7/64-inch Hex Wrench	-	Any Source	EHSI installation and removal.

CAUTION: When mounting the EHSI, do not press on display window as damage may result.

(b) Tighten lower right mounting screw

(c) Insert hex wrench into lower-left hole approximately 0.75 inch (1.9 cm) and engage jackscrew.

(d) Turn jackscrew clockwise until finger tight.

(e) Slide EHSI into mounting tray.

(f) Rotate jackscrew counter-clockwise until EHSI is fully engaged in tray connectors.

(g) Install lower-left screw.

(h) Tighten upper two screws.

CAUTION: Verify face of EHSI is flush with instrument panel. If face of EHSI protrudes more than 0.0625 inch (1.6 mm), remove unit and reinstall.

(i) Reset HSI#1 and HSI#2 circuit breakers.

(j) If SN3308 EHSI is a different unit from the originally installed SN3308 EHSI:

1 Perform Functional Test - SN3308 EHSI Setup. (Refer to 34-50)

2 Perform Functional Test - Flux Detector Calibration with SN3308 EHSI Installed. (Refer to 34-50)

3 Perform Operational Check - SN3308 EHSI. (Refer to 34-50)

(k) If SN3308 EHSI is the same unit as the originally installed SN3308 EHSI:

1 Perform Operational Check - SN3308 EHSI. (Refer to 34-50)

(3) Operational Test - SN3308 EHSI System

CAUTION: Prior to verifying SN3308 EHSI system, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Verify SN3308 EHSI system.

(b) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(c) Set all other cockpit controlled electrical switches to OFF positions.

(d) Place airplane in as realistic flight environment as possible.

(e) Taxi airplane to compass rose, if available.

(f) If using compass rose for verification:

1 Align centerline of airplane on magnetic North heading (±1°).

(g) If using boresight compass for verification:

WARNING: Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(h) Align airplane with West and verify SN3308 EHSI system indicates 90° turn.

(i) Align airplane with North and verify SN3308 EHSI system indicates 90° turn.

(j) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(k) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(4) Functional Test - SN3308 EHSI Setup

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
VOR Signal Generator (if steady VOR frequency is not available)	NAV-402	Any Source	Simulate VOR bearing.

(b) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Pull circuit breakers.

1 Pull HSI#1 circuit breaker, then verify EHSI remains ON. Reset HSI#1 circuit breaker.
2 Pull HSI#2 circuit breaker, then verify EHSI remains ON.
3 Pull HSI#1 circuit breaker, then verify EHSI shuts OFF.

(e) On SN3308 EHSI, press and hold [SHFT] and [A-B].

(f) Reset HSI#1 and HSI#2 circuit breakers.

(g) Continue to hold [SHFT] and [A-B] until the first Maintenance Menu page appears.

Note: Press [NEXT] or [LAST] to cycle the Maintenance Menu pages.Use [UP] or [DOWN] arrows to change selection, and rotate right knob to change setting for selection.

(h) Press [LAST] key repeatedly to access 2: Compass System page.

(i) Set parameters for the 2: Compass System page.

GYRO TYPE	MID-CONT DG
GYRO VALID	P1-9 LOW
SLAVING	YES
FLUX GATE	STEC 6446
QUADRANT	270°
PEAKING	6

(j) The 3: Compass Calibration page is not used.

(k) Set parameters for the 4: BRG PTR Setup page.

BRG NAV-1	429
NAV-2	COMPOSITE
BRG ADF-1	DISABLED
ADF-2	DISABLED

(l) Set parameters for the 5: DME-1 Select page.

CURRENT SELECTION	NOT INSTALLED

(m) Set parameters for the 6: DME-2 Select page.

CURRENT SELECTION	NOT INSTALLED

(n) Set parameters for the 7: DME 1 / 2 Change page.

DME1:	NOT INSTALLED
DME2:	NOT INSTALLED

(o) Set parameters for the 8: FCS Emulation page.

CURRENT SELECTION	CENTURY 21/31/41 DC

(p) Set parameters for the 9: FCS Change page.

HDG DATUM - CURRENT	+RIGHT
CRS DATUM - CURRENT	+RIGHT
REF VOLTS - CURRENT	04.950

(q) Adjust HDG Bug.

1 On SN3308 EHSI, select CURRENT-REF VOLTS on the Maintenance Menu page.
2 Press [360] to select Map page.
3 Press [SYNC] to center HDG bug.
4 Press [SHFT], then [MAINT] to return to the Maintenance Menu page.
5 On System 55X A/P programmer/computer, press [HDG].
6 Adjust CURRENT-REF VOLTS until yokes are centered, and have little or no left/right movement.
7 On SN3308 EHSI, press [360] to confirm adjustment.
8 Press [SYNC] to center HDG bug.
9 Verify little to no yoke movement.
10 On SN3308 EHSI, rotate RH knob 1-2 degrees left of current heading. Yoke should respond accordingly.
11 On SN3308 EHSI, rotate RH knob 1-2 degrees right of current heading. Yoke should respond accordingly.
12 If necessary, press [SHFT], then [MAINT] to return to the Maintenance Menu page and re-adjust HDG bug until yokes respond correctly.
13 On LH yoke, press A/P DISC switch to disconnect autopilot.

(r) Set parameters for the 10: LNAV-1 Select page.

CURRENT SELECTION	GARMIN GNS 430(ARINC)

(s) Set parameters for the 11: LNAV-2 Select page.

CURRENT SELECTION	NONE

(t) Set parameters for the 12: LNAV 1 / 2 Change page.

LNAV 1	GARMIN GNS 430(ARINC)
ANNUN	SERIAL
COURSE	OBS/LEG
DEVIATION	SER DATA
LNAV 2	NONE

(u) Set parameters for the 13: MKR Select page.

CURRENT SELECTION	KING KMA-24

(v) Set parameters for the 14: MKR Change page.

MKR	KING KMA-24
MKR VALID	VALID HIGH
THRESH	2.0 Volts
DEVIATION	SER DATA
LNAV 2	NONE

(w) Set parameters for the 15: NAV Change page.

Note: VHF Omni-directional Range (VOR) value for 175° is not labeled in display.

NAV-1 ENABLE	YES
PORT	429 PORT-2
NAV-2 ENABLE	NO
RELAY MODE	MASTER
ILS LOCKOUT	NO
COMPOSITE-2	000.0
	175°

(x) Adjust NAV2 BRG PTR.

1 On SN3308 EHSI, select COMPOSITE-2 on Maintenance Menu page.
2 Press [360].
3 Select NAV1 and NAV2 bearing pointers by pressing [BRG] until both are displayed.

CAUTION: If steady local VOR frequency is not available, use VOR signal generator.

Note: Use same frequency on both GPS's, preferably generated with a VOR signal generator.

4 On dual GNS or GNS/GNC, select a stable NAV signal for GPS1 and GPS2.
5 Verify that both BGR PTR's are indicating the same bearing.
6 On SN3308 EHSI, note bearing of NAV1 BGR PTR at bottom left.
7 Press [SHFT], then [MAINT] to return to Maintenance Menu page.
8 With COMPOSITE-2 selected, adjust value until bearing in lower left corner matches NAV1 BRG PTR noted previously.
9 Press [360] to confirm adjustment.
10 If necessary, re-adjust NAV2 BRG PTR until pointers are at the same bearing.

(y) Set parameters for the 16: Relay Sense page.

NAV-2	OFF
GPS-1	OFF
GPS-2	OFF
CDI SRC SEL	OFF
RCVR 1 / 2	OFF

(z) The 17: System LCD Setups page is not used.

(aa) Set parameters for the 18: System page.

COLOR SELECT	PILOT
400 Hz INVERTER (w/ Stormscope)	ENABLED
400 Hz INVERTER (w/o Stormscope)	DISABLE
BOOTSTRAP OUT (w/ Stormscope)	NORMAL
BOOTSTRAP OUT (w/o Stormscope)	OFF
WX DETECTION (w/ Stormscope)	WX-500
WX DETECTION (w/o Stormscope)	OFF

(ab) The remaining pages 19 through 27 are for diagnostics and do not require setup.

(ac) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(ad) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

S. Slave Amplifier - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-508)**

(1) Removal - Slave Amplifier

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull HSI#1 and HSI#2 circuit breakers.

(c) Remove passenger side carpeting.

(d) Remove access panel CF2R from cabin floor.

(e) Disconnect slave amplifier connector assembly.

(f) Remove screws securing slave amplifier to access panel and remove from airplane.

(2) Installation - Slave Amplifier

(a) Position slaving amplifier to access panel CF2R and secure with screws.

(b) Connect connector assembly.

(c) Install access panel CF2R.

(d) Reset HSI#1 and HSI#2 circuit breakers.

T. Flux Detector - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-508)**

(1) Removal - Flux Detector

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull HSI#1 and HSI#2 circuit breakers.

(c) Remove wing access panel RW6.

(d) Remove cable tie securing connector to wing. Remove flux detector from airplane.

(e) Remove screws and washers securing flux detector to standoffs.

(2) Installation - Flux Detector

CAUTION: Verify flux detector is installed with arrow and word FORE embossed on top of flux detector pointing forward. Failure to do will cause HSI system malfunction.

(a) Position flux detector to standoffs and secure with washers and screws.

(b) Connect connector assembly.

(c) Secure connector assembly to tie down with cable tie.

(d) *Serials 1005 thru 1422 w/* NSD-360A *HSI:* Perform Functional Test - Flux Detector Calibration with NSD-360A HSI Installed. (Refer to 34-50)

(e) *Serials 1005 thru 1422 w/ NSD-1000 HSI:* Perform Functional Test - Flux Detector Calibration with NSD-1000 HSI Installed. (Refer to 34-50)

(f) *Serials 1005 thru 1422 w/ SN3308 EHSI:* Perform Functional Test - Flux Detector Calibration with SN3308 EHSI Installed. (Refer to 34-50)

(g) Reset HSI#1 and HSI#2 circuit breakers.

(3) Functional Test - Flux Detector Calibration with NSD-360A HSI Installed

CAUTION: Prior to calibrating flux detector, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

CAUTION: Using the boresight compass for calibration requires two technicians.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Calibrate flux detector.

(b) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(c) Set all other cockpit controlled electrical switches to OFF positions.

(d) Place airplane in as realistic flight environment as possible.

(e) Taxi airplane to compass rose, if available.

(f) If using compass rose for calibration:

1 Align centerline of airplane on magnetic North heading (±1°).

(g) If using boresight compass for verification:

WARNING: **Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.**

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(h) Align airplane with North. Rotate HSI compass card to center slaving meter at 45°. Record heading deviation.

(i) Align airplane with East. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(j) Align airplane with South. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(k) Align airplane with West. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(l) Find average deviation and direction of average deviation.

(m) Rotate flux detector in opposite direction of the deviation by degrees of average deviation.

(n) Repeat heading checks.

(o) Readjust if necessary.

(p) Compare North and South heading deviations. Deviations that occur on same side of the North-South reference line are reduced by adjusting N-S adjusting screw on compensator.

(q) Compare East and West heading deviations. Deviations that occur on same side of the East-West reference line are reduced by adjusting E-W adjusting screw on compensator.

(r) Repeat heading checks.

(s) Re-adjust if necessary.

(4) Functional Test - Flux Detector Calibration with NSD-1000 HSI Installed

CAUTION: Prior to calibrating flux detector, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

CAUTION: Using the boresight compass for calibration requires two technicians.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Calibrate flux detector.

(b) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(c) Set all other cockpit controlled electrical switches to OFF positions.

(d) Place airplane in as realistic flight environment as possible.

(e) Taxi airplane to compass rose, if available.

(f) If using compass rose for calibration:

1 Align centerline of airplane on magnetic North heading (±1°).

(g) If using boresight compass for verification:

WARNING: **Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.**

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(h) Align airplane with North. Rotate HSI compass card to center slaving meter at 45°. Record heading deviation.

(i) Align airplane with East. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(j) Align airplane with South. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(k) Align airplane with West. Rotate HSI compass card to center slaving meter at 45°. Read heading deviation.

(l) Find average deviation and direction of average deviation.

(m) Rotate flux detector in opposite direction of the deviation by degrees of average deviation.

(n) Repeat heading checks.

(o) Readjust if necessary.

(p) Compare North and South heading deviations. Deviations that occur on same side of the North-South reference line are reduced by adjusting N-S adjusting screw on compensator.

(q) Compare East and West heading deviations. Deviations that occur on same side of the East-West reference line are reduced by adjusting E-W adjusting screw on compensator.

(r) Repeat heading checks.

(s) Re-adjust if necessary.

(5) Functional Test - Flux Detector Calibration with SN3308 EHSI Installed

CAUTION: Prior to calibrating flux detector, verify that doors are closed, flaps are in retracted position, engine is running, and airplane is in level flight attitude.

Engine starting, taxiing, and shut-down may only be performed by authorized personnel.

Note: If compass rose is not available, a calibrated boresight compass may be used.

(a) Acquire necessary tools, equipment, and supplies.

CAUTION: Using the boresight compass for calibration requires two technicians.

Description	P/N or Spec.	Supplier	Purpose
Boresight Compass (if compass rose is unavailable)	±1° accuracy	Any Source	Calibrate flux detector.

(b) Set BAT 1, BAT 2, ALT 1, ALT 2, PITOT HEAT, and all radio switches to ON positions.

(c) Set all other cockpit controlled electrical switches to OFF positions.

(d) Place airplane in as realistic flight environment as possible.

(e) Taxi airplane to compass rose, if available.

(f) If using compass rose for calibration:

1 Align centerline of airplane on magnetic North heading (±1°).

(g) If using boresight compass for verification:

WARNING: Use of a boresight compass requires two technicians. Do not stand or let anyone else stand close to the arc of the airplane's propeller while conducting test.

1 With outside technician standing 20-30 ft (6-9 m) in front of airplane and through the use of hand signals, have outside technician direct technician at controls to move airplane so propeller spinner and vertical stabilizer align with magnetic North.

(h) Align airplane with North. Highlight North calibration value and adjust using right knob to calibrate heading.

(i) Align airplane with East. Highlight East calibration value and adjust using right knob to calibrate heading.

(j) Align airplane with South. Highlight South calibration value and adjust using right knob to calibrate heading.

(k) Align airplane with West. Highlight West calibration value and adjust using right knob to calibrate heading.

(l) Repeat heading checks.

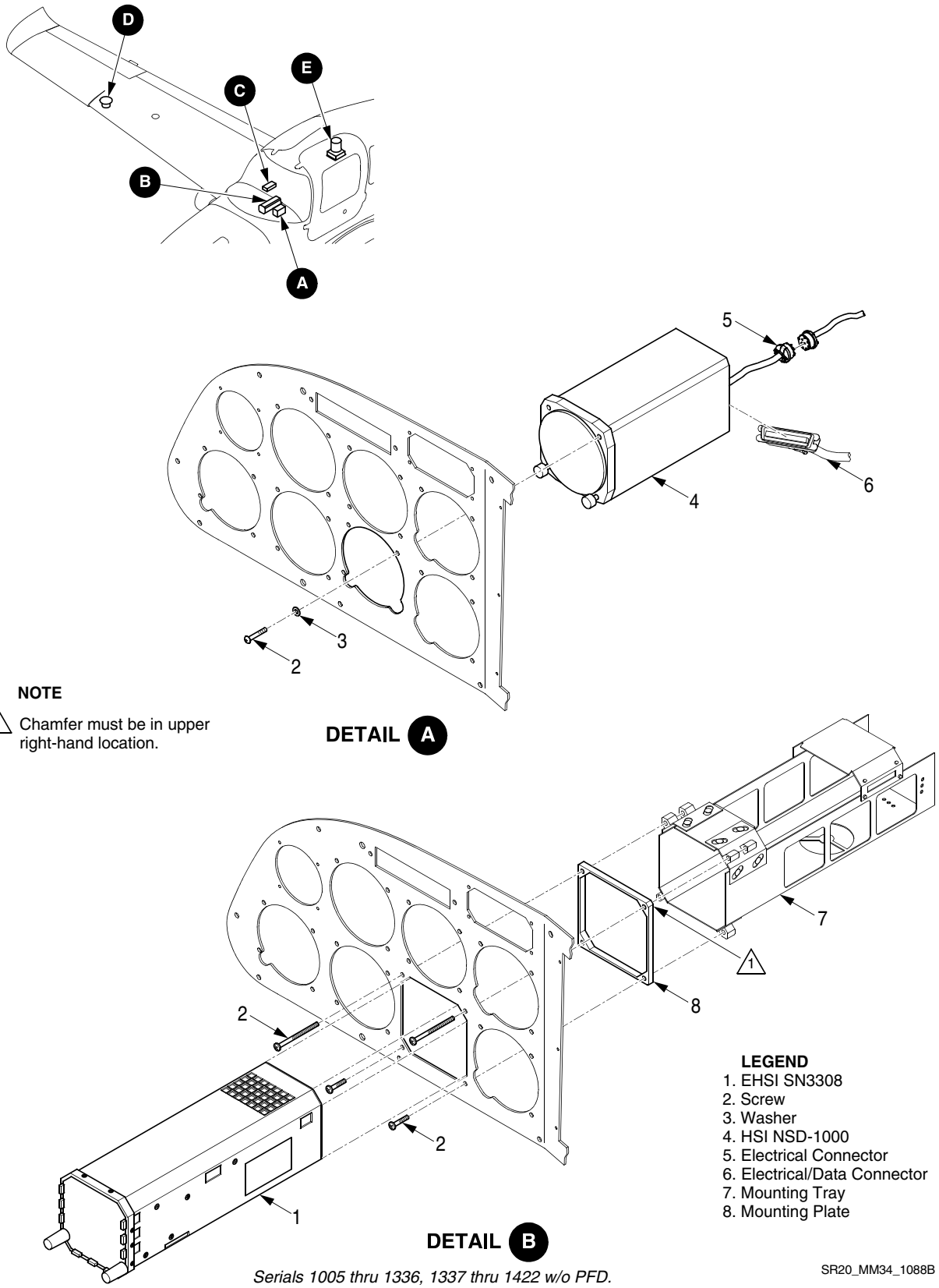
(m) Toggle BAT 1 switch to OFF, then ON position to put EHSI in normal operating mode.

U. Remote Gyro - *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD* **(See Figure 34-508)**

CAUTION: Remote gyro is a precision instrument and is easily damaged by rough handling. Always place remote gyro on a padded surface. Avoid all shock impacts to gyro.

(1) Removal - Remote Gyro
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull HSI#1 and HSI#2 circuit breakers.
  (c) Remove RH passenger seat. (Refer to 25-10)
  (d) Disconnect remote gyro connector assembly.
  (e) Remove screws securing remote gyro to fuselage mounting tray and remove from airplane.

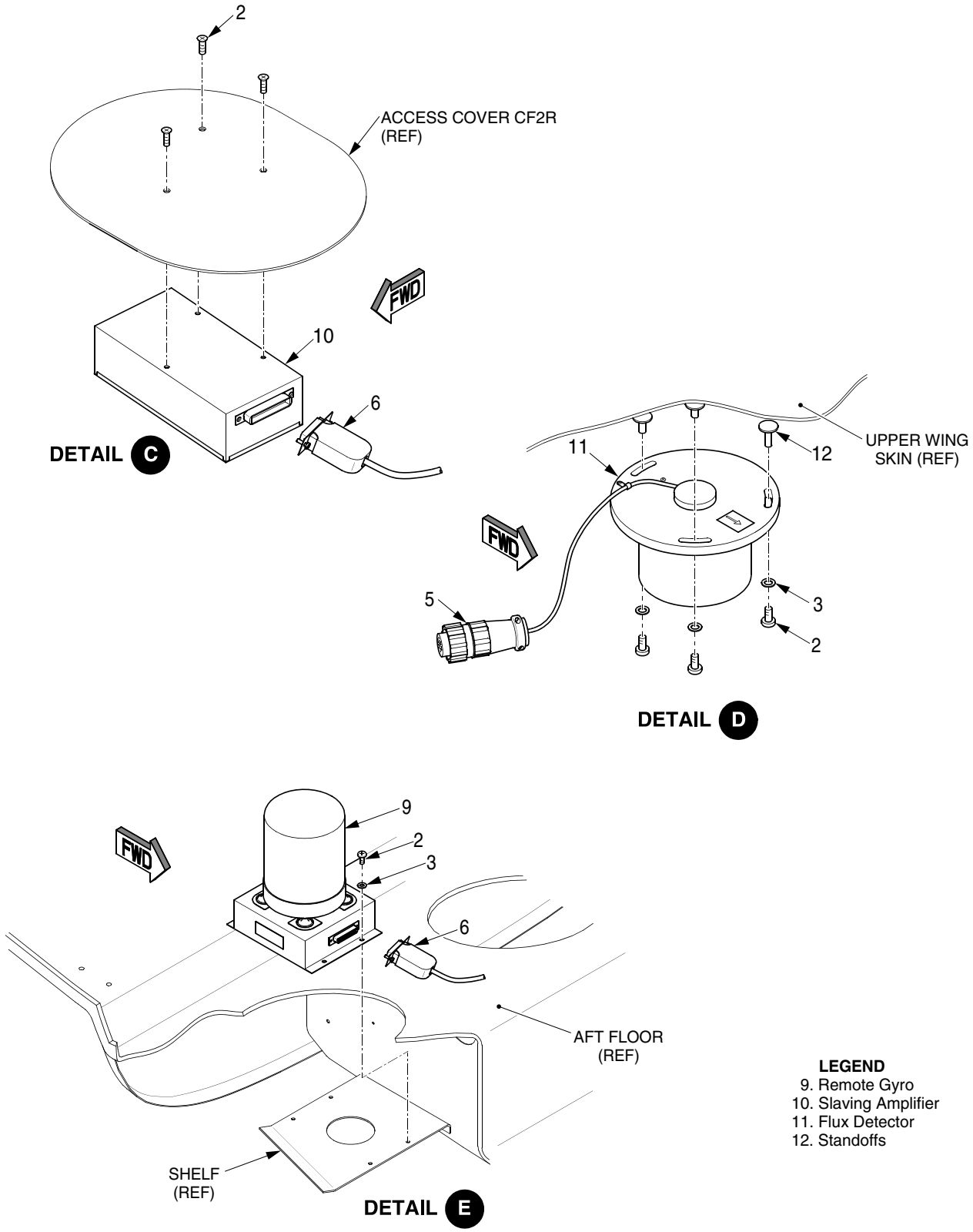
(2) Installation - Remote Gyro
  (a) Position remote gyro to mounting tray and secure with screws.
  (b) Connect remote gyro electrical connector assembly.
  (c) Install RH passenger seat. (Refer to 25-10)
  (d) Reset HSI#1 and HSI#2 circuit breakers.
  (e) Perform Operational Check - SN3308 EHSI. (Refer to 34-50)



Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

Figure 34-508
HSI Components - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1336, 1337 thru 1422 w/o PFD



Serials 1005 thru 1336, 1337 thru 1422 w/o PFD.

Figure 34-508
HSI Components - Serials 1005 thru 1336, 1337 thru 1422 w/o PFD (Sheet 2 of 2)

V. XM Weather Receiver - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 34-509)

Note: *Serials 1473 thru 1581 w/ factory installed XM Weather, Serials 1005 thru 1612 after SB 2X-34-06 w/ COM1 / XM antenna in kit:* The XM Receiver and COM1 share the same antenna. For maintenance practices pertinent to the XM Weather antenna on these airplanes, refer to COM1 / XM Weather Antenna. (Refer to 34-50)

Serials 1613 & subs w/ factory installed XM Weather, Serials 1005 & subs after SB 2X-34-06 w/ standalone XM antenna in kit: The XM Receiver uses a standalone antenna. For maintenance practices pertinent to the XM Weather antenna on these airplanes, refer XM Weather Antenna. (Refer to 34-50)

Serials w/ WAAS GPS/XM antenna: The XM Receiver and GPS1 share the same antenna. For maintenance practices pertinent to the XM Weather antenna on these airplanes, refer XM Weather Antenna. (Refer to 34-50)

(1) Removal - XM Weather Receiver
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.
  (c) *Serials 1005 thru 1797:* Remove MFD. (Refer to 31-60)
  (d) *Serials 1005 thru 1797:* Remove glareshield. (Refer to 25-10)
  (e) *Serials 1798 & subs:* Remove RH rear cabin side trim. (Refer to 25-10)
  (f) Disconnect antenna cable from receiver.
  (g) *Serials 1747 & subs w/o WAAS GPS, Serials 1005 thru 1746 after SB 2X-34-06:* Remove attenuator from "Ant In" input.
  (h) To remove receiver:
    1 Disconnect electrical connector from receiver.
    2 *Serials 1005 thru 1797:* At RH forward console, remove screws and washers securing receiver to attach brackets. Remove receiver from airplane.

      Note: *Serials 1798 & subs:* At upper aft receiver installation hole, two thin washers are installed between the receiver and fuselage. Retain washers when removing screw at this location.

    3 *Serials 1798 & subs:* At RH aft fuselage, remove screws and washers securing receiver to fuselage. Remove receiver from airplane.

(2) Installation - XM Weather Receiver
  (a) To install receiver:
    1 *Serials 1005 thru 1797:* At RH forward console, position receiver to attach brackets and secure with screws and washers.

      Note: *Serials 1798 & subs:* At upper aft receiver installation hole, two thin washers are installed between the receiver and fuselage.

    2 *Serials 1798 & subs:* At RH aft fuselage, position receiver to fuselage and secure with screws and washers.
    3 Connect electrical connector to receiver.
  (b) *Serials 1747 & subs w/o WAAS GPS, Serials 1005 thru 1746 after SB 2X-34-06:* Connect attenuator to "Ant In" input on receiver. Torque attenuator nut to 7 - 10 in-lbs (0.79 - 1.1 Nm).
  (c) Connect antenna cable to "Ant In" input on receiver. Torque cable nut to 7 - 10 in-lbs (0.79 - 1.1 Nm).

(d) *Serials 1005 thru 1797:* Install glareshield. (Refer to 25-10)
(e) *Serials 1005 thru 1797:* Install MFD. (Refer to 31-60)
(f) *Serials 1798 & subs:* Install RH rear cabin side trim. (Refer to 25-10)
(g) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.
(h) Perform Operational Test - XM Weather Receiver. (Refer to 34-50)
(i) *Serials 1005 & subs w/ XM Radio:* Perform Operational Test - XM Radio. (Refer to 23-30)

(3) Operational Test - XM Weather Receiver
(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.
(b) Set GNS power in GPS1 position to ON position.
(c) Bring airplane to an area that has as few obstacles to line-of-sight viewing to the southern horizon as possible.
(d) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
(e) If Engine Monitoring is selected, press [Fuel Done].
(f) Rotate left knob to select Trip page.
(g) Press [Display] until “Broadcast Status” is selected.
(h) Verify SIGNAL QUALITY is reported as “Good”, “Marginal”, “Weak”, or “None”.
(i) If the receiver is working, antenna and cabling are correct, and airplane is in view of at least one XM Weather satellite, SIGNAL QUALITY will be “Good” and the RECEIVER ID will be reported.
(j) If SIGNAL QUALITY is not reported as “Good”, the antenna field of view may be obstructed. Try moving or rotating the airplane until SIGNAL QUALITY improves.
(k) Set GNS power in GPS1 position to OFF position.
(l) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

W. XM Weather Receiver Brackets - *Serials 1005 thru 1797* (See Figure 34-509)

(1) Removal - XM Weather Receiver Brackets

(a) Remove XM Receiver. (Refer to 34-50)

(b) Remove screws, washers, and nuts securing aft attach bracket to console ribs. Remove aft attach bracket.

(c) Remove screws, washers, and nuts securing forward attach bracket to lower strut. Remove forward attach bracket.

(2) Installation - XM Weather Receiver Brackets

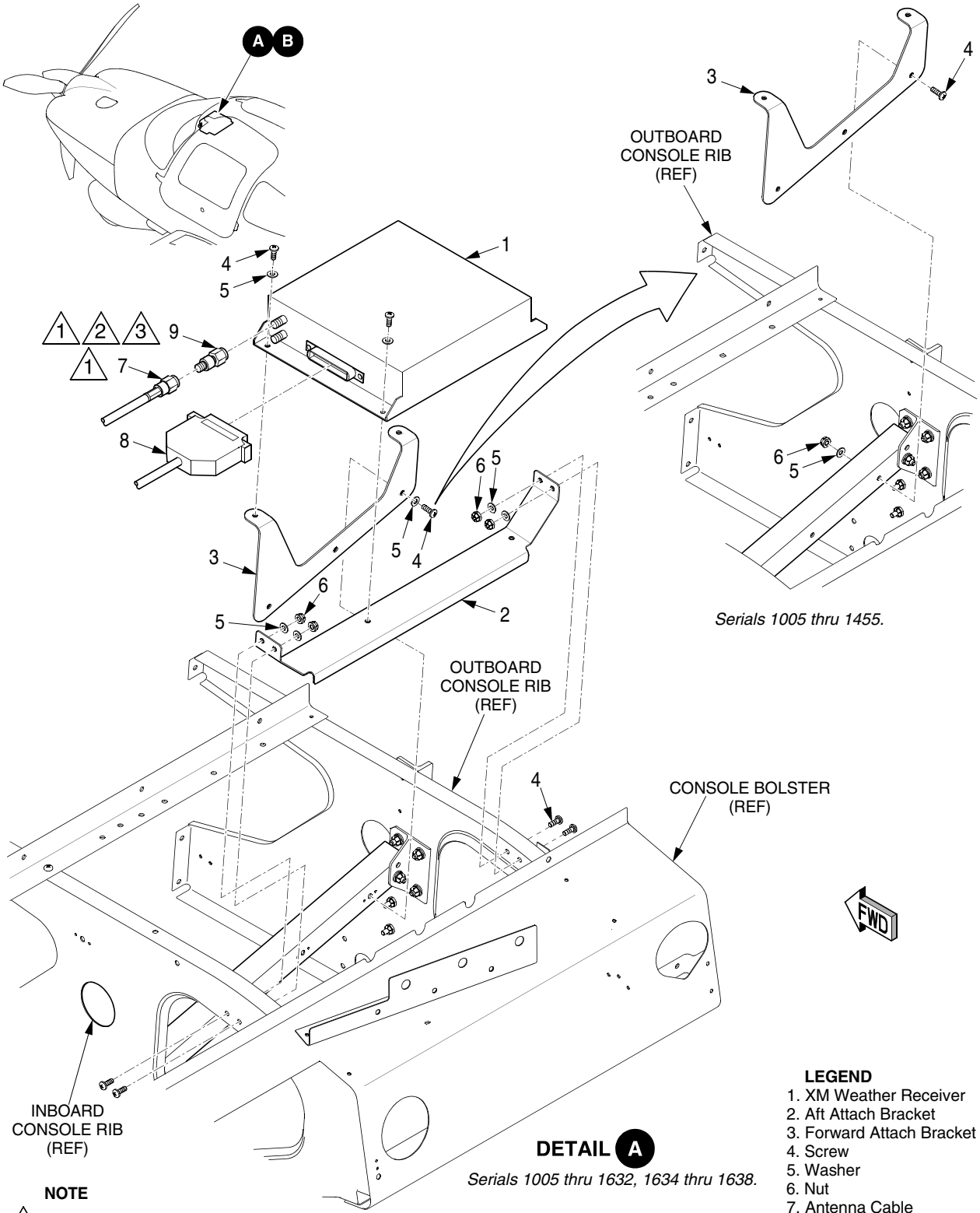
(a) Position forward attach bracket at forward installation holes on lower strut between RH outboard and inboard console ribs.

(b) Install screws, washers, and nuts securing forward attach bracket to lower strut.

(c) Position aft attach bracket at aft installation holes on RH outboard and inboard console ribs.

(d) Install screws, washers, and nuts securing aft attach bracket to console ribs.

(e) Install XM Receiver. (Refer to 34-50).



LEGEND

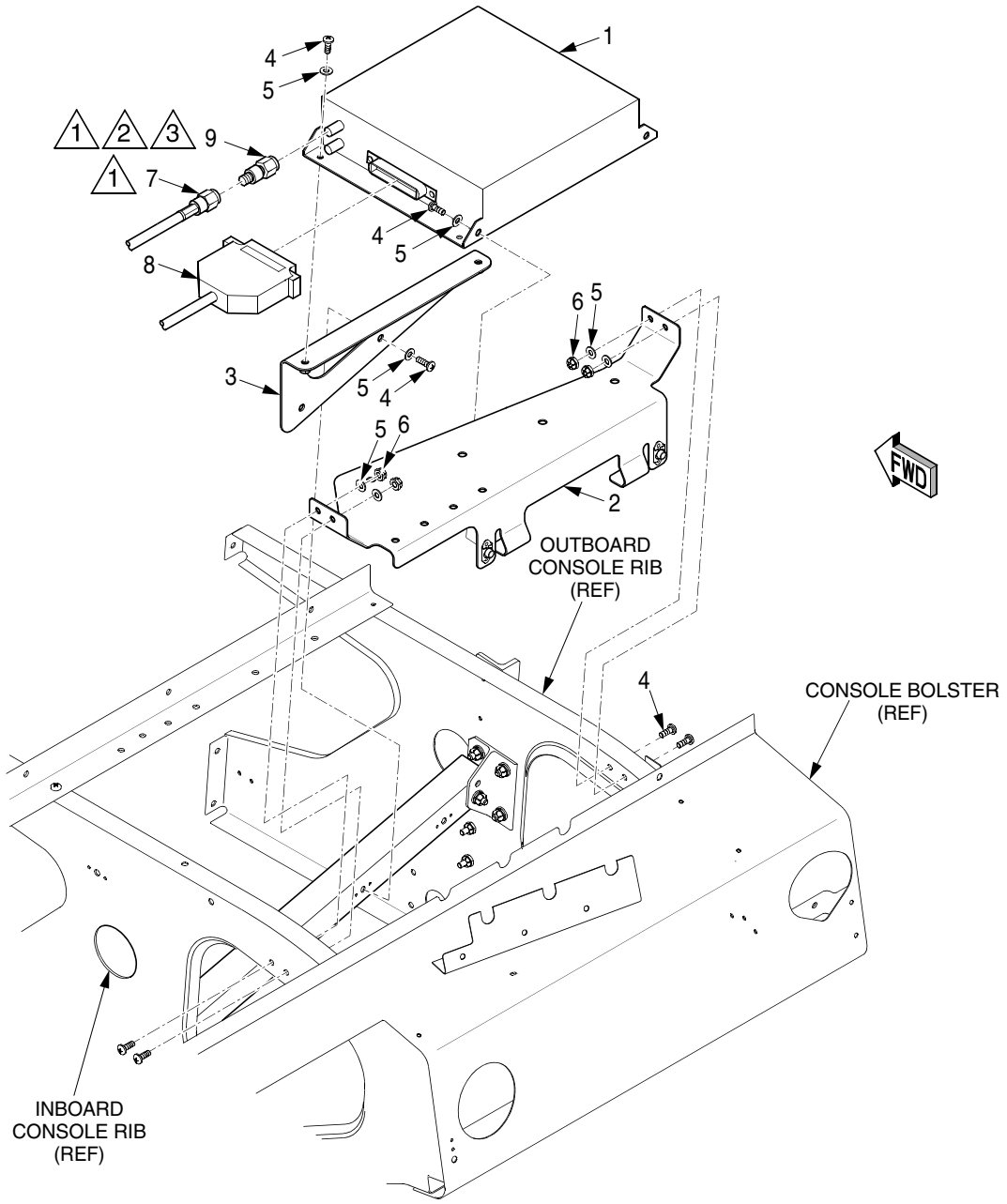
1. XM Weather Receiver
2. Aft Attach Bracket
3. Forward Attach Bracket
4. Screw
5. Washer
6. Nut
7. Antenna Cable
8. Electrical Cable
9. Attenuator

SR20_MM34_2039D

NOTE

1. Serials 1747 & subs, Serials 1005 thru 1746 after SB 2X-34-06 w/ attenuator in kit.
2. Torque nut to 7 - 10 in-lb (0.79 - 1.1 Nm).
3. Serials w/ WAAS: Do not install attenuator.

Figure 34-509
XM Weather Receiver - Serials 1005 thru 1638 (Sheet 1 of 3)



DETAIL B

Serials 1633, 1639 thru 1797.

LEGEND

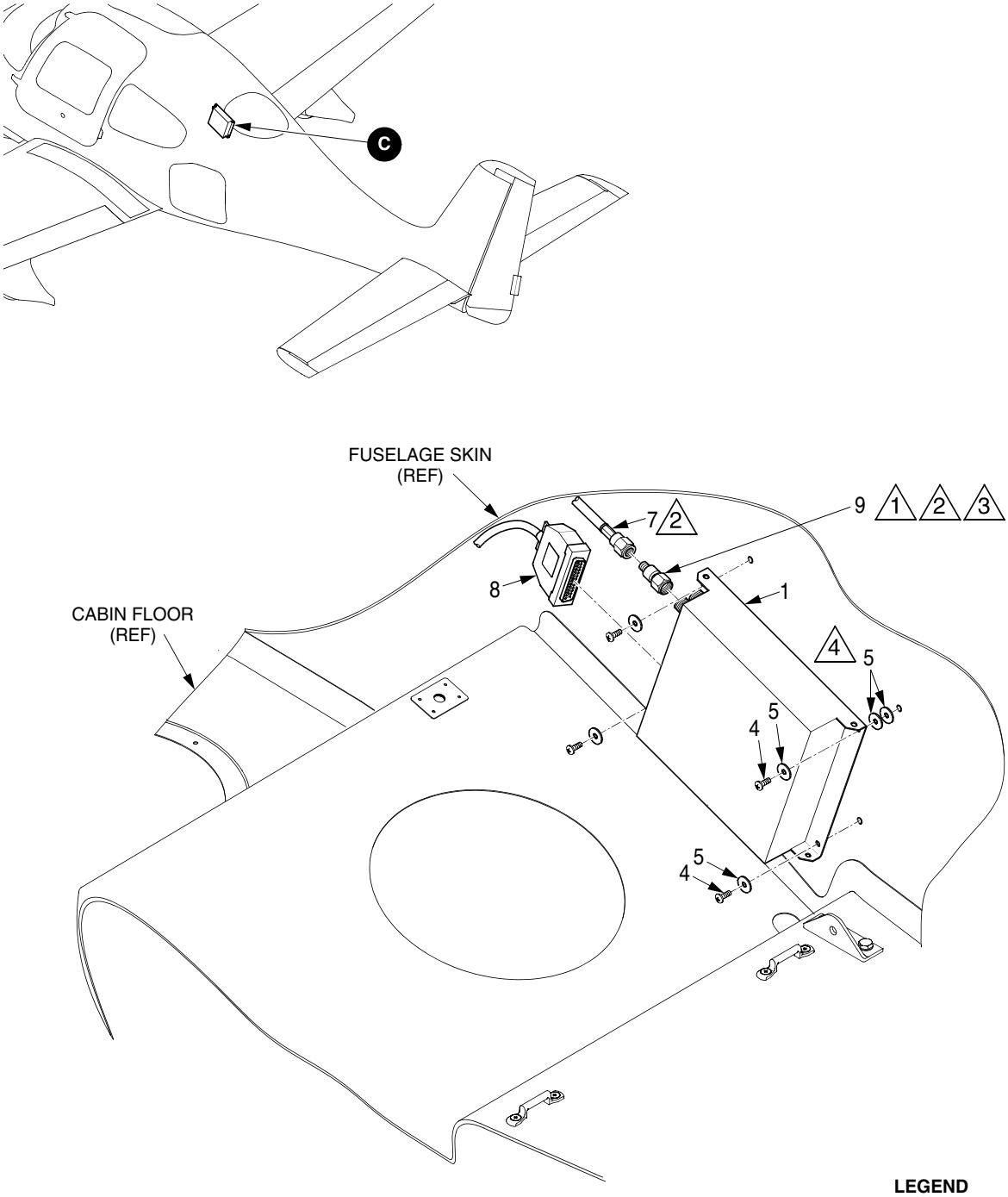
1. XM Weather Receiver
2. Aft Attach Bracket
3. Forward Attach Bracket
4. Screw
5. Washer
6. Nut
7. Antenna Cable
8. Electrical Cable
9. Attenuator

NOTE

1. Serials 1747 & subs, Serials 1005 thru 1746 after SB 2X-34-06 w/ attenuator in kit.
2. Torque nut to 7 - 10 in-lb (0.79 - 1.1 Nm).
3. Serials w/ WAAS: Do not install attenuator.

SR20_MM34_2328B

Figure 34-509
XM Weather Receiver - Serials 1639 thru 1797 (Sheet 2 of 3)



NOTE

1. *Serials 1747 & subs, Serials 1005 thru 1746 after SB 2X-34-06 w/attenuator in kit.*
2. Torque nut to 7 - 10 in-lb (0.79 - 1.1 Nm).
3. *Serials w/WAAS:* Do not install attenuator.
4. At upper aft receiver installation hole, two thin washers are installed between the receiver and fuselage.

DETAIL C

Serials 1798 & subs.

LEGEND

1. XM Weather Receiver
4. Screw
5. Washer
7. Antenna Cable
8. Electrical Cable
9. Attenuator

SR20_MM34_2674

Figure 34-509
XM Weather Receiver - Serials 1798 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 3 of 3)

X. XM Weather Receiver - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-5010)**

(1) Removal - GDL 69A XM Weather Receiver

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 1005 thru 2126:* Pull WEATHER circuit breaker.

(c) *Serials 2127 & subs:* Pull WEATHER/DATALINK circuit breaker.

(d) Remove empennage access panel RE3. (Refer to 06-00)

(e) Remove ELT. (Refer to 25-60)

(f) Loosen screw securing handle-lock mechanism to receiver.

(g) Lift handle-lock mechanism to disengage receiver from connectors.

(h) Remove receiver from rack.

(2) Installation - GDL 69A XM Weather Receiver

(a) Position receiver to rack, ensuring handle-lock mechanism engages slot on side of rack.

(b) Using handle-lock mechanism, gently push receiver into rack to engage connectors.

(c) Tighten screw securing handle-lock mechanism to receiver.

(d) *Serials 1005 thru 2126:* Reset WEATHER circuit breaker.

(e) *Serials 2127 & subs:* Reset WEATHER/DATALINK circuit breaker.

(f) Install ELT. (Refer to 25-60)

(g) Install empennage access panel RE3. (Refer to 06-00)

(h) If XM Weather Receiver has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

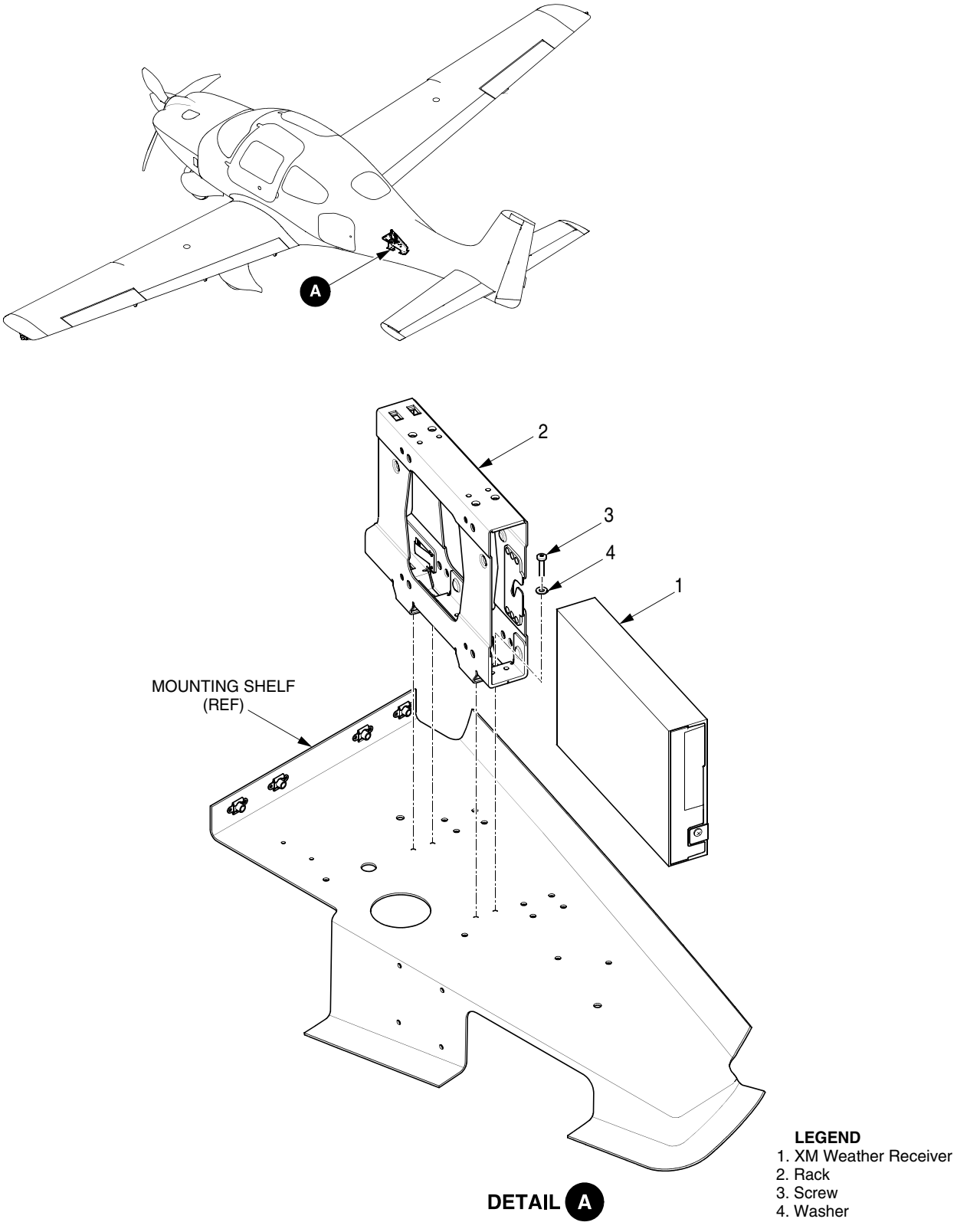


Figure 34-5010
XM Weather Receiver - Serials 2016 & subs w/ Perspective Avionics

Y. XM *Weather* Antenna - *Serials 1582 & subs w/ factory XM Weather, Serials 1005 & subs after SB 2X-34-06 w/ standalone XM antenna in kit, Serials w/ WAAS GPS/XM antenna* (See Figure 34-5011)

(1) Removal - XM Weather Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(c) Remove cabin headliner. (Refer to 25-10)

(d) Disconnect XM Weather cable from antenna.

(e) *Serials w/ WAAS GPS:* Disconnect GPS1 cable from antenna.

(f) Remove nuts, washers, and screws securing antenna to fuselage.

(g) Remove antenna and gasket from fuselage.

(h) Remove remaining sealant from fuselage.

(2) Installation - XM Weather Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position gasket and antenna to fuselage and insert screws through mounting holes.

CAUTION: To prevent damage to rubber gasket at screwhead, turn nuts onto screws during installation.

Note: Tighten forward screws prior to tightening aft screws.

(c) Install washers and nuts securing antenna to fuselage. Torque nuts to maximum of 20 - 25 in-lb (2.26 - 2.82 Nm).

(d) Fillet seal antenna perimeter. (Refer to 20-10)

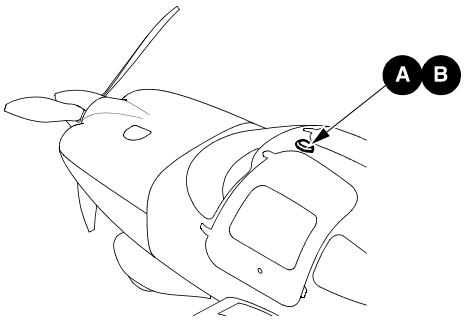
(e) Connect XM Weather cable to antenna.

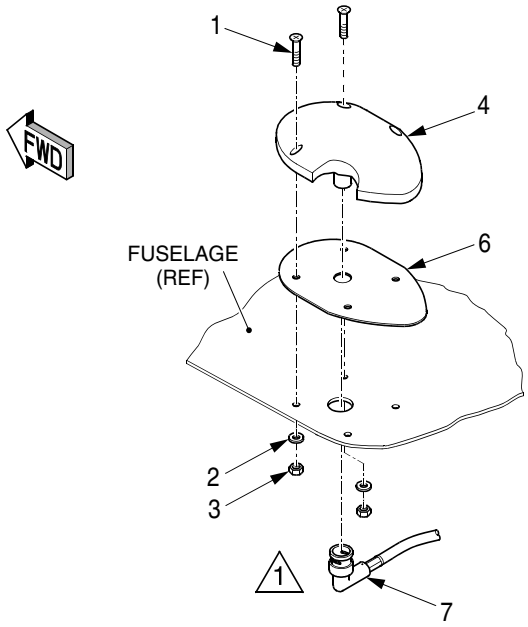
(f) *Serials w/ WAAS GPS:* Connect GPS1 cable to antenna.

(g) Install cabin headliner. (Refer to 25-10)

(h) Reset ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

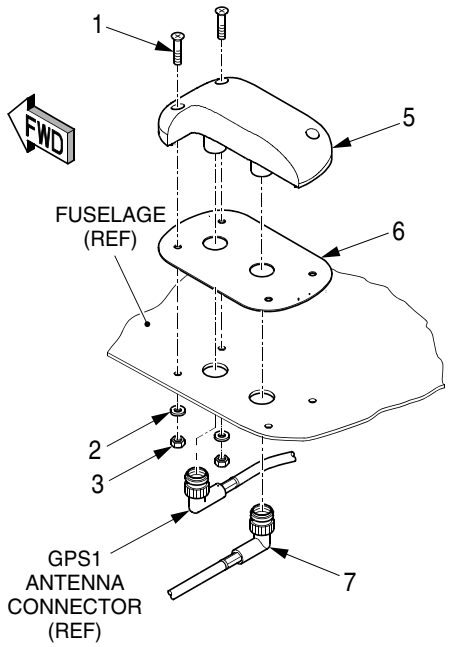
EFFECTIVITY:
Serials 1582 & subs w/ factory XM Weather, Serials 1005 & subs after SB 2X-34-06 w/ standalone XM antenna in kit, Serials w/ WAAS GPS/XM antenna





DETAIL A

Serials 1582 thru 1801, 1803 thru 1815 w/ factory XM Weather,
Serials 1005 thru 1801, 1803 thru 1815 after SB 2X-34-06 w/ standalone XM antenna in kit.



DETAIL B

Serials 1802, 1816 & subs w/ WAAS GPS/XM,
Serials 1005 thru 1422 after SB 2X-34-23,
Serials 1337 thru 1801, 1803 thru 1815 after SB 2X-34-24.

LEGEND

1. Screw
2. Washer
3. Nut
4. XM Weather Antenna
5. WAAS GPS/XM Weather Antenna
6. Gasket
7. Antenna Connector

NOTE

1 At upper aft receiver installation hole, two thin washers are installed between the receiver and fuselage.

SR20_MM34_2612C

Figure 34-5011
XM Weather Antenna - Serials 1582 & subs w/ factory XM Weather

Z. Iridium GSR 56 Transceiver - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-5012)**

(1) Removal - Iridium GSR 56 Transceiver

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull WEATHER/DATALINK circuit breaker.

(c) Remove empennage access panel RE3. (Refer to 06-00)

(d) To prevent debris and components from falling into bottom of empennage, place catch cloth below transceiver installation.

(e) Loosen screw securing handle-lock mechanism to transceiver.

(f) Lift handle-lock mechanism to disengage transceiver from connectors.

(g) Remove transceiver from rack.

(2) Installation - Iridium GSR 56 Transceiver

(a) Position transceiver to rack, ensuring handle-lock mechanism engages slot on side of rack.

(b) Using handle-lock mechanism, gently push transceiver into rack to engage connectors.

(c) Tighten screw securing handle-lock mechanism to transceiver.

(d) Remove catch cloth from below transceiver installation.

(e) Using a vacuum cleaner, remove all debris from fuselage floor.

(f) Install empennage access panel RE3. (Refer to 06-00)

(g) Reset WEATHER/DATALINK circuit breaker.

(h) If avionics system has not been previously configured for GSR 56 or system configuration has been corrupted, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)

(i) Perform Operational Test - Iridium GSR 56 Transceiver. (Refer to 34-50)

(j) If GSR 56 has been replaced with a new or different unit, or original unit has been repaired, perform Functional Test - Iridium GSR 56 Transceiver. (Refer to 34-50)

(3) Operational Test - Iridium GSR 56 Transceiver

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) On MFD, press [ENT] softkey to acknowledge prompts as directed.

(c) On Initial Usable Fuel page, press [ENT] softkey to accept usable fuel quantity.

(d) On FMS keyboard, Rotate outer dial of [CRSR] knob to select the Aux page group.

(e) Rotate inner dial of [CRSR] knob to select the Aux (System Status) page.

(f) Press inner dial of [CRSR] knob to activate cursor.

(g) Scroll through LRU INFO window and verify that the green check-mark is in the STATUS column for the GSR1.

(h) Press inner dial of [CRSR] knob to de-activate cursor.

(i) Position the aircraft away from buildings. The Iridium antenna must have an unobstructed view of the sky.

(j) Rotate outer dial of [CRSR] knob to select the Aux page group.

(k) Rotate inner dial of [CRSR] knob to select the Aux (Satellite Phone) page.

(l) Verify that Iridium signal strength - green bars above the satellite icon - shows 4 to 5 bars.

(m) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(4) Functional Test - Iridium GSR 56 Transceiver

Note: Prior to performing Functional Test - Iridium GSR 56 Transceiver, contact Garmin Flight Data Service for weather and/or voice system activation.

(a) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(b) On MFD, press [ENT] softkey to acknowledge prompts as directed.

(c) On Initial Usable Fuel page, press [ENT] softkey to accept usable fuel quantity.

(d) For weather activation:

1 Rotate outer dial of [CRSR] knob to select the Map page group.

2 Rotate inner dial of [CRSR] knob to select the Map (Weather Data Link) page.

Note: Press MENU to select DISPLAY GFDS WEATHER from the PAGE MENU, if required.

3 Press MENU button on the keypad to activate PAGE MENU pop-up screen.

4 Select 'Register with GFDS' from PAGE MENU pop-up screen and press [ENT] softkey.

5 Using FMS knobs, enter registration number in NEW REGISTRATION field.

6 Position cursor on 'REGISTER' and press [ENT] softkey to initiate registration process.

Note: Enabling a temporary Iridium network registration can take approximately 30 minutes. System registration is complete when 'REGISTERED' is displayed on STATUS field.)

(e) For voice activation:

1 *Serials w/ GMA 347:* On audio panel, select [TEL] and [PILOT] to ensure telephone I/O is enabled.

2 *Serials w/ GMA 350*: On audio panel, select *ENTERTAINMENT* button (shown as a phone and music-note symbol) and [PILOT] to ensure telephone I/O is enabled.

3 Ensure pilot's headset is active.

4 Rotate outer dial of [CRSR] knob to select the Aux page group.

5 Rotate inner dial of [CRSR] knob to select the Aux (Satellite Phone) page.

6 Press [DIAL] softkey to display PHONE CALL pop-up screen.

Note: Completing call will incur charges to service billing.

7 Use FMS knobs or MFD bezel keys to enter a working phone number.

8 Select OK and press [ENT] softkey to initiate phone call.

9 Verify that call completes and that call quality is acceptable.

(f) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

AA. Iridium GSR 56 Transceiver Rack - *Serials 2016 & subs w/ Perspective Avionics*

(1) Removal - Iridium GSR 56 Transceiver Rack
- (a) Remove Iridium GSR 56 transceiver. (Refer to 34-50)
- (b) Disconnect antenna and GIA #2 wire harnesses from rack connectors.
- (c) Remove Iridium GSR 56 mounting shelf. (Refer to 34-50)
- (d) Remove screws and washers securing rack to mounting shelf.

(2) Installation - Iridium GSR 56 Transceiver Rack
- (a) Position rack to mounting shelf and secure with screws and washers.
- (b) Install Iridium GSR 56 mounting shelf. (Refer to 34-50)
- (c) Connect antenna and GIA #2 wire harnesses to rack connectors.
- (d) Install Iridium GSR 56 transceiver. (Refer to 34-50).

AB. Iridium GSR 56 Mounting Shelf - *Serials 2016 & subs w/ Perspective Avionics*

(1) Removal - Iridium GSR 56 Mounting Shelf

(a) Disconnect antenna and GIA #2 wire harnesses from rack connectors.

(b) Remove aft cabin bulkhead (BH 222) trim panel and carpet. (Refer to 25-10)

(c) Remove screws and washers securing mounting shelf to aft cabin bulkhead (BH 222). Remove mounting bracket.

(2) Installation - Iridium GSR 56 Mounting Shelf

(a) Position mounting shelf to aft cabin bulkhead (BH 222) and secure with screws and washers.

(b) Install aft cabin bulkhead (BH 222) trim panel and carpet. (Refer to 25-10)

(c) Connect antenna and GIA #2 wire harnesses to rack connectors.

(d) Perform Operational Test - Iridium GSR 56 Transceiver. (Refer to 34-50)

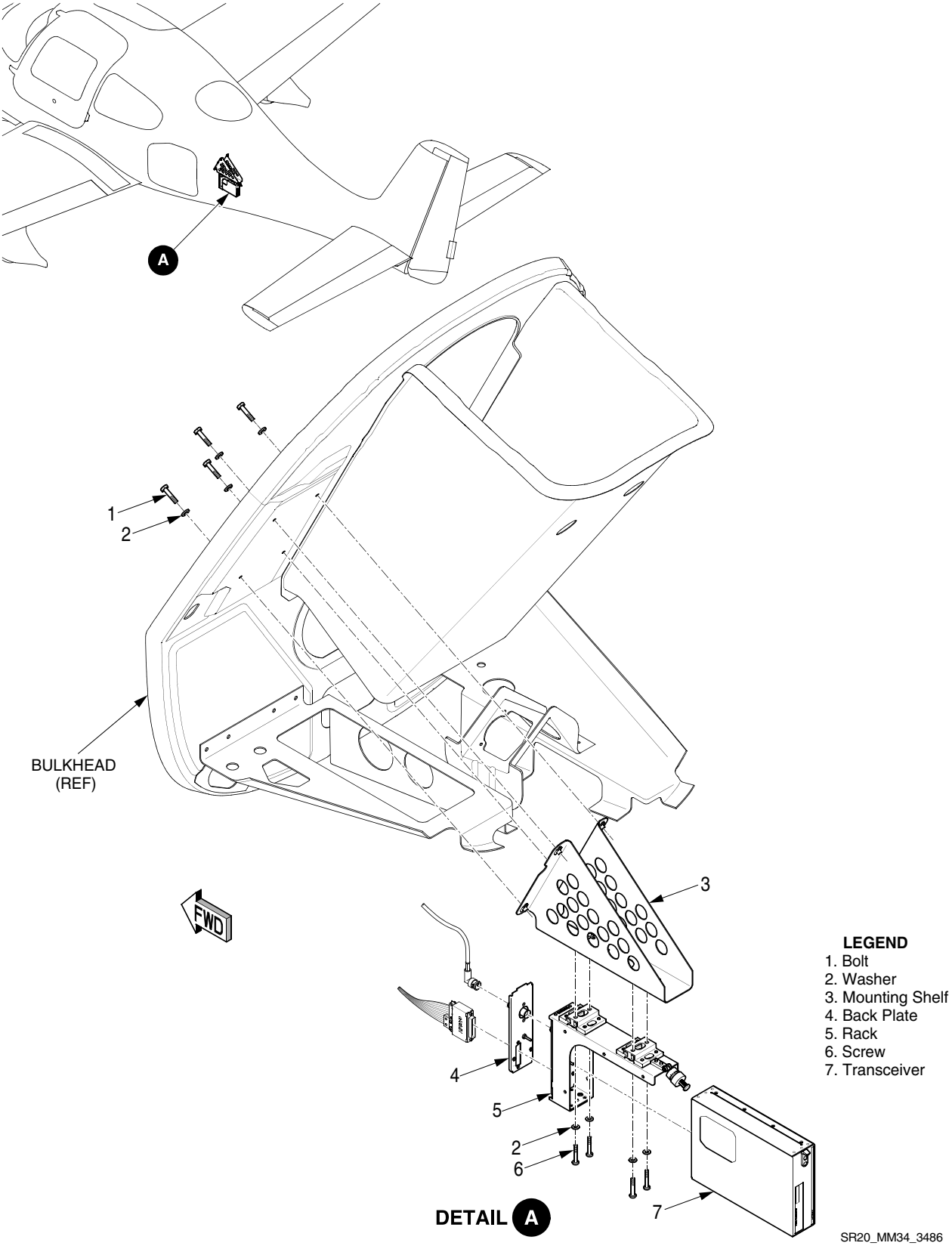


Figure 34-5012
Iridium Weather System - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

AC. Automatic Direction Finder (ADF) Receiver - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-5013)**

(1) Removal - ADF Receiver

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull DME / ADF circuit breaker.

(c) Loosen screw to disengage ADF receiver from mounting tray connectors.

(d) Remove ADF receiver from mounting tray.

(2) Installation - ADF Receiver

(a) Position ADF receiver into mounting tray until connectors mate.

(b) Tighten screw to fully engage connectors, then tighten an additional quarter turn.

(c) Reset DME / ADF circuit breaker.

(d) Perform Operational Test - ADF Receiver. (Refer to 34-50)

(3) Operational Test - ADF Receiver

(a) Verify ADF window is displayed on PFD. If ADF window is not displayed, press [PFD] softkey.

(b) Using either [BRG1] or [BRG2] softkeys, toggle softkey until ADF bearing is displayed.

(c) Press [BACK] softkey.

(d) Verify ADF window is not invalid (no red ‘X’).

(e) Verify audio from tuned station can be heard on pilot and copilot headsets.

(f) Verify audio from tuned station can be heard over cabin speaker.

AD. Automatic Direction Finder (ADF) Antenna - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 34-5013)**

(1) Removal - ADF Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull DME / ADF circuit breaker.

(c) Remove access panel CF3C. (Refer to 06-00)

(d) Remove nut and washers securing terminal ring to antenna backing plate.

(e) Remove screws securing antenna to backing plate. Remove antenna from airplane.

(2) Installation - ADF Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position antenna to fuselage.

(c) Install screws securing antenna to backing plate.

(d) Position terminal ring to antenna backing plate and secure with washer and nut.

(e) Install access panel CF3C. (Refer to 06-00)

(f) Fillet seal antenna perimeter. (Refer to 20-10)

(g) Reset DME / ADF circuit breaker.

(h) Perform Operational Test - ADF Receiver. (Refer to 34-50)

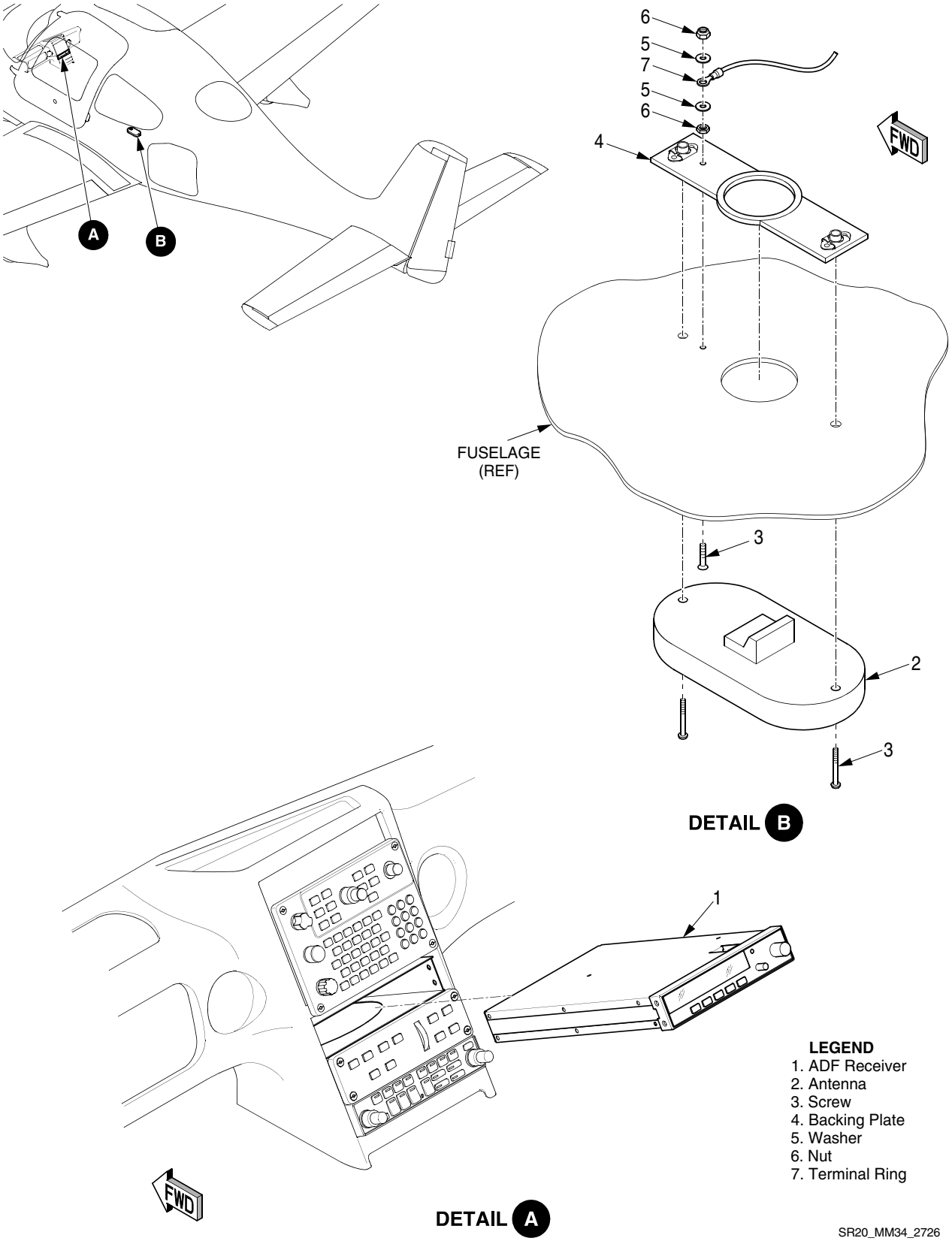


Figure 34-5013
ADF Receiver and Antenna Installation - Serials 2016 & subs w/ Perspective Avionics

AE. KN 63 Distance Measuring Equipment (DME) Receiver - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-5014)

(1) Removal - KN 63 DME Receiver

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull DME / ADF circuit breaker.

(c) Remove access panel CF1L and CF2L. (Refer to 06-00)

(d) Disconnect connector from DME receiver.

(e) Remove screws securing DME receiver mounting shelf to fuselage floor.

(f) Remove screws and washers securing DME receiver to mounting shelf. Remove DME receiver from airplane.

(2) Installation - KN 63 DME Receiver

(a) Position DME receiver to mounting shelf and secure with screws and washers.

(b) Position DME receiver mounting shelf to fuselage floor and secure with screws.

(c) Connect connector to DME receiver.

(d) Install access panel CF1L and CF2L. (Refer to 06-00)

(e) Reset DME / ADF circuit breaker.

(f) Perform Operational Test - DME Receiver. (Refer to 34-50)

(3) Operational Test - DME Receiver

(a) On PFD, press [PFD] softkey, then press [DME] softkey to display DME window.

(b) On PFD, press [ADF/DME] softkey. Verify ADF/DME TUNING screen is displayed.

(c) With ADF/DME TUNING screen activated, use outer [FMS] knob to highlight DME field.

(d) Verify NAV1, NAV2 and HOLD modes can be selected by turning inner [FMS] knob.

(e) Verify NAV1 frequency is set to 108.00.

(f) Verify NAV2 frequency is set to 117.00.

(g) Press [ENT] softkey to select DME NAV1 mode. Verify DME window display is set to NAV1 frequency of 108.00.

(h) Press [ENT] softkey to select DME NAV2 mode. Verify DME window display is set to NAV2 frequency of 117.00.

(i) Press [ENT] softkey to select DME HOLD mode. Verify last selected NAV frequency of 117.00 remains the same when NAV2 frequency is changed.

(j) On audio panel, press [DME] button to select DME audio.

(k) On audio panel, press [SPKR] button to turn on cabin speaker.

(l) Verify DME audio can be heard over cabin speaker.

(m) On PFD, set DME mode to NAV2 and verify DME distance is dashed out.

AF. KN 63 Distance Measuring Equipment (DME) Antenna - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-5014)

(1) Removal - KN 63 DME Antenna

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull DME / ADF circuit breaker.

(c) Remove access panel CF8. (Refer to 06-00)

(d) Disconnect antenna cable from antenna.

(e) Remove nut, and washers securing antenna to cabin floor. Remove antenna from airplane.

(2) Installation - KN 63 DME Antenna

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Position antenna to cabin floor and secure with washers and nuts.

(c) Connect antenna cable to antenna.

(d) Install access panel CF8. (Refer to 06-00)

CAUTION: Ensure drain hole is unobstructed and free of sealant.

(e) Fillet seal antenna perimeter. (Refer to 20-10)

(f) Reset DME / ADF circuit breaker.

(g) Perform Operational Test - DME Receiver. (Refer to 34-50)

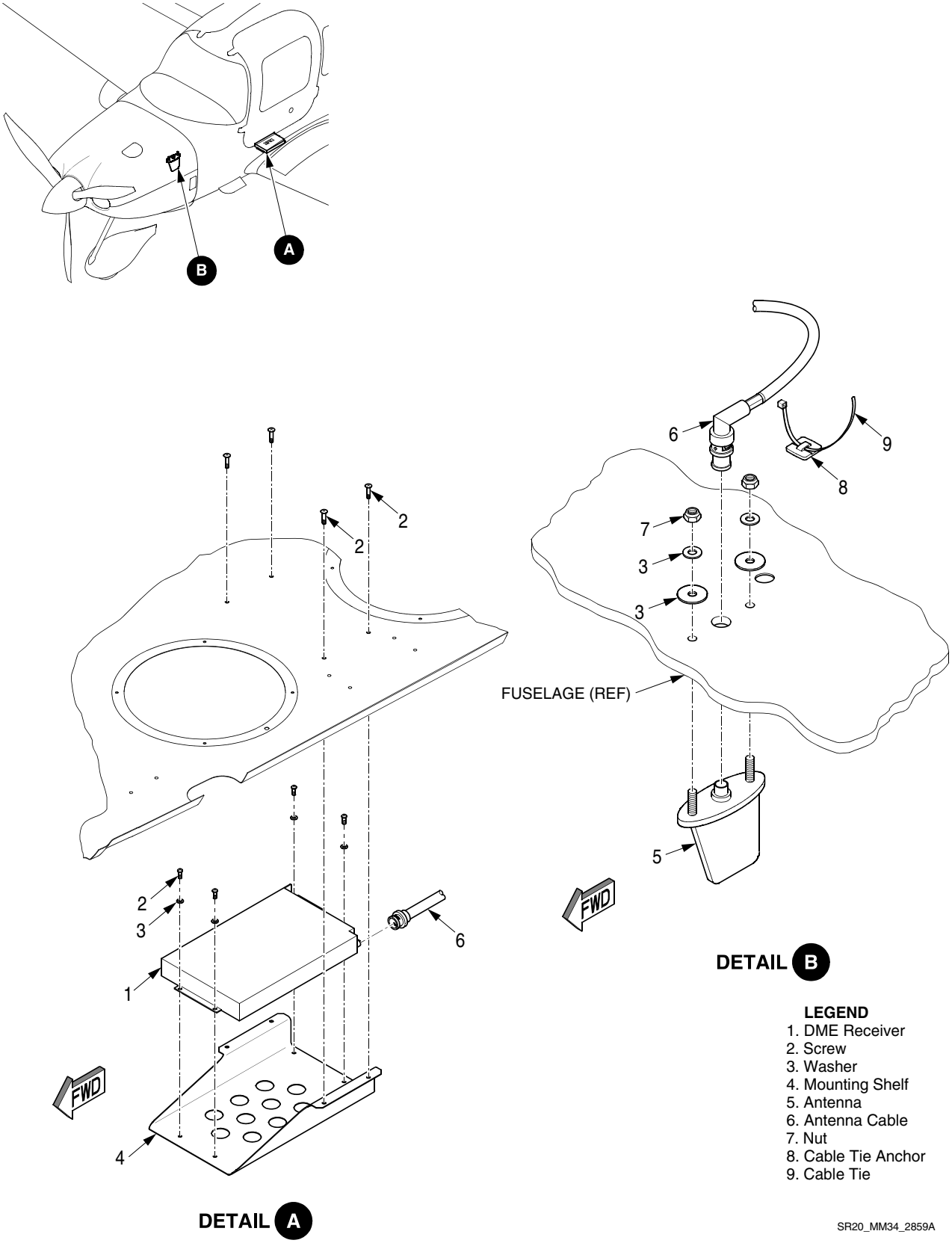


Figure 34-5014
DME Receiver and Antenna Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

FLIGHT MANAGEMENT COMPUTING

1. DESCRIPTION

This section covers that portion of the system which combines navigational data to compute or manage the aircraft's geographical position or theoretical flight path. This includes the GCU 478 Flight Management System (FMS) keyboard.

The GCU 478 FMS keyboard is an alphanumeric, softkey keyboard that provides the primary interface to the Perspective Avionics system. Located in the upper radio rack, the FMS keyboard is used for avionics system data entry, PFD/MFD operation, and NAV/COM tuning. 28 VDC for FMS keyboard operation is supplied through the 5-amp KEYPADS / AP CTRL circuit breaker on Main Bus 1.

For additional information on the FMS keyboard, refer to the Perspective Integrated Avionics System Pilot's Guide for a complete description of the system, its operating modes, and additional detailed operating procedures. (Refer to 05-10)

The GCU 478 FMS keyboard is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

2. MAINTENANCE PRACTICES

A. GCU 478 Flight Management System (FMS) Keyboard - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 34-601)

(1) Removal - GCU 478 FMS Keyboard

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull KEYPADS / AP CTRL circuit breaker.

(c) Rotate captive screws counter-clockwise 1/4 turn to loosen keyboard.

(d) Loosen screws securing electrical connector to keyboard.

(e) Remove keyboard from radio rack.

(2) Installation - GCU 478 FMS Keyboard

(a) Ensure alignment marks on captive screws are in the horizontal position.

(b) Position electrical connector to keyboard and secure with screws.

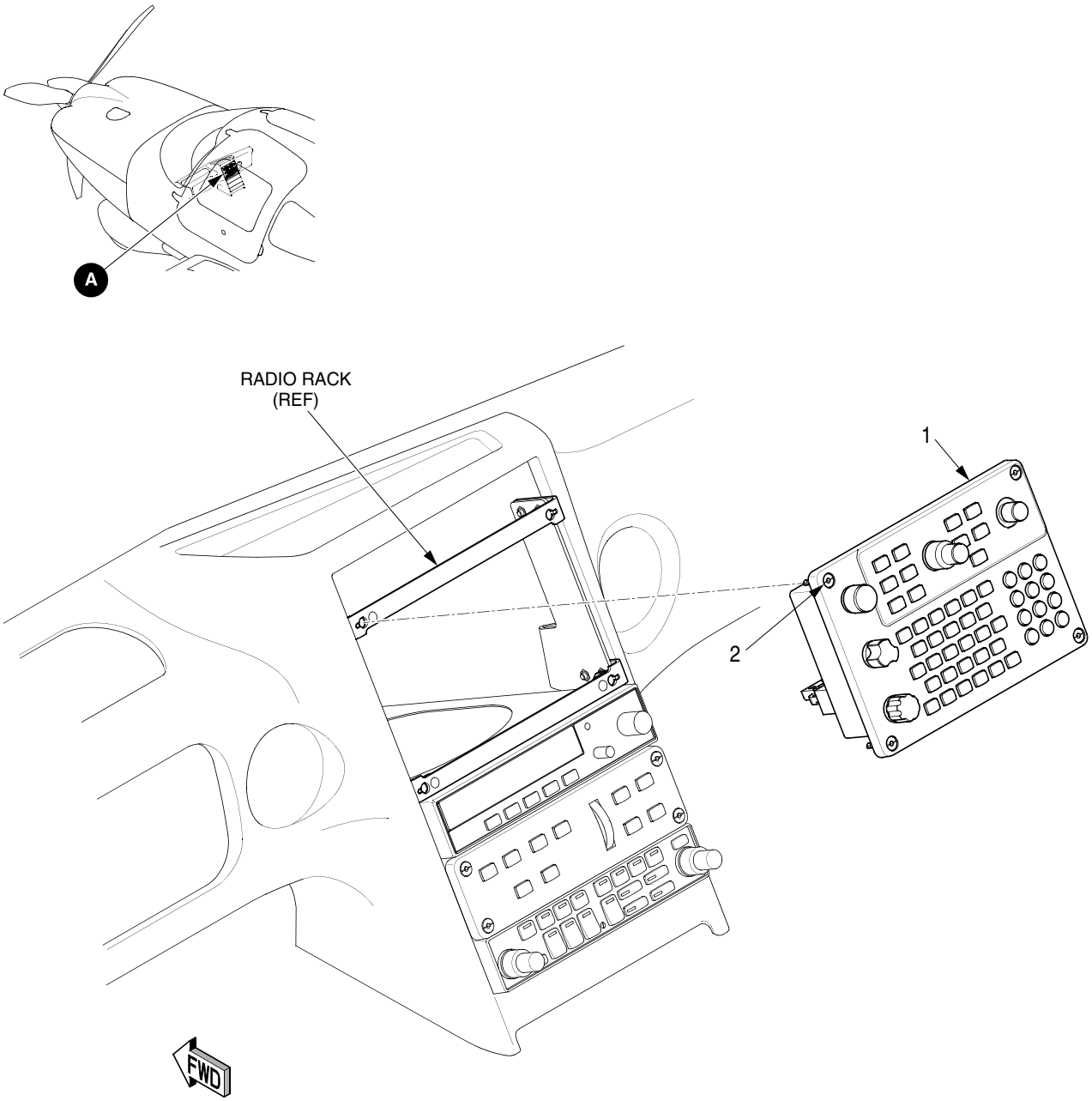
(c) Position keyboard to radio rack.

(d) Rotate captive screws clockwise 1/4 turn to secure keyboard.

(e) Verify alignment marks on screws are in the vertical position.

(f) Reset KEYPADS / AP CTRL circuit breaker.

(g) If GCU 478 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)



LEGEND
1. GCU 478 FMS Keyboard
2. Captive Screw

DETAIL A

SR20_MM34_2758

Figure 34-601
GCU 478 FMS Keyboard - Serials 2016 & subs w/ Perspective Avionics

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CHAPTER 35

OXYGEN

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CHAPTER 35 - OXYGEN

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OXYGEN

1. GENERAL

This chapter describes those units and components which store, regulate and deliver oxygen to the passengers and crew.

Certain oxygen systems are approved for use in the airplane. Refer to the Pilot's Operating Handbook and the applicable operating manuals listed in the front of this book for additional operating and maintenance information.

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CHAPTER 37

VACUUM

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CHAPTER 37 - VACUUM

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VACUUM

1. GENERAL

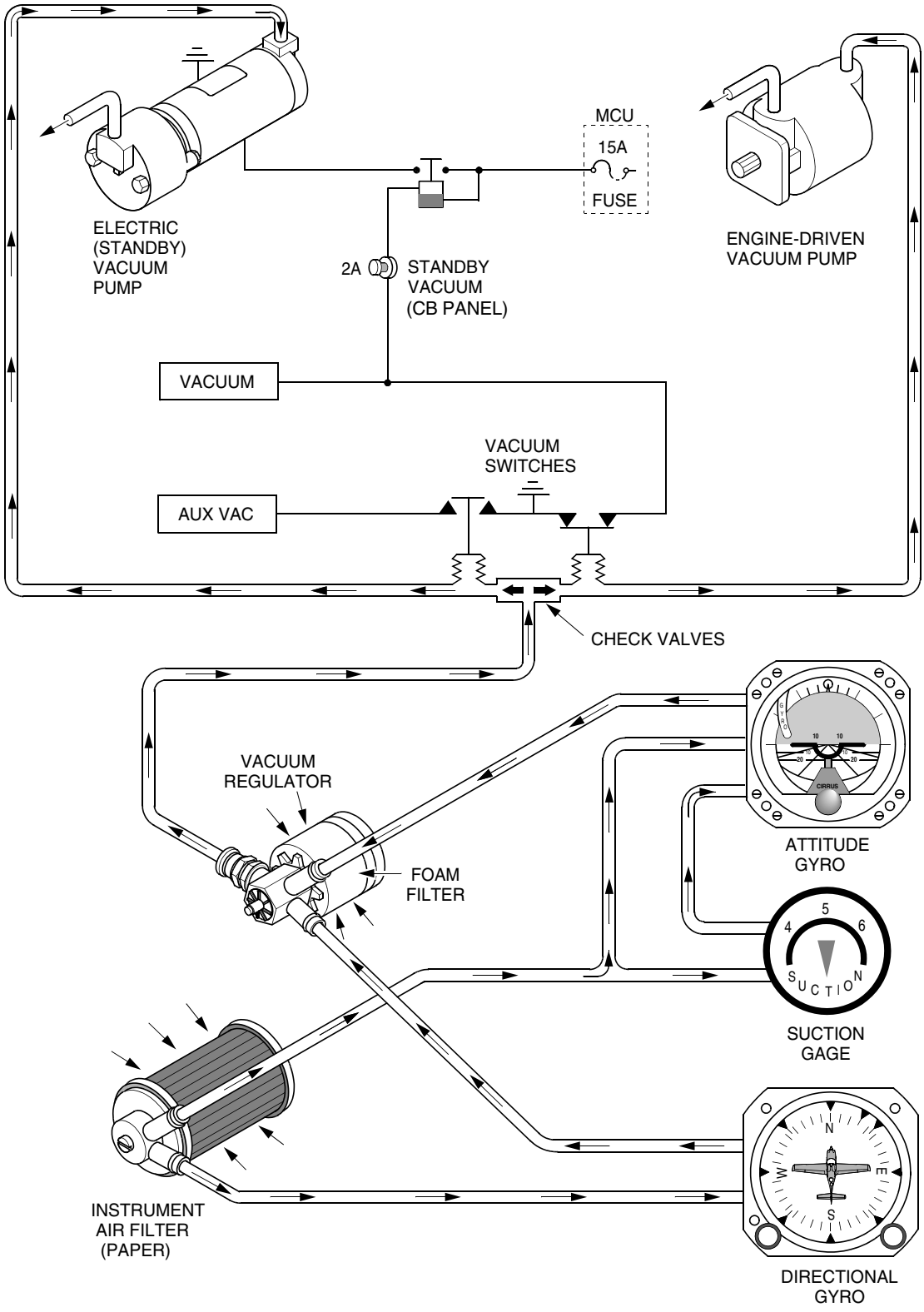
Serials 1005 thru 1267: This chapter describes those units and components used to provide suction necessary to operate the attitude and directional gyros. The vacuum system consists of an engine-driven vacuum pump, an electric vacuum pump for backup, two vacuum switches, two annunciators, vacuum manifold, vacuum regulator, vacuum system air filter, and suction gage.

The backup portion of the system operates automatically to provide vacuum for the instruments should the engine-driven vacuum pump fail. Switches in the valve manifold detect low vacuum in the system, illuminate the VACUUM warning annunciator, and trip a relay which energizes the backup electric vacuum pump. This condition exists whenever the Master switch is on and the engine is not operating or the engine driven vacuum pump fails.

During engine start the red VACUUM annunciator will illuminate. The standby vacuum pump will start and the amber AUX VAC light will illuminate. After a short delay, the attitude indicator GYRO flag will pull. After the engine is started, the red VACUUM annunciator will switch off. The standby pump will stop and the amber AUX VAC light will switch off. See Figure 37-1 for simplified system schematic. (See Figure 37-001)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
High suction gage readings.	Vacuum regulator incorrectly adjusted.	Adjust vacuum regulator. (Refer to 37-10)
	Ruptured vacuum regulator diaphragm or leaky cover rivets.	Replace vacuum regulator. (Refer to 37-10)
	Dirty vacuum regulator foam filter.	Replace filter. (Refer to 37-10)
Low Suction gage reading.	Dirty vacuum system filters.	Replace filters. (Refer to 37-10)
	Malfunctioning pump.	Replace pump. (Refer to 37-10)
	Malfunctioning vacuum manifold.	Replace manifold.
	Vacuum regulator incorrectly adjusted.	Adjust vacuum regulator. (Refer to 37-10)
	Line from filter to suction gage pinched, clogged or dirty.	Check all lines and fittings.
No suction gage reading.	Vacuum system filter clogged or dirty.	Replace filter. (Refer to 37-10)
	Line from filter to suction gage clogged or dirty.	Check all lines and fittings.
	Malfunctioning pump.	Replace pump. (Refer to 37-10)
	Malfunctioning manifold.	Replace manifold.
	Faulty attitude gyro.	Replace attitude gyro.
No vacuum indication at instrument.	Malfunctioning pump.	Replace pump. (Refer to 37-10)
	Line gyro to vacuum filter pinched, clogged or dirty.	Check all lines and fittings.
Vacuum regulator cannot be adjusted.	Lines leaking	Check all lines and fittings.
	Vacuum pump malfunction.	Replace pump.
Vacuum correct on ground but will not maintain pressure at altitude.	Vacuum pump malfunctioning.	Replace pump.
	Vacuum regulator sticky.	Clean regulator.
Vacuum correct, but pressure erratic or shows complete loss in flight.	Vacuum regulator sticky.	Clean regulator.
Pressure can only be maintained at full throttle on ground.	Leak in system.	Repair or replace line.
	Worn pump.	Replace pump. (Refer to 37-10)
	Regulator sticky.	Clean regulator.
Suction gage indication follows engine rpm.	Foreign matter on regulator's seat	Raise regulator's diaphragm with thin blunt tool. Remove the contaminant. Reset regulator.



Serials 1005 thru 1267.

SR20_MM37_1017A

Figure 37-001
Vacuum System

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DISTRIBUTION

1. DESCRIPTION

The engine-driven vacuum pump is located on the center, aft side of engine and provides primary vacuum air for the vacuum system.

The electric vacuum pump provides backup vacuum air and operates on 28 VDC supplied through a 15-amp fuse on the airplanes' primary bus. The electric vacuum pump is mounted on the forward lower left side of the firewall.

The check valve manifold, while providing a means of coupling the dual vacuum sources, also furnishes vacuum source isolation in the event that one of the sources is not in operation. The check valve manifold is mounted on the forward upper left side of the firewall.

Two vacuum switches are mounted on the check valve manifold. Each switch controls the illumination of the appropriate vacuum light. The lights (mounted in the annunciator panel) will illuminate if the engine-driven vacuum pump should become inoperable. The auxiliary vacuum light (when illuminated) tells the pilot that the back-up vacuum pump is operating.

The switch used to monitor the engine-driven vacuum pump is located closest to the engine and is normally closed (engine off). The switch used to monitor the electric vacuum pump is located closest to external power receptacle and is normally open (engine-driven and electric vacuum pump turned off).

The vacuum regulator, located on left, aft side of the firewall, incorporates an adjustment screw to provide constant system vacuum for the operation of the gyro instruments. A foam "garter" filter around the regulator prevents dust from entering the vacuum system. This foam "garter" filter must be replaced periodically. Failure to replace this filter at the required interval, will cause contaminated air to be drawn into the dry air pump, contributing to short air pump life, or even failure.

The instrument air filter provides continual filtering for proper operation of the vacuum system and is located on the left aft side of the firewall.

Hoses and clamps should be examined and inspected carefully whenever engine maintenance practices call for hoses to be disconnected.

2. MAINTENANCE PRACTICES

A. Engine-Driven Vacuum Pump (See Figure 37-101)

(1) Removal - Engine-Driven Vacuum Pump

(a) Remove intake and outlet hoses from vacuum pump.

(b) Remove nuts and washers securing vacuum pump to engine mounting pad.

(c) Remove vacuum pump from airplane and discard used mounting gasket.

(2) Installation - Engine-Driven Vacuum Pump

CAUTION: Keep pump ports capped until hoses are installed to prevent foreign materials from entering the pump.

Clamping vice across center housing will cause internal failure of carbon rotors. Clamp vice on pump flange only.

(a) Remove all residual gasket material from the engine mounting pad.

(b) Using a vise with soft metal or wooden jaws, clamp vacuum pump flange in vise with drive coupling downward.

(c) Install and hand tighten fittings on vacuum pump.

CAUTION: Overtightening fittings will damage fittings. Do not make more than on turn beyond hand-tight position to position for hose alignment.

(d) Tighten fitting to desired position.

(e) Install new vacuum pump gasket over mount pad studs.

(f) Install vacuum pump over new vacuum pump gasket and install washers and nuts. Torque to 70 in-lb (7.9 Nm)

(g) Attach intake and outlet hoses to vacuum pump.

(h) Secure hoses with cable ties.

B. Electric (Stand-by) Vacuum Pump (See Figure 37-101)

CAUTION: Ensure electrical power to airplane is off prior to performing maintenance.

(1) Removal - Electric (Stand-by) Vacuum Pump
  (a) Ensure BATTERY and AVIONICS master switches are in off position.
  (b) Pull STANDBY VACUUM circuit breaker.
  (c) Disconnect electrical connections to pump.
  (d) Remove intake and outlet hoses from pump.
  (e) Loosen clamps attaching pump to mounting bracket.
  (f) Remove pump from airplane.

(2) Installation - Electric (Stand-by) Vacuum Pump

CAUTION: Keep pump ports capped until hoses are installed to prevent foreign materials from entering the pump.

  (a) Position pump in mounting clamps so that clamps are centered around electric motor housing and tighten clamps.
  (b) Attach intake and outlet hoses to pump.
  (c) Connect electrical leads to pump terminals.
  (d) Secure hoses and electrical leads with cable ties.
  (e) Reset STANDBY VACUUM circuit breaker.

C. Check Valve Manifold (See Figure 37-101)

CAUTION: Ensure electrical power to airplane is off prior to performing maintenance.

(1) Removal - Check Valve Manifold
  (a) Disconnect electrical connections to manifold.
  (b) Remove outlet hoses from manifold.
  (c) Loosen manifold flared nut fitting from firewall fitting and remove manifold from airplane.

(2) Installation - Check Valve Manifold
  (a) Position and install manifold flared nut fitting on firewall fitting.
  (b) Install outlet hoses to manifold.
  (c) Connect electrical leads to manifold terminals.

(3) Inspection/Check - Check Valve Manifold

WARNING: **Synthetic rubber components in manifolds and check valves deteriorate with age causing a loss of flexibility and the inability of the check valve to fully seat against the valve seat. Extremely deteriorated valves may separate at the hinge rendering the manifold/check valve inoperative and possibly restricting downstream airflow. An improperly functioning manifold/check valve could cause loss of the dual air pump redundancy feature.**

  (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vacuum System Test Kit	343	Airborne	Test check valves.

  (b) Remove Check Valve Manifold. (Refer to 37-10)
  (c) Connect the hand pump to one of the two outer (vacuum pump) manifold fittings. Slowly provide 3 PSI of air pressure to the manifold fitting and inspect for any leaks. If no leaks are present, check the remaining manifold fitting (outer). Replace Check Valve Manifold if a leak is present.
  (d) Connect the hand pump to the middle (instrument) manifold fitting. Apply suction slowly until 9 in.hg. of mercury is applied to the manifold assembly and inspect for any leaks. During this procedure, neither check valve should allow any airflow. Replace Check Valve Manifold if a leak is present.
  (e) Install Check Valve Manifold. (Refer to 37-10)

D. Vacuum Regulator (See Figure 37-101)

(1) Removal - Vacuum Regulator

(a) Remove glareshield.(Refer to 25-10)

(b) Remove inlet hoses from aft side of regulator.

(c) Remove outlet hose from forward side of regulator.

(d) Loosen clamp nut securing regulator to bracket and remove regulator.

(2) Installation - Vacuum Regulator

(a) Insert regulator into mounting bracket.

(b) Tighten clamp nut to secure regulator to bracket.

(c) Attach inlet hoses to aft side of regulator.

(d) Attach outlet hose to forward side of regulator.

(e) Install glareshield (Refer to 25-10)

(3) Adjustment/Test - Vacuum Regulator

Note: Do not reset the regulator until the filter and lines have been checked.

(a) Bend locking tabs away from bottom of regulator adjusting screw.

Note: Engine starting, run-up, taxiing, and shut-down may only be performed by authorized personnel.

(b) Start and run-up engine to 1700 RPM. (Refer to Pilot's Operating Handbook)

(c) While running engine at 1700 RPM, the suction gage should indicate 5.0 (+/- 0.2) inches of mercury. If reading is not in this range, shut down the engine and adjust the regulator. (Turn regulator adjustment screw clockwise to increase pressure, counterclockwise to decrease pressure.)

(d) Start engine and repeat check.

(e) Upon completion of check, bend locking tabs down and over adjustment screw.

E. Vacuum Regulator Garter Filter (See Figure 37-101)

(1) Removal - Vacuum Regulator Garter Filter

(a) Remove glareshield. (Refer to 25-10)

(b) Pull garter filter off regulator and remove from airplane.

(2) Installation - Vacuum Regulator Garter Filter

(a) Install garter filter by carefully stretching filter over regulator. Ensuring filter is properly position on regulator.

(b) Install glareshield. (Refer to 25-10)

F. Instrument Air Filter (See Figure 37-101)

(1) Removal - Instrument Air Filter

(a) Remove glareshield. (Refer to 25-10)

(b) Remove outlet hoses from filter.

(c) Unscrew filter from nutplate on console rib.

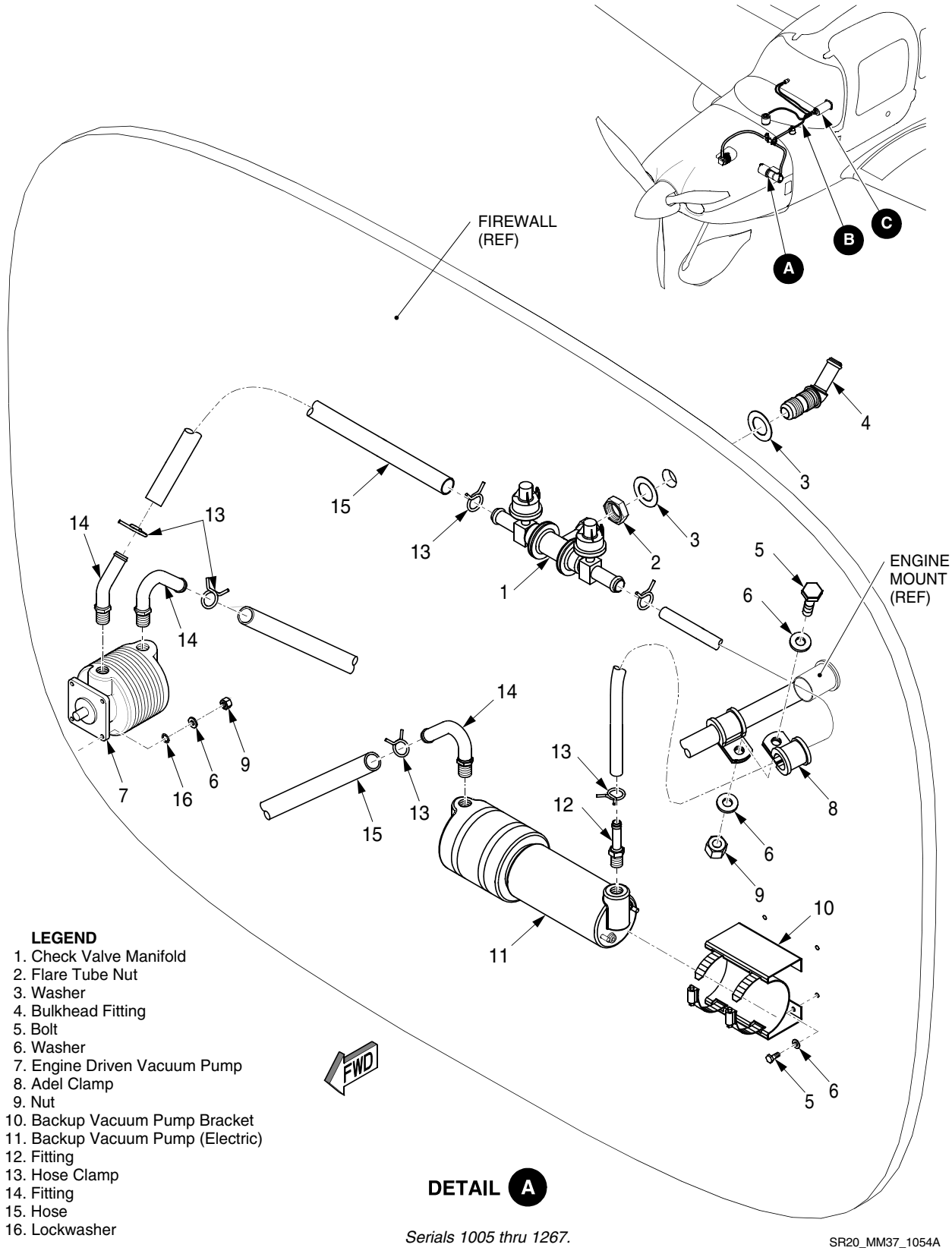
(d) Remove filter from airplane.

(2) Installation - Instrument Air Filter

(a) Position filter over nutplate on console and install.

(b) Install outlet hoses to filter.

(c) Install glareshield. (Refer to 25-10)

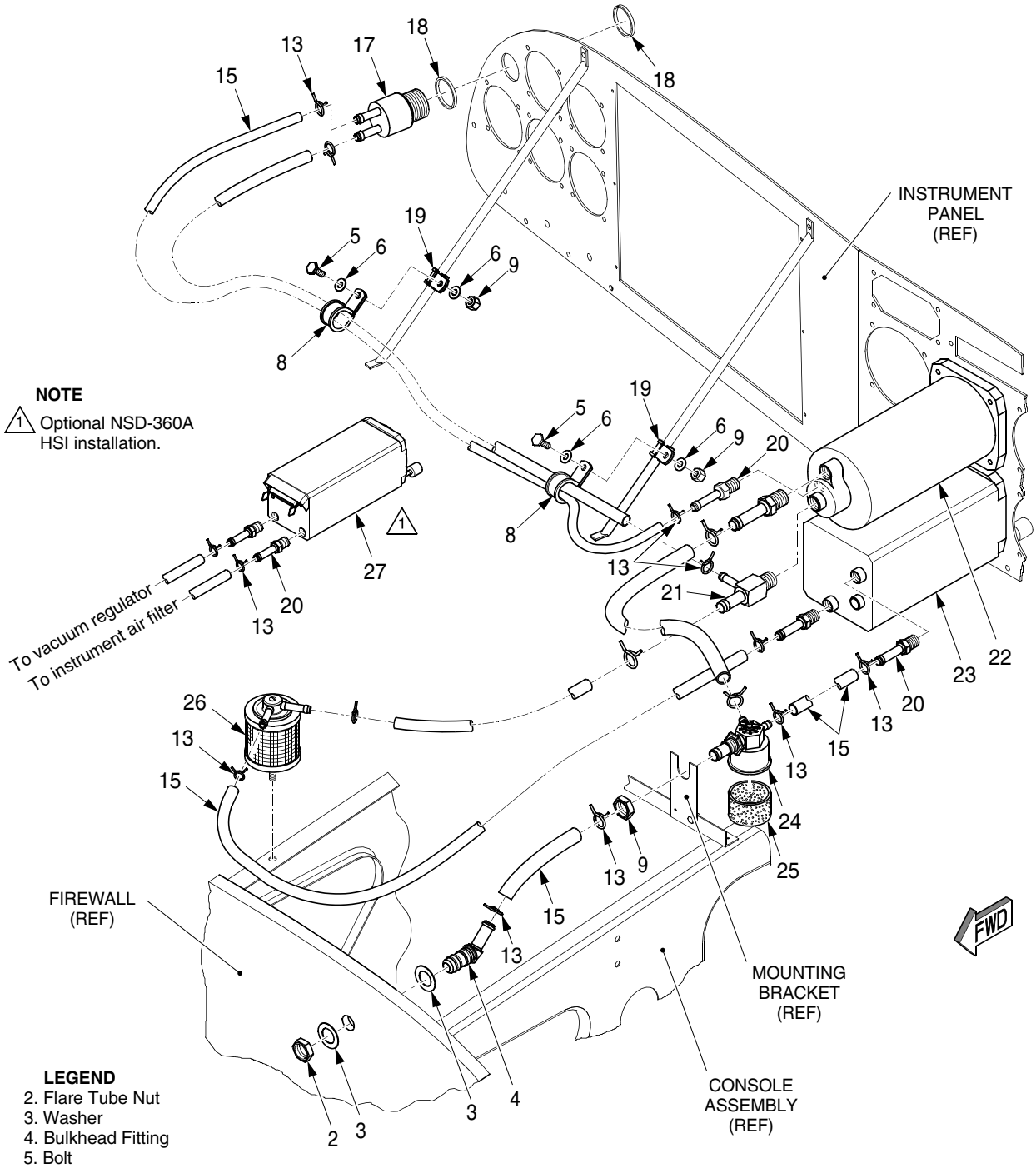


LEGEND

1. Check Valve Manifold
2. Flare Tube Nut
3. Washer
4. Bulkhead Fitting
5. Bolt
6. Washer
7. Engine Driven Vacuum Pump
8. Adel Clamp
9. Nut
10. Backup Vacuum Pump Bracket
11. Backup Vacuum Pump (Electric)
12. Fitting
13. Hose Clamp
14. Fitting
15. Hose
16. Lockwasher

Figure 37-101
Vacuum System (Sheet 1 of 3)

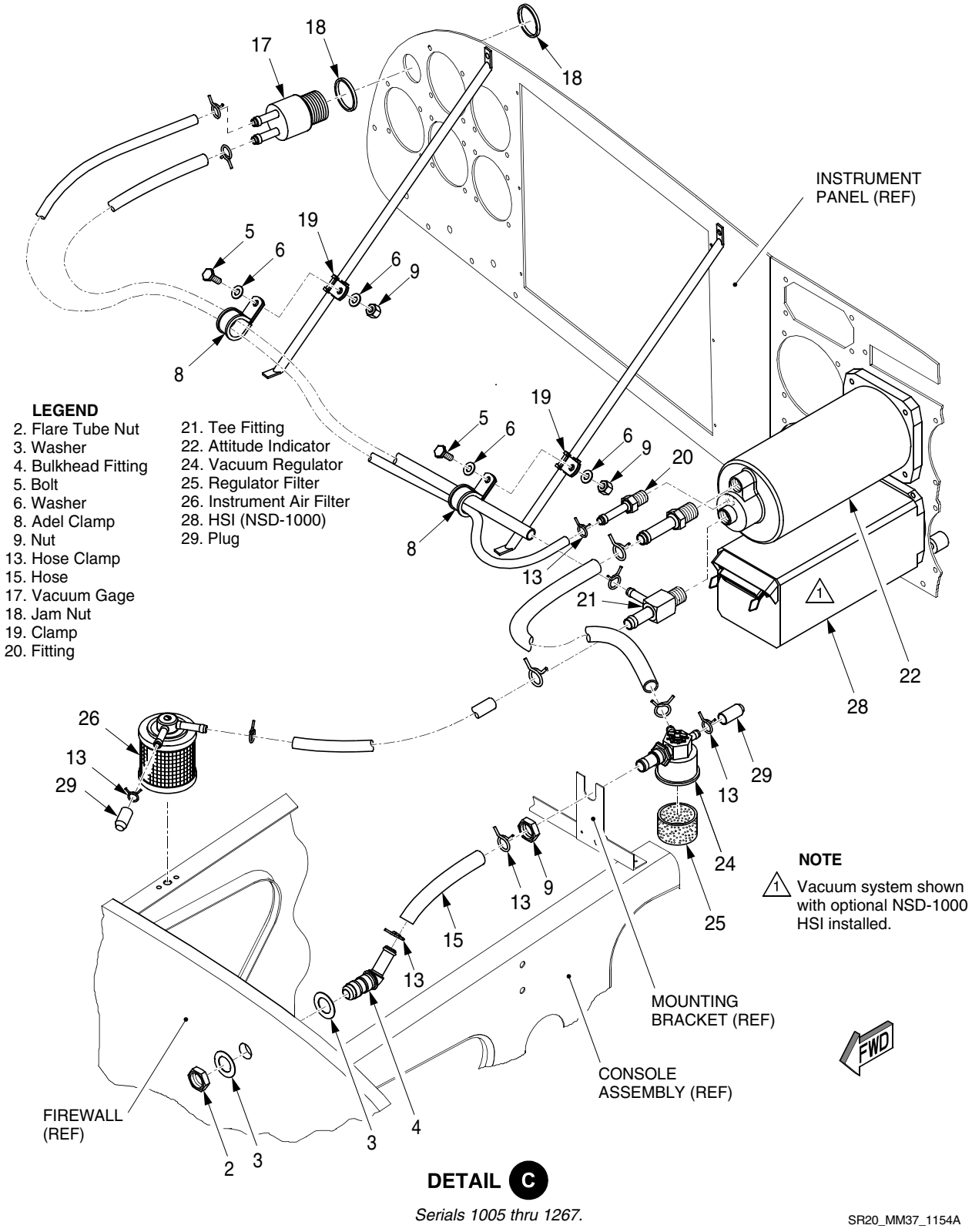
EFFECTIVITY:
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LEGEND

2. Flare Tube Nut
3. Washer
4. Bulkhead Fitting
5. Bolt
6. Washer
8. Adel Clamp
9. Nut
13. Hose Clamp
15. Hose
17. Vacuum Gage
18. Jam Nut
19. Clamp
20. Fitting
21. Tee Fitting
22. Attitude Indicator
23. Directional Gyro
24. Vacuum Regulator
25. Regulator Filter
26. Instrument Air Filter
27. HSI (NSD-360A)

Figure 37-101
Vacuum System (Sheet 2 of 3)



DETAIL C

Serials 1005 thru 1267.

SR20_MM37_1154A

Figure 37-101
Vacuum System (Sheet 3 of 3)

INDICATING

1. DESCRIPTION

The vacuum gage, located on the right side of the instrument panel, is calibrated in inches of mercury and indicates suction available for operation of the attitude and directional gyros. Refer to 34-20, Attitude and Direction, for additional maintenance practices on the vacuum driven gyros. (Refer to 34-20)

A red vacuum warning light is installed on the annunciator panel to indicate low vacuum or failure of the engine driven vacuum pump.

An amber auxiliary vacuum caution light is installed on the annunciator panel to indicate the electric (back-up) vacuum pump is supplying vacuum.

2. MAINTENANCE PRACTICES

A. Vacuum Gage (See Figure 37-101)

(1) Removal - Vacuum Gage

(a) Remove glareshield. (Refer to 25-10)

(b) Remove vacuum and vent hoses and cap off.

(c) Unscrew knurled lens mounting vacuum gage to instrument panel.

(d) Remove vacuum gage from airplane.

(2) Installation - Vacuum Gage

(a) Position vacuum gage in instrument panel and secure with threaded dial lens. End of thread on gage must be flush with dial lens.

(b) Attach vacuum and vent hoses. Fitting base marked “P” is the vacuum line, fitting base marked “V” is the vent line.

(c) Install glareshield. (Refer to 25-10)

B. Vacuum Warning Annunciator Light and Auxiliary Vacuum Annunciator Light

The vacuum warning annunciator light and auxiliary vacuum annunciator light may illuminate, warning the pilot of possible low system vacuum, failure of the engine driven vacuum pump, or indication that the electric (back-up) vacuum pump is supplying vacuum.

C. Directional Gyro

Refer to 34-20, Attitude and Direction, for additional maintenance practices on the directional gyro. (Refer to 34-20)

D. Attitude Indicator

Refer to 34-20, Attitude and Direction, for additional maintenance practices on the attitude indicator. (Refer to 34-20)

CHAPTER 42

INTEGRATED MODULAR AVIONICS

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CHAPTER 42 - INTEGRATED MODULAR AVIONICS

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INTEGRATED MODULAR AVIONICS

1. GENERAL

This chapter describes those units and components which comprise the entire avionics system. This includes the Perspective Integrated Avionics System, and networked components.

For additional information on the Perspective Integrated Avionics System, see Perspective Line Maintenance Manual.

For additional information on other avionics components, see respective manufacturer's approved Instructions For Continued Airworthiness.

2. MAINTENANCE PRACTICES

A. Tests

(1) Adjustment/Test - Component Software and Configuration Loading

CAUTION: This procedure does not support MD302 Standby Attitude Module Software Loading. See the Flight Environmental Systems Section for more information about the MD302. (Refer to 34-10)

Note: No software loading is required if the original component is reinstalled. This does not include units that were returned for repair as the software and configuration files are deleted during the repair testing process.

If a new, repaired, or exchanged component is installed, load software and configuration files from the Cirrus Perspective software loader card.

(a) Pull STARTER and FUEL PUMP circuit breakers.

(b) Connect 28 ±1 VDC external power to external power receptacle.

CAUTION: Failure to remove database cards may result in cards becoming corrupted.

Do not cancel a software upload that is in progress. A canceled software upload may result in an unresponsive component.

(c) Remove SD cards from top and bottom slots of MFD and PFD.

(d) Insert Cirrus Perspective software loader card into top slot of MFD.

(e) Perform Software and Configuration Loading according to Cirrus Perspective Line Maintenance Manual.

(f) Remove Cirrus Perspective software loader card from PFD.

(g) Insert SD cards into top and bottom slots of MFD and PFD.

CORE SYSTEM

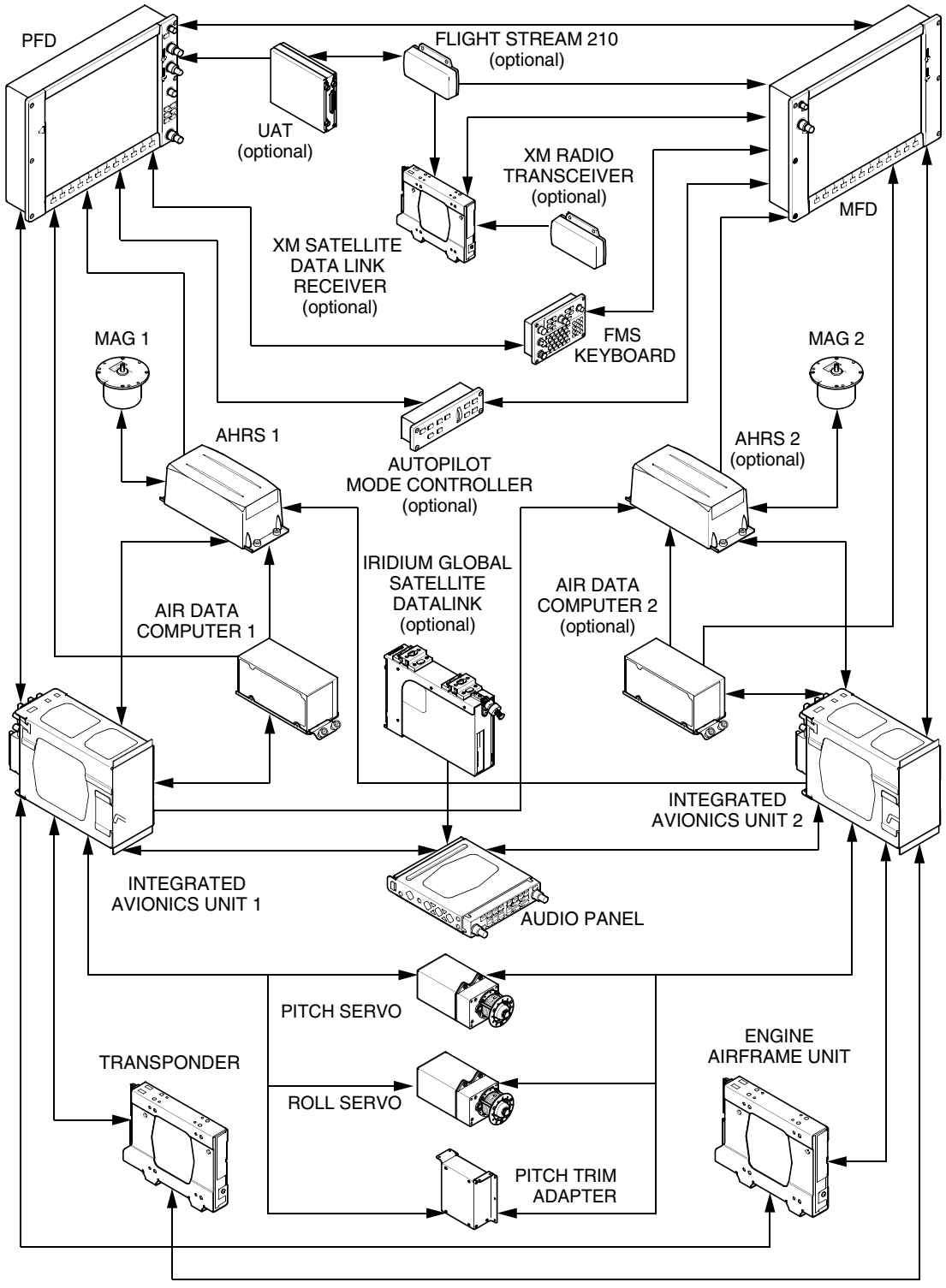
1. DESCRIPTION

The Perspective Integrated Avionics System provides advanced cockpit functionality and improved situational awareness through the use of fully integrated flight, engine, communication, navigation and monitoring equipment. The system consists of the following Line Replaceable Units (LRUs):

- GDU Primary Flight Display (PFD) (Refer to 31-60)
- GDU Multi-Function Display (MFD) (Refer to 31-60)
- GCU 478 Flight Management System Keyboard (Refer to 34-60)
- GRS 77 Attitude and Heading Reference System (Refer to 34-20)
- GDC 74A Air Data Computer (Refer to 34-10)
- GIA 63W Integrated Avionics Unit (Refer to 31-40)
- GEA 71 Engine Airframe Unit (Refer to 77-40)
- GTX 32 Mode A, C Transponder (Refer to 34-50)
- Audio Panel w/ Integrated Marker Beacon Receiver
  - GMA 347 - *Serials 2016 thru 2126* (Refer to 23-50)
  - GMA 350 - *Serials 2127 & subs* (Refer to 23-50)
  - GMA 350c (Optional) (Refer to 23-50)
- GFC 700 3-Axis Autopilot and GMC 705 Controller (Refer to 22-13)
- GTX 33 Mode S Transponder (Refer to 34-50)
- GSR 56 Iridium Satellite Weather Receiver (Optional) - *Serials 2127 & subs* (Refer to 34-50)
- GDL 69/69A XM Satellite Weather/Radio Receiver (Optional) (Refer to 34-50)
  - GRT 10 XM Radio Remote Transceiver - *Serials 2016 thru 2302* (Optional) (Refer to 23-30)
  - GRC 10 XM Radio Remote Control - *Serials 2016 thru 2302* (Optional) (Refer to 23-30)
- Flight Stream 210 Bluetooth™ Transceiver (Optional) (Refer to 23-30)
- GDL 88 UAT/ADS-B Transceiver (Optional) (Refer to 23-20)

2. TROUBLESHOOTING

Trouble - PFD	Probable Cause	Remedy
Software file load fails.	LRU failure.	Ensure that LRU is reporting data on System Status page (LRU is 'ONLINE'). Check data path wiring as needed.
		Retry software file load or try using a different card. Ensure that the MFD is not touched during the loading process.
		Ensure that LRU part number is compatible with software version and Card Loader.
		Replace LRU.
Configuration file load fails.	LRU failure.	Ensure that LRU is reporting data on System Status page (LRU is 'ONLINE'). Check data path wiring as needed.
		Retry configuration file load or try using a different card. Ensure that the MFD is not touched during the loading process.
		Ensure that LRU part number is compatible with software version and Card Loader.
		Replace LRU.



SR20_MM42_2896D

Figure 42-201
Perspective Integrated Avionics System Schematic

3. MAINTENANCE PRACTICES

A. Perspective Integrated Avionics System

CAUTION: Contact Cirrus for disposition prior to performing system software load.

Note: Prior to any software load, perform a service publication search for Service Advisories or Bulletins notifying owners/operators of recent software updates.

This procedure installs and configures the software for the entire Perspective Avionics system. For individual component setups, refer to the appropriate component section.

(1) Adjustment/Test - Perspective Integrated Avionics System Software and Configuration Loading

(a) Connect 28 ±1 VDC external power to external power receptacle.

(b) Pull STARTER and FUEL PUMP circuit breakers.

(c) Perform software and configuration loading in accordance with Cirrus Perspective Line Maintenance Manual. (Refer to 05-10)

(d) Reset STARTER and FUEL PUMP circuit breakers.

(e) Disconnect 28 ±1 VDC external power from external power receptacle.

(2) Adjustment/Test - Navigation Database Loading

For maintenance practices related to navigation database loading, see Cirrus Perspective Pilot's Guide. (Refer to 05-10)

NETWORK COMPONENTS

1. GENERAL

Additional components provide advanced cockpit functionality and improved situational awareness through the use of fully integrated flight, engine, communication, navigation and monitoring equipment. The system consists of the following Line Replaceable Units (LRUs):

- MD302 Standby Attitude Module (Optional) (Refer to 34-10)
- Max Viz Enhanced Vision System (Optional) (Refer to 93-50)
- Bendix/King KR 87 Automatic Direction Finder (Optional) (Refer to 34-50)
- Bendix-King KN 63 Distance Measuring Equipment (Optional) (Refer to 34-50)
- Emergency Locator Transmitter (ELT) (Refer to 25-60)
- Recoverable Data Module (RDM) (Refer to 31-30)
- L-3 Skywatch Traffic Advisory System (Optional) (Refer to 34-40)
- L-3 Stormscope WX-500 Weather Mapping Sensor (Optional) (Refer to 34-40)
- Synthetic Vision System (Optional) (Refer to 34-40)

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CHAPTER 51

STANDARD PRACTICES: STRUCTURES

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STANDARD PRACTICES: STRUCTURES

1. GENERAL

This Chapter contains standard practices for the maintenance and repair of composite structures for Cirrus aircraft and components. The objective governing all recommendations in the following procedures is to restore the composite structure to its original level of strength and durability.

The general procedure for using the Chapter 51 - Standard Practices: Structures is as follows:

The extent of damage is determined using the methods outlined in Section 10 - Investigation, which contains guidance for identification of damage and associated classifications. (Refer to 51-10)

Processes and methods used in the repair of the aircraft are described in Section 20 - Processes. (Refer to 51-20)

Approved materials and equipment necessary to perform standard repairs are contained in Section 30 - Materials. Prior to each repair process, a table listing all necessary tools, equipment, and supplies is provided. (Refer to 51-30)

Section 70 - Standard Repairs contains specific composite repair procedures that are used with the supporting processes outlined in Section 20. (Refer to 51-70)

Prior to each repair process, a table listing all necessary tools, equipment, and supplies is provided. For information related to safety equipment refer to Section 00 - Standard Practices: Structures. (Refer to 51-00)

A discussion on personnel qualifications, description of the primary structural components, Airframe Zone Diagrams outlining the principal repair areas, and a definition of terms used in this Chapter are included below.

A. Personnel Qualifications and Safety

Repair personnel must be fully qualified in the preparation and handling of repair materials and the repair of composite laminate construction.

The capability of a repair to satisfactorily maintain its integrity for the remaining life of the aircraft is dependent on the quality of the repair. Therefore, it is essential that the procedures outlined in this Chapter be carefully followed and that all repairs be conducted with the highest possible degree of workmanship.

Materials used for the manufacture and repair of laminates are potentially dangerous. Prior to performing any repair the following Health and Safety Information, Safety Equipment, and First Aid Procedures should be reviewed:

WARNING: The repair procedures described in this Chapter call for the use of processes and/or substances that may be harmful to the health if adequate precautions are not taken. Materials used for the manufacture of laminates are potentially dangerous and may cause a number of health hazards.

(1) Health and Safety Information

(a) Materials used for the manufacture of laminates are potentially dangerous and prior to use the material safety data sheets must be read.

(b) Damaged composite materials may cause a number of health hazards. Single fiber particles, with a diameter of 3 to 4 microns and a length of less than 0.1 mm pose the greatest threat to the respiratory system. Respiratory protection is essential for those operations, such as drilling and sanding where dust exists or is generated.

(c) Composite material dust is injurious to health. A respirator must be worn at all times when drilling or sanding composite materials.

(d) Individual fiber filaments are very brittle and broken fiber may cause irritation to the skin. Approved barrier creams should be used and protective clothing worn. If irritation is felt, thorough washing and rinsing will remove loose filaments.

(e) Technicians should, before mixing and using the repair resin, apply liberal quantities of approved barrier cream to their hands (particularly around the finger nails) and wrists.

(f) To keep resin from contacting the hands, rubber gloves must be used (in addition to the barrier cream) when carrying out a repair.

(g) Resin deposits on the skin should be removed before they set hard by wiping with a clean rag. Removal of obstinate deposits of resin and final cleaning of the hands after the repair should be carried out by applying a quantity of white vinegar, thoroughly rubbing in, wiping with a clean rag, and followed by washing in warm water. Resin that is allowed to set hard on the skin cannot be removed.

(h) Acetone should not be used on the hands as it removes the natural oils from the skin and may have other associated health hazards.

(2) Safety Equipment

(a) Respiratory Protection-Dust and Vapor Masks

Depending on the hazard presented by the material being used, appropriate masks must be worn. When sanding, a dust mask must be worn. When masks are worn for protection against gases or chemical vapors, ensure the correct type of mask is used. Full-face (negative pressure) masks are available and can be fitted with a wide range of filter canisters to suit gases, solvents, or particulates against which protection is required. Always consult the Material Safety Data Sheet for each hazard, and use the recommended protection.

(b) Eye and Ear Protection

Goggles giving all-round eye protection should be worn when drilling or sanding composite materials, and when chemicals are being used. Ear protection should be worn for noisy processes such as grinding.

(c) Clothing

A resin proof apron should be worn when the situation demands that level of care. If materials being used are toxic by absorption through the skin, coveralls providing complete protection may be worn.

(d) Barrier Creams

An approved barrier cream should be rubbed into the hands before commencing work with resins and adhesives. Moisturizing creams and barrier creams protect the skin but must be regarded only as supplements. They should be used in conjunction with gloves rather than as a replacement for gloves. Refer to Section 30 - Materials for approved barrier creams. (Refer to 51-30)

(3) First Aid Procedures

Refer to the products material safety data sheet for additional first aid information.

(a) Skin Contact

Immediately remove liquids from the skin by wiping with disposable towels, then cleanse the skin with white vinegar, followed by washing with warm soapy water. Do not use solvents.

(b) Eye Contamination or Irritation

Immediately flush the affected eye with eyewash bottle or fountain - or with low-pressure running water- for at least 15 minutes. Seek medical attention promptly.

(c) Inhalation

Operators affected by the inhalation of vapor, droplets, etc., should be taken immediately into fresh air and made to rest while medical attention is called.

(d) Clothing

Remove and isolate contaminated overalls and clothing. Launder before re-use.

(e) Ingestion

Immediately rinse the mouth repeatedly with water. If swallowing has occurred, drink plenty of water. Seek medical attention promptly.

B. Primary Structural Components

The airplane is constructed primarily of composite materials composed of fiberglass, carbon, epoxy resin, and foam core. Each component uses a combination of construction methods, employing varying ply thicknesses to achieve the necessary strength for component sections with differing load requirements. Primary structural components include: fuselage, wing, vertical stabilizer, and horizontal stabilizer. For additional information pertaining to the structural components listed below, see the referenced Chapter following each component description.

(1) Fuselage

The fuselage is a fiberglass/epoxy structure. The skins form a monocoque shell with the left and right halves bonded together. The main section of the fuselage is reinforced by a rollcage structure that supports loads in case of a rollover. The rollover structure also contains side longerons to support bending loads in the fuselage. In addition, the fuselage contains a floor structure and floor longerons as well as bulkheads to add stability. Forward and aft spars as well as two ribs support the empennage. (Refer to 53-00)

(2) Wing

The wing is a fiberglass/epoxy, bonded structure consisting of a main spar, aft shear webs, sixteen main ribs, fourteen leading edge ribs, upper and lower skins, and two wing tips. (Refer to 57-00)

(3) Vertical Stabilizer

The vertical stabilizer consists of two C-channel spars fabricated from fiberglass/epoxy. Two ribs are bonded to the spars and the right and left fuselage skins cover the ribs and spars to form a two cell box beam structure that resists bending and torsion created by wind gust and aircraft maneuvers. The vertical stabilizer is structurally bonded to the fuselage. (Refer to 55-30)

(4) Horizontal Stabilizer

The horizontal stabilizer is a fiberglass/epoxy composite assembly composed of sandwich skins bonded to ribs and spars. The horizontal stabilizer is structurally bonded to the fuselage. (Refer to 55-10)

C. Construction Methods

Construction methods used in primary structural components are described below:

(1) Secondary Bond

Composed of paste adhesive, secondary bonds are used most commonly at primary structural joints to bond previously cured composite parts together. For example, the spar-to-ribs bond forming the torque box is a secondary bond.

(2) Solid Laminate

Composed of fiberglass and/or carbon, and epoxy, solid laminates are used where thinner construction is required at lightly loaded areas, such as aft shear webs and most ribs.

(3) Sandwich Construction

Composed of fiberglass and/or carbon, and epoxy composite layers encasing closed-cell foam core, sandwich construction stabilizes both layers to prevent buckling in more heavily loaded areas, such as wing skins, bulkheads, floors, longerons, and ribs.

D. Metal Components - Corrosion Control

Corrosion is the deterioration of metal by chemical or electrochemical attack. Water which is allowed to remain on the aircraft and industrial pollution are the major causes of corrosion in aircraft. The two general types of corrosion are Direct chemical attack. (i.e. spilled battery acid) and Electrochemical attack which requires a medium. (usually water)

(1) Forms of Corrosion

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

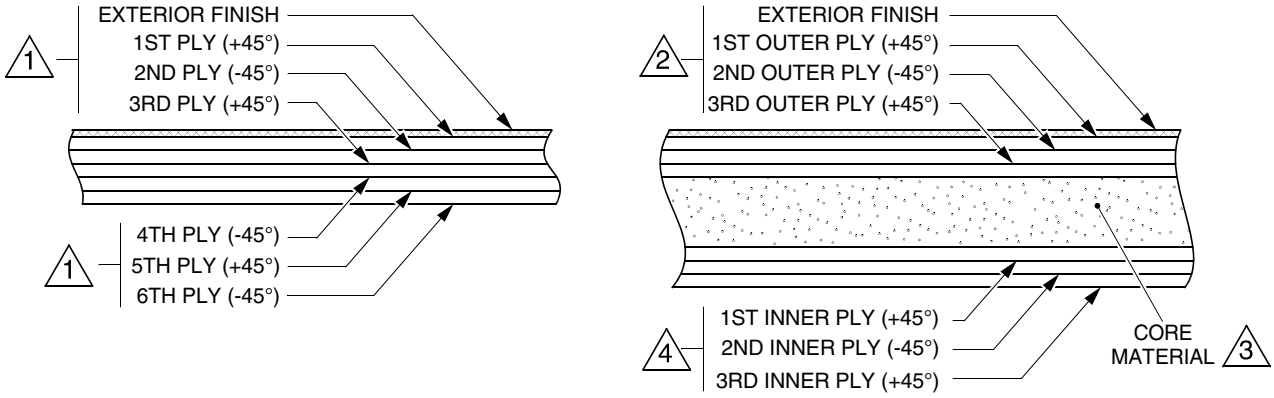
(2) Conditions Affecting Corrosion

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

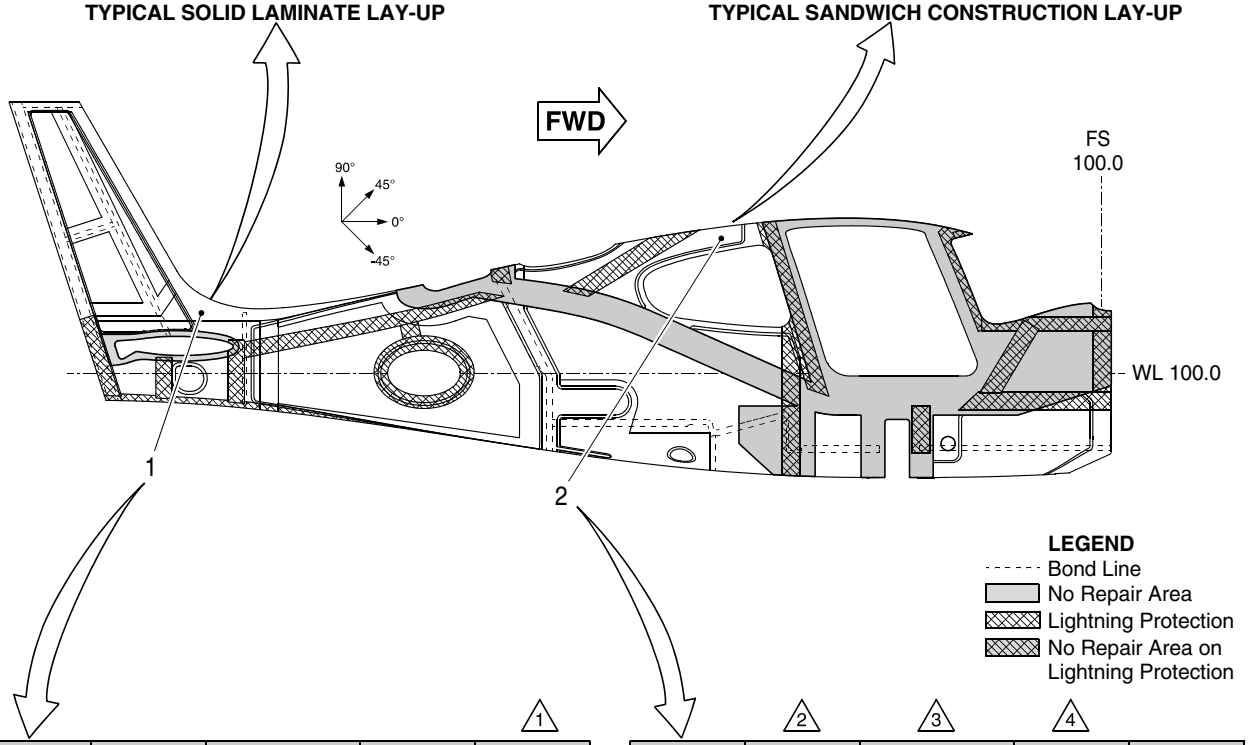
E. Airframe Zone Diagrams (See Figure 51-001), (See Figure 51-002)

To aid the repair technician in determining the structural criticality of each damage site, the following zone diagrams identify original ply lay-up sections, composite repair zones, no-repair zones, and areas with embedded expanded metal mesh (EMM) used in the electrical bonding of the aircraft.

CAUTION: Contact Cirrus Design before attempting to repair any composite structure within the shaded no-repair zones. (Refer to AMM-Intro-)



TYPICAL SOLID LAMINATE LAY-UP **TYPICAL SANDWICH CONSTRUCTION LAY-UP**



Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
2	3	0.375 (9.525)	3	-

PLY LAY-UP TABLE

NOTE

The 0° reference line runs parallel to WL100 for the fuselage, perpendicular to WL100 for the wing skin, and the horizontal stabilizer skin.

Repair plies are laid up alternately +45° and -45° from the 0° reference unless orientation is specifically defined in this section or as a part of a Cirrus authorized field repair instruction.

Generally, the thickness of one ply is 0.008 - 0.010 inch (0.203 - 0.254 mm). To verify, or if no value is found in the ply lay-up tables, determine ply count by dividing measured laminate thickness by 0.009 inch (0.229 mm).

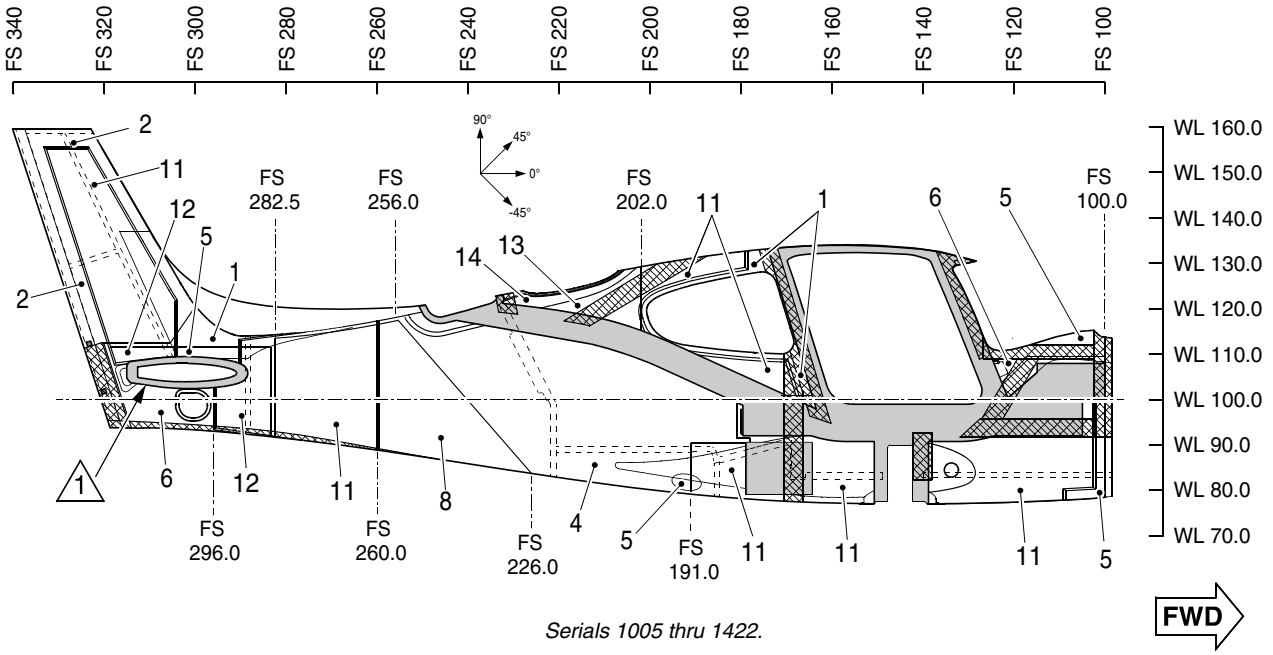
If no repair ply quantity is indicated, install twice as many plies as original lay-up.

1:1 wet-lay repair plies are acceptable on engine cowling, main/nose landing gear fairings, wing tips, and wing root fairings.

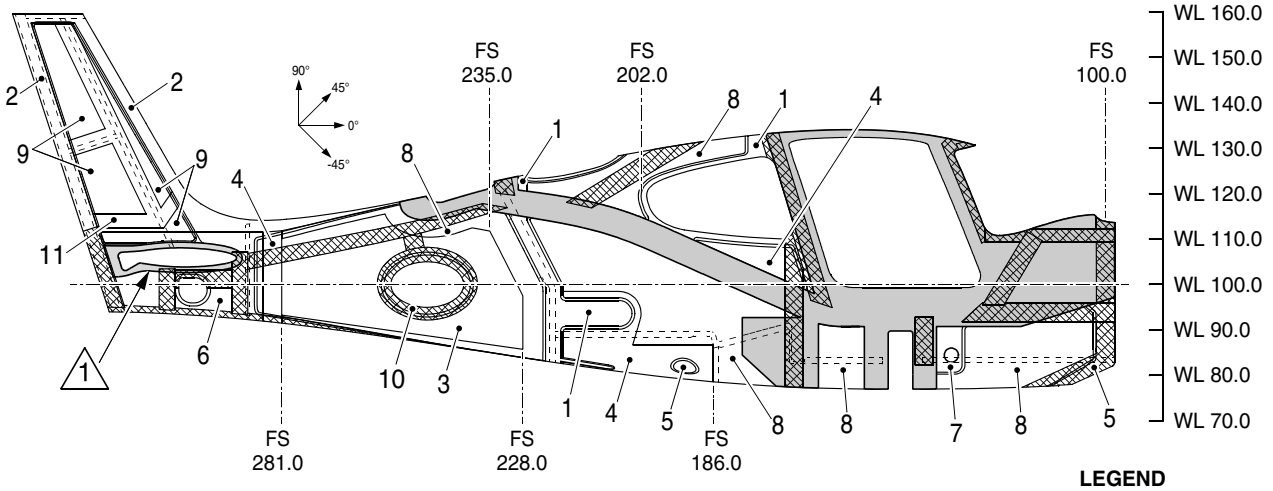
It is not permissible to place repair laminations over Expanded Metal Mesh (EMM). EMM must be removed sufficiently to accommodate the repair and replaced after the repair has been fully cured and inspected.

SR20_MM51_1204E

Figure 51-001
Airframe Zone Diagrams Legend and Example Data



Serials 1005 thru 1422.



Serials 1423 thru 2015.

LEGEND

- Bond Line
- No Repair Area *
- Lightning Protection
- No Repair Area on Lightning Protection

NOTE

1. Fuselage flange repair allowed per horizontal stabilizer removal, refer to 55-10.

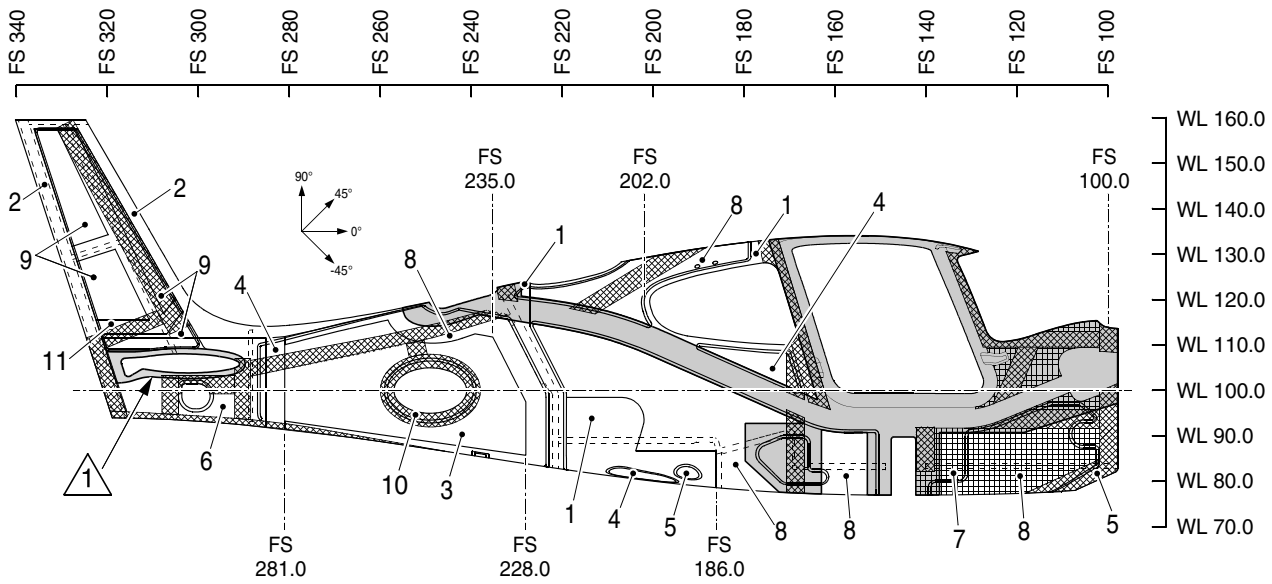
RIGHT SIDE VIEW FUSELAGE

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-
5	-	-	-	8
6	-	-	-	10
7	-	-	-	12

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
8	2	0.375 (9.525)	2	-
9	2	0.250 (6.350)	1	-
10	-	-	-	9
11	2	0.250 (6.350)	2	-
12	4	0.250 (6.350)	4	-
13	4	0.250 (6.350)	4	-
14	5	0.375 (9.525)	5	-

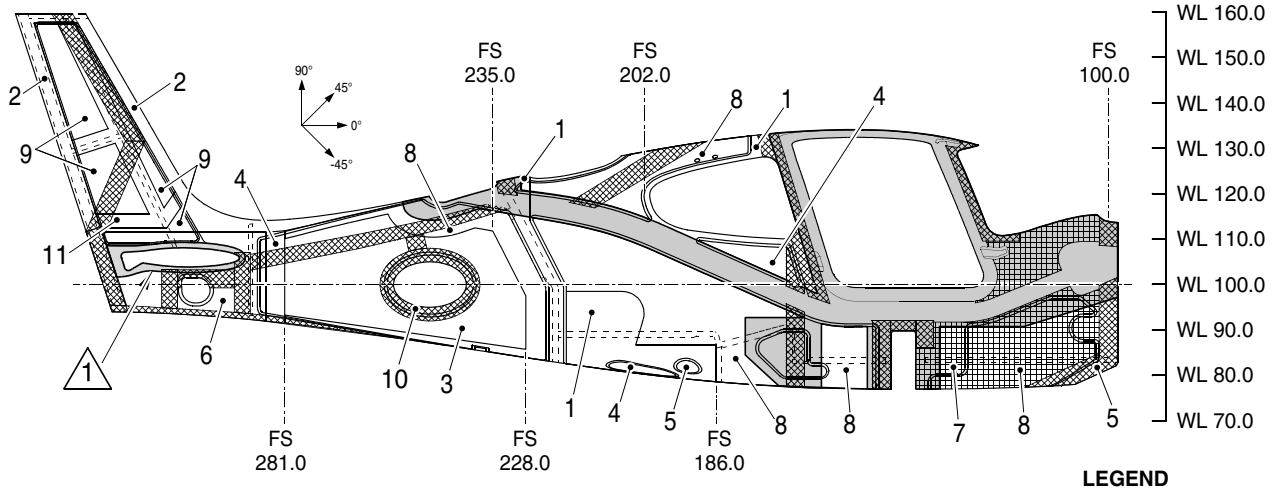
SR20_MM51_1906C

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 2015 (1 of 29)



Serials 2016 thru 2029.

FWD



Serials 2030 & subs.

LEGEND
- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

NOTE

1 Fuselage flange repair allowed per horizontal stabilizer removal, refer to 55-10.

RIGHT SIDE VIEW FUSELAGE

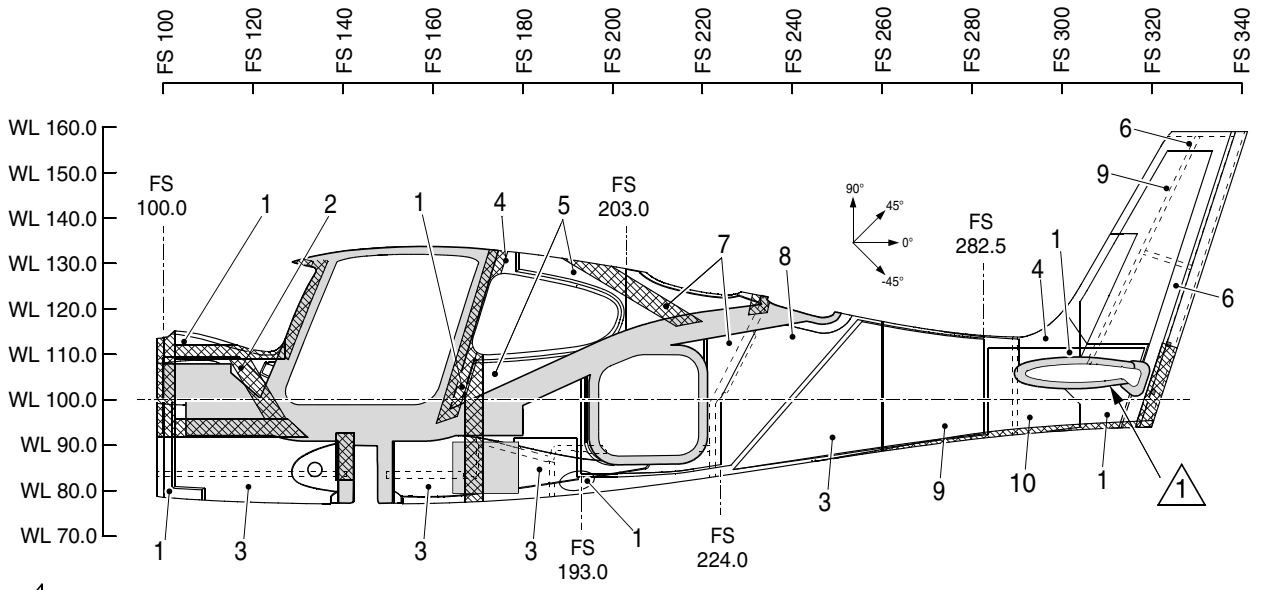
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-
5	-	-	-	8
6	-	-	-	10
7	-	-	-	12

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
8	2	0.375 (9.525)	2	-
9	2	0.250 (6.350)	1	-
10	-	-	-	9
11	2	0.250 (6.350)	2	-
12	4	0.250 (6.350)	4	-
13	4	0.250 (6.350)	4	-
14	5	0.375 (9.525)	5	-

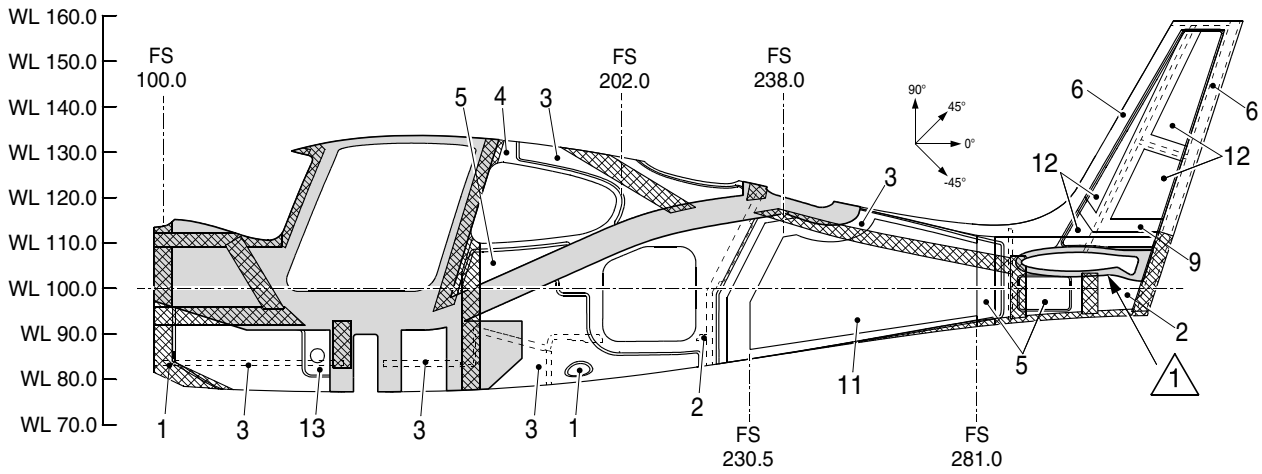
SR20_MM51_3378

Figure 51-002
Airframe Zone Diagrams - Serials 2016 & subs (2 of 29)

EFFECTIVITY:
Serials 2016 & subs



Serials 1005 thru 1422.



Serials 1423 thru 2015.

LEGEND

- Bond Line
- No Repair Area *
- Lightning Protection
- No Repair Area on Lightning Protection

***NOTE**

1 Fuselage flange repair allowed per horizontal stabilizer removal, refer to 55-10.

LEFT SIDE VIEW FUSELAGE

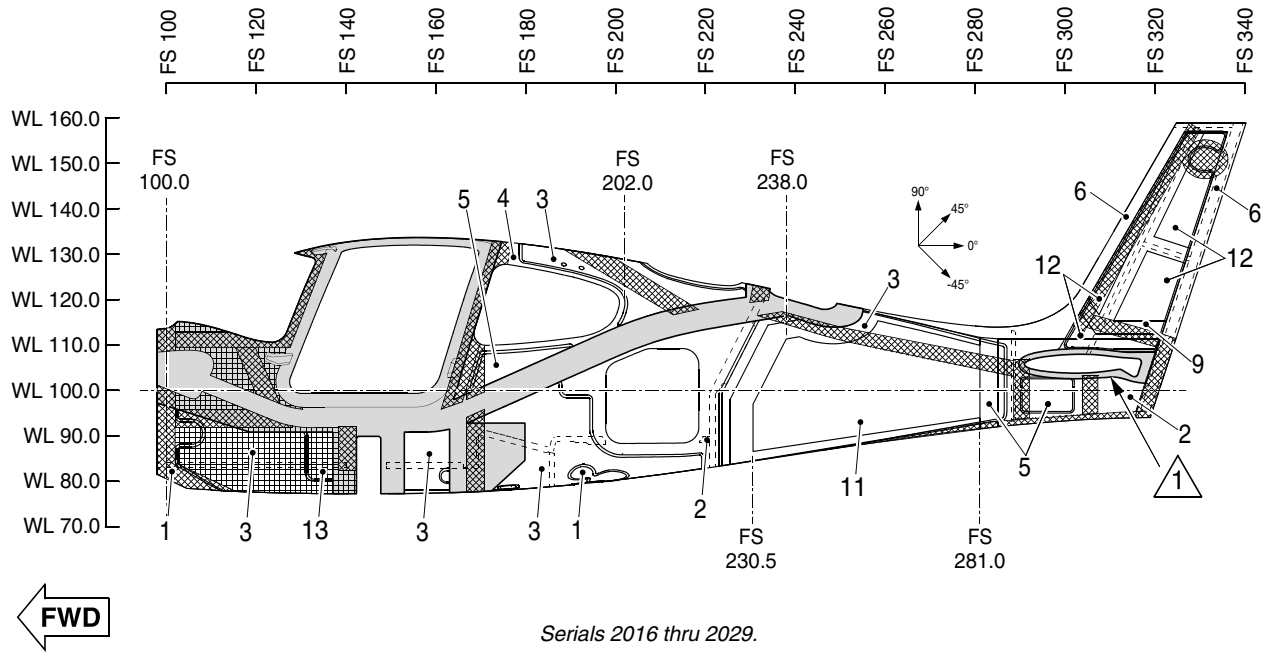
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	8
2	-	-	-	10
3	2	0.375 (9.525)	2	-
4	-	-	-	6
5	3	0.375 (9.525)	3	-
6	-	-	-	4
7	5	0.375 (9.525)	5	-

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
8	4	0.375 (9.525)	4	-
9	2	0.250 (6.350)	2	-
10	4	0.250 (6.350)	4	-
11	2	0.375 (9.525)	1	-
12	2	0.250 (6.350)	1	-
13	-	-	-	12

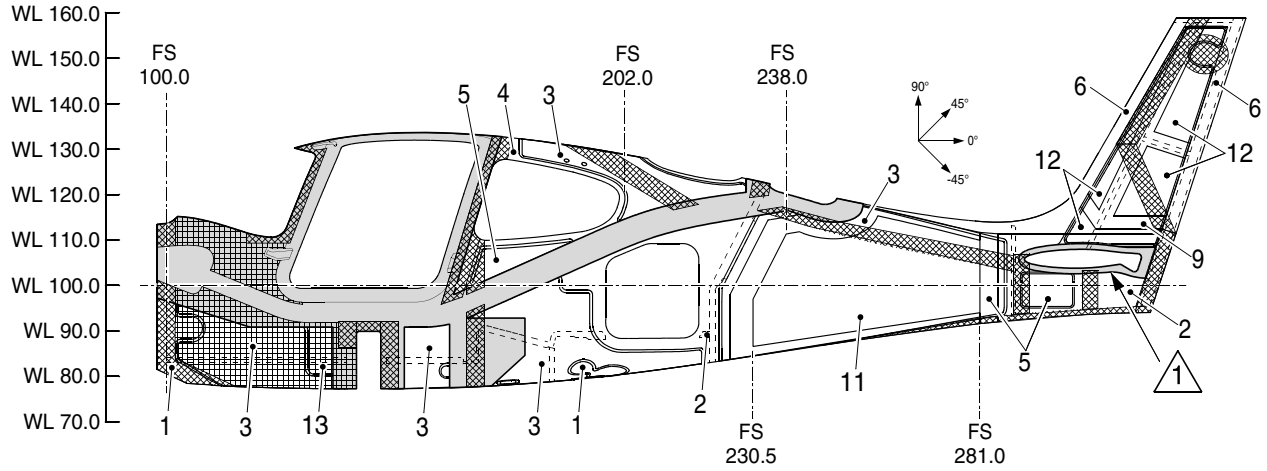
SR20_MM51_1908C

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 2015 (3 of 29)

EFFECTIVITY:
Serials 1005 thru 2015



Serials 2016 thru 2029.



Serials 2030 & subs.

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

NOTE

1 Fuselage flange repair allowed per horizontal stabilizer removal, refer to 55-10.

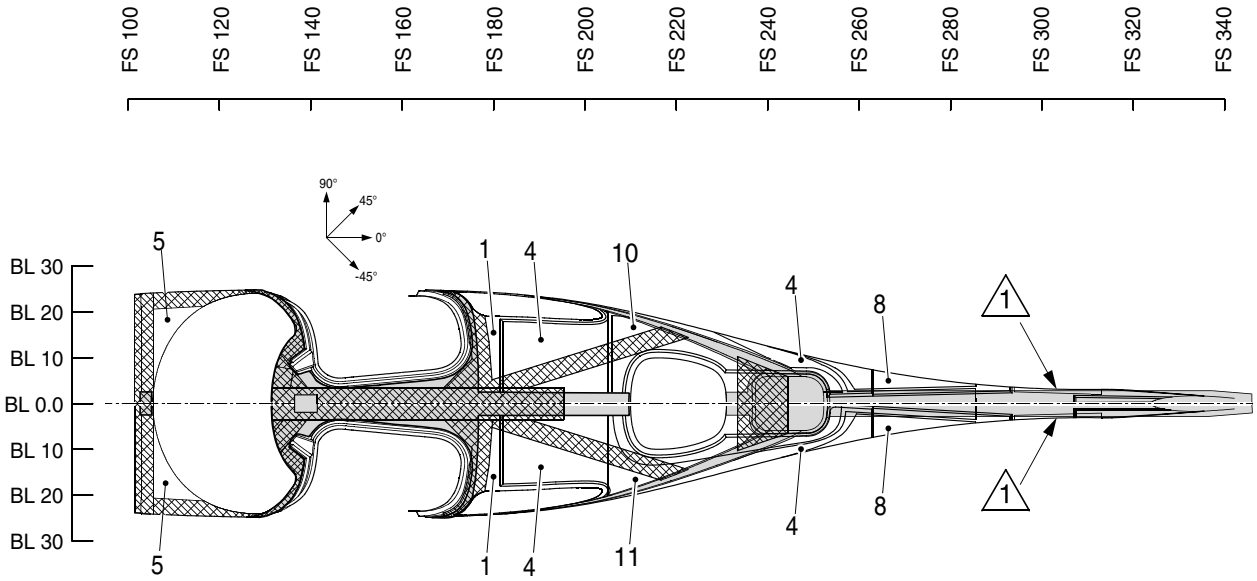
LEFT SIDE VIEW FUSELAGE

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	8
2	-	-	-	10
3	2	0.375 (9.525)	2	-
4	-	-	-	6
5	3	0.375 (9.525)	3	-
6	-	-	-	4
7	5	0.375 (9.525)	5	-

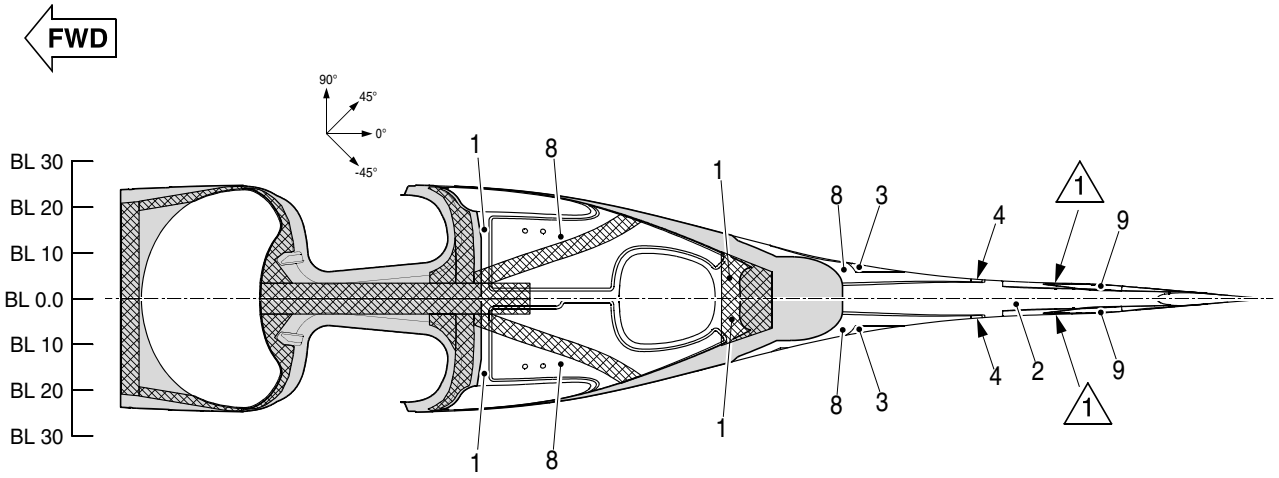
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
8	4	0.375 (9.525)	4	-
9	2	0.250 (6.350)	2	-
10	4	0.250 (6.350)	4	-
11	2	0.375 (9.525)	1	-
12	2	0.250 (6.350)	1	-
13	-	-	-	12

SR20_MM51_3379

Figure 51-002
Airframe Zone Diagrams - Serials 2016 & subs (4 of 29)



Serials 1005 thru 1422.



Serials 1423 thru 2015.

NOTE

1 For fuselage flange repairs at horizontal stabilizer, refer to 53-10.

LEGEND

- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

TOP VIEW FUSELAGE

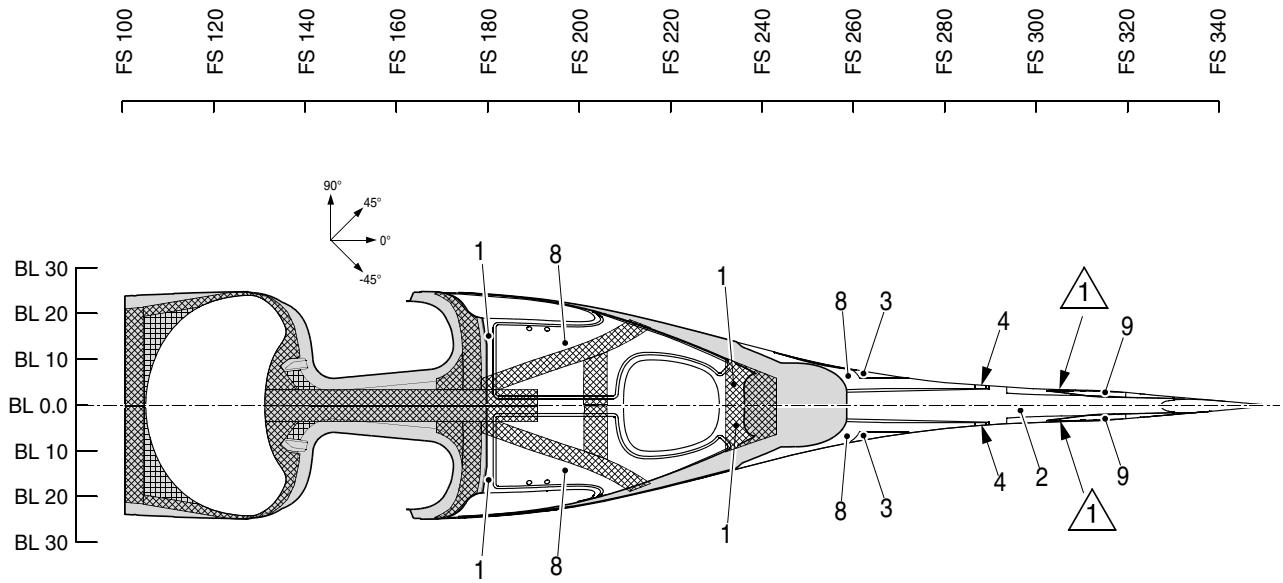
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-
5	-	-	-	8
6	-	-	-	10

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
7	-	-	-	12
8	2	0.375 (9.525)	2	-
9	2	0.250 (6.350)	1	-
10	4	0.375 (9.525)	4	-
11	5	0.375 (9.525)	5	-

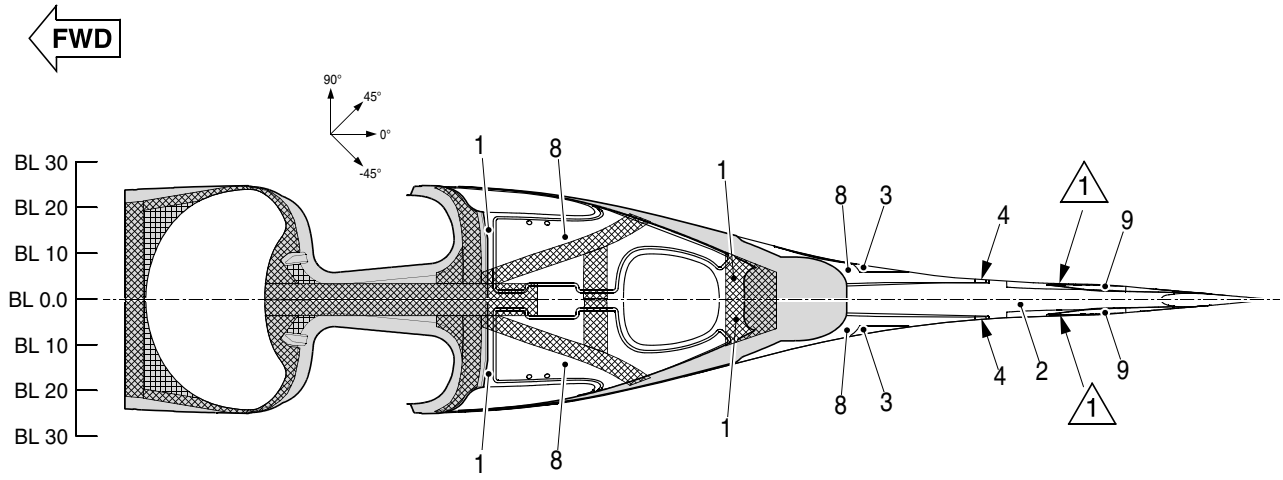
SR20_MM51_1910C

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 2015 (5 of 29)

EFFECTIVITY:
Serials 1005 thru 2015



Serials 2016 thru 2029.



Serials 2030 & subs.

NOTE

1 For fuselage flange repairs at horizontal stabilizer, refer to 53-10.

LEGEND

- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

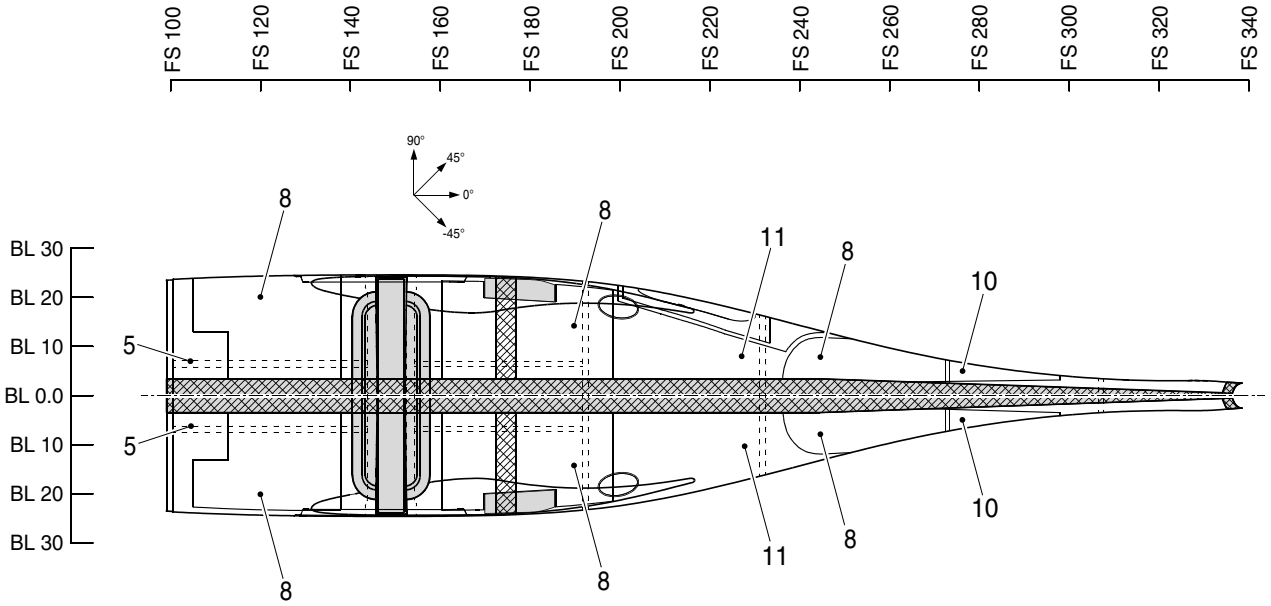
TOP VIEW FUSELAGE

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-
5	-	-	-	8

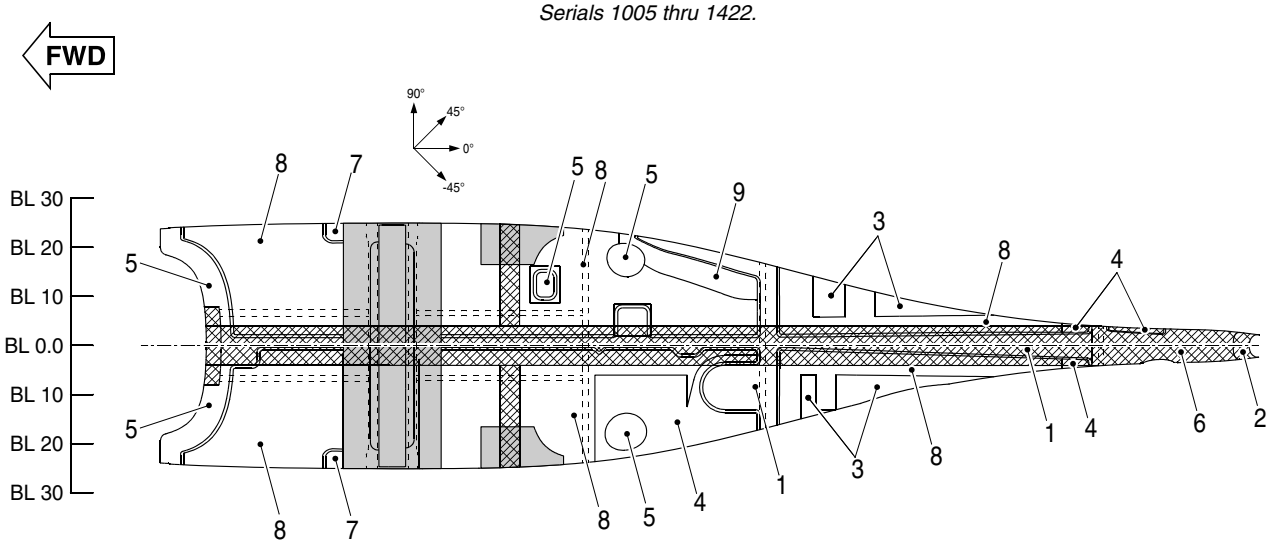
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
6	-	-	-	10
7	-	-	-	12
8	2	0.375 (9.525)	2	-
9	2	0.250 (6.350)	1	-

SR20_MM51_3380

Figure 51-002
Airframe Zone Diagrams - Serials 2016 & subs (6 of 29)



Serials 1005 thru 1422.



Serials 1423 thru 2015.

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

BOTTOM VIEW FUSELAGE

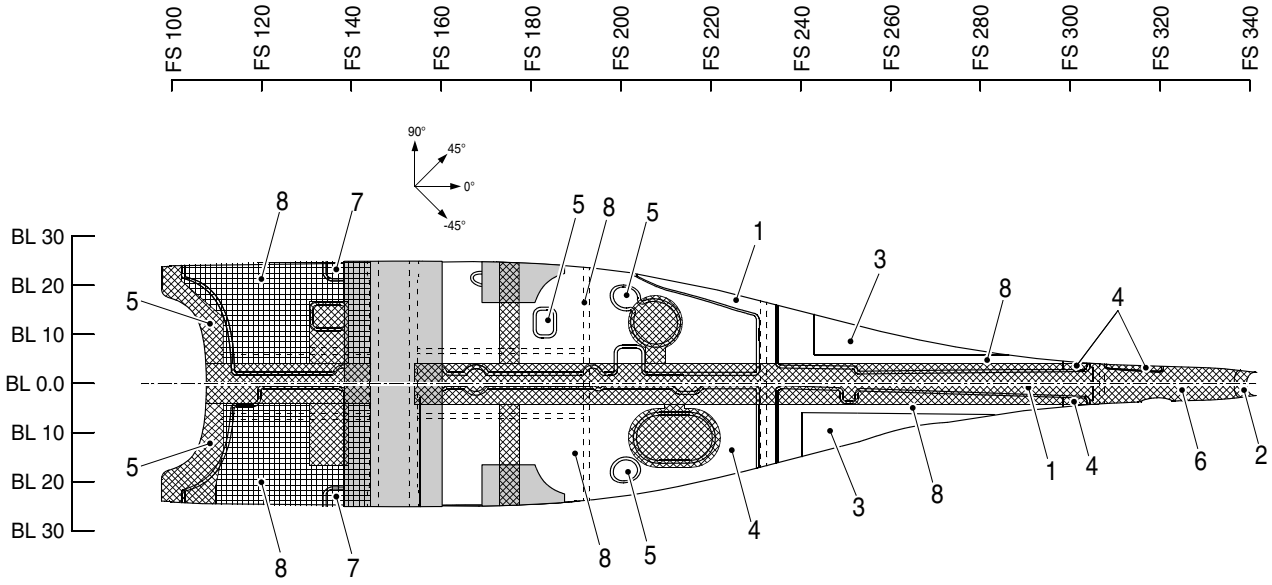
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-
5	-	-	-	8
6	-	-	-	10

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
7	-	-	-	12
8	2	0.375 (9.525)	2	-
9	5	0.375 (9.525)	5	-
10	2	0.250 (6.350)	2	-
11	4	0.375 (9.525)	4	-

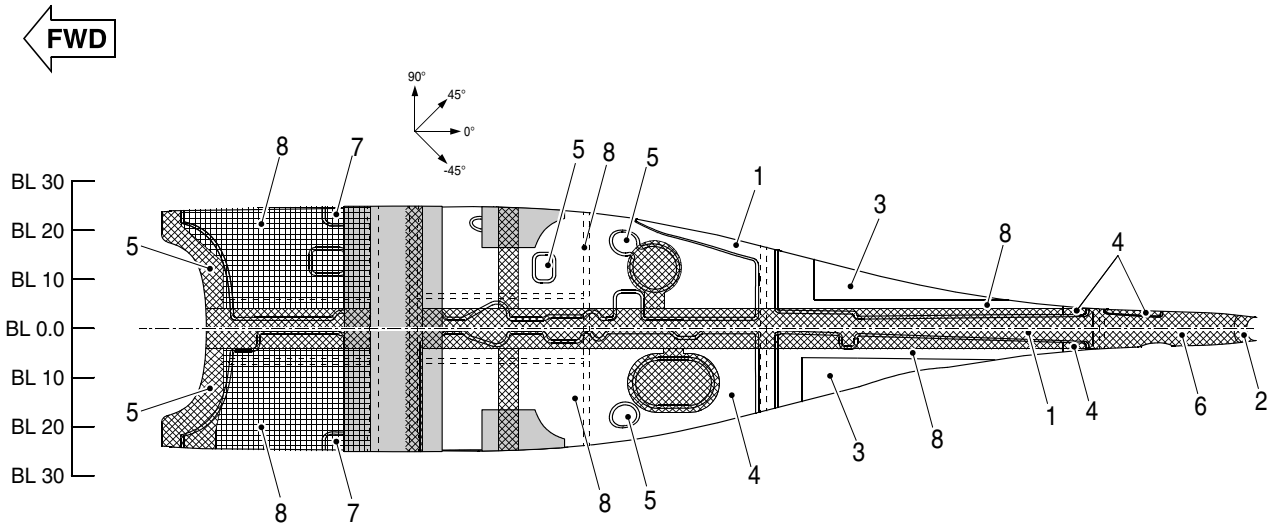
SR20_MM51_1912B

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 2015 (7 of 29)

EFFECTIVITY:
Serials 1005 thru 2015



Serials 2016 thru 2029.



Serials 2030 & subs.

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

BOTTOM VIEW FUSELAGE

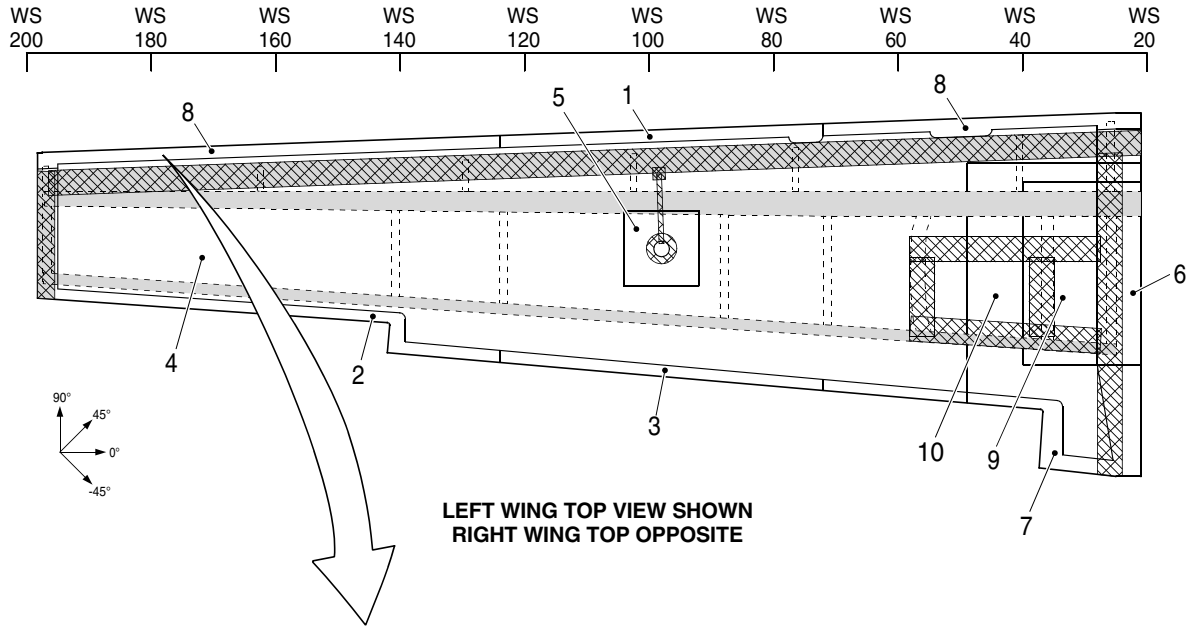
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	4
3	2	0.375 (9.525)	1	-
4	3	0.375 (9.525)	3	-

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
5	-	-	-	8
6	-	-	-	10
7	-	-	-	12
8	2	0.375 (9.525)	2	-

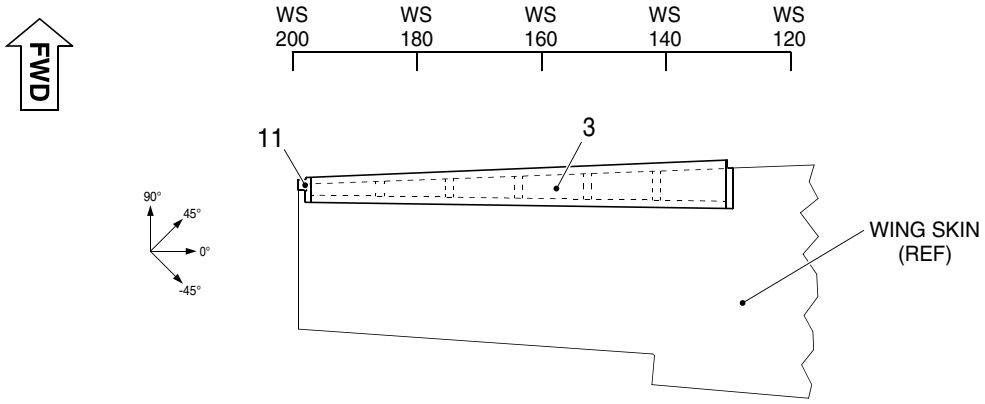
SR20_MM51_3381

Figure 51-002
Airframe Zone Diagrams - Serials 2016 & subs (8 of 29)

EFFECTIVITY:
Serials 2016 & subs



LEFT WING TOP VIEW SHOWN
RIGHT WING TOP OPPOSITE



LEFT WING CUFF TOP VIEW SHOWN
RIGHT WING CUFF TOP OPPOSITE

Serials 1005 thru 1877, 1879 thru 1885.

LEGEND
- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

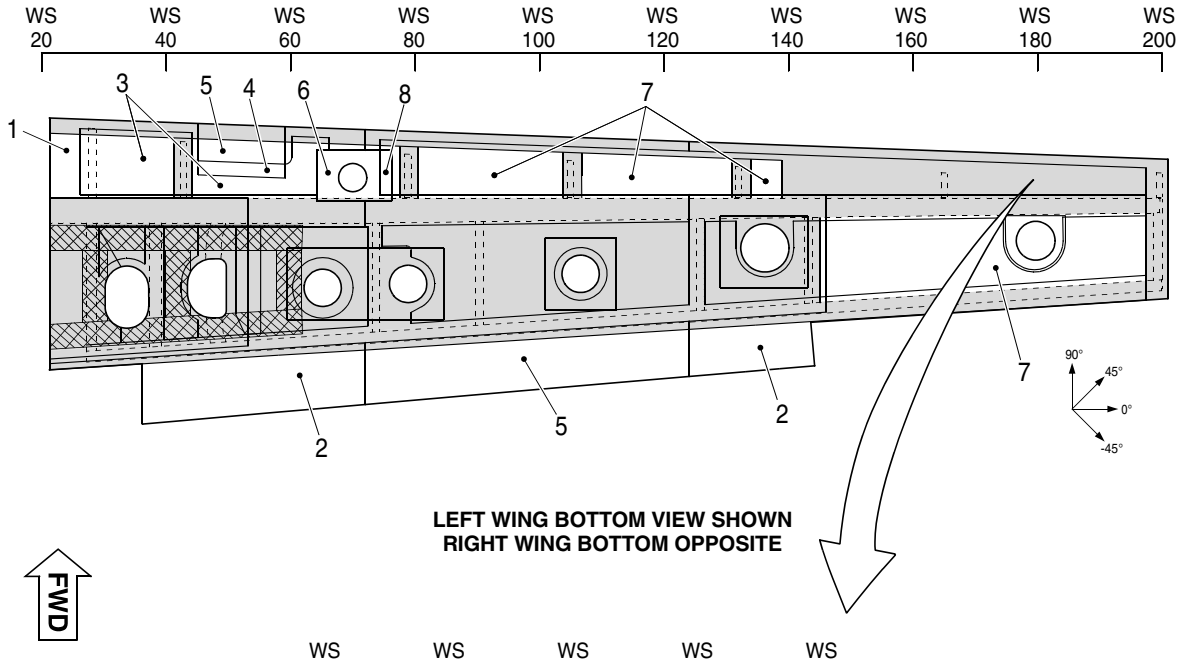
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	6	1.5 to 1.0
2	-	-	-	4	1.5 to 1.0
3	-	-	-	4	2.0 to 1.0
4	2	0.375 (9.525)	2	-	2.0 to 1.0
5	-	-	-	9	2.5 to 1.0
6	-	-	-	8	3.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
7	-	-	-	6	1.0 to 1.0
8	-	-	-	6	2.0 to 1.0
9	4	0.375 (9.525)	4	-	2.0 to 1.0
10	4	0.375 (9.525)	2	-	2.5 to 1.0
11	-	-	-	8	2.0 to 1.0

SR20_MM51_2128B

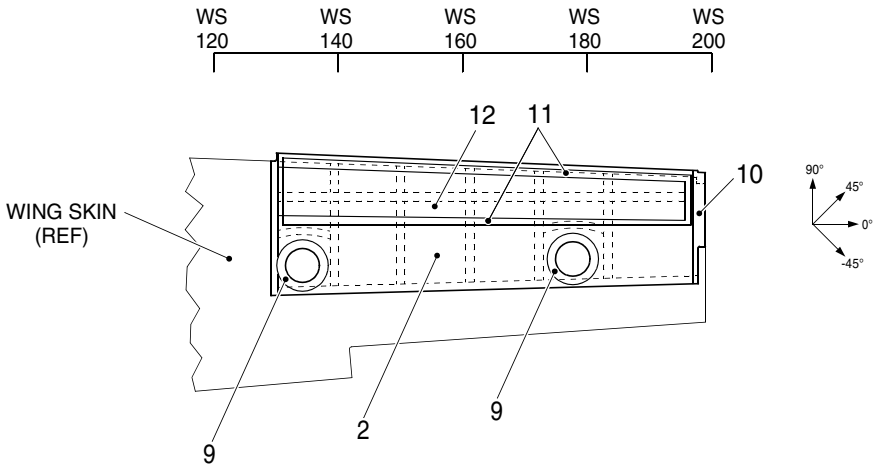
Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1885 (9 of 29)

EFFECTIVITY:
Serials 1005 thru 1885



LEFT WING BOTTOM VIEW SHOWN
RIGHT WING BOTTOM OPPOSITE

FWD



LEFT WING CUFF BOTTOM VIEW SHOWN
RIGHT WING CUFF BOTTOM OPPOSITE

Serials 1005 thru 1877, 1879 thru 1885.

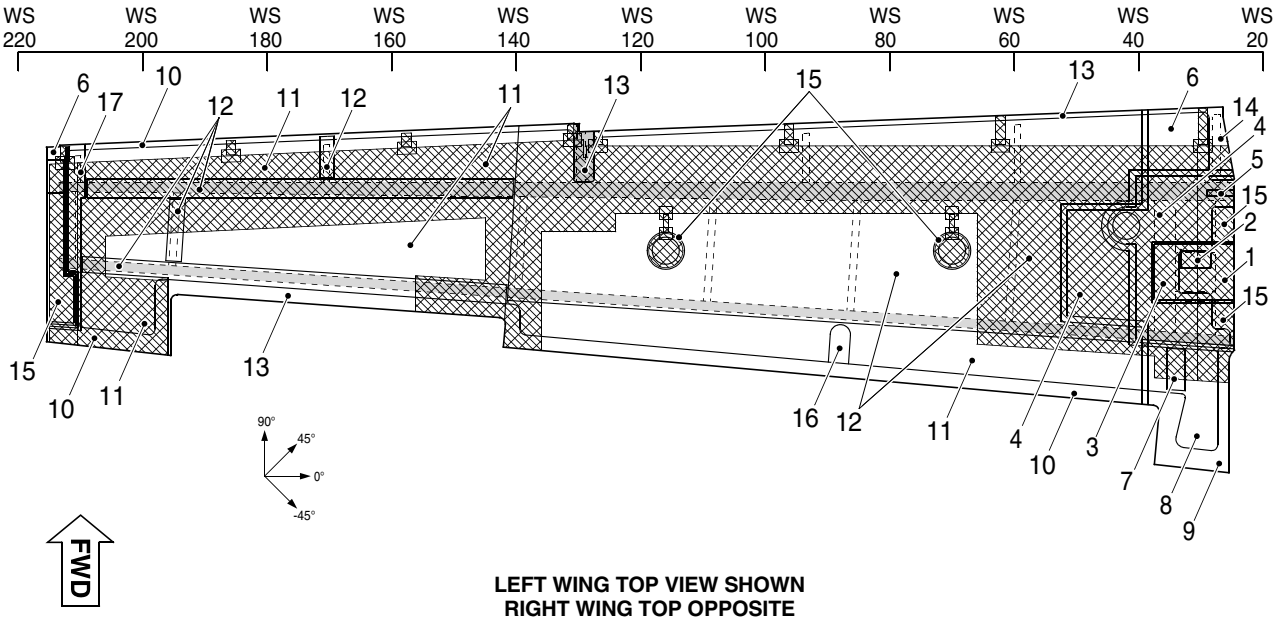
LEGEND
Bond Line
Lightning Protection

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	4	1.5 to 1.0
2	-	-	-	4	2.0 to 1.0
3	2	0.375 (9.525)	2	-	1.5 to 1.0
4	2	0.375 (9.525)	3	-	2.0 to 1.0
5	-	-	-	5	2.0 to 1.0
6	-	-	-	8	2.5 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
7	2	0.375 (9.525)	2	-	2.0 to 1.0
8	-	-	-	8	1.5 to 1.0
9	-	-	-	6	2.0 to 1.0
10	-	-	-	8	2.0 to 1.0
11	2	0.250 (6.350)	1	-	2.0 to 1.0
12	2	0.250 (6.350)	2	-	2.0 to 1.0

SR20_MM51_1209D

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1885 (10 of 29)



LEFT WING TOP VIEW SHOWN
RIGHT WING TOP OPPOSITE

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

Serials 1878, 1886 & subs.

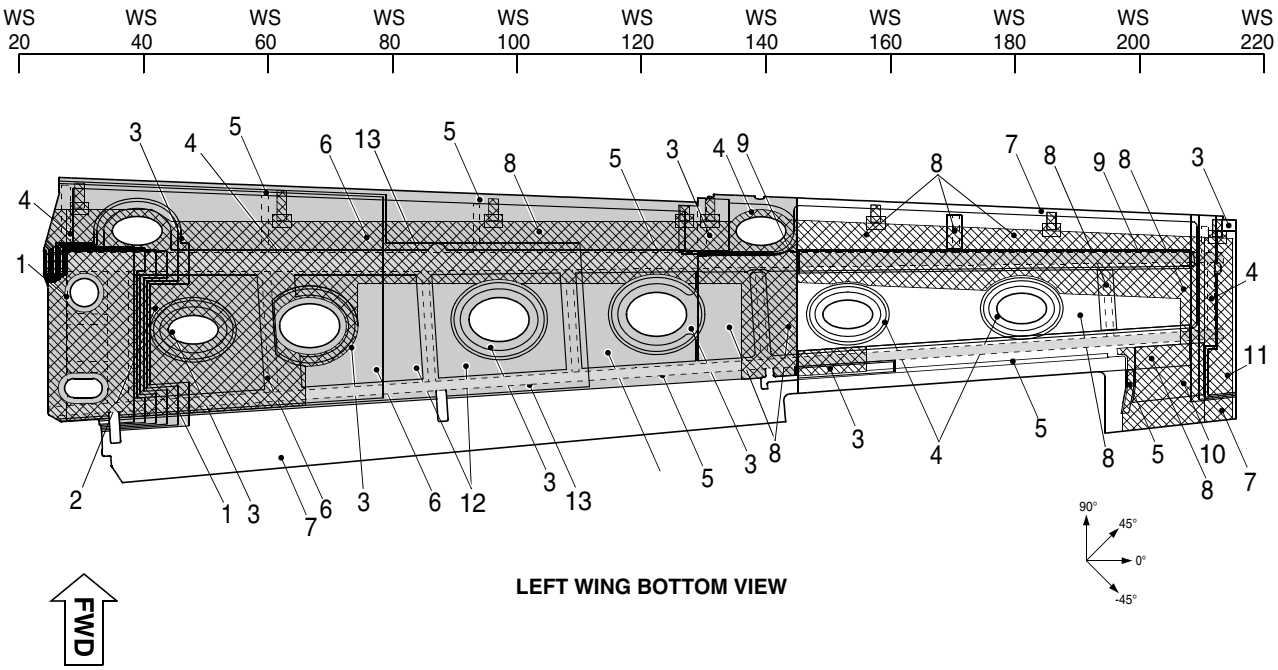
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	12	1.5 to 1.0
2	-	-	-	14	1.5 to 1.0
3	4	0.375 (9.525)	8	-	1.5 to 1.0
4	4	0.375 (9.525)	4	-	2.0 to 1.0
5	6	0.335 (8.509)	6	-	2.0 to 1.0
6	-	-	-	7	1.5 to 1.0
7	4	0.375 (9.525)	2	-	2.0 to 1.0
8	4	0.375 (9.525)	1	-	1.5 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
9	-	-	-	5	1.5 to 1.0
10	-	-	-	3	1.5 to 1.0
11	2	0.375 (9.525)	1	-	2.0 to 1.0
12	2	0.375 (9.525)	2	-	2.0 to 1.0
13	-	-	-	4	2.0 to 1.0
14	-	-	-	6	2.0 to 1.0
15	-	-	-	8	2.0 to 1.0
16	2	0.125 (3.175)	1	-	1.5 to 1.0
17	2	0.375 (9.525)	3	-	1.5 to 1.0

SR20_MM51_2738A

Figure 51-002
Airframe Zone Diagrams - Serials 1886 & subs (11 of 29)

EFFECTIVITY:
Serials 1886 & subs



LEFT WING BOTTOM VIEW

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

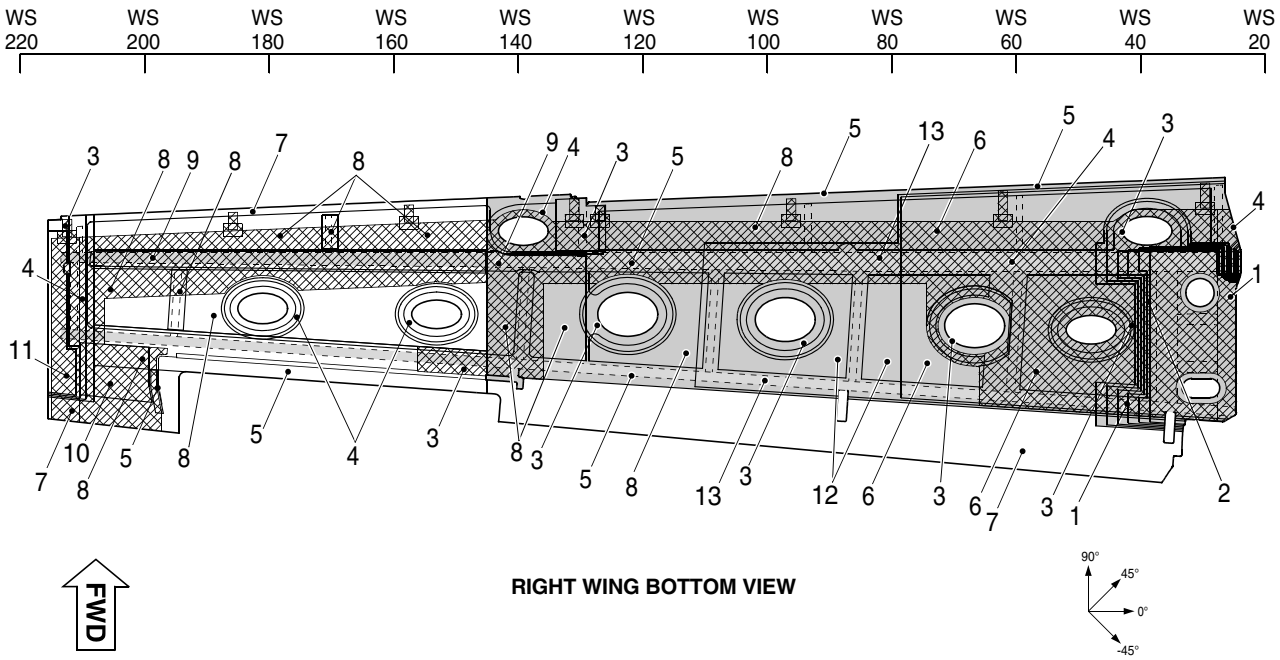
Serials 1878, 1886 & subs.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	12	2.0 to 1.0
2	3	0.375 (9.525)	5	-	2.0 to 1.0
3	-	-	-	8	2.0 to 1.0
4	-	-	-	6	1.5 to 1.0
5	-	-	-	4	1.5 to 1.0
6	3	0.375 (9.525)	3	-	1.5 to 1.0
7	-	-	-	3	1.0 to 1.0
8	2	0.375 (9.525)	-	-	2.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
9	2	0.225 (5.715)	2	-	2.0 to 1.0
10	2	0.375 (9.525)	1	-	1.5 to 1.0
11	-	-	-	9	1.0 to 1.0
12	2	0.375 (9.525)	3	-	2.0 to 1.0
13	-	-	-	5	2.0 to 1.0

SR20_MM51_2739

Figure 51-002
Airframe Zone Diagrams - Serials 1886 & subs (12 of 29)



RIGHT WING BOTTOM VIEW

LEGEND

- Bond Line
- No Repair Area
- Lightning Protection
- No Repair Area on Lightning Protection

Serials 1878, 1886 & subs.

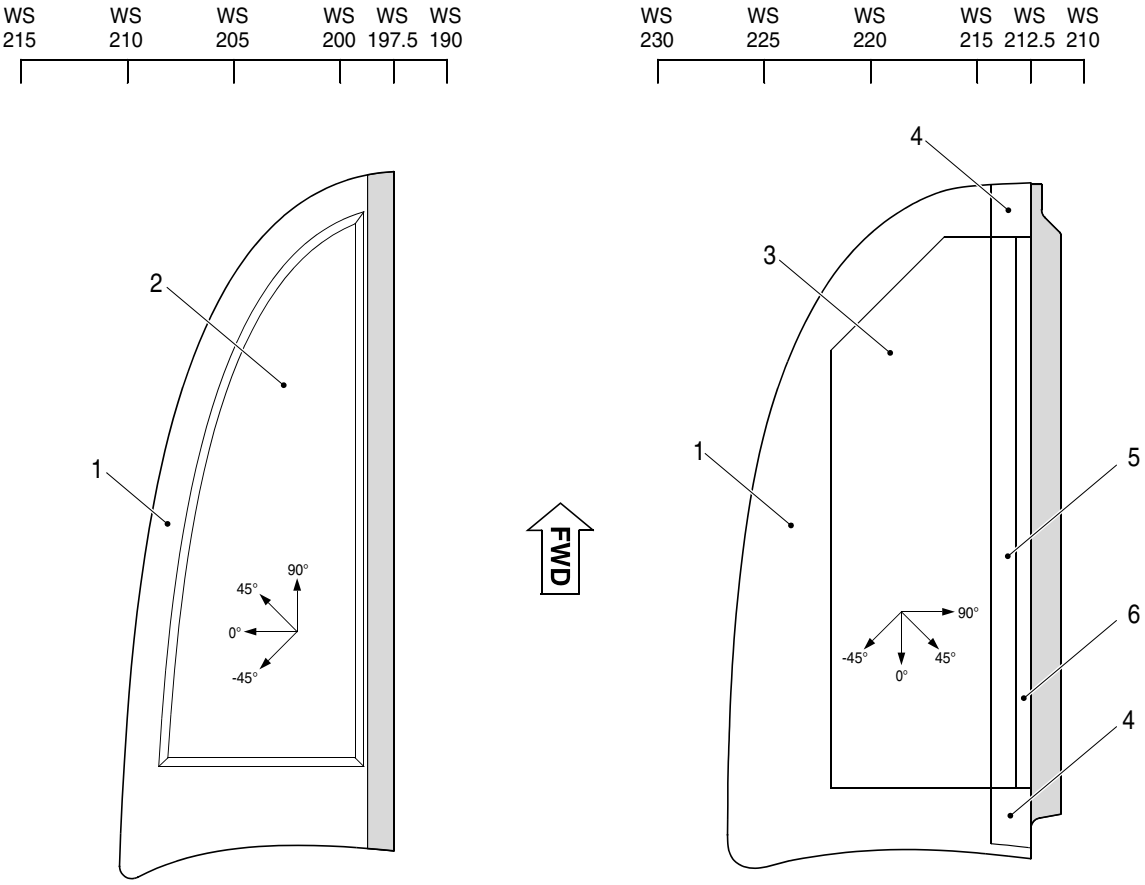
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	12	2.0 to 1.0
2	3	0.375 (9.525)	5	-	2.0 to 1.0
3	-	-	-	8	2.0 to 1.0
4	-	-	-	6	1.5 to 1.0
5	-	-	-	4	1.5 to 1.0
6	3	0.375 (9.525)	3	-	1.5 to 1.0
7	-	-	-	3	1.0 to 1.0
8	2	0.375 (9.525)	2	-	2.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
9	2	0.225 (5.715)	2	-	2.0 to 1.0
10	2	0.375 (9.525)	1	-	1.5 to 1.0
11	-	-	-	9	1.0 to 1.0
12	2	0.375 (9.525)	3	-	2.0 to 1.0
13	-	-	-	5	2.0 to 1.0

SR20_MM51_2740A

Figure 51-002
Airframe Zone Diagrams - Serials 1886 & subs (13 of 29)

EFFECTIVITY:
Serials 1886 & subs



Serials 1005 thru 1877, 1879 thru 1885.

Serials 1878, 1886 & subs.

LEGEND

No Repair Area

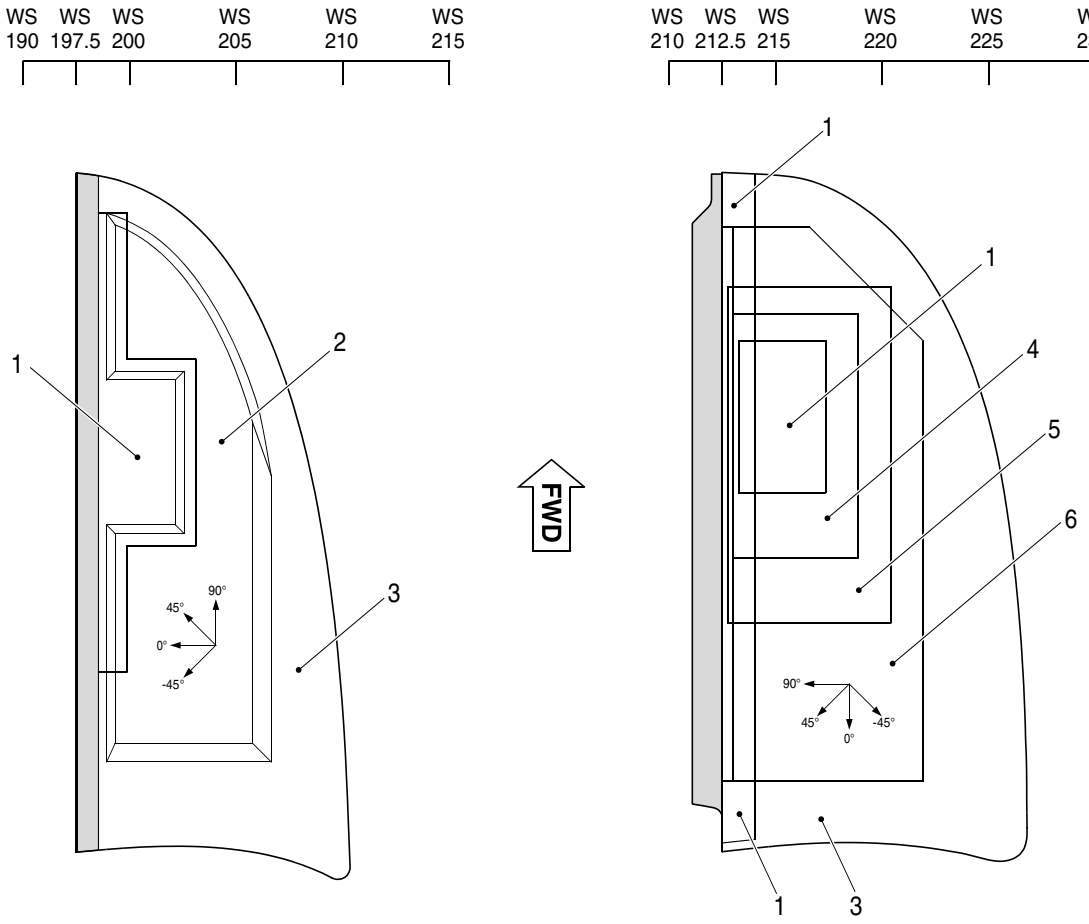
LEFT WING TIP TOP VIEW SHOWN
RIGHT WING TIP TOP OPPOSITE

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	4	1.0 to 1.0
2	2	0.250 (6.350)	2	-	1.0 to 1.0
3	-	-	-	5	1.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
4	-	-	-	6	1.0 to 1.0
5	-	-	-	7	1.0 to 1.0
6	-	-	-	8	1.0 to 1.0

SR20_MM51_3118

Figure 51-002
Airframe Zone Diagrams (14 of 29)



Serials 1005 thru 1877, 1879 thru 1885.

Serials 1878, 1886 & subs.

LEGEND
No Repair Area

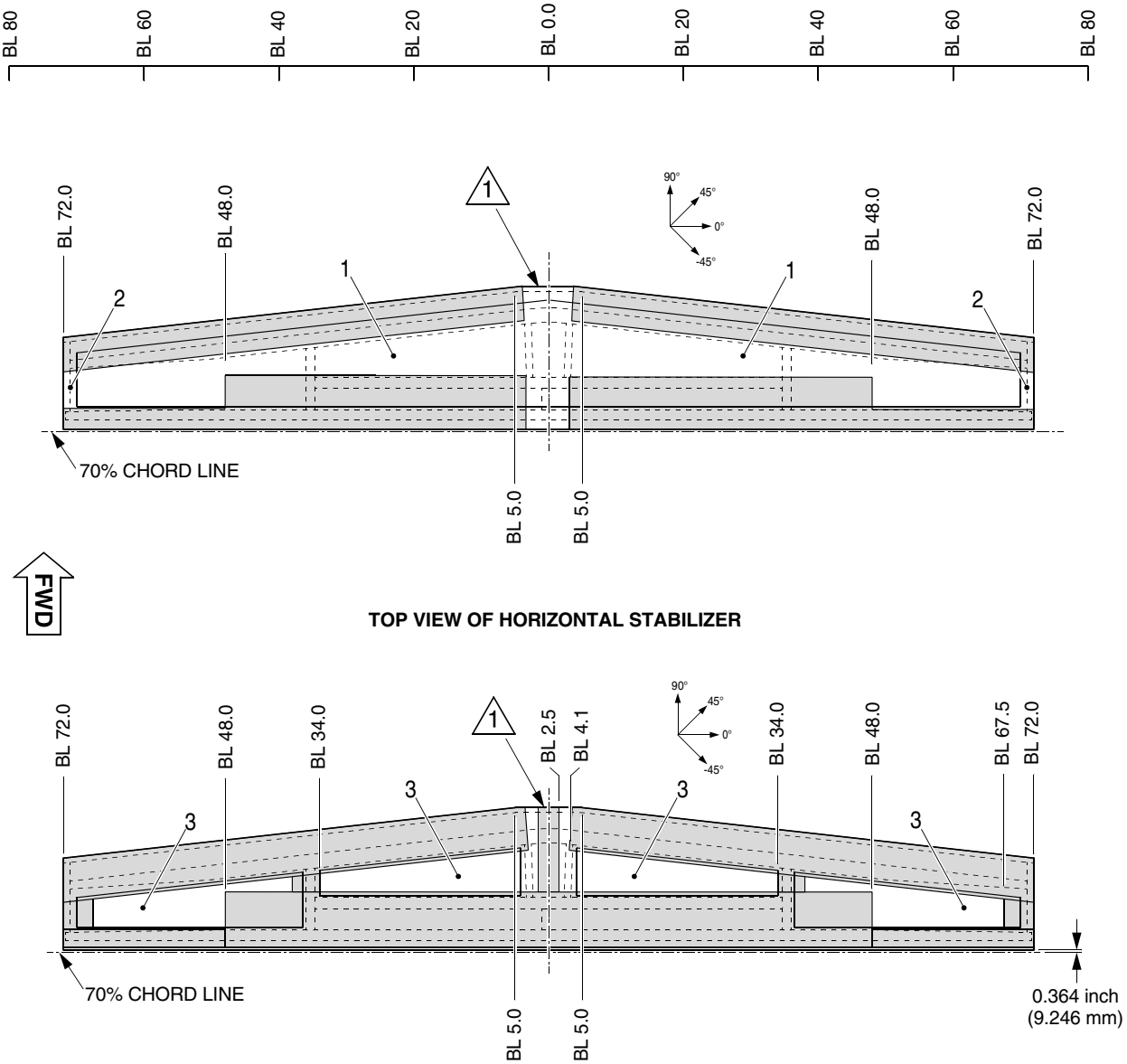
LEFT WING TIP BOTTOM VIEW SHOWN
RIGHT WING TIP BOTTOM OPPOSITE

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	8	1.0 to 1.0
2	2	0.250 (6.350)	2	-	1.0 to 1.0
3	-	-	-	4	1.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
4	-	-	-	7	1.0 to 1.0
5	-	-	-	6	1.0 to 1.0
6	-	-	-	5	1.0 to 1.0

SR20_MM51_3120

Figure 51-002
Airframe Zone Diagrams (15 of 29)



TOP VIEW OF HORIZONTAL STABILIZER

BOTTOM VIEW HORIZONTAL STABILIZER

***NOTE**

1 Horizontal stabilizer repairs between LBL 5.0 and RBL 5.0 allowed per horizontal stabilizer removal, refer to 55-10.

LEGEND

Bond Line

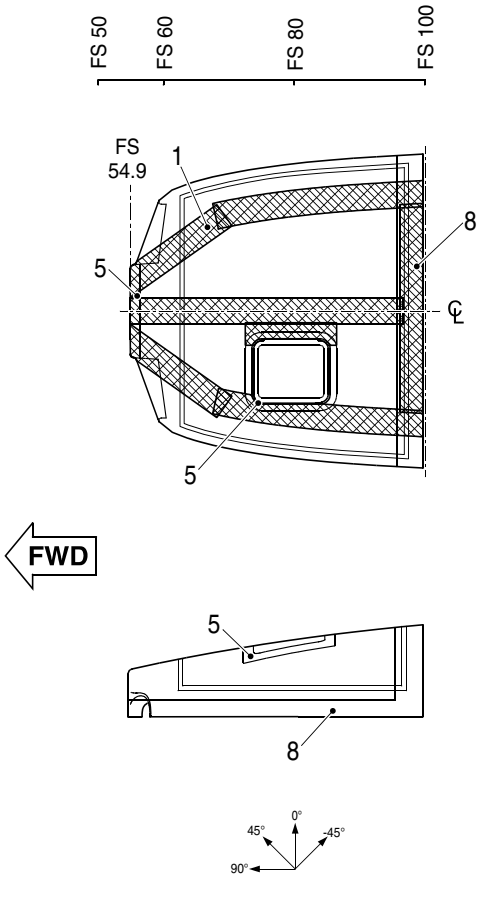
No Repair Area *

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	2	-
2	-	-	-	4

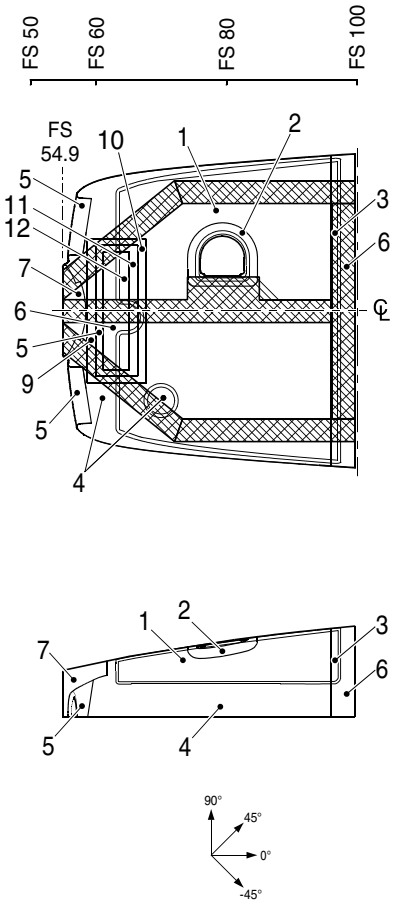
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
3	2	0.125 (3.175)	2	-

SR20_MM51_1211E

Figure 51-002
Airframe Zone Diagrams (16 of 29)



Serials 1005 thru 1422.



Serials 1423 & subs.

UPPER COWL

LEGEND

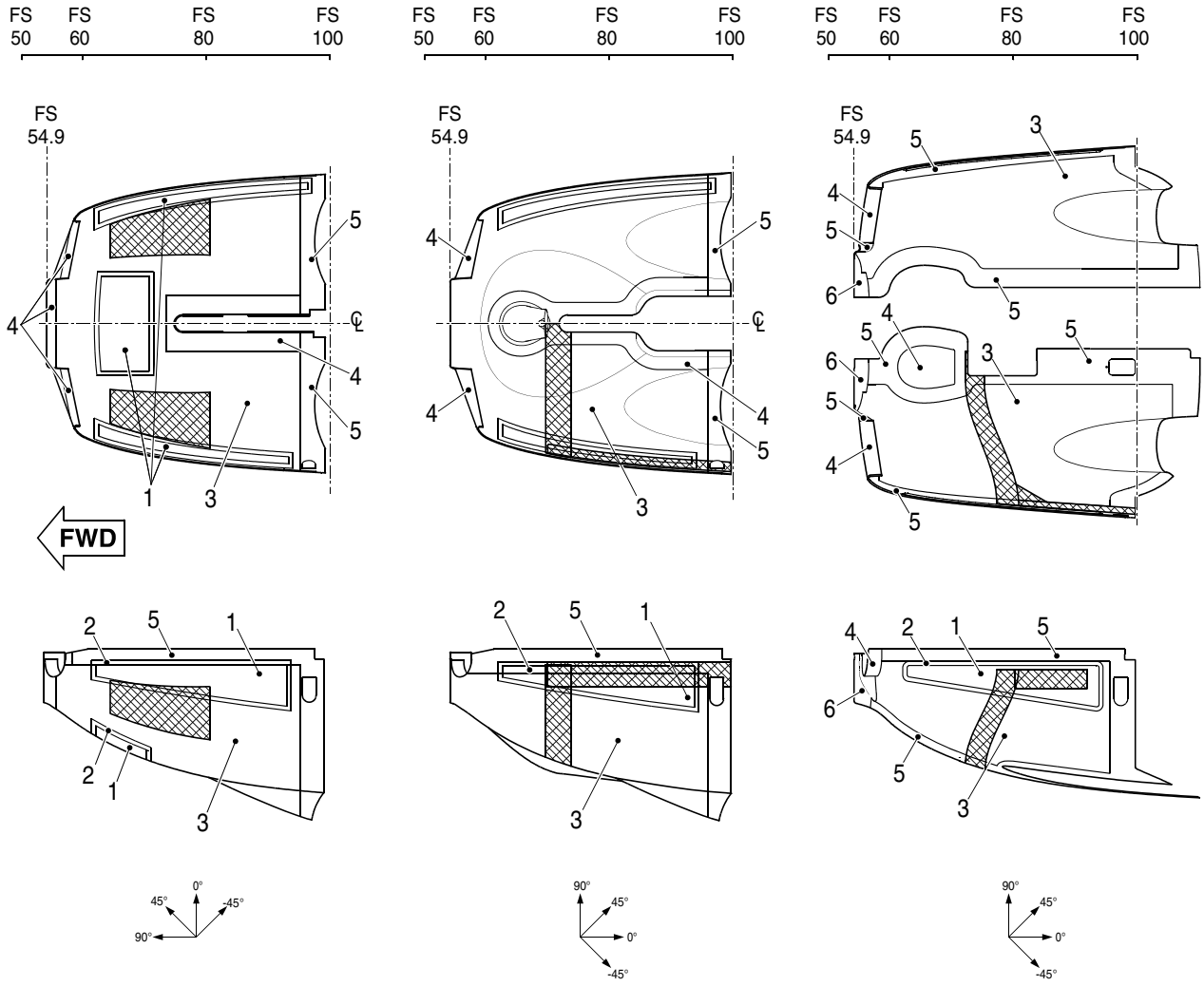
Lightning Protection

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	1	-
2	3	0.250 (6.350)	2	-
3	4	0.250 (6.350)	3	-
4	-	-	-	3
5	-	-	-	5
5	-	-	-	6

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
7	-	-	-	10
8	-	-	-	7
9	-	-	-	4
10	2	0.250 (6.350)	2	-
11	2	0.250 (6.350)	3	-
12	2	0.250 (6.350)	4	-

SR20_MM51_1914B

Figure 51-002
Airframe Zone Diagrams (17 of 29)



Serials 1005 thru 1147. *Serials 1148 thru 1422.* *Serials 1423 thru 1681.*

LOWER COWL

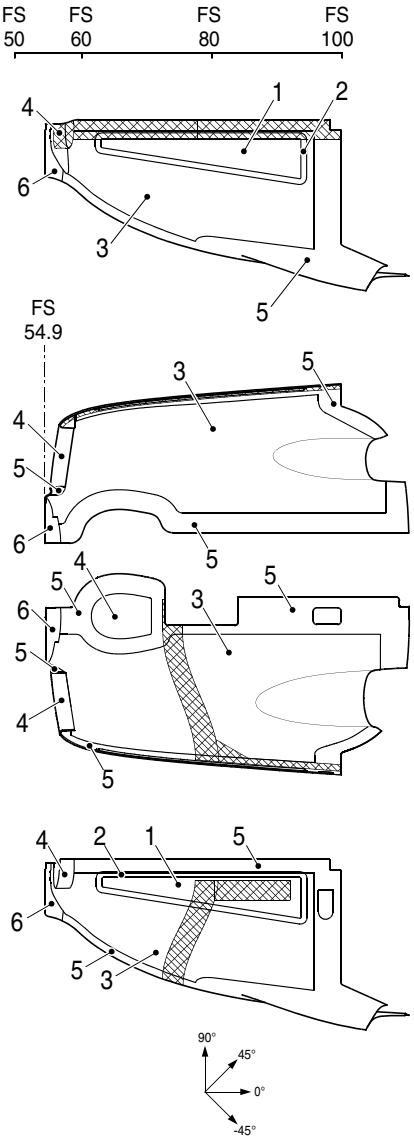
LEGEND
Lightning Protection

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	1	-
2	4	0.250 (6.350)	3	-
3	-	-	-	3

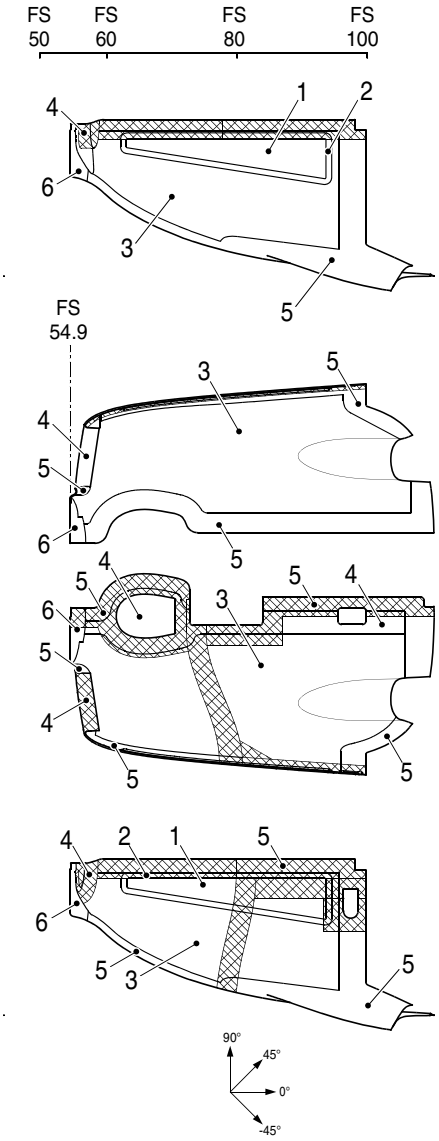
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
4	-	-	-	5
5	-	-	-	7
6	-	-	-	10

SR20_MM51_1927B

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1681 (18 of 29)



Serials 1682 thru 1689.



Serials 1690 thru 1877, 1879 thru 1885.

FWD

LOWER COWL

LEGEND
Lightning Protection

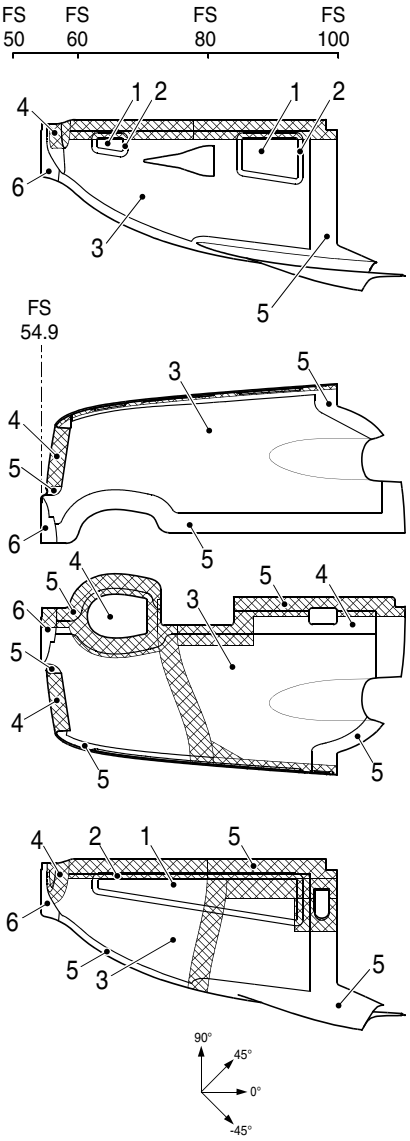
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	1	-
2	4	0.250 (6.350)	3	-
3	-	-	-	3

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
4	-	-	-	5
5	-	-	-	7
6	-	-	-	10

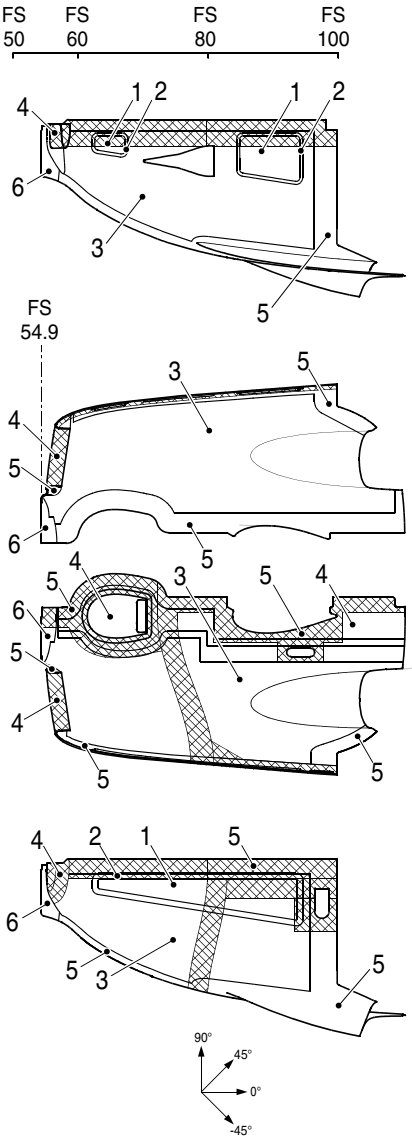
SR20_MM51_2741A

Figure 51-002
Airframe Zone Diagrams - Serials 1682 thru 1885 (19 of 29)

EFFECTIVITY:
Serials 1682 thru 1885



Serials 1878, 1886 thru 2064.



Serials 2065 & subs.

FWD

LOWER COWL

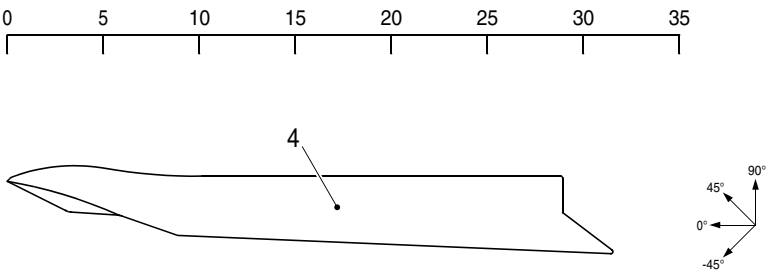
LEGEND
Lightning Protection

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	1	-
2	4	0.250 (6.350)	3	-
3	-	-	-	3

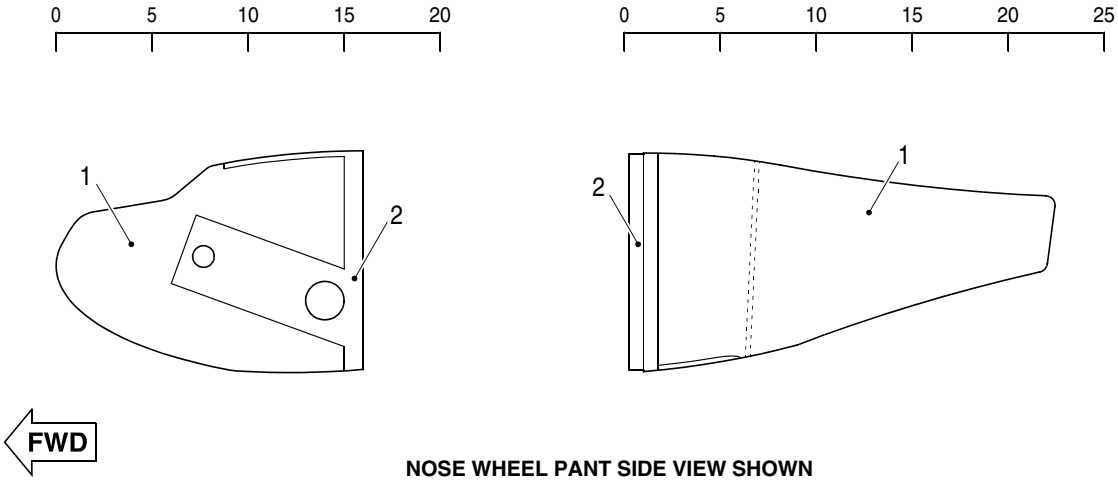
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
4	-	-	-	5
5	-	-	-	7
6	-	-	-	10

SR20_MM51_3373

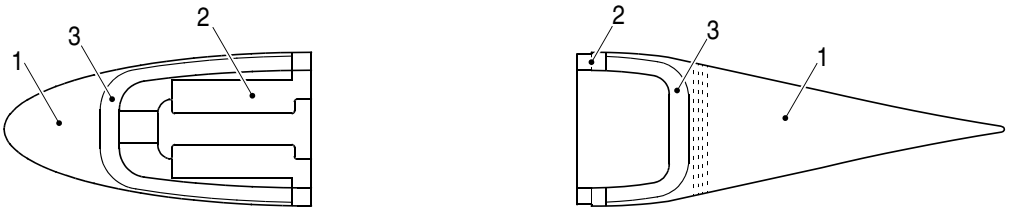
Figure 51-002
Airframe Zone Diagrams - Serials 1886 & subs (20 of 29)



NOSE GEAR FAIRING SIDE VIEW SHOWN



NOSE WHEEL PANT SIDE VIEW SHOWN



NOSE WHEEL PANT BOTTOM VIEW SHOWN

LEGEND

Bond Line

Serials 1005 thru 1424, 1431 thru 1475.

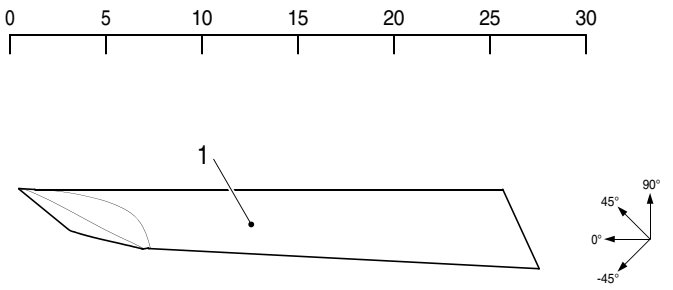
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	8	1.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
3	-	-	-	6	1.0 to 1.0
4	-	-	-	4	1.0 to 1.0

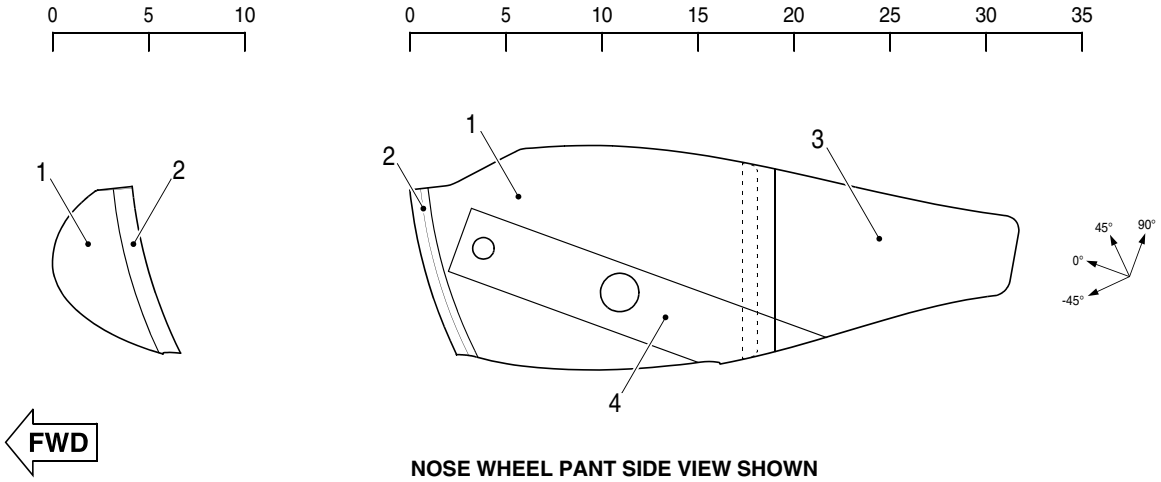
SR20_MM51_3127

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1424, 1431 thru 1475 (21 of 29)

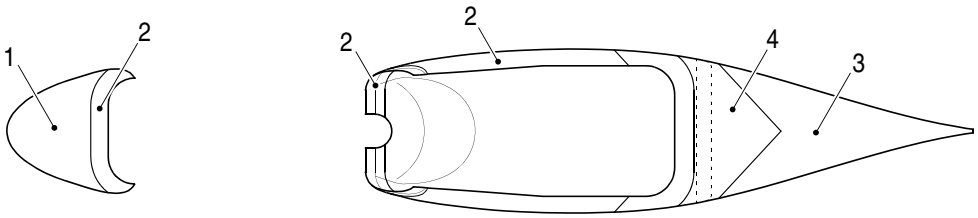
EFFECTIVITY:
Serials 1005 thru 1424, 1431 thru 1475



NOSE GEAR FAIRING SIDE VIEW SHOWN



NOSE WHEEL PANT SIDE VIEW SHOWN



NOSE WHEEL PANT BOTTOM VIEW SHOWN

LEGEND

Bond Line

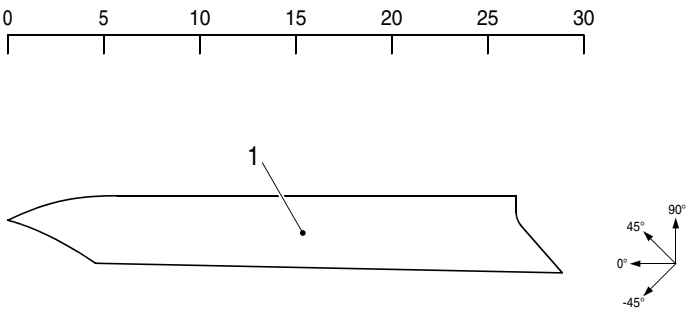
Serials 1425 thru 1430, 1476 thru 1877, 1879 thru 1885.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	5	1.0 to 1.0

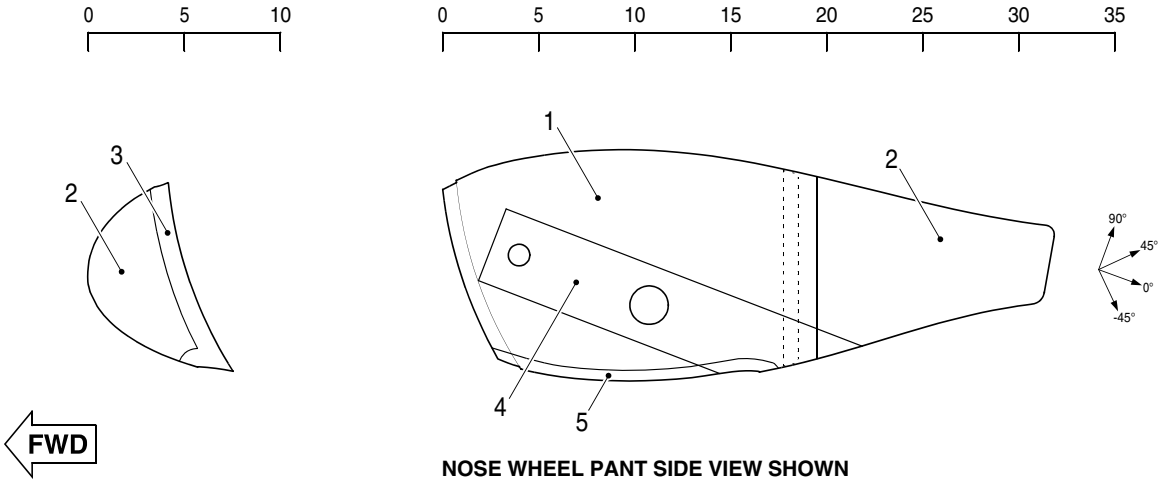
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
3	-	-	-	2	1.0 to 1.0
4	-	-	-	10	1.0 to 1.0

SR20_MM51_3128

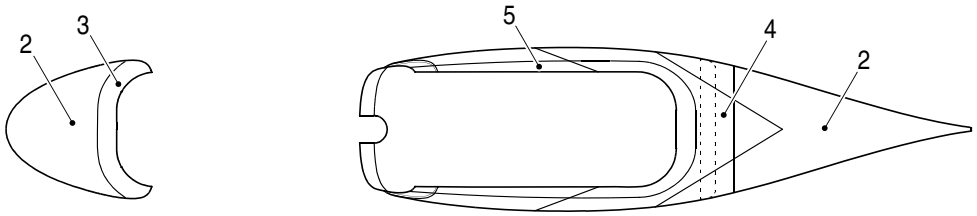
Figure 51-002
Airframe Zone Diagrams - Serials 1425 thru 1430, 1476 thru 1885 (22 of 29)



NOSE GEAR FAIRING SIDE VIEW SHOWN



NOSE WHEEL PANT SIDE VIEW SHOWN



NOSE WHEEL PANT BOTTOM VIEW SHOWN

LEGEND

Bond Line

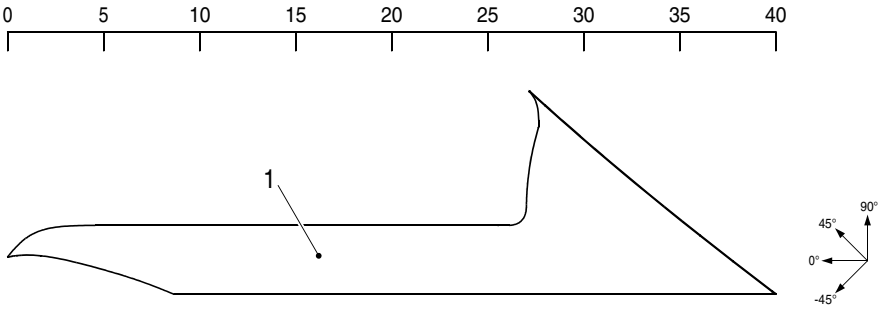
Serials 1878, 1886 thru 2064.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	2	1.0 to 1.0
3	-	-	-	4	1.0 to 1.0

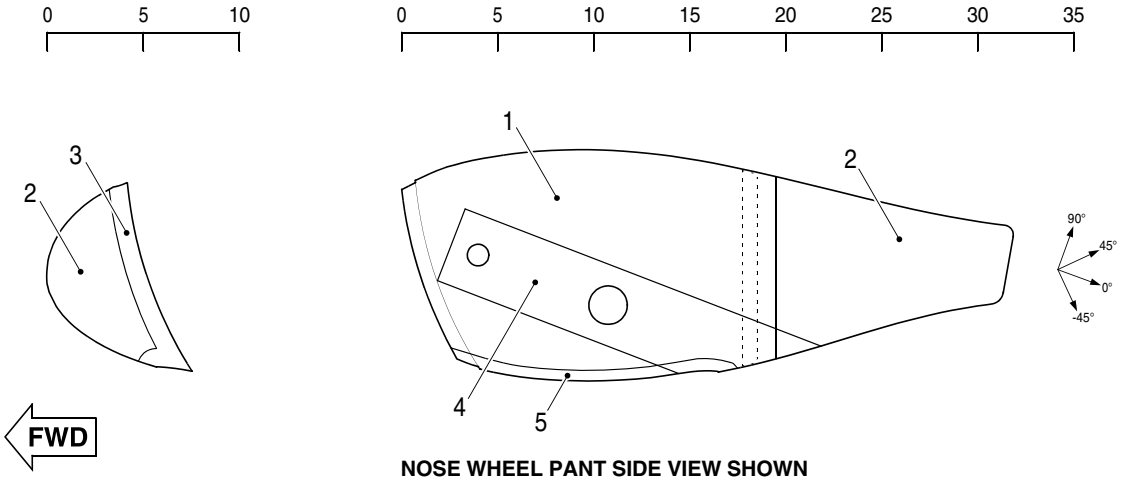
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
4	-	-	-	10	1.0 to 1.0
5	-	-	-	5	1.0 to 1.0

SR20_MM51_3129A

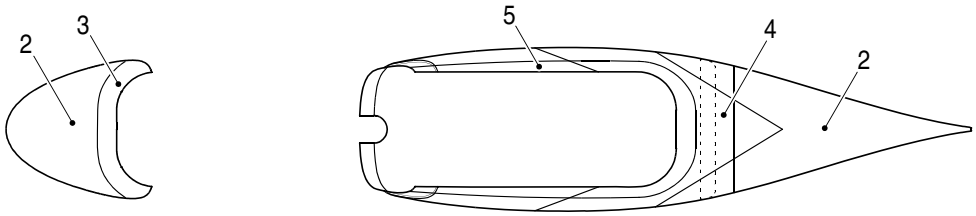
Figure 51-002
Airframe Zone Diagrams - Serials 1886 thru 2064 (23 of 29)



NOSE GEAR FAIRING SIDE VIEW SHOWN



NOSE WHEEL PANT SIDE VIEW SHOWN



NOSE WHEEL PANT BOTTOM VIEW SHOWN

LEGEND

Bond Line

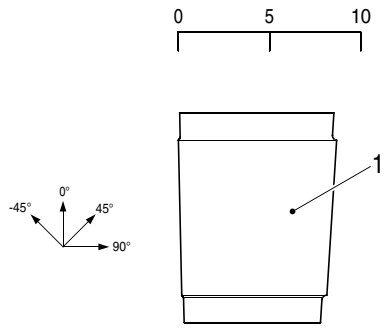
Serials 2065 & subs.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	2	1.0 to 1.0
3	-	-	-	4	1.0 to 1.0

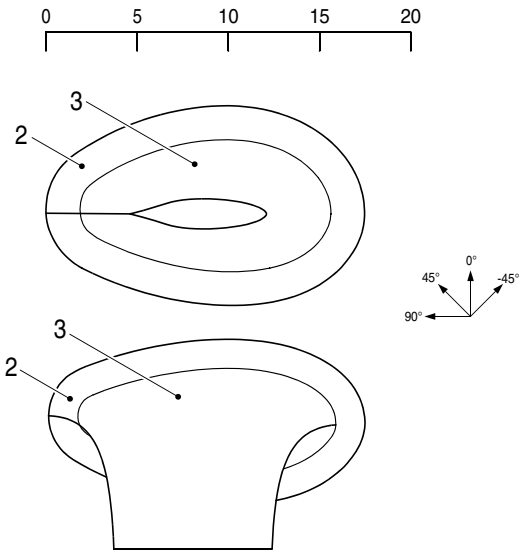
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
4	-	-	-	10	1.0 to 1.0
5	-	-	-	5	1.0 to 1.0

SR20_MM51_3374

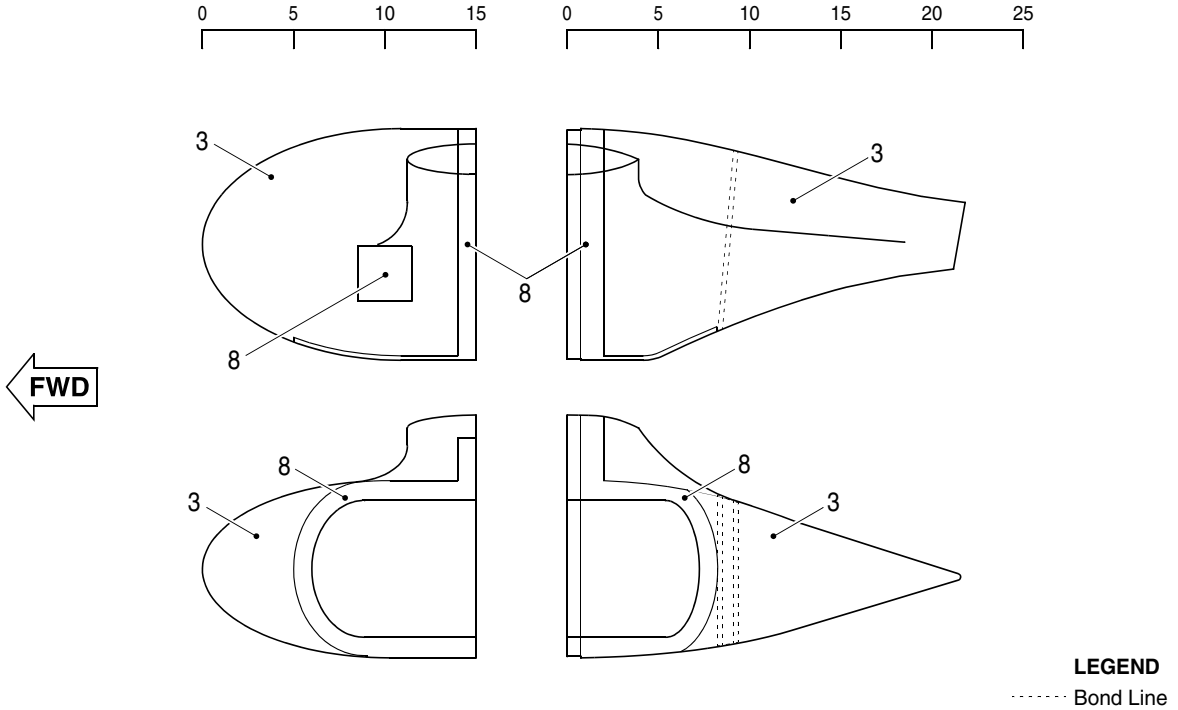
Figure 51-002
Airframe Zone Diagrams - Serials 2065 & subs (24 of 29)



MAIN GEAR STRUT FAIRING LEFT SIDE SHOWN
MAIN GEAR STRUT FAIRING RIGHT SIDE OPPOSITE



MAIN GEAR UPPER STRUT FAIRING LEFT SIDE SHOWN
MAIN GEAR UPPER STRUT FAIRING RIGHT SIDE OPPOSITE



MAIN WHEEL PANT LEFT SIDE SHOWN
MAIN WHEEL PANT RIGHT SIDE OPPOSITE
Serials 1005 thru 1137.

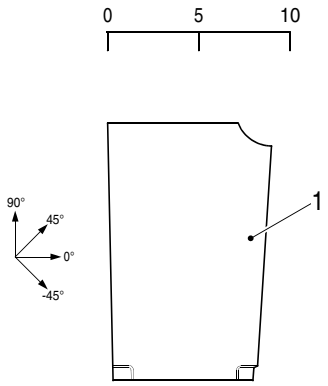
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	4	1.0 to 1.0
2	-	-	-	5	1.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
3	-	-	-	3	1.0 to 1.0
4	-	-	-	8	1.0 to 1.0

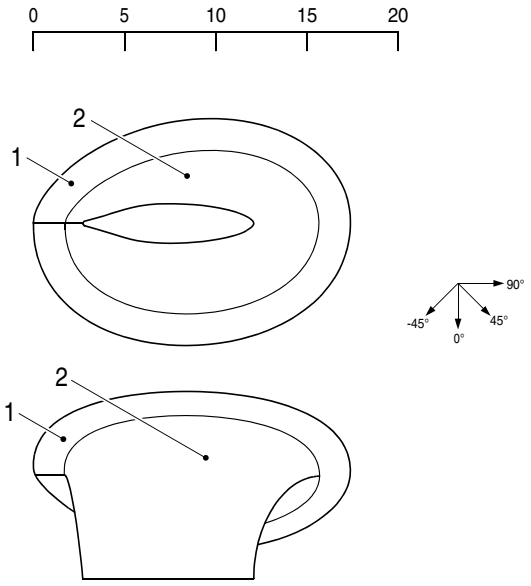
SR20_MM51_3130

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1137 (25 of 29)

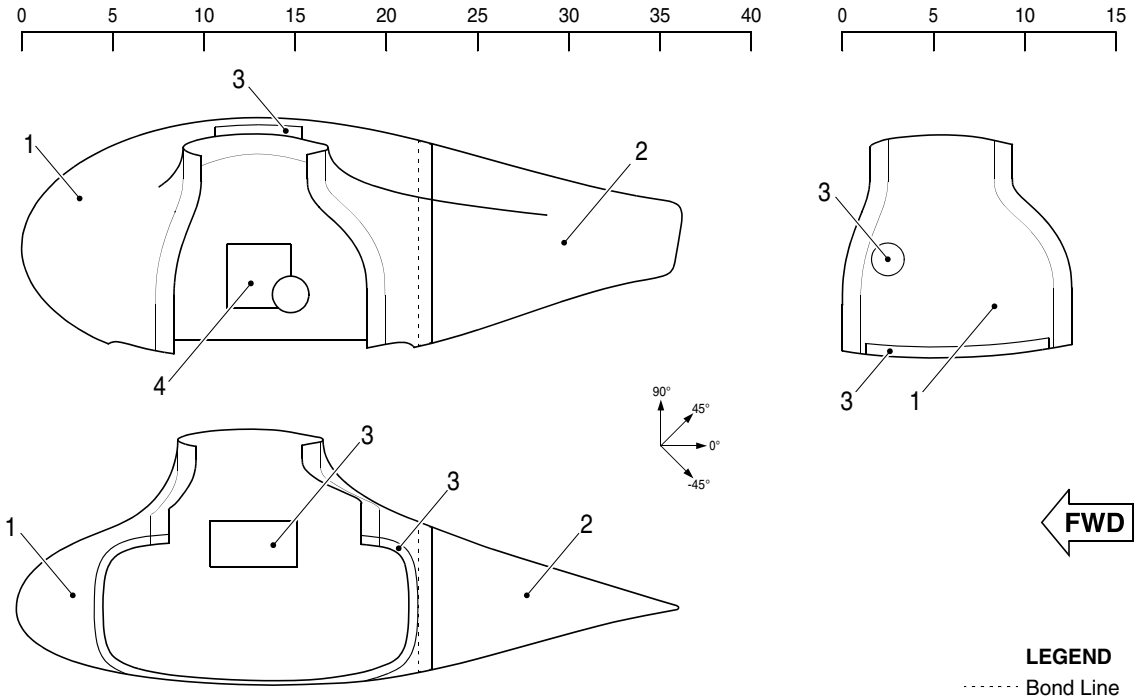
EFFECTIVITY:
Serials 1005 thru 1137



MAIN GEAR STRUT FAIRING LEFT SIDE SHOWN
MAIN GEAR STRUT FAIRING RIGHT SIDE OPPOSITE



MAIN GEAR UPPER STRUT FAIRING LEFT SIDE SHOWN
MAIN GEAR UPPER STRUT FAIRING RIGHT SIDE OPPOSITE



LEGEND
Bond Line

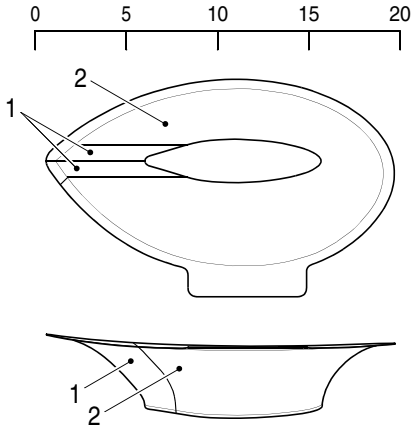
MAIN WHEEL PANT LEFT SIDE SHOWN
MAIN WHEEL PANT RIGHT SIDE OPPOSITE
Serials 1138 thru 1877, 1879 thru 1885.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	2	1.0 to 1.0

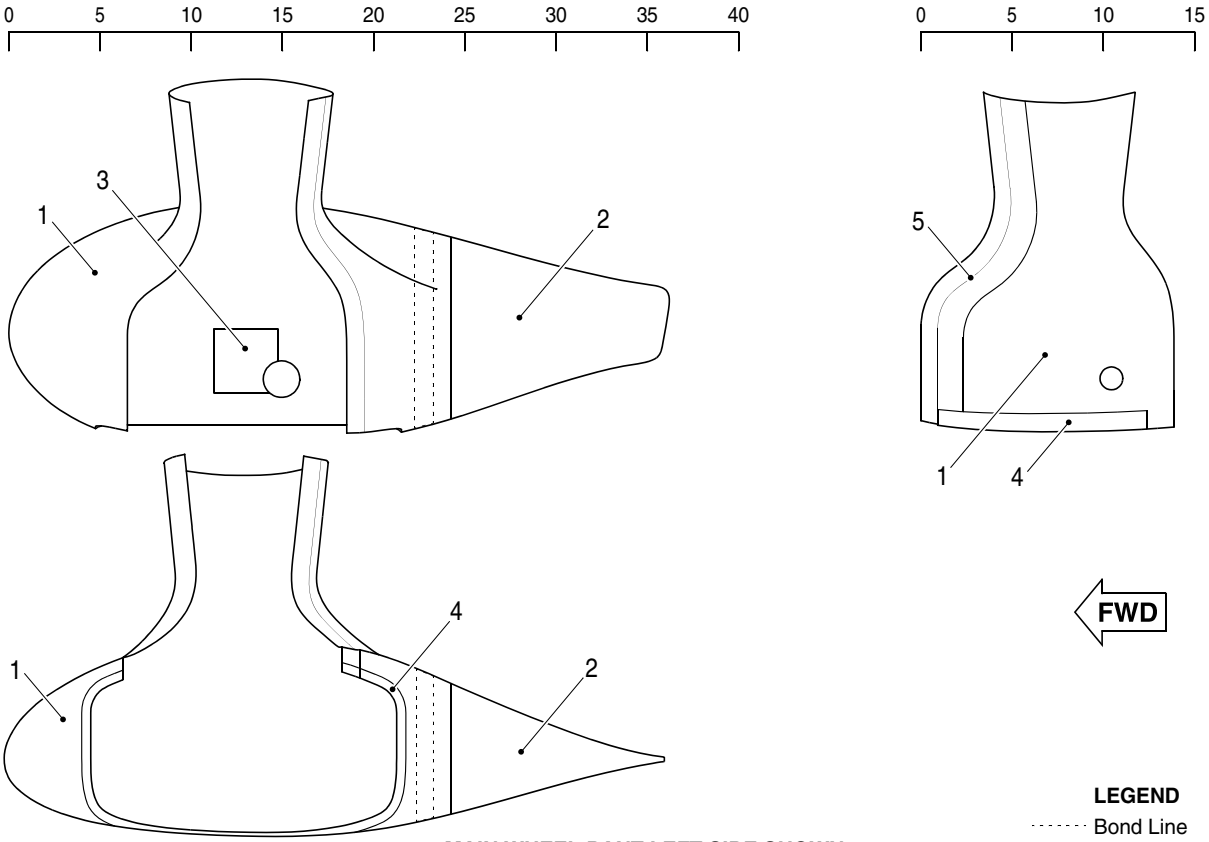
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
3	-	-	-	5	1.0 to 1.0
4	-	-	-	8	1.0 to 1.0

SR20_MM51_3131

Figure 51-002
Airframe Zone Diagrams - Serials 1138 thru 1885 (26 of 29)



MAIN GEAR UPPER STRUT FAIRING LEFT SIDE SHOWN
MAIN GEAR UPPER STRUT FAIRING RIGHT SIDE OPPOSITE



MAIN WHEEL PANT LEFT SIDE SHOWN
MAIN WHEEL PANT RIGHT SIDE OPPOSITE
Serials 1878, 1886 & subs.

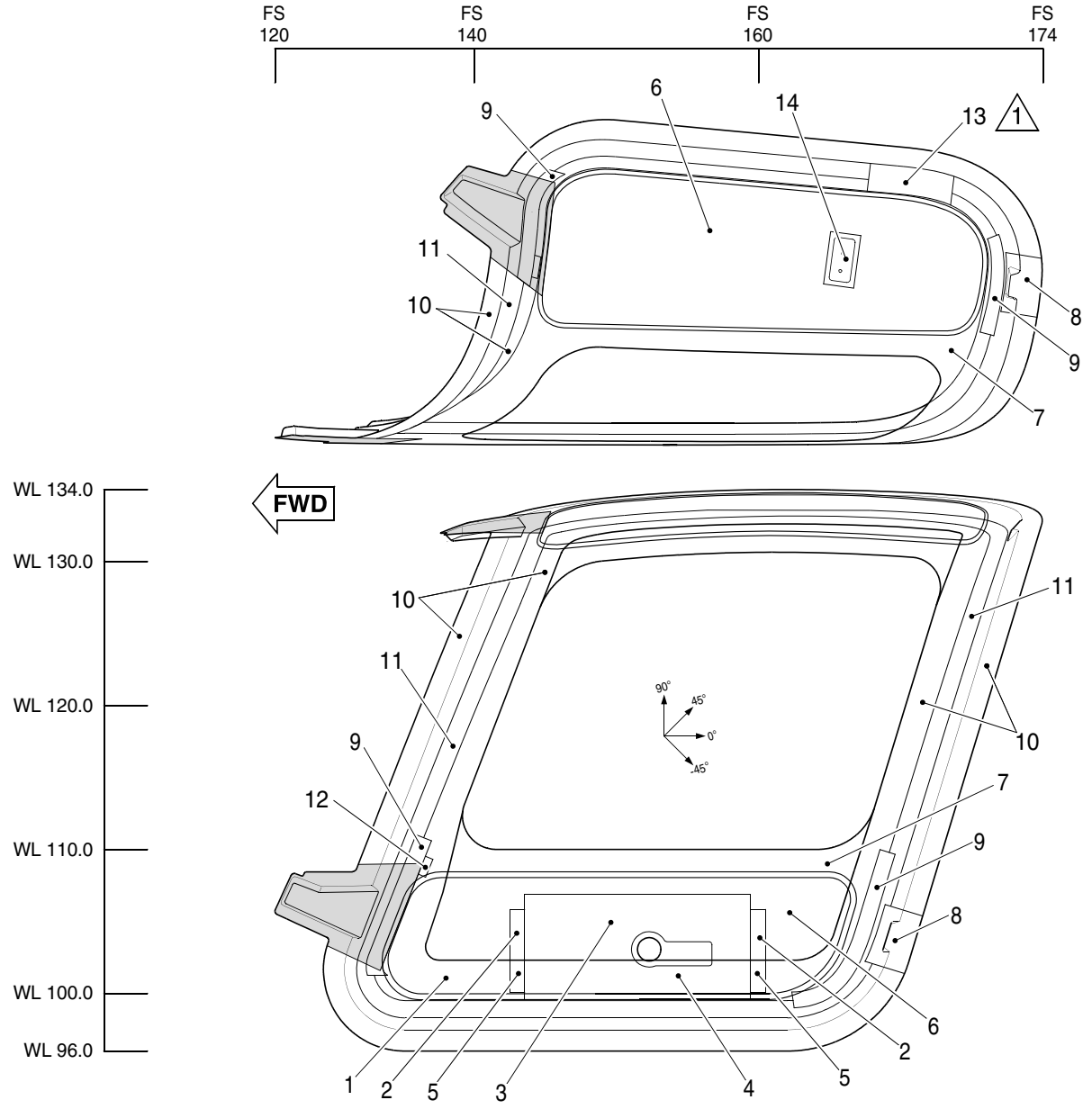
Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	3	1.0 to 1.0
2	-	-	-	2	1.0 to 1.0
3	-	-	-	8	1.0 to 1.0

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
4	-	-	-	5	1.0 to 1.0
5	-	-	-	4	1.0 to 1.0

SR20_MM51_3132

Figure 51-002
Airframe Zone Diagrams - Serials 1886 & subs (27 of 29)

EFFECTIVITY:
Serials 1886 & subs



NOTE

1 *Serials 1307 thru 1422 only.*

CABIN DOOR OUTER SKIN

Serials 1005 thru 1422.

LEGEND

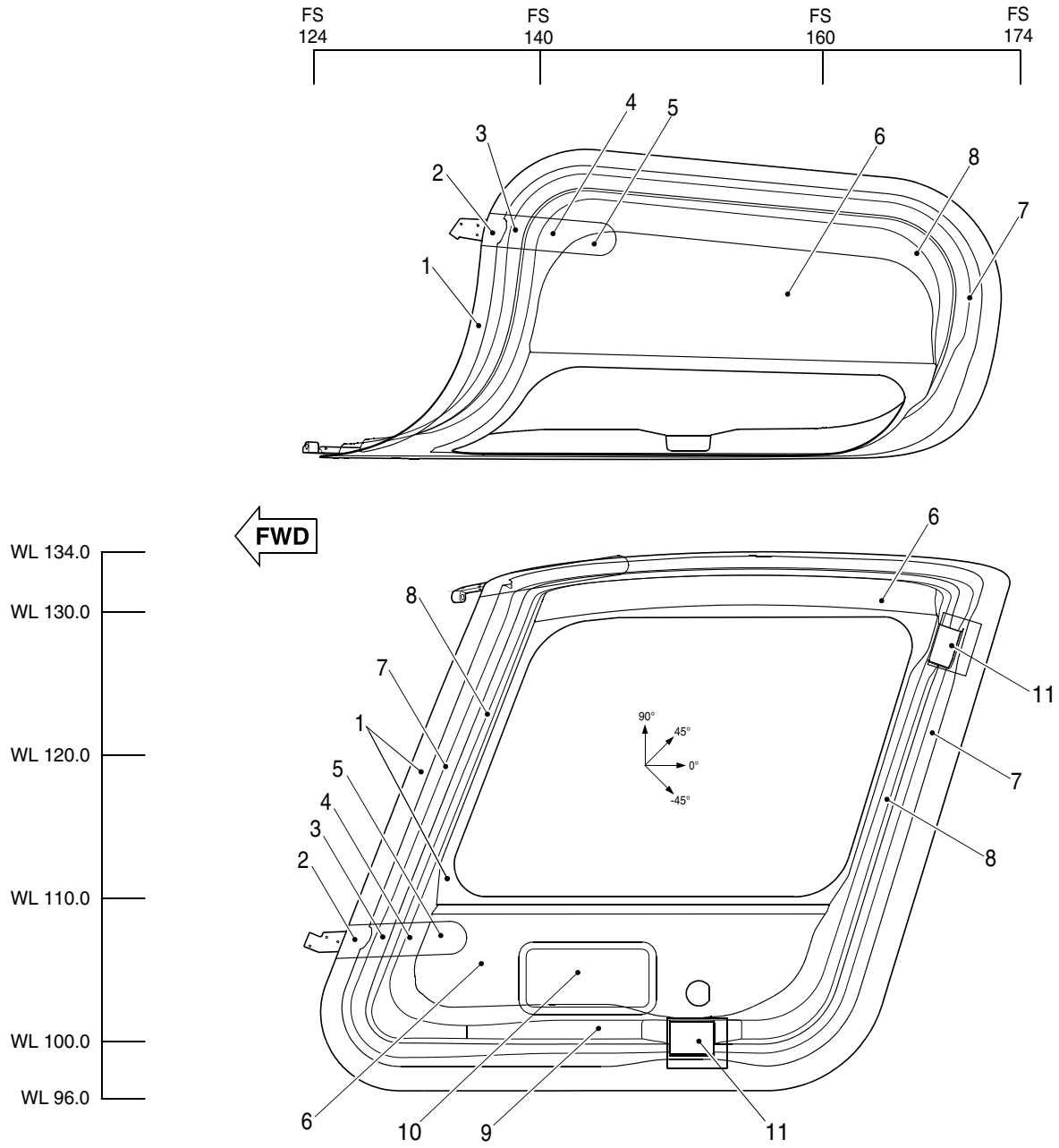
No Repair Area

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	2	0.250 (6.350)	4	-
2	3	0.250 (6.350)	2	-
3	3	0.250 (6.350)	3	-
4	3	0.250 (6.350)	6	-
5	3	0.250 (6.350)	4	-
6	2	0.250 (6.350)	2	-
7	-	-	-	4

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
8	-	-	-	7
9	-	-	-	15
10	-	-	-	6
11	-	-	-	13
12	-	-	-	8
13	-	-	-	9
14	2	0.250 (6.350)	3	-

SR20_MM51_2126

Figure 51-002
Airframe Zone Diagrams - Serials 1005 thru 1422 (28 of 29)



CABIN DOOR

Serials 1423 & subs.

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
1	-	-	-	6
2	-	-	-	8
3	5	0.77 (19.56)	3	-
4	5	1.15 (29.21)	3	-
5	5	0.25 (6.35)	3	-
6	3	0.25 (6.35)	3	-

Reference Number	Outer Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity
7	3	0.77 (19.56)	3	-
8	3	1.15 (29.21)	3	-
9	3	1.95 (49.53)	3	-
10	3	0.25 (6.35)	5	-
11	3	1.15 (29.21)	4	-

SR20_MM51_2133

Figure 51-002
Airframe Zone Diagrams - Serials 1423 & subs (29 of 29)

EFFECTIVITY:
Serials 1423 & subs

F. Definition of Terms

A	
Abrasion	Wearing away a material surface by friction. Particles become detached by a combined cutting, shearing and tearing action.
Accelerator	A material which is added to a mixture of resin and catalyst to speed up the curing reaction.
Adhesion	The state in which two surfaces are held together by interfacial forces consisting of chemical, mechanical forces or both.
Adhesive	A substance capable of holding materials together by adhesion.
Advanced Composite	Composite materials in which relatively high strength and/or stiffness fibers are embedded in homogeneous matrix materials.
Air Bubble Void	Air entrapment within and between the plies of the laminate.
Ambient Temperature	Environment temperature surrounding the object under consideration. Usually refers to room temperature.
Amine Blush	A wax-like film on cured epoxy surfaces. It is a by-product of the epoxy curing process and may begin to form during the initial cure phase.
B	
Backing Plate	A plate used behind a hole in the structure when making a composite repair. The backing plate is considered a tool and is not considered to add any strength to the repair.
Bag Side	The side of a vacuum bagged part opposite the tool surface.
Bleeder Cloth	A material, usually treated or untreated fiberglass cloth, used in the manufacture of composite parts to absorb excess resin.The bleeder cloth is separated from the part after cure and is not part of the composite.
Bond Gap	The attachment of an interface between an adhesive and an adherend.
Bond Joint	The structure between two parts, that connects the two parts together. A standard bond joint includes one layer of adhesive joining the two parts. A shimmed bond joint includes two layers of adhesive separated by a solid composite shim.
Bond Length	The length of area overlapping bond (usually much longer than the width).
Bond Void	An area in a bondline void of adhesive.
Bond Width	The overlapping width of the components being joined.
Bonding	See “Secondary Bonding”.
Bondline	The path of the bond. The bondline is not necessarily straight, and may fork into different directions when two complexly shaped parts are bonded together.
Bondline Thickness	The thickness of the adhesive between two bonded parts. The bond thickness may be larger than the bond gap due to the hydraulic forces of the adhesive holding the parts farther apart. Bondline thickness is synonymous with bond thickness and adhesive thickness.

Bondline Thickness, Total	The sum of the thicknesses of the bondlines in a shimmed bond joint. A shim installed in a bond joint will result in two bondlines of thickness, X and Y. The total bondline thickness is the sum of X and Y. Total bondline thickness is synonymous with total adhesive thickness.
Breather Cloth	A loosely woven material such as fiberglass fabric which is placed between the composite layup and the vacuum bag to provide a continuous vacuum path. Breathers are generally separated from resin by a barrier such as a layer of FEP (Fluorinated Ethylene Propylene) film.
Bridging	A condition where one or more plies in a composite layup span a radius, step or chamfer without full contact resulting in a local void or a zone of un-reinforced resin.
Butt Splice	A joint formed by fitting segments end-to-end or side-by-side with no overlap required. Commonly used where thickness is critical and/or where reinforcement continuity is not required.
C	
Cap	The flange of a spar, typically at right angles to the web. Usually used as the faying surface for a secondary bond to other structure, such as a wing skin.
Co-bonding	The act of curing a composite laminate and simultaneously bonding it to another prepared surface.
Co-Curing	The act of curing and bonding multiple composite details in the same composite assembly during the same cure cycle.
Composite Material	A complex material in which two or more distinct structurally complementary substances are used together to produce structural or functional properties not present in the individual components. No chemical mixing occurs in the individual components. Properties may be highly directional, being dependant on the distribution and orientation of substances within the material.
Core	The central member, usually foam or honeycomb, of a sandwich construction to which the laminate faces of the sandwich are attached or bonded.
Core Crush	A permanent collapse, distortion, or compression of the core in a core sandwich composite.
Core Depression	A localized indentation or gouge in the core of a core sandwich composite.
Core Separation	A partial or complete breaking of core node bonds which are found in honeycomb core material.
Core Splicing	The joining of two core segments by bonding, pegging or crushing one segment into another.
Cosmetic Repair	A score or minor abrasion through the resin coat.
Crack (Composite)	1) A break, fracture, or split of a part, resulting in local resin or matrix damage and possible fiber tearing. 2) A fracture in a previously sound bond, characterized by separation of material. See also “Disbond”.
Crazing	Minute cracks which appear on the surface of a laminate at stress concentrations or resin rich areas.
Cross Ply	Filamentary laminate and sandwich face sheets which are not uniaxial - oriented at 90° with respect to uniaxial direction.

Cure	To permanently change the properties of a resin system by controlled chemical reaction. This may require applied heat and pressure over a length of time.
Cure Cycle	The variation of temperature and pressure over a period of time used to cure a composite detail.
D	
Deformation	Any change of form or shape produced in a body by a stress or force.
Degradation	A deleterious change in the chemical structure of a plastic.
Delamination	Separation of the core and laminate face sheets or separation between plies of a laminate.
Disbond	An area within a bonded interface between two parts in which an adhesion failure or separation has occurred.
Discoloration	Local areas of lighter, darker, or otherwise differently appearing laminate. Changes in opacity can appear as discoloration also.
Doubler Ply	A local reinforcement ply in laminate structure.
Drape	Ability of cloth to conform to irregular shape.
Dry Area(s)	Area(s) of incomplete surface film where the reinforcement has not been sufficiently wetted with resin. Also called "surface porosity". This condition may not be limited to the surface of a part.
E	
Elevated Temperature	Material temperature of 180° F when loaded into a test fixture.
EMM	Expanded Metal Mesh - A metallic mesh applied near one surface of the laminate to direct current caused by lightning strike in flight.
Epoxy	A flexible thermosetting resin made by polymerization of an epoxide.
F	
Faying Surface	The surface of adherends in contact with the adhesive and joined, or about to be joined.
Fiber Damage	Local tearing or breakage of several individual filaments of reinforcing fibers within a yarn or roving group.
Fiber Direction	The orientation or alignment of the longitudinal axis of the fiber with respect to a stated reference axis.
Fiberglass	Fibrous form of glass used in making filaments, woven fabric, yarns, etc.
Fiberglass Cloth	Woven fiberglass material.
Filament	A single continuous homogeneous strand of material (fiber), characterized by extreme length, usually limited by spool weight.
Fill	Yarn oriented at right angles to the warp yarns in a woven fabric. Direction perpendicular to the lengthwise (continuous) dimension in a woven fabric.

Filler	A relatively inert substance added to a material to alter its physical, mechanical, thermal, electrical, and other properties. Fillers are also used to lower cost and density.
Finish	A treatment applied to the fibers to improve bonding between the fiber surface and matrix resin.
G	
Gelling Time	The time taken for a resin to set to a non-fluid gel state.
Glass Cloth	A type of fabric made from fine spun glass filaments which are woven into a strong, tough fabric. These fabrics are used to construct, reinforce, and repair composite structures.
Glass Fiber	Filaments of fine spun glass.
Glass/Resin Ratio	Proportions of glass reinforcement and resin by volume or more usually by weight. Used as an indicator of quality and physical properties.
H	
Hand Lay-Up	An open mold process in which resin and fiber reinforcements are applied to the mold and the composite is built up by hand.
Handling Life	The period of time in which the material still maintains physical and chemical properties within the specified limits.
Hardener	See “Curing Agent”.
Hybrid	A composite comprised of two or more composite material systems, such as graphite/epoxy with glass/epoxy.
I	
Impact Damage	Separation of material through the thickness or visible cracks on surface caused by impact with another object.
Inclusion	1) Unintentional placement in a composite layup of foreign material which are visible to the unaided eye, such as particles, films, etc. 2) Particles or pieces of substance in a bond joint that are foreign to its composition.
J	
Joint	The location at which two adherends are held together with a layer of adhesive. The general area of contact for a bonded joint.
K	
L	
Lamina	Single layer of unidirectional or woven fibers embedded in a resin matrix.
Laminate	Product made by bonding together two or more layers (laminae) of material or materials. Usually the matrix acts as the bonding material with the curing process normally effected through the use of a catalyst, pressure and/or heat (although not necessarily in combination).
Laminate Orientation	The configuration of a composite laminate with regard to the direction of each ply relative to a specified direction, and the exact sequence of individual plies.

Lamination	The process of preparing a laminate.
Lap	A joint formed by the overlap of a ply or laminate over another. Usually characterized by a “lap distance” or “ply drop off distance”. The lap length is the distance available for the overlapping repair or reinforcing ply to develop strength.
Lap Joint	A joint made by placing one adherend partly over another and bonding the overlapped portions together.
Lay-Up	1) A fabrication process where successive layers of material are placed on a tool to fabricate a laminate or core sandwich. 2) The uncured part itself. 3) The composition of a laminate expressed as the percentage of fibers in each direction. 4) The stacking sequence.
M	
Matrix	The homogeneous material in which the fibers of a composite are embedded.
Microcracking	Microscopic cracks in a matrix.
N	
O	
Overlap Splice	A joint formed by overlapping one segment with the next. Used where reinforcement continuity is required. May also be formed by a third piece that overlaps both segments to be joined. Implied by the term “splice” in reference to the lay-up process.
P	
Peel Ply	A special ply used as the outer layer which is peeled off after cure to provide a smooth contaminate free repair surface.
Pin Holes	Small holes in a cured part surface which are unfilled by matrix material.
Pitting	Small crater in the surfaces of a part, with its width approximately of the same order of magnitude as its depth. See also "Pin Holes".
Plies	Layers of material (glass cloth or glass fiber) which are laminated together.
Ply	A single layer of tape, fabric or filaments.
Ply Wrinkle	A condition where one or more plies in a cured composite part are ridged, depressed or folded.
Polymer	An organic material composed of long molecular chains consisting of repeating chemical units.
Porosity	A cluster of small voids within an otherwise solid material, usually expressed as a volumetric percentage. The presence of numerous visible pin holes, pits, or small voids. Can be localized or wide spread.
Pot Life	The length of time that a catalyzed thermosetting resin system retains a viscosity low enough to be used in processing.

Q	
R	
Release Film	An impermeable layer of film that does not bond to the resin being cured. Both sides of the release film are adhesive free.
Release Tape	A plastic film with adhesive backing on one side. Release tape is used during backing plate manufacture to allow the backing plate to release from the lay-up surface without damage.
Resin	The matrix material in fiber/resin composites, i.e. epoxy resin.
Resin Content	The amount of resin matrix in a composite. The resin content may be expressed as a weight percentage or as a volume percentage.
Resin Infusion	A laminate manufacturing process where by resin is drawn through the reinforcing fibres using vacuum, most usually under a flexible vacuum bag.
Resin Pocket	An apparent accumulation of excess resin in a small, localized area.
Resin Richness	An area of excess resin, usually occurs at radii, steps or transition points on a composite. A local area of the laminate that exceeds nominal resin content. It is usually characterized by excessive laminate thickness and sometimes appears to have some discoloration.
Resin Starved	An area of resin deficiency resulting in uncovered fibers, surface porosity or pin holes. See also “Dry Area(s)”.
Retarder	A material which slows down the rate of cure of a resin (opposite to accelerator).
S	
Sandwich Construction	A bonded structure in which a core of material such as rigid foam is bonded between two laminate face sheets of metal or fiberglass cloth. Sandwich constructed materials are used where high strength and light weight are required.
Scarf Joint	A joint made by cutting away angular segments of a part and then either bonding a second part with similar angular cuts or wet laying material with staggered widths.
Scratch	Shallow mark, groove, or channel on the laminate surface. Features are not considered scratches if intentionally molded into the part (e.g. scribe lines).
Secondary Bond	The joining together, by the process of adhesive bonding, of two or more components, during which the only chemical or thermal reaction occurring is the curing of the adhesive itself. The term secondary implies that this is a secondary process, and occurs after the laminates have been cured. The term secondary DOES NOT imply that the joint is non-structural or unimportant. The most common application of the secondary bond are primary structural joints.
Selvage Edge	The edge on either side of a woven fabric, finished so as to prevent raveling.
Shelf Life or Storage Life	Length of time a material can be stored under specified environmental conditions and continue to meet applicable specification requirements and/or remain suitable for its intended function.
Stiffener	Bonded frames to support a panel and reduce panel dimensions

Storage Life	The time in storage over which the material maintains its mechanical properties as defined by the specification.
Symmetrical Laminate	A composite laminate in which the ply orientation is symmetrical about the laminate mid-plane, i.e. (0,+45,-45,-45,+45,0).
T	
Template	A pattern made of any suitable material to permit the layout of parts with a minimum expenditure of time and effort.
Tool Side	The surface of the part which is in contact with the tool during fabrication. See also “Inner Mold Line” and “Outer Mold Line”.
Tow	A bundle of fibers. Yarns are made from one or more “tows”.
U	
Unidirectional Cloth	A cloth with high strength in one direction (either weft or warp), as compared with the other.
V	
Vacuum Bag	A flexible encapsulating membrane over a composite layup which is used for compacting the composite under vacuum pressure prior to cure and providing pressure during cure.
Void	1) An empty space within the resin-fiber system. Voids are due to local resin starvation and ply bridging. 2) Gaseous pockets that have been trapped within the adhesive and between the adherends.
W	
Whitening	The separation of fabric from resin. White color occurs due to the way light refracts in the composite laminate. Indicates the onset of fatigue failure. The size of the initial failure spots corresponds to the weave crimp dimensions.
Warp	Lengthwise direction in woven fabric.
Water Absorption	The increase in weight of a test specimen of defined dimensions after immersion in water for a specified time at a specified temperature.
Weave	Interlacing of a series of yarns in 2 or more directions.
Web	A sheet or plate section connecting relatively thicker sections (flanges, caps, etc.) of a structural element.
Weft	The transverse threads or fibres in a woven fabric. Those fibres running perpendicular to the warp.
Wet Lay-up	A method of making a reinforced product by applying the resin system as a liquid when the reinforcement is put in place.
Wet-Lay	See "Wet Lay-up".
Woven Roving	The weaving together of rovings which are non-woven, non-twisted strands of glass filaments laid together in ‘parallel’.
Wrinkle	An imperfection in the laminate in which one or more plies has the appearance of a wave, wrinkle, or crease.

X	
Y	
Z	

DAMAGE ASSESSMENT AND REPORTING

1. DESCRIPTION

This section discusses the procedures required to assess and report component or structural damage so that a suitable repair procedure may be performed.

The task of repair begins when it has been determined that the structure has been damaged and that the damage is sufficient to require the structure to be repaired. The existence of damage may be obvious - lamination penetration or component disbonding. Conversely, proper identification and classification may be difficult, due to the elastic-brittle nature of composite laminate materials. Impact is the most common cause of damage and will usually leave visual evidence. If the exterior surface is damaged, always assume that the underlying structure may also be damaged.

Non-destructive inspection is an essential component in both assessing the original damage and inspecting the final repair. Examination of the structure is important to determine the extent of any damage that might have occurred.

2. MAINTENANCE PRACTICES

A. Damage Assessment and Reporting Procedure

When reporting damage to Cirrus Design, follow the established reporting procedure described below. This ensures that airplane down time is kept to a minimum and Cirrus Design has all the information necessary to provide instructions for a suitable repair.

(1) Reporting Procedure

(a) Inspect area to determine extent and degree of damage. (Refer to 51-10)

Note: In the event of a wing tip or outboard wing strike, it is recommended that a detailed inspection be accomplished of the aft wing-attach fitting and associated support-structure at fuselage station FS190 to include: aft torque-box fitting, aft torque-box spar, aft wing attach fitting, fuselage skin, the aft passenger-floor, and aft passenger-seat structure.

(b) Classify damage type. (Refer to 51-10)

(c) Classify repair type. (Refer to 51-10)

(d) Following the Damage Assessment and Reporting Flowchart, determine if it is necessary to contact Cirrus Design Customer Service for disposition. (See Figure 51-101)

1 If a Major Repair not covered in AMM or a Restricted Repair: Collect information for damage report as outlined in Reporting procedure of this section. (Refer to 51-10)

2 If a Cosmetic Repair or a Major Repair covered in AMM: Repair per specified procedures in AMM.

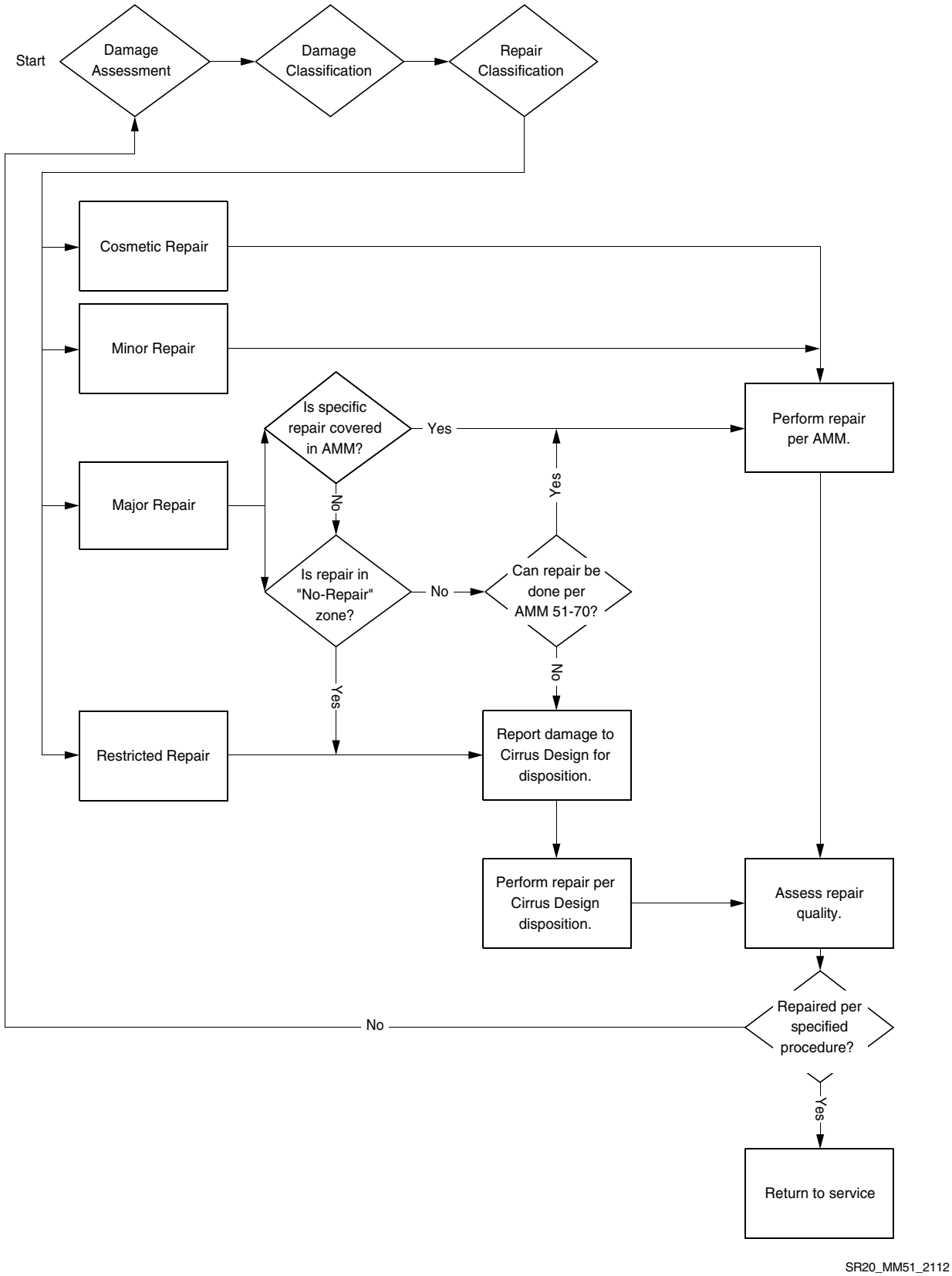


Figure 51-101
Damage Assessment and Reporting FlowChart

B. Determining Extent of Damage

Currently, there are two methods of non-destructive inspection techniques that may be used to determine the existence and extent of composite damage; Visual Inspection and Coin Tap Test. More advanced inspection techniques such as mechanical impedance, ultrasonic, and IR thermography may be used in specific repairs under the guidance of Cirrus Design. All suspect areas, including obvious damage, should be inspected with visual and coin tap techniques.

(1) Visual Inspection

Although only the outer surface layers can be directly assessed, the importance of visual inspection should not be underestimated. Surface imperfections originating from impact damage (scuffing, chipping, surface cracking, crazing), near surface delaminations (bulging) and severe disbonding can all be identified using this technique. On exposed laminate, damage to laminate will appear white. If the backside of a pure laminate area is accessible, the translucent nature of fiberglass can be used to advantage and internal features and delaminations can be seen as a dark or gray area when backlit.

While the true extent of any internal damage may not be completely assessed, visual inspection targets an area for further non-destructive inspection techniques. Visual inspection can be enhanced by the use of high intensity light, endoscopes, fibrescopes etc., and augmented with digital photography for permanent record. In most cases, the removal of the surface coat is required when the damage has occurred beneath the surface or the suspect area is difficult to access. To ascertain the quality of a repair, a visual inspection should be performed after any repair. Use the following as guidelines when performing a visual inspection:

(a) To enhance familiarization with fuselage construction, examine the Airframe Zone Diagrams before performing tap test. (Refer to 51-00)

(b) If necessary, remove surface coat around damaged area. (Refer to 51-20)

(c) Examine component tactually by running hands over surface of suspect repair area to feel for surface imperfections and anomalies.

(d) Paint is generally more brittle than the composite and will crack before the laminate is damaged.

(e) Cracked paint does not indicate the extent of the damage, only that damage has occurred.

(f) While dimple and dent damage is similar in appearance to hail damage on a metal surface, delamination and disbonding is more difficult to detect. It is sometimes possible to feel this type of damage by pressing on the area. A dis-bond or delamination may feel soft and movement between the separated layers may be detected.

(g) If possible, use a back light to reveal internal defects and delaminations.

(h) Examine exposed laminate for stress whitening.

(i) If possible, the backside of the suspected area should be examined. Use of a borescope is recommended to assess internal damage. The interior surfaces are usually not painted and damage to glass-fabric structures will show up as a white area.

(j) Use a permanent marker to mark suspect areas found tactually or with slight visual imperfections to facilitate coin tap test.

(2) Coin Tap Test

Performed by an experienced technician, the coin tap test is an accurate method for determining laminate damage. The surface to be tested is tapped with a small metal object, and the acoustic response gives information on the state of the composite structure. A clear, sharp, ringing sound is indicative of a well-bonded solid structure, while a dull sound or thud indicates a void or delamination. The audible variation is then mapped out on the surface of structure with a permanent marker. It is important to note that the coin tap test is subjective and requires that the technician have good hearing and understands the underlying composite structure. To ascertain the quality of a repair, a coin tap test should be performed after any repair. Use the following as guidelines when performing a coin tap test:

(a) To enhance familiarization with fuselage construction, examine the Airframe Zone Diagrams before performing tap test. (Refer to 51-00)

(b) Prior to performing tap test, locate an undamaged area with similar structure to that of the suspected damaged area. Use this surface as a sound reference. For example, if the suspect repair area lies directly over a rib, or is of sandwich construction, the reference area should also be this type of construction.

(c) Use a consistent tap rate and tap force.

(d) If possible, the coin tap test should be used in conjunction with a borescope examination.

C. Damage Classification

Damage to composite laminates can be divided into four classes: Cosmetic, Secondary Bond, Solid Laminate, and Sandwich Structure damage.

(1) Cosmetic

Non-structural damage which includes gouges, scratches, dents, or other defects that are confined to the surface protection of the laminate.

(2) Secondary Bond Damage (See Figure 51-102)

Secondary bond damage is defined as disbonding occurring between two pre-cured components. May be structural or non-structural in nature.

(3) Solid Laminate Damage (See Figure 51-103)

Structural or non-structural damage which extended beneath the surface protection and affected the solid laminate underneath.

(a) Non-Penetrating

1 Abrasion - The wearing away of a portion of the laminate by either natural (rain, wind, etc.) or man-made (grit blasting, collision).

2 Delamination - Single plane or multi-plane separation of adjacent layers within a multi-layer component.

3 Surface Impact or Dent - Damage area compressed beyond the structure's typical contour. Damage area edges are smooth.

4 Gouge - Extended penetration through one laminate surface. Often associated with witness marks from the impact and delamination damage. Direction of impact event can be inferred from the impact orientation. Damage area edges are rough.

(b) Penetrating

1 Fracture - Through-thickness discontinuity or separation of the laminate. Defined both as surface rupture (partial separation) of the laminate and as a complete separation due to external or internal forces.

2 Penetration - Penetration through entire laminate surface.

(4) Sandwich Structure Damage (See Figure 51-104)

Sandwich structure damage may occur to the outer laminate skin only, outer laminate skin and core, or penetration of both laminate skins and core.

(a) Laminate Only - Damage to one side of the sandwich construction with no core damage. Laminate Only damage to sandwich structure can be identified using the Solid Laminate Damage classifications. (Refer to 51-10)

(b) Laminate And Core - Damage to one side of the sandwich construction that exposes foam core. No penetration through core or opposite laminate surface.

(c) Sandwich Penetration - Damage to both sides of sandwich construction. Both laminate surfaces punctured, foam core exposed.

D. Repair Classification

There are four types of repair classifications: cosmetic, minor repair, major repair, and restricted (i.e. non-field repairable).

(1) Cosmetic

Cosmetic repairs are designed to repair localized surface defects to the original profile and to prevent moisture ingress. They are applicable only to minor defects which have no significant effect on the structural strength to sustain stress loading.

(2) Minor

14 CFR, Part 1 § 1.1 describes a minor repair as a repair other than a major repair.

(3) Major

14 CFR, Part 1 § 1.1 describes a major repair as a repair, that if improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or a repair that is not done according to accepted practices or cannot be done by elementary operations.

Major repairs are field allowable if the repair area does not fall into a no-repair zone, and the repair does not require non-standard repair procedures. Additional, the repair is field allowable if the repair is specifically covered in the AMM. All other major repairs require Cirrus Design Engineering disposition. (Refer to AMM-Intro-)

(4) Restricted

Restricted repairs are repairs that occur in no-repair zones as depicted in the Airframe Zone Diagrams. (Refer to 51-00)

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

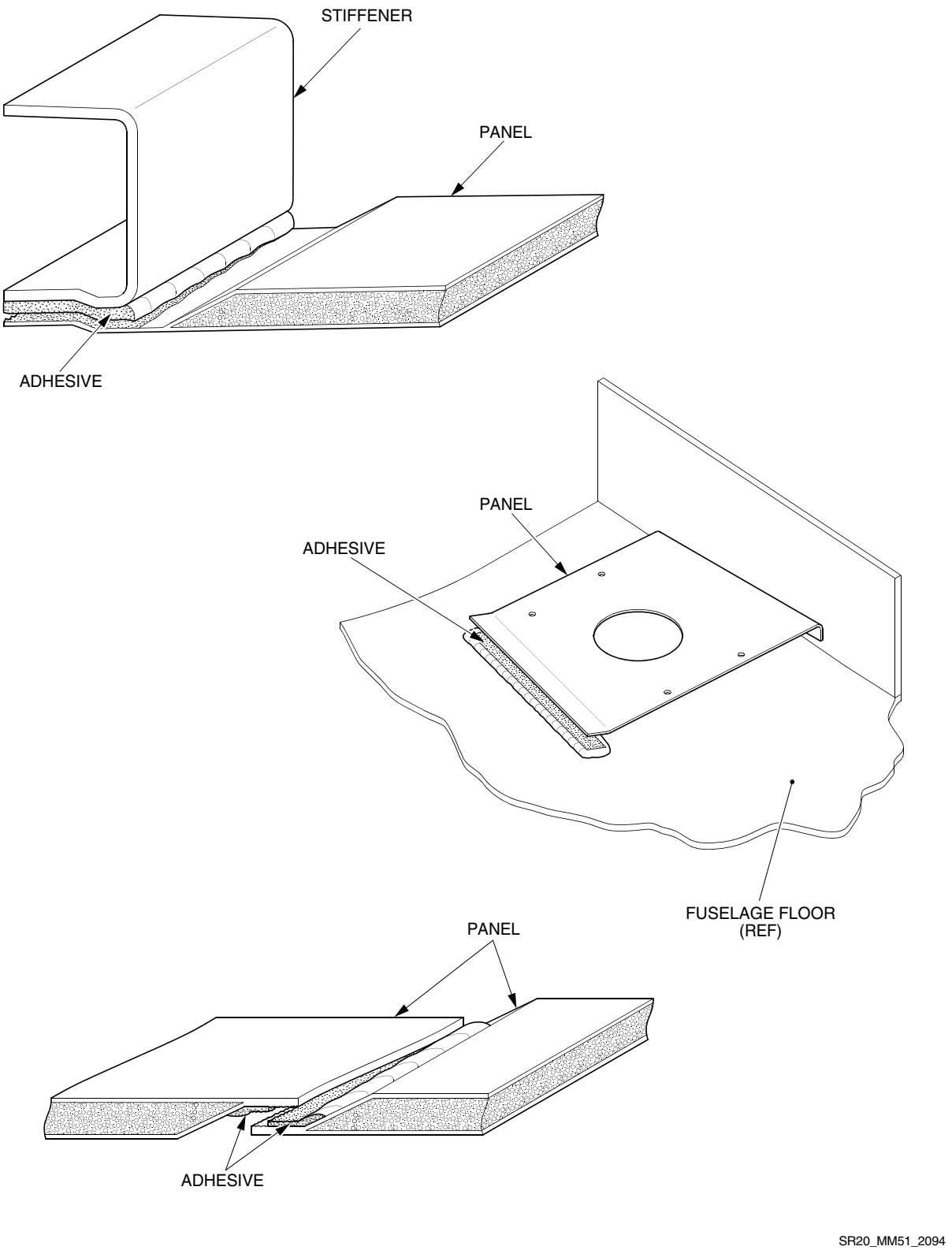


Figure 51-102
Secondary Bond Damage

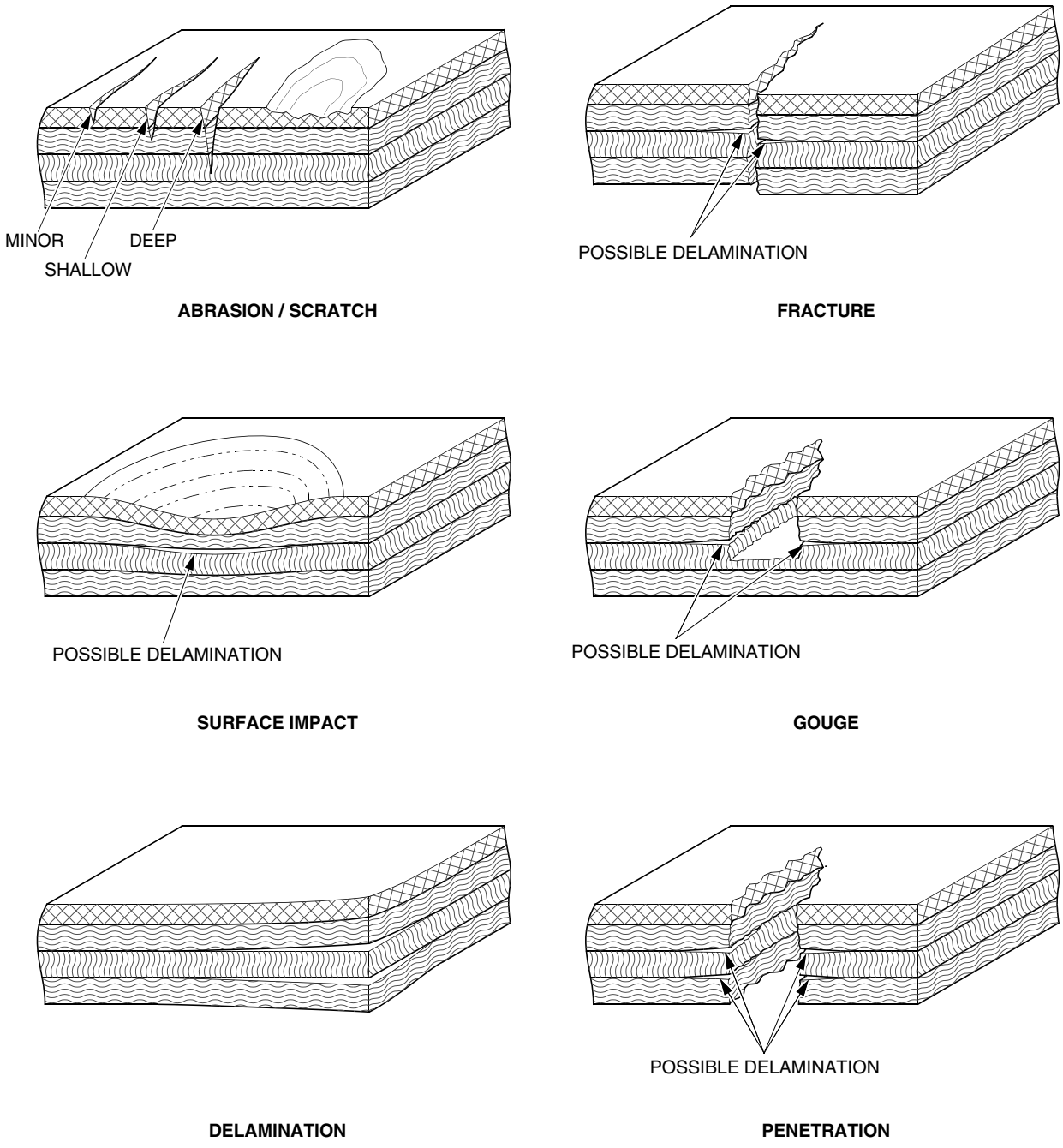
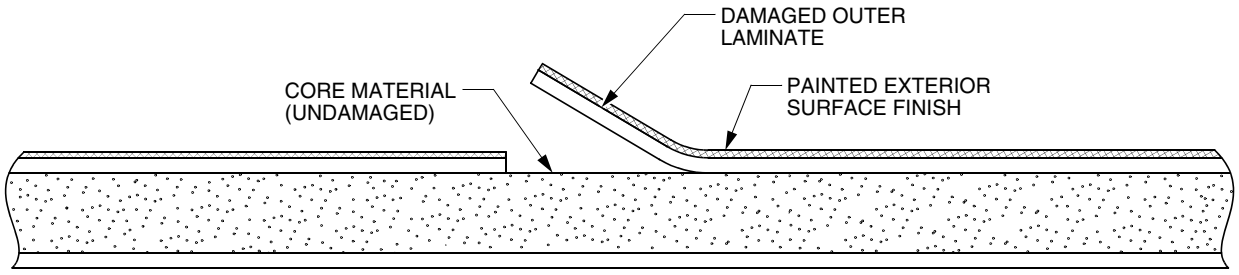
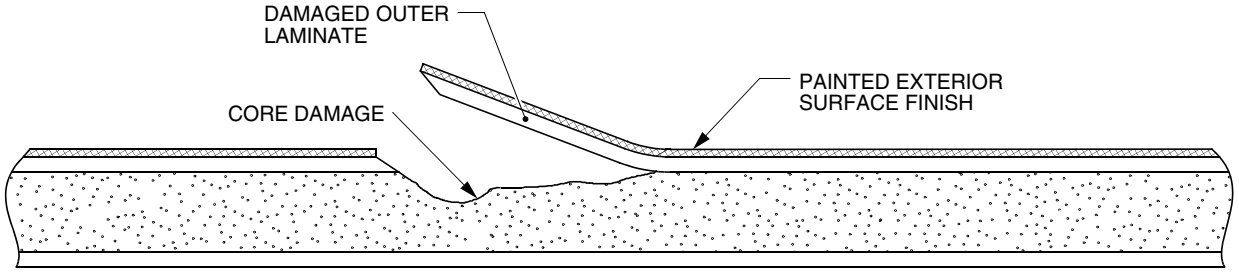


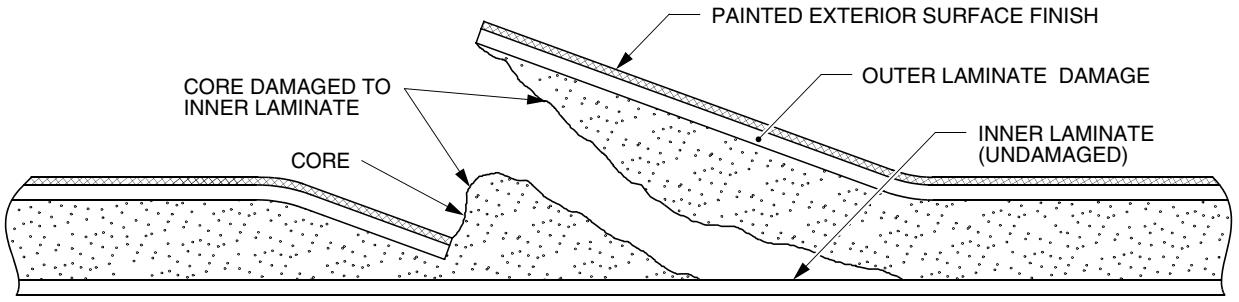
Figure 51-103
Solid Laminate Damage



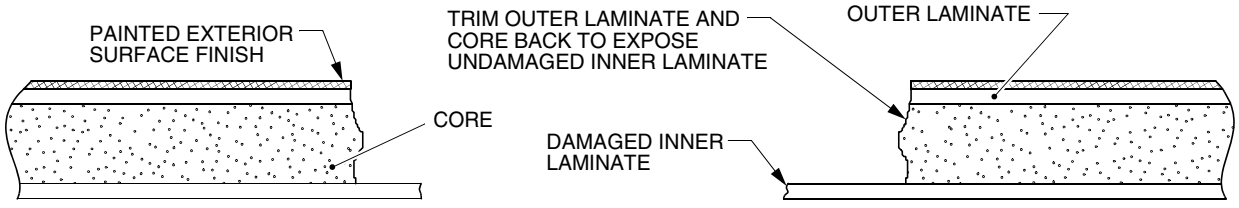
LAMINATE DAMAGE ONLY
MINOR CORE DAMAGE & OUTER LAMINATE REPAIR



MINOR CORE DAMAGE
CORE SECTION REPLACEMENT & OUTER LAMINATE REPAIR



MAJOR CORE DAMAGE



SANDWICH PENETRATION

SR20_MM51_1213

Figure 51-104
Sandwich Structure Damage

E. Reporting (See Figure 51-101)

Accurate and complete reporting is required to communicate the details of damage to the engineer responsible for developing the structural repair. Incomplete and/or inaccurate reporting of damage will result in requests to the operator for additional information and create time delays with a net result of increased aircraft down times.

These guidelines are intended to demonstrate acceptable methods of reporting damage necessary to ensure accurate documentation and avoid delays. Reporters of damage should be aware that a remote structural repair engineer can only base the remedial action on the information presented to him. Therefore, it is the responsibility of the reporter to give full details of all damage sustained.

(1) Basic Information

The following headings must be included, ideally on the front sheet, on every communication sent:

(a) Aircraft serial number
(b) Aircraft hours
(c) Aircraft's location
(d) Aircraft operator
(e) Contact name, telephone, E-mail address, and fax number
(f) Traceable document reference number (if available)
(g) Component part number and/or serial number (if applicable)
(h) Date damage occurred

(2) Documentation Content and Layout

The damage report should provide as much information as possible concerning the damage, cause, and other relevant details in a standardized format described below. Damage definitions and component names/descriptions contained within AMM Chapter 51, Section 00 - Standard Practices: Structures, will enable the author to utilize the correct terminology, thus providing a clearer understanding of the damage/parts affected. (Refer to 51-00)

The document format should use the following headings, when applicable, in the same order:

(a) Damage Classification

What is the classification of the damage - Secondary Bond, Solid Laminate, or Sandwich Structure?

(b) Damage Location

An accurate description of the damage location is absolutely necessary. Referencing the definitions and figures in AMM Chapter 06 - Dimensions And Areas (Refer to 06-00), the Airframe Zone Diagrams in AMM Chapter 51, Section 00 - Standard Practices: Structures (Refer to 51-00), or the Airframe Inspection Diagrams shown below (Refer to 51-10), include any combination of the following parameters that describe the condition(s):

1 Affected part name(s) and drawing number(s)
2 Left hand (LH) or Right hand (RH)
3 Fuselage Station (FS) - Forward and Aft location
4 Wing Station (WS) or Buttock Line (BL) - Inboard and Outboard, (-) Left and (+) Right locations
5 Waterline (WL) - Up and Down location
6 Specific dimensions from key part features/details
7 Exterior vs. interior

If there is more than one area of damage, each area should be labeled in some manner (e.g. 1, 2, 3, …; A, B, C, …; 1A, 1B, 2A, …).

When documenting a condition such as clearance between a cable and a pass-through hole, the clock number and “view from” side should be documented. This is important to communication the direction that the cable is off center.

EXAMPLE: The clearance between the aileron crossover cable and the RH, aft longeron hole is 0.040" at 9 o'clock as viewed looking inboard.

(c) Damage Extent

An accurate description of the damage extent, including the size of different types of defects in a local area is necessary. Include any combination of the following parameters that describe the condition(s):

1 Type of damage (impact, crack, crushed core, delamination, etc.)
2 Length and Width in inches
3 Circumference as a percentage of an affected hole.
4 Diameter or Radius in inches
5 Area in square inches
6 Number of plies affected
7 Depth in inches or number of plies

In a situation where material has been removed, both the amount of material removed and the amount of material remaining should be documented.

Often times it is important to know what is not damaged. For example, if there is a leading edge impact near one of the leading edge ribs, inspect the rib and rib bonds and report if they are unaffected.

When a hole is near an Edge Of a Part (EOP), or another hole/detail is oversized or elongated, the size and shape of the hole and the amount of material between it and the other details should be documented. Minimum Edge Distance (the distance from the center of a hole to the EOP) is very important information. The Minimum Edge Distance must be documented whenever it falls below 2D + 0.050". If sufficient edge distance exists, a note to this effect should be made in the documentation.

(d) Cracks/Crazing

Has the area been checked for cracks and/or crazing using a suitable Non Destructive Test Method? Which method was used? What were the results?

(e) Denting

What is the extent of the denting? Is the dent hard or flexible, i.e. will it “pop” in and out to the touch? Does the dent pass over any underlying structure (Refer to 51-00).

(f) Delamination/De-bonding

Has delamination of the composite structure occurred? How far does the delamination extend?

(g) Underlying Structure

Has the damage extended beyond surface to structure such as stingers, spars, and ribs?

(h) Fasteners

Are any fasteners damaged and if so, to what extent?

(i) Existing Repairs

Are there any existing repairs in the immediate vicinity of the reported damage?

(j) Photographs and Illustrations

Digital photographs can be used to good effect to provide overall impressions and detailed damage depictions. Several photographs of the same area but taken from different angles will provide the best results. For thorough documentation, consider using a photo

sequence that begins with the entire aircraft in view, then move in to include entire affected component, and finally close-up pictures of the damaged structure.

Photographs are most helpful when dimensions and station locations are defined on the aircraft. Referencing the figures in AMM Chapter 06 - Dimensions And Areas (Refer to 06-00) and the Airframe Zone Diagrams in AMM Chapter 51, Section 00 - Standard Practices: Structures (Refer to 51-00), write dimensions and station locations on masking tape in order to preserve the aircraft finish, or, if the surface finish will be reworked, directly on the aircraft itself.

Consider using a mirror to facilitate difficult to take photos.

Suitable illustrations for depicting damage location may be obtained from the Airplane Maintenance Manual or Illustrated Parts Catalog. Always state relevant Chapter and Section along with the illustration part number, i.e. IPC 27-10-01 Illustration p/n SR22_PC27_1234A.

(3) Damage Reporting Examples

The examples in the following table are taken directly from actual damage and nonconformance reports. Typically, the damage seen in service will differ from the examples provided below, however, the basic ideas are applicable.

Good Damage Report Description	Poor Damage Report Description
Thick bond between LH 26.5 L/E rib and main spar, 0.125" across entire bondline.	LH main spar to 26.5 L/E rib is thick 0.125" • *This description does not define where the bondline is thick.* • *This description does not specify “what” is thick - The bond is thick.*
Thick bond between aft shear web and upper wing skin - thickness is 0.080" at WS 164, tapers to 0.145" at WS 170, is constant between WS 170 and WS 190, then tapers back to 0.080" at WS 195.	Shear web from WS 177 to 150 has thick bond 0.145 • *This description does not specify what bond is thick. The aft shear web is bonded to many ribs, and the upper and lower skins.* • *The description should include the full part name “aft shear web”.* • *This description implies that at WS 177 the bond immediately jumps from 0.080" to 0.145", and then at WS 150 decreases immediately back to 0.080".*
Thick bond between WS 35 stub rib and main spar web, 0.123" across entire bondline.	Thick bond between main spar web and 35 stub rib - 0.123" across entire bondline. • *As a general rule, when documenting two parts that are bonded together, list the smaller part, or the part with the bonding flange first.*
Delamination of lower, LH engine mount hole on forward side. 2 plies affected around 80% of hole circumference. Max width 0.20".	Engine mount hole delamed 0.2". • *This example contained an improper variant of the word delaminated.* • *The extent of the delamination around the hole, the number of plies affected and the specific hole are not specified.*

Good Damage Report Description	Poor Damage Report Description
Bond void between RH 37 rib and main spar upper cap, 40% void.	RH 37 rib to main spar upper cap bond is 40% voided. • *All of the necessary information is included in this description, but an attempt should be made at standardizing the format of the description.*
Bond voids between LH 36 rib and forward spar: 1) bond to spar upper cap is 50% void. 2) bond to spar lower cap is 70% void. 3) bond to spar web is 60% void.	3 bonding surfaces voided on forward edges of LH 36 rib to forward spar. Upper: 50% voided, Lower: 70% voided, Web 60% voided. • *Bonding surfaces cannot be voided - bonds or bondlines can have voids.* • *Each bond should be listed as a separate item.*
General Rule: Use correct part names whenever possible. Best practices; use part number in conjunction with part name.	General Rule: Avoid describing conditions with only the part numbers.
General Rule: Use key words, phrases, and common abbreviations and acronyms listed in the AMM.	General Rule: Avoid making up new words, phrases, abbreviations, or acronyms.
General Rule: Use specific and accurate terms which will promote confidence in the description of the condition.	General Rule: Avoid using words and phrases like: Approximately… Appears to be… Anywhere from X to Y… These words and phrases do not promote confidence in the description - additional information will likely be requested.
General Rule: Document only the information required to describe the condition completely. Document only the facts. Use as few words as possible to communicate the information	General Rule: Do not elaborate with unnecessary information that does not specifically add to the readers understanding of the existing condition.

(4) Information Transmittal (See Figure 51-105)

Damage reporting by means of the telephone is valuable in alerting the Cirrus Design of impending action required, but this method will not instigate any repair design. The quickest and most effective method is to send reports via e-mail or fax. E-mail is the preferred method as data transmitted via fax is susceptible to distortion, smudging, and other forms of degradation. When transmitting damage reports the following guidelines should be observed:

(a) Whenever possible inform recipient by telephone that urgent damage reports are being sent. It is not uncommon for documents not to arrive.

(b) All text should be in bold black capitals.

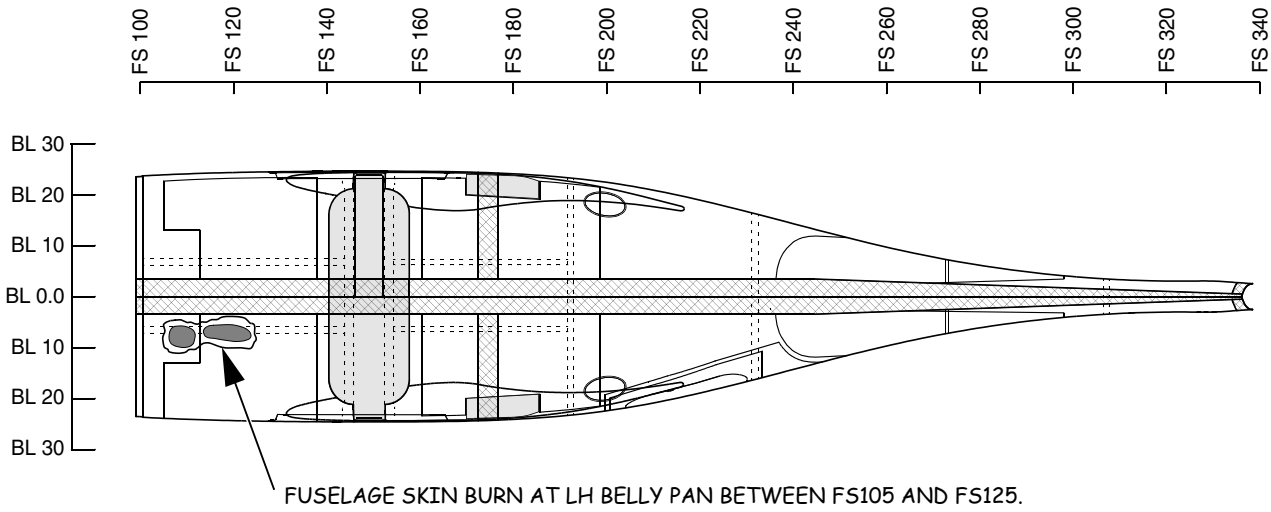
(c) Follow the document structure as described in Documentation Content and Layout Procedure. (Refer to 51-10)

(d) Provide positive identification on each sheet's relationship. This can be achieved by individual numbering of sheets with a sketch plan on sheet 1 indicating how the numbered sheets are related.

Aircraft Damage Report

Model: SR20 Serial: 1423 Registration: N1234 Hobbs Meter: 1262
Aircraft Location: ANYTOWN, USA Aircraft Operator: JOHN DOE
Contact Name: Joe AP Phone: (123) 456-7890
E-Mail: joeap@mechanics.com Fax: (123) 456-1112
Date damage occurred: 7/3/02
Reference Document (if applicable): N/A
Component part number and/or serial number (if applicable): N/A
Damage Classification: SANDWICH STRUCTURE DAMAGE - LAMINATE AND CORE
Damage Location: AT LH BELLY PAN BETWEEN FS105 AND FS125.

Damage Extent: SEE PHOTO - BURN EXTENDS INTO 2 LAYERS OF SQUARE REINFORCEMENT CORE PIECE JUST AFT OF FIREWALL. COMPLETLEY BURNED THROUGH CORE MATERIAL AS DEPICTED IN PHOTO.
Cracks/Crazing: N/A
Denting: N/A
Delamination/Debonding: SEE PHOTOS.
Underlying Structure: N/A
Fasteners: N/A
Photographs and Illustrations: SEE ATTACHED.



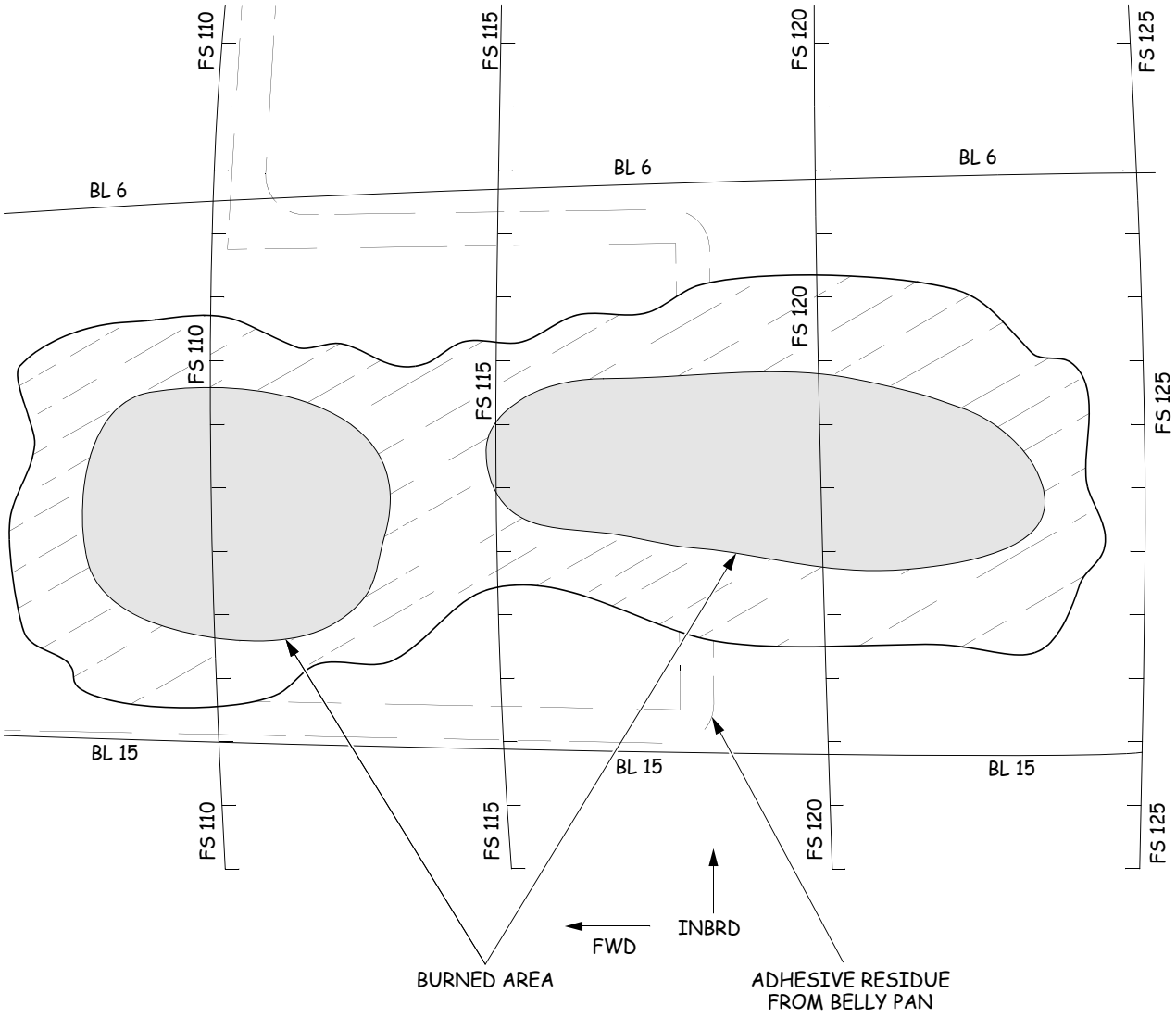
Sheet: 1 of 2

SR20_MM51_2292

Figure 51-105
Damage Report Sample (Sheet 1 of 2)

Aircraft Damage Report

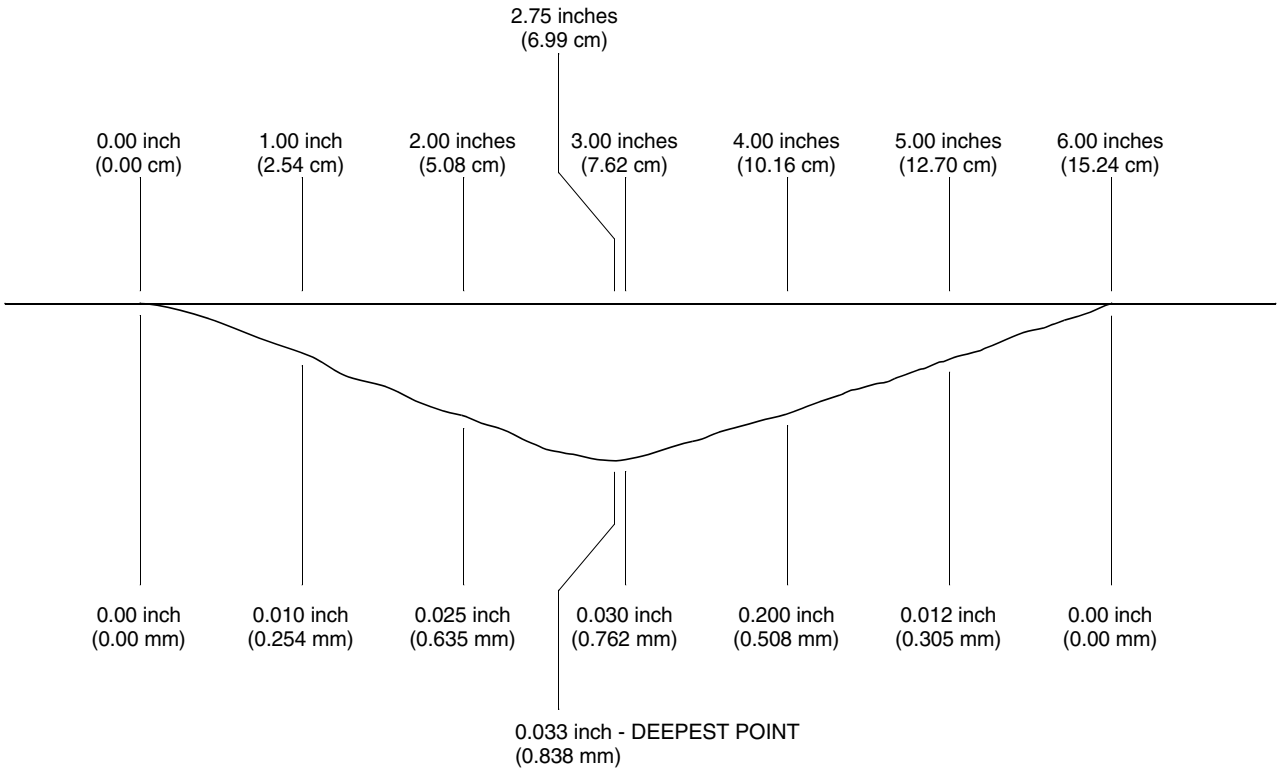
Model: SR20 Serial: 1423 Registration: N1234 Hobbs Meter: 1262
Aircraft Location: ANYTOWN, USA Aircraft Operator: JOHN DOE
Contact Name: Joe AP Phone: (123) 456-7890
E-Mail: joeap@mechanics.com Fax: (123) 456-1112
Date damage occurred: 7/3/02
Reference Document (if applicable): N/A
Component part number and/or serial number (if applicable): N/A



Sheet: 2 of 2

SR20_MM51_2294

Figure 51-105
Damage Report Sample (Sheet 2 of 2)



SR20_MM51_2296

Figure 51-106
Example of Reporting Depths of Dent Depression

F. Metal Components - Corrosion Inspection

(1) Corrosion Prone Areas

Certain areas are more prone to corrosion than others. The following list is intended to be a general guide to areas where corrosion is frequently found.

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(2) Inspection/Check - Airframe General Corrosion

Corrosion should be inspected for at every inspection. In trouble areas, the inspection frequency should be increased.

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

G. Airframe Inspection Diagrams

The design engineer responsible for developing the repair may request that additional structural inspections be completed. The following Airframe Inspection Diagrams are intended to provide standardized inspection criteria to facilitate the repair design process. Depending on the extent of the damage and repair, the design engineer may request the entire structure be inspected per the following diagrams or only specified diagrams be used.

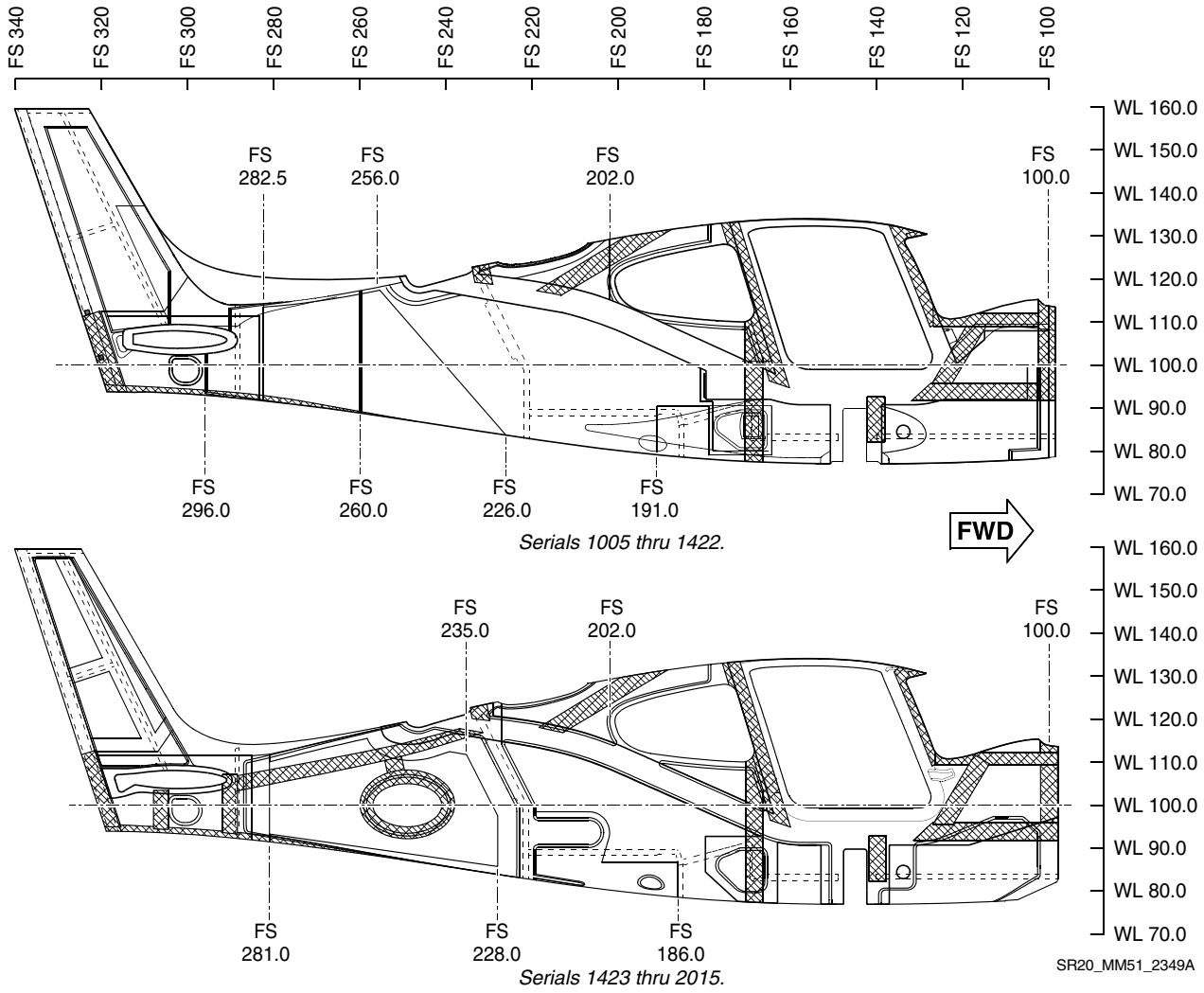


Figure 51-107
Fuselage And Vertical Stabilizer - RH View - Serials 1005 thru 2015

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
Firewall Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
Aft Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
WL 131.25 Rib	×

Structure	Chk'd
General Condition	
Bonds To Fuselage Structure	
WL 159.5 Rib	×
General Condition	
Bonds To Fuselage Structure	

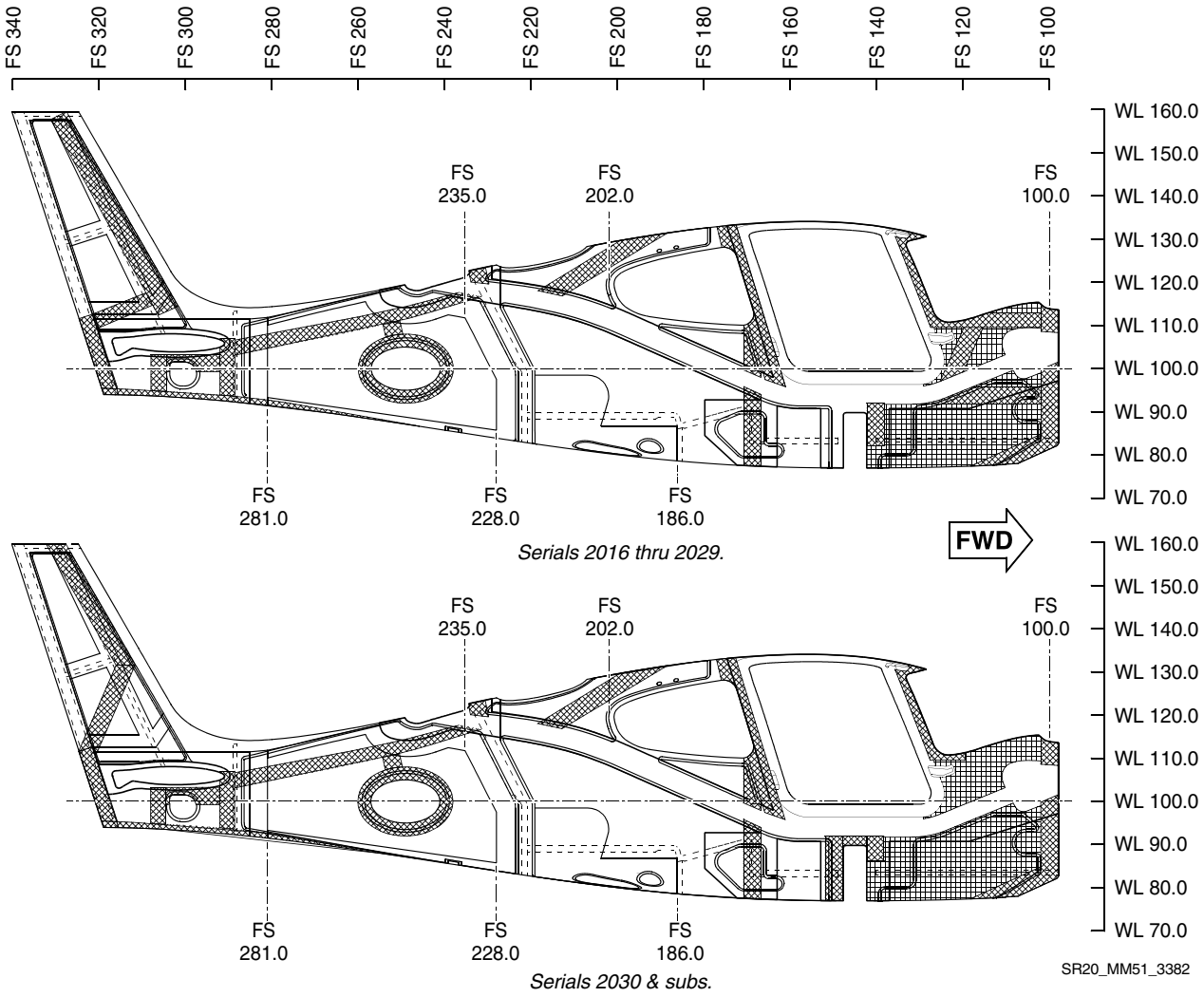
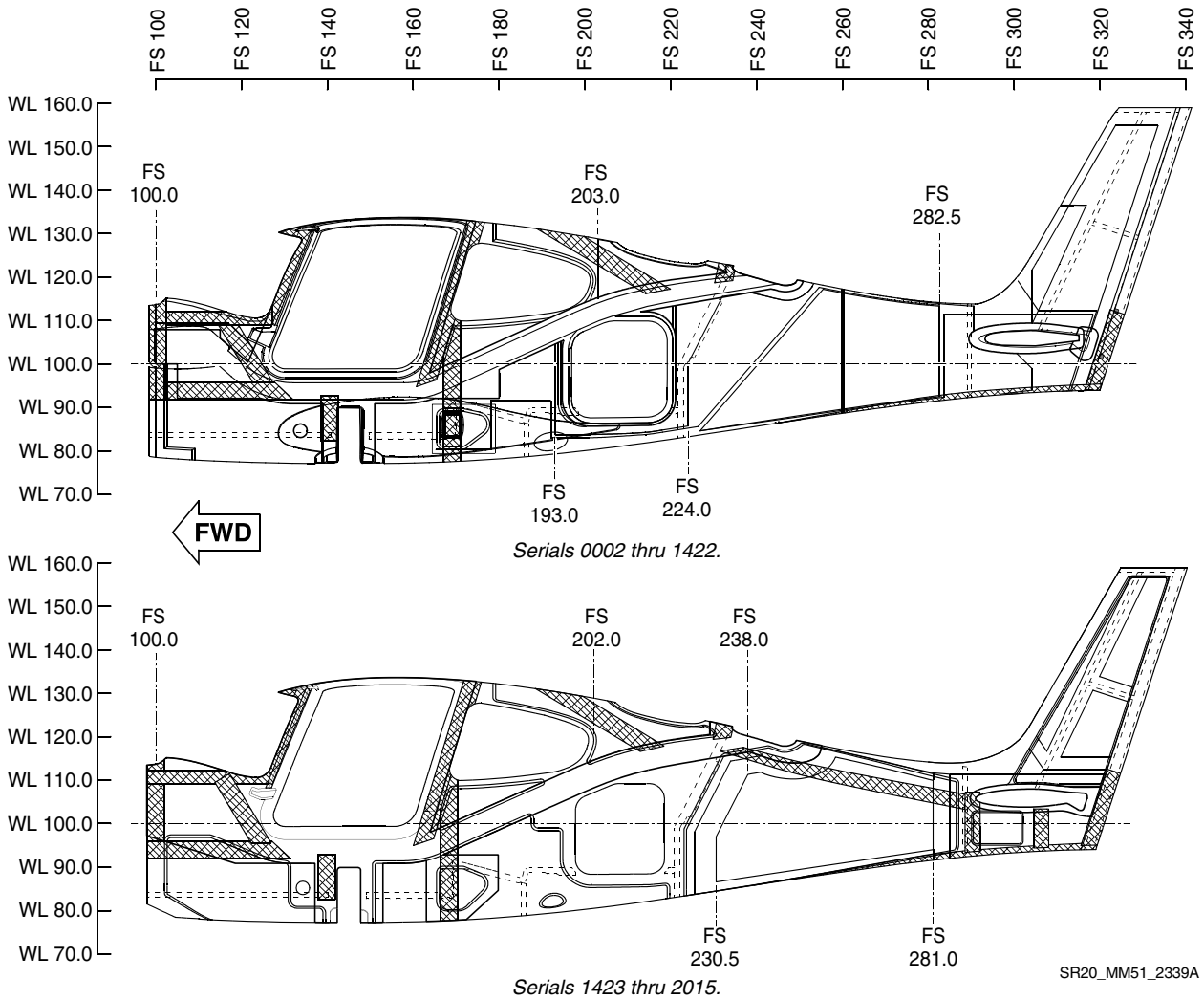


Figure 51-108
Fuselage And Vertical Stabilizer - RH View - Serials 2016 & subs

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
Firewall Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
Aft Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
WL 131.25 Rib	×

Structure	Chk'd
General Condition	
Bonds To Fuselage Structure	
WL 159.5 Rib	×
General Condition	
Bonds To Fuselage Structure	



Serials 0002 thru 1422.

Serials 1423 thru 2015.

Figure 51-109
Fuselage And Vertical Stabilizer - LH View - Serials 1005 thru 2015

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
Firewall Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
Aft Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
WL 131.25 Rib	×

Structure	Chk'd
General Condition	
Bonds To Fuselage Structure	
WL 159.5 Rib	×
General Condition	
Bonds To Fuselage Structure	

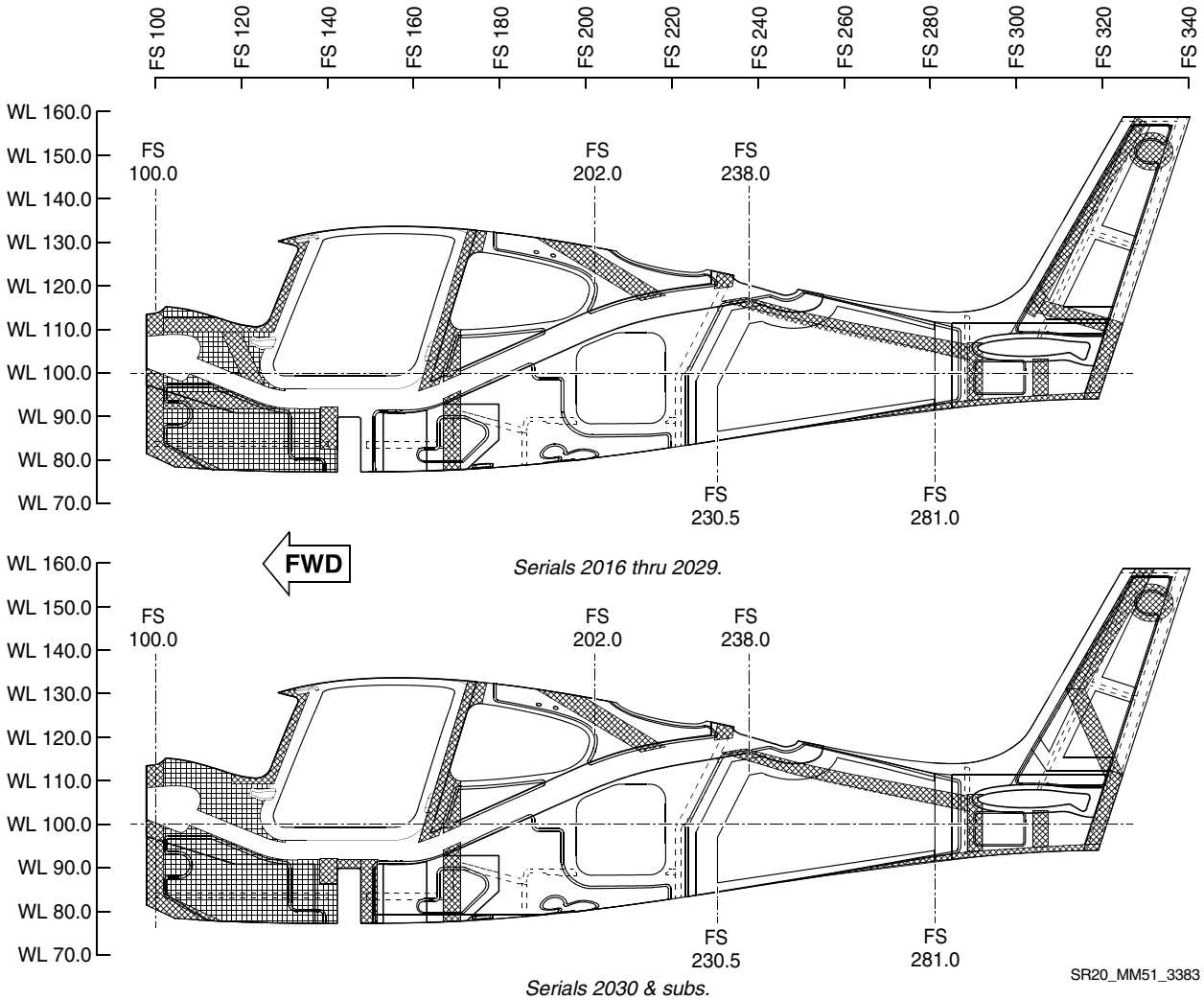


Figure 51-1010
Fuselage And Vertical Stabilizer - LH View - Serials 2016 & subs

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
Firewall Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
Forward Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
Aft Vertical Spar	×
General Condition	
Bonds To Fuselage Structure	
WL 131.25 Rib	×

Structure	Chk'd
General Condition	
Bonds To Fuselage Structure	
WL 159.5 Rib	×
General Condition	
Bonds To Fuselage Structure	

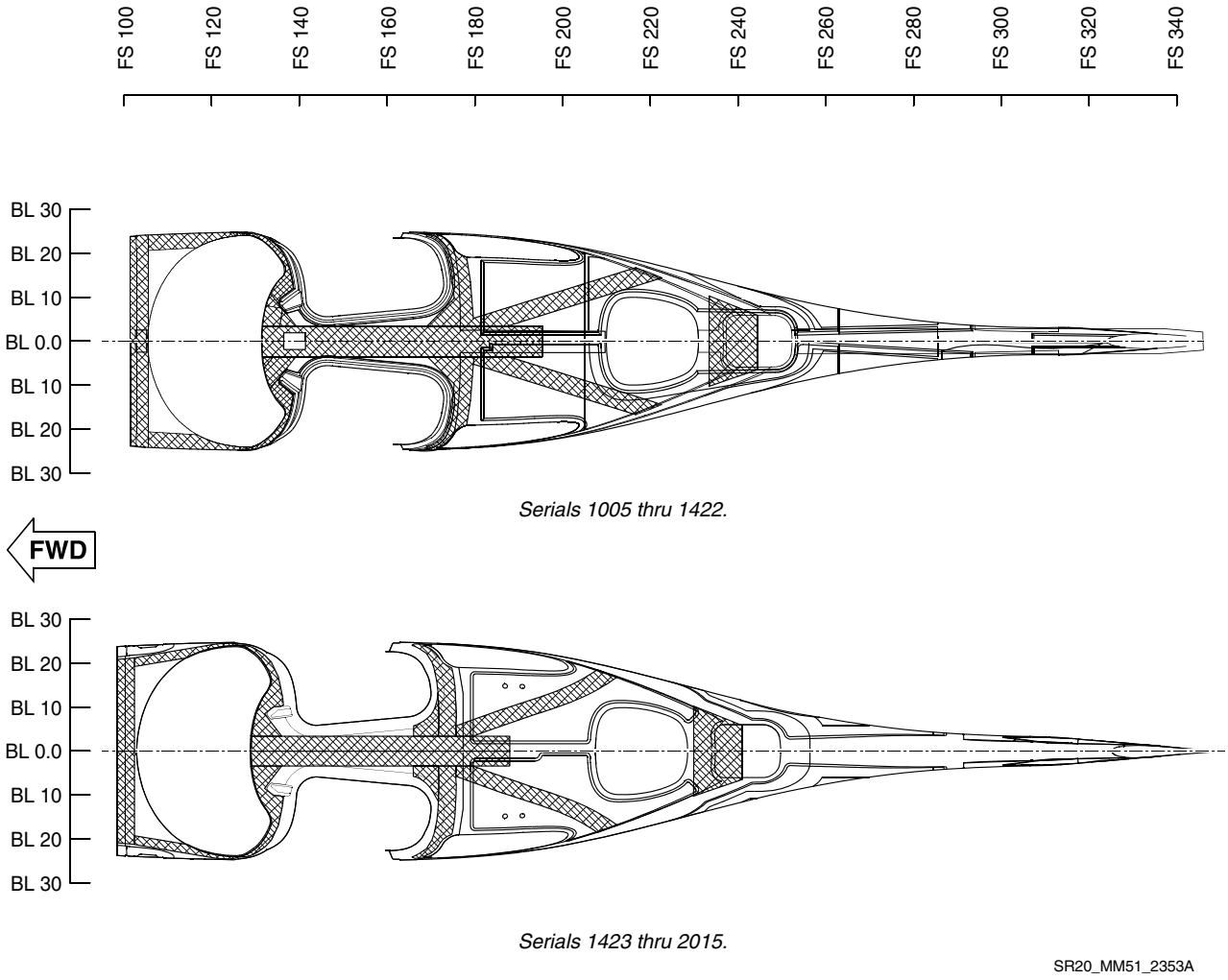


Figure 51-1011
Fuselage And Vertical Stabilizer - Top View - Serials 1005 thru 2015

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
CAPS Cover	×
General Condition	
Bonds To Fuselage Structure	
Upper Door Hinge	×
General Condition	
Grab Handle	×
General Condition	

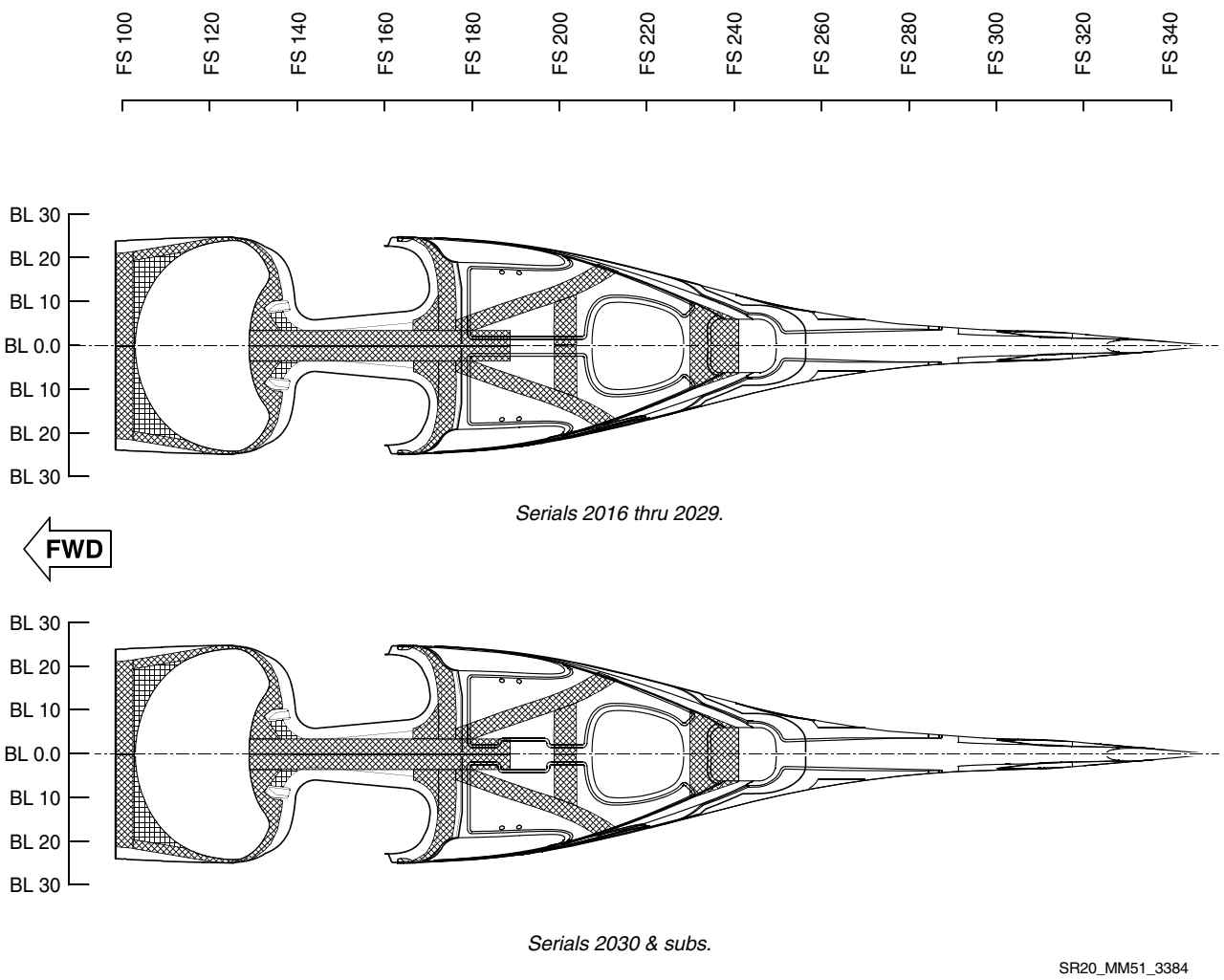


Figure 51-1012
Fuselage And Vertical Stabilizer - Top View - Serials 2016 & subs

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	
CAPS Cover	×
General Condition	
Bonds To Fuselage Structure	
Upper Door Hinge	×
General Condition	
Grab Handle	×
General Condition	

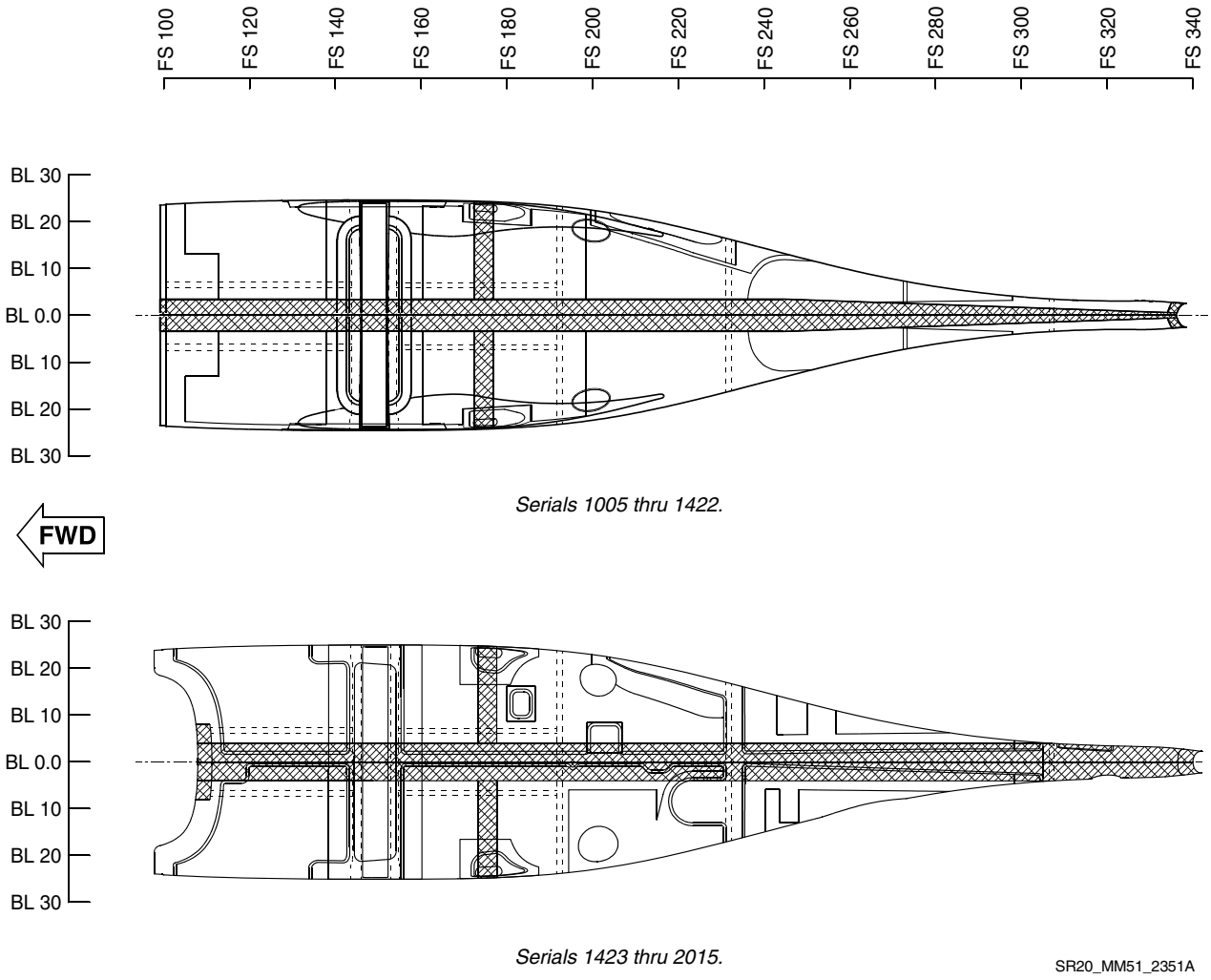


Figure 51-1013
Fuselage And Vertical Stabilizer - Bottom View - Serials 1005 thru 2015

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	×
Firewall Bulkhead	
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	

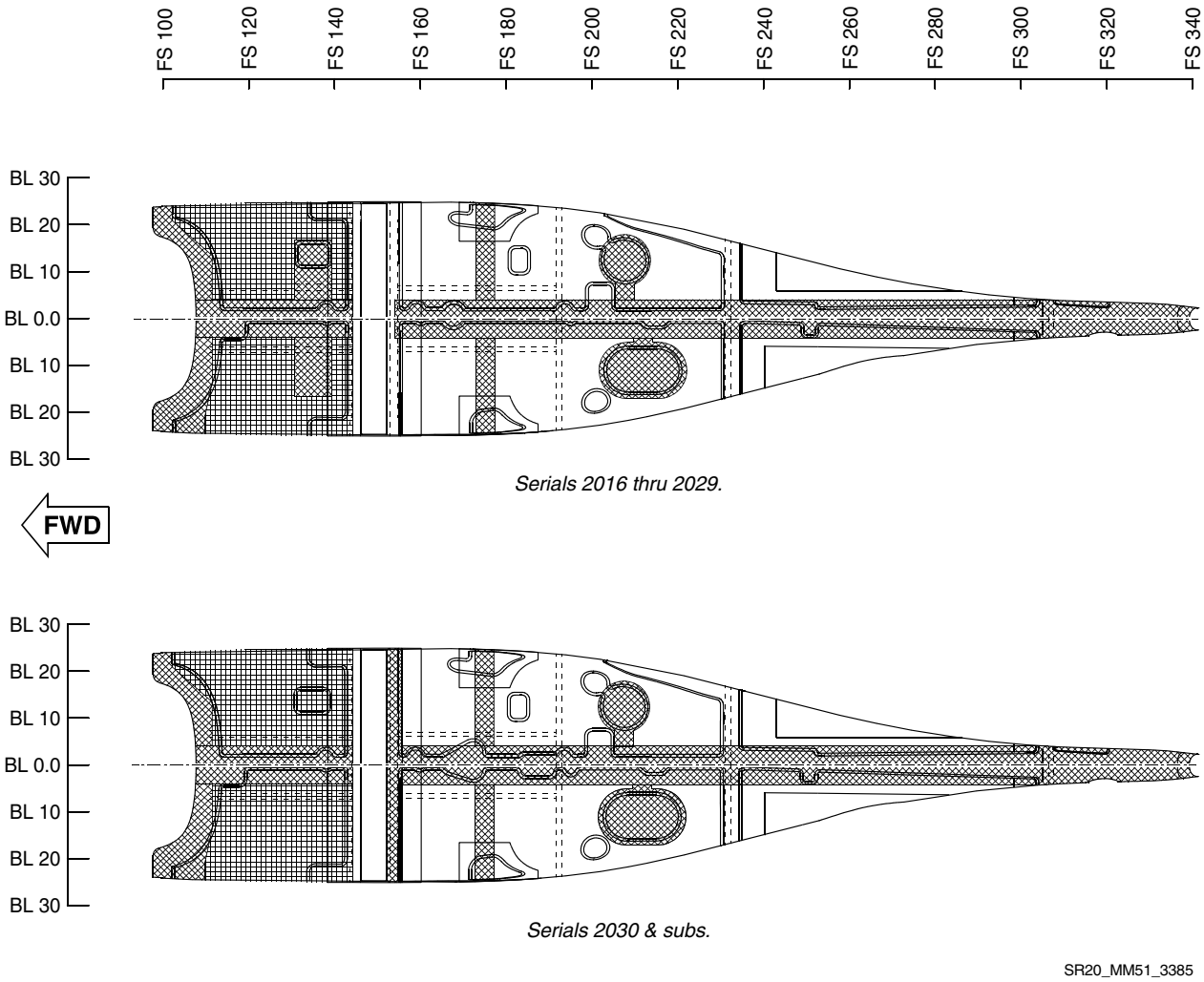


Figure 51-1014
Fuselage And Vertical Stabilizer - Bottom View - Serials 2016 & subs

Structure	Chk'd
Fuselage Skins	×
General Condition	
Bonds To Fuselage Structure	
Cabin Door Fit	×
Firewall Bulkhead	
General Condition	
Bonds To Fuselage Structure	
Forward Longerons	×
General Condition	
Bonds To Fuselage Structure	
Spar Cover	×
General Condition	
Bonds To Fuselage Structure	
Belly Closure	×
General Condition	
Bonds To Fuselage Structure	
Aft Longerons	×
General Condition	
Bonds To Fuselage Structure	

Structure	Chk'd
FS 186.1 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 222 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 289 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	
FS 306 Bulkhead	×
General Condition	
Bonds To Fuselage Structure	

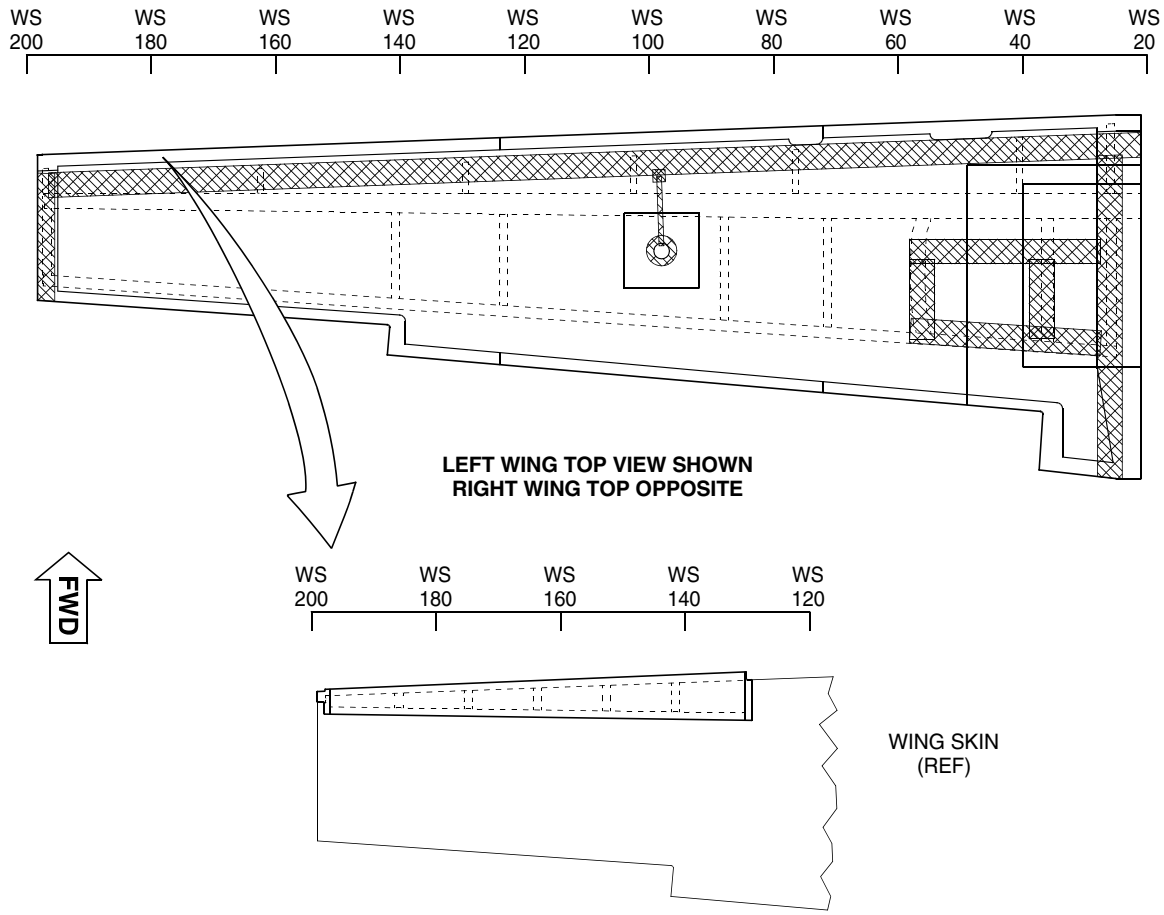
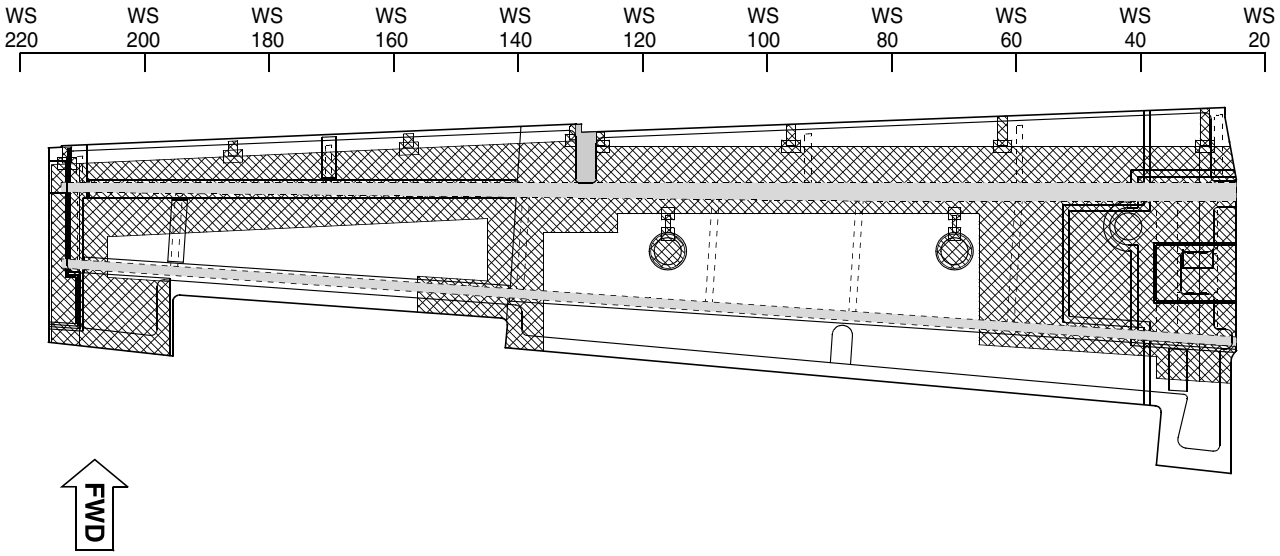


Figure 51-1015
Wing - Top View - Serials 1005 thru 1885

Structure	Chk'd
Upper Wing Skin	×
General Condition	
Wing Tip Flange	
Bond To Lower Wing Skin	
Lower Wing Skin	×
General Condition	
Wing Tip Flange	
Main Spar	×
General Condition	
Bonds To Wing Skins	
Aft Shear Web	×
General Condition	
Bonds To Wing Skins	
WS 26.5 Rib	×
General Condition	
Bonds To Wing Structure	
WS 37 Rib	×
General Condition	
Bonds To Wing Structure	

Structure	Chk'd
Canted Rib	×
General Condition	
Bonds To Wing Structure	
Stub Rib	×
General Condition	
Bonds To Wing Structure	
Lateral Rib	
General Condition	
Bonds To Wing Structure	
WS 72.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 88.625 Rib	×
General Condition	
Bonds To Wing Structure	
WS 124.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 141.375 Rib	×

Structure	Chk'd
General Condition	
Bonds To Wing Structure	
WS 197.5 Rib	×
General Condition	
Bonds To Wing Structure	
Shear Pin Bearing Plate	
Leading Edge Ribs	×
General Condition	
Bonds To Wing Structure	
Step Closeouts	×
General Condition	
Bonds To Wing Structure	
Attachments	×
Main Wing Attach	
Aft Wing Attach	
Wing Tips	×
General Condition	
Shear Web Bond	



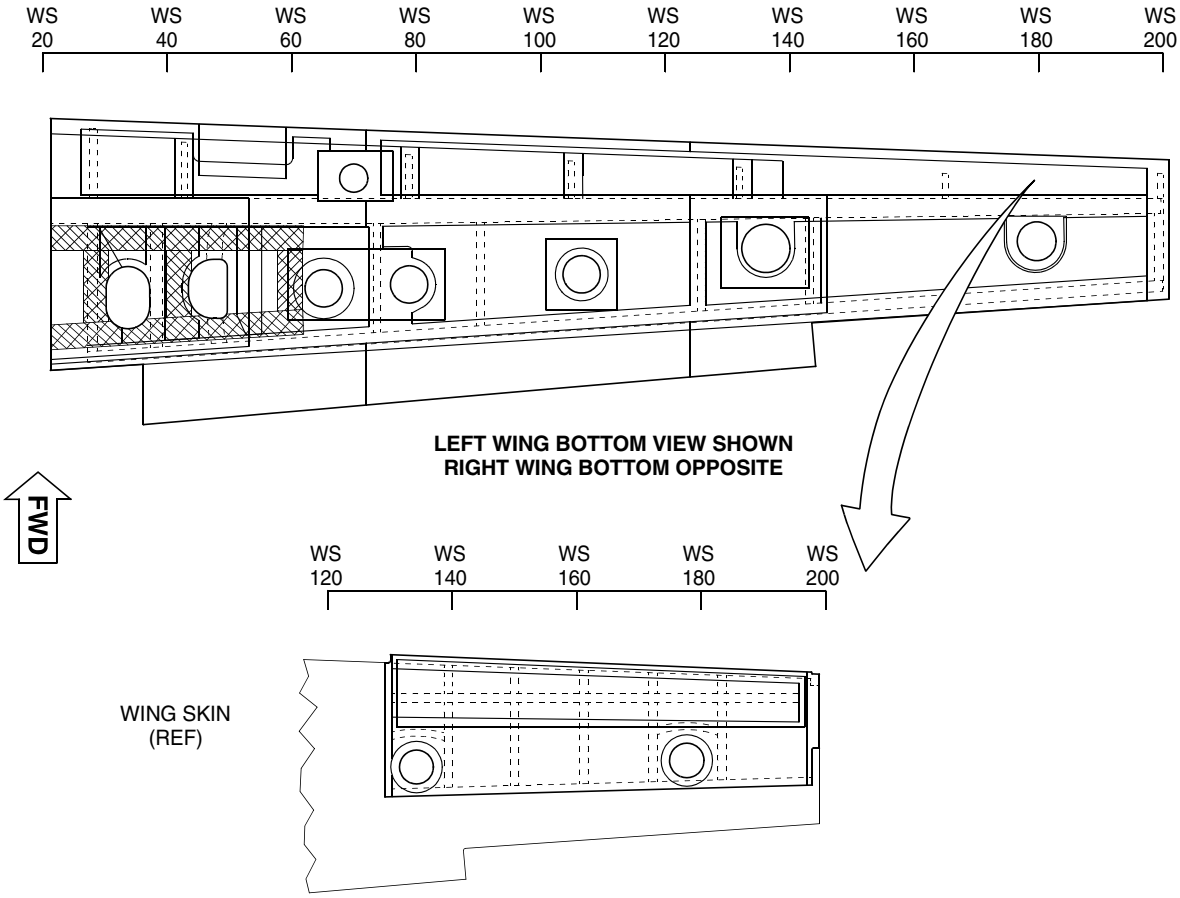
LEFT WING TOP VIEW SHOWN
RIGHT WING TOP OPPOSITE

Serials 1878, 1886 & subs.

SR20_MM51_2746B

Figure 51-1016
Wing - Top View - Serials 1886 & subs

Structure	Chk'd
Upper Wing Skin	×
General Condition	
Wing Tip Flange	
Bond To Lower Wing Skin	
Lower Wing Skin	×
General Condition	
Wing Tip Flange	
Main Spar	×
General Condition	
Bonds To Wing Skins	
Aft Shear Web	×
General Condition	
Bonds To Wing Skins	
WS 27.25 Rib	×
General Condition	
Bonds To Wing Structure	
WS 37.0 Rib	×
General Condition	
Bonds To Wing Structure	
Stub Rib	×
General Condition	
Bonds To Wing Structure	
Lateral Rib	×
General Condition	
Bonds To Wing Structure	
WS 61.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 87.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 110.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 140.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 196.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 213.0 Rib	×
General Condition	
Bonds To Wing Structure	
Shear Pin Bearing Plate	
Leading Edge Ribs	×
General Condition	
Bonds To Wing Structure	
Step Closeouts	×
General Condition	
Bonds To Wing Structure	
Attachments	×
Main Wing Attach	
Aft Wing Attach	
Wing Tips	×
General Condition	
Shear Web Bond	
Shear Pin And Bracket	



Serials 1005 thru 1877, 1879 thru 1885.

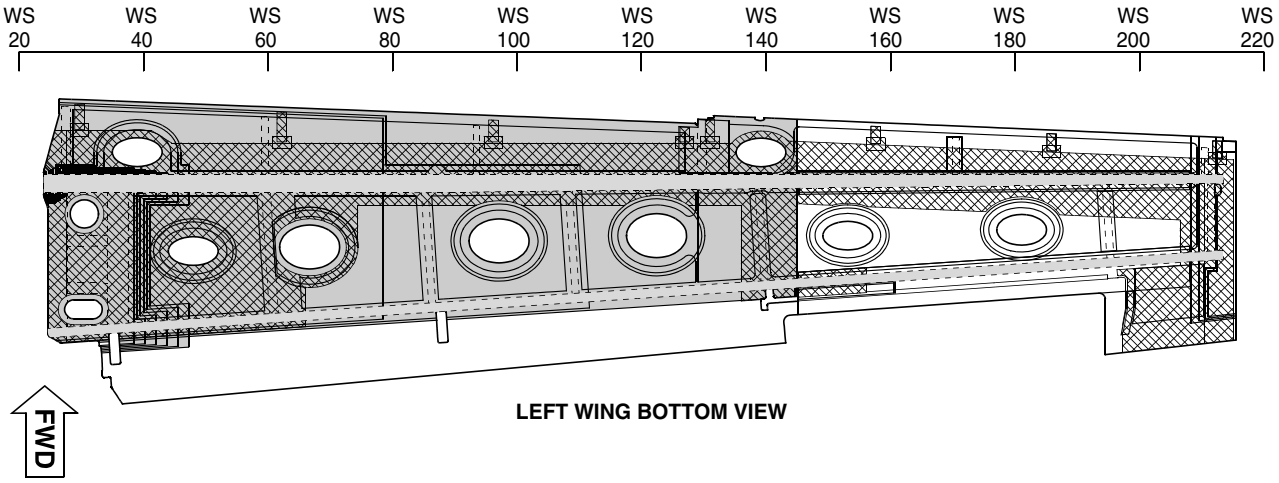
SR20_MM51_2357A

Figure 51-1017
Wing - Bottom View - Serials 1005 thru 1885

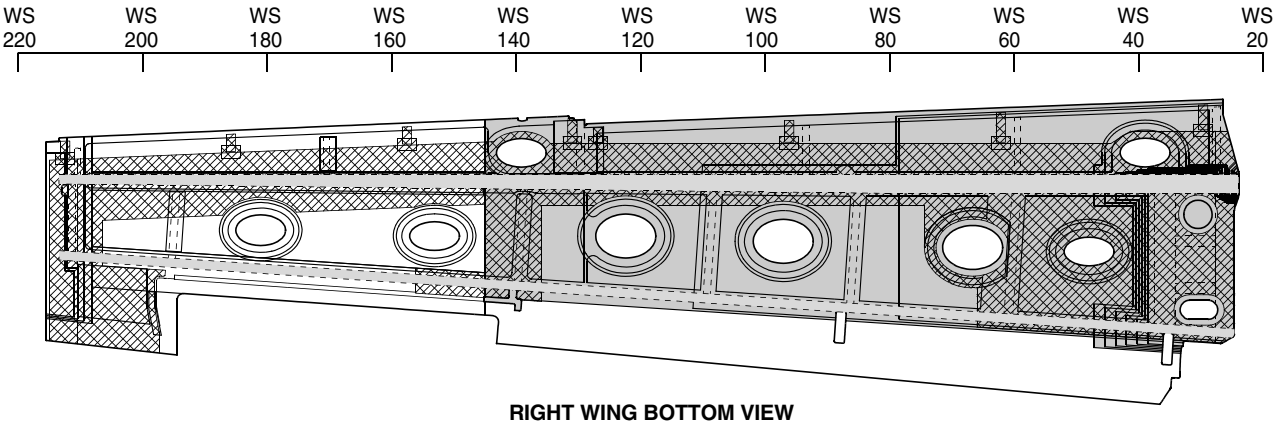
Structure	Chk'd
Upper Wing Skin	×
General Condition	
Wing Tip Flange	
Bond To Lower Wing Skin	
Lower Wing Skin	×
General Condition	
Wing Tip Flange	
Main Spar	×
General Condition	
Bonds To Wing Skins	
Aft Shear Web	×
General Condition	
Bonds To Wing Skins	
WS 26.5 Rib	×
General Condition	
Bonds To Wing Structure	
WS 37 Rib	×
General Condition	
Bonds To Wing Structure	

Structure	Chk'd
Canted Rib	×
General Condition	
Bonds To Wing Structure	
Stub Rib	×
General Condition	
Bonds To Wing Structure	
Lateral Rib	×
General Condition	
Bonds To Wing Structure	
WS 72.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 88.625 Rib	×
General Condition	
Bonds To Wing Structure	
WS 124.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 141.375 Rib	×

Structure	Chk'd
General Condition	
Bonds To Wing Structure	
WS 197.5 Rib	×
General Condition	
Bonds To Wing Structure	
Shear Pin Bearing Plate	
Leading Edge Ribs	×
General Condition	
Bonds To Wing Structure	
Step Closeouts	×
General Condition	
Bonds To Wing Structure	
Attachments	×
Main Wing Attach	
Aft Wing Attach	
Wing Tips	×
General Condition	
Shear Web Bond	
Main Landing Gear	×
Attach Points	



LEFT WING BOTTOM VIEW



RIGHT WING BOTTOM VIEW

Serials 1878, 1886 & subs.

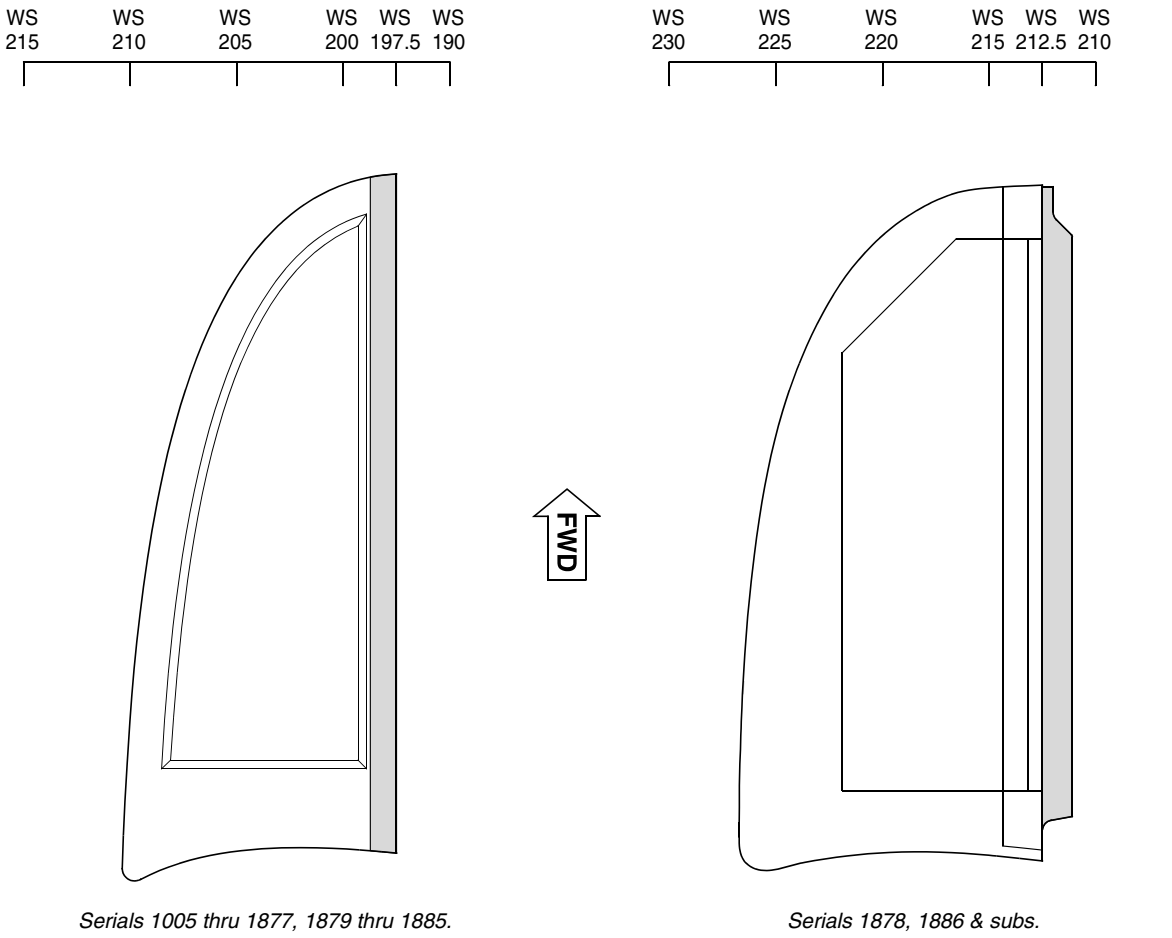
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Figure 51-1018
Wing - Bottom View - Serials 1886 & subs

Structure	Chk'd
Upper Wing Skin	×
General Condition	
Wing Tip Flange	
Bond To Lower Wing Skin	
Lower Wing Skin	×
General Condition	
Wing Tip Flange	
Main Spar	×
General Condition	
Bonds To Wing Skins	
Aft Shear Web	×
General Condition	
Bonds To Wing Skins	
WS 27.25 Rib	×
General Condition	
Bonds To Wing Structure	
WS 37.0 Rib	×
General Condition	
Bonds To Wing Structure	

Structure	Chk'd
Lateral Rib	×
General Condition	
Bonds To Wing Structure	
WS 61.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 87.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 110.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 140.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 196.0 Rib	×
General Condition	
Bonds To Wing Structure	
WS 213.0 Rib	×

Structure	Chk'd
General Condition	
Bonds To Wing Structure	
Shear Pin Bearing Plate	
Leading Edge Ribs	×
General Condition	
Bonds To Wing Structure	
Step Closeouts	×
General Condition	
Bonds To Wing Structure	
Attachments	×
Main Wing Attach	
Aft Wing Attach	
Wing Tips	×
General Condition	
Shear Web Bond	
Shear Pin And Bracket	
Main Landing Gear	×
Attach Points	



Serials 1005 thru 1877, 1879 thru 1885.

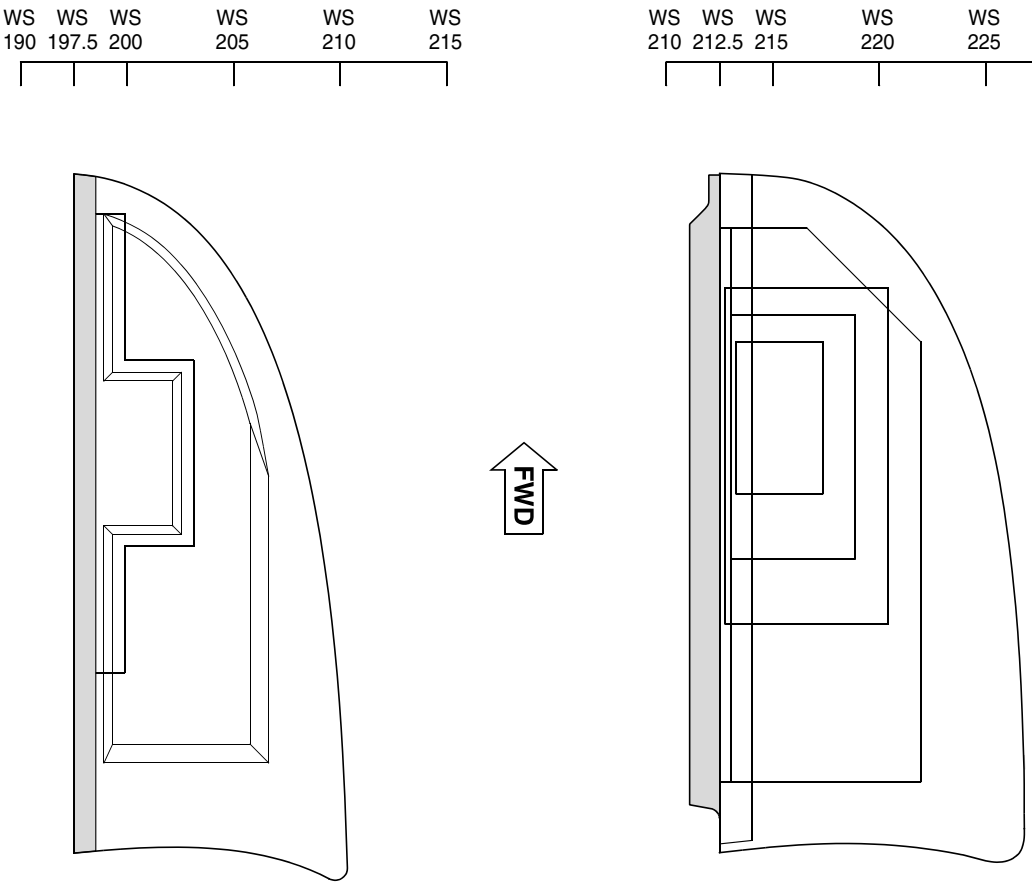
Serials 1878, 1886 & subs.

LEFT WING TIP TOP VIEW SHOWN
RIGHT WING TIP TOP OPPOSITE

SR20_MM51_3122

Figure 51-1019
Wing Tip - Top View

Structure	Chk'd
General Condition	



Serials 1005 thru 1877, 1879 thru 1885.

Serials 1878, 1886 & subs.

LEFT WING TIP BOTTOM VIEW SHOWN
RIGHT WING TIP BOTTOM OPPOSITE

SR20_MM51_3124

Figure 51-1020
Wing Tip - Bottom View

Structure	Chk'd
General Condition	

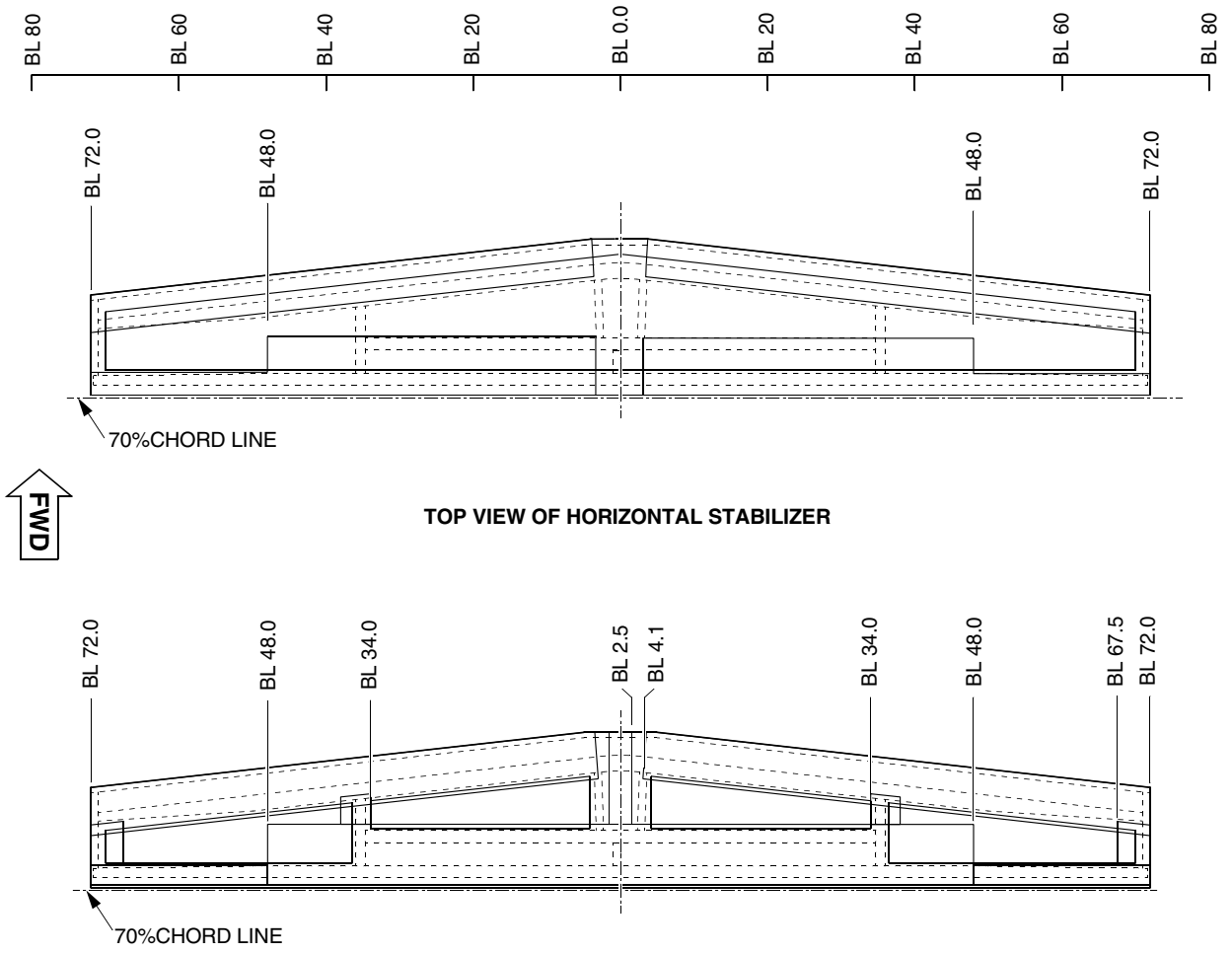
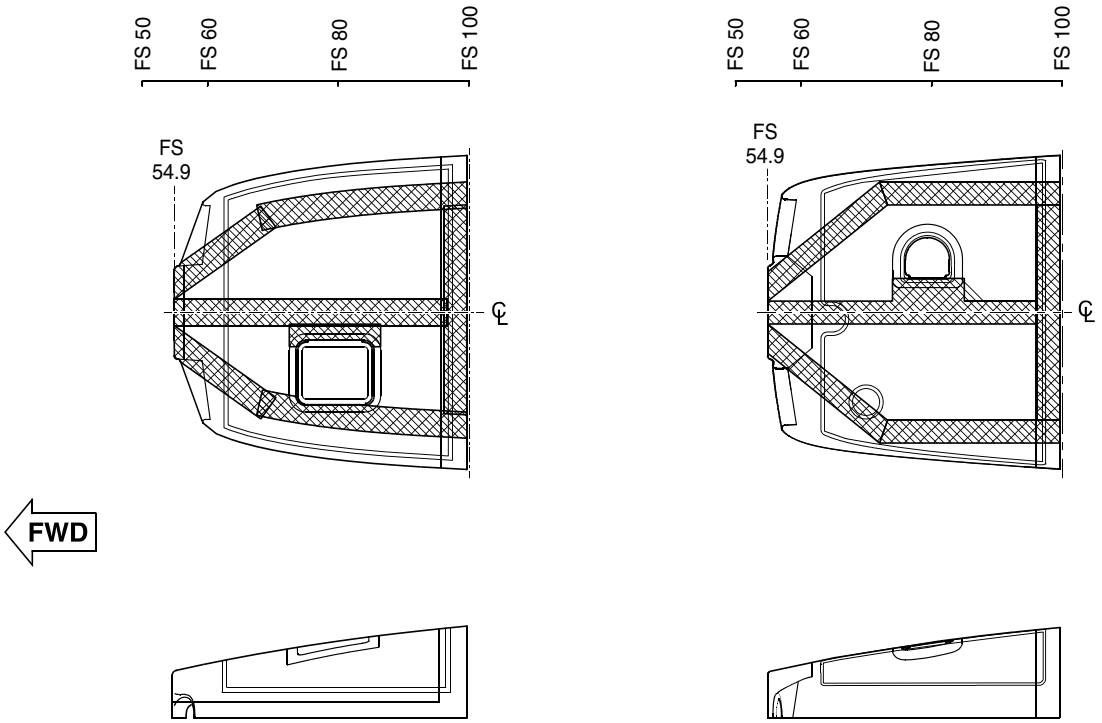


Figure 51-1021
Horizontal Stabilizer

Structure	Chk'd
Upper Horizontal Stabilizer Skin	×
General Condition	
Bonds To Stabilizer Structure	
Lower Horizontal Stabilizer Skin	×
General Condition	
Bonds To Stabilizer Structure	
Forward Spar	×
General Condition	
Bonds To Stabilizer Structure	
Mid Spar	×
General Condition	
Bonds To Stabilizer Structure	
Aft Spar	×
General Condition	
Bonds To Stabilizer Structure	
BL 0.0 Rib	×
General Condition	
Bonds To Stabilizer Structure	
Fuselage Intersection Ribs	×

Structure	Chk'd
General Condition	
Bonds To Stabilizer Structure	
BL 36.0 Ribs	×
General Condition	
Bonds To Stabilizer Structure	
BL 72.0 Ribs	×
General Condition	
Bonds To Stabilizer Structure	



Serials 1005 thru 1422.

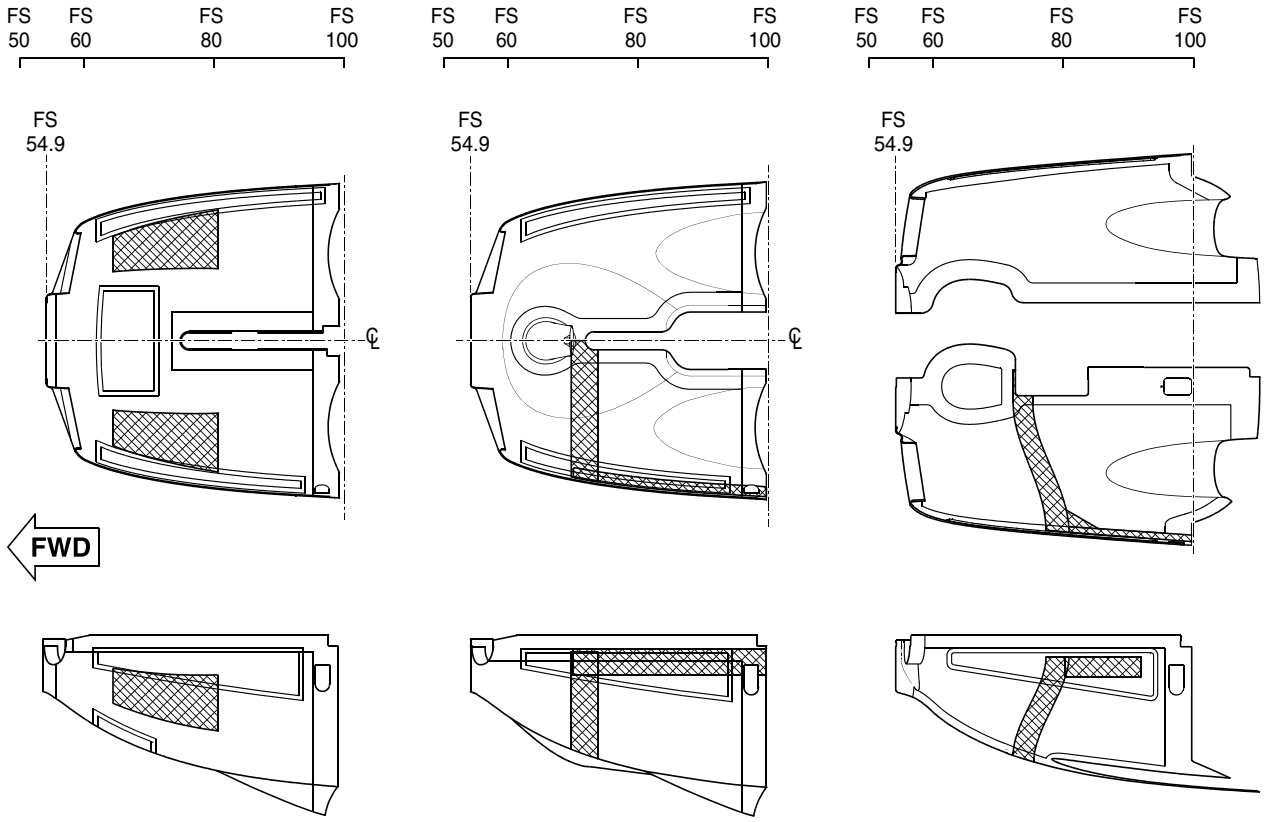
Serials 1423 & subs.

UPPER COWL

SR20_MM51_2363

Figure 51-1022
Upper Engine Cowl

Structure	Chk'd
General Condition	



Serials 1005 thru 1147. *Serials 1148 thru 1422.* *Serials 1423 thru 1681.*

LOWER COWL

SR20_MM51_2361A

Figure 51-1023
Lower Engine Cowl - Serials 1005 thru 1681

Structure	Chk'd
General Condition	

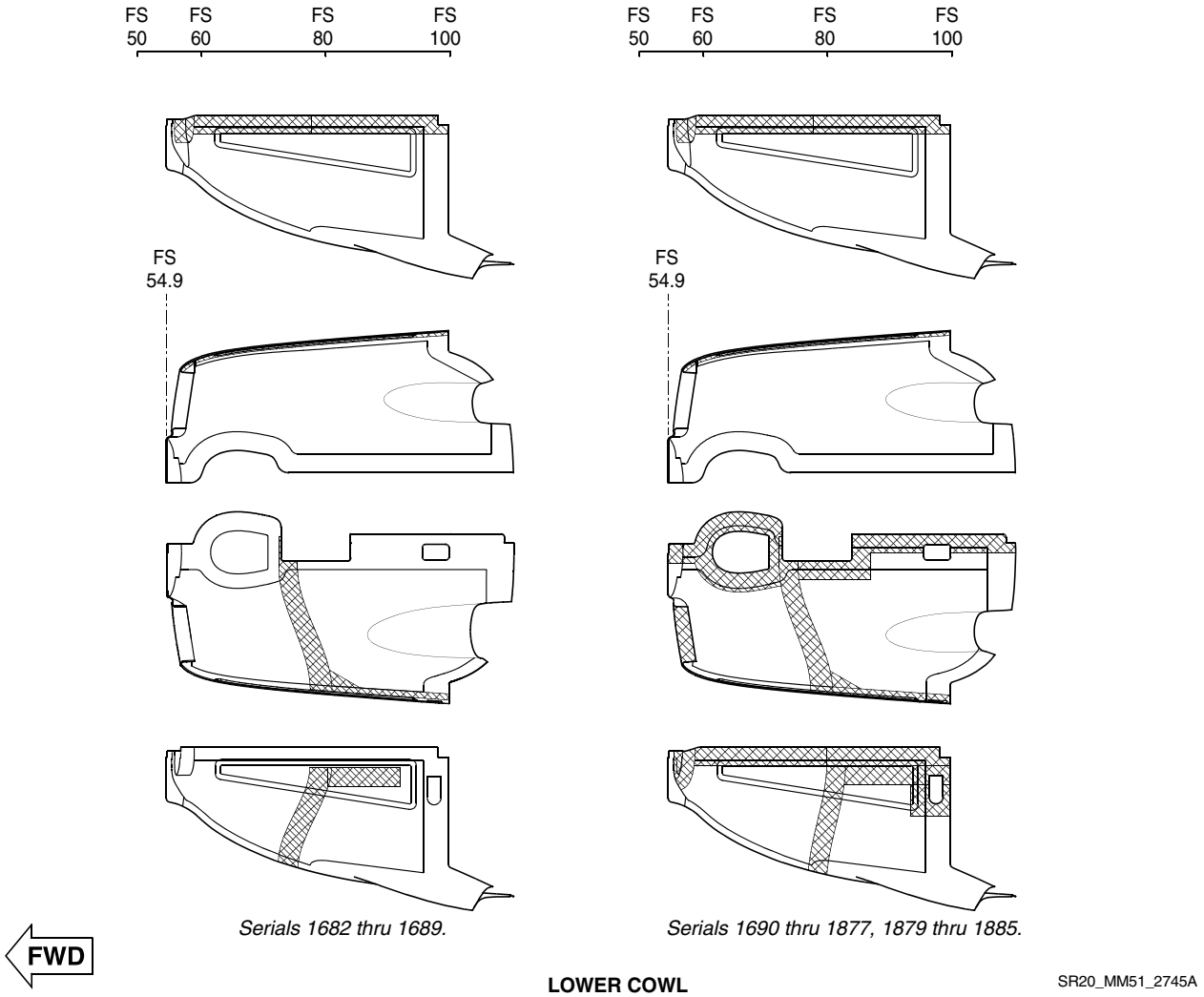


Figure 51-1024
Lower Engine Cowl - Serials 1682 thru 1885

Structure	Chk'd
General Condition	

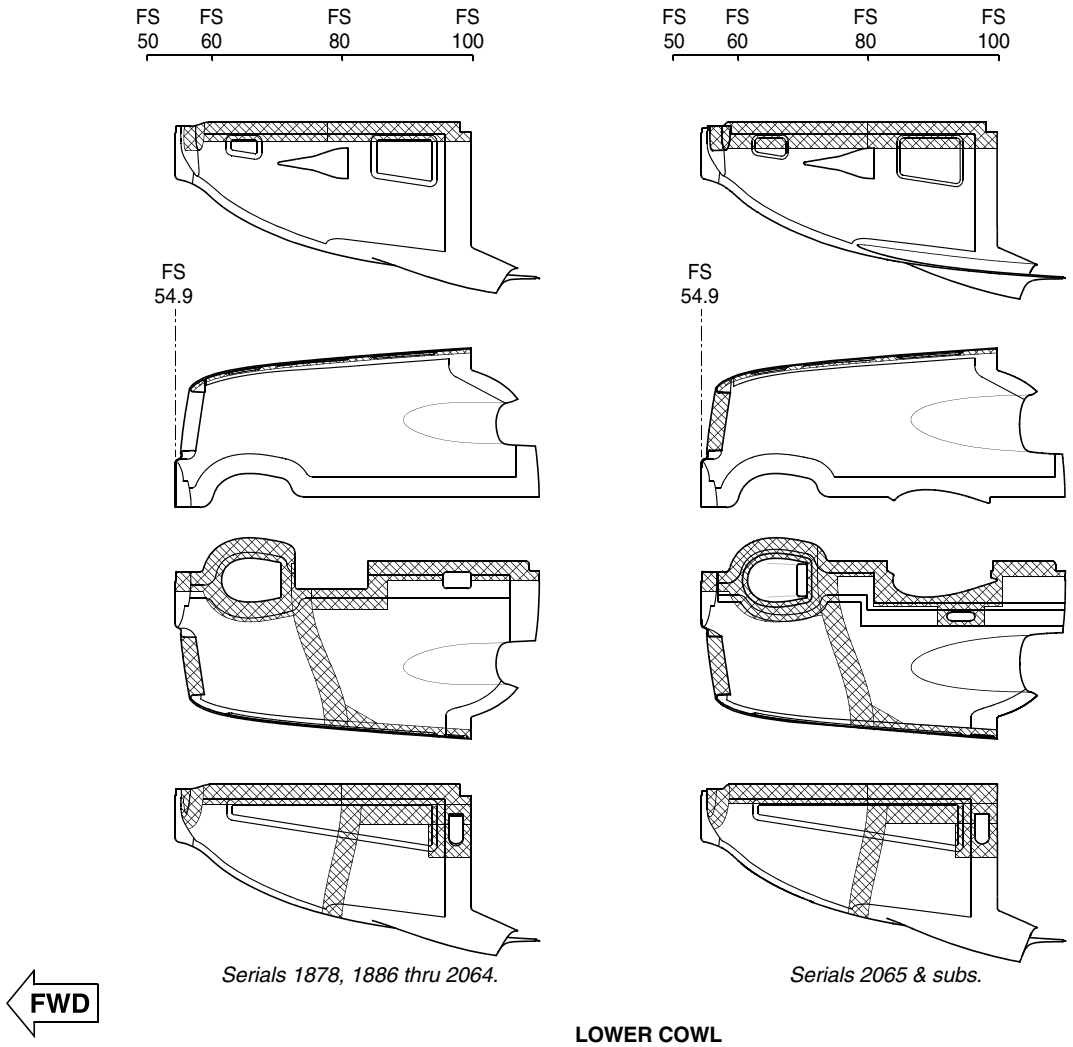
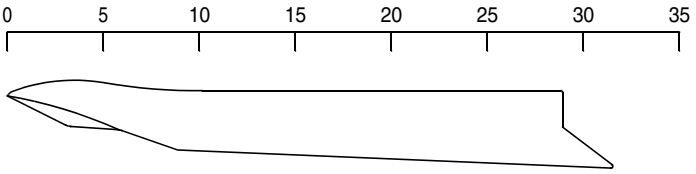
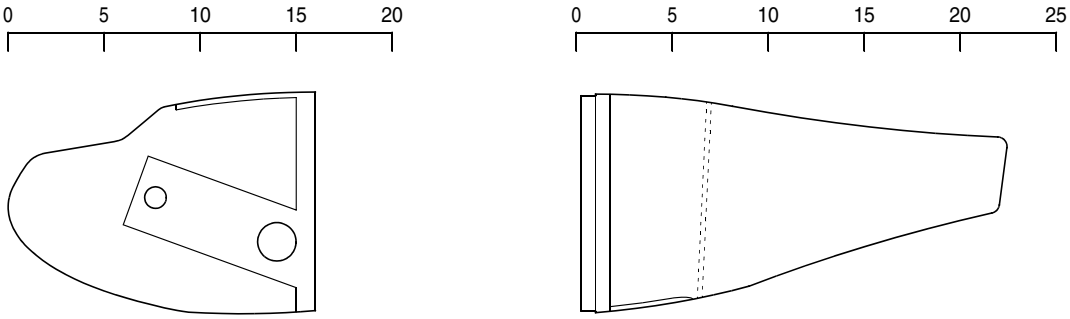


Figure 51-1025
Lower Engine Cowl - Serials 1886 & subs

Structure	Chk'd
General Condition	



NOSE GEAR FAIRING SIDE VIEW SHOWN



NOSE WHEEL PANT SIDE VIEW SHOWN



NOSE WHEEL PANT BOTTOM VIEW SHOWN

Serials 1005 thru 1424, 1431 thru 1475.

SR20_MM51_3138

Figure 51-1026
Nose Gear Fairing Installation - Serials 1005 thru 1424, 1431 thru 1475

Structure	Chk'd
General Condition	

EFFECTIVITY:
Serials 1005 thru 1424, 1431 thru 1475

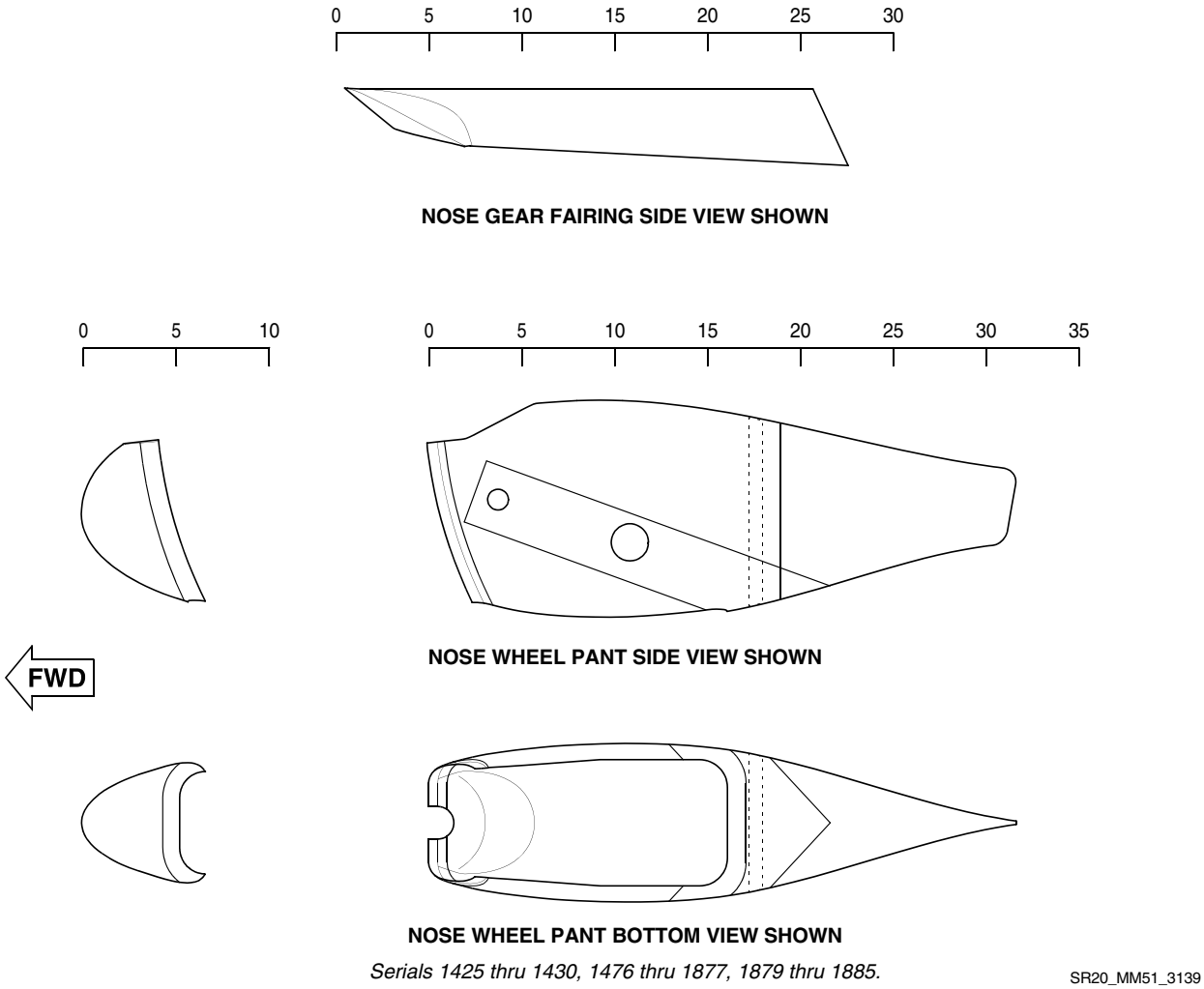


Figure 51-1027
Nose Gear Fairing Installation - Serials 1425 thru 1430, 1476 thru 1877, 1879 thru 1885

Structure	Chk'd
General Condition	

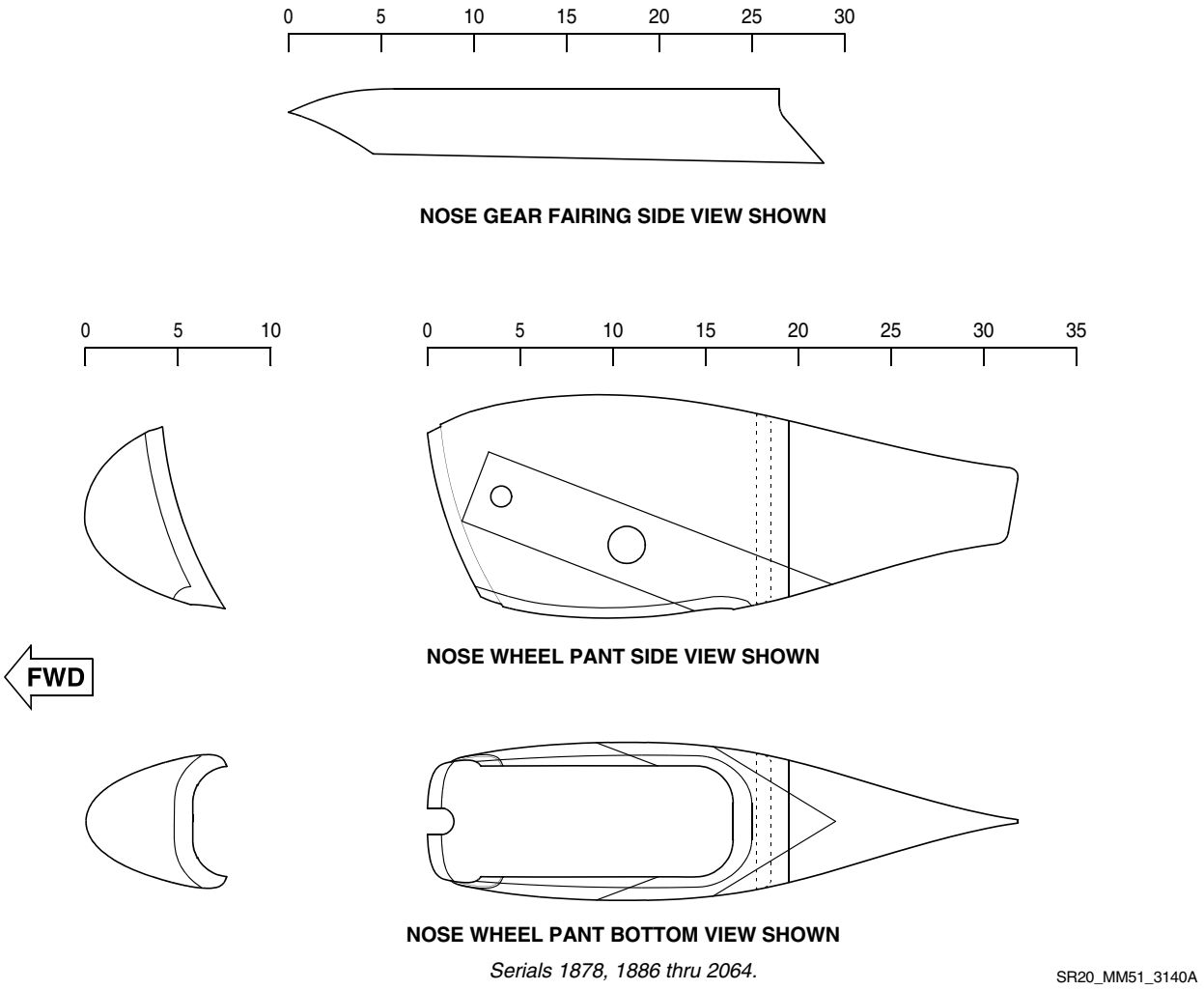


Figure 51-1028
Nose Gear Fairing Installation - Serials 1878, 1886 thru 2064

Structure	Chk'd
General Condition	

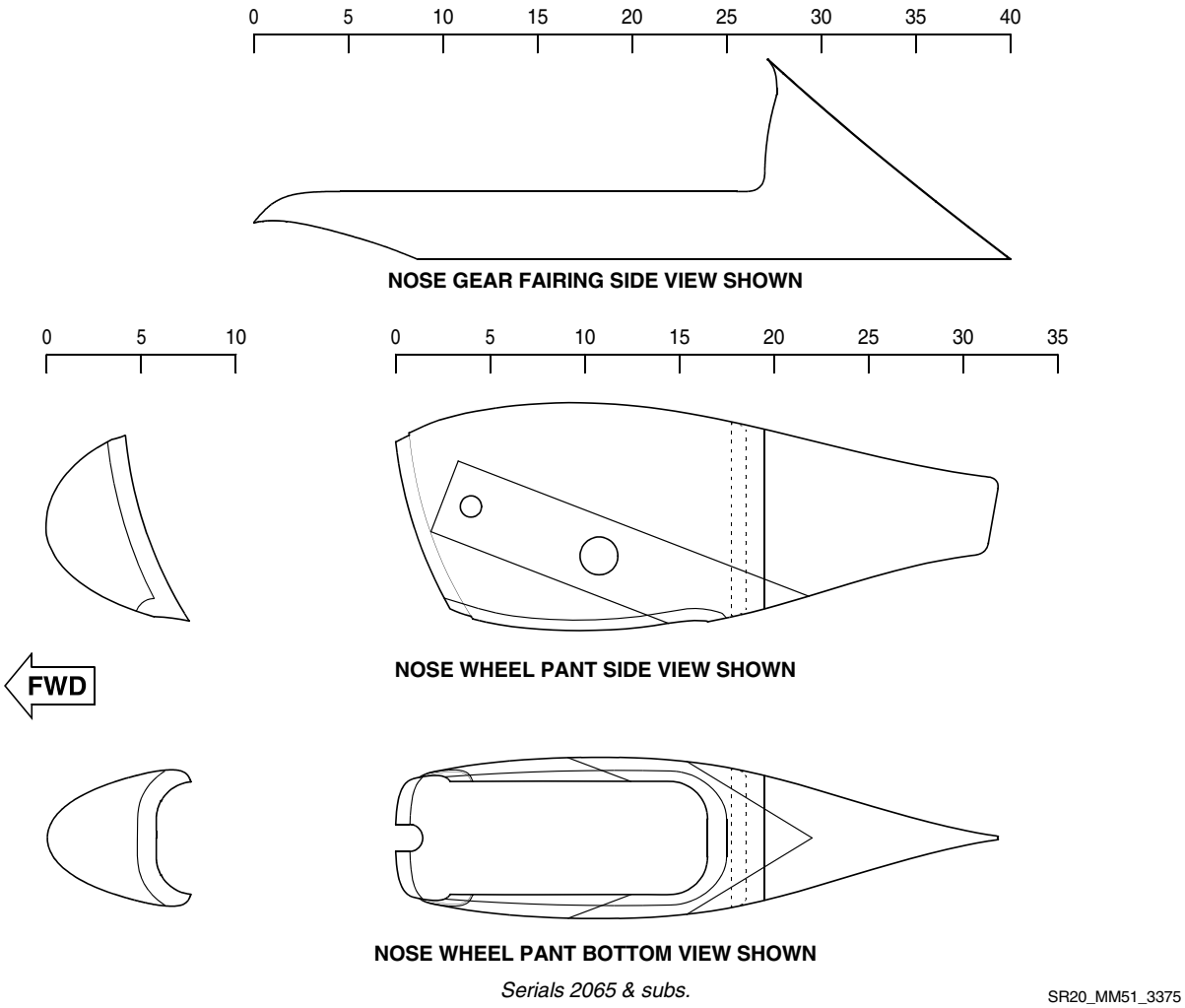
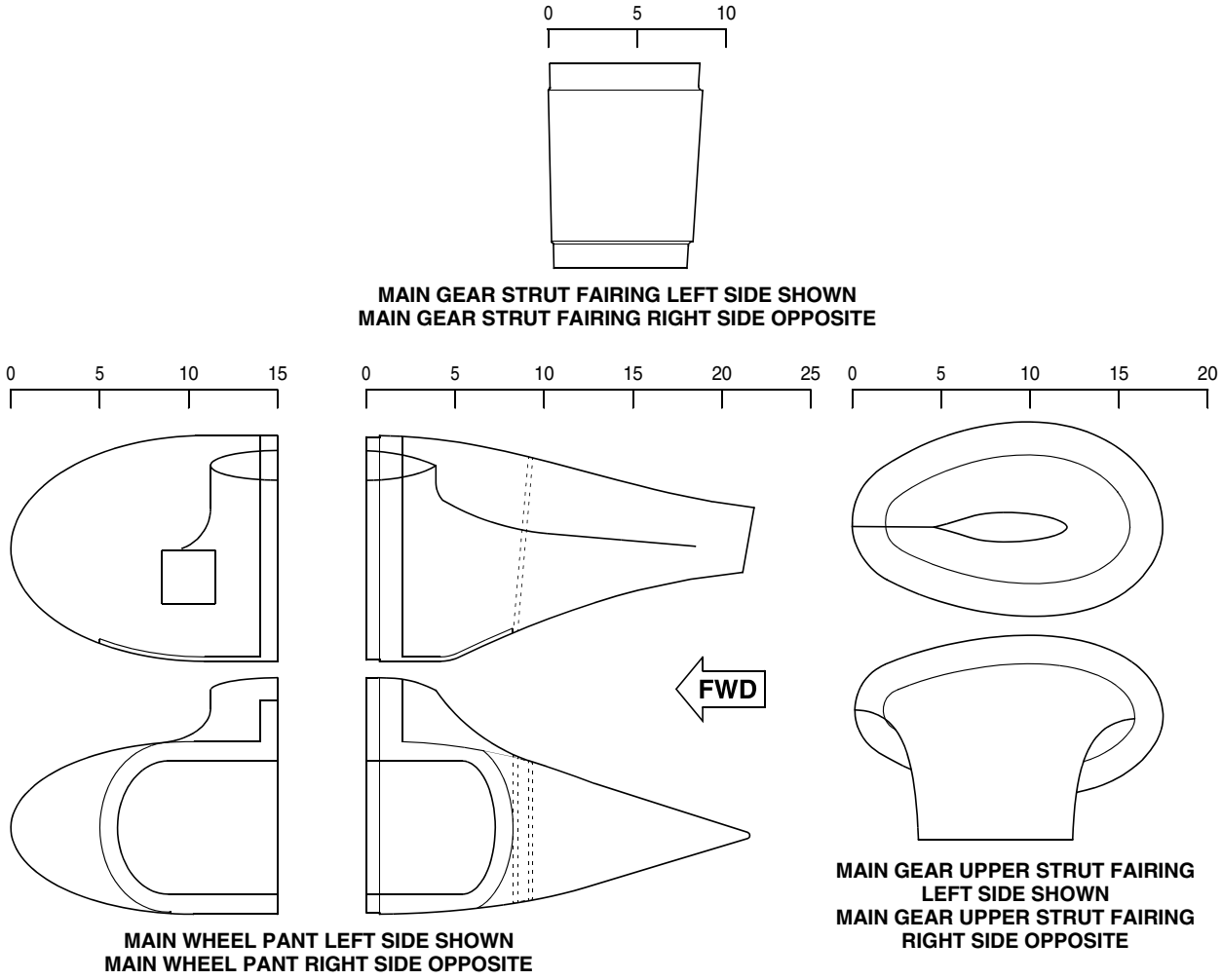


Figure 51-1029
Nose Gear Fairing Installation - Serials 2065 & subs

Structure	Chk'd
General Condition	



Serials 1005 thru 1137.

Figure 51-1030
Main Gear Fairing Installation - Serials 1005 thru 1137

Structure	Chk'd
General Condition	

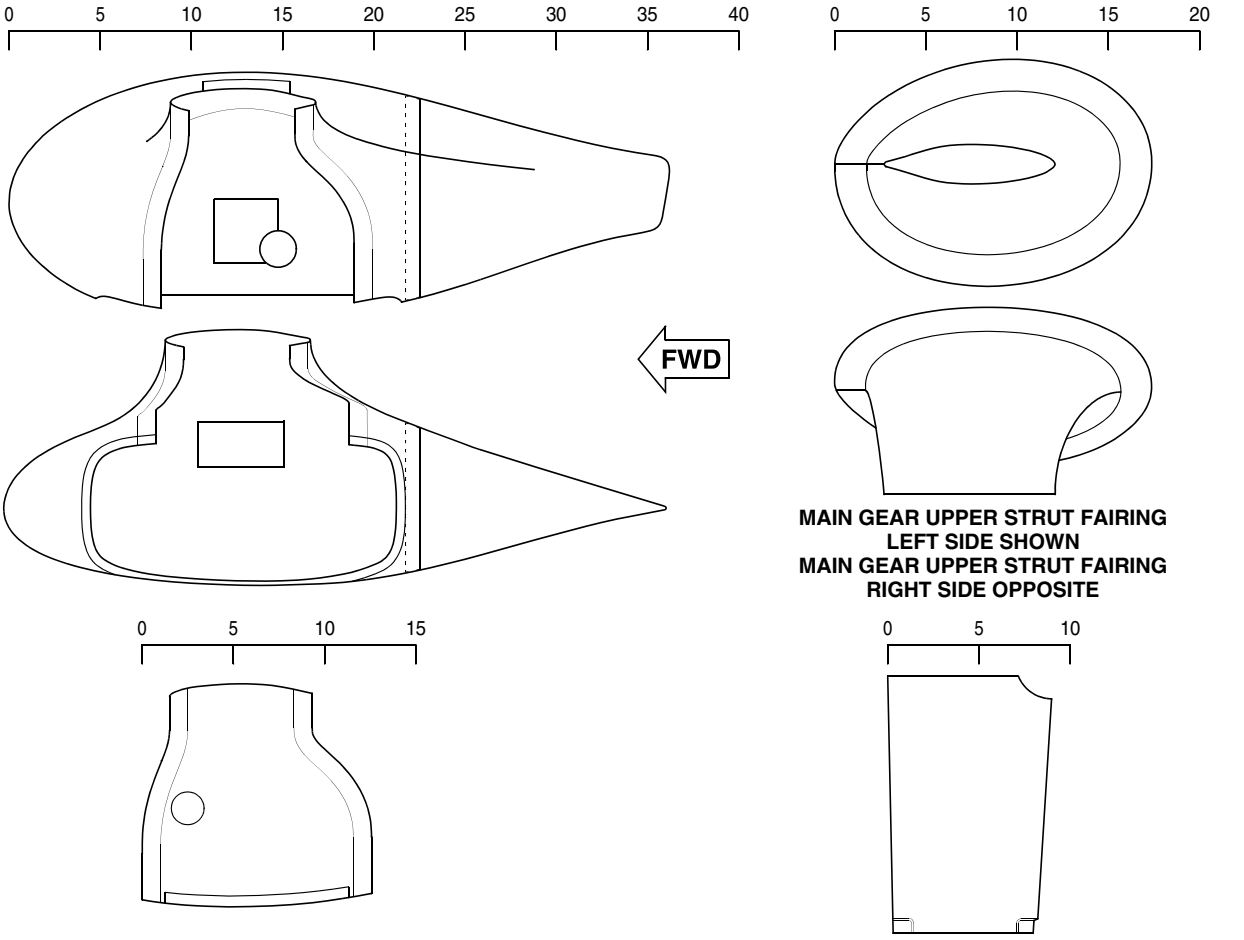


Figure 51-1031
Main Gear Fairing Installation - Serials 1138 thru 1877, 1879 thru 1885

Structure	Chk'd
General Condition	

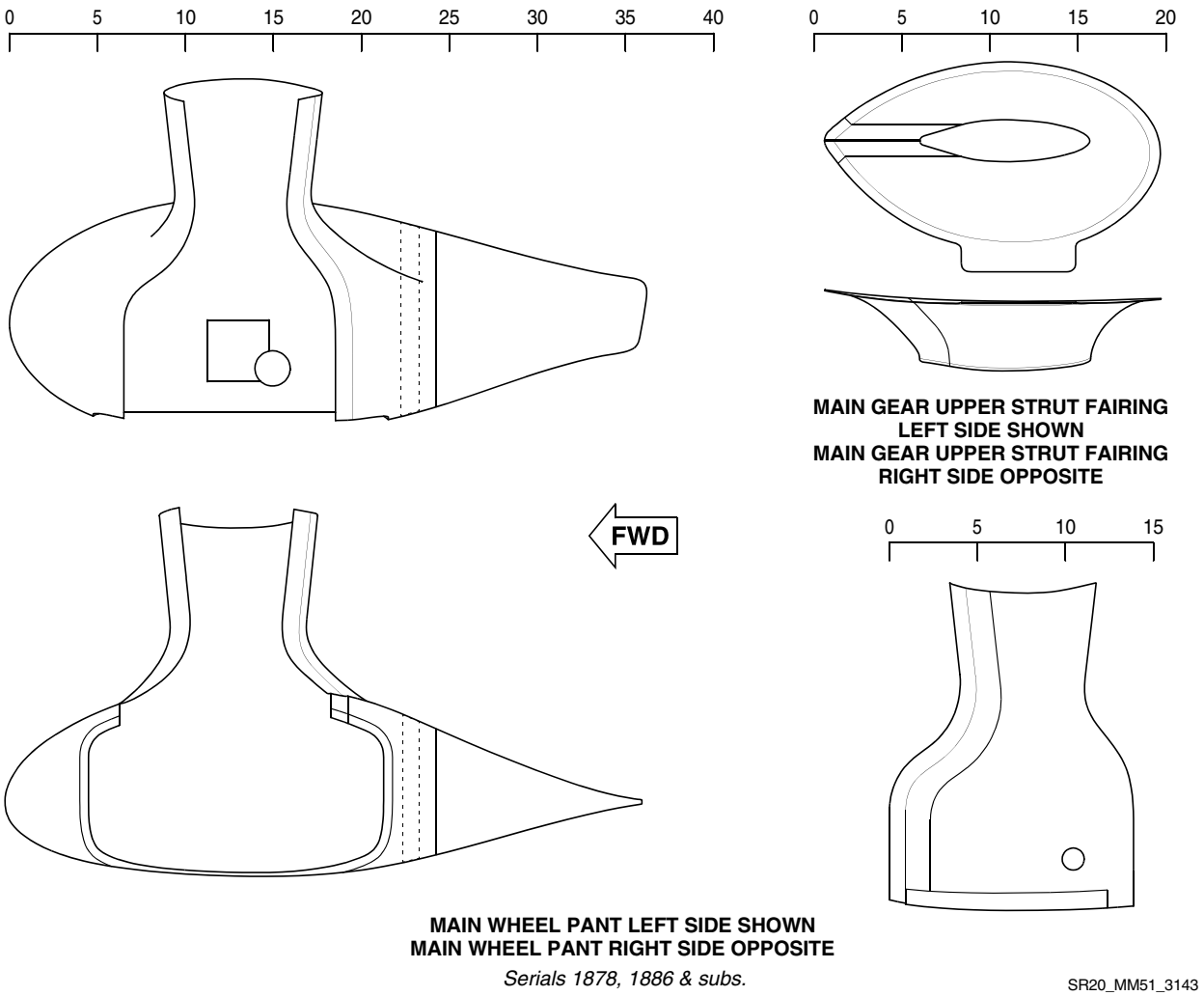
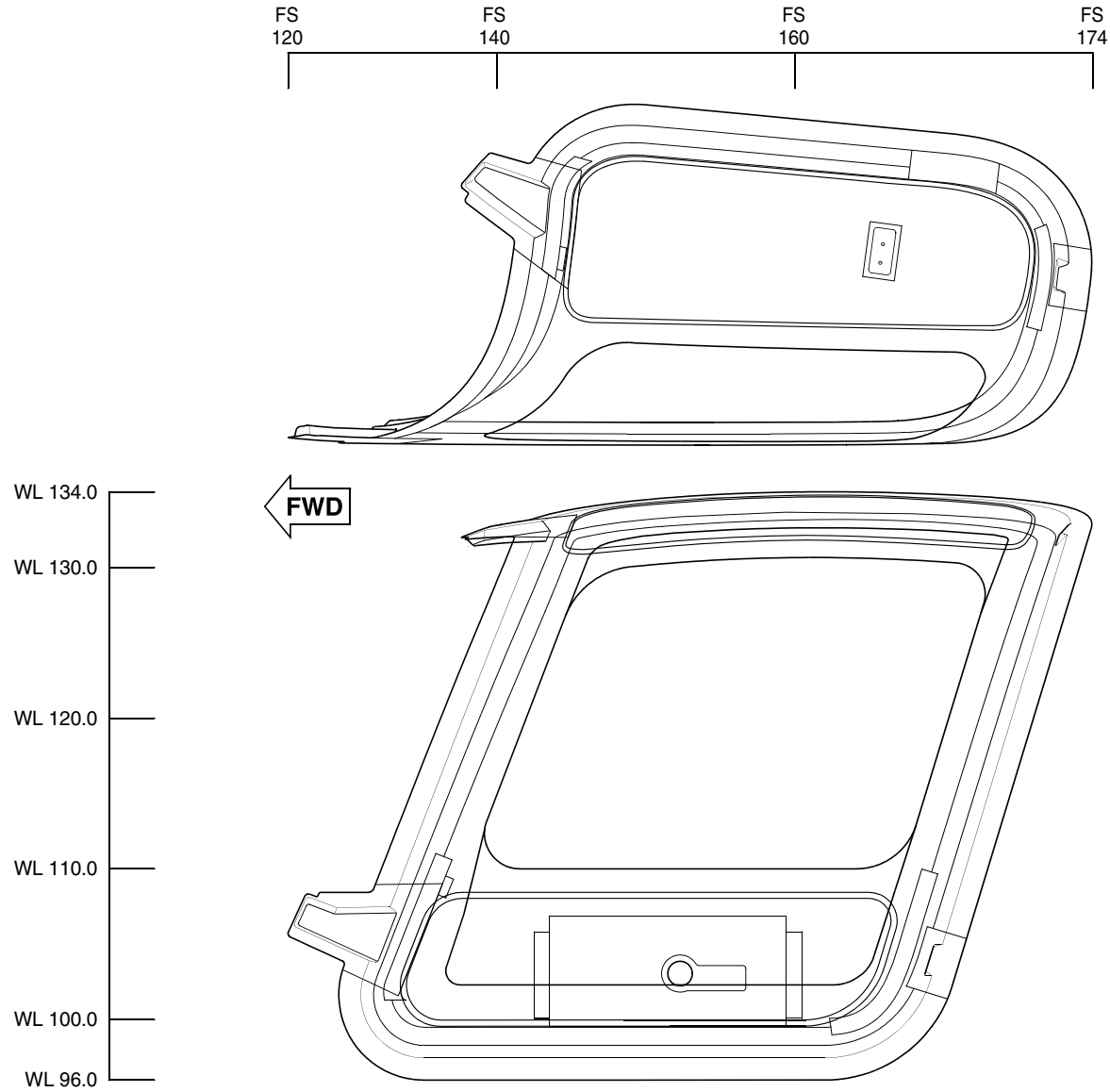


Figure 51-1032
Main Gear Fairing Installation - Serials 1878, 1886 & subs

Structure	Chk'd
General Condition	



CABIN DOOR OUTER SKIN
Serials 1005 thru 1422.

SR20_MM51_2365

Figure 51-1033
Doors - Serials 1005 thru 1422

Structure	Chk'd
General Condition	

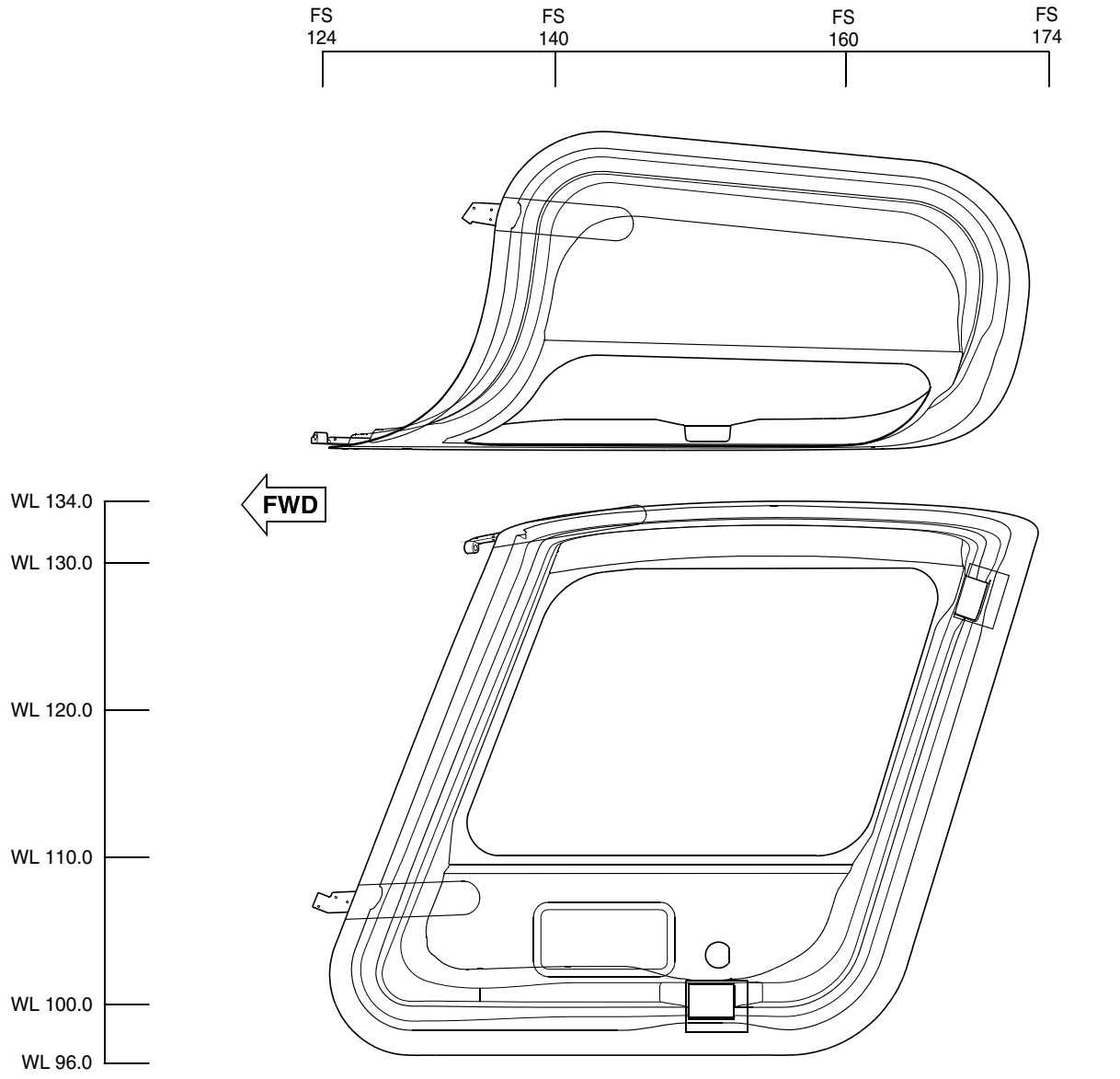
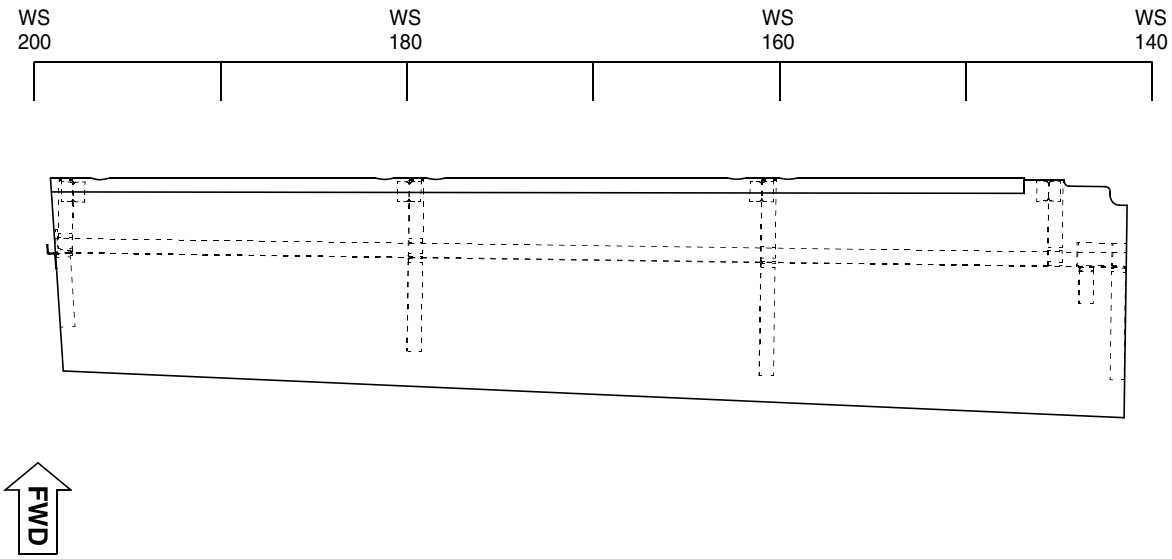


Figure 51-1034
Doors - Serials 1423 and subs

Structure	Chk'd
General Condition	

EFFECTIVITY:
Serials 1423 and subs



LEFT AILERON SHOWN
RIGHT AILERON OPPOSITE

SR20_MM51_2379

Figure 51-1035
Ailerons

Ailerons	×
General Condition	
Hinge Structure	
Attach Holes On Aileron Structure	
Attach Holes On Wing Structure	

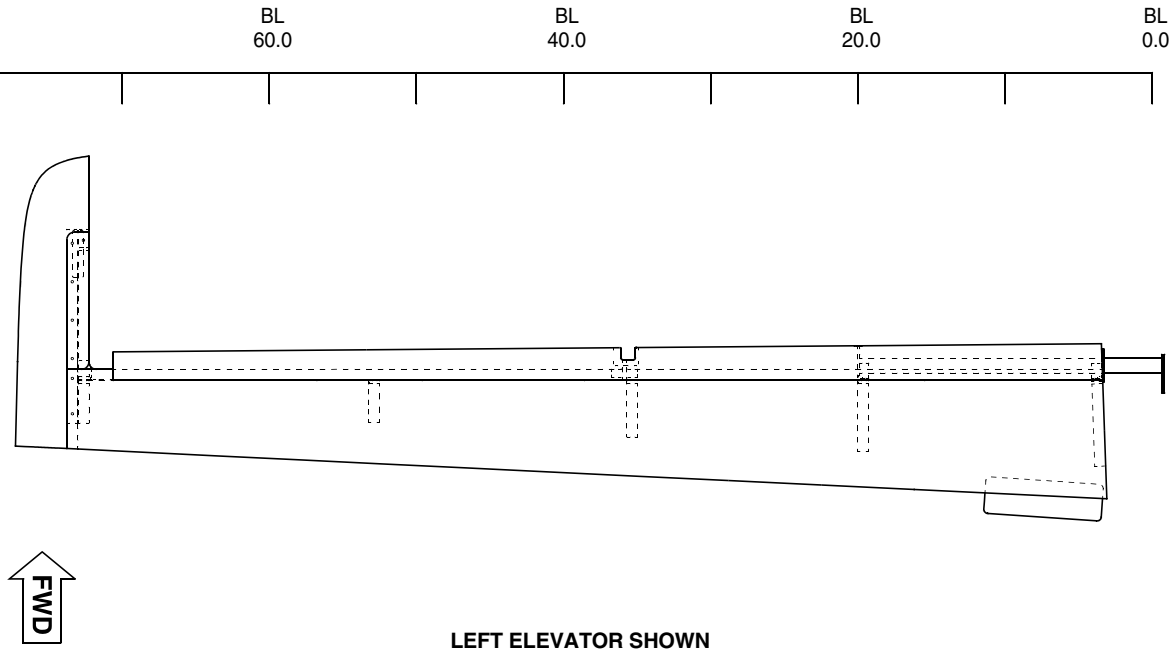


Figure 51-1036
Elevators

Elevators	×
General Condition	
Hinge Structure	
Attach Holes On Elevator Structure	
Attach Holes Horizontal Stab	

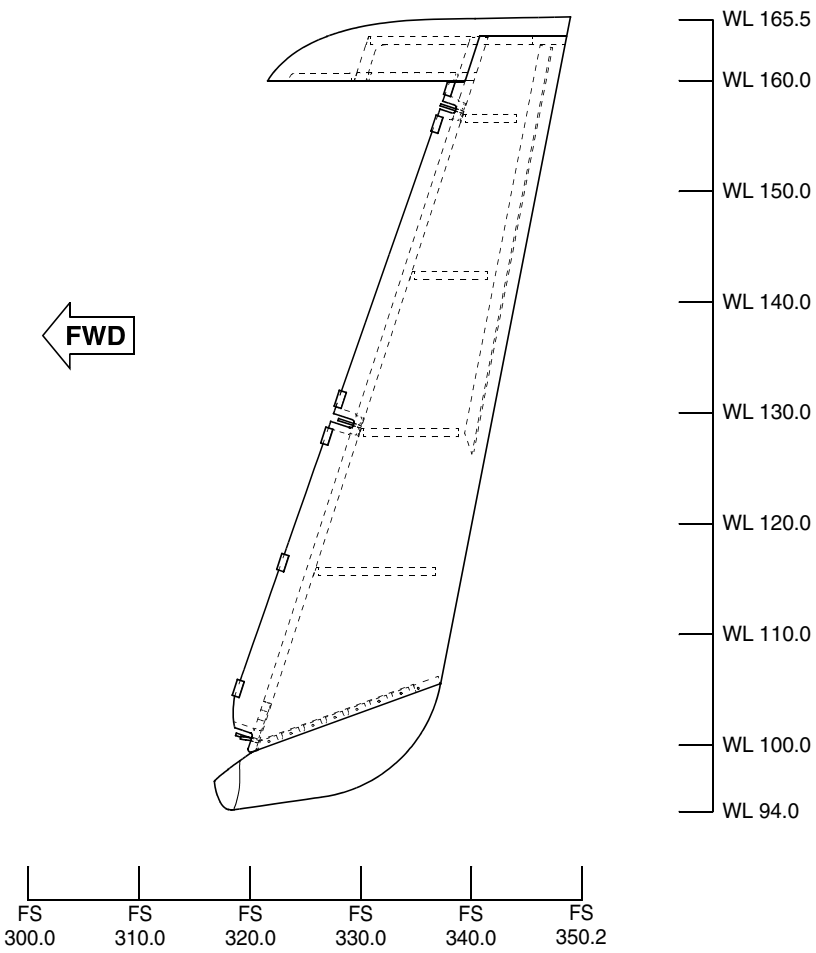
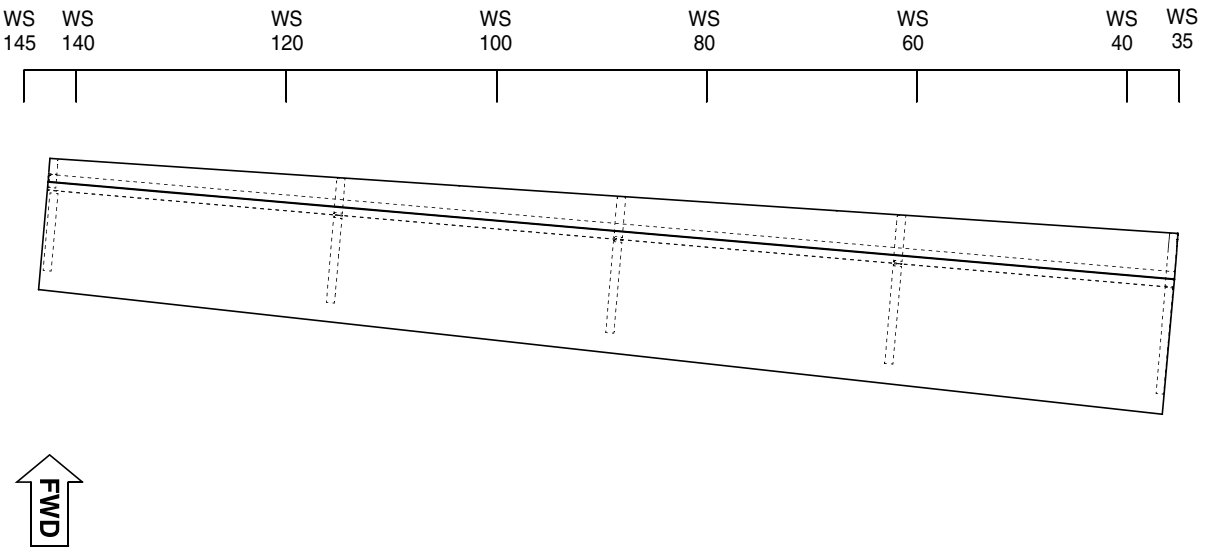


Figure 51-1037
Rudder

Rudder	×
General Condition	
Hinge Structure	
Attach Holes On Rudder Structure	
Attach Holes Fuselage/Vertical Stab	



LEFT FLAP SHOWN
RIGHT FLAP OPPOSITE

SR20_MM51_2381

Figure 51-1038
Flaps

Flaps	×
General Condition	
Hinge Structure	
Attach Holes On Flap Structure	
Attach Holes On Wing Structure	

PROCESSES

1. DESCRIPTION

This section provides guidance for repair processes used in Section 70 - Standard Repairs and other specific repairs found throughout the manual. (Refer to 51-70) In general, processes are organized by chronological order in the repair sequence; Repair Preparation, Repair Application, Cure Cycle, and Painting. Guidelines and requirements on proper repair environment and machining parameters are also discussed.

A. General Information and Requirements

Refer to Section 00 - Standard Practices: Structures for detailed information on personnel qualifications and safety information, construction methods, and Airframe Zone Diagrams. (Refer to 51-00)

Section 10 - Investigation, contains guidance for identification of damage, associated classifications and repairs, and damage reporting procedures. (Refer to 51-10)

Refer to Section 30 - Materials for a listing of all approved materials necessary to perform standard repairs. (Refer to 51-30)

Section 70 - Standard Repairs contains composite repair procedures that are used with the supporting processes outlined in Section 20. (Refer to 51-70)

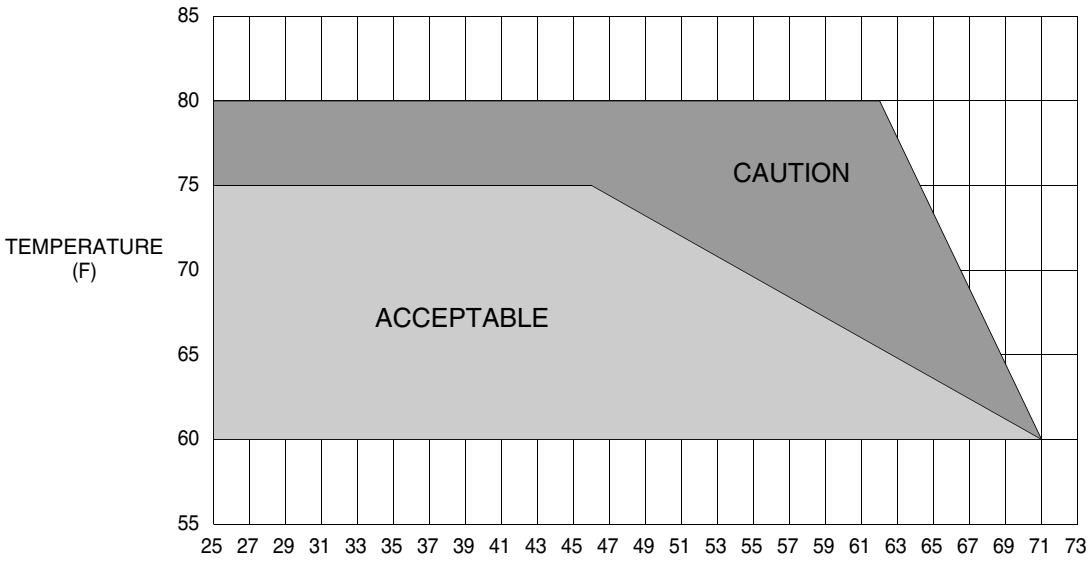
B. Repair Environment (See Figure 51-201)

The environment required for repairs depends upon the specific repair being made. A cosmetic repair can usually be made in an uncontrolled environment while more stringent conditions are required for minor and major repairs.

Heating, ventilating, and air conditioning are among the most important systems of the composite repair environment. Since repair processes involve the use of resins, adhesives and solvents, it is important that the work area has adequate ventilation to ensure a safe environment. Humidity and temperature control is also necessary to ensure the integrity of any repair carried out. Temperature and humidity recording equipment should be located in the area so that environmental conditions can be routinely checked.

Guidelines for a proper composite repair environment are:

- The area must be completely enclosed.
- Temperature and humidity must be controlled so that the minimum temperature is 60° F (16° C) with a corresponding relative humidity not greater than 71 percent and the maximum temperature is 75° F (24° C) with a corresponding relative humidity not greater than 46 percent.
- The area where surface cleaning of the laminates is done should be isolated from operations that generate dust, oil vapors, or other contaminants.
- The operation of fume-producing equipment and fuel-powered combustion engines should not be allowed. Battery-powered equipment is permitted.
- Machining or other dust-producing processes should not be allowed in the repair area once the repair of the damaged structure has been initiated.
- Protect all surrounding structures that may come in contact with adhesive prior to application procedures.
- Material specification must be referenced for specific adhesive application requirements.
- Composite parts must be handled with clean and powder free gloves prior to bonding.
- Discarded composite material is to be placed in an appropriate wrapping (e.g. polyethylene bag) and disposed of as industrial waste. Composite material must not be disposed of by incineration.



The Acceptable area is the standard storage and bonding environment. The Caution area indicates storage and bond operations may continue for a limited time under special procedures while measures are being taken to bring the environment back into the Acceptable area.

SR20_MM51_1817A

Figure 51-201
Temperature and Humidity Range for Composite Repair Environment

2. MAINTENANCE PRACTICES

A. Machining Parameters

Some repairs or installations may require drilling a hole into the composite surface of the airplane. The following guidelines should be used when drilling into composite structure.

(1) Drills (See Figure 51-202)

(a) Before drilling, verify path of drill bit is clear of any installed components, wire harnesses, or plumbing. When applicable, use a drill depth stop to avoid drilling deeper than necessary.

(b) When drilling over wires, wire harnesses or electronic equipment, cover area with plastic. Drill shavings can become lodged in wire bundles and wear through insulation, possibly causing electrical problems.

(c) Drilling into a composite surface can cause delamination and a possible loss of structural integrity. To minimize delamination, drill at a high RPM with a very sharp or new drill bit.

(d) Make sure that the hole is correctly aligned to the material surface. Control the drill by use of a suitable jig or bushed template.

(e) Avoid forcing the drill bit into the material. Apply steady pressure and allow the drill to do the work. The inner circumference of the drilled hole may be sealed with 5 minute epoxy.

(f) Prevent delamination and fiber damage on the exit face when drilling. Use back-up or break-out support material where possible.

(2) Drilling Technique

(a) Before drilling, verify path of drill bit is clear of any installed components, wire harnesses, or plumbing. When applicable, use a drill depth stop to avoid drilling deeper than necessary.

(b) Drilling into a composite surface can cause delamination and a possible loss of structural integrity. To minimize delamination, drill at a high RPM with a very sharp or new drill bit.

(c) Make sure that the hole is correctly aligned to the material surface. Control the drill by use of a suitable jig or bushed template.

(d) Avoid forcing the drill bit into the material. Apply steady pressure and allow the drill to do the work. The inner circumference of the drilled hole may be sealed with 5 minute epoxy.

(e) Prevent delamination and fiber damage on the exit face when drilling. Use back-up or break-out support material where possible.

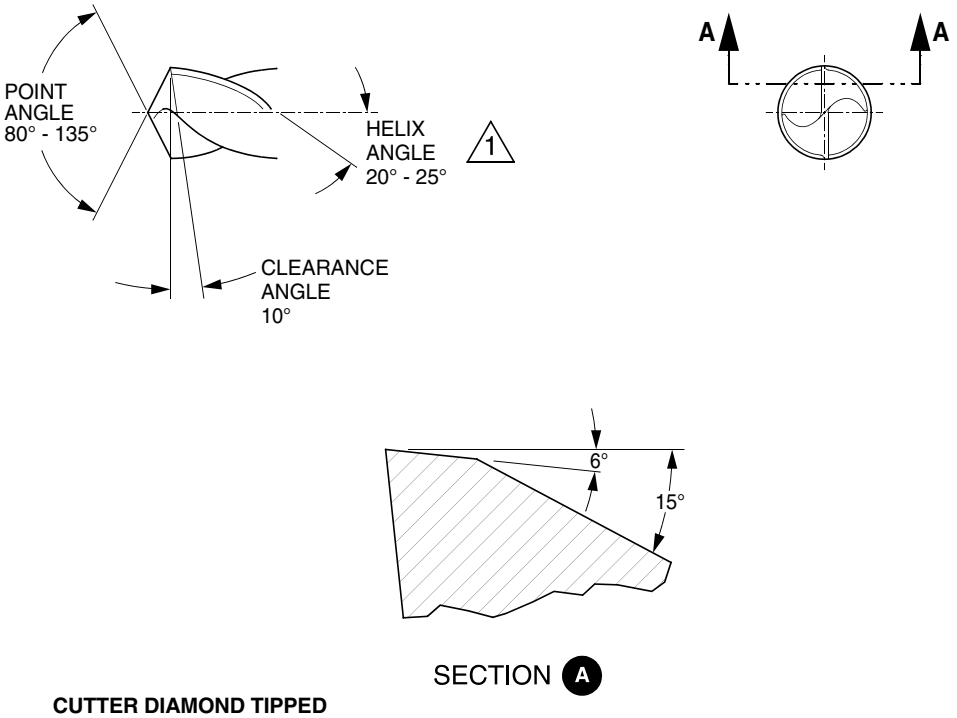
(f) Prevent delamination and fiber damage caused by overheating of the drill. Overheating of laminate is indicated by yellow or brown discoloration around perimeter of hole.

B. Metal Components - Corrosion Removal and Control

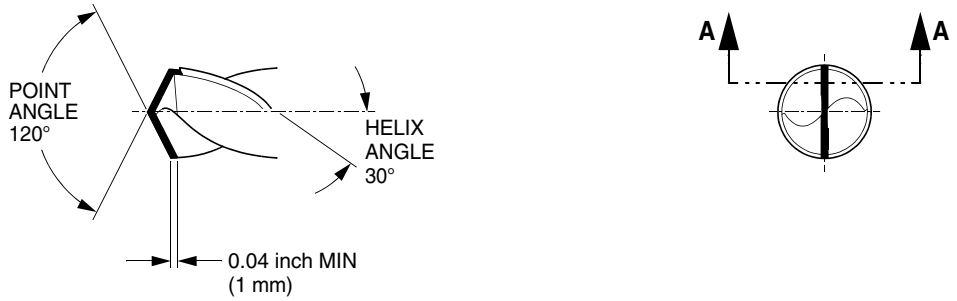
All corrosion products must be removed prior to refinishing. If they are not removed, corrosion will begin again, even though the affected area is refinished.

Contact Cirrus Design for disposition. (Refer to AMM-Intro-)

CARBIDE OR CARBIDE TIPPED



CUTTER DIAMOND TIPPED



Tool	Cutter Material	Feed Range
Countersink	Carbide	Speed feed: 0.16 - 0.66 ft/min (0.05 - 0.2 m/min) Drill speed: 800 - 1200 rpm
	Diamond tipped	Speed feed: 0.33 - 0.98 ft/min (0.1 - 0.3 m/min) Drill speed: 1200 - 2400 rpm
Router bit	Carbide or diamond tipped	Speed range: 492 - 1640 ft/min (150 - 500 m/min) Feed range: dependent on cutting depth

NOTE

1 The helix angle shall be maintained through the insert to the drill point by carbide tipped drills.

SR22_MM51_2143

Figure 51-202
Drill Specifications

C. Repair Preparation

(1) Surface Protection Removal

This procedure is used only is to remove the paint, primer, and filler partially or completely to the underlying composite necessary for damage assessment or cosmetic repair. Refer to Procedure - Repair Surface Preparation for abrasion steps necessary for lamination repair. (Refer to 51-20)

CAUTION: Do not use chemical strippers to remove surface protection. Chemical strippers may leave a residue and breakdown the epoxy resin.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vacuum	-	Any Source	Cleaning.
Sanding Pad	-	Any Source	Abrasion.
Emery Cloth (paint removal only)	120- 240 grade	Any Source	Abrasion.
Aluminum Oxide Paper (primer and filler removal)	80-120 grade	Any Source	Abrasion.

(b) Solvent clean repair area. (Refer to 20-30)

(c) Remove surface protection by abrasion. (Refer to 51-20)

CAUTION: If Expanded Metal Mesh (EMM) is encountered when removing surface protection, use care not to sand EMM after it becomes shiny. The EMM is very thin and can easily be sanded through.

1 For paint removal only, lightly sand surface with emery cloth until the layer of primer is exposed.

2 For primer and paint removal, sand surface until the laminate is exposed. For hand sanding, use 120- 240 grade emery cloth. If sanding with orbital sander, use 80-120 grade aluminum oxide paper.

(2) Damage Removal

The strength of a composite repair relies upon the integrity of the undamaged and uncontaminated supporting material. It is importance that repair surface preparation is carried out to a high standard to ensure good repair integrity. All damaged structure and other contaminants must be removed from the composite laminate before repair the can be started.

Glass fiber composites can be removed by hand or through the use of various rotary tools. To maintain tool life, carbide or diamond cutting edges are recommended.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Paint Brush	-	Any Source	Cleaning.
Vacuum	-	Any Source	Cleaning.
Utility Knife	-	Any Source	Damage removal.
Rotary Tool	-	Any Source	Damage removal.

Description	P/N or Spec.	Supplier	Purpose
90° Die Grinder	-	Any Source	Damage removal.
Orbital Sander	-	Any Source	Abrasion.

(b) Using brush and vacuum, thoroughly remove any loose contaminants from repair area.

(c) Mark the outline of the extent of the damage and the area of surface protection to be removed.

(d) Remove surface protection from the damage area. (Refer to 51-20)

CAUTION: Remove the minimum amount of undamaged and uncontaminated supporting material. If questions on appropriate damage removal exist, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(e) If performing a Sandwich Structure Replacement:

CAUTION: Minimum overlap is 1.0 inch (2.54 cm). If laminate is 4-ply or greater, maximum overlap is 2.0 inch (5.08 cm). Laminate less than 2-ply is too thin for this repair.

1 Using putty knife, remove enough core to expose a border of undamaged inner laminate 0.5 inch (1.3 cm) wide minimum for each ply of the repair. For example: A 3-ply damaged laminate would be trimmed back 1.5 inches (3.8 cm) minimum.

2 Sand off residual core from the surface of the inner laminate. Be careful not to cause separation between core and inner laminate during this operation.

3 Inspect for separation of the inner laminate from the core. Continue to sand back until all separated laminate is removed.

(f) If applicable, Remove EMM:

CAUTION: Exercise great care while removing EMM. Abrasive materials can quickly cut through EMM, damaging underlying fiberglass plies.

Avoid operating the removal tool at high speeds, excessively tilting the tool, or leaving the tool in the same area for more than a few seconds. Use slower tool speeds combined with a flatter edgeless operation to cause the EMM to disbond from the laminate surface without damaging underlying fiberglass plies. Move the tool frequently to visually ensure no damage occurs during the removal process.

1 Using rotary tool or orbital sander, gently abrade the EMM surface.

2 As outer resin coat is abraded, the EMM with become polished and begin to blister.

3 Once blistered, remove EMM with a utility knife.

(g) Remove damaged material using a utility knife, rotary tool, or die grinder with depth gauges installed when applicable.

(3) Determining Ply Count

Ply count refers to the number of plies in a given thickness of unfinished laminate. To determine ply count, measure the thickness of undamaged, unpainted laminate in a area adjacent to the repair area then verify by comparing the measurement to the ply lay-up tables in the Airframe Zone Diagrams. (Refer to 51-00)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Micrometer	-	Any Source	Measurement.

(b) Remove surface protection from section of repair area. (Refer to 51-20)

(c) Solvent clean repair area. (Refer to 20-30)

Note: The thickness of one ply is 0.008 - 0.010 inch (0.203 - 0.254 mm). To verify, or if no value is found in the ply lay-up tables, determine ply count by dividing measured laminate thickness by 0.009 inch (0.229 mm).

(d) Using a micrometer, measure the thickness of undamaged, unpainted laminate in an area adjacent to the repair area.

(e) For partially penetrated damage:

1 Using a micrometer, measure the thickness of damaged laminate in the repair area.

2 Determine number of damaged plies by subtracting thickness of damaged laminate from undamaged laminate.

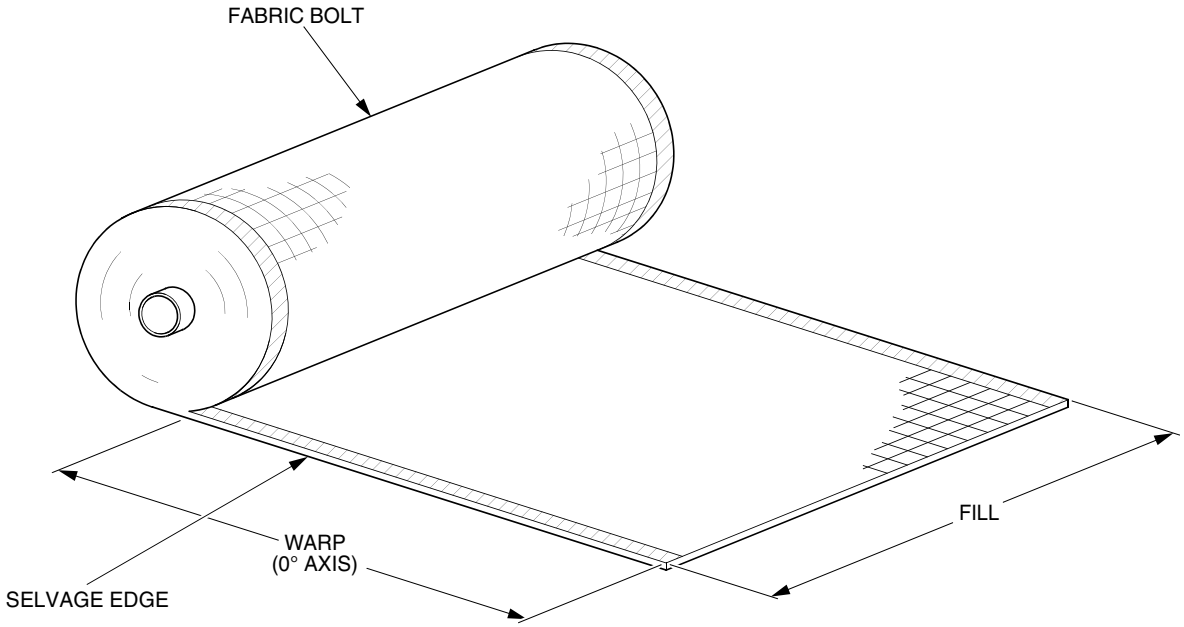
(f) Reference the ply lay-up tables in the Airframe Zone Diagrams, to verify the number of plies. (Refer to 51-00)

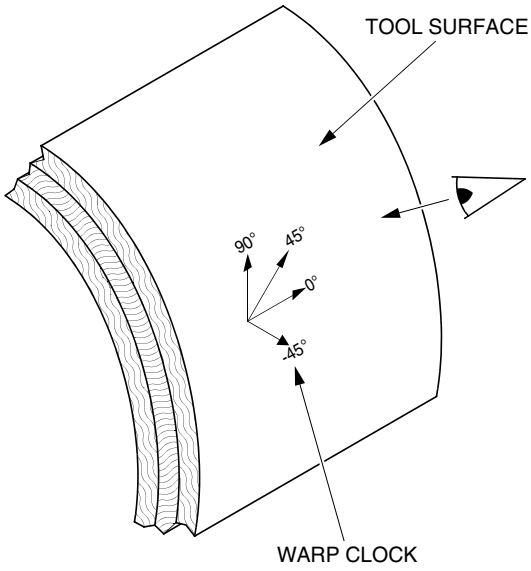
(4) Determining Ply Orientation (See Figure 51-203)

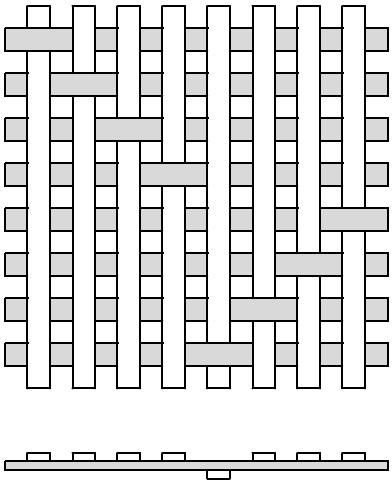
The glass-fabric used for repair on this airplane is Hexcel 7781. This fabric is considered a balanced cloth because approximately 50% of the fibers run parallel to warp, and approximately 50% run perpendicular to warp. Fibers that run parallel to the selvage edge have a fiber orientation of 0°. The warp clock, located on each of the Airframe Zone Diagrams, is used to determine ply orientation by indicating how the – and + angled plies are defined. The warp clock is always viewed from the outside of the fuselage, or the tool surface, looking in. (Refer to 51-00)

Generally, the +0° axis is parallel to the ground and/or centerline of the fuselage. For example, the main spar runs perpendicular to the 0° axis. The 90° axis is always perpendicular to the 0° axis. The 45° axis is located by moving clockwise from 0° to 90°.

Once ply orientation is determined, it is permissible to mark the warp axis on the repair fabric with a permanent marker.







SPECIAL BALANCED FIBERGLASS TYPE 7781

SR20_MM51_1190A

Figure 51-203
Determining Ply Orientation

(5) Repair Surface Preparation

Generally, hand-sanding or a orbital type sander are the preferred methods of repair surface preparation. Care must be exercised not to apply excessive pressure on the sander, which could tear into the laminate. The grade of sanding paper is to be chosen to suit and give a smooth finish. Do not use grinders, air files, or other single-action tools as they tend to intensify pressure and will rapidly remove paint and damage the underlying laminate.

To facilitate proper sanding depth and surface coverage, marking the composite repair area with a permanent maker to act as a depth tracer is recommended.

Remove dust and observe laminate surface frequently during the sanding procedure. If fiber damage is apparent, stop sanding and repair the damaged area. When preparing peel ply surfaces, sand surface until the impression left from the peel ply is no longer visible. When preparing surfaces where no peel ply was present, such as barrier film, sand surface until no gloss is visible. Replace or clean sandpaper often.

The repair surface must be free of EMM in an area equal to the size and shape of the largest repair ply plus 0.5".

CAUTION: Do not use chemical strippers to remove surface protection. Chemical strippers may leave a residue and breakdown the epoxy resin.

Note: To prevent possible re-contamination of the repair area, the repair must be done immediately following repair surface preparation.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tape	-	Any Source	Masking.
Paper	-	Any Source	Masking.
Vacuum	-	Any Source	Cleaning.
Paint Brush	-	Any Source	Cleaning.
Permanent Marker	(Refer to 51-30)	(Refer to 51-30)	Depth tracer.
Sanding Pad	-	Any Source	Abrasion.
Aluminum Oxide Paper (hand sanding)	60 to 80 grade	Any Source	Abrasion.
Orbital Sander	-	Any Source	Abrasion.
Aluminum Oxide Paper (orbital sander)	120 to 180 grade	Any Source	Abrasion.

(b) Remove damage from repair area. (Refer to 51-20)

(c) Determine warp axis and draw 0° reference line so it intersects the center of the damage. This line will later be used for positioning repair plies.

(d) Mask off area surrounding repair with masking tape and paper. This area should include the intended faying surface area plus at least 2 inches (50 mm).

(e) If applicable, install backing plate. (Refer to 51-20)

(f) For secondary bond damage, sand repair area:

1 Define sanding area with marker and fill area with a cross-hatch of other random pattern. Allow a short drying period before sanding until depth tracer is dry to the touch.

2 Sand repair area in a random pattern until depth tracer is gone. Frequently clean repair surface of contaminants using vacuum and paint brush.

(g) For sandwich penetration damage requiring foam core replacement, replace foam core. (Refer to 51-20)

(h) For sandwich penetration damage requiring sandwich structure replacement, replace section. (Refer to 51-20)

(i) For solid laminate and composite sandwich structure, sand repair area:

1 Define sanding area with marker.

Note: Laminate that is 2-ply or less does not require a taper.

2 Sand repair area in a random pattern so that face of damaged laminate tapers to a 1:50 ratio (i.e., taper length is 50 times the thickness of the laminate). Frequently clean repair surface of contaminants using vacuum and paint brush.

(j) If applicable, prepare Expanded Metal Mesh (EMM) surface:

CAUTION: Do not sand EMM after it becomes shiny. EMM is very thin and can easily be sanded through.

1 At perimeter of EMM, use 80 grade sand paper or finer to lightly sand existing EMM until shiny.

2 Prepare perimeter of existing EMM so that replacement EMM overlaps existing EMM by at least 0.2 inch (5.0 mm). (Refer to 51-20)

(k) Solvent clean repair area. (Refer to 20-30)

(l) Dry repair area. (Refer to 51-20)

(6) Repair Ply Construction (See Figure 51-204)

After the extent of damage is determined, repair plies may be made. A template is used to assist in cutting the correct shape and size of glass-fabric. Release film or clear plastic sheet may be used for template construction.

Once the template is made, glass-fiber cloth can be cut. Use clean, sharp scissors or a razor knife. Dull tools will catch and pull fibers, distorting the fabric. To reduce the likelihood of stress risers developing post repair, round the edges of the repair plies when cutting. Exercise caution when cutting and handling the glass-fiber cloth to maintain fiber orientation. Do not handle glass-fabric materials with bare hands.

When three or less repair plies are required, a 1.0 inch (2.5 cm) minimum overlap of all repair plies is required. When more than three repair plies are required, a 0.5 inch (1.3 cm) minimum initial overlap is required along with each subsequent ply extending 0.5 inch (1.3 cm) minimum beyond the previous plies.

It is difficult to determine the fiber orientation of a piece of cloth once the selvage edge has been removed. If the selvage edge is unknown the fabric must be discarded. When cutting plies, hold template against the fabric as this will reduce the chance of distorting the material. Ensure template is positioned in the proper orientation. The template should be kept with the repair ply.

To determine number of repair plies to prepare, reference the ply lay-up tables in the Airframe Zone Diagrams. (Refer to 51-00) If no repair ply quantity is shown, always prepare and install twice as many repair plies as original lay-up in order to ensure that original strength is achieved.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape	-	Any Source	Template fabrication.
Plastic Sheet	-	Any Source	Template fabrication.
Permanent Marker	(Refer to 51-30)	(Refer to 51-30)	Template fabrication.
Scissors	-	Any Source	Cutting.
Glass Fiber Cloth	(Refer to 51-30)	(Refer to 51-30)	Ply construction.

(b) Prepare repair surface. (Refer to 51-20)

(c) Construct template as follows:

1 Referencing ply lay-up tables in the Airframe Zone Diagrams, determine number of repair plies necessary for repair. (Refer to 51-00)

2 Tape plastic sheet over damaged area.

3 Center, offset, and draw perimeter line on plastic 1.0 inch (2.5 cm) from the inside edge of damage. This is the dimension of the first and smallest repair ply.

4 Center, offset, and draw another perimeter line 0.5 - 1.0 inch (1.3 - 2.5 cm) from the existing line. This is the dimension of the next repair ply.

5 Repeat above steps for each subsequent repair ply.

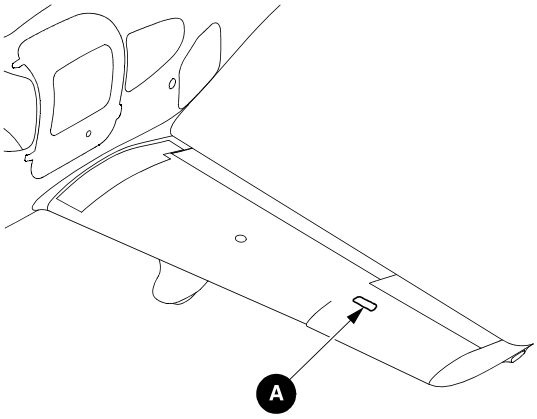
6 Label template boxes with correct ply orientation for later reference. (Refer to 51-20)

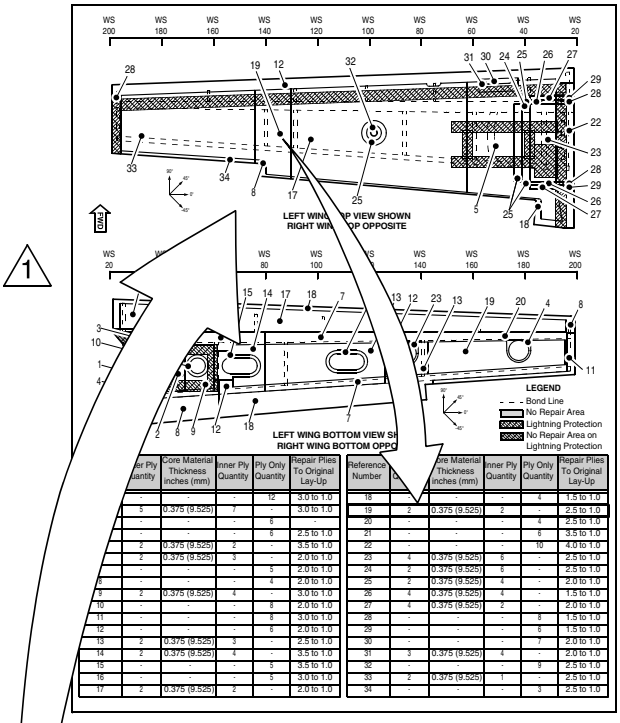
(d) Cut repair plies as follows:

1 Place fabric on a contaminate-free cutting surface.

2 Position and orient template on fabric.

3 Cut fabric to the same dimension as template.





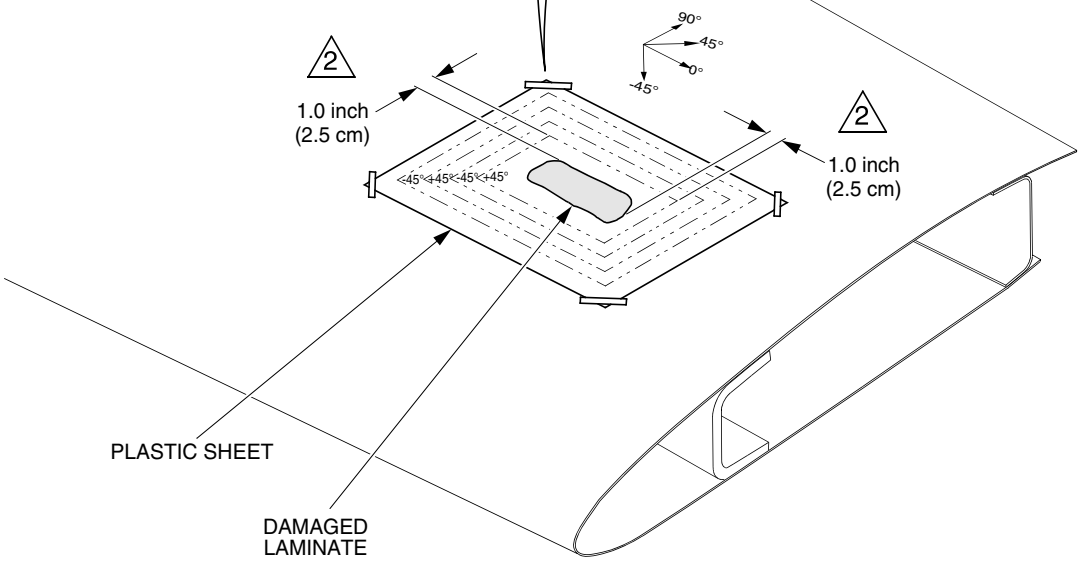
Reference Number	Inner Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
1	-	-	-	12	3.0 to 1.0
2	5	0.375 (9.525)	7	-	3.0 to 1.0
3	-	-	-	6	-
4	-	-	-	6	2.5 to 1.5
5	2	0.375 (9.525)	2	-	3.5 to 1.0
6	2	0.375 (9.525)	3	-	2.0 to 1.0
7	-	-	-	5	2.0 to 1.0
8	-	-	-	4	2.0 to 1.0
9	2	0.375 (9.525)	4	-	3.0 to 1.0
10	-	-	-	8	2.0 to 1.0
11	-	-	-	8	3.0 to 1.5
12	-	-	-	6	2.0 to 1.0
13	2	0.375 (9.525)	3	-	2.5 to 1.0
14	2	0.375 (9.525)	4	-	3.5 to 1.0
15	-	-	-	5	3.5 to 1.0
16	-	-	-	5	3.0 to 1.0
17	2	0.375 (9.525)	2	-	2.0 to 1.0

Reference Number	Inner Ply Quantity	Core Material Thickness inches (mm)	Inner Ply Quantity	Ply Only Quantity	Repair Plies To Original Lay-Up
18	-	-	-	4	1.5 to 1.0
19	2	0.375 (9.525)	2	-	2.5 to 1.0
20	-	-	-	4	2.5 to 1.0
21	-	-	-	6	3.5 to 1.0
22	-	-	-	10	4.0 to 1.0
23	4	0.375 (9.525)	6	-	2.5 to 1.0
24	2	0.375 (9.525)	6	-	2.5 to 1.0
25	2	0.375 (9.525)	4	-	2.0 to 1.0
26	4	0.375 (9.525)	4	-	1.5 to 1.0
27	4	0.375 (9.525)	2	-	2.0 to 1.0
28	-	-	-	8	1.5 to 1.0
29	-	-	-	6	1.5 to 1.0
30	-	-	-	7	2.0 to 1.0
31	3	0.375 (9.525)	4	-	2.0 to 1.0
32	-	-	-	9	2.5 to 1.0
33	2	0.375 (9.525)	1	-	2.5 to 1.0
34	-	-	-	3	2.5 to 1.0

NOTE

1. Reference ply lay-up tables on the Airframe Zone Diagrams to determine ply count. If no repair ply quantity is indicated, install twice as many plies as original lay-up.

2. When three or less repair plies are required, a 1.0 inch (2.5 cm) (minimum) overlap of all repair plies is required. When more than three repair plies are required, a 0.5 inch (1.3 cm) (minimum) initial overlap is required along with each subsequent ply extending 0.5 inch (1.3 cm) (minimum) beyond the previous plies.



DETAIL A

SR20_MM51_2118

Figure 51-204
Repair Ply Construction

(7) Backing Plate Construction

Backing plates are used to repair composites that have been punctured by serving to bridge the hole left during the damage event. A backing plate can be bonded to the inner or outer surface of the repair area and are constructed from the same material used for repairing the laminate. The number of plies required is dependent on the size of the hole. To ensure finished backing plate does not warp, lay backing plate plies up in opposing orientation. Minor warping is not cause for concern as the plates are generally thin and flexible and can be forced to the correct contour when necessary.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Release Film	(Refer to 51-30)	(Refer to 51-30)	Backing plate construction.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Backing plate construction.
Non-Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Backing plate construction.
Glass Fiber Cloth	(Refer to 51-30)	(Refer to 51-30)	Backing plate construction.

Note: Final repair surface sanding must be done with backing plate installed.

(b) Remove surface protection. (Refer to 51-20)

(c) Determine extent of damage. (Refer to 51-10)

(d) To facilitate separation of backing plate from lay-up surface, cover repair area with release film. Remove all wrinkles.

(e) Offset and draw perimeter line on release film 1.0 inch (2.5 cm) from the inside edge of hole. This is the dimension of the backing plate.

(f) Cut backing plate plies to the same dimension as perimeter line.

(g) Mix non-structural resin. (Refer to 51-30)

(h) Construct backing plate using Laminating by Transfer method. (Refer to 51-20)

(8) Water Break Test

CAUTION: The following procedure should only be performed at the disposition of Cirrus Design or if specifically referenced by repair.

A water break test will show when the repair area surface has been correctly prepared and will ensures maximum bond strength.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
De-Mineralized Water	-	Any Source	Cleaning.

(b) Solvent clean repair area. (Refer to 20-30)

(c) Dry repair area. (Refer to 51-20)

Note: When there is no risk of getting water trapped in open sandwich or the structure, a thin layer of de-mineralized water may be sprayed on the surface.

(d) Perform Water Break Inspection.

1 Soak cloth with de-mineralized water and move cloth across repair surface to apply a thin layer of water to the surface.

2 Inspect the wetted surface. When water forms a complete thin layer over whole of the surface, and surface tension of the water does not cause water to form into drops or beads, surface is clean.

3 Leave the water on the surface for 30 seconds. The water must remain as a complete film over the surface for this period.

4 If the water separates or forms drops or beads within the 30 seconds, repeat solvent cleaning procedure. (Refer to 20-30)

(e) Repeat Procedure - Water Break Test until no contamination is noted on drying cloth. (Refer to 51-20)

(f) Dry repair area. (Refer to 51-20)

(9) Drying Composite Structure (See Figure 51-205)

Because composites can trap water during service or repair, it is essential to thoroughly dry the structure before a repair is performed. Trapped moisture can cause composite structure disbonding or delamination both inside and outside the repair area due to due steam pressure generated during the cure cycle.

Since there is no practical method for quantifying the moisture content of a composite structure, the structure should always be considered as saturated. Even when the composite structure is visually dry it is necessary to perform a final drying before repairing. Visible liquid should first be removed using absorbtion, vacuuming, and/or compressed air. Radiant heat or hot air may be used as the final drying technique.

CAUTION: Liquids that do not dry completely or leave a residue (jet fuel or hydraulic fluid for example), must be cleaned and dried by some other method or the contaminated part replaced entirely. Call Cirrus Design for disposition. (Refer to AMM-Intro-)

(a) Dry any visible liquid as follows:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean, lint free)	-	Any Source	Liquid removal.
Vacuum	-	Any Source	Liquid removal.
Dry Compressed Air	-	Any Source	Liquid removal.

2 Solvent clean repair area. (Refer to 20-30)

3 Absorb visible liquid using cotton cloth.

CAUTION: Do not allow flammable liquids or gases to enter the vacuum pump. Ensure a vacuum system is approved for flammable liquid removal is used.

4 If necessary, use vacuum to remove liquid from affected areas.

CAUTION: Care should be taken not to force water further into the structure or to damage the structure with excessive pressure. Do not exceed gage pressure of 30 psi.

5 If necessary, use dry compressed air to remove liquid from affected areas.

(b) Final dry repair area using the following Radiant Heat or Hot Air methods.

(c) Drying Using Radiant Heat (See Figure 51-205)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean, lint free)	-	Any Source	Liquid removal.
250 W Heat Lamp(s)	-	Any Source	Liquid removal.
Electronic Temperature Control Unit	A419ABG-3C	Johnson Controls, Inc. Milwaukee, WI 53201 414-524-4000	Temperature control.
Infrared Thermometer	MiniTemp MT4 w/ laser point	Raytek Corporation Santa Cruz, CA 95061 800-866-5478	Temperature measurement.

2 Remove visible liquid.

3 Solvent clean repair area. (Refer to 20-30)

4 Install thermocouple(s) at center of heated area.

5 Connect electronic temperature control unit(s) and thermocouple(s).

CAUTION: Do not cause damage to the structure by over-heating. Ensure heat lamps are properly calibrated. Do not exceed part temperature of 195° F (91° C) and do not allow air temperature to exceed 200° F (93° C).

6 Apply required heat to structure ensuring temperature is raised at a rate not greater than 1.0° - 5.0° F (0.6° - 2.8° C) per minute.

7 Monitor temperature and dry structure for two hours.

8 Remove heat from structure ensuring temperature is lowered at a rate not greater than 1.0° - 15.0° F (0.6° - 8.4° C) per minute.

9 Let structure cool to room temperature before beginning repair.

(d) Drying Using Hot Air (See Figure 51-205)

To supply heated air, use a hot air dryer with temperature control, or optionally, a dryer system driven by thermocouples. Do not use hot air dryers without some method of temperature monitoring in place as temperatures achieved may be too high.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean, lint free)	-	Any Source	Liquid removal.

Description	P/N or Spec.	Supplier	Purpose
Hot Air Dryer (1500 - 1875 Watt)	-	Any Source	Liquid removal.
Infrared Thermometer	MiniTemp MT4 w/ laser point	Raytek Corporation Santa Cruz, CA 95061 800-866-5478	Temperature measurement.

2 Remove visible liquid.

3 Solvent clean repair area. (Refer to 20-30)

4 To maintain a constant distance between dryer and structure, place hot air dryer in holding fixture.

5 Install thermocouple(s) at center of air flow area.

6 Connect monitor and thermocouple(s).

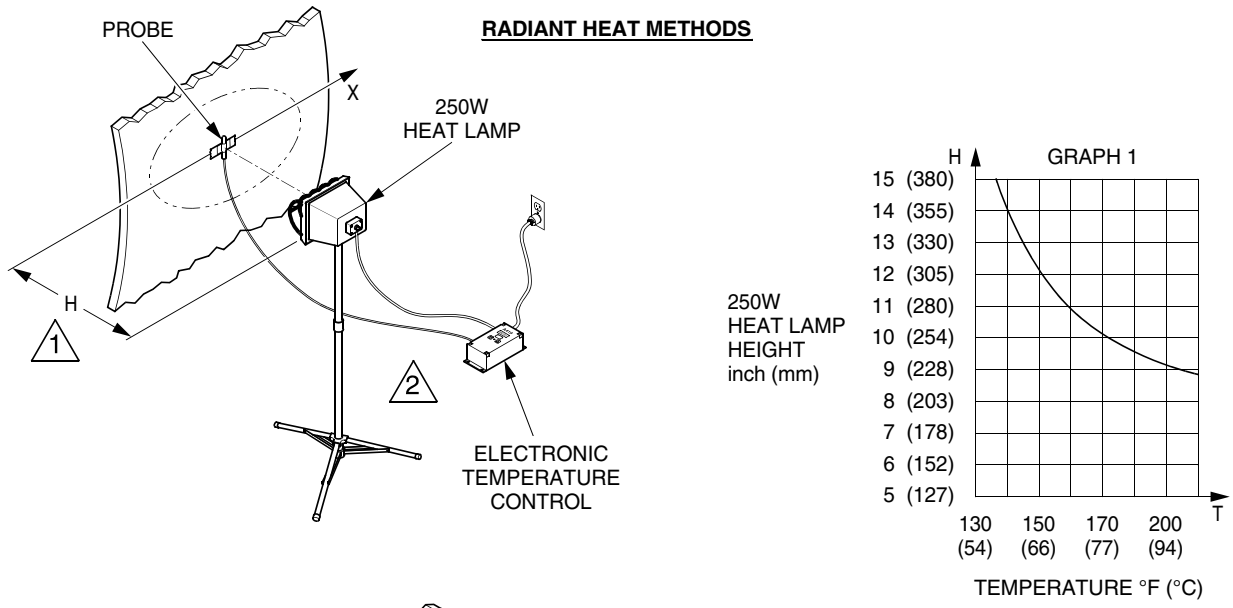
CAUTION: Do not cause damage to the structure by over-heating. Ensure dryers are no closer than 10 inches (25 cm) from structure. Do not exceed part temperature of 195° F (91° C).

7 Apply required heat to structure ensuring temperature is raised at a rate not greater than 1.0° - 5.0° F (0.6° - 2.8° C) per minute.

8 Periodically monitor temperature using infrared thermometer and dry structure for two hours.

9 Remove heat from structure ensuring temperature is lowered at a rate not greater than 1.0° - 15.0° F (0.6° - 8.4° C) per minute.

10 Let structure cool to room temperature before beginning repair.



NOTE

1. METHOD 1:
   Construct Graph 1 to show the temperature at the center of the heated area as a function of the distance between the heat lamp and surface.

2. METHOD 2:
   Use electronic temperature control to maintain constant heat.

3. Periodically check temperature with infrared thermometer.

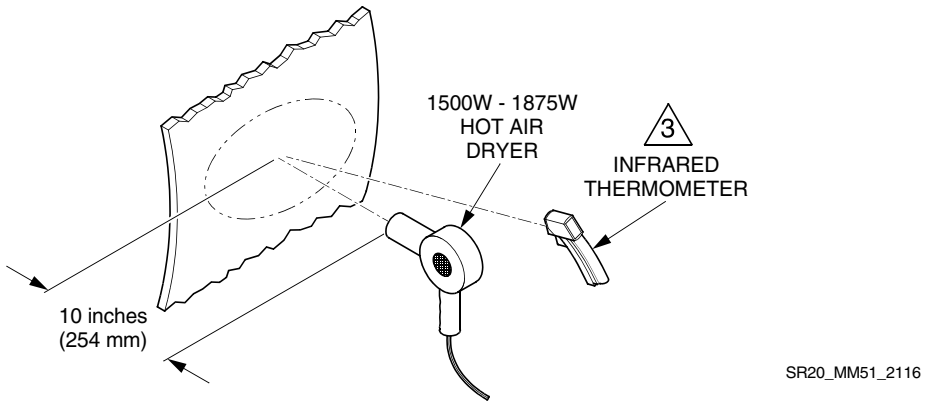


Figure 51-205
Typical Drying Methods

D. Repair Processes

(1) Amine Blush Detection and Removal

CAUTION: Special preparation may be required for surfaces repaired with epoxies using polyamine hardeners such as Epon 862 or PTM&W ES6292. During the cure process, amine blush, a thin, waxy film may form on the surface of the epoxy. This film can greatly impair the strength of a repair bond.

Amine blush is a thin, waxy, soap-like film that forms on the surface of mixed epoxy resins that use aliphatic amines - such as Epon 862 or PTM&W ES6292 - in the hardener. The blush film begins to form on the surface of the adhesive immediately after being applied.

During a wet repair, in order to achieve a successful bond, the blush film must be broken when the faying surfaces are pressed together. For this to happen, the adhesive applied to both faying surfaces must be thick enough to be disrupted or "squish out".

Additional methods of eliminating amine blush are available; during the repair process; always applying peel ply over the surface of the epoxy which will removed the film when the peel ply is peeled from the cured epoxy, or remove the blush using a water wash.

To remove the blush using the water wash method, wash the surface with clean water and an abrasive pad. Dry the surface with plain white paper towels to remove the dissolved blush before it dries on the surface. After washing with the abrasive pad, the surface should appear dull. Sand any remaining glossy areas.

(2) MGS L418-Based Structural Adhesive Application

Application of structural adhesive is required for secondary bond repairs where the technician must bond two pre-cured components together.

Note: Nominal bondline thickness for structural repair is 0.060 +0.020/-0.055 inch (0.152 +0.051/-0.140 cm) unless otherwise noted.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wooden or Plastic Spatula	-	Any Source	Apply adhesive.
Cartridge or Extrusion Gun	-	Any Source	Apply adhesive.
Bond Fixture (as necessary)	-	Any Source	Bonding.
Clamps (as necessary)	-	Any Source	Bonding.
MGS L418-Based Structural Adhesive	(Refer to 51-30)	(Refer to 51-30)	Core replacement.

(b) Prepare repair surface as necessary. (Refer to 51-20)

(c) Pre-fit faying surfaces of parts to ensure the bond fixture used will bring the bonded surfaces into an allowable tolerance during adhesive curing.

(d) Mix structural adhesive. (Refer to 51-30)

(e) Prior to applying the bulk of adhesive, wet the faying surface by working a thin layer of adhesive into the laminate substrate.

(f) Apply a sufficient quantity of adhesive, determining the actual bond gap and width, so that the joint will be completely filled over the faying surface width.

Note: The adhesive bead should have a high point near the center of the bead to avoid entrapped air. When more than one bead is required, apply immediately adjacent to the prior bead to form one large bead.

(g) Apply a bead of adhesive down the center of the bond width, approximately 0.13 - 0.25 inch (3.18 - 6.35 mm) bead for each 1.0 inch (25.4 mm) of bond width.

Note: Avoid applying, removing, and re-applying clamping pressure, as this will cause air to become entrapped in the bond gap.

(h) Secure parts in bond fixture, ensuring that pressure is applied uniformly.

(i) Check edge of bondline for excess adhesive. Remove excess adhesive with cloth dampened with isopropyl alcohol.

(j) Cure bond. (Refer to 51-20)

(3) PTM&W ES6292-Based Structural Adhesive Application (See Figure 51-206)

Application of structural adhesive is required for secondary bond repairs where the technician must bond two pre-cured components together.

CAUTION: PTM&W ES6292, when allowed to sit creates amine blush. This surface layer inhibits proper bonding and care must be taken to avoid it. (Refer to 51-20)

Proper application of PTM&W ES6292 adhesive is critical to obtaining full bond strength. Application procedures differ from other structural adhesive applications and should be fully understood before mixing.

Note: Nominal bondline thickness for structural repair is 0.060 +0.020/-0.055 inch (0.152 +0.051/-0.140 cm) unless otherwise noted.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Trowel, 1/4” V-notch	-	Any Source	Spread adhesive.
Cartridge or Extrusion Gun	-	Any Source	Apply adhesive.
Bond Fixture (as necessary)	-	Any Source	Bonding.
Clamps (as necessary)	-	Any Source	Bonding.
PTM&W ES6292-Based Structural Adhesive	(Refer to 51-30)	(Refer to 51-30)	Bond Repairs.

(b) Prepare repair surface as necessary. (Refer to 51-20)

(c) Pre-fit faying surfaces of parts to ensure the bond fixture used will bring the bonded surfaces into an allowable tolerance during adhesive curing.

Note: PTM&W ES6292 A/B Paste Adhesive has a pot-life at 68^{o}F of 45 minutes. High ambient temperatures will shorten pot-life. An 18^{o}F increase will cut pot-life to 22 minutes. Relative humidity above 65% accelerates reaction and also shortens pot-life. Working-life of 35 minutes is similarly affected.

(d) Mix structural adhesive. (Refer to 51-30)

(e) On first surface of the repair, apply adhesive using one of the following methods.

1 Apply a uniform layer of adhesive greater than 0.015 inch (0.381 mm) thick, or

2 Apply a layer of adhesive using 1/4” V-notch trowel. The troweled surface should be uniform with no thin layers between peaks. Use only light pressure when applying adhesive with trowel. Discard or rework trowel if points are blunt, resulting in thin layer between peaks.

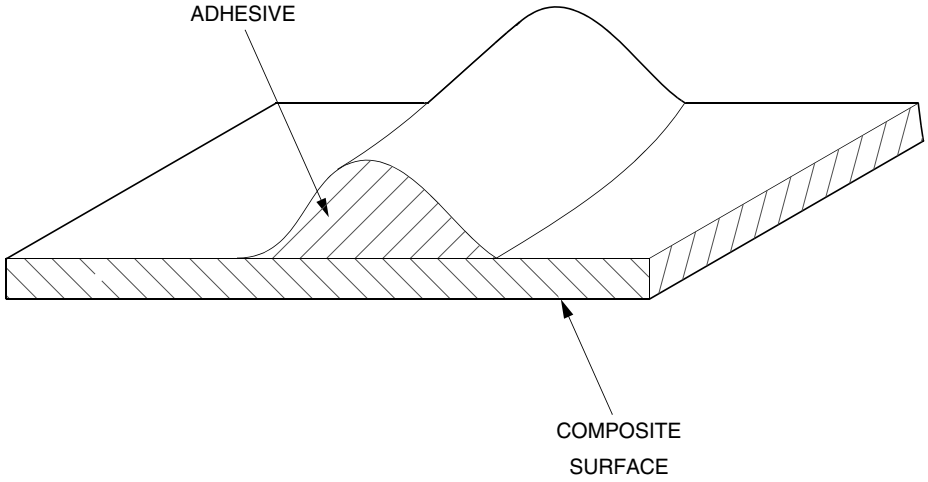
(f) On the second surface, apply a bead of adhesive. Adhesive bead should have a high point near center of bead to avoid entrapped air. When more than one bead is required, apply immediately adjacent to prior bead to form one large bead

Note: Avoid applying, removing, and re-applying clamping pressure, as this will cause air to become entrapped in the bond gap.

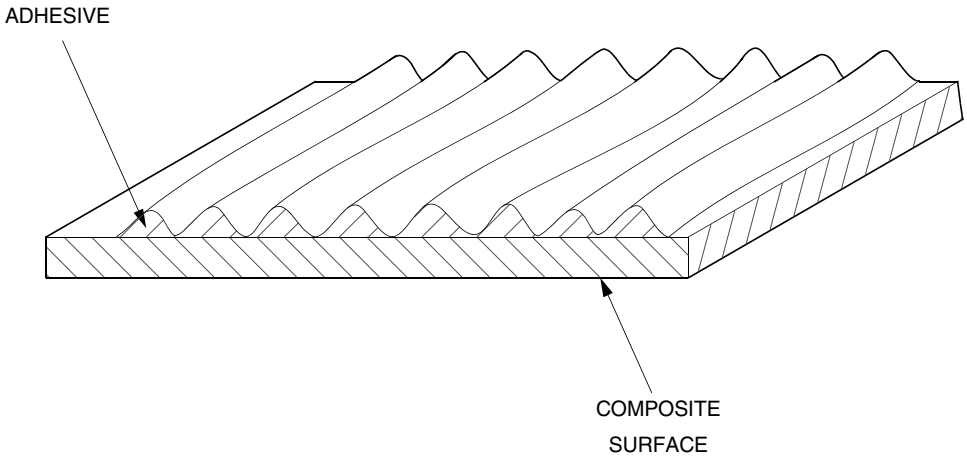
(g) Secure parts in bond fixture, ensuring that pressure is applied uniformly. Keep in mind short working-life of adhesive.

(h) Remove excess adhesive from edge of bondline with cloth dampened with isopropyl alcohol.

(i) Cure bond. (Refer to 51-20)



APPLICATION OF ADHESIVE BEAD



APPLICATION OF V-NOTCH TROWEL LAYER

SR20_MM51_2997

Figure 51-206
PTM&W ES6292-Based Structural Adhesive Application

(4) Filler Paste Application

Filler paste may be used to fill dents, gouges, or other voids left in the core or laminate material after surface preparation. It may also be used for bonding replacement foam core sections and expanded metal mesh.

For structural composite sandwich repairs, because MGS L418 and L285-based filler paste uses the same base resin as the structural adhesive, MGS L418 and L285-based filler paste may be used without curing the repair surface prior to lamination as would be required if using the Epon 862-based filler paste.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wooden or Plastic Spatula	-	Any Source	Apply filler paste.

(b) Prepare repair surface as necessary. (Refer to 51-20)

(c) Mix filler paste. (Refer to 51-30)

(d) Using a clean spatula or wooden applicator, fill indentation with paste. Paste should be approximately flush with surrounding core.

(5) Backing Plate Installation (See Figure 51-207)

Backing plates installed to the underside of the repair area must be manufactured on a surface with a similar shape to the damaged area. The backing plate shall be approximately 1.0 inch (2.5 cm) larger than the diameter of the hole it is bridging.

If the underside of puncture is not accessible, the backing plate must be installed on the topside of the puncture. This is accomplished by sanding the repair area and backing plate to a matched taper to form a scarf joint with a maximum overlap of 0.25 inch (0.64 cm) on the topside of the puncture.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vacuum	-	Any Source	Cleaning.
Paint Brush	-	Any Source	Cleaning.
Permanent Marker	(Refer to 51-30)	(Refer to 51-30)	Depth tracer.
Sanding Pad	-	Any Source	Abrasion.
Aluminum Oxide Paper (hand sanding)	60 to 80 grade	Any Source	Abrasion.
Orbital Sander	-	Any Source	Abrasion.
Aluminum Oxide Paper (orbital sander)	120 to 180 grade	Any Source	Abrasion.
5 Minute Epoxy	(Refer to 51-30)	(Refer to 51-30)	Backing plate installation.
Clecos or Small Screws	-	Any Source	Backing plate installation.

(b) Sand installation area according to backing plate location and trim:

Backing plate installed to underside of repair area;

1 Define sanding area with marker and fill area with a cross-hatch of other random pattern. Allow a short drying period before sanding until depth tracer is dry to the touch.

2 Sand repair area in a random pattern until depth tracer is gone. Frequently clean repair surface of contaminants using vacuum and paint brush.

3 Trimmed backing plate to final size. Verify size and shape of backing plate will not interfere with other structure or systems.

Backing plate installed to topside of repair area;

4 Sand backing plate and topside of laminate in a random pattern to form a scarf joint. Frequently clean repair surface of contaminants using vacuum and paint brush. Backing plate should be flush or slightly recessed to the surrounding laminate when placed on topside of puncture.

5 Trim the backing plate to a maximum overlap of 0.25 inch (0.64 cm).

(c) Place the backing plate into position.

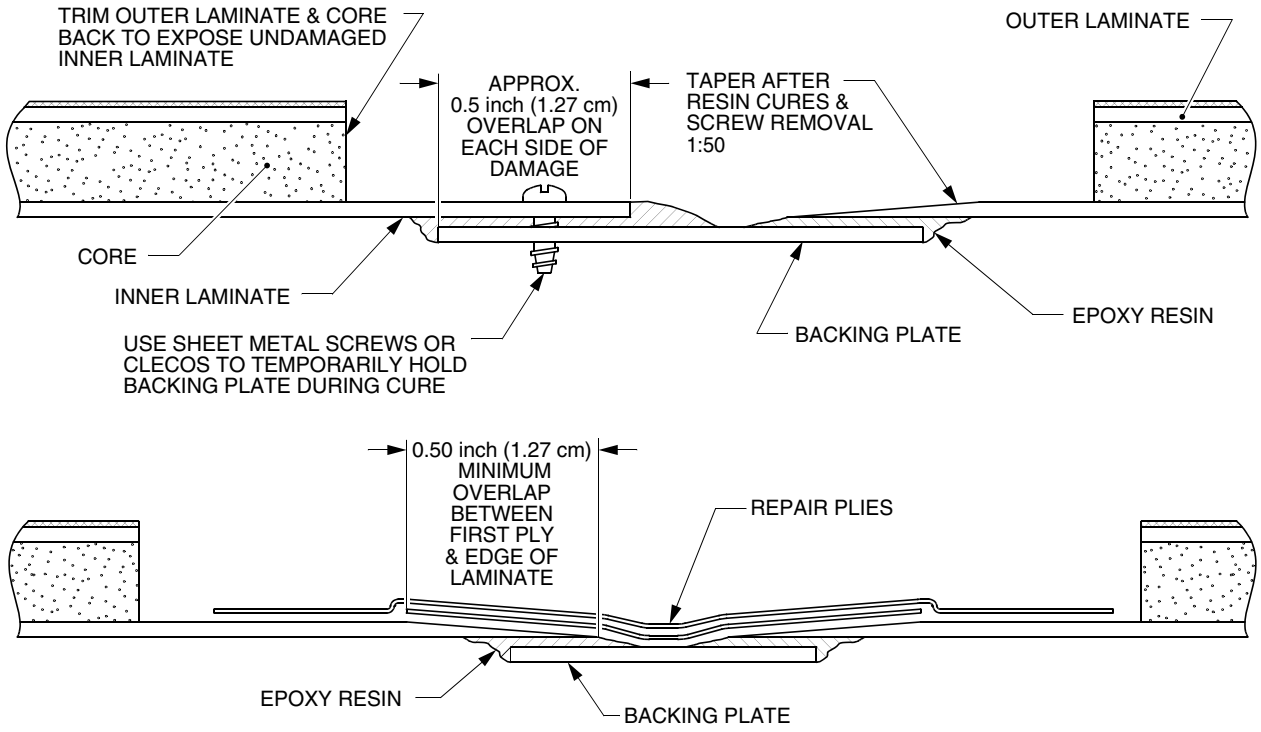
(d) If necessary, remove the peel ply from backing plate.

(e) Solvent clean repair area. (Refer to 20-30)

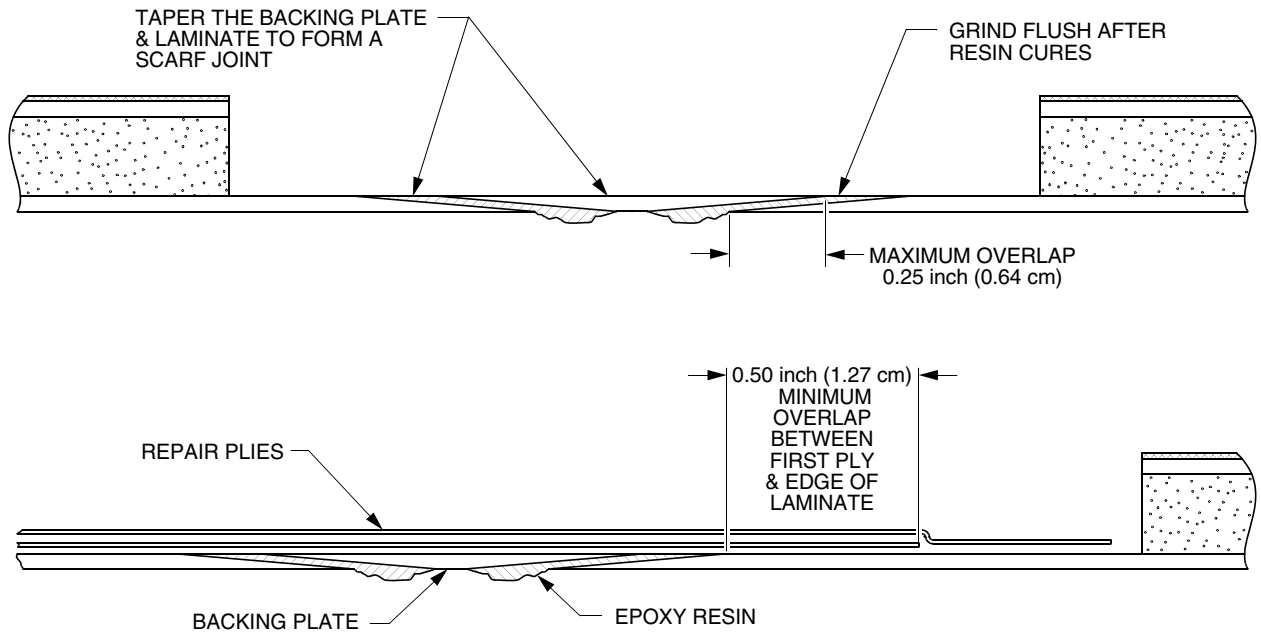
Note: If difficult to manipulate backing plate into place, attach a temporary handle to plate with tape or hot glue.

(f) If necessary, fasten backing plate to laminate with clecos or sheet metal screws during bonding process.

(g) Bond backing plate to laminate with 5 Minute Epoxy.



ATTACH BACKING PLATE ON BOTTOM SIDE (AS SHOWN ABOVE) WHEN BACKSIDE IS ACCESSIBLE



ATTACH BACKING PLATE ON TOP SIDE (AS SHOWN ABOVE) WHEN BACKSIDE IS NOT ACCESSIBLE

SR20_MM51_1194A

Figure 51-207
Typical Backing Plate Installation

(6) Foam Core Replacement

Foam core must be replaced prior to laminate repair if significant damage to the core exists due to penetration of the composite sandwich structure.

MGS L418 and L285, and Epon 862-based filler paste may be used for foam core replacement. When using MGS L418 and L285 based filler paste, no cure is required prior to the lamination process because the filler paste uses the same base resin as the structural adhesive. Epon 862-based filler paste should be considered when replacing foam core in complex shaped areas as the total time required for the necessary cure, surface preparation, and lay-up will be shorter.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Utility Knife	-	Any Source	Core removal.
Putty Knife	-	Any Source	Core removal.
Rotary Tool	-	Any Source	Core removal.
Aluminum Oxide Paper	80 to 120 grade	Any Source	Abrasion.
Sandwich Core Material	(Refer to 51-30)	(Refer to 51-30)	Core replacement.
Wooden or Plastic Spatula	-	Any Source	Apply filler paste.
Filler Paste	(Refer to 51-30)	(Refer to 51-30)	Core replacement.

(b) Using rotary tool, utility knife, and putty knife, cut material as required to remove entire damaged core. Ensure extents of material removal are perpendicular to the toolside surface. Maintain a minimum 1.0 inch (2.5 cm) radius on core removal.

CAUTION: Do not damage bagside (interior) laminate during core removal.

Note: It may be necessary to install a backing plate to the reverse side of the inner laminate to support this process.

(c) Sand off residual core from the surface of the inner laminate. Be careful not to cause separation between core and inner laminate during this operation.

(d) Inspect for separation of the inner laminate from the core. Continue to sand back until all separated laminate is removed.

(e) Fabricate core replacement to fit repair area with a maximum gap of 0.10 inch (0.25 cm) and thickness to match core area to be repaired.

(f) Prepare bond surface by sanding inner laminate with 80 to 120 grade paper.

(g) Remove all dust and debris with clean oil free compressed air and a vacuum.

(h) Solvent clean repair area. (Refer to 20-30)

(i) Mix filler paste. (Refer to 51-30)

(j) Apply filler paste to edges and underside of core and a thin layer to the inner laminate surface. (Refer to 51-20)

Note: On contoured surfaces it will be necessary to apply enough pressure to maintain contact between core and inner laminate. Small weights may be used to apply sufficient pressure.

(k) Insert core into damaged area and lightly clamp core into place.

(l) Cure repair. (Refer to 51-20)

(7) Sandwich Structure Replacement

CAUTION: Prior to performing a sandwich structure replacement, Cirrus Design must be contacted for disposition. (Refer to AMM-Intro-)

Sandwich Structure Replacement is necessary if significant damage to the core exists due to penetration of the composite sandwich structure and if location of repair is contoured, such as the wing leading edge, or if backside of repair area is inaccessible.

The damaged section of the sandwich structure is removed and replacement structure is bonded into place using tapered scarf joints.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Utility Knife	-	Any Source	Skin/core removal.
Putty Knife	-	Any Source	Core removal.
Aluminum Oxide Paper	80 to 120 grade	Any Source	Abrasion.
Wooden or Plastic Spatula	-	Any Source	Apply filler paste.
L418/H418 Structural Adhesive	(Refer to 51-30)	(Refer to 51-30)	Core replacement.

CAUTION: Do not taper solid laminate at repair area to form a scarf joint.

(b) If core of existing repair area transitions into solid laminate, such as wing leading edge, remove solid laminate from core transition to edge of repair area.

(c) Determine relationship of replacement part to existing repair area. Measure and cut replacement part slightly oversized so that it can be trimmed/sanded for fit-up.

Note: 2-ply laminate does not require a taper.

(d) If laminate is 3-ply or greater, sand the faying surfaces of the replacement part and existing repair area in a random pattern so that scarf joint tapers to a 1:50 ratio (i.e., taper length is 50 times the thickness of the laminate). Frequently clean repair surfaces of contaminants using vacuum and paint brush.

(e) Verify replacement part fit-up to existing repair area has a maximum gap of 0.10 inch (2.54 mm).

(f) Prepare bond surface by sanding inner laminate with 80 to 120 grade paper.

(g) Prepare repair area. (Refer to 51-20)

(h) Mix structural adhesive. (Refer to 51-30)

(i) Apply structural adhesive to edges and adjoining surfaces of existing repair area and a thin layer to the inner laminate surface. (Refer to 51-20)

(j) Insert replacement part into existing repair area and lightly clamp into place.

(k) Cure repair. (Refer to 51-20)

(8) Laminating - In Place Method (See Figure 51-208)

The Laminating in place method is used when the area of damage does not present difficulty for applying repair plies.

To determine number of repair plies to prepare, reference the ply lay-up tables in the Airframe Zone Diagrams. (Refer to 51-00) If no repair ply quantity is shown, always prepare and install

twice as many repair plies as the original lay-up in order to assure that the original strength is achieved.

Center each ply over the damage. Each ply must have half of the total overlap on all sides of the damaged area or over the previous repair ply. The first, smallest ply must be 0.5 - 1.0 inch (1.3 - 2.5 cm) larger than the damaged area. Each following ply must be 0.5 - 1.0 inch (1.3 - 2.5 cm) larger than the previous repair ply.

Plies must be installed in the same orientation as the original plies. Every other repair ply must be installed in opposing orientation to prevent the repair from warping. When using peel ply, position the peel ply on the outermost ply only. Ensure peel plies are removed prior to secondary bonding. Do not bond repair plies on top of peel ply.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scissors	-	Any Source	Cutting.
Paint Brush	-	Any Source	Resin application.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.

(b) If applicable, prepare backing plate. (Refer to 51-20)

(c) Prepare repair area. (Refer to 51-20)

(d) Prepare repair plies. (Refer to 51-20)

(e) If applicable, prepare EMM surfaces. (Refer to 51-20)

(f) If necessary, mix MGS L418-based filler paste and apply to fill any dents, gouges, or other voids in prepared repair surface. (Refer to 51-20)

(g) Mix structural resin. (Refer to 51-30)

(h) If applicable, remove clecos or sheet metal screws used to temporarily attach backing plate to laminate.

(i) Lay-up glass fabric as follows:

1 Apply thin coat of resin to repair area using a clean brush.

2 Using the template, warp axis and/or 0° reference line, align and center the first, smallest ply over the damaged area.

3 Lightly flatten the ply with the brush. Allow time for resin to wick through the ply from below.

4 “Stipple” the ply with the brush to work air bubbles to the edge of the ply. If necessary, add resin to saturate dry areas. When excess resin has been brought to the surface with the stippling processes and all air bubbles have been removed, coat the ply with a thin layer of resin.

5 Repeat above steps for each subsequent repair ply.

(j) If repairing an outside, finished surface apply peel ply as follows:

1 Apply a thin coat of resin to repair area using a clean brush.

2 Apply peel ply over repair area.

3 Lightly flatten the ply with the brush. Allow time for resin to wick through the ply from below.

Note: Peel ply can be worked more aggressively than repair plies and becomes transparent when saturated with resin.

4 “Stipple” or tap the ply, to work air bubbles to the edge of the ply. If necessary, add resin to saturate dry areas.

(k) Cure repair. (Refer to 51-20)

(l) If applicable, install EMM. (Refer to 51-20)

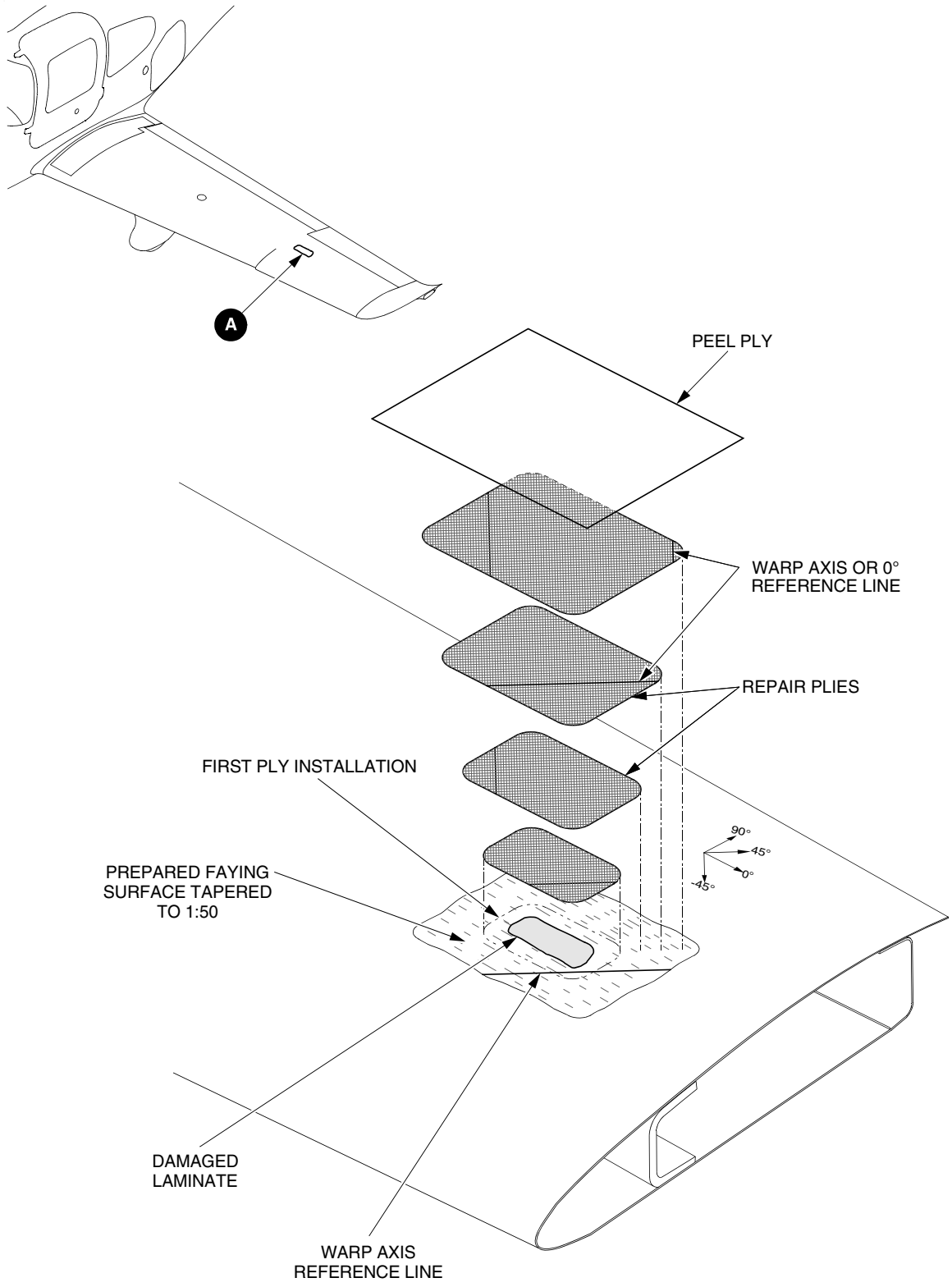


Figure 51-208
Laminating - In Place Method

(9) Laminating - Transfer Method (See Figure 51-209)

This method is used when the repair is in a difficult position. The Transfer Method is similar to Laminating in Place, except the repair plies are stacked on a sheet of release film and then wet-ted-out with resin. The repair plies assembly is then centered and applied to repair surface.

To determine number of repair plies to prepare, reference the ply lay-up tables in the Airframe Zone Diagrams. (Refer to 51-00) If no repair ply quantity is shown, always prepare and install twice as many repair plies as the original lay-up in order to assure that the original strength is achieved.

Center each ply over the damage. Each ply must have half of the total overlap on all sides of the damaged area or over the previous repair ply. The first, smallest ply must be 0.5 - 1.0 inch (1.3 - 2.5 cm) larger than the damaged area. Each following ply must be 0.5 - 1.0 inch (1.3 - 2.5 cm) larger than the previous repair ply.

Plies must be installed in the same orientation as the original plies. Every other repair ply must be installed in opposing orientation to prevent the repair from warping.

When using peel ply, position the peel ply on the outermost ply only. Ensure peel plies are removed prior to secondary bonding. Do not bond plies on top of peel ply.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scissors	-	Any Source	Cutting.
Paint Brush	-	Any Source	Resin application.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Squeegee	-	Any Source	Repair lay-up.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.

(b) If applicable, prepare backing plate. (Refer to 51-20)

(c) Prepare repair area. (Refer to 51-20)

(d) Prepare repair plies. (Refer to 51-20)

(e) If applicable, prepare EMM surfaces. (Refer to 51-20)

(f) Cut two sheets of release film approximately 6 inches (15 cm) larger than the total repair area.

(g) Place one sheet of release film on a flat, contaminate-free work surface.

(h) To ensure proper ply orientation, draw 0° reference line on work surface to replicate actual repair area.

(i) If repairing an outside, finished surface apply a sheet of peel ply with same shape and size as outermost repair ply onto the release film.

(j) If necessary, mix MGS L418-based filler paste and apply to fill any dents, gouges, or other voids in prepared repair surface. (Refer to 51-20)

(k) Mix structural resin. (Refer to 51-30)

(l) If applicable, remove clecos or sheet metal screws used to temporarily attach backing plate to laminate.

(m) Lay-up glass fabric as follows:

1 Using the template, warp axis and/or 0° reference line, align and center the final, largest repair ply over release film or peel ply.

2 Repeat above step for each subsequent repair ply, working from largest to smallest ply.

3 Apply a coat of resin to repair ply assembly using a clean brush.

4 “Stipple” the ply assembly with brush to work the resin into the plies and work the air bubbles to the edge of the plies. If necessary, add resin to saturate dry areas.

5 When excess resin has been brought to the surface with the stippling process and all air bubbles have been removed, coat the ply with a thin layer of resin.

6 Center and place second sheet of release film over the stacked repair plies.

7 Using squeegee, work out trapped air and excess resin from repair ply assembly with a squeegee.

(n) At repair area, apply thin coat of resin using a clean brush.

(o) Peel second sheet of release film away from the last repair ply laid-up on the stack.

(p) Carefully lift stacked repair plies and turn over so smallest repair ply is on bottom.

(q) Using the warp axis and/or 0° reference line, align, center, and install stacked plies to repair area.

(r) Peel remaining sheet of release film away from stacked plies.

(s) “Stipple” or tap the ply, to work air bubbles to the edge of the repair plies. If necessary, add resin to saturate dry areas. When repair plies are saturated and air bubbles have been removed, coat the repair plies with a thin layer of resin.

(t) If repairing an outside, finished surface apply peel ply as follows:

1 Apply a thin coat of resin to repair area using a clean brush.

2 Apply peel ply over repair area.

3 Lightly flatten the ply with the brush. Allow time for resin to wick through the ply from below.

Note: Peel ply can be worked more aggressively than repair plies and becomes transparent when saturated with resin.

4 “Stipple” or tap the ply, to work air bubbles to the edge of the ply. If necessary, add resin to saturate dry areas.

(u) Cure repair. (Refer to 51-20)

(v) If applicable, install EMM. (Refer to 51-20)

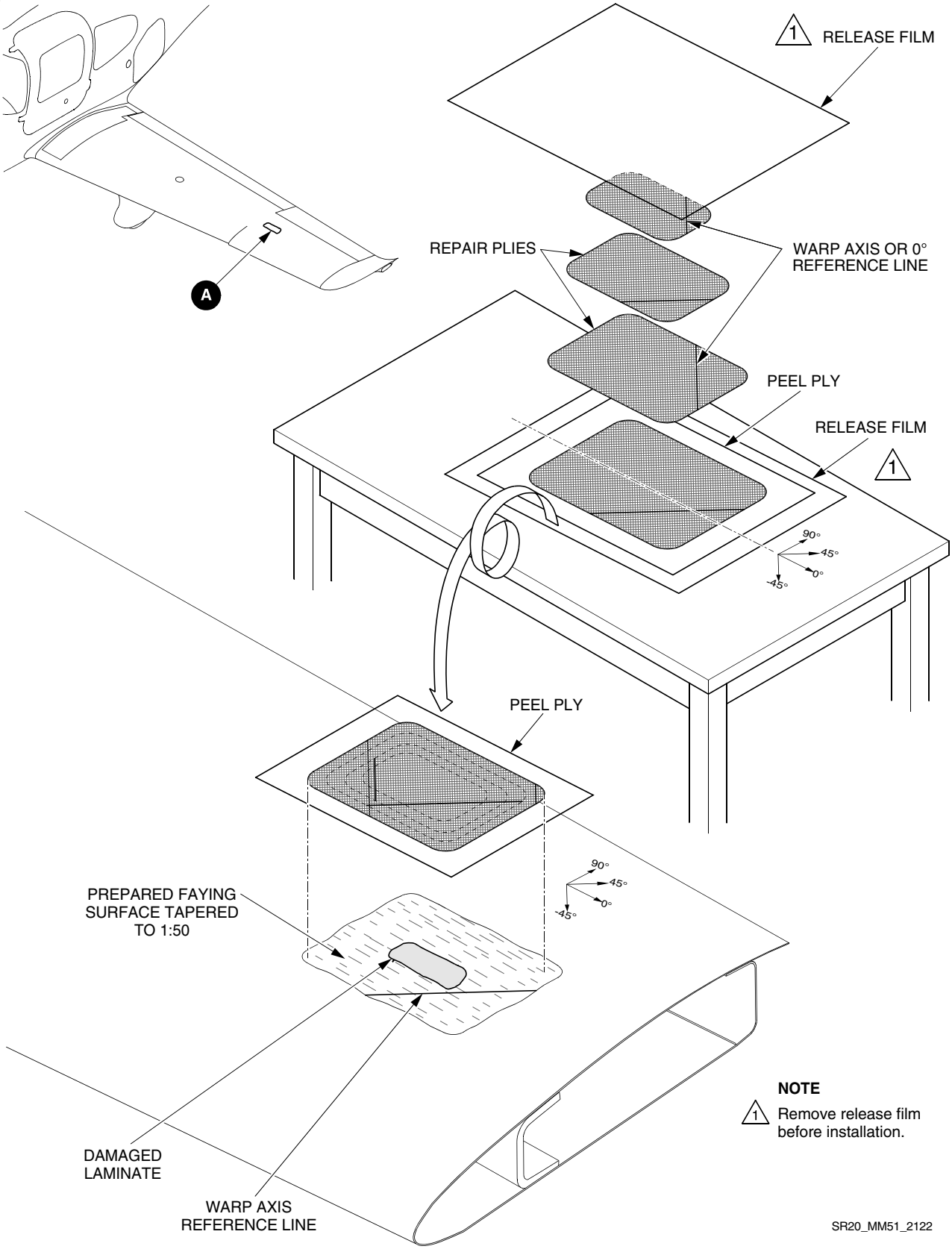


Figure 51-209
Laminating - Transfer Method

(10) Expanded Metal Mesh (EMM) (See Figure 51-2010)

Expanded metal mesh (EMM) is used throughout the airplane for electrical bonding and shielding. When repairing an area that contains EMM, the EMM must be laid over the final ply and overlap existing EMM by at least 0.2 inch (5.0 mm).

When preparing surface for EMM under antennas, the EMM should be exposed in at least 70% of the defined area. The defined area is typically the antenna footprint. The footprint area can be exceeded, but should not be more than 0.5 inch (12.7 mm) outside the footprint. When preparing surface for EMM under bolts or washers, the EMM should be exposed in at least 90% of the defined area. Areas under bolts and washers can be exposed outside the bolt/washer area but should not exceed twice the diameter area.

CAUTION: Because the quality of repair must be thoroughly inspected, do not apply EMM during the wet lay-up portion of an outer laminate repair. The repair should be fully cured and inspected before EMM is installed.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Scissors	-	Any Source	Cutting.
Vacuum	-	Any Source	Cleaning.
Sanding Pad	-	Any Source	Abrasion.
Tape	-	Any Source	Facilitate installation.
Paint Brush	-	Any Source	Repair lay-up.
Razor	-	Any Source	Cutting.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.
Expanded Metal Mesh	(Refer to 51-30)	(Refer to 51-30)	Bonding and shielding.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Facilitate installation.
Epon 862 or L285/H287 Filler Paste	(Refer to 51-30)	(Refer to 51-30)	Repair lay-up.

CAUTION: Do not lay repair plies over EMM. Replacement EMM must be installed over top layer of repair.

(b) Using 80 grade sand paper or finer, burnish existing EMM until shiny. Frequently clean surface of contaminants using vacuum and paint brush to ensure EMM is not damaged.

(c) Using 80 grade sand paper or finer, burnish replacement EMM until shiny.

(d) Vacuum repair area.

(e) Solvent clean repair area. (Refer to 20-30)

(f) Cut EMM. Verify replacement EMM overlaps existing EMM by at least 0.2 inch (0.5 cm).

(g) Cut two pieces of peel ply. Verify peel ply will overlap installed EMM by at least 1.0 inch (2.5 cm).

(h) Cut two pieces of glass repair fabric. Verify glass repair fabric will overlap installed EMM by at least 0.5 inch (12.7 mm).

Note: For repair areas with complex shape, it is allowable to fold small pleats into the EMM to enable the EMM to conform to contour of repair.

(i) Place EMM on repair surface and using a clean plastic spreader, shape EMM to contour of repair surface.

(j) Secure EMM by taping outer 0.125 inch (mm) of the perimeter of the EMM to repair area. Ensure tape does not interfere with replacement EMM bonding surface.

(k) Mix non-structural Epon 862 or L285/H287 filler paste. (Refer to 51-30)

(l) Squeegee filler paste into mesh of EMM. Apply paste from different directions to ensure mesh is filled. Allow Epon 862 or L285/H287 filler paste to cure one hour.

(m) Mix non-structural Epon 862 or L285/H287 resin. (Refer to 51-30)

(n) Apply a coat of resin to repair area with a clean brush.

(o) Apply peel ply over EMM repair surface.

(p) Apply both pieces of glass repair fabric over EMM. This temporarily installed fabric adds weight and rigidity to the repair which helps ensure the EMM fully contacts the underlying repair surface.

(q) Apply a coat of resin to repair area with a clean brush.

(r) Lightly flatten and “stipple” the repair to ensure the EMM conforms to same contour as underlying repair surface.

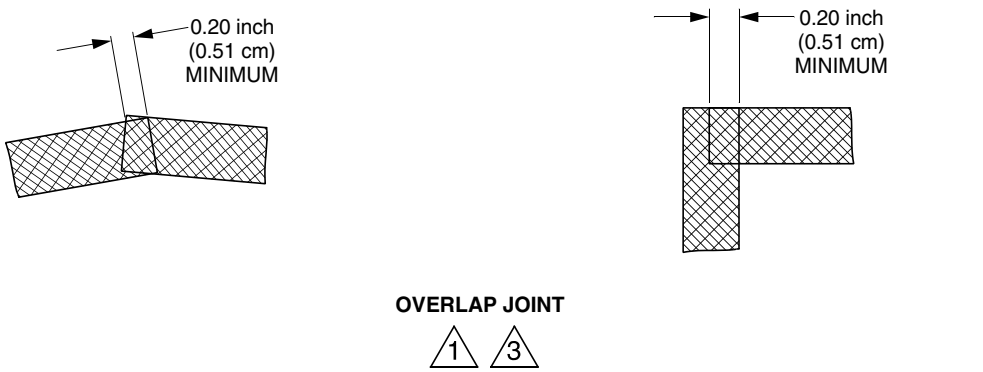
(s) Apply peel ply over EMM repair surface.

(t) Flatten and smooth the EMM repair. Allow time for resin to wick through the ply from below.

(u) Initial cure repair. (Refer to 51-20)

(v) Remove tape, peel ply, and glass cloth from EMM repair.

(w) EMM that was covered with tape will not be resin impregnated. Carefully cut dry EMM away from repair using sharp razor.



NOTE

1 Overlap joints are defined as joints that require direct contact between pieces of EMM. These joints can be the result of splices of material or areas where EMM meet and overlap to maintain electrical bonding. Overlap joints shall be metal to metal with no glass fiber allowed between EMM layers. Overlaps shall have a minimum of 0.2 inch (0.5 cm) overlap.

2 Butt joints are defined as joints that do not overlap but require that the EMM pieces are as close as possible to each other. Gaps between materials on butt joints can be up to but not exceed 0.187 inch (0.475 cm). When sections of EMM run parallel for lengths greater than 2.0 feet (0.6 m), the butt joint gap may exceed 0.187 inch (0.475 cm) for up to 12.0 inches (30.5 cm) and not more than 25% of the overall butt joint length. Butt joint gap shall never exceed 0.5 inch (1.3 cm), unless specified.

3 When sanding EMM under antennas, the EMM should be exposed in at least 70% of the defined area. The defined area is typically the antenna footprint. The footprint area can be exceeded, but should not be more than 0.5 inch (1.3 cm) outside the footprint. When sanding EMM under bolts or washers, the EMM should be exposed in at least 90% of the defined area. Areas under bolts and washers can be exposed outside the bolt/washer area but should not exceed twice the diameter area.

SR20_MM51_2124

Figure 51-2010
Expanded Metal Mesh

E. Curing Composite Repairs (See Figure 51-2011)

For a repair to achieve full strength, the resin system used in the repair must be properly cured. The curing processes involves heating the entire repair area using an artificial heat source, namely, a common hot air dryer. A typical arrangement for hot air dryer enclosure and monitoring system is included below.

Cure temperatures noted are part temperature not ambient air temperature. During hot air cures, ambient air temperature should be approximately 15° - 25° F (8.3° - 13.9° C) higher than the desired repair temperature. However, because the exact ambient air temperature required is dependent on many factors such as shop temperature, insulation of the enclosure, thickness of the repair, etc., ambient air temperature can be monitored using a thermometer.

Proper thermocouple placement is crucial for proper high-temperature repairs using portable heating systems. Most composite parts contain variances in thickness and/or temperature conductivity of the materials which will create this temperature variation during cure. There may also be heat sinks and non-uniformity in underlying structure.

If the technician is properly trained and thoroughly familiar with the curing technique, thermal blankets offer very good control of curing temperature and even distribution of heating. Thermal blankets typically are made with wires embedded in silicone rubber and can be used at high temperatures. Thermal blankets must be considerably larger than the area being cured. For example, an 8 inches (200 mm) diameter circular repair will require at least a 12 inches (300 mm) diameter heat blanket. Using this size of blanket allows for thermocouple placement well inside the blanket edges.

When thermal blankets are used, multiple thermocouples are required. This is because thermocouple failures are common and replacement during a running cure is virtually impossible. Also, temperatures can easily vary widely across a repair area during cure: 60 - 80ºF (35 - 45ºC) spreads are not uncommon.

Other curing techniques such as vacuum bagging and ovens may also be used if available and the technician is properly trained and thoroughly familiar with the curing technique.

For repairs performed to sandwich structure, it is often difficult to properly heat the inner laminate completely and is therefore necessary to perform two post-cure cycles. This is accomplished by repairing the structure in two phases; the inner laminate is repaired and fully cured then the core and outer laminate are repaired and a complete cure cycle is performed.

Part temperature should be raised at a rate of 1.0° - 5.0° F (0.6° - 2.8° C) per minute. Part temperature should be lowered at a rate of 1.0° - 15.0° F (0.6° - 8.4° C) per minute. Bringing the part temperature up slowly is preferred as this allows the resin to solidify at a lower temperature. During the first part of the cure cycle the repair plies should be observed frequently. Any air trapped within the repair will expand when heat is applied. Before the resin solidifies, it is important to lance any bubbles that form with a scribe or pin, and push the ply down with a brush.

Multi-step post-cures may be used providing the total time at temperature meets the minimum requirement.

Note: A multi-step post cure may be used providing the total time at temperature meets the minimum requirement. Initial cure requirements must be met if assembly will be handled between post cure steps

CAUTION: Room temperature cures of MGS L418/H418 and MGS L285/H287 are not allowed. These structural resin repair systems will not cure to a suitable condition at room temperatures.

Do not allow part temperature to exceed 210° F (93° C) and do not allow ambient air temperature to exceed 205° F (96° C).

Type	P/N or Spec.	Cure Cycle	
Structural Resin **or** Paste Adhesive Repair System: MGS L418-Based	L418 H418	Initial	3 hours at 150°-210°F (66°-99°C) or 5 hours at 125°-210°F (52°-99°C)
		Post	10 hours at 175°-210°F (79°-99°C)
Structural Resin Repair System: MGS L285-Based	L285 H287	Initial	1 hour at 150°-210°F (66°-99°C) or 3 hours at 125°-210°F (52°-99°C)
		Post	7 hours at 180°-210°F (82°-99°C)
Structural High Temperature Resin: Hysol EA 9396-Based[a]	9396-A 9396-B	Initial	30 mins at 125°-210°F (52°- 99°C) or 24 hours at 65°-210°F (18°- 99°C)
		Post	1 hours at 200°-210°F (93°- 99°C)
Structural Paste Adhesive Repair System: PTM&W ES6292-Based	ES6292-A ES6292-B w/ Beads	Initial	1 hour at 120°-210°F (49°- 99°C)
		Post	5 hours at 180°-210°F (82°- 99°C)
Structural High Temperature Paste Adhesive: Hysol EA 9395-Based[b]	9395-A 9395-B	Initial	30 mins at 125°-210°F (52°- 99°C) or 24 hours at 65°-210°F (18°- 99°C)
		Post	1 hours at 200°-210°F (93°- 99°C)
Non-Structural Resin Repair System: Epon-Based	Epon 862 Epicure 3234	Initial	24 hours at 65°-75°F (18°-24°C) or 3 hours at 120°-210°F (49°-99°C) or 1 hours at 150°-210°F (66°-99°C)
		Post	2 hours at 150°-210°F (66°-xx°C)
Non-Structural Resin Repair System: Epon-Based with Heloxy Dilutant	Epon 862 Heloxy 68 Epicure 3234	Initial	24 hours at 65°-75°F (18°-24°C) or 3 hours at 120°-210°F (49°-99°C) or 1 hours at 150°-210°F (66°-99°C)
		Post	2 hours at 150°-210°F (66°-99°C)
Non-Structural Resin Repair System: Derakane-Based	Derakane 470-36 Nuodex, Cobalt Naphthenate, 6% Luperox CU90	Initial	8 hours at 65°-75°F (18°-24°C) or 1 hours at 150°-210°F (66°-99°C)
		Post	24 hours at 65°-75°F (18°-24°C) or 6 hours at 150°-210°F (66°-99°C)

Figure 51-2011
Cure Temperatures and Times

Type	P/N or Spec.	Cure Cycle	
Non-Structural Resin Repair System: PTM&W-Based	PR2032 PH3660	Initial	24 hours at 65°-75°F (18°-24°C) or 3 hours at 120°-210°F (49°-99°C) or 1 hours at 150°-210°F (66°-99°C)
		Post	2 hours at 150°-210°F (66°-99°C)

Figure 51-2011
Cure Temperatures and Times (Continued)

a. Serials 1815 and subsequent with high temperature firewall only. Engine compartment side only.
b. Serials 1815 and subsequent with high temperature firewall only. Engine compartment side only.

(1) Typical Cure Using Hot Air Dryer Enclosure and Monitoring System (See Figure 51-2012)

A simple enclosure around the repair is constructed using bagging film taped to the surrounding structure. A slit is cut into the enclosure and the hot air dryer positioned in such a way that it doesn't contact the structure and is not blowing directly at the repair area. Thermocouples should be placed in contact with the structure immediately adjacent to the repair. At least one thermocouples should be used for every 1 - 2 square feet of repair area. It is recommended that at least two thermocouples be used. Part temperature is controlled through the use of an electronic temperature control unit which will shut the hot air dryer off at a preset temperature. Part temperature may also be controlled by cutting vent holes in or insulating the enclosure and/or by insulating the backside of the repair area. The electronic temperature control unit is used below.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Stick Pin	-	Any Source	Release trapped air.
Thermocouple Monitor With Infrared-RS232 adaptor, serial adaptor, and 2 Type J Thermocouple Probes	600-1050/ 600-0092	Telatemp Corporation Fullerton, California 92831 800-321-5160	Indicating and recording.
Bagging Film	(Refer to 51-30)	(Refer to 51-30)	Enclosure.
Electronic Temperature Control Unit[a]	A419ABG-3C	Johnson Controls, Inc. Milwaukee, WI 53201 414-524-4000	Temperature control.
Infrared Thermometer[b]	MiniTemp MT4 w/ laser point	Raytek Corporation Santa Cruz, CA 95061 800-866-5478	Measurement.
Bagging Film Breather (100 sq. ft.)	(Refer to 51-30)	(Refer to 51-30)	Protection.
Flashbreaker Tape 2.0 inches (5.0 cm)	(Refer to 51-30)	(Refer to 51-30)	Protection.
Masking Tape (2 Rolls)	3.0 inches (7.6 cm)	Any Source	Sealing.
Blow Dryer (1500 - 1875 Watt)	-	Any Source	Heating.

a. or equivalent
b. or equivalent

(b) Solvent clean area where bag will be attached. (Refer to 20-30)

(c) Attach thermocouple monitor and electronic temperature control unit probes near repair area.

(d) Construct enclosure around repair area using bagging film material and masking tape.

(e) Place a small slit in bagging film material and use masking tape to attach blow dryer with breather insulation wrapped around the outlet to prevent scuffing.

(f) Place masking tape at the locations where thermocouple probes will be positioned.

CAUTION: Do not allow Flashbreaker tape to contact airplane finish during cure process.

(g) Place Flashbreaker tape on top of the thermocouple probe masking tape locations.

(h) Place thermocouple on top of Flashbreaker tape.

(i) To prevent the thermocouple from coming loose, place Flashbreaker tape on top of the thermocouple.

(j) Place breather insulation on top of the Flashbreaker tape.

(k) To prevent direct air from making contact with the thermocouple, place Flashbreaker tape on top of the thermocouple.

(l) Connect the probes to the thermocouple monitor.

(m) Turn thermocouple monitor ON. Make sure the channels connected are indicating properly and the monitor indicates the correct thermocouple type.

(n) Set thermocouple monitoring system to record temperatures once per minute.

(o) Connect electronic temperature control unit to power.

(p) Connect hot air dryer to electronic temperature control unit.

(q) Connect thermocouple probes to the electronic temperature control unit.

(r) Turn electronic temperature control unit ON. Set electronic temperature control unit to desired shut-off temperature.

(s) Turn blow dryer on and, if necessary, cover enclosure with insulation to achieve specific cure temperature readings on thermocouple reader. (See Figure 51-2012)

(t) When cure temperature is stabilized, press the PRINT button on the thermocouple monitor to begin recording cure cycle temperatures.

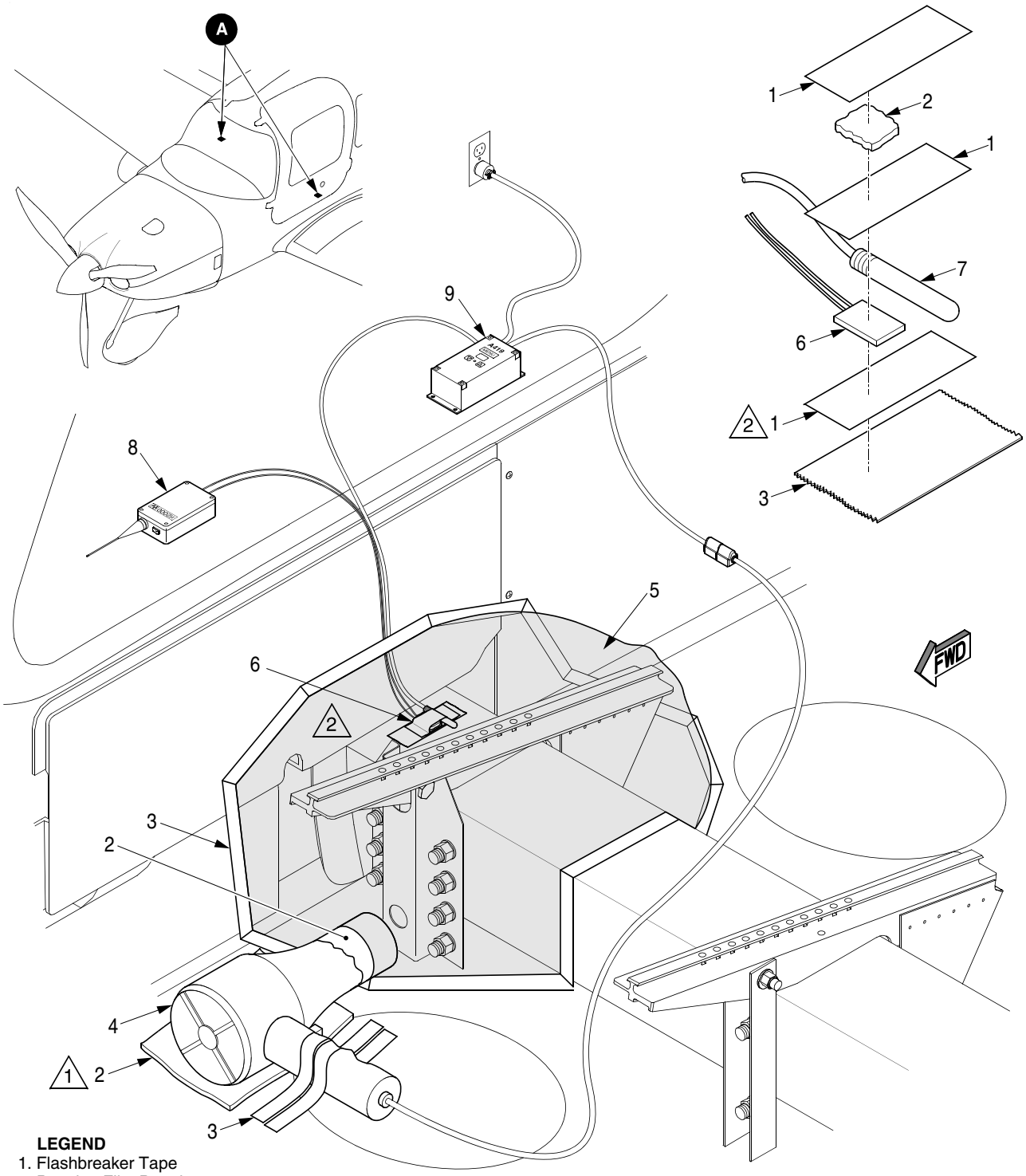
CAUTION: During cure cycle, repair plies should be observed frequently. Any air trapped within repair will expand when heat is applied and it is necessary to deflate any bubbles that form. Puncture bubbles with pin and push ply down with a brush. This must be done before resin solidifies.

Note: If temperature readings fall below specified cure temperature, that time cannot be counted as part of the cure time.

(u) Cure repair for specified time and temperature. (See Figure 51-2012)

(v) Stop temperature recording, turn off blow dryer, remove enclosure, and remove thermocouple probes and electronic temperature control unit.

(w) Print recorded temperatures from computer. Title, copy, and retain temperature printouts.



LEGEND

1. Flashbreaker Tape
2. Bagging Film Breather
3. Masking Tape
4. Blow Dryer
5. Bagging Film
6. Thermocouple Probe
7. Temperature Sensor
8. Thermocouple Monitor & Recorder
9. Electronic Temperature Control

NOTE

1. Place breather material under outlet to prevent scuffing.
2. Keep flashbreaker tape off airplane finish.

Figure 51-2012
Typical Cure Method

F. Exterior Finish

To ensure that the temperature of the composite structure is kept below 150° F (66° C), the maximum allowable paint on the wing will have an absorptivity not greater than 0.4, with an emissivity of at least 0.9. The maximum allowable paint on the fuselage will have an absorptivity not greater than 0.6, with an emissivity of at least 0.7. Refer to Section 51-30 for approved paints. (Refer to 51-30)

(1) Paint Schemes

- No striping or contrasting paint scheme is allowed on composite wing surfaces, horizontal stabilizer surfaces, or on concave portions of wing root fairings and horizontal root fillets, except for nationality and registration marks which shall be in accordance with the operating rules of the applicable registration authority and within the limitations specified in Chapter 4 - Airworthiness Limitations, of this manual.
- Wing tips and elevator tips may have contrasting colors covering 100% of their exterior surface.
- Rudder tips may have contrasting colors covering 100% of their exterior surface.
- Wheel pants and landing gear fairings may have contrasting colors covering 100% of their surface area.
- Metal control surfaces are not subject to paint scheme or color limitations.
- The vertical stabilizer may have contrasting colors covering 100% of their exterior surface.
- On fuselage, aft of baggage compartment bulkhead, in addition to registration markings, total stripe width shall not exceed 51% of fuselage height per side. If stripe width is measured along the contour, then fuselage height should also be measured along the contour (from top center to bottom center). If stripe width is measured by horizontal projection, then fuselage height should also be measured by horizontal projection (vertical dimension only, overall local height).
- On fuselage, forward of baggage compartment bulkhead, stripe width shall not exceed 12 inches per side. Additionally, stripe width shall not exceed 6 inches at fuselage stations where doors are located.
- No stripe or contrasting color is allowed on fuselage above bottom edge of windows forward of baggage compartment bulkhead.
- Striping or contrasting colors are allowed on any of the fairings without limitation, except as specified above (fairings include engine cowl, dorsal fairing and wing root fairings).

WARNING: **Aircraft control surface balance is critical to safe flight. If any paint, body filler, striping, or other material is added to a control surface, the control must be re-balanced.**

CAUTION: Use only approved materials per Section 30 - Materials.

CAUTION: Ensure all materials, areas and parts listed below are properly protected against paint materials by masking:
Pitot tube, static ports, engine air intake, engine exhaust ducts, engine drains, fresh air intakes, landing gears, door seals, cabin window and windshield and seals, electrical equipment and cables, plastic materials, avionics, OAT probes, stall warning vent, stall strips.

(2) Spot Putty Application

Spot putty is used to fill small cosmetic defects such as pits and minor scratches. After the repair area has been filled with body filler (if required) and/or coated with surfacer, a thin layer of spot putty may be applied to fill minute cosmetic defects and/or minor scratches.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aluminum Oxide Paper	320 grade	Any Source	Abrasion.
Compressed Air	-	Any Source	Cleaning.
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
Exterior Putty	(Refer to 51-30)	(Refer to 51-30)	Repair.

(b) Blow surface clean with compressed air.

(c) Solvent clean the application area. (Refer to 20-30)

(d) Apply spot putty with a clean applicator as per manufacturer's instructions.

(e) When the spot putty has cured, lightly sand the surface with 320 grade sandpaper to assure a smooth and defect free surface.

(f) Blow surface clean with compressed air.

(g) Solvent clean the application area. (Refer to 20-30)

(h) Apply the final coat of surfacer. (Refer to 51-20)

(3) Body Filler Application

Body filler is used for repairing cosmetic blemishes, dents, and to fill large surface imperfections and gaps at seams or bond joints.

Over large areas, body filler thickness shall not exceed 0.13 inch (3.3 mm). No more than 15% of the surface may be covered with body filler and no more than 5% of the surface area shall have filler thicker than 0.10 inch (2.5 mm). Body filler thickness in small local areas (less the 10 square inches) or at seams and joints may exceed maximum filler thickness. Filler thickness can be measured by inserting the pointed end of a toothpick into uncured filler.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aluminum Oxide Paper	36 to 320 grade	Any Source	Abrasion.
Compressed Air	-	Any Source	Cleaning.
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
Exterior Filler	(Refer to 51-30)	(Refer to 51-30)	Repair.

(b) Mask off all surfaces that do not require filling or where filler is not permitted.

(c) Sand area with 80 grade to 120 grade sandpaper.

(d) Blow surface clean with compressed air.

(e) Solvent clean the application area.

(f) Mix body filler thoroughly per manufacturer's instructions.

(g) Apply body filler with a clean applicator according to the manufacturer's instructions.

(h) When the body filler is cured, rough out shape with 36 grade sandpaper. When the shape is approximately correct, switch to 80 grade sandpaper for final shaping.

(i) If using surfacer, sand the area with at least 120 grade sandpaper.

(j) If only using sealer, sand the area with at least 320 grade sandpaper to remove all sanding scratches.

(k) Remove all excess body filler.

(l) Blow surface clean with compressed air.

(m) Solvent clean the application area. (Refer to 20-30)

(n) If needed, apply spot putty to fill all minute scratches or cosmetic defects. Apply spot putty with a clean applicator according to manufacturer's instructions. (Refer to 51-20)

(o) When the spot putty has cured, lightly sand the surface with 120 grade sandpaper to assure a smooth and defect free surface.

(p) Blow surface clean with compressed air.

(q) Solvent clean the application area. (Refer to 20-30)

(4) Primer Application

Primer must be within the thickness range identified in the manufacturer's Technical Data Sheet.

Surfacer (high build primer) is used to fill minor imperfections, pinholes, and waviness of exterior surfaces. In most cases, it is unnecessary to use a straight primer when surfacer is being used. Usually surfacer will be applied in three individual coats. Primer is used to help paint adhere to the airplane.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape, 2-inch	-	Any Source	Abrasion.
Aluminum Oxide Paper	120 to 400 grade	Any Source	Abrasion.
Compressed Air	-	Any Source	Cleaning.
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
Exterior Paint Primer System	(Refer to 51-30)	(Refer to 51-30)	Repair.

(b) Mask off all surfaces that do not require primer or where primer is not permitted.

(c) Lightly sand the application area for primer with at least 320 grade sandpaper.

(d) Blow surface clean with compressed air.

(e) Solvent clean the application area. (Refer to 20-30)

(f) Mix primer per manufacturer's instructions.

(g) Apply primer as recommended by the manufacturer.

(h) To determine low areas after application of the first primer coat, block sand with 120 grade sandpaper. If necessary, apply spot putty to low areas. (Refer to 51-20)

(i) Contoured to the proper shape, blow surface clean with compressed air.

(j) Solvent clean the application area. (Refer to 20-30)

(k) Inspect application for any cosmetic blemishes and minor surface defects. If needed, apply spot putty to those areas. (Refer to 51-20)

(l) Dry sand final surface coat with 320 grade sandpaper. Optional wet sanding is permitted.

(m) After final sanding, examine the surface for any imperfections.

(5) Sealer Application

Sealer prevents moisture from effecting the fillers and staining of the topcoat from chemicals released by the fillers. Sealers should be applied over any body filler or putty. Apply sealer to entire primer surface if required by the manufacturer's instructions.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aluminum Oxide Paper	At least 320 grade	Any Source	Abrasion.
Compressed Air	-	Any Source	Cleaning.
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
Exterior Paint Sealer System	(Refer to 51-30)	(Refer to 51-30)	Repair.

(b) Mask off all surfaces that do not require sealer or where sealer is not permitted.

(c) If required, lightly sand the surfacer with at least 320 grade sandpaper.

(d) If required, blow surface clean with compressed air.

(e) Solvent clean the application area. (Refer to 20-30)

(f) Thoroughly mix sealer in accordance with manufacturer's instructions.

(g) Apply one coat of sealer to the entire surface per the manufacturer's instructions.

(6) Paint Application

Single Stage Paint System: It is not necessary to sand sealer prior to application of paint as long as it is applied within the time limit specified by the manufacturer. If set time of the sealer is unknown, beyond the manufacturer allowed limit, or if the surface required rework, the surface must be sanded with at least 320 grade wet/dry sandpaper and solvent cleaned prior to painting.

As an alternative to wet-sanding, the entire surface may be abraded with a fine grade of Scotchbrite. Scotchbrite will not flatten the surface, only remove gloss. Wet sand if the surface requires flattening.

Single Stage top coat thickness shall be applied in accordance with the manufacturer's data sheet. Maximum top coat thickness may be exceeded in repaired areas. No more than 5% of the total surface area shall have top coat in excess of manufacturer's requirements.

Two Stage Paint System: Prior to application of the base coat, the primed surface must be sanded with at least 320 grade sand paper.

Base coat and clear coat thickness shall be applied in accordance with the manufacturer's data sheet. Paint thickness is verified by multiplying the average dried thickness by the number of coats applied. See manufacturer's information for average dried thickness.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Adhesive Tape	-	Any Source	Inspection.
Masking Tape and Paper	-	Any Source	Masking.
Tack Cloth	-	Any Source	Cleaning.
Aluminum Oxide Paper	400 grade	Any Source	Abrasion.

Description	P/N or Spec.	Supplier	Purpose
Aluminum Oxide Paper	320 grade	Any Source	Abrasion.
Compressed Air	-	Any Source	Cleaning.
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning.
Exterior Polyurethane, Acrylic, or Base/Clear Coat Paint System	(Refer to 51-30)	(Refer to 51-30)	Repair.

(b) Mask off all surfaces that do not require paint or where paint is not permitted.

(c) Use adhesive tape to check quality of surrounding paint adhesion. If necessary rework and solvent clean areas of poor adhesion.

(d) If necessary, apply body filler and/or spot putty to remove any surface defects.

(e) Apply primer system. (Refer to 51-20)

(f) Apply sealer system. (Refer to 51-20)

(g) If using base/clear coat paint system, abrade primer with 320 grade sand paper.

(h) Visually inspect prepared surface for imperfections prior to application of paint. Rework and solvent clean any damaged or defective areas. (Refer to 20-30)

(i) Solvent clean application area. (Refer to 20-30)

(j) Wipe entire area to be painted with a tack cloth.

CAUTION: If using base/clear coat paint system, the base coat must be mixed as catalyzed system.

(k) Mix and apply paint per manufacturer's instructions.

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MATERIALS

1. DESCRIPTION

This section lists the approved materials required for repair of the airplane.

A. General Information and Requirements

Refer to Section 00 - Standard Practices: Structures for detailed information on personnel qualifications and safety information, construction methods, and Airframe Zone Diagrams. (Refer to 51-00)

Section 10 - Investigation, contains guidance for identification of damage, associated classifications and repairs, and damage reporting procedures. (Refer to 51-10)

Section 20 - Processes, describes specific processes and methods used in the repair of the aircraft. (Refer to 51-20)

Section 70 - Standard Repairs contains composite repair procedures that are used with the supporting processes outlined in Section 20. (Refer to 51-70)

2. MAINTENANCE PRACTICES

A. Storage and Handling

Repair materials require specific storage and handling considerations.

- Read and follow all storage and handling instructions contained in the Material Safety Data Sheet (MSDS).
- Store repair materials in a cool, dry environment.
- All repair materials must be stored in accordance with the manufacturer's instructions.
- Do not exceed the manufacturer's specified shelf life.
- Maintain records for all materials held in storage.

B. Approved Materials

(1) Structural and Non-Structural Repair Systems

Type	Component	P/N or Spec.	Manufacturer
Structural Resin Repair System	Base Resin Curing Agent	L418 H418	MGS Kunstharzprodukte GmbH D-70309 Stuttgart +49-711-38 98 00-0
Structural Resin Repair System	Base Resin Curing Agent	L285 H287	MGS Kunstharzprodukte GmbH D-70309 Stuttgart +49-711-38 98 00-0
Structural Paste Adhesive Repair System	Base Resin Curing Agent	ES6292-A ES6292-B w/ Beads	PTM&W Industries, Inc. Santa Fe Springs, CA 90670 800-421-1518 Repair System may only be purchased through the Factory Service Center.
Structural High Temperature Resin Repair System[a]	Base Resin Curing Agent	Hysol EA 9396-A Hysol EA 9396-B	Henkel Corporation 2850 Willow Pass Road Bay Point, CA 94565-0031 925-458-8278
Structural High Temperature Paste Adhesive Repair System[b]	Base Resin Curing Agent	Hysol EA 9395-A Hysol EA 9395-B	Henkel Corporation 2850 Willow Pass Road Bay Point, CA 94565-0031 925-458-8278
Non-Structural Resin Repair System	Base Resin Curing Agent	Epon 862 Epicure 3234	Resolution Performance Products Houston, TX 77210-4500 877-859-2800
	Base Resin Modifier Curing Agent	Epon 862 Heloxy 68 Epicure 3234	
Non-Structural Resin Repair System	Base Resin	Derakane 470-36	Dow Chemical Midland, MI 48674 517-636-1000
	Modifier	Cobalt Napthenate 6%	Condea Servo LLC Piscataway, NJ 08855
	Curing Agent	Luperox CU90	Elf Atochem North America Piffard, NY 14533 585-243-0330
Non-Structural Resin Repair System	Base Resin Curing Agent	PR2032 PH3630(~0.5 hour pot life) PH3660 (~1 hour pot life) PH3665 (~2 hours pot life)	PTM&W Industries, Inc. Santa Fe Springs, CA 90670 800-421-1518

a. Serials 1815 and subsequent with high temperature firewall only. Use on engine compartment side of firewall only.
b. Serials 1815 and subsequent with high temperature firewall only. Use on engine compartment side of firewall only

(2) Filler Materials

Type	P/N or Spec.	Manufacturer
Fumed Silica	Aerosil 200 Pharma	Degussa Corporation Parsippany, NJ 07054-0677 877-202-3463
Microfiller	Sil-32, Sil-Cell	Silbrico Corporation Hodgkins, IL 60525 800-323-4287

(3) Bondline Control Materials

Type	P/N or Spec.	Manufacturer
Glass Beads	Microbead Class IV, 60+80 sieve size, 9.7 to 6.9 mil	MO-SCI Rolla, MO 65401 573-364-2338

(4) Repair Fabrics

Type	P/N or Spec.	Manufacturer
Structural Glass Fiber Fabric	7781 / F16 *or* F3	Hexcel Stamford, CT 06901 800-431-1110
Non-Structural Carbon Fiber Fabric	282	
Non-Structural Glass Fiber Fabric	7781 / F16 *or* F3 7725 / F16 *or* F3 7520 / F16 *or* F3	
Carbon Uni Tape, Prepreg	950-1	Cytec Engineered Material Winona, MN 55987 507 452-8127

(5) Sandwich Core Material

Type	P/N or Spec.	Manufacturer
Sandwich Core Material, Divinycell HT	HT 61 HT 70 HTZ 70 HT110	DIAB Inc. Desoto, TX 75115 972-228-7600

(6) Exterior Finish Body Fillers

Type	P/N or Spec.	Manufacturer
Flexible Ext. Spot Putty	100238	Fibre Glass - Evercoat Co. Cincinnati, OH 45242 513-489-7600
Spot-Lite, Light Weight Ext. Body Filler	100445	
Z-Grip Premium Body Filler	Refer to manufacturer.	
Plastik Honey Body Filler Thinner	Refer to manufacturer.	
Glaze Coat Spot Putty	Refer to manufacturer.	
Cream Hardener	Refer to manufacturer.	
Smart Grip Filler	Refer to manufacturer.	Gearhead Products Inc. Indianapolis, IN 46204 317- 237-3678
Smart Premium Glaze Spot Putty	Refer to manufacturer.	
Filler, P-17 High-Heat Resistant [a]	#17	AdTech Charlotte, MI 48813 800-255-9934
Filler, P-11 Flexible [a]	#11 Type 1 Blk	

a. De-ice porous panel installation only. Used to fill void between panel and wing skin.

(7) Primer

Type	P/N or Spec.	Manufacturer
Epoxy Primer, PPG Fleet Series (Metal only) Epoxy Primer Base - Gray See manufacturer's data sheet for optional components.	F3993	PPG Industries, Inc. Pittsburgh, PA 15272 877-367-4721
Primer, PPG Fleet Series (Composites/ABS Plastic only) Surfacer Base See manufacturer's data sheet for optional components.	K36 K38	PPG Industries, Inc. Pittsburgh, PA 15272 877-367-4721
Urethane Primer Surfacer (Composites/ABS Plastic only) Surfacer Base See manufacturer's data sheet for optional components.	CMO481030	Sherwin-Williams Aerospace Coatings Andover, KS 67002

Type	P/N or Spec.	Manufacturer
Primer Surfacer, P30 SpectraPrime Color (Composites/ABS Plastic only) Surfacer Base See manufacturer's data sheet for optional components.	 SpectraPrime	Sherwin-Williams 800-474-3794

(8) Paint Sealer

Type	P/N or Spec.	Manufacturer
POLANE Plus Sealer Primer Base (light gray) Catalyst Polyurethane Reducer Polane Exterior Catalyst Accelerator	 E65A71 V66V44 R7K69 Medium R7K84 Fast R7K94 Very Fast V66VB11	Sherwin-Williams
Primer/Sealer DP and DPLF Series Epoxy Primer Base DP Catalyst DT Reducer	 401 and 402 860, 870, and 885	PPG Industries
PPG Aerospace Series Epoxy Primer Primer Base (gray) Primer Activator Compliant Thinner	 CA 7501A CA 7501B CA 1805CX	PPG Aerospace

(9) Exterior Paint System - Single Stage

Type	P/N or Spec.	Manufacturer
Fleet - Single Stage Paint System, DSS Series: Top Coat - Cirrus White See manufacturer's data sheet for optional components.	 DSS92813 DSS90841 DSS91330 DSS91536	PPG Industries, Inc. Pittsburgh, PA 15272 877-367-4721

EFFECTIVITY:
All

(10) Exterior Paint System - Two Stage

Type	P/N or Spec.	Manufacturer
Fleet - Two Stage Paint System: Base/Clear Coat Base Coat - White Base Coat - Silver Pearl Base Coat - Sterling 2011 Base Coat - Gold Base Coat - Black# Base Coat - Gulf Blue* Base Coat - Imperial Red* Base Coat - Orange* Base Coat - Yellow* Base Coat - Titanium* *Fuselage Only. #Accent Only. Clear Coat Clear Coat Clear Coat - Spot Repair Only See manufacturer's data sheet for optional components.	 FBC92813 FBC37121 FBC920048 FBC918202 FBC9700A FBC105020 / FBC105220 FBC919387 FBC920318/1&2 FBC801070 FBC918510 F3905 F3906 F3930	PPG Industries, Inc. Pittsburgh, PA 15272 877-367-4721

Type	P/N or Spec.	Manufacturer
SKYscapes 850 and 855 - Two Stage Paint System Base/Clear Coat Base Coat - Snow White Base Coat - Sterling Silver Base Coat - Frost Blue Base Coat - Titanium Base Coat - Champagne Gold Base Coat - Solar Yellow Base Coat - Dragonfly Green Base Coat - Gulf Blue* Base Coat - Imperial Red* Base Coat - Agate Grey* Base Coat - Sedona Red* Base Coat - Athens Blue* Base Coat - Driftwood Tan* Base Coat - Corso Red* Base Coat - Mantis Green* Base Coat - Monaco Blue* Base Coat - Monarch Blue* Base Coat - Titan Grey* Base Coat - Phantom Silver* *Fuselage Only See manufacturer's data sheet for system being used for applicable base coat hardeners and reducers. Clear Coat Clear Coat Hardener Clear Coat Reducer See manufacturer's data sheet for optional components.	 CM0850102 / CM0855102 SGM06660 / CM0855660 SGM200001 SGM200006 SGM06751 S200105 / SG200105 SGM200595 SGM06662 SGP06661 SGM200002 SGE200005 SGP200007 SGM06750 S11279 / SG11279 S11402 / SG11402 S11432 / SG11432 S200597 / SG200597 S00598 / SG00598 SGM200599 CM0850CC1 CMO0850CH1 CMO110106 / CM0110104	Sherwin-Williams Aerospace Coatings Andover, KS 67002
Wing Walk Class 1 Exterior Paints Base Part Number (A-A-59166)* * Color Matched to Approved Wing Colors Thinner Accelerator	 PT-766 Sterling PT-766 Snow White PT-766 Frost Blue PT-766 Champagne Gold PT-766 Solar Yellow PT-766 Dragonfly Green PT-1003, Type 1 Polykick	Products Techniques, Inc.

(11) Interior Paint System

Type	P/N or Spec.	Manufacturer
Polane T Interior Enamel Paint System: Black Cocoa Tan Slate Tawny Driftwood Gray Impala (Soft Touch) Slate (Soft Touch) Tawny (Soft Touch)	 F63TXB14208-1417 F63B12 F63TXN12058-4302 F63TXA14206-1417 F63TXA12806-4302 F63TXH12761-4302 F63TXH12473-4302 F63TXA10315-4302 F63TXH14754-4302 F63TXB13073-4302 F63TXH13038-4302	Sherwin Williams Cleveland, Ohio 44115 216-566-2000
TEC/SYSTEM 97 Interior Vinyl Coating Paint System: Stone	 97-48690-L	Martin-Senour Warrensville Heights, OH 44128 800-526-6704
Soft Touch Polyurethane Coating Paint System: Clear Coat Thinner Hardener	 ST2010 ST2011 ST2012	ALSA Corporation Vernon, CA 90058 800-999-4120
Soft Touch Polyester Coating Paint System: Clear Reducer Hardener	 6125SP 6396SP 6225SP	PPG Industries, Inc. Pittsburgh, PA 15272 877-367-4721

(12) General Adhesives

Type	P/N or Spec.	Manufacturer
Epoxy Adhesive	5 Minute Epoxy	Devcon Danvers, MA 01923 800-933-8266
	Loctite E-00NS	Henkel Corporation Bay Point, CA 94565-0031 925-458-8278

(13) Sealants

Type	P/N or Spec.	Manufacturer
Sealant w/ Semkit Applicator Typically used for window installation.[a]	PRC-1829, Class B (polythioether)	PRC - Desoto Glendale, CA 91203 818-247-7140
Sealant w/ Semkit Applicator Typically used for interior fuel bay sealing and wing/horizontal root fairing installation. Alternate for window installation.[a]	AMS-3277, Type II, Class B (polythioether) ***or*** AMS-S-8802, Type II, Class B (polysulfide)	Any Source
Sealant w/ Semkit Applicator Typically used for sealing fuel bay access panels.	AMS-S-83318	Any Source
High Temperature Sealant	736 RTV	Dow Corning Corporation Midlands, MI 48686 517-496-6000
Primer Typically used to ensure bond between pre-heater pad and engine.	PR-1200 Prime Coat	
Caulk Sealant Typically used for antenna sealing. Specific sealant used for exterior cosmetic window sealing.[b]	C850A 151-8273 White	Sherwin Williams Cleveland, Ohio 44115 216-566-2000
	1518281 Antique White	
	1518299 0920-A Beige	
	051135-06580 White	3M Company St. Paul, MN 55144 888-364-3577
	08361 Gray	
	08360 White	
	08364 Beige	
	62529252306 Clear[c]	
	62527752331 White	
	62527852339 Black[b]	
	62527952337 Gray	
High Temperature Sealant w/ Semkit Applicator Typically used on firewall.	AMS-3374, Type I	Any Source

Type	P/N or Spec.	Manufacturer
Firewall Sealant	CS-1900	Flame Master Corp. Sun Valley, CA 91352 818-982-1655
General-Purpose Acetoxy Sealant	RTV103	Momentive Performance Materials Waterford, NY 12188 800-424-9300
Primer, Adhesion Promoter	AC 137 Red	3M Company St. Paul, MN 55144 888-364-3577
Primer, Thread Sealant	Loctite 7471	Henkel Corporation Bay Point, CA 94565-0031 925-458-8278
Thread Sealant	Loctite 569	
Fuel Cap Conductive Sealant	PRC-2200, Class B	PRC - Desoto Glendale, CA 91203 818-247-7140

a. For adhesive application at window installation, primer is required to improve adhesion of sealant to acylic bonding flange. Do not apply primer to composite bonding surface.
b. Acceptable for use on cosmetic window seal.
c. Permissible to add basecoat to match aircraft's exterior color:
   1. To each cartridge of sealant, add 10ml of approved basecoat component only.
   2. Mix sealant until evenly distributed.

(14) Expanded Metal Mesh

Type	P/N or Spec.	Manufacturer
Expanded Metal Mesh, Aluminum, 0.060 lb-ft² (0.293 kg-m²) Typically used for general EMM repairs.	AL060CX	Astroseal Products Chester, CT 06412 860-526-8605
Expanded Metal Mesh, Aluminum, 0.028 lb-ft² (0.137 kg-m²) Typically used for ground path between Wing Skin EMM and Fuel Cap Assembly.	AL028CX	
Expanded Metal Mesh, Copper, 0.029 lb-ft² (0.142 kg-m²) Typically used for ground path between Wing Skin EMM and Fuel Cap Assembly.	CU029 CX31	
Expanded Metal Mesh, Aluminum, 0.028 lb-ft² (0.137 kg-m²) Typically used for ground path.	7AL(1145)9-078	Dexmet Corporation Wallingford, CT 06492 203-294-4440
Expanded Metal Mesh, Aluminum, 0.060 lb-ft² (0.293 kg-m²) Typically used for ground path.	5AL(1145)15-078	

(15) Peel Ply

Type	P/N or Spec.	Manufacturer
Peel Ply, Polyester Sheet 400° F (204° C)	Stitch Ply G	Airtech International, Inc. Huntington Beach, CA 92647 714-899-8100

(16) Release Film

Type	P/N or Spec.	Manufacturer
Release Film, Polyvinyl Chloride (PVC) Film	WL4600 WL5200 A4000R	Airtech International, Inc. Huntington Beach, CA 92647 714-899-8100
	D5000	De-Comp Composites, Inc. Cleveland, OK 74020 877-609-5088

(17) Corrosion Inhibitor

Type	P/N or Spec.	Manufacturer
Corrosion Preventative Compound, General	ACF-50	Lear Chemical Research Mississauga, ON Canada L5T 1Z2 800-256-2548
	LPS 3	LPS Laboratories Tucker, GA 30085 770-934-7800
Corrosion Preventative Compound, Avionics/Electrical	ACF-50	Lear Chemical Research Mississauga, ON Canada L5T 1Z2 800-256-2548

(18) Miscellaneous

Type	P/N or Spec.	Manufacturer
Barrier Cream	SBS 40	DEB SBS, Inc. Stanley, NC 28164 704-263-4240
Permanent Marker	0888X	Avery Dennison Pasadena, CA 91103-3596 626-304-2000
Bagging Film	BF-250602	Northern Fiberglass Hampton, NH 03843 603-926-1910
Bagging Film Breather	A-3000-60	Northern Fiberglass Hampton, NH 03843 603-926-1910
Flashbreaker Tape	8951	3M Center St. Paul, MN 55144-1000 888-364-3577
Copper Tape, Tin Plated	8271-0300-76 8271-0400-76	Instrument Specialties Euless,TX 76040 817-267-2651
Aluminum Tape	MIL-T-47014	Any Source
General Purpose Adhesive Cleaner	08984	3M Center St. Paul, MN 55144-1000 888-364-3577

C. Structural Repair Systems

CAUTION: Preparation of the following repair systems can generate excessive amounts of heat when reacted in large volumes and, if not handled properly, can result in an exothermic reaction and self ignition.

(1) Preparation of MGS L418-Based **or** L285-Based **or** Hysol EA 9396-Based Structural Resins

MGS L418-Based and/or L285-Based Structural Resins are the primary resin systems used in all composite repairs.

CAUTION: Hysol EA 9396-Based Structural Resins may only be used on the engine compartment side of the firewall on Serials 1815 and subsequent.

Resin Repair Components	Mix Ratio (By Weight)	Calculated Component Weight
L418 Base Resin H418 Curing Agent	100 parts Base Resin to 40 parts Curing Agent (100:40)	Net Curing Agent Weight = Net Resin Weight × 0.4
L285 Base Resin H287 Curing Agent	100 parts Base Resin to 40 parts Curing Agent (100:40)	Net Curing Agent Weight = Net Resin Weight × 0.4
Hysol EA 9396 Base Resin Hysol EA 9396 Curing Agent	100 parts Base Resin to 30 parts Curing Agent (100:30)	Net Curing Agent Weight = Net Resin Weight × 0.3

Figure 51-301 Mixing Ratio

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
L418 Structural Resin System **or**	(Refer to 51-30)	(Refer to 51-30)	Laminate repair.
L285 Structural Resin System **or**	(Refer to 51-30)	(Refer to 51-30)	Laminate repair.
Hysol EA 9396 Structural Resin System	(Refer to 51-30)	(Refer to 51-30)	Laminate repair.
Mixing Container	Wax Free	Any Source	Mixing.
Stirrer or Hand-Mixer	-	Any Source	Mixing.
Scale	18605T84	McMaster-Carr Atlanta, GA 30374-0100 404-346-7000	Weighing.

(b) Zero scale to ensure accurate measurements.

(c) Place empty mixing container on scale and record Container Weight.

(d) Pour required amount of base resin into mixing container.

(e) Place mixing container with base resin on scale and record Gross Resin Weight.

(f) Subtract Container Weight from Gross Resin Weight to determine Net Resin Weight.

(g) Determine amount of curing agent required for Net Resin Weight.

Example:

If the mix ratio is 100 parts base resin to 40 parts curing agent (100:40) and repair requires 8.82 oz (250 gm) of resin, amount of curing agent is calculated as follows:

Net Curing Agent Weight = Net Resin Weight × 0.4

Net Curing Agent Weight = 8.82 oz (250 gm) × 0.4

Net Curing Agent Weight = 3.53 oz (100 gm)

(h) Place empty mixing container on scale and record Container Weight.

(i) Add Container Weight and Net Curing Agent Weight together to determine Gross Curing Agent Weight.

(j) With empty mixing container on scale, pour curing agent into mixing container until Gross Curing Agent Weight is obtained.

(k) Mix curing agent and base resin. Stir mixture continuously and mix thoroughly. Mix resin to uniform appearance with no swirls or color differences. After resin appears uniform, mix for an additional two minutes. Continue to mix until no clouding is visible in the mixing container.

(2) Preparation of MGS L418-Based Structural Paste Adhesive

MGS L418-Based Structural Paste Adhesive is the primary adhesive system used in all composite repairs.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fumed Silica (Aerosil 200)	(Refer to 51-30)	(Refer to 51-30)	Resin viscosity.
Microfiller (Sil 32, Sil-Cell)	(Refer to 51-30)	(Refer to 51-30)	Resin viscosity.
Glass Beads (Microbead Class IV, 60+80 sieve size, 9.7 to 6.9 mil)	(Refer to 51-30)	(Refer to 51-30)	Bondline control.
Mixing Container	Wax Free	Any Source	Mixing.
High Speed Continuous Mixer	-	Any Source	Mixing.
Sawtooth Mixing Blade 2 inch diameter 3 inch diameter 4 inch diameter	 DB2B DB3B DB4B	 INDCO, Inc. New Albany, IN 47151 800-942-9742	Mixing.
Paddle Type Mixing Blade	-	Any Source	Mixing.
Scale	18605T84	McMaster-Carr Atlanta, GA 30374-0100 404-346-7000	Weighing.

(b) Prepare MGS L418-Based Structural Resin. (Refer to 51-30)

(c) From values obtained when mixing structural resin, subtract Container Weight from Gross Resin Weight to determine Net Resin Weight.

(d) Determine structural adhesive mix ratio with fumed silica and microfiller as specified.

Example:

If the mix ratio is 100 parts mixed resin to 5.3 parts fumed silica to 9 parts microfiller (100:5.3:9) and repair requires 8.82 oz (250 gm) of resin, amount of fumed silica and microfiller is calculated as follows:

Net Fumed Silica Weight = Net Resin Weight × 0.053

Net Fumed Silica Weight = 8.82 oz (250 gm) × 0.053

Net Fumed Silica Weight = 0.47 oz (13.25 gm)

Net Resin Weight = Net Resin Weight + Net Fumed Silica Weight

Net Resin Weight = 8.82 oz + 0.47 oz (250 gm + 13.25 gm)

Net Resin Weight = 9.29 oz (263.25 gm)

Net Microfiller Weight = Net Resin Weight × 0.090

Net Microfiller Weight = 9.29 oz (263.25 gm) × 0.090

Net Microfiller Weight = 0.84 oz (23.69 gm)

Note: Acceptable range for fumed silica is 5.1 to 5.5 parts and for microfiller is 8.8 to 9.2 parts.

Material	Mix Ratio (By Weight)	Calculated Component Weight
Mixed Resin Aerosil (Fumed Silica) Sil-Cell (Microfiller)	100 parts Mixed Resin to 5.3 parts Fumed Silica to 9 parts Microfiller (100:5.3:9)	Net Fumed Silica Weight = Net Resin Weight × 0.053 Net Microfiller Weight = Net Resin Weight × 0.090

(e) Place empty mixing container on scale and record Container Weight.

(f) Add Container Weight and Net Fumed Silica Weight together to determine Gross Fumed Silica Weight.

(g) With empty mixing container on scale, pour fumed silica into mixing container until Gross Fumed Silica Weight is obtained.

(h) Add fumed silica to mixing container with mixed resin.

CAUTION: Fumed silica must be mixed at a high rate of speed. Hand mixing is not sufficient as it can not provide adequate shear to disperse the material.

Blade tip speed must be 22 to 33 feet per second (7 to 10 meters per second) for entire duration of mixing cycle. (See Figure 51-302)

Note: Blade to mixing container diameter ratio of 1:2 to 1:3 is recommended. (See Figure 51-302)

(i) Position sawtooth blade 0.5 to 1.0 times blade diameter from bottom of mixing container.

Material	Mix Ratio (By Weight)	Calculated Component Weight
Mixed Resin Aerosil (Fumed Silica) Sil-Cell (Microfiller)	100 parts Mixed Resin to 5.3 parts Fumed Silica to 9 parts Microfiller (100:5.3:9)	Net Fumed Silica Weight = Net Resin Weight × 0.053 Net Microfiller Weight = Net Resin Weight × 0.090

CAUTION: Keep dispersion time to a minimum to prevent excessive temperature build-up. Typical dispersion times are one to two minutes.

(j) Use a tip speed of 22 to 33 feet per second (7 to 10 meters per second) to mix resin with fumed silica between 1500 to 2000 RPM.

(k) Clean off blade and return excess to container.

(l) Place empty mixing container on scale and record Container Weight.

(m) Add Container Weight and Net Microfiller Weight together to determine Gross Microfiller Weight.

(n) With empty mixing container on scale, pour microfiller into mixing container until Gross Microfiller Weight is obtained.

(o) Add microfiller to mixing container with mixed resin.

CAUTION: Microfiller will be damaged by high shear mixing speed. Mix at low speed only.

Material will adhere to the container sidewalls; scrape the inside of the container several times to ensure all material is mixed. If the material is not properly mixed, the resin will not obtain full strength.

(p) Use paddle-type mixing blade to slowly fold microfiller into mixed resin.

(q) Mix until material is uniform in texture.

(r) From values obtained when adding fumed silica and microfiller, subtract Container Weight from Gross Resin Weight to determine Net Resin Weight.

(s) Determine structural adhesive mix ratio with glass beads as specified.

Example:

If the mix ratio is 100 parts mixed adhesive to 2 parts mixed glass beads (100:2) and repair requires 8.82 oz (250 gm) of adhesive, amount of glass beads is calculated as follows:

Net Glass Beads Weight = Net Resin Weight × 0.02

Net Glass Beads Weight = 8.82 oz (250 gm) × 0.02

Net Glass Beads Weight = 0.18 oz (5.00 gm)

Note: Acceptable range for glass beads is 1.5 to 2.5 parts.

Material	Mix Ratio (By Weight)	Calculated Component Weight
Mixed Resin Glass Beads	100 parts Mixed Resin to 2 parts Glass Beads (100:2)	Net Glass Beads Weight = Net Resin Weight × 0.02

(t) Place empty mixing container on scale and record Container Weight.

(u) Add Container Weight and Net Glass Beads Weight together to determine Gross Glass Beads Weight.

(v) With empty mixing container on scale, pour glass beads into mixing container until Gross Glass Beads Weight is obtained.

(w) Add glass beads to mixing container with mixed resin.

CAUTION: Avoid entrapping air during the mixing process.

Glass beads will be damaged by high shear mixing speed. Mix at low speed only.

(x) Use paddle-type mixing blade to slowly fold glass beads into mixed resin.

(y) Mix until material is uniform in texture.

			Mixing Speed (RPM)						
			1000	1500	2000	2500	3000	3500	4000
Blade Diameter (inch)	1.5	Blade Tip Speed (feet per second)	7	10	13	16	20	23	26
	2.0		9	13	17	22	26	31	35
	2.5		11	16	22	27	33	38	44
	3.0		13	20	26	33	39	46	52
	3.5		15	23	31	38	46	53	61
	4.0		17	26	35	44	52	61	70
	4.5		20	29	39	49	59	69	79
	5.0		22	33	44	55	65	76	87

Figure 51-302
Blade Diameter and Mixing Speed Guide for MGS L418-Based Structural Adhesive

Note: Recommended blade tip speed of 22 - 33 feet per second (7 - 10 meters per second) shown in shaded regions.

(3) Preparation of PTM&W ES6292-Based **or** Hysol EA 9395-Based Structural Paste Adhesive

CAUTION: Hysol EA 9395-Based Structural Paste Adhesive may only be used on the engine compartment side of the firewall on Serials 1815 and subsequent.

Resin Repair Components	Mix Ratio (By Weight)	Calculated Component Weight
ES6292-A (Base Resin) ES6292-B w/ Beads (Curing Agent)	100 parts Base Resin to 31.5 parts Curing Agent (100:31.5)	Net Curing Agent Weight = Net Resin Weight × 0.315
Hysol EA 9395 Base Resin Hysol EA 9395 Curing Agent	100 parts Base Resin to 17 parts Curing Agent (100:17)	Net Curing Agent Weight = Net Resin Weight × 0.17

Figure 51-303 Mixing Ratio

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
PTM&W ES6292-Based Structural Paste Adhesive	(Refer to 51-30)	(Refer to 51-30)	Base resin system.
Structural High Temperature Paste Adhesive: Hysol EA 9395-Based	(Refer to 51-30)	(Refer to 51-30)	Base resin system.
Stirrer or Hand-Mixer	-	Any Source	Mixing.
Mixing Container	Wax Free	Any Source	Mixing.
Scale	18605T84[a]	McMaster-Carr Atlanta, GA 30374-0100 404-346-7000	Weighing.

a. or equivalent

(b) Zero scale to ensure accurate measurements.
(c) Place empty mixing container on scale and record Container Weight.
(d) Pour required amount of base resin into mixing container.
(e) Place mixing container with base resin on scale and record Gross Resin Weight.
(f) Subtract Container Weight from Gross Resin Weight to determine Net Resin Weight.
(g) Determine amount of curing agent required for Net Resin Weight.

Example:

If the mix ratio is 100 parts base resin to 31.5 parts curing agent (100:31.5) and repair requires 8.82 oz (250 gm) of resin, amount of curing agent is calculated as follows:

Net Curing Agent Weight = Net Resin Weight × 0.315

Net Curing Agent Weight = 8.82 oz (250 gm) × 0.315

Net Curing Agent Weight = 2.78 oz (78.75 gm)

Note: Acceptable range for curing agent is 31 to 32 parts.

(h) Place empty mixing container on scale and record Container Weight.

(i) Add Container Weight and Net Curing Agent Weight together to determine Gross Curing Agent Weight.

(j) With empty mixing container on scale, pour curing agent into mixing container until Gross Curing Agent Weight is obtained.

CAUTION: Material may be manually mixed using a flat edged mixing utensil, a low speed drill with impeller blade, a slow speed stand mixer, or similar. Use of a high speed drill and shearing blade are not allowed. Glass beads in curing agent will be damaged by high shear mixing speed.

Material will adhere to the container sidewalls; scrape the inside of the container several times to ensure all material is mixed. If the material is not properly mixed, the resin will not obtain full strength.

(k) Mix curing agent and base resin. Stir mixture continuously and mix thoroughly. Mix resin to uniform appearance with no swirls or color differences. After resin appears uniform, mix for an additional two minutes.

(l) “Double cup” or pour/scrape adhesive from one container to another container to ensure adhesive is fully mixed.

(m) To prevent moisture and carbon dioxide contamination, air in the head space of storage containers must be replaced with inert nitrogen gas. It is recommended that a nitrogen purge be conducted on 5 gallon containers each time material is dispensed, and from the smaller containers upon filling. Perform the following steps prior to returning PTM&W ES6292-Based Repair System to storage:

1 Using compressed nitrogen, any grade, set pressure regulator at 10 psi or less.

2 Open lid of container slightly and place hose, or similar, inside container. Dispense enough nitrogen to replace all the air in the head space. Remove hose and immediately place lid on container.

3 Store materials in accordance with the manufacturer’s instructions.

(n) Create inspection sample.

All repairs using PTM&W ES6292-Based Structural Adhesive must create a post cure inspection sample to ensure the adhesive was properly mixed.

1 Place sample of resin into a container (small shallow dish or paper).

2 Verify sample is approximately 0.5 inch (1.27 cm) thick and 2.0 inches (5.0 cm) in diameter.

3 Cure sample with repair.

4 Remove inspection sample from container.

5 Place inspection sample on hard, clean surface suitable for breaking with chisel.

CAUTION: Avoid shattering inspection sample into small fragments. Gently tap sample with chisel and hammer to produce a clean fracture.

6 Use hammer and chisel to break inspection sample.

7 Verify cross-sectional fragments are homogenous. If dark or swirling colors are present in the sample, the resin was not mixed properly. Contact Cirrus Design for disposition.

D. Non-Structural Repair Systems

CAUTION: Preparation of the following repair system can generate excessive amounts of heat when reacted in large volumes and, if not handled properly, can result in an exothermic reaction and self ignition.

(1) Preparation of Non-Structural Resin

Non-structural resin is used to repair areas of damaged plies in non-structural components, such as the cabin doors, wheel fairings, or cowling. It is also used specifically to seal laminate in the fuel bay walls and install EMM and in the preparation of filler paste.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Non-Structural Resin	(Refer to 51-30)	(Refer to 51-30)	Laminate repair.
Mixing Container	Wax Free	Any Source	Mixing.
Stirrer or Hand-Mixer	-	Any Source	Mixing.
Scale	18605T84	McMaster-Carr Atlanta, GA 30374-0100 404-346-7000	Weighing.

(b) Zero scale to ensure accurate measurements.

(c) Place empty mixing container on scale and record Container Weight.

(d) Pour required amount of base resin into mixing container.

(e) Place mixing container with base resin on scale and record Gross Resin Weight.

(f) Subtract Container Weight from Gross Resin Weight to determine Net Resin Weight.

(g) Determine amount of additional component(s) required for Net Resin Weight.

Example:

If the mix ratio is 100 parts base resin to 11 parts modifier to 16 parts curing agent (100:11:16) and repair requires 8.82 oz (250 gm) of resin, amount of modifier and curing agent is calculated as follows:

Net Modifier Weight = Net Resin Weight × 0.11

Net Modifier Weight = 8.82 oz (250 gm) × 0.11

Net Modifier Weight = 0.97 oz (27.5 gm)

Net Resin Weight = Net Resin Weight + Net Modifier Weight

Net Resin Weight = 8.82 oz + 0.97 oz (250 gm + 27.5 gm)

Net Resin Weight = 9.79 oz (277.5 gm)

Net Curing Agent Weight = Net Resin Weight × 0.16

Net Curing Agent Weight = 9.79 oz (277.5 gm) × 0.16

Net Curing Agent Weight = 1.57 oz (44.4 gm)

Resin Repair Components	Mix Ratio (By Weight)	Calculated Component Weight
Epon 862 (Base Resin) Epicure 3234 (Curing Agent)	100 parts Base Resin to 14.25 parts Curing Agent (100:14.25)	Net Curing Agent Weight = Net Resin Weight × 0.1425
Epon 862 (Base Resin) Heloxy 68 (Modifier) Epicure 3234 (Curing Agent)	100 parts Base Resin to 11 parts Modifier to 16 parts Curing Agent (100:11:16)	Net Modifier Weight = Net Resin Weight × 0.11 Net Curing Agent Weight = (Net Resin Weight + Net Modifier Weight) × 0.16
Derakane 470-36 (Base Resin) Cobalt Napthenate 6% (Modifier) Luperox CU90 (Curing Agent)	100 parts Base Resin to 0.2 part Modifier to 1 part Curing Agent (100:0.2:1)	Net Modifier Weight = Net Resin Weight × 0.002 Net Curing Agent Weight = (Net Resin Weight + Net Modifier Weight) × 0.01
PR2032 (Base Resin) PH3630 (Curing Agent) PH3660 (Curing Agent) PH3665 (Curing Agent)	100 parts Base Resin to 27 parts Curing Agent (100:27)	Net Curing Agent Weight = Net Resin Weight × 0.27

WARNING: For Derakane-Based Repair System, the modifier must always be added to the resin before the addition of any curing agent. Do not mix the modifier directly into the curing agent, as a violent chemical reaction will occur.

(h) For repair systems using modifiers, perform the following steps:

1 Place empty mixing container on scale. Record Container Weight.

2 Add Container Weight and Net Modifier Weight together to determine Gross Modifier Weight.

3 With mixing container on scale, pour modifier into mixing container until Gross Modifier Weight is obtained.

4 Mix modifier and resin. Stir mixture continuously and mix thoroughly. Mix resin to uniform appearance with no swirls or color differences. After resin appears uniform, mix for an additional two minutes. Continue to mix until no clouding is visible in the mixing container.

(i) Place empty mixing container on scale. Record Container Weight.

(j) Add Container Weight and Net Curing Agent Weight together to determine Gross Curing Agent Weight.

(k) With mixing container on scale, pour curing agent into mixing container until Gross Curing Agent Weight is obtained.

(l) Mix curing agent and resin. Stir mixture continuously and mix thoroughly. Mix resin to uniform appearance with no swirls or color differences. After resin appears uniform, mix for an additional two minutes. Continue to mix until no clouding is visible in the mixing container.

(2) Preparation of Filler Paste

Epon 862-based filler paste may be used to fill dents, gouges, or other voids left in the core or laminate material after surface preparation and for EMM installation. While the cure time is shorter than MGS L418 and L285-Based Filler Paste, for structural repairs, because Epon 862-

based filler paste uses a different base resin as the structural adhesive, the repair surface must be fully cured before continuing on with the lamination process. However, this may be considered an advantage when replacing foam core in complex shaped areas as the total time required for the necessary cure, surface preparation, and lay-up will be shorter.

MGS L418 and L285-based filler paste is used to fill dents, gouges, or other voids left in the core or laminate material after surface preparation. Because MGS L418 and L285-based filler paste uses the same base resin as the structural adhesive, surface irregularities may be filled without curing the repair surface prior to the lamination process as would be required if using the Epon 862-based filler paste.

Note: This procedure shall not be used to mix filler paste in a quantity larger than 11 oz (300 gm) of non-structural resin.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Structural or Non-structural Resin	(Refer to 51-30)	(Refer to 51-30)	Base resin.
Fumed Silica (Aerosil 200)	(Refer to 51-30)	(Refer to 51-30)	Resin viscosity.
Microfiller (Sil 32, Sil-Cell)	(Refer to 51-30)	(Refer to 51-30)	Resin viscosity.
Mixing Container	Wax Free	Any Source	Mixing.
Stirrer or Hand-Mixer	-	Any Source	Mixing.

(b) Prepare applicable structural or non-structural resin. (Refer to 51-30)

(c) Add fillers to achieve desired consistency as specified in table below.

(d) Mix until material is uniform in texture.

Material	Mix Ratio (By Volume)
Mixed Resin Aerosil (Fumed Silica) Sil-Cell (Microfiller)	1 part Mixed Resin to 0 - 3 parts Fumed Silica to 0 - 0.5 parts Microfiller

(3) Preparation of Liquid Shim

Liquid shim is a non-structural repair used to fill gaps (shim) between two component such as found on the lower landing gear attach bracket installation.

Note: This procedure shall not be used to mix filler paste in a quantity larger than 11 oz (300 gm) of non-structural resin.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Non-structural Resin	(Refer to 51-30)	(Refer to 51-30)	Base resin.
Microfiller (Sil 32, Sil-Cell)	(Refer to 51-30)	(Refer to 51-30)	Resin viscosity.
Mixing Container	Wax Free	Any Source	Mixing.

Description	P/N or Spec.	Supplier	Purpose
Stirrer or Hand-Mixer	-	Any Source	Mixing.

(b) Prepare applicable non-structural resin. (Refer to 51-30)

(c) Add Aerosil to achieve consistency of petroleum jelly as specified in table below.

(d) Mix until material is uniform in texture.

Material	Mix Ratio (By Volume)
Mixed Resin Aerosil (Fumed Silica)	1 part Mixed Resin to 0 - 3 parts Fumed Silica

E. Flight Control Surfaces

(1) Flight Control Surfaces

The flight control surfaces are manufactured using 6061-T6 aluminum sheet metal. Refer to Section 70, Standard Repairs for specific repair criteria before performing maintenance on flight control surfaces. (Refer to 51-70)

CAUTION: Blind rivets shall not be substituted for solid rivets for any hinge, fitting, torque tube, mass balance support, or bellcrank attachment. Contact Cirrus Design for disposition prior to performing repairs to these components. (Refer to AMM-Intro-)

- Mechanically locking blind rivets may be substituted for solid rivets for skin-to-spar flange and skin-to-rib flange joints only.
- Mechanically locking blind rivets may be used for skin repairs within the fastener pattern of an existing rib-to-spar skin bay.
- Replacement or repair fasteners must not result in a knife-edge countersink condition.
- If oversize fasteners are required, universal head fasteners must be used.

The following blind rivets may be substituted for solid rivets except for hinge, fitting, torque tube, mass balance support, or bellcrank attachment repairs:

Blind Rivet P/N	Equivalent Solid Rivet P/N
NAS9303B-4-() CR3214-4-()	NAS1097AD4
NAS9301B-4-() CR3213-4-()	MS20470AD4

STANDARD REPAIRS

1. DESCRIPTION

This section outlines approved standard repairs for the aircraft.

A. General Information and Requirements

Refer to Section 00 - Standard Practices: Structures for detailed information on personnel qualifications and safety information, construction methods, and Airframe Zone Diagrams. (Refer to 51-00)

Section 10 - Investigation, contains guidance for identification of damage, associated classifications and repairs, and damage reporting procedures. (Refer to 51-10)

Section 20 - Processes, describes specific processes and methods used in the repair of the aircraft. (Refer to 51-20)

Refer to Section 30 - Materials for a listing of all approved materials necessary to perform standard repairs. (Refer to 51-30)

2. MAINTENANCE PRACTICES

A. Cosmetic Damage

Cosmetic damage is defined as non-structural damage which includes gouges, scratches, dents, or other defects that are confined to the surface protection of the laminate.

(1) Gouges, Scratches, Dents, and Other Surface Protection Anomalies

(a) Determine the size and shape of the repair. (Refer to 51-10)

(b) Remove surface protection. (Refer to 51-20)

(c) Apply spot putty. (Refer to 51-20)
or
Apply body filler. (Refer to 51-20)

(d) Apply paint to repair area. (Refer to 51-20)

B. Secondary Bond Repairs

Secondary bond repairs are used to repair disbonds on secondary bonded composite structure.

(1) Bonded Joint

Bonded joint repairs are used to repair bond damage of secondary bonded composite structure. Typically between two pre-cured components.

(a) Determine the size and shape of the repair. (Refer to 51-10)
(b) Remove damage. (Refer to 51-20)
(c) Prepare repair surface. (Refer to 51-20)
(d) Apply structural adhesive. (Refer to 51-20)
(e) If applicable, apply paint to repair area. (Refer to 51-20)

C. Solid Laminate Repair

Solid laminate damage is where damage has extended beneath the surface protection and affected the underlying composite laminate.

(1) Non-Penetrating

Non-penetration damage includes delamination where ply separation in laminate has occurred due to abrasion, surface impact where structure has become cracked or dented from forcible contact, or gouged where a portion of ply layers have been displaced.

(a) Determine the size and shape of the repair. (Refer to 51-10)
(b) Remove damage. (Refer to 51-20)
(c) Prepare repair surface. (Refer to 51-20)
(d) Perform Laminating in Place. (Refer to 51-20)
or
Perform Laminating By Transfer Method. (Refer to 51-20)
(e) Apply paint to repair area. (Refer to 51-20)

(2) Penetrating

This form of repair addresses damage that has fully penetrated or fractured the laminate and necessitates a two-sided structural repair. A backing plate must be constructed and installed to the underside of the repair area. If the underside of the repair area is not accessible, the backing plate must be installed to the topside of the puncture.

(a) Determine the size and shape of the repair. (Refer to 51-10)
(b) Remove damage. (Refer to 51-20)
(c) Construct backing plate. (Refer to 51-20)
(d) Prepare repair surface. (Refer to 51-20)
(e) Perform Laminating in Place. (Refer to 51-20)
or
Perform Laminating By Transfer Method. (Refer to 51-20)
(f) Apply paint to repair area. (Refer to 51-20)

D. Sandwich Structure Repair

(1) Laminate Only (See Figure 51-701)

Laminate only damage in sandwich structure is where damage has extended beneath the surface protection and affected the laminate underneath. Damage includes delamination where ply separation in laminate has occurred due to adhesive failure, impacted laminate where structure has become cracked or dented from forcible contact, and gouged laminate where a portion of ply layers have been displaced but penetration has not occurred.

(a) For maintenance practices pertinent to laminate only damage, refer to Solid Laminate Repairs. (Refer to 51-70)

(2) Laminate and Core (See Figure 51-702), (See Figure 51-703)

Laminate and core damage is defined as damage to one side of the sandwich construction that exposes foam core. No penetration through core or opposite laminate surface. The damage is less than or equal to 4.0 × 4.0 × 0.15 inches (10.16 × 10.16 × 0.38 cm) deep or 2.0 × 2.0 × ***n*** inches (5.08 × 5.08 × ***n*** cm) deep where ***n*** represents full core depth.

(a) Determine the size and shape of the repair. (Refer to 51-10)
(b) Remove damage. (Refer to 51-20)
(c) Perform Foam Core Replacement. (Refer to 51-20)
(d) Prepare laminate repair surface. (Refer to 51-20)
(e) Perform Laminating in Place. (Refer to 51-20)
or
Perform Laminating By Transfer Method. (Refer to 51-20)
(f) Apply paint to repair area. (Refer to 51-20)

(3) Sandwich Penetration (See Figure 51-704)

Sandwich penetration damage is defined as damage to both sides of the sandwich construction that exposes foam core. Penetration through the core and opposite laminate surface. The damage is less than or equal to 4.0 × 4.0 × 0.15 inches (10.16 × 10.16 × 0.38 cm) deep or 2.0 × 2.0 × ***n*** inches (5.08 × 5.08 × ***n*** cm) deep where ***n*** represents full core depth.

(a) Determine the size and shape of the repair. (Refer to 51-10)
(b) Remove damage. (Refer to 51-20)
(c) Construct backing plate. (Refer to 51-20)
(d) Perform Foam Core Replacement. (Refer to 51-20)
(e) Prepare laminate repair surface. (Refer to 51-20)
(f) Perform Laminating in Place. (Refer to 51-20)
or
Perform Laminating By Transfer Method. (Refer to 51-20)
(g) Apply paint to repair area. (Refer to 51-20)

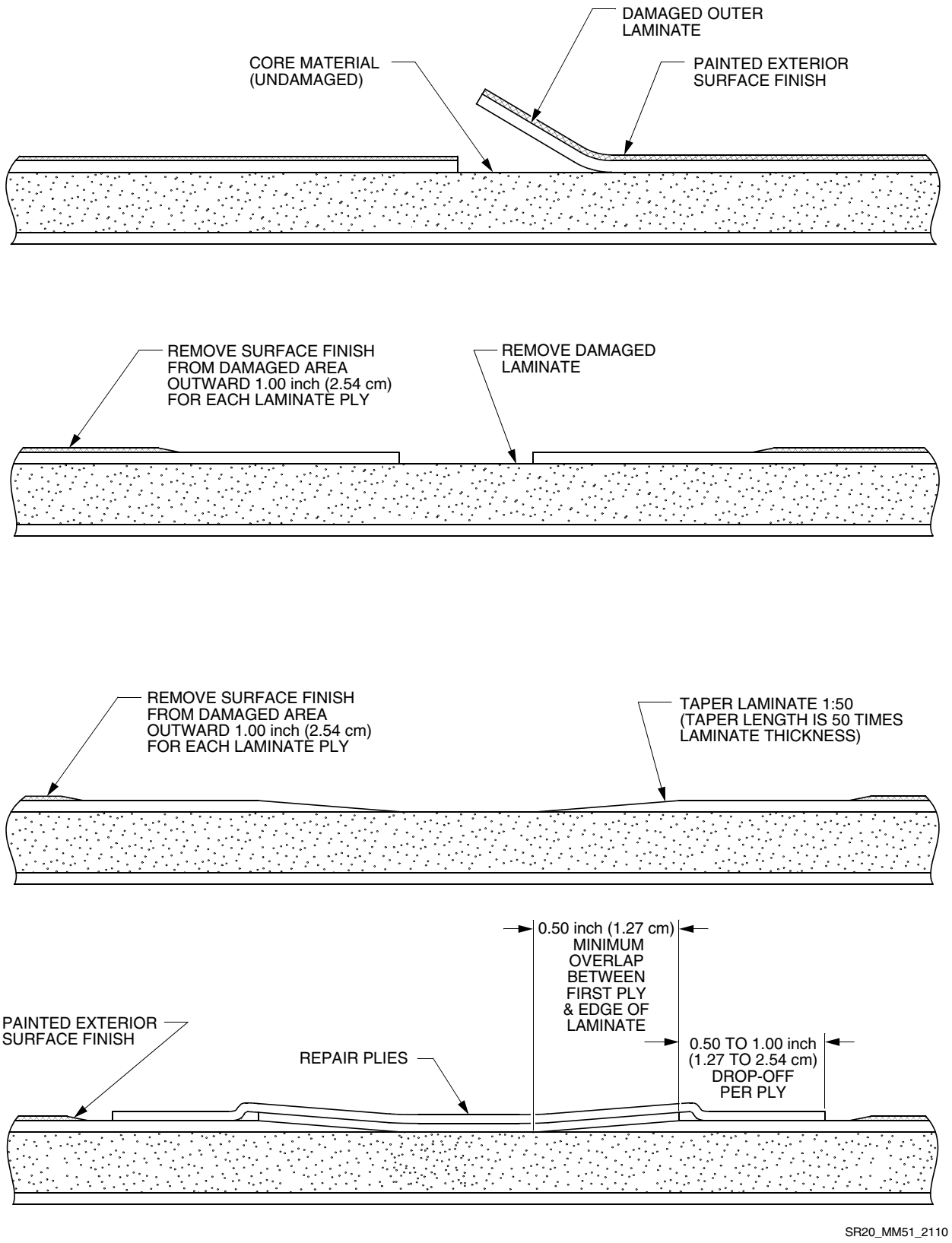


Figure 51-701
Laminate Only

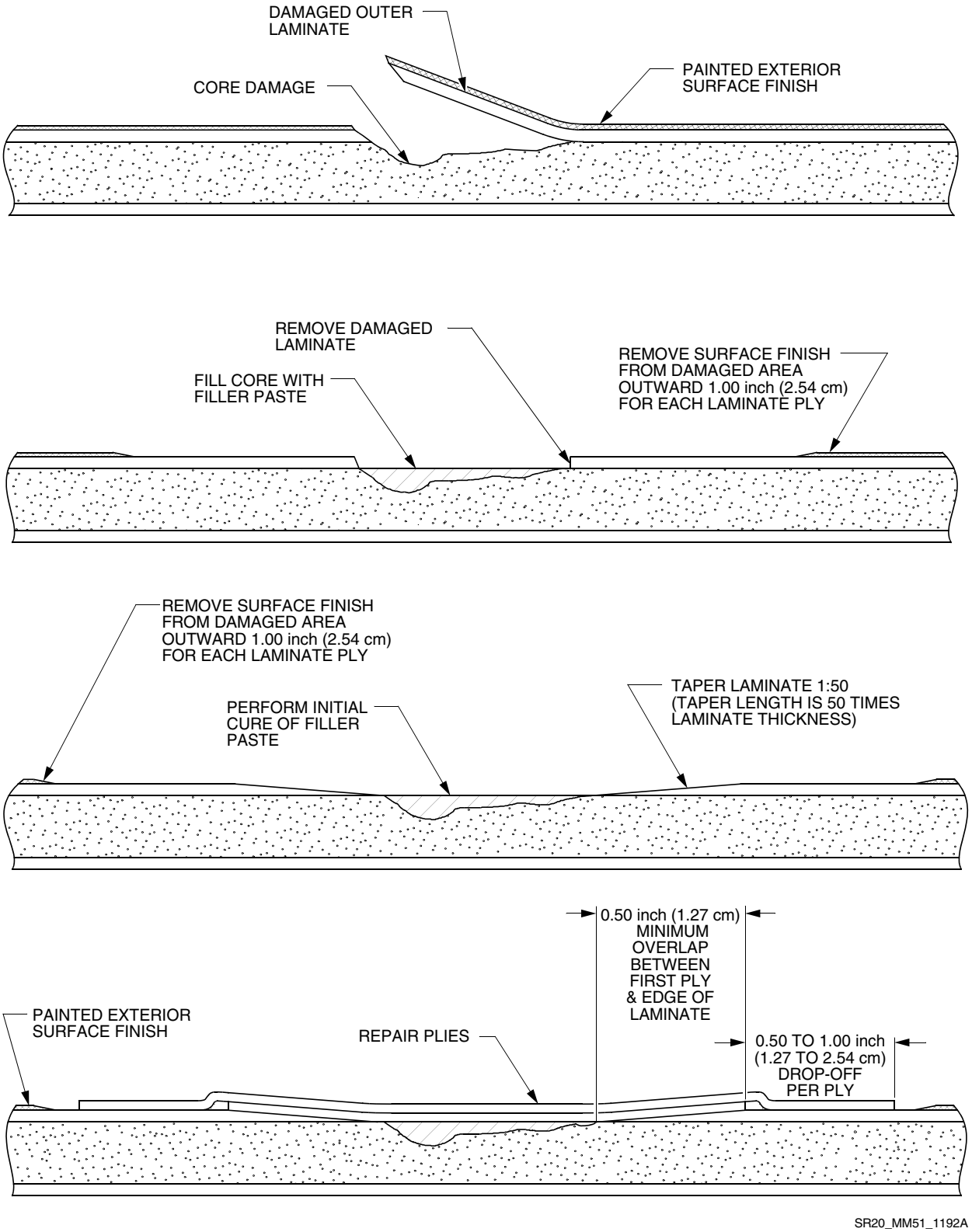


Figure 51-702
Laminate and Core Repair

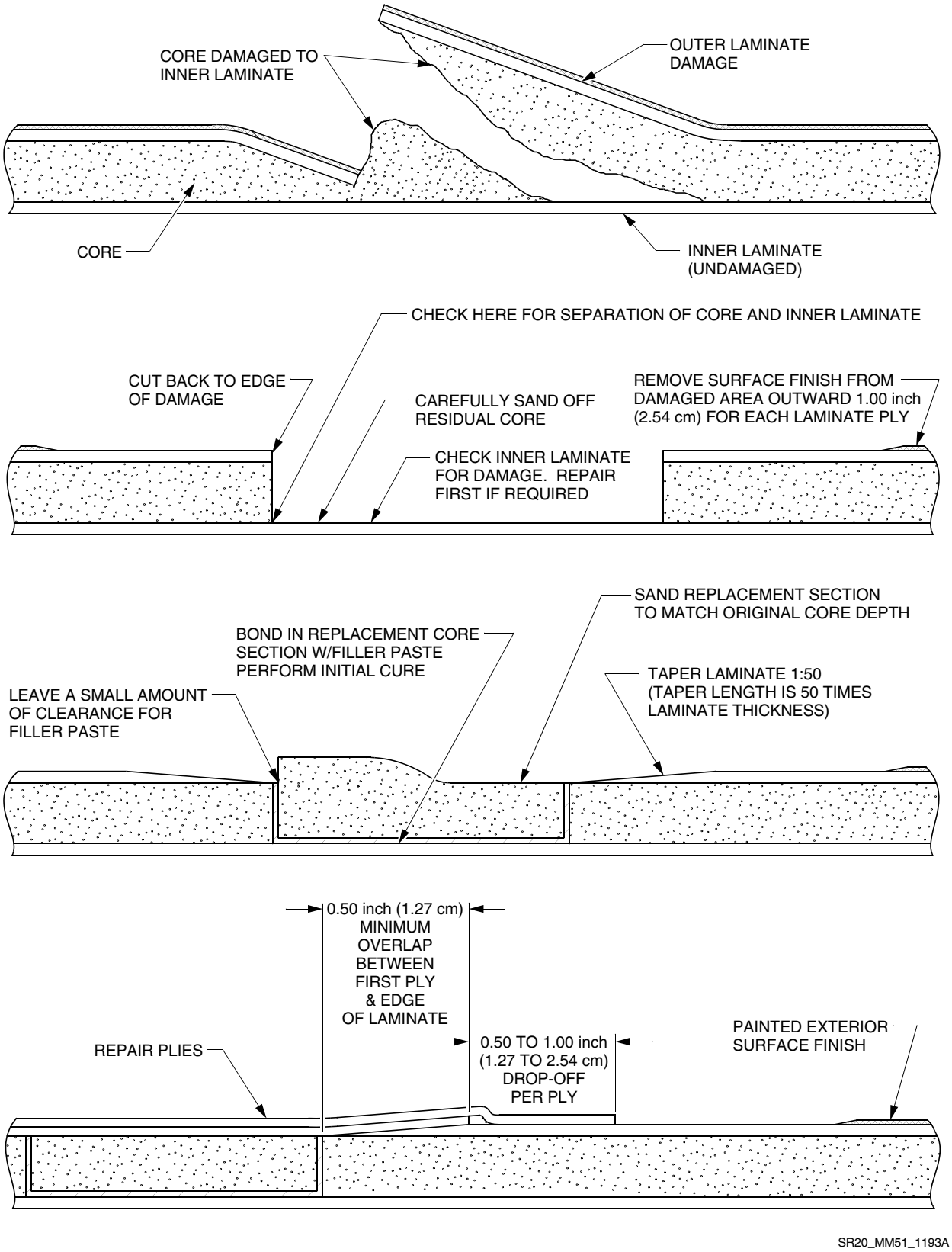


Figure 51-703
Laminate and Core Replacement

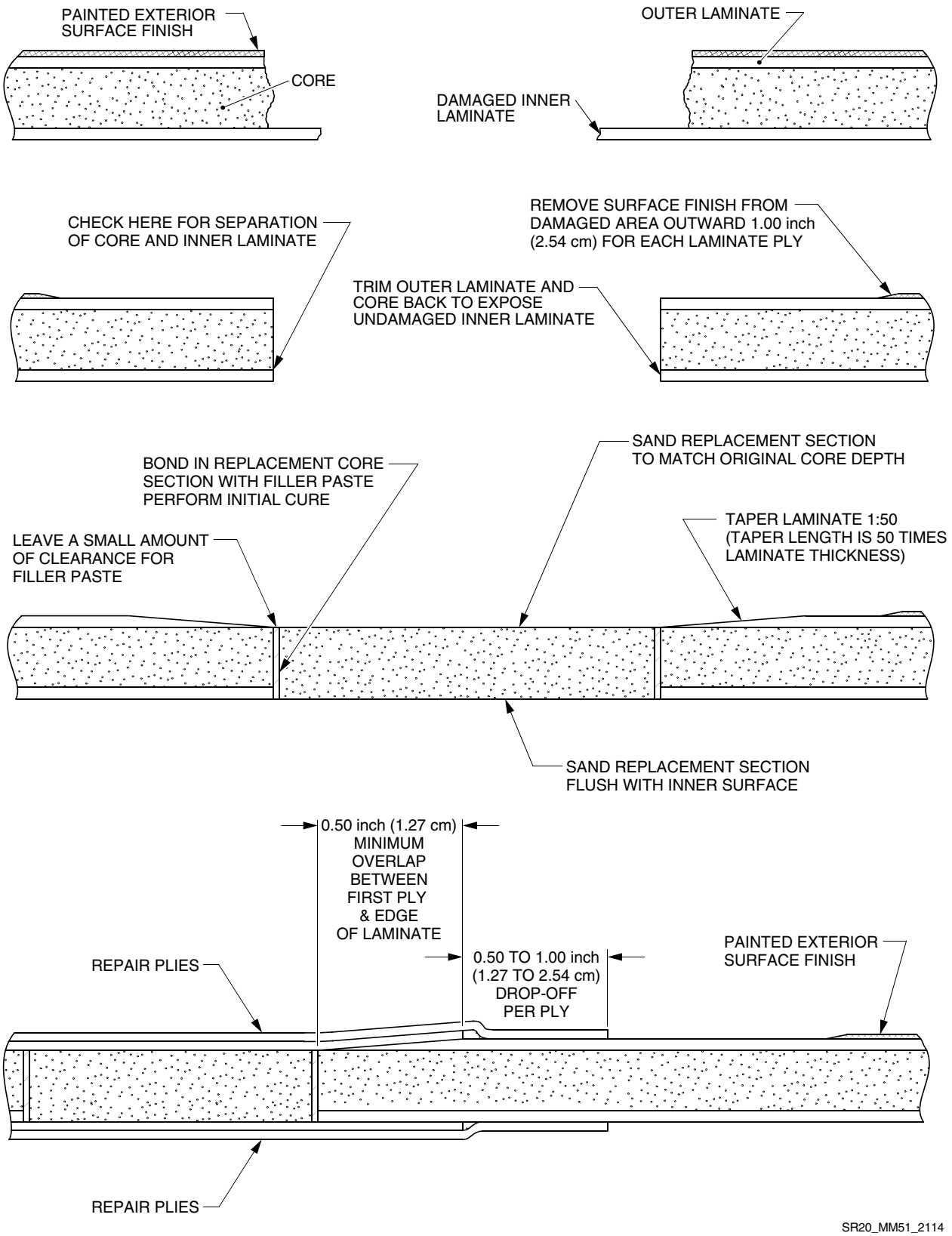


Figure 51-704
Sandwich Penetration - Foam Core Replacement (Sheet 1 of 2)

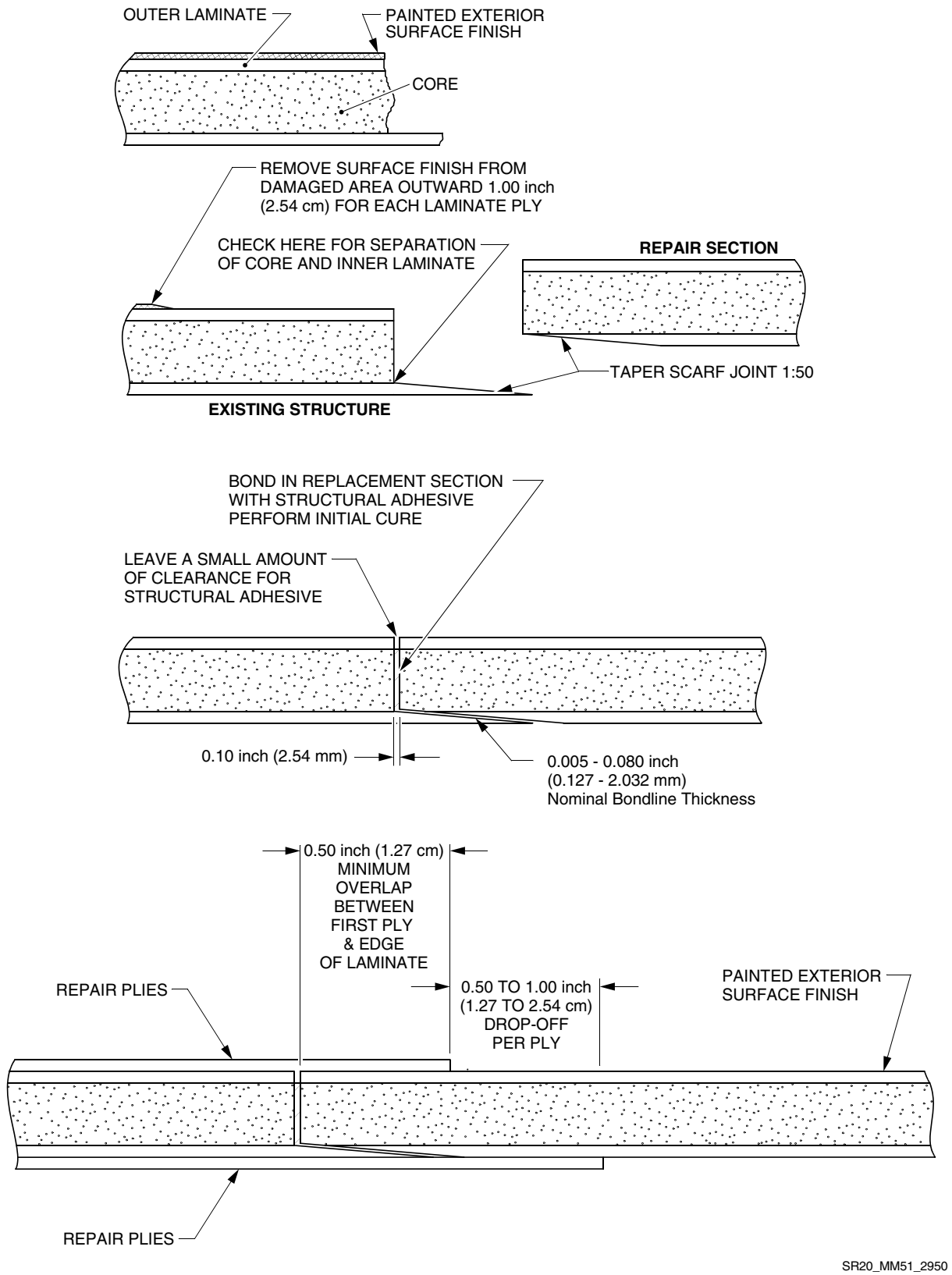


Figure 51-704
Sandwich Penetration - Sandwich Structure Replacement (Sheet 2 of 2)

E. Flight Control Surfaces

Sheet metal repair of flight control surface skins, ribs, and spars is authorized when accomplished in accordance with FAA AC 43.13-1B and the approved materials listed in Section 30, Materials. (Refer to 51-30)

Any sheet metal repairs (other than replacement of original type design fasteners) require that the base material strength of that repair be developed in accordance with FAA AC 43.13-1B.

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ELECTRICAL BONDING

1. DESCRIPTION

This section includes topics concerning the electrical bonding of aircraft structure as well as electrical bonding of subsystems to aircraft structure.

2. MAINTENANCE PRACTICES

A. Electrical Bonding and Shielding - *Serials 2016 & subs w/ Perspective Avionics*

(1) Inspection/Check - Electrical Bonding and Shielding

Note: The Perspective Avionics components mount in individual racks. Each individual rack is mounted to a metal shelf spanning across the top of the console. Measure bonding between metal part of component and the metal shelf. Verify measured value meets requirements of Figure 51-801. (See Figure 51-801)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Milliohm Meter	-	Any Source	Measure electrical bonding.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(c) Remove PFD. (Refer to 31-60)
(d) Measure bonding of MFD.
(e) Remove MFD. (Refer to 31-60)
(f) Measure bonding of the following components:
1 GRS 77 AHRS (x2)
2 GDC 74A Air Data Computer (x2)
3 GIA 63W Integrated Avionics Unit (x2)
4 GEA 71 Engine Airframe Unit
5 GMC Automatic Flight Control System
6 GCU FMS Keyboard
7 GMA Audio Control Unit
8 GA 58 Antenna (GTS 800 Upper Antenna)
9 EMI Shielding (x2)
(g) Install PFD. (Refer to 31-60)
(h) Measure bonding of PFD.
(i) Install MFD. (Refer to 31-60)

Component	Resistance (Milliohms)
EMI Shielding	5
GA 58 Antenna	10
GCU FMS Keyboard	15
GDC 74A Air Data Computer	5
GEA 71 Engine Airframe Unit	5
GIA 63W Integrated Avionics Unit (x2)	5
GMA Audio Control Unit	5
GMC Automatic Flight Control System	15
GRS 77 AHRS (x2)	5
MFD	10
PFD	10

Figure 51-801
Electrical Bonding - Serials 2016 & subs w/ Perspective Avionics

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CHAPTER 52

DOORS

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CHAPTER 52 - DOORS

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DOORS

1. GENERAL

Two forward hinged doors on both sides of the fuselage allow cabin ingress and egress.

Serials 1005 thru 1422: Latching pins at the rear of each door are engaged by a door handle.

Serials 1423 & subs: Striker pins attached to the fuselage are engaged by latches at the upper and lower rear sections of the cabin door assembly.

Serials 1423 thru 2302: Latches are disengaged by a door lever internally and a push-button externally.

Serials 2303 & subs: Latches are disengaged by a door lever internally and a door handle externally.

A gas strut provides assistance opening, and holding, the door open. Front seat armrests are integral with the doors' interior. A baggage door is located on the left side of the airplane behind the rear seat. The door is hinged on the forward edge and latched on the rear edge. Occupants exit rearward off of the wing via a step.

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PASSENGER AND CREW DOORS

1. DESCRIPTION AND OPERATION

Serials 1005 thru 1422: The two crew/passenger doors incorporate a flush-mount outside door handle, key-operated door lock, and a conventional inside door handle. The door latch handle is centered under the window. Latching pins at the rear top and rear bottom of each door are engaged by that door's handle. To open either door from outside the airplane, push in on the forward end handle to release the handle from the flush mount position, rotate handle down and forward to the OPEN position, and the gas strut will then automatically assist in raising the door to the full up position. To close the door from inside of the airplane, pull the door shut and rotate handle to the CLOSED position. When handle is rotated to the CLOSED position, a detent holds the handle in position. To close the doors from outside of the airplane, close the door with the interior handle in the forward (OPEN) position and then latch the door by rotating the outside door handle up and forward to the CLOSED position.

Serials 1423 thru 2302: The two crew/passenger doors incorporate a push-button outside entry mechanism, key-operated door lock, and an inside door lever. The door lever is centered under the window. Latches at the rear top and bottom of each door are engaged by that door's lever. To open either door from outside the airplane, depress the push-button entry mechanism, and the gas strut will then automatically assist in raising the door to the full up position. To close the door from inside of the airplane, pull the door shut firmly by its handle to engage latches. To close the doors from outside of the airplane, push the door firmly to engage latches.

Serials 2303 & subs: The two crew/passenger doors incorporate a flush-mount outside door handle, key-operated door lock, and an inside door lever. The door lever is centered under the window. Latches at the rear top and bottom of each door are engaged by that door's lever. To open either door from outside the airplane, rotate the exterior handle upward until both latches disengage, and the gas strut will then automatically assist in raising the door to the full up position. To open either door from inside the airplane, rotate the interior handle upward until both latches disengage, and the gas strut will then automatically assist in raising the door to the full up position. To close the door from inside of the airplane, pull the door shut firmly by its handle to engage latches. To close the doors from outside of the airplane, push the door firmly to engage latches. The door operates as both a slam catch and a manually commanded, positive engagement draw-in latch. The door will operate in slam catch mode with light to moderate closing force with the other door open (to relieve rapid build-up of cabin door pressure) or moderate to heavy closing force with the opposite door closed. If the door does not fully engage in slam catch mode, it can be drawn closed by operation of the interior or exterior handle. From the semi-closed position, the door can be drawn closed by rotating either the interior or exterior handle until both upper and lower latches sound an audible click.

Serials 1005 thru 1422: Rotating the door handle either inserts or retracts two round pins into or out of receivers on the aft door jamb. The round pins operate by push-pull cable and linkage. The handle mechanism is designed to allow the inside handle to operate while the outside handle stays nestled into a depression, yet the outside handle will twist the inside door handle to the open or closed position. A detent pin, which is a roller follower on the handle actuation disk, holds the handle assembly in the fully latched, and the open, positions. The inside door handle in the closed position is nestled into the armrest, and in the unlatched position, juts up into the crew's forearm. The mechanism has a spring detent which requires a deliberate effort to overcome. This is the only locking mechanism on the inside.

Serials 1423 thru 2302: Depressing the door lever releases two latches from pins on the aft and bottom door jamb. The latches operate by pull cable and linkage.

Serials 2303 & subs: Rotating the interior or exterior door handle releases two latches from pins on the aft and bottom door jamb. The latches operate by pull cable and linkage. The interior door handle in the closed position is nestled into the armrest, and in the unlatched position, juts up into the crew's forearm as an indication that the door latch mechanism is not fully engaged.

The external security lock doesn't hinder escape from within. Their function is only to disable external access to the cabin. At least one of the two doors is unlocked anytime the airplane is occupied, for it must be unlocked to enter, and it cannot be locked from inside.

Serials w/o Convenience Lighting: To lock crew/passenger entry doors when leaving the airplane, insert the key into the lock and rotate counter-clockwise.

Serials 2303 & subs w/ Convenience Lighting: To lock crew/passenger entry doors when leaving the airplane, insert the key into the lock and rotate counter-clockwise or press the lock button on the battery-operated wireless key fob. The doors unlock automatically when aircraft power is applied. Locking the doors with the wireless key fob activates convenience lighting. The key fob will not actuate the door locks when the BAT 1 switch is ON. For information regarding convenience lighting, see Lights. (Refer to 33-00)

The outer skin of the door is molded from a glass and carbon fiber-epoxy matrix. Front seat armrests are integral with the doors' interior.

2. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Cabin door operation is not smooth.	Cabin door gas strut locking tab is damaged.	Replace cabin door gas strut. (Refer to 52-10)
	Cabin door gas strut is bent.	Replace cabin door gas strut. (Refer to 52-10)
	Serials 1423 & subs: Cabin door rod end is bent.	Replace cabin door rod end. (Refer to 52-10)
Cabin door closure is difficult.	Trapped, unvented air in cabin door seal bulb is preventing cabin door seal from flexing to allow cabin door closure.	Perform Inspection/Check - Cabin Door Seals. (Refer to 53-40)
Serials 1005 thru 1422: Cabin door does not conform to the fuselage opening contour.	Cabin door installation is skewed.	Perform Adjustment - Cabin Door. (Refer to 52-10)
Serials 1423 & subs: Cabin door does not conform to the fuselage opening contour.	Cabin door installation is skewed.	Perform Adjustment - Cabin Door. (Refer to 52-10)
	Cabin door rod end is bent.	Replace cabin door rod end. (Refer to 52-10)
Serials 1423 & subs: Linear gap between fuselage exterior and cabin door edge is out of tolerance.	Cabin door installation is skewed.	Perform Adjustment - Cabin Door. (Refer to 52-10)
	Cabin door rod end is bent.	Replace cabin door rod end. (Refer to 52-10)
Serials 1423 & subs: Cabin door latches do not engage properly.	Cabin door striker pins are misaligned with latches.	Perform Adjustment - Cabin Door Striker Pin. (Refer to 53-40)
Serials 1423 & subs: Cabin door latches do not engage simultaneously.	Cabin door latch tension is incorrect.	Perform Adjustment - Latch Assembly. (Refer to 52-10)
Serials 1423 thru 2302: Push-button entry mechanism is hard to open.		
Serials 1423 & subs: Moisture enters cabin interior at upper door hinge.	Sealant at upper door hinge is damaged.	Perform Inspection - Upper Cabin Door Hinge Sealant. (Refer to 52-10)
Serials 1423 & subs: Attaching parts at upper door hinge rotate with door operation.	Attaching parts at upper door hinge are binding.	Perform Inspection - Upper Cabin Door Hinge Binding. (Refer to 52-10)

3. MAINTENANCE PRACTICES

A. Cabin Door - *Serials 1005 thru 1422* (See Figure 52-101)

(1) Removal - Cabin Door

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flat, Open-End Wrench	3/4 inch (19 mm)	Any Source	Strut removal.

(b) Remove glareshield trim. (Refer to 25-10)

(c) Remove lower windshield trim. (Refer to 25-10)

(d) Remove upper windshield trim. (Refer to 25-10)

(e) Cut the safety wire used to secure the lower door hinge bolt to the safety wire tab.

CAUTION: Do not remove the lower door hinge bolt. The lower door hinge retaining bolt only needs to be loosened to accomplish door removal. The door must be almost fully closed to allow easy removal.

(f) Ensure cabin door is in almost fully closed position.

(g) Loosen the lower door hinge bolt approximately five turns counterclockwise to allow lower door hinge to become dislodged from its mount.

WARNING: Ensure gas strut rod is not fully compressed during removal. Sudden extension of partially removed gas strut rod could result in damage to airplane or injury to aircraft technician.

(h) Ensure cabin door is in fully open position.

(i) *Serials 1005-1422 After SB2X-52-08*: Remove wire retaining clip from gas strut inboard rod end.

(j) Remove locking cap from gas strut inboard rod end.

(k) Position flat wrench around neck of ball stud between attach bracket and gas strut inboard rod end.

CAUTION: *Serials Before SB2X-52-08*: The ball stud snaps into four locking tabs integral to the gas strut rod end. Use caution during gas strut removal to avoid damaging locking tabs. If any one of the locking tabs cracks or breaks loose, the rod end must be replaced.

(l) Gently pry gas strut inboard rod end off of ball stud.

(m) Slide door up and off of the upper door hinge pivot pin.

(2) Installation - Cabin Door

(a) Slide upper door hinge over the upper door hinge pivot pin.

(b) Pivot cabin door on upper door hinge pivot pin to fully open position.

WARNING: Ensure gas strut rod is not fully compressed during installation. Sudden extension of partially installed gas strut rod could result in damage to airplane or injury to aircraft technician.

(c) Visually inspect gas strut rod ends and locking caps or retaining wire clips for cracked or missing tabs, security, and general condition.

CAUTION: *Serials before SB2X-52-08:* The ball stud snaps into four locking tabs integral to the gas strut rod end. Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

(d) Position gas strut rod end to ball stud and press firmly to secure.

(e) *Serials 1005-1422 After SB2X-52-08:* Install wire retaining clip to gas strut rod end.

(f) Install locking cap to gas strut rod end.

(g) Ensure cabin door is in almost fully closed position.

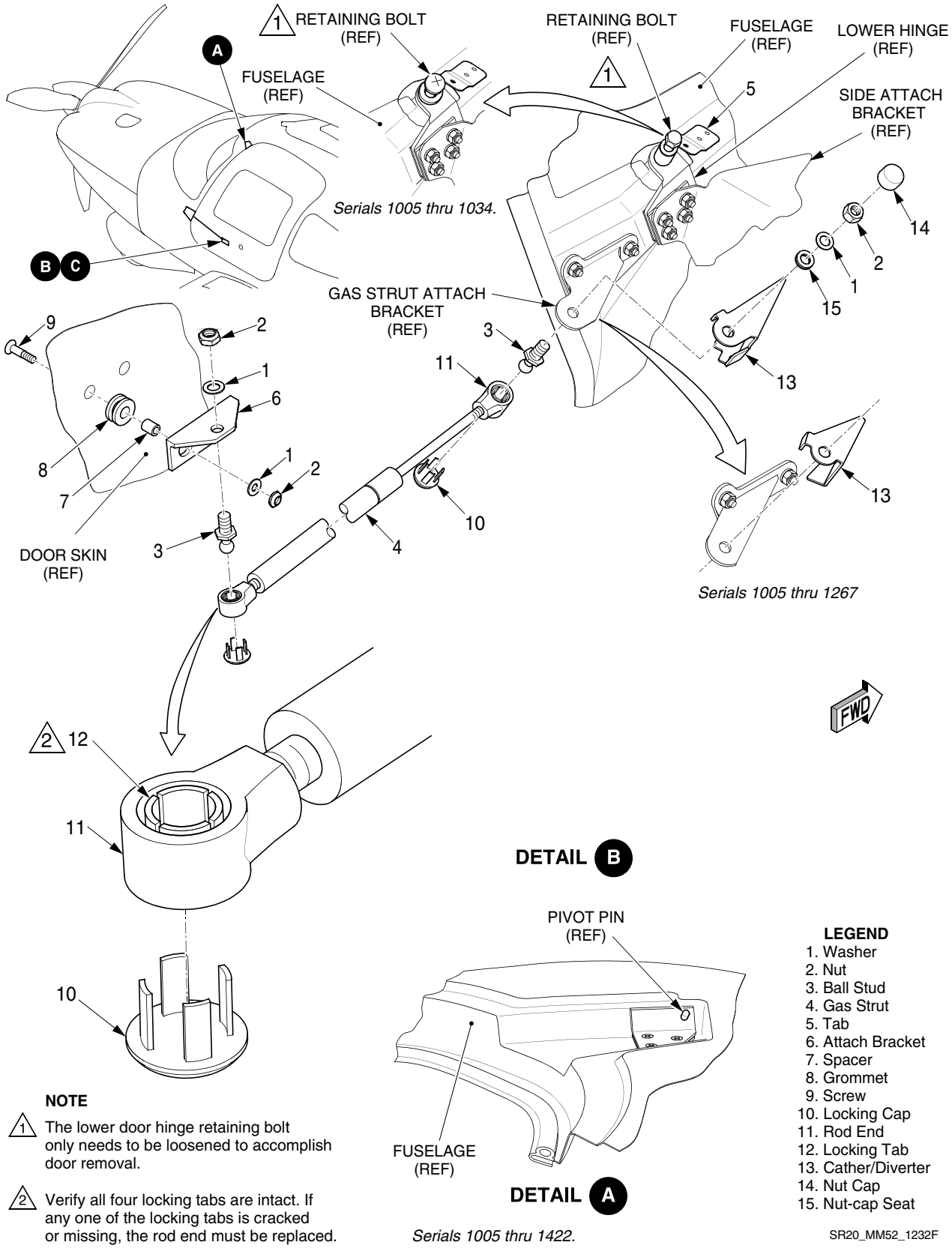
(h) Place the lower door hinge into position and secure the hinge and door by tightening the lower door hinge retaining bolt, washer, shim, and spacer.

(i) Perform Adjustment - Cabin Door. (Refer to 52-10)

(j) Install upper windshield trim. (Refer to 25-10)

(k) Install lower windshield trim. (Refer to 25-10)

(l) Install the glareshield trim. (Refer to 25-10)



NOTE

1 The lower door hinge retaining bolt only needs to be loosened to accomplish door removal.

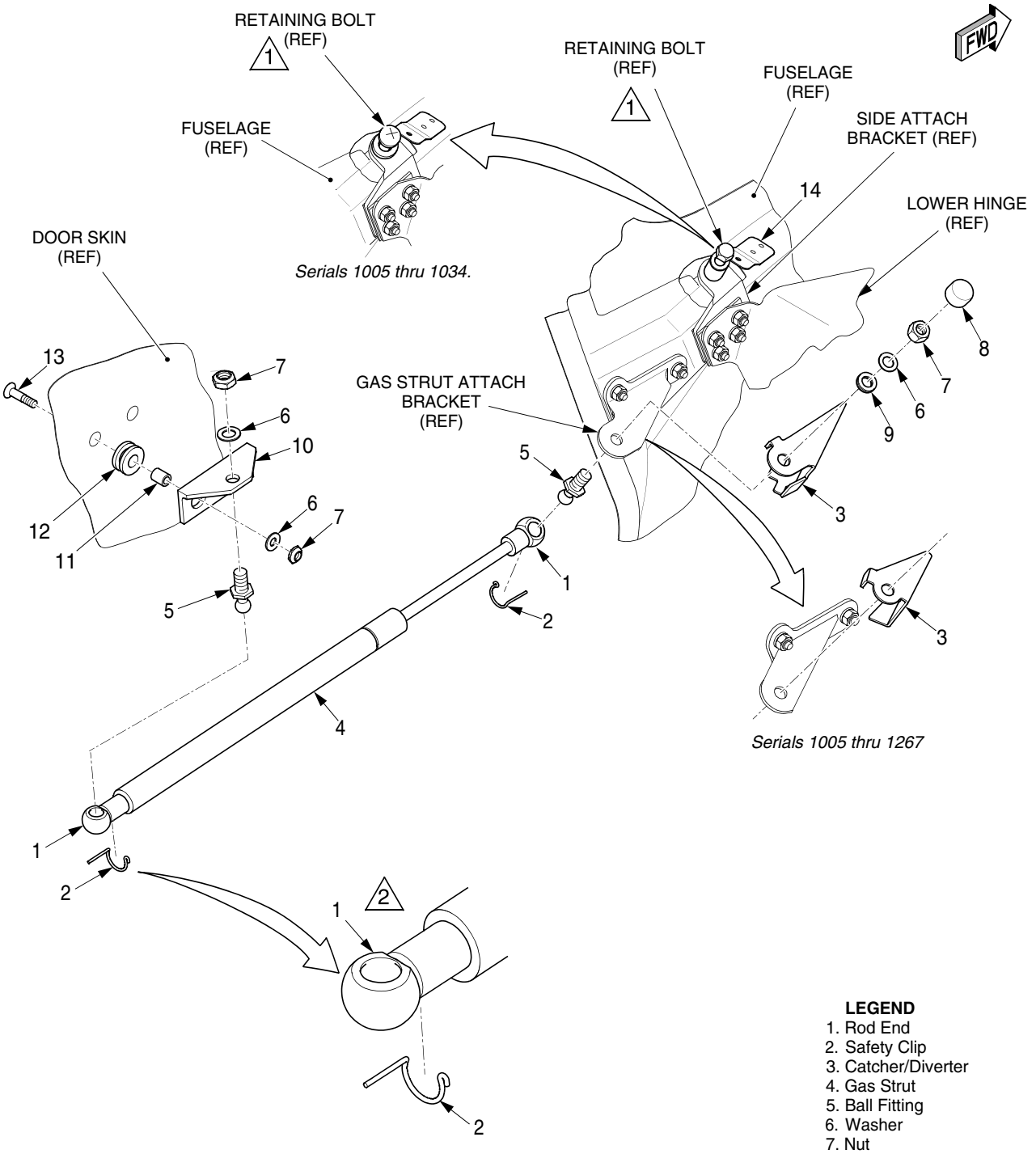
2 Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

LEGEND

1. Washer
2. Nut
3. Ball Stud
4. Gas Strut
5. Tab
6. Attach Bracket
7. Spacer
8. Grommet
9. Screw
10. Locking Cap
11. Rod End
12. Locking Tab
13. Cather/Diverter
14. Nut Cap
15. Nut-cap Seat

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Figure 52-101
Cabin Door Installation - Serials 1005 thru 1422 (1 of 2)



NOTE

1. The lower door hinge retaining bolt only needs to be loosened to accomplish door removal.

2. Ensure wire safety clip is installed on rod end after ball fitting is inserted.

LEGEND

1. Rod End
2. Safety Clip
3. Catcher/Diverter
4. Gas Strut
5. Ball Fitting
6. Washer
7. Nut
8. Cap
9. Nut-cap Seat
10. Attach Bracket
11. Spacer
12. Grommet
13. Screw
14. Tab

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Figure 52-101
Cabin Door Installation - Serials 1005 thru 1422 After SB2X-52-08 (2 of 2)

(3) Adjustment - Cabin Door

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Dry Film Lubricant	LPS 1	LPS Laboratories Atlanta, GA 30084 800-241-8334	Lubrication.
Reamer	5/16-inch	Any Source	Enlarge inner diameter of pin receiver.
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Cotton Cloth (clean, lint free)	-	Any Source	Solvent clean.
Compressed Air (contaminate free)	-	Any Source	Clean.

(b) With the cabin door in the closed position, visually inspect the door fit-up. Ensure that cabin door conforms to the contour of the fuselage opening.

(c) Clean out door pin receivers using isopropyl alcohol and cotton swab. (Refer to 12-20)

(d) Open door and rotate inside door handle to closed position.

(e) Remove any impurities from the door pin, such as paint overspray, buffing compound, etc.

(f) Lubricate the door pin using dry film lubricant.

(g) With inside door handle in spring back position, measure top and bottom pin protrusion.

(h) Verify lower pin protrudes 0.312 - 0.375 inch (7.925 - 9.525 mm), and upper pin protrudes 0.687 - 0.750 inch (17.450 - 19.050 mm). If necessary, adjust latch assembly. (Refer to 52-10)

(i) If interference exists between door pin(s) and receiver(s), use 5/16-inch reamer to increase inner diameter of door pin receiver(s) as required.

CAUTION: Do not use drill bit to increase inner diameter of pin receiver. Use of drill bit is too aggressive and will spin door pin receiver in door jam.

(j) To restore upper door pin alignment to the door pin receiver, add a washer to the upper door hinge pin. Refer to section 52-10 in the Aircraft Maintenance Manual for assembly and disassembly procedures.

(k) Clean door handle latch mechanism with compressed air to remove any impurities such as dust, buffing compound, etc.

(l) Lubricate door handle latch mechanism with a dry film lubricant.

(m) Ensure lower door pin actuation lever is not bent. If necessary, replace lower door pin actuation lever. (Refer to 52-10)

Note: Trapped, unvented air in cabin door seal bulb may prevent cabin door seal from flexing under closed spacing between door and jam, interfering with cabin door closure.

(n) If door closure is difficult, perform Inspection/Check - Cabin Door Seals. (Refer to 53-40)

B. Cabin Door - *Serials 1423 & subs* (See Figure 52-102)

(1) Removal - Cabin Door

CAUTION: Two aircraft technicians are needed to provide door support during hinge disassembly.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flat, Open-End Wrench	3/4 inch (19 mm)	Any Source	Strut removal.

(b) With the cabin door in the closed position, visually inspect the door fit-up. Ensure that cabin door conforms to the contour of the fuselage opening.

(c) Around perimeter of cabin door, verify linear gap between fuselage exterior and cabin door edge is 0.060 - 0.125 inch (1.524 - 3.175 mm).

(d) If the cabin door is skewed to contour of the fuselage opening or linear gap is out of tolerance, make note of required adjustments to be performed during cabin door installation. (See Figure 52-103)

(e) Remove glareshield trim. (Refer to 25-10)

(f) *Serials w/o Perspective Avionics:* Remove lower windshield trim. (Refer to 25-10)

(g) Remove upper windshield trim. (Refer to 25-10)

(h) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect door lock harness.

1 Pull CONV LIGHTS circuit breaker.

2 Remove kick plate. (Refer to 25-10)

3 Remove mid console trim. (Refer to 25-10)

4 Remove washer and bolt securing terminal ring to inboard gas strut attach bracket.

5 Remove cable tie securing door lock harness to fuselage.

6 Identify and disconnect electrical connector from wire harness.

(i) Remove screws securing upper and lower hinge plate covers to door hinges.

(j) Remove bolt, washers, nut, and cotter pin securing lower rod end to lower door hinge.

(k) Remove nut, washers, and cotter pin securing upper rod end to cabin door hinge pin at upper door hinge.

WARNING: Ensure gas strut rod is not fully compressed during removal. Sudden extension of partially removed gas strut rod could result in damage to airplane or injury to aircraft technician.

(l) Ensure cabin door is in fully open position.

(m) *Serials 1005-1422 After SB2X-52-08*: Remove wire retaining clip from gas strut inboard rod end.

(n) Remove locking cap from gas strut inboard rod end.

(o) Position flat wrench around neck of ball stud between attach bracket and gas strut inboard rod end.

CAUTION: *Serials before SB2x-52-08:* The ball stud snaps into four locking tabs integral to the gas strut rod end. Use caution during gas strut removal to avoid damaging locking tabs. If any one of the locking tabs cracks or breaks loose, the rod end must be replaced.

(p) Gently pry gas strut inboard rod end off of ball stud.

(q) Lift door away from the fuselage.

(2) Installation - Cabin Door

CAUTION: Two aircraft technicians are needed to provide door support during hinge assembly.

Note: Hardware stack-up sequence is optional to achieve the door fit-up requirements. Washers may be substituted as required to shim door in door jamb/hinge pocket and obtain acceptable thread engagement.

(a) Fit door onto fuselage door opening in closed position.
(b) Position the upper cabin door rod end onto the upper hinge pin.
(c) Pivot cabin door on upper hinge pin to fully open position.

WARNING: **Ensure gas strut rod is not fully compressed during installation. Sudden extension of partially installed gas strut rod could result in damage to airplane or injury to aircraft technician.**

(d) Visually inspect gas strut rod ends and locking caps or wire retaining clips for cracked or missing tabs, security, and general condition.

CAUTION: *Serials before SB2X-52-08:* The ball stud snaps into four locking tabs integral to the gas strut rod end. Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

(e) Position gas strut rod end to ball stud and press firmly to secure.
(f) *Serials before SB2X-52-08:* Install wire retaining clip to gas strut rod end.
(g) Install locking cap to gas strut rod end.
(h) Loosely secure the cabin door rod end to the upper door hinge with hinge pin, washers, and nut. Tighten nut until slight binding is detected, and then back off to previous cotter pin hole position.
(i) Position and secure the lower cabin door rod end to the lower door hinge with bolt, washers, and nut.
(j) Perform Adjustment - Cabin Door. (Refer to 52-10)
(k) Perform Inspection - Upper Cabin Door Hinge Binding. (Refer to 52-10)
(l) At nut on lower cabin door hinge, torque nut to 15 - 20 in-lbs (1.7 - 2.2 Nm) and install cotter pin. (Refer to 20-60)
(m) At nut on upper cabin door hinge, install cotter pin.
(n) Install screws securing upper and lower hinge plate covers to door hinges.
(o) *Serials 2303 & subs w/ Convenience Lighting:* Connect door lock harness.
1 Install bolt and washer securing terminal ring to inboard gas strut attach bracket.

Note: Secure wire so that harness can flex when door is opened.

2 Secure door lock harness to fuselage with cable tie.
3 Connect electrical connector to wire harness.
4 Install mid console trim. (Refer to 25-10)
5 Install kick plate. (Refer to 25-10)
6 Reset CONV LIGHTS circuit breaker.
(p) Install upper windshield trim. (Refer to 25-10)
(q) *Serials w/o Perspective Avionics:* Install lower windshield trim. (Refer to 25-10)
(r) Install glareshield trim. (Refer to 25-10)

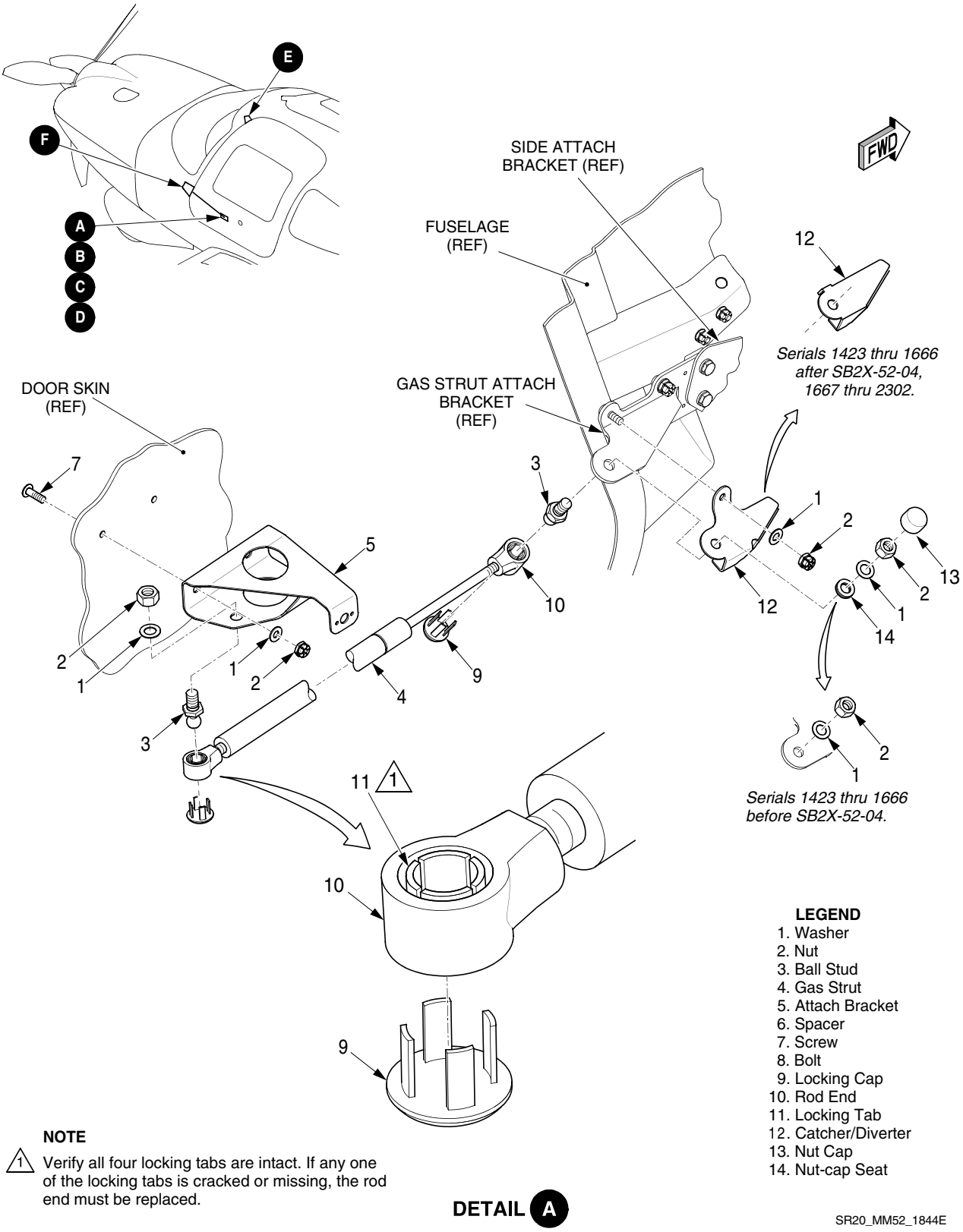
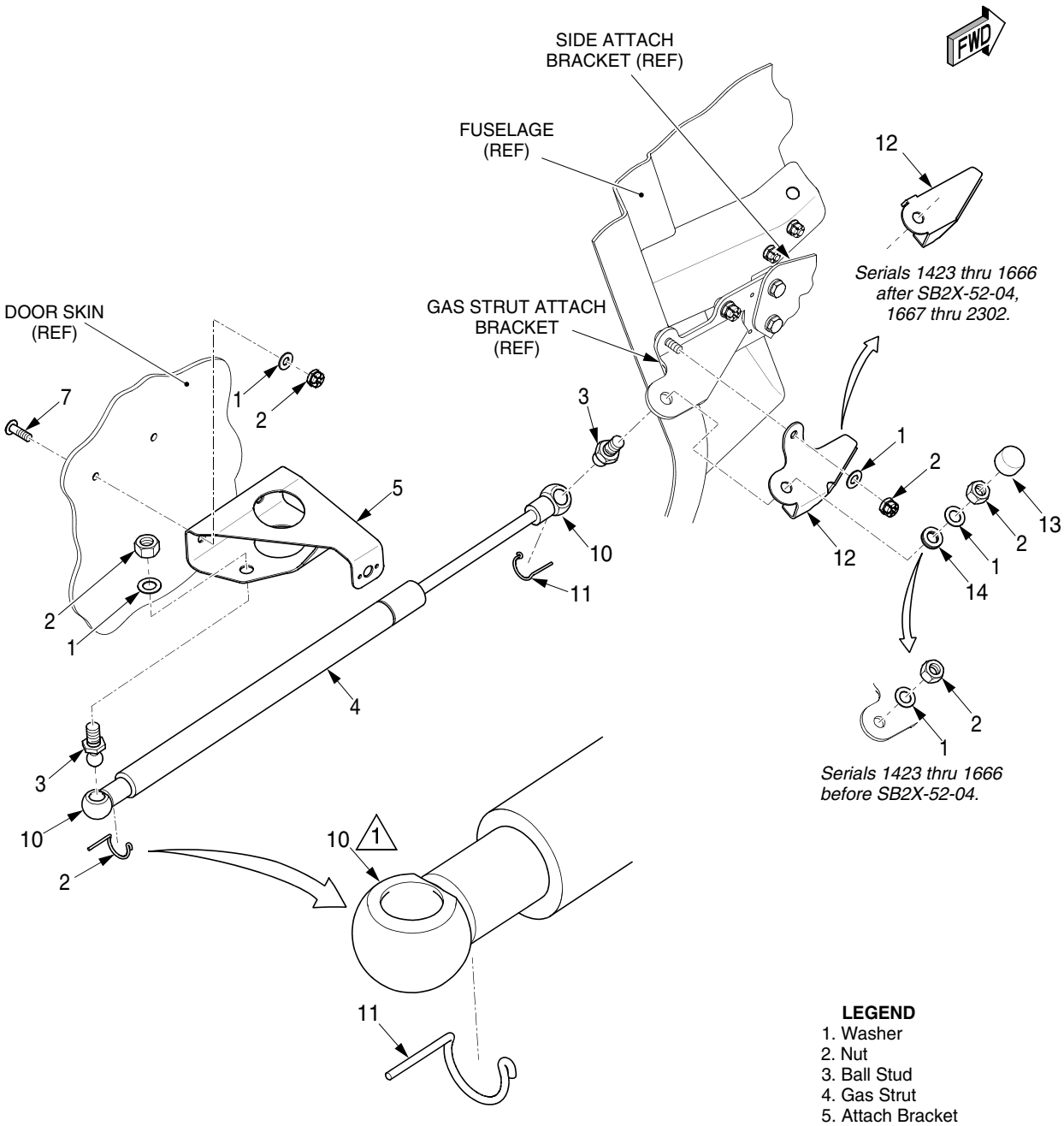


Figure 52-102
Cabin Door Installation - Serials 1423 & subs w/o Convenience Lighting (Sheet 1 of 5)

EFFECTIVITY:
Serials 1423 & subs w/o Convenience Lighting



LEGEND

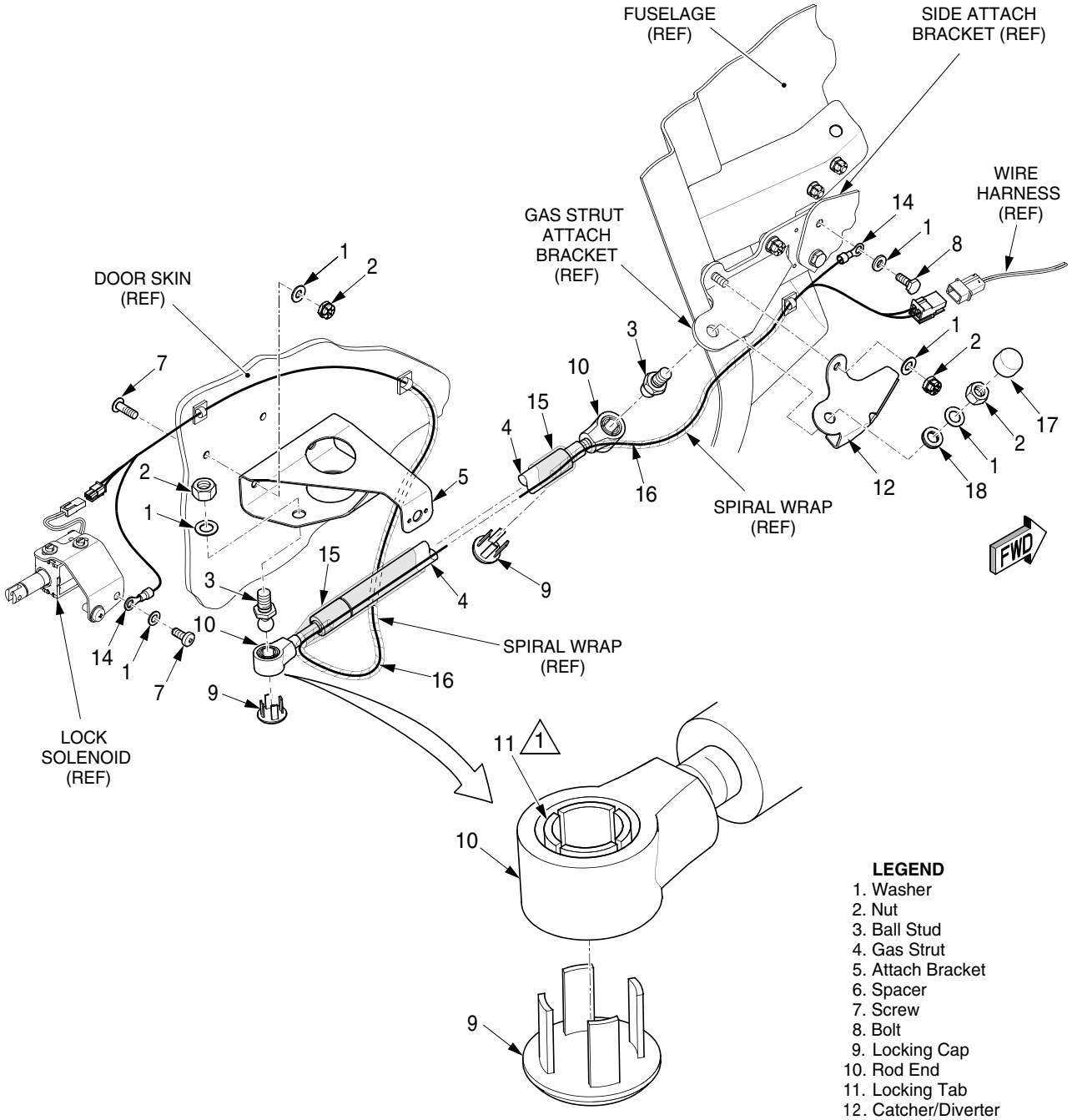
1. Washer
2. Nut
3. Ball Stud
4. Gas Strut
5. Attach Bracket
6. Spacer
7. Screw
8. Bolt
9. Locking Cap
10. Rod End
11. Safety Clip
12. Catcher/Diverter
13. Nut Cap
14. Nut-cap Seat

NOTE

1 Ensure wire safety clip is installed on rod end after ball fitting is inserted.

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Figure 52-102
Cabin Door Installation - Serials 1423 & subs After SB2X-52-08 (Sheet 2 of 5)



LEGEND

1. Washer
2. Nut
3. Ball Stud
4. Gas Strut
5. Attach Bracket
6. Spacer
7. Screw
8. Bolt
9. Locking Cap
10. Rod End
11. Locking Tab
12. Catcher/Diverter
13. Nut Cap
14. Terminal Ring
15. Shrink Tube
16. Door Lock Harness
17. Nut Cap
18. Nut-cap Seat

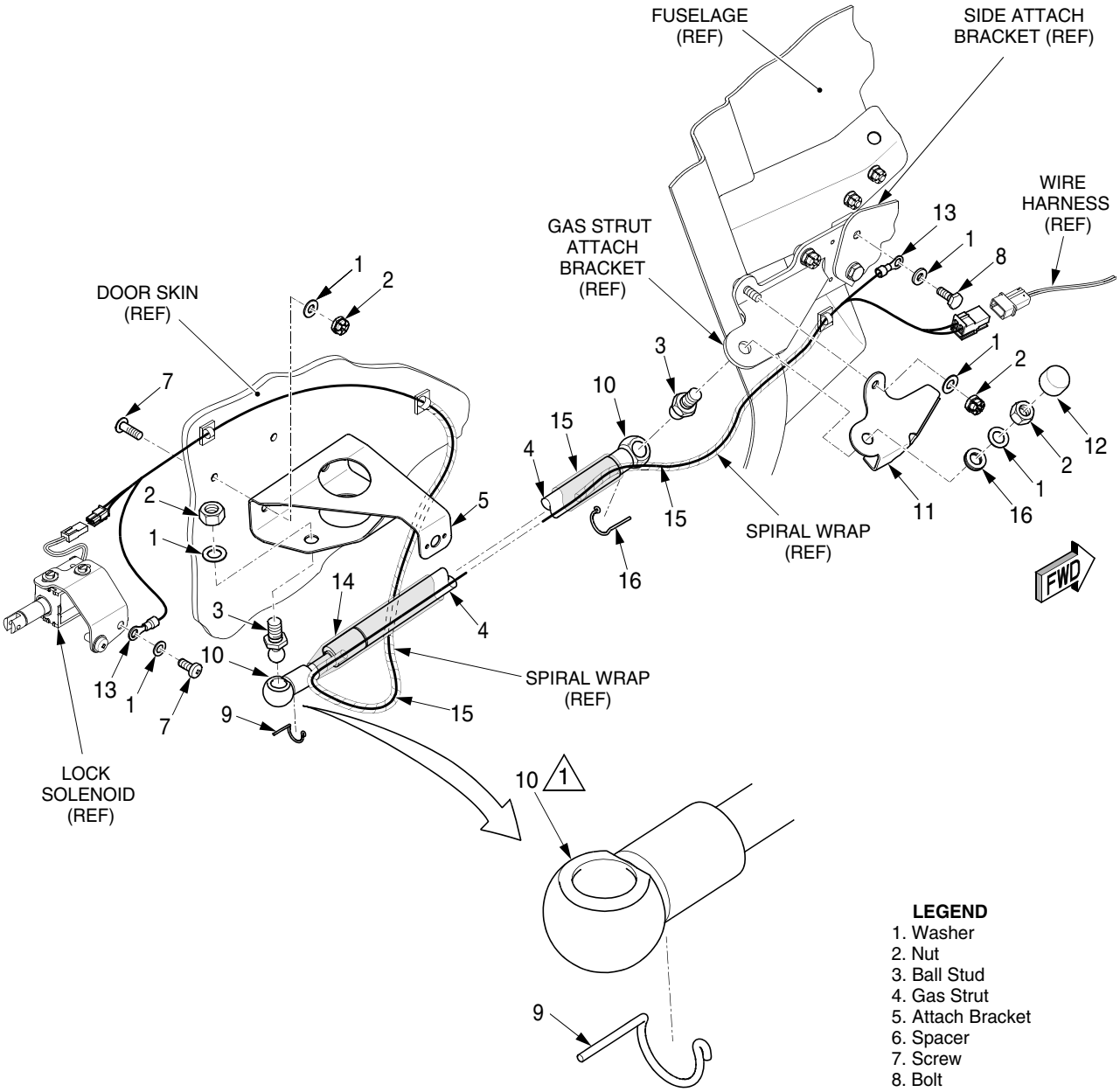
NOTE

1 Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

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Figure 52-102
Cabin Door Installation - Serials 2303 & subs w/ Convenience Lighting (Sheet 3 of 5)

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting



LEGEND

1. Washer
2. Nut
3. Ball Stud
4. Gas Strut
5. Attach Bracket
6. Spacer
7. Screw
8. Bolt
9. Locking Cap
10. Rod End
11. Catcher/Diverter
12. Nut Cap
13. Terminal Ring
14. Shrink Tube
15. Door Lock Harness
16. Nut-cap Seat

NOTE

1. Ensure wire safety clip is installed on rod end after ball fitting is inserted.

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Figure 52-102
Cabin Door Installation - Serials 2303 & subs w/ Convenience Lighting After SB2X-52-08 (Sheet 4 of 5)

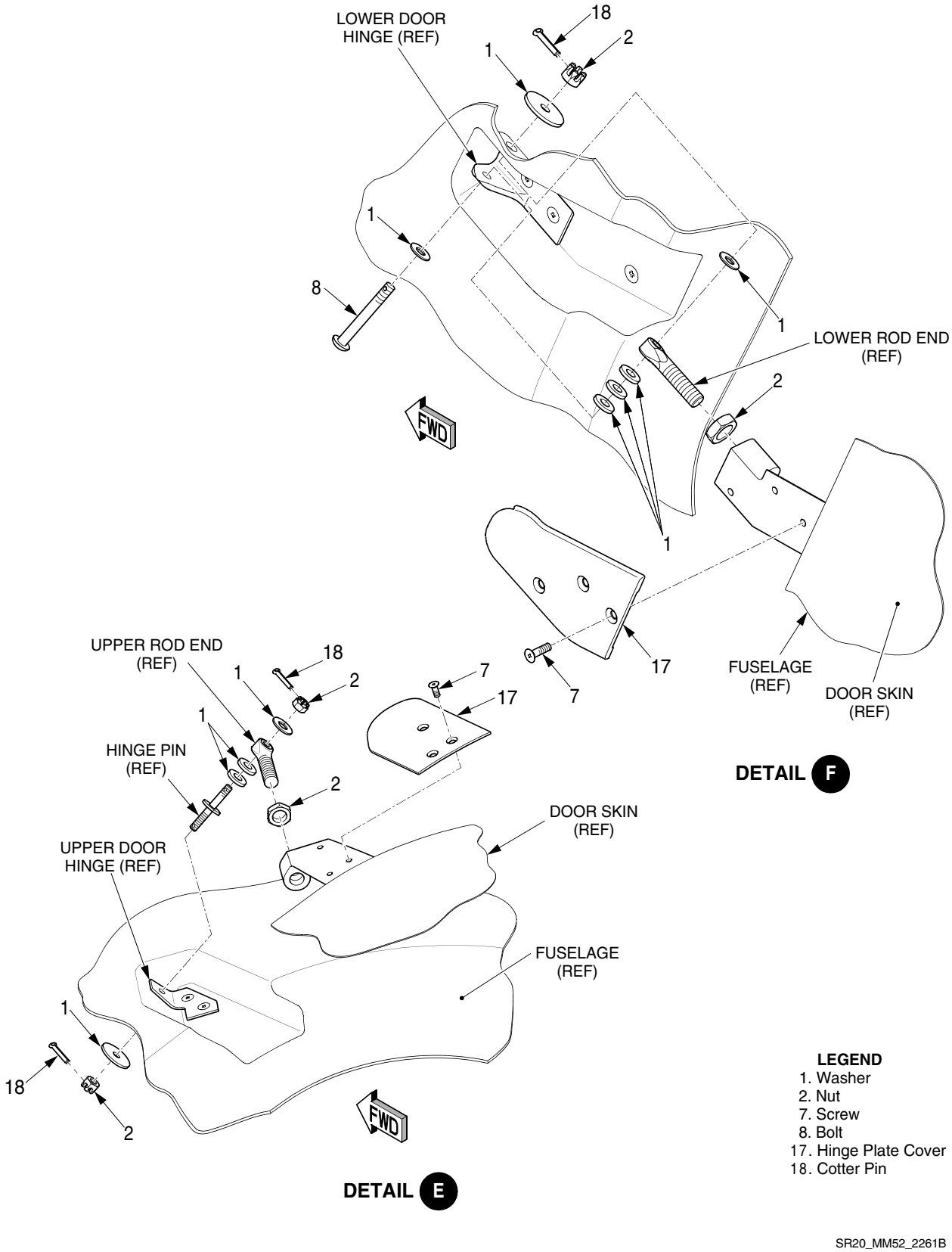


Figure 52-102
Cabin Door Installation - Serials 1423 & subs (Sheet 5 of 5)

(3) Adjustment - Cabin Door (See Figure 52-103)

(a) With the cabin door in the closed position, visually inspect the door fit-up. Ensure that cabin door conforms to the contour of the fuselage opening.

(b) Around perimeter of cabin door, verify linear gap between fuselage exterior and cabin door edge is 0.060 - 0.125 inch (1.524 - 3.175 mm).

(c) If the cabin door is skewed to contour of the fuselage opening or linear gap is out of tolerance, adjust door hinges.

(d) To adjust cabin door forward and up:

1 Remove cabin door. (Refer to 52-10)

2 Rotate upper cabin door rod end clockwise as required.

3 Install cabin door. (Refer to 52-10)

(e) To adjust cabin door aft and down:

1 Remove cabin door. (Refer to 52-10)

2 Rotate upper cabin door rod end counter-clockwise as required.

3 Install cabin door. (Refer to 52-10)

(f) To adjust cabin door forward and down:

1 Remove attaching parts securing improved cabin door rod end to lower door hinge.

2 Rotate lower cabin door rod end clockwise as required.

3 Install attaching parts securing cabin door rod end to lower door hinge. Torque nut to 15 - 20 in-lbs (1.7 - 2.2 Nm) and install cotter pin.

(g) To adjust cabin door aft and up:

1 Remove attaching parts securing improved cabin door rod end to lower door hinge.

2 Rotate lower cabin door rod end counter-clockwise as required.

3 Install attaching parts securing cabin door rod end to lower door hinge. Torque nut to 15 - 20 in-lbs (1.7 - 2.2 Nm) and install cotter pin.

(h) Repeat Adjustment - Cabin Door until proper door fit-up is achieved.

(i) Visually inspect the cabin door latch engagements while slowly pulling the cabin door into the closed position. Note the alignment of the striker pins with the cabin door latches.

(j) If the striker pins are centered with the door latch forks, pull the cabin door to the closed position to verify that the latches engage normally with striker pins.

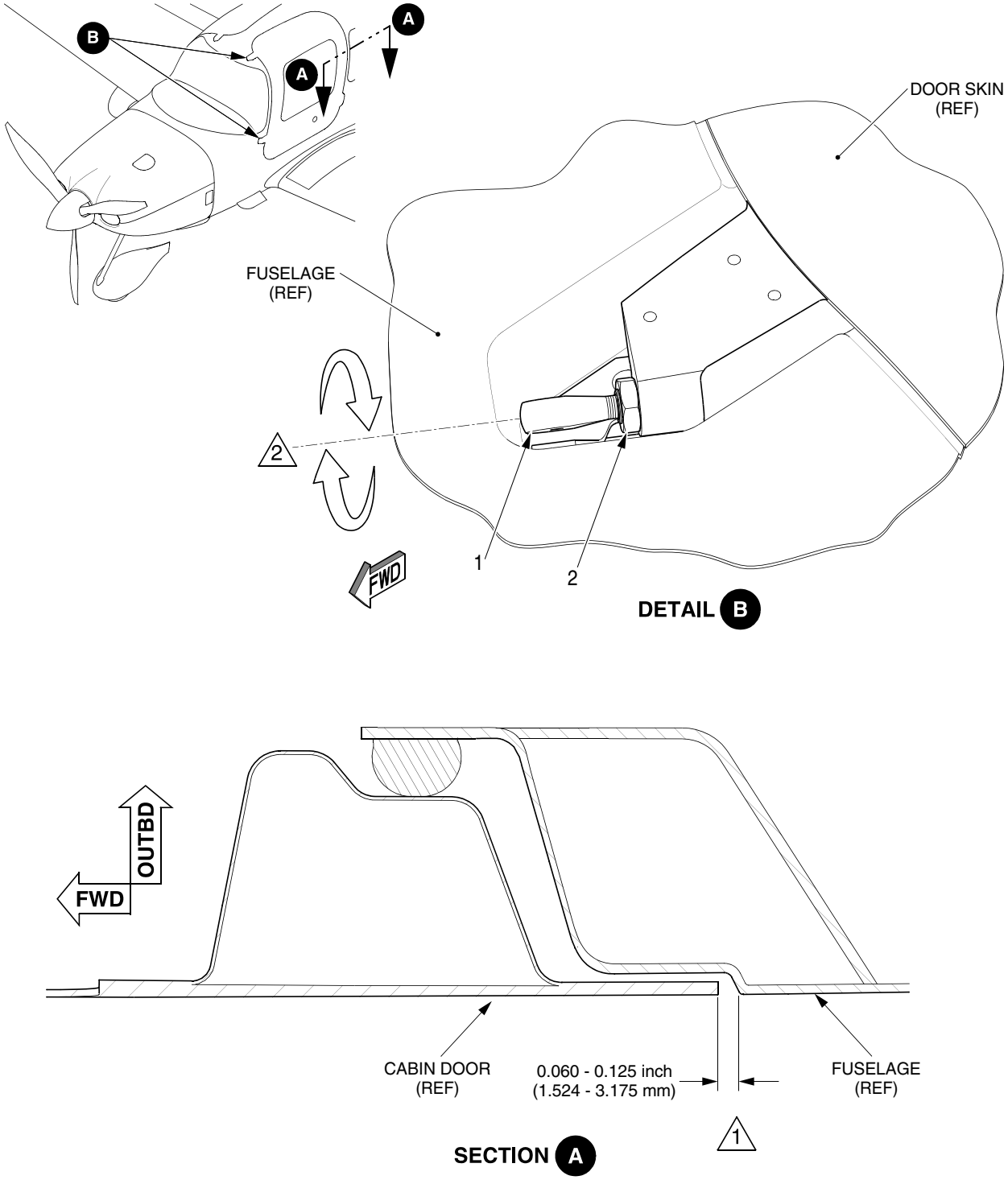
(k) If the cabin door latches are misaligned:

1 Loosen edges of sidewall air duct and rear cabin side trim from door jamb. (Refer to 25-10)

2 Perform Adjustment - Cabin Door Striker Pin to adjust striker pins. (Refer to 53-40)

3 To verify correct latch tension, perform Adjustment - Latch Assembly. (Refer to 52-10)

4 Secure edges of sidewall air duct and rear cabin side trim to door jamb. (Refer to 25-10)



NOTE

1. Around perimeter of cabin door, verify linear gap between fuselage exterior and cabin door edge is 0.060 - 0.125 inch (1.524 - 3.175 mm).

2. With attaching hardware removed, rotate rod end as required to facilitate any necessary adjustment.

LEGEND
1. Rod End
2. Jam Nut

SR20_MM52_2650A

Figure 52-103
Cabin Door Adjustment - Serials 1423 & subs

(4) Inspection - Upper Cabin Door Hinge Binding

(a) Open and close cabin door. Observe upper cabin door attaching parts for signs of binding and verify that attaching parts do not rotate with the cabin door rod end.

(b) If upper cabin door attaching parts do not rotate with the cabin door rod end, the cabin door is properly installed.

(c) If upper cabin door attaching parts rotate with the cabin door rod end and has been previously reamed, binding will interfere with proper cabin door operation. Contact Cirrus Design for disposition.

(d) If upper cabin door attaching parts rotate with the cabin door rod end and has not been previously reamed, ream rod end bushing.

1 Remove cabin door. (Refer to 52-10)

2 At upper cabin door hinge bar, measure and record distance from forward surface of hinge bar to the hinge axis of the cabin door rod end.

3 Remove upper cabin door rod end. (Refer to 52-10)

4 Ream and install upper cabin door rod end. (Refer to 52-10)

5 Perform Inspection - Upper Cabin Door Hinge Sealant. (Refer to 52-10)

6 Install cabin door. (Refer to 52-10)

(5) Inspection - Upper Cabin Door Hinge Sealant

(a) At perimeter of the upper cabin door hinge attaching parts, inspect sealant between the fuselage and large area washer.

(b) If sealant is cracked or shows other signs of damage:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Solvent clean.
Cotton Cloth (clean, lint free)	-	Any Source	Solvent clean.
Non-Metallic Scraper	-	Any Source	Remove sealant residue.
Sealant	736	Dow Corning	Apply sealant.

2 If installed, remove cabin door. (Refer to 52-10)

3 Remove hinge pin, large area washer, nut, and cotter pin from upper door hinge.

4 At interior of upper door hinge, scrape existing sealant residue from fuselage and hinge bolt hole. Solvent clean installation area. (Refer to 20-30)

5 Solvent clean installation area with isopropyl alcohol. (Refer to 20-30)

6 Apply sealant to circumference of installation area. (Refer to 20-10)

7 Press large area washer firmly to installation area.

8 Apply sealant to lower threaded portion of hinge pin. (Refer to 20-10)

9 Position hinge pin to upper door hinge installation hole.

10 Install nut securing hinge pin to fuselage. Torque nut to 15 - 20 in-lbs (1.7 - 2.2 Nm) and install cotter pin. (Refer to 20-60)

11 Apply sealant to nut perimeter. (Refer to 20-10)

12 Install cabin door. (Refer to 52-10)

C. Cabin Door Gas Strut (See Figure 52-101) (See Figure 52-102)

(1) Removal - Cabin Door Gas Strut

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Flat, Open-End Wrench	3/4 inch (19 mm)	Any Source	Strut removal.

(b) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect door lock harness on inboard side.

1 Pull CONV LIGHTS circuit breaker.
2 Remove kick plate. (Refer to 25-10)
3 Remove mid console trim. (Refer to 25-10)
4 Remove washer and bolt securing terminal ring to inboard gas strut attach bracket.
5 Remove cable tie securing door lock harness to fuselage.
6 Identify and disconnect electrical connector from wire harness.

WARNING: **Ensure gas strut rod is not fully compressed during removal. Sudden extension of partially removed gas strut rod could result in damage to airplane or injury to aircraft technician.**

(c) Ensure cabin door is in fully open position.

(d) *Serials after SB2X-52-08*: Remove wire retaining wire clip from gas strut inboard rod end.

(e) Remove locking cap from gas strut inboard rod end.

(f) Position flat wrench around neck of ball stud between attach bracket and gas strut inboard rod end.

CAUTION: *Serials before SB2X-52-08:* The ball stud snaps into four locking tabs integral to the gas strut rod end. Use caution during gas strut removal to avoid damaging locking tabs. If any one of the locking tabs cracks or breaks loose, the rod end must be replaced.

(g) Gently pry gas strut inboard rod end off of ball stud.

(h) Remove interior door trim. (Refer to 25-10)

(i) *Serials 2303 & subs w/ Convenience Lighting:* Disconnect door lock harness on outboard side.

1 Remove washer and screw securing terminal ring to door lock bracket.
2 Remove cable tie securing door lock harness to door.
3 Disconnect electrical connector from door lock solenoid.

(j) *Serials after SB2X-52-08*: Remove wire retaining wire clip from gas strut inboard rod end

(k) Remove locking cap from gas strut outboard rod end.

(l) Position flat wrench around neck of ball stud between attach bracket and gas strut outboard rod end.

(m) Gently pry gas strut outboard rod end off of ball stud.

(n) Remove gas strut from airplane.

(o) *Serials 2303 & subs w/ Convenience Lighting:* If replacing cabin door gas strut with new unit, remove heat shrink securing door lock harness to gas strut and discard heat shrink. Retain harness and wire guide.

(2) Installation - Cabin Door Gas Strut

(a) *Serials 2303 & subs w/ Convenience Lighting:* If replacing cabin door gas strut with new unit, acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shrink Tube, Adhesive-lined	M23053/4-204-0	Any Source.	Secure harness.

WARNING: **Ensure gas strut rod is not fully compressed during installation. Sudden extension of partially installed gas strut rod could result in damage to airplane or injury to aircraft technician.**

(b) Ensure cabin door is in fully open position.

CAUTION: *Serials before SB2X-52-08:* The ball stud snaps into four locking tabs integral to the gas strut rod end. Verify all four locking tabs are intact. If any one of the locking tabs is cracked or missing, the rod end must be replaced.

(c) Visually inspect gas strut rod ends and locking caps or wire retaining clips for cracked or missing tabs, security, and general condition.

(d) Position gas strut outboard rod end to ball stud and press firmly to secure.

(e) *Serials after SB2X-52-08*: Install wire retaining wire clip to gas strut inboard rod end

(f) Install locking cap to gas strut outboard rod end.

(g) *Serials 2303 & subs w/ Convenience Lighting:* Connect door lock harness on outboard side.

1 Install screw and washer securing terminal ring to door lock bracket and safety wire. (Refer to 20-50)

2 Secure door lock harness to door with cable tie.

3 Connect electrical connector to door lock solenoid.

(h) *Serials 2303 & subs w/ Convenience Lighting:* If replacing cabin door gas strut with new unit, secure harness to gas strut with wire guide and heat shrink.

(i) Install interior door trim. (Refer to 25-10)

(j) Position gas strut inboard rod end to ball stud and press firmly to secure.

(k) *Serials after SB2X-52-08*: Install wire retaining wire clip to gas strut inboard rod end

(l) Install locking cap to gas strut inboard rod end.

(m) *Serials 2303 & subs w/ Convenience Lighting:* Connect door lock harness on inboard side.

1 Install bolt and washer securing terminal ring to inboard gas strut attach bracket.

Note: Secure wire so that harness can flex when door is opened.

2 Secure door lock harness to fuselage with cable tie.

3 Connect electrical connector to wire harness.

4 Install mid console trim. (Refer to 25-10)

5 Install kick plate. (Refer to 25-10)

6 Reset CONV LIGHTS circuit breaker.

D. Catcher/Diverter - Serials *1668 & subs, Serials 1005 thru 1667 after SB 2X-52-04 and SB2X-52-08*

(1) Removal - Catcher/Diverter

(a) Remove cabin door gas strut. (Refer to 52-10)

(b) *Serials 1005 thru 1422:* Remove nut-cap seat, washer, nut, and nut-cap securing ball fitting and catcher/diverter to forward attach bracket.

(c) *Serials 1423 thru 2302:* Remove nut-cap seat, washer, nut, and nut-cap securing ball fitting and catcher/diverter to forward attach bracket.

(d) *Serials 2303 & subs:* Remove nut-cap seat, washers, nuts, and nut-cap securing ball fitting and catcher/diverter to forward attach bracket.

(2) Installation - Catcher/Diverter

Note: Ensure catcher/diverter is installed on top of forward attach bracket.

(a) *Serials 1423 & subs:* Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Threadlocker	Loctite™ 242	Any Source.	Lock threads.

(b) Position catcher/diverter over forward attach bracket so that the gas strut rod end will be captured by the catcher/diverter.

1 Apply threadlocker to threads of ball fitting and nut-cap seat.

2 Install nut-cap seat, washer, nut, and nut-cap securing ball fitting and new catcher/diverter to forward attach bracket.

Note: It is acceptable to remove up to 0.01 inch from nut-cap seat to achieve proper thread engagement.

3 Verify thread engagement is maximum 0.06 inch sub-flush with upper surface of nut.

4 *Serials 2303 & subs:* Install washer and nut securing catcher/diverter to forward attach bracket.

(c) Install cabin door gas strut. (Refer to 52-10)

E. Cabin Door Rod End - *Serials 1423 & subs* **(See Figure 52-102)**

(1) Removal - Cabin Door Rod End

(a) At cabin door hinge bar, measure and record distance from forward surface of hinge bar to the hinge axis of the cabin door rod end.

(b) Loosen lock nut on cabin door rod end.

(c) Remove cabin door rod end.

(2) Installation - Cabin Door Rod End

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Reamer	#8	Any Source	Ream bushing.

(b) Insert and rotate cabin door hinge bolt/pin into cabin door rod end bushing. If it is difficult to insert cabin door hinge bolt/pin through bushing or friction exists while rotating bolt/pin in bushing, increase inner diameter of bushing.

1 Use reamer to increase inner diameter of cabin door rod end bushing to Ø 0.195 ±0.005 inch (4.953 ±0.127 mm).

2 Verify cabin door hinge bolt/pin rotates freely in cabin door rod end bushing.

Note: To facilitate adjustment of cabin door rod end following installation, install lock nut closer to hinge axis of the rod end than previously measured.

(c) Install cabin door rod end to upper cabin door hinge bar. Adjust cabin door rod end as required until measurements recorded previously are obtained.

(d) Tighten lock nut on cabin door rod end.

F. Handle Assembly - *Serials 1005 thru 1422* **(See Figure 52-104)**

(1) Removal - Handle Assembly

Note: The exterior handle can be removed by just removing roll pin from interior handle shaft. Always use correct size pin punch when removing roll pins.

(a) Remove screw and washer securing interior handle to interior handle shaft.
(b) Remove door trim panel. (Refer to 25-10)
(c) Remove nuts and washers from spring return bracket. Remove spring return bracket.
(d) Remove roll pin from interior handle shaft.
(e) *Serials 1005 thru 1213:* Remove screws and washers securing span bracket to door. Remove span bracket.
(f) *Serials 1214 thru 1422:* Remove nuts and washers securing span bracket to door. Remove span bracket.
(g) Remove roll pin securing main shaft to actuation disk.
(h) Slide actuation disk assembly off main shaft and position aside.
(i) Remove exterior handle from cabin door main shaft.

(2) Installation - Handle Assembly

Note: Lubricate all moving cabin door latch mechanisms with a dry film lubricant. (Refer to 12-20)

(a) Install exterior handle to cabin door main shaft.
(b) Position and slide actuation disk assembly onto main shaft.
(c) Secure main shaft to actuation disk with roll pin.
(d) *Serials 1005 thru 1213:* Secure span bracket to door with screws and washers.
(e) *Serials 1214 thru 1422:* Secure span bracket to door with nuts and washers.
(f) Install interior handle shaft roll pin.
(g) Secure spring return bracket with washers and nuts.
(h) Secure door trim. (Refer to 25-10)
(i) Secure interior handle to interior handle shaft with screw and washer.

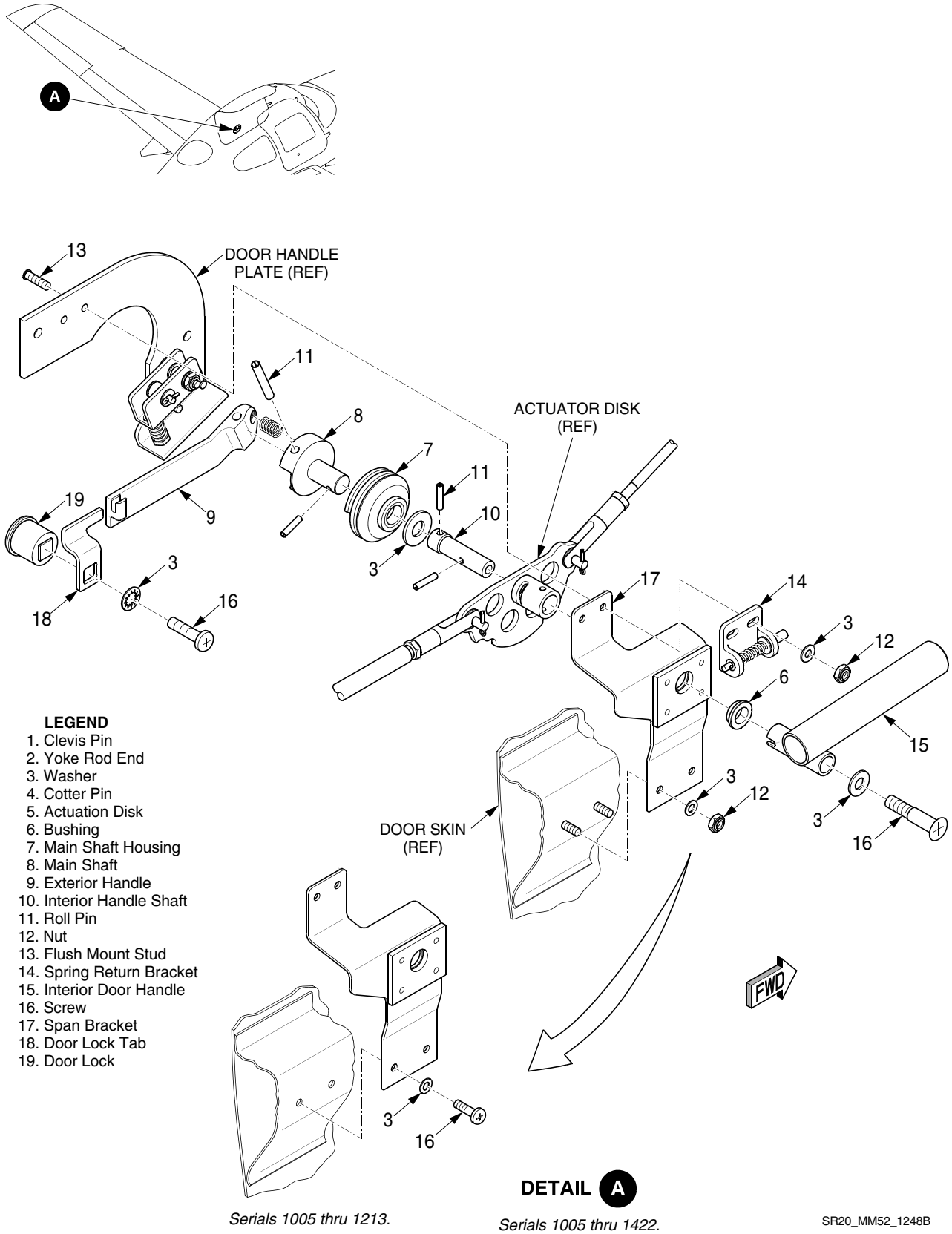


Figure 52-104
Handle Assembly - Serials 1005 thru 1422

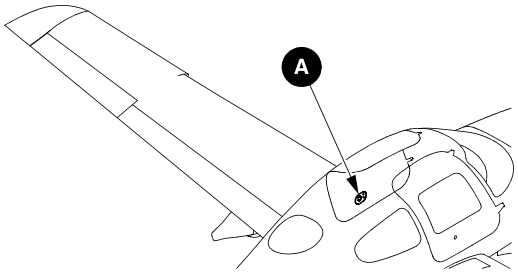
G. Handle Assembly - *Serials 1423 thru 2302* **(See Figure 52-105)**

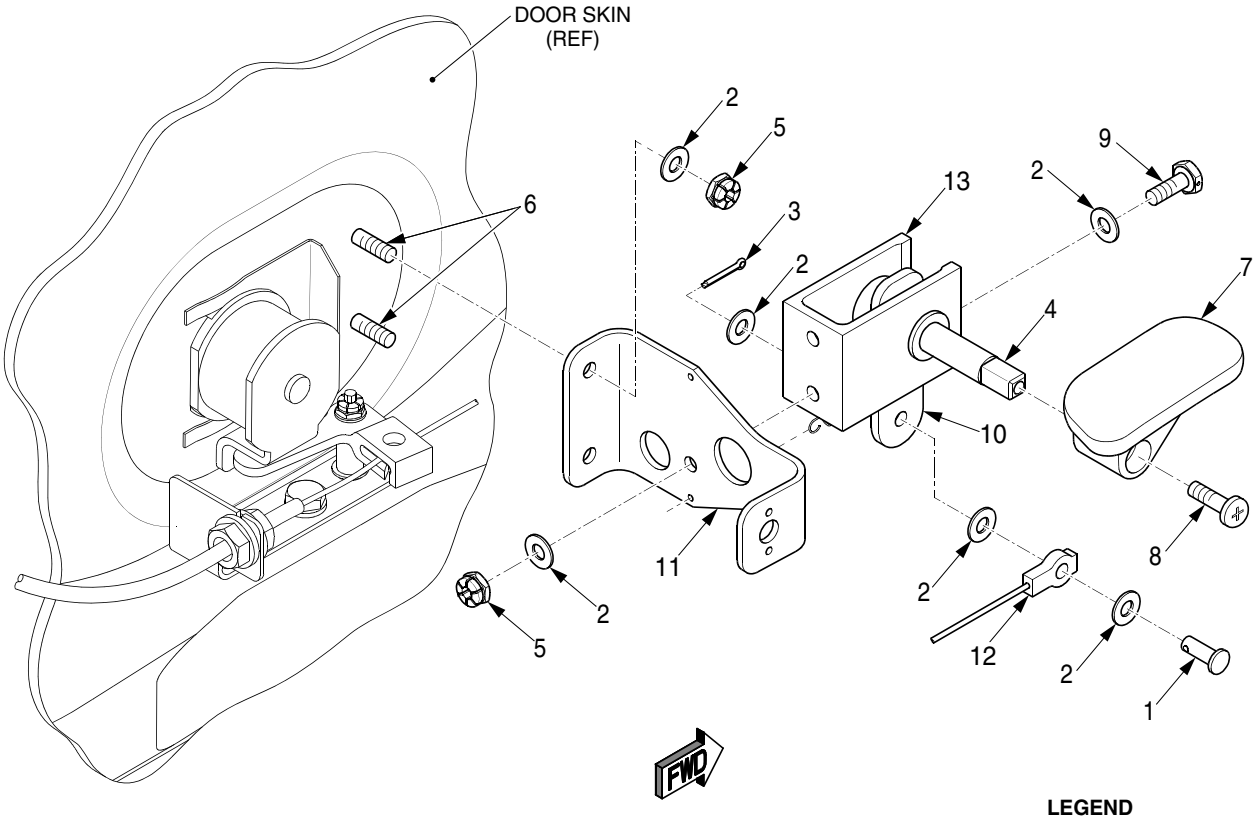
(1) Removal - Handle Lever
  (a) Remove door handle. (Refer to 25-10)
  (b) Remove screw securing handle lever to interior handle shaft. Remove handle lever.

(2) Installation - Handle Lever
  (a) Secure handle lever to interior lever shaft with screw.
  (b) Install door handle. (Refer to 25-10)

(3) Removal - Handle Lever Assembly
  (a) Remove handle lever. (Refer to 52-10)
  (b) Remove door trim panel. (Refer to 25-10)
  (c) Remove cotter pin, washers, and clevis pin securing end of cable to actuation arm.
  (d) Remove bolts, washers, and nuts securing clevis handle to handle bracket.

(4) Installation - Handle Lever Assembly
  (a) Secure clevis handle to handle bracket with bolts, washers, and nuts.
  (b) Secure end of cable to actuation arm with cotter pin, washers, and clevis pin.
  (c) Secure door trim panel. (Refer to 25-10)
  (d) Install handle lever. (Refer to 52-10)





LEGEND

1. Clevis Pin
2. Washer
3. Cotter Pin
4. Interior Handle Shaft
5. Nut
6. Flush Mount Stud
7. Interior Door Handle
8. Screw
9. Bolt
10. Actuation Arm
11. Handle Bracket
12. Latch Actuation Cable
13. Clevis Handle

DETAIL A

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Figure 52-105
Handle Assembly - Serials 1423 thru 2302

H. Handle Assembly - *Serials 2303 & subs* (See Figure 52-106)

(1) Removal - Handle Lever

(a) Remove door handle. (Refer to 25-10)

(b) Remove screw and washer securing handle lever to interior handle shaft. Remove handle lever.

(2) Installation - Handle Lever

(a) Secure handle lever to interior handle shaft with washer and screw.

(b) Perform Adjustment/Test - Handle Lever Angle. (Refer to 52-10)

(c) Install door handle. (Refer to 25-10)

(3) Removal - Exterior Handle

(a) Remove handle lever. (Refer to 52-10)

(b) Remove door trim panel. (Refer to 25-10)

(c) Remove cotter pin, nut, and washer securing exterior handle axle to door actuation assembly.

(d) Remove exterior handle assembly from airplane.

(4) Installation - Exterior Handle

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	Aeroshell 22 or Mobil SHC-100	Any Source.	Lubricate kick-out cam.

CAUTION: Do not allow handle to contact side of exterior housing prior to adjusting kick-out cam as it may damage housing.

(b) Position axle through exterior housing and secure to door actuation assembly with washer and nut.

(c) Adjust nut so that handle is secure, and handle motion is free from resistance. Install new cotter pin.

(d) Adjust kick-out cam.

1 Loosen cam adjustment nut.

2 Move exterior handle to either fully open or fully closed position.

3 Using hex wrench, adjust cam to provide approximately 0.1 inch (2.54 mm) clearance between handle and edge of housing.

4 Ensure there is freeplay between cam and exterior handle cam track throughout the full range of handle motion.

5 Tighten cam adjustment nut.

6 Lubricate cam surface with grease.

(e) Install door trim panel. (Refer to 25-10)

(f) Install handle lever. (Refer to 52-10)

(5) Adjustment - Handle Lever Angle (See Figure 52-107)

(a) With cabin door in closed position, verify handle lever is flush with armrest with a tolerance of ±0.075 inch (1.905 mm).

(b) If handle lever is not flush with armrest, adjust handle angle.

Note: Note adjustment required to make handle lever flush with armrest.

1 Remove handle lever. (Refer to 52-10)

2 Remove door trim panel. (Refer to 25-10)

3 Remove nut, washers, clip, and bolt securing door cable to lower cable mounting bracket.

4 Remove turnbuckle securing inboard link of door actuation assembly to door cable.

5 Remove cotter pin, washer, and clevis pin securing outboard link of door actuation assembly to lower gearbox.

6 Raise/lower handle lever as required by adjusting outboard link.

Note: To lower handle lever shorten outboard link. Each clockwise half-turn of rod end lowers forward tip of handle lever by approximately 0.083 inch (2.11 mm).

To raise handle lever lengthen outboard link. Each counterclockwise half-turn of rod end raises forward tip of handle lever by approximately 0.083 inch (2.11 mm).

7 Secure outboard link of door actuation assembly to lower gearbox using clevis pin, washer, and new cotter pin.

8 Install turnbuckle securing inboard link of door actuation assembly to door cable.

9 Install bolt, clip, washers, and nut securing door cable to lower cable mounting bracket.

10 Install door trim panel. (Refer to 25-10)

11 Install handle lever. (Refer to 52-10)

12 Perform Adjustment - Latch Assembly. (Refer to 52-10)

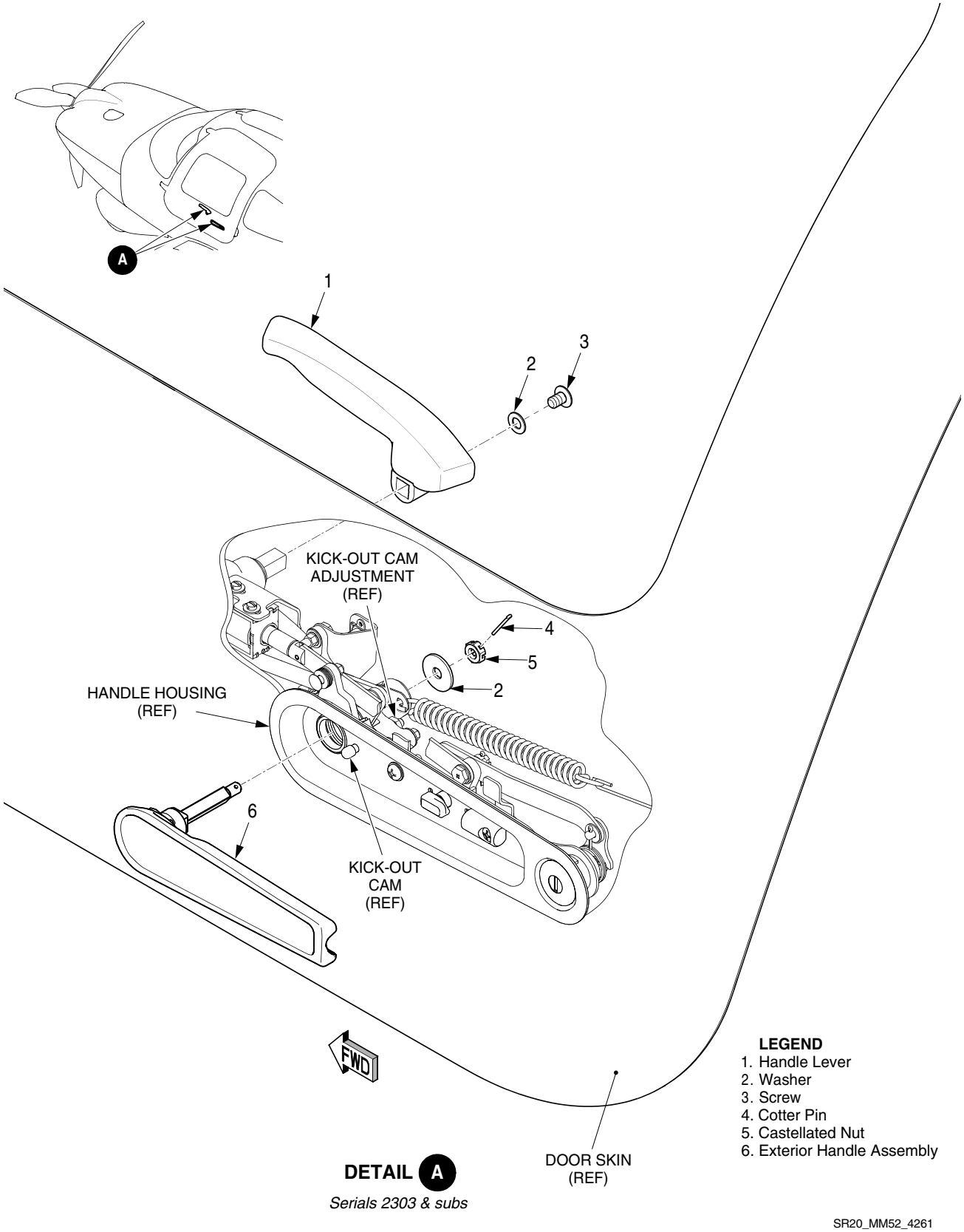


Figure 52-106
Handle Assembly - Serials 2303 & subs

EFFECTIVITY:
Serials 2303 & subs

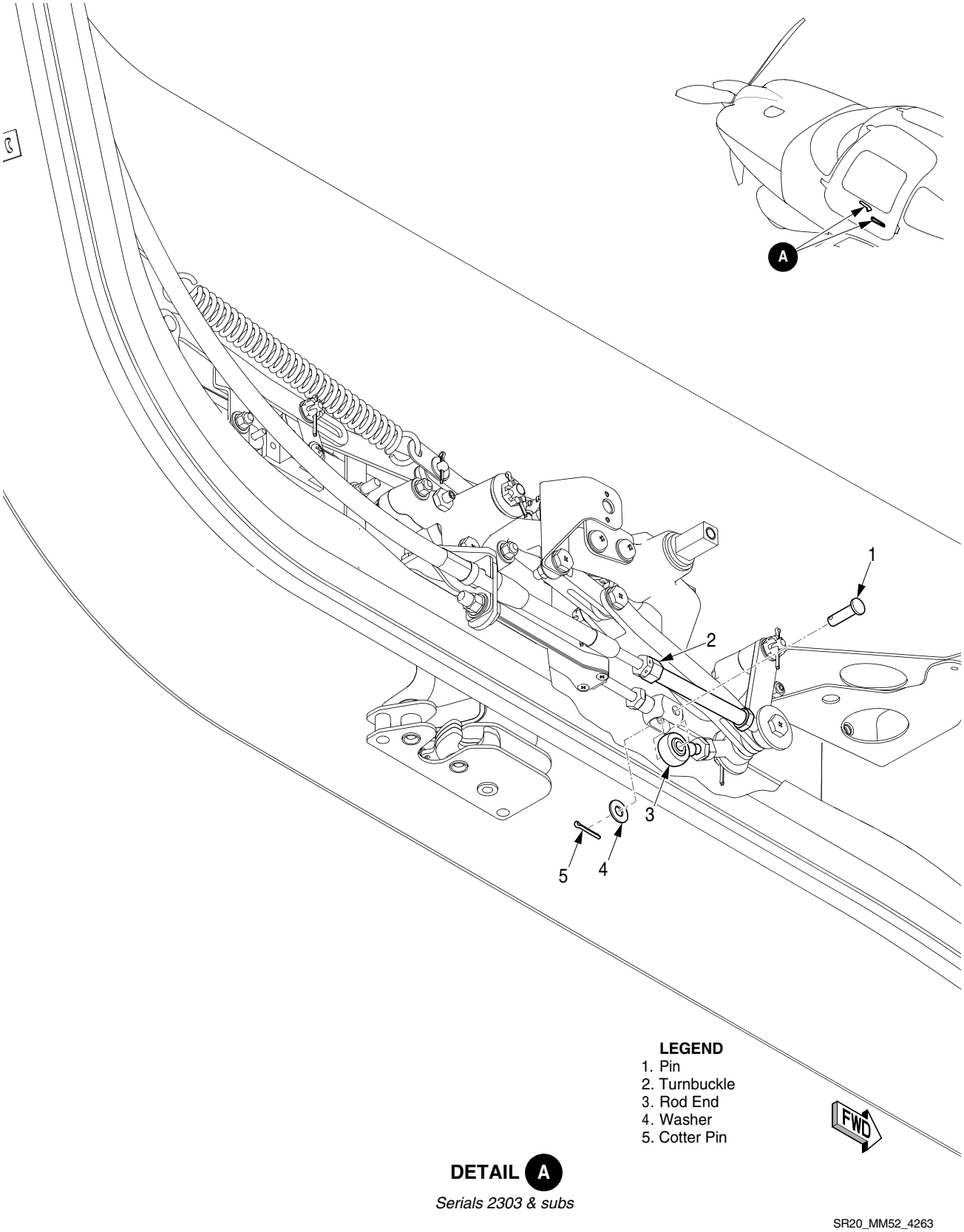


Figure 52-107
Handle Lever Angle and Latching Timing Adjustment - Serials 2303 & subs

I. Lock Assembly - *Serials 2303 & subs* **(See Figure 52-108)**

(1) Removal - Lock Assembly

(a) *Serials w/ Convenience Lighting:* Pull CONV LIGHTS circuit breaker.

(b) Remove handle lever. (Refer to 52-10)

(c) Remove door trim panel. (Refer to 25-10)

Note: To facilitate removal of lock assembly, extension spring may be disconnected from spring hook.

(d) *Serials w/ Convenience Lighting:* Disconnect door lock solenoid electrical connector.

(e) *Serials w/ Convenience Lighting:* Remove safety wire, screws, and washers securing terminal ring and lock solenoid to solenoid bracket.

(f) *Serials w/o Convenience Lighting:* Remove safety wire, screws, and washers securing lock solenoid to solenoid bracket.

(g) Remove washers and screws securing solenoid bracket to door actuation assembly.

(h) Remove safety wire and roll pin securing lock solenoid to lock solenoid linkage.

(i) Remove cotter pin, nut, washers, and bolt securing lock solenoid linkage to door lock linkage and pivot lock.

(j) Remove cotter pin, washer, and clevis pin securing door lock linkage to lock cylinder cam.

(k) Remove safety wire and lock retention clip securing door lock cylinder and gasket to exterior handle housing.

(l) Remove retention clip securing lock cylinder cam to lock.

(m) Remove lock assembly from airplane.

(2) Installation - Lock Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	242	Any Source	Install solenoid bracket.

(b) Position door lock cylinder and new gasket to exterior handle housing.

(c) Position lock cylinder cam to lock and secure with retention clip.

(d) Secure door lock cylinder to exterior handle housing with lock retention clip and safety wire.

(e) Install clevis pin, washer, and new cotter pin securing door lock linkage to lock cylinder cam.

(f) Install bolt, washers, nut, and new cotter pin securing lock solenoid linkage to door lock linkage and pivot lock.

(g) Install roll pin securing lock solenoid to lock solenoid linkage and safety wire.

(h) Apply Loctite® to threads of screws and install screws and washers securing solenoid bracket to door actuation assembly.

(i) *Serials w/o Convenience Lighting:* Install screws and washers securing lock solenoid to solenoid bracket and safety wire. (Refer to 20-50)

(j) *Serials w/ Convenience Lighting:* Install screws and washers securing lock solenoid and terminal ring to solenoid bracket and safety wire. (Refer to 20-50)

(k) Ensure clearance exists around linkages.

(l) Ensure solenoid magnet can catch and hold lock mechanism in locked position.

(m) Ensure full travel against stop in pivot lock is achieved in unlocked position.

(n) *Serials w/ Convenience Lighting:* Connect electrical connector to door lock solenoid.

(o) If disconnected during removal, connect extension spring to spring hook.
(p) Install door trim panel. (Refer to 25-10)
(q) Install handle lever. (Refer to 52-10)
(r) *Serials w/ Convenience Lighting:* Reset CONV LIGHTS circuit breaker.

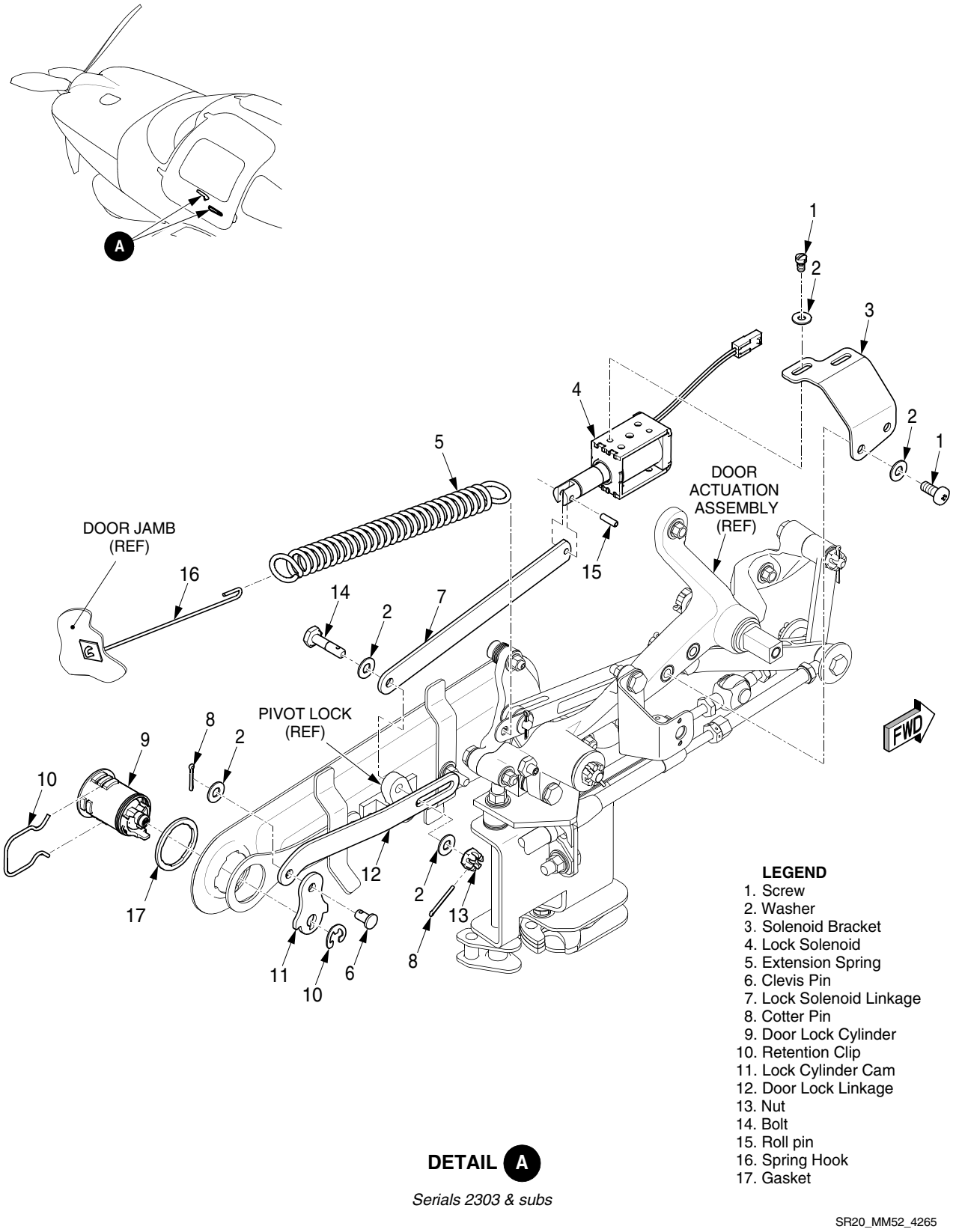


Figure 52-108
Door Lock Assembly - Serials 2303 & subs

EFFECTIVITY:
Serials 2303 & subs

J. Latch Assembly - *Serials 1005 thru 1422* (See Figure 52-109)

(1) Removal - Latch Assembly

(a) Remove screw and washer securing interior handle to interior handle shaft.

(b) Remove door trim panel. (Refer to 25-10)

(c) Remove screws, washers, and nuts securing lower and upper cable attach brackets to door.

(d) Remove cotter pins, clevis pins, and washers securing yoke rod ends to actuation disk.

(e) Remove cotter pins, clevis pins, and washers securing yoke rod ends to inner spring tubes.

(f) Remove nuts and yoke rod ends from actuation levers.

(g) Remove roll pins securing door pins and cable pin springs to inner spring tubes.

(h) Remove grommets and plastic flanged bearings from outer spring tubes.

(i) Remove screws securing outer spring tubes to door.

(2) Installation - Latch Assembly

Note: Lubricate all moving cabin door latch mechanisms with a dry film lubricant. (Refer to 12-20)

(a) Install screws securing outer spring tubes to door.

(b) Slide grommets over back of outer spring tubes.

(c) Insert plastic flanged bearings into front of outer spring tubes.

(d) Insert cable pin springs and door pins into inner spring tubes. Secure door pins to inner spring tubes with roll pins.

(e) Secure actuation levers to yoke rod ends with nuts.

(f) Secure yoke rod ends to inner spring tubes with cotter pins, clevis pins, and washers.

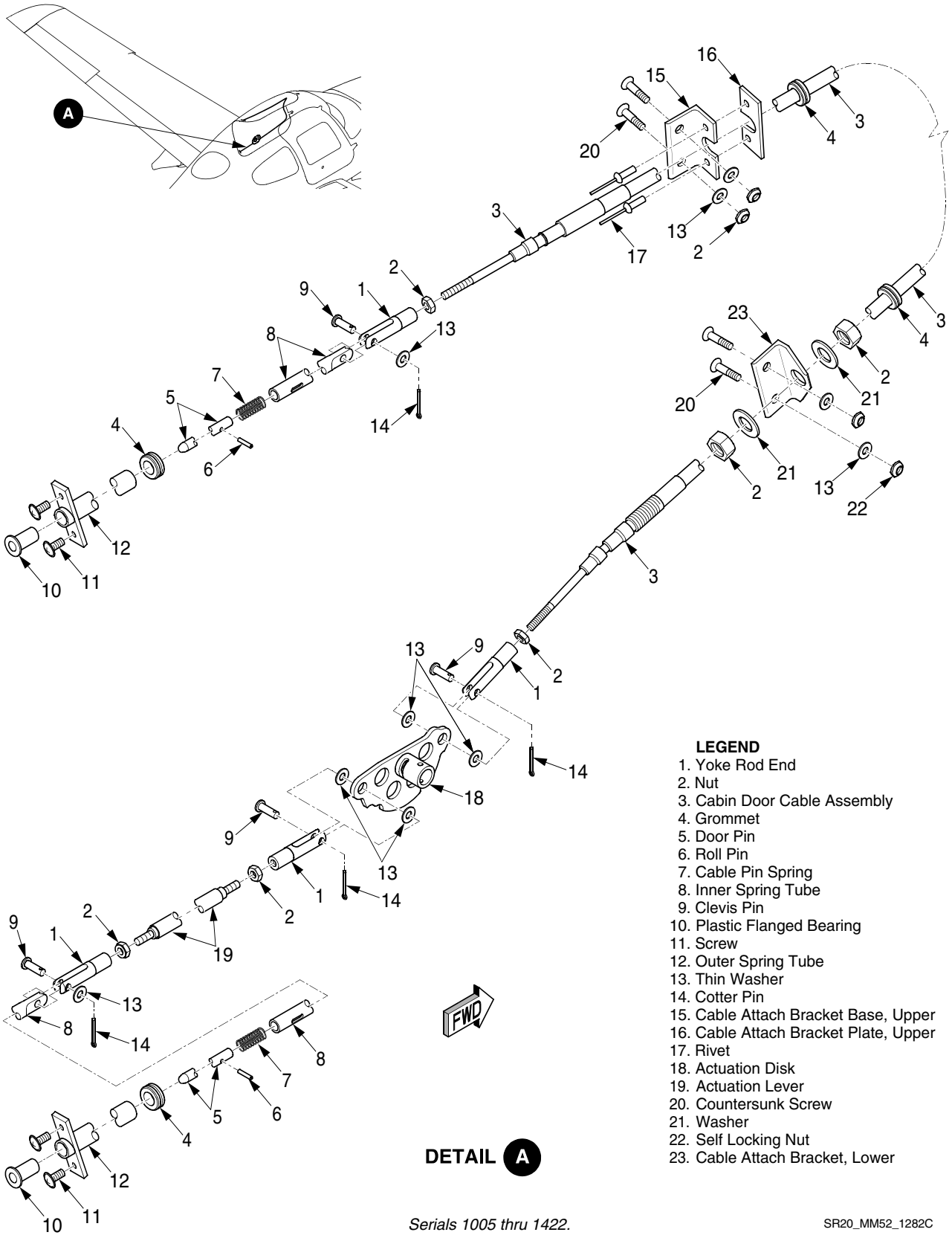
(g) Secure yoke rod ends to actuation disk with cotter pins, clevis pins, and washers.

(h) Position and secure lower and upper cable attach brackets to door with screws, washers, and nuts.

(i) Secure door trim. (Refer to 25-10)

(j) Secure interior handle to interior handle shaft with screw and washer.

(k) Perform Adjustment - Latch Assembly. (Refer to 52-10)



Serials 1005 thru 1422.

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Figure 52-109
Latch Assembly - Serials 1005 thru 1422

EFFECTIVITY:
Serials 1005 thru 1422

(3) Adjustment - Latch Assembly (See Figure 52-1010)

(a) Open cabin door and hold cabin door handle in full open position (keeping pressure on the compression springs).

(b) Inspect and measure clearance between both door pins and receivers using a feeler gage.

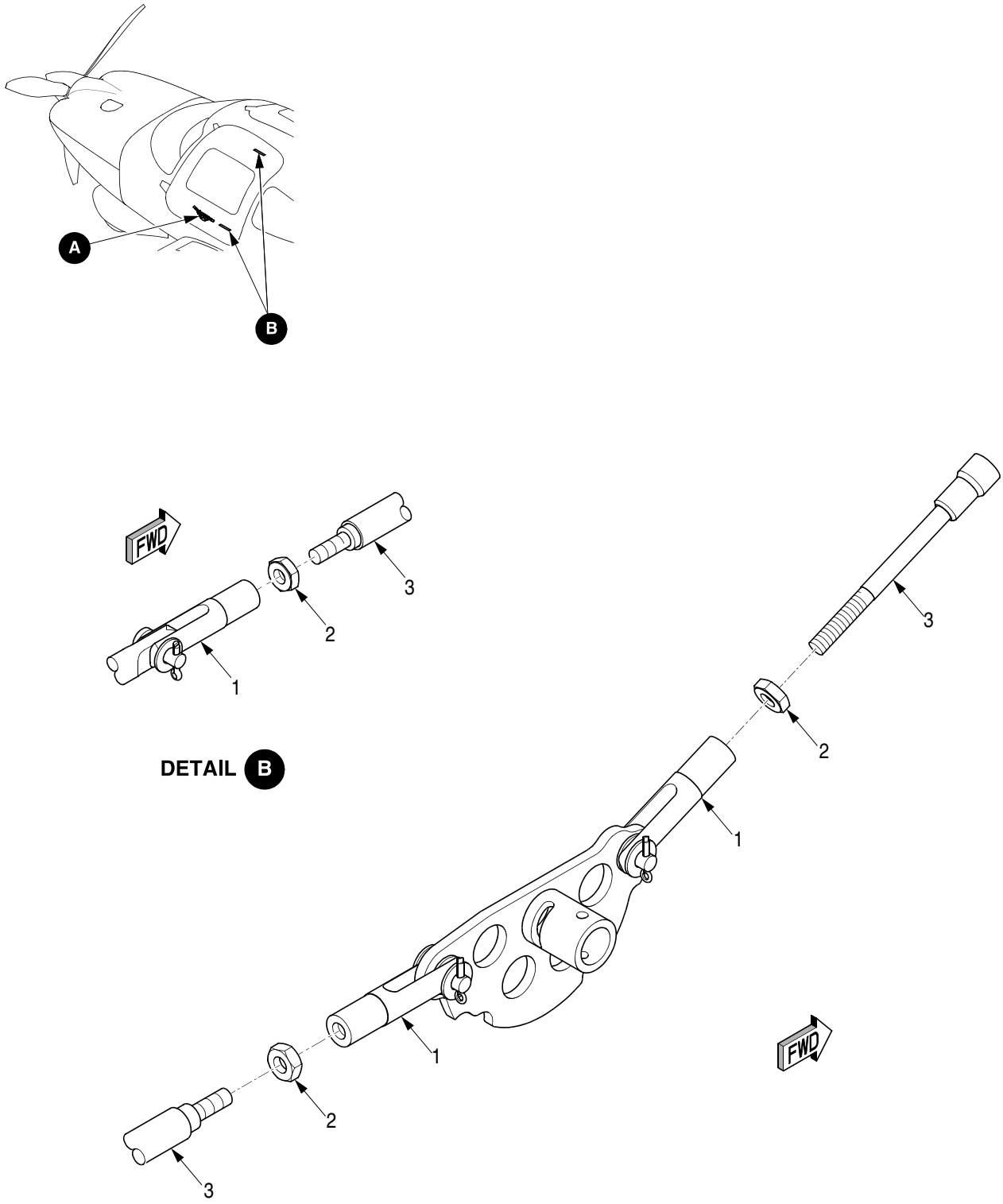
(c) The door pin and receiver clearance should be between 0.00 and 0.05 inch (0.00 and 1.27 cm). If pins need adjustment, proceed with the following steps.

1 Remove door trim panel. (Refer to 25-10)

2 Remove appropriate rod end and turn rod end in corresponding direction.

3 Repeat above procedures as required until specified clearance is obtained.

4 Secure door trim. (Refer to 25-10)



LEGEND
1. Yoke Rod End
2. Plain Nut
3. Cabin Door Cable Assembly

Serials 1005 thru 1422.

SR20_MM52_1187C

Figure 52-1010
Latch Assembly Adjustment - Serials 1005 thru 1422

K. Latch Assembly - *Serials 1423 thru 2302* (See Figure 52-1011)

(1) Removal - Latch Assembly

(a) Remove handle lever. (Refer to 52-10)

(b) Remove door trim panel. (Refer to 25-10)

(c) Remove nut, washers, rotary arm, and spacer securing actuator to rotary latch.

(d) Remove bolts and washers securing cable bracket, spacer, and rotary latch to door. Remove rotary latch.

(2) Installation - Latch Assembly

(a) Position rotary latch, spacer, and cable bracket to door. Install bolts and washers securing rotary latch, spacer, and cable bracket to door. Torque to 15.0 - 20.0 in-lb (1.7 - 2.2 Nm).

(b) Install actuator.

1 Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Small Brushes	-	Any Source	Apply primer and Loctite.
Primer	7471 or 7649	Henkel Loctite Corp. Rocky Hill, CT 06067 860-571-5100	Prepare rotary arm mating surfaces.
Loctite	262	Henkel Loctite Corp. Rocky Hill, CT 06067 860-571-5100	Gap fill mating surfaces of rotary arm.

2 Solvent clean inner square mating surfaces of rotary arm with isopropyl alcohol. (Refer to 20-30)

3 Use clean brush to apply primer on inner square mating surfaces of rotary arm. Allow to dry. (Refer to 20-40)

4 Position actuator to rotary latch with washers, spacer, and rotary arm.

5 Use clean brush to apply Loctite on inner square mating surfaces of rotary arm. (Refer to 20-40)

6 Rock rotary arm until Loctite fills entire gap between rotary arm and actuator.

7 Install upper washer and wipe excess Loctite from actuator threads with cloth.

Note: At rotary arm attachment, use approved alternate spacer and washer(s) stackup as required. (Refer to IPC)

8 Secure rotary arm to actuator with nut, washers, and spacer.

CAUTION: Rotary arm gap verification and alignment must be accomplished within a few minutes of applying Loctite while nut is secured and before Loctite sets.

(c) Align rotary arms. (See Figure 52-1012)

1 Verify gap between rotary arm and washer/spacer stackup is 0.01 to 0.03 inch (0.25 to 0.76 mm) and spacer rotates freely.

If clearance is not within tolerance or spacer does not rotate, remove nut securing rotary arm to actuator before Loctite sets and contact Cirrus Design Customer Service for disposition.

2 For upper rotary arm, perform alignment by locating rotary arm approximately centered between its limits of rotation on actuator.

3 For lower rotary arm, perform alignment by placing latch into latched position. Apply light pressure to rotary arm until it is approximately 0.01 to 0.03 inch (0.25 to 0.76 mm) above actuation arm of push button. If clearance is below tolerance, gently press rotary arm in the opposite direction and re-apply light pressure until clearance tolerance is met.

(d) Secure door trim panel. (Refer to 25-10)

(e) Install handle lever. (Refer to 52-10)

(3) Removal - Cable Attach Bracket

(a) Remove latch assembly. (Refer to 52-10)

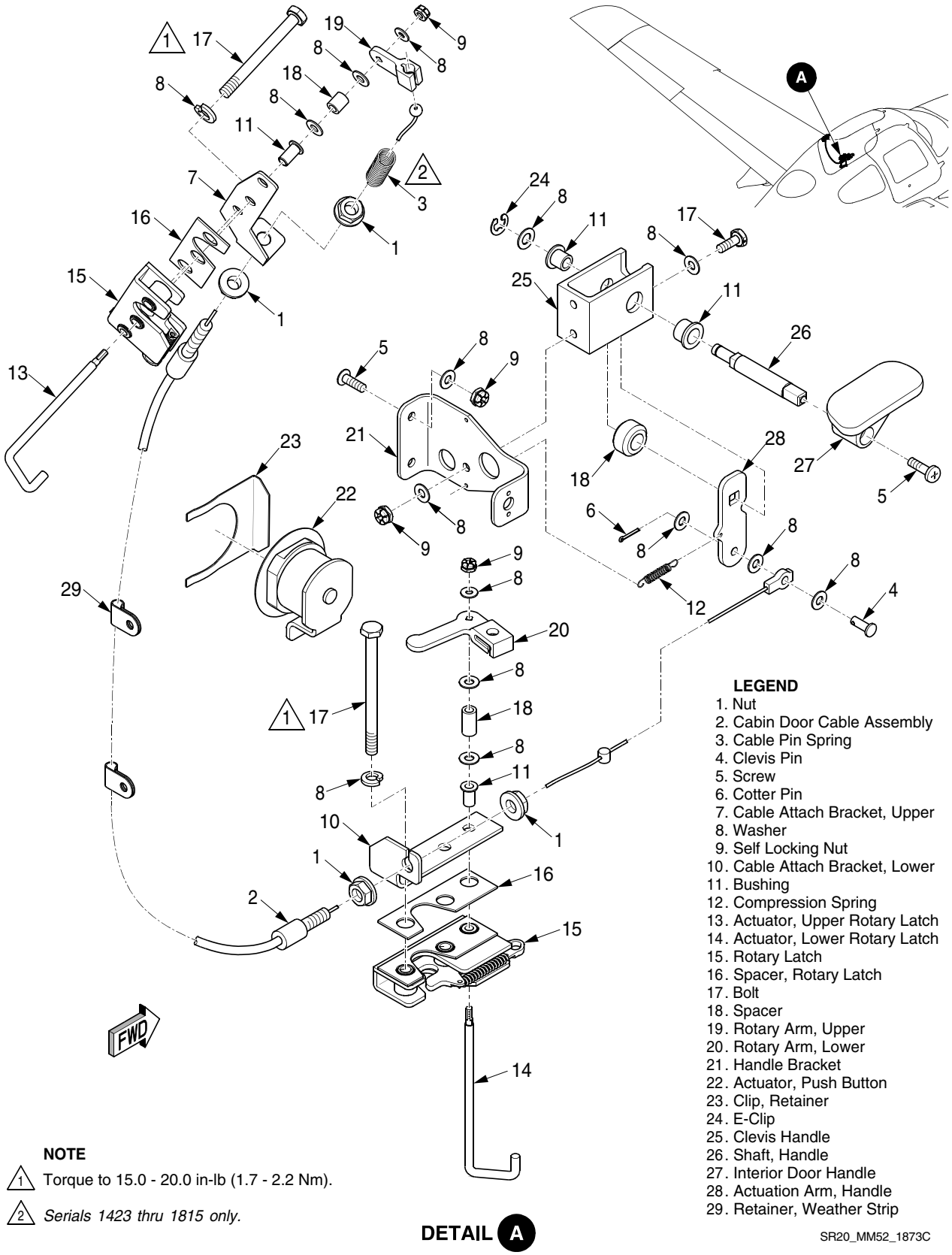
(b) Loosen nuts securing cable to cable attach bracket.

(c) Remove cable attach bracket.

(4) Installation - Cable Attach Bracket

(a) Tighten nuts securing cable to cable attach bracket.

(b) Install latch assembly. (Refer to 52-10)



LEGEND

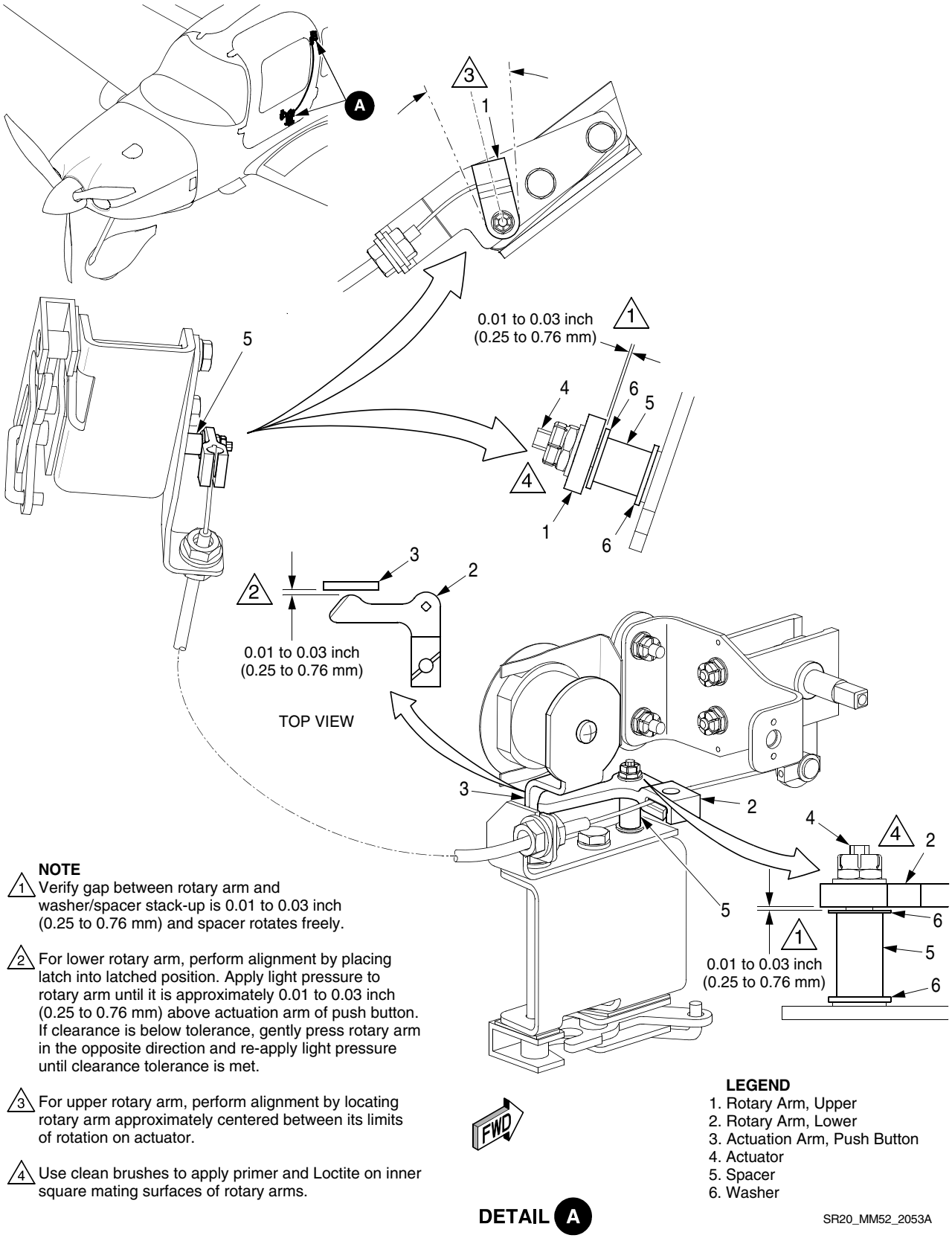
1. Nut
2. Cabin Door Cable Assembly
3. Cable Pin Spring
4. Clevis Pin
5. Screw
6. Cotter Pin
7. Cable Attach Bracket, Upper
8. Washer
9. Self Locking Nut
10. Cable Attach Bracket, Lower
11. Bushing
12. Compression Spring
13. Actuator, Upper Rotary Latch
14. Actuator, Lower Rotary Latch
15. Rotary Latch
16. Spacer, Rotary Latch
17. Bolt
18. Spacer
19. Rotary Arm, Upper
20. Rotary Arm, Lower
21. Handle Bracket
22. Actuator, Push Button
23. Clip, Retainer
24. E-Clip
25. Clevis Handle
26. Shaft, Handle
27. Interior Door Handle
28. Actuation Arm, Handle
29. Retainer, Weather Strip

NOTE

1. Torque to 15.0 - 20.0 in-lb (1.7 - 2.2 Nm).
2. *Serials 1423 thru 1815 only.*

SR20_MM52_1873C

Figure 52-1011
Latch Assembly - Serials 1423 thru 2302



NOTE

1. Verify gap between rotary arm and washer/spacer stack-up is 0.01 to 0.03 inch (0.25 to 0.76 mm) and spacer rotates freely.
2. For lower rotary arm, perform alignment by placing latch into latched position. Apply light pressure to rotary arm until it is approximately 0.01 to 0.03 inch (0.25 to 0.76 mm) above actuation arm of push button. If clearance is below tolerance, gently press rotary arm in the opposite direction and re-apply light pressure until clearance tolerance is met.
3. For upper rotary arm, perform alignment by locating rotary arm approximately centered between its limits of rotation on actuator.
4. Use clean brushes to apply primer and Loctite on inner square mating surfaces of rotary arms.

LEGEND

1. Rotary Arm, Upper
2. Rotary Arm, Lower
3. Actuation Arm, Push Button
4. Actuator
5. Spacer
6. Washer

DETAIL A

SR20_MM52_2053A

Figure 52-1012
Rotary Arm Alignment - Serials 1423 thru 2302

(5) Adjustment - Latch Assembly (See Figure 52-1013)

(a) Open the cabin door.

(b) Manually rotate both latches to closed position with door open.

(c) Slowly depress exterior push button until lower latch releases.

If upper latch is still engaged or disengages last, latch tension is too loose and adjustment is required.

If both latches are disengaged, manually depress lever on upper latch mechanism. If upper latch can be closed easily, no adjustment is required. If upper latch closes with difficulty or won't engage, latch tension is too tight and adjustment is required.

1 Remove handle lever. (Refer to 52-10)

2 Remove door trim panel. (Refer to 25-10)

3 Loosen nuts securing upper cable to cable attach bracket.

4 Adjust cable end attachment locations by threading nuts as required to achieve specified cable tension.

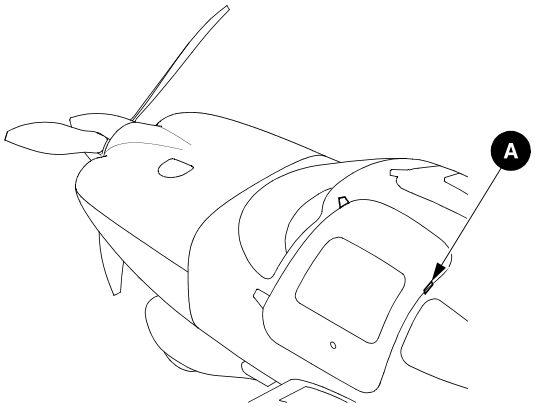
CAUTION: To minimize slack in cable, ensure cable end ball fitting only has a maximum of 0.03 inch (0.76 mm) of looseness.

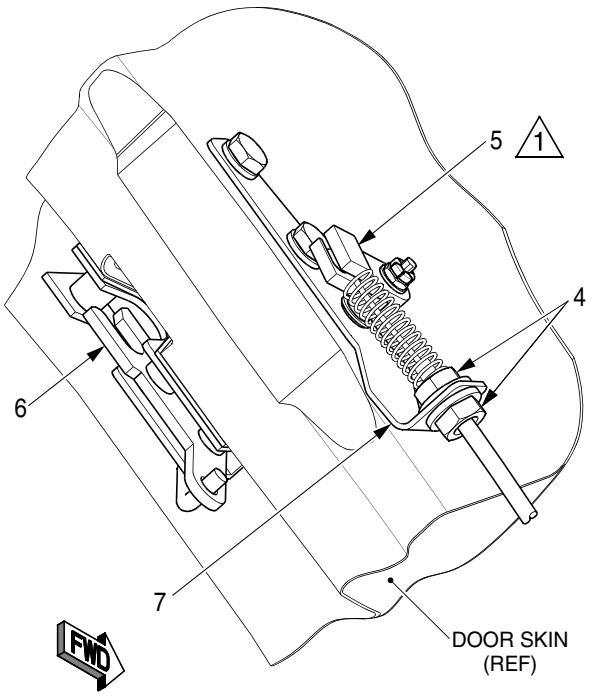
5 Tighten nuts securing cable to cable attach bracket.

6 Repeat above procedures as required until both latches disengage as required when cabin door push button is depressed.

7 Secure door trim. (Refer to 25-10)

8 Install handle lever. (Refer to 52-10)





DETAIL A

LEGEND

4. Nut
5. Ball Fitting
6. Upper Latch Lever
7. Cable Attach Bracket

NOTE

1. To minimize slack in cable, ensure cable end ball fitting only has a maximum of 0.03 inch (0.76 mm) of looseness.

SR20_MM52_1882A

Figure 52-1013
Latch Assembly Adjustment - Serials 1423 thru 2302

EFFECTIVITY:
Serials 1423 thru 2302

L. Latch Assembly - *Serials 2303 & subs* **(See Figure 52-1014)**

(1) Removal - Upper Latch Assembly

(a) Remove handle lever. (Refer to 52-10)

(b) Remove door trim panel. (Refer to 25-10)

(c) Remove cotter pin, washer, and clevis pin securing door cable rod end to upper gearbox rod end.

(d) Remove nuts, washers, and spacers securing latch studs to upper gearbox.

(e) Remove upper latch assembly and upper gearbox from airplane.

(2) Installation - Upper Latch Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	262	Any Source	Install latch studs to latch assembly.

Note: If installing new latch assembly, secure latch studs to latch assembly with Loctite®.

(b) Position upper latch assembly and upper gearbox to door jamb.

(c) Install spacers, washers, and nuts securing latch studs to upper gearbox. Torque nuts to 20 in-lb (2.2 Nm).

CAUTION: Forward edge of gearbox must not contact door as deformation of gearbox may result.

(d) Ensure forward edge of gearbox does not contact door. Washers may be added as required under gearbox to achieve clearance.

CAUTION: Latch assembly must not contact door as deformation of latch assembly frame may result.

(e) Ensure latch assembly does not contact door.

(f) Ensure latch assembly frame is approximately parallel to gearbox. Washers may be added as required to achieve proper fit.

(g) Test movement of gearbox/latch assembly system.

1 Open latch by pulling gearbox rod end.

2 With latch fully opened, depress door latch arm on latch assembly to first detent position.

3 Close latch by pushing gearbox rod end.

4 Repeat several times, verifying movement is free of excessive friction.

(h) Remove nuts, washers, and spacers securing latch studs to upper gearbox.

Note: Wet install latch studs to door jamb. (Refer to 20-10)

(i) Install spacers, washers, and nuts securing latch studs to upper gearbox with sealant between latch studs and door jamb. (Refer to 20-10)

(j) Torque nuts to 20 in-lb (2.2 Nm).

(k) Test movement of gearbox/latch assembly system.

1 Open latch by pulling gearbox rod end.

2 With latch fully opened, depress door latch arm on latch assembly to first detent position.

3 Close latch by pushing gearbox rod end.

4 Repeat several times, verifying movement is free of excessive friction.

(l) Install clevis pin, washer, and new cotter pin securing door cable rod end to upper gearbox rod end.

(m) Install door trim panel. (Refer to 25-10)

(n) Install handle lever. (Refer to 52-10)

(o) Perform Adjustment - Latch Assembly. (Refer to 52-10)

(3) Removal - Lower Latch Assembly

(a) Remove handle lever. (Refer to 52-10)

(b) Remove door trim panel. (Refer to 25-10)

(c) Remove nut, washers, clip, and bolt securing door cable to lower cable mounting bracket.

(d) Remove turnbuckle securing inboard link of door actuation assembly to door cable.

(e) Remove cotter pin, washer, and clevis pin securing outboard link of door actuation assembly to lower gearbox.

(f) Remove nuts and washers securing latch studs to lower gearbox.

(g) Remove upper latch assembly and gearbox from airplane.

(4) Installation - Lower Latch Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	262	Any Source	Install latch studs to latch assembly.

Note: If installing new latch assembly, secure latch studs to latch assembly with Loctite®.

(b) Install washers and nuts securing latch studs to upper gearbox. Torque nuts to 20 in-lb (2.2 Nm).

CAUTION: Forward edge of gear case must not contact door as deformation of gearbox may result.

(c) Ensure forward edge of gearbox does not contact door. Washers may be added as required under gearbox to achieve clearance.

CAUTION: Latch assembly must not contact door as deformation of latch assembly frame may result.

(d) Ensure latch assembly does not contact door.

(e) Ensure latch assembly frame is approximately parallel to gearbox. Washers may be added as required to achieve proper fit.

(f) Test movement of gearbox/latch assembly system.

1 Open latch by pulling gearbox rod end.

2 With latch fully opened, depress door latch arm on latch assembly to first detent position.

3 Close latch by pushing gearbox rod end.

4 Repeat several times, verifying movement is free of excessive friction.

(g) Remove nuts and washers securing latch studs to upper gearbox.

Note: Wet install latch studs to door jamb. (Refer to 20-10)

(h) Install washers and nuts securing latch studs to upper gearbox with sealant between latch studs and door jamb. (Refer to 20-10)

(i) Torque nuts to 20 in-lb (2.2 Nm).

(j) Test movement of gearbox/latch assembly system.

1 Open latch by pulling gearbox rod end.

2 With latch fully opened, depress door latch arm on latch assembly to first detent position.

3 Close latch by pushing gearbox rod end.

4 Repeat several times, verifying movement is free of excessive friction.

(k) Secure outboard link of door actuation assembly to lower gearbox using clevis pin, washer, and new cotter pin.

(l) Install turnbuckle securing inboard link of door actuation assembly to door cable.

(m) Install bolt, clip, washers, and nut securing door cable to lower cable mounting bracket.

(n) Install door trim panel. (Refer to 25-10)

(o) Install handle lever. (Refer to 52-10)

(p) Perform Adjustment - Latch Assembly. (Refer to 52-10)

(5) Adjustment - Latch Assembly (See Figure 52-107)

Note: Cabin doors must be closed slowly to verify latch assembly adjustment.

(a) Slowly close cabin door using either interior or exterior handle and verify upper and lower latches close at approximately the same time.

(b) If upper and lower latches do not close at approximately the same time, adjust latch assembly via turnbuckle on inboard link.

1 Remove handle lever. (Refer to 52-10)

2 Remove door trim panel. (Refer to 25-10)

CAUTION: Adjustment of the upper and lower latches to close at exactly the same time may not be possible. Over adjusting the turnbuckle to advance the timing of the upper latch may deform the upper cable attach bracket.

Note: Adjusting the turnbuckle to lengthen the inboard link will advance the timing of the upper latch. Adjusting the turnbuckle to shorten the inboard link will retard the timing of the upper latch.

3 Adjust turnbuckle until both latches close at approximately the same time.

4 Install door trim panel. (Refer to 25-10)

5 Install handle lever. (Refer to 52-10)

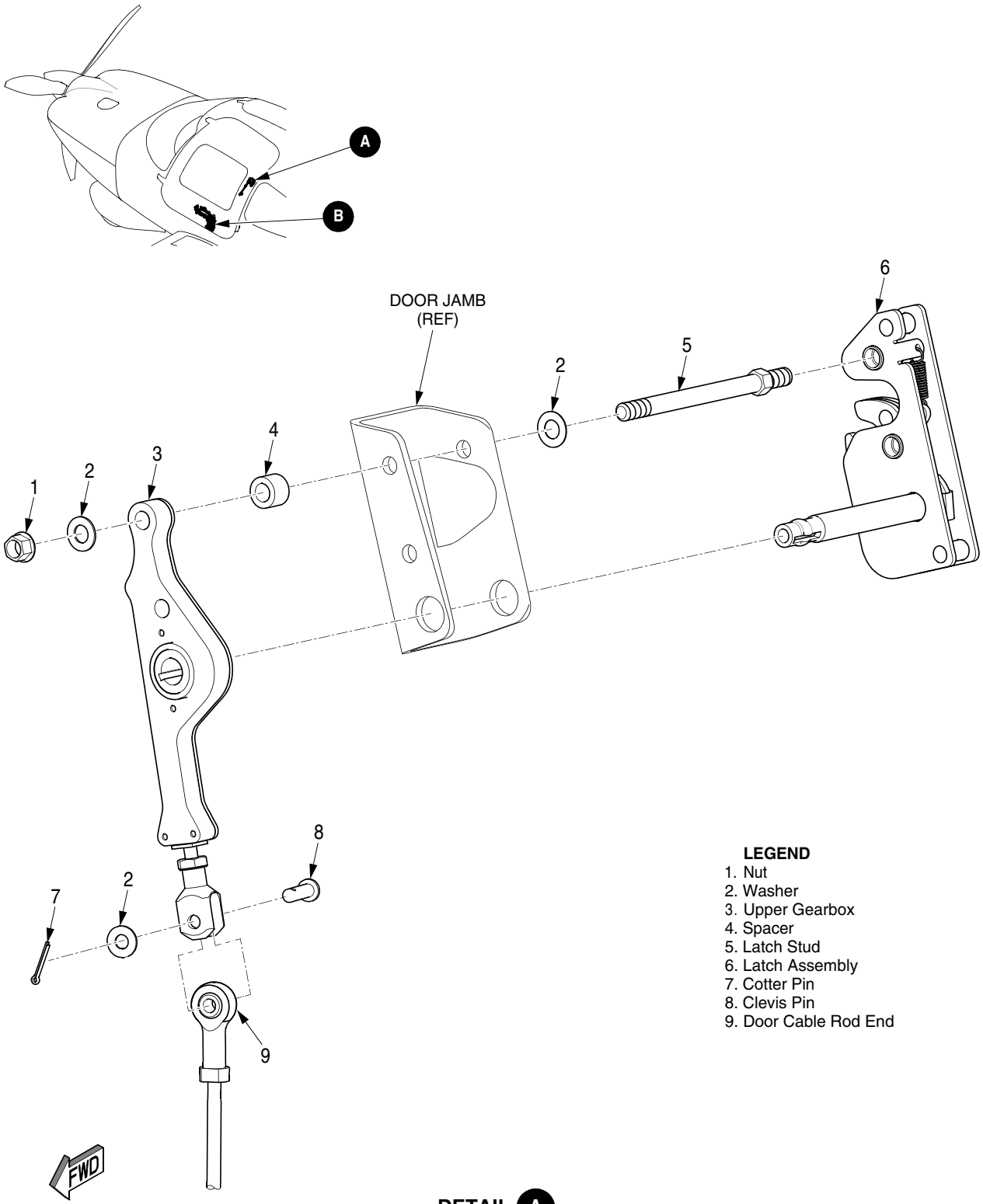
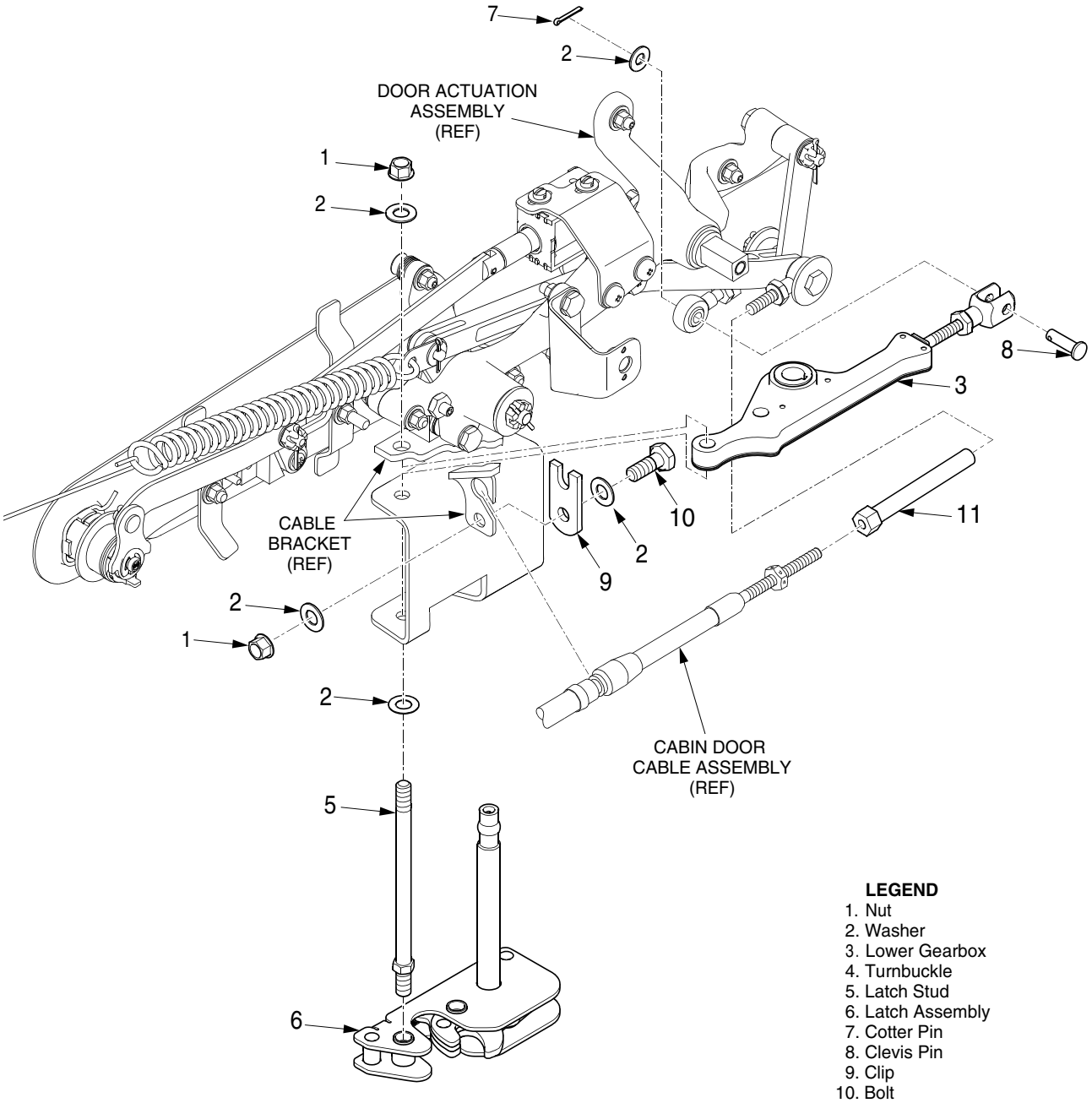


Figure 52-1014
Latch Assembly - Serials 2303 & subs (1 of 2)

EFFECTIVITY:
Serials 2303 & subs



DETAIL B

Serials 2303 & subs

SR20_MM52_4269

Figure 52-1014
Latch Assembly - Serials 2303 & subs (2 of 2)

EFFECTIVITY:
Serials 2303 & subs

M. Cabin Door Proximity Sensor - *Serials 2303 & subs w/ Convenience Lighting* **(See Figure 52-1015)**

(1) Removal - Cabin Door Proximity Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Heat Gun	-	Any Source	Remove adhesive.
Sandpaper	60-grit to 120-grit	Any source	Remove adhesive.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull CONV LIGHTS circuit breaker.

(d) Remove sidewall air duct trim. (Refer to 25-10)

(e) Disconnect cabin door proximity sensor from wire harness.

CAUTION: Adhesive securing sensor to fuselage does not require a high degree of heat to disbond. Do not exceed 175 °F (79 °C).

Do not cut or gouge laminate when removing adhesive.

Note: Note location of sensor to facilitate reinstallation.

(f) Apply heat to adhesive bonding sensor to fuselage. As adhesive heats and softens, pull sensor free from fuselage. Discard sensor.

(g) Using sandpaper, remove adhesive from fuselage.

(h) Solvent clean with isopropyl alcohol to remove adhesive residue. (Refer to 20-30)

(2) Installation - Cabin Door Proximity Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Adhesive, Methacrylate, 2-Part	14165	Devcon	Install sensor.

(b) Solvent clean faying surface on fuselage with isopropyl alcohol. (Refer to 20-30)

(c) Mix adhesive in accordance with the manufacturer's instructions.

(d) Apply adhesive to faying surface in accordance with the manufacturer's instructions.

(e) Secure sensor to fuselage ensuring that pressure is applied uniformly.

(f) Carefully remove any excess adhesive from edges of sensor with cloth dampened with isopropyl alcohol.

(g) Cure bond in accordance with the manufacturer's instructions.

(h) Connect cabin door proximity sensor to wire harness.

(i) Reset CONV LIGHTS circuit breaker.

(j) Verify proper operation of sensor.

(k) Install sidewall air duct trim. (Refer to 25-10)

N. Cabin Door Magnet - *Serials 2303 & subs w/ Convenience Lighting* **(See Figure 52-1015)**

(1) Removal - Cabin Door Magnet

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove screw securing magnet to cabin door.

(c) Remove magnet from airplane.

(2) Installation - Cabin Door Magnet

(a) Secure magnet to cabin door with screw.

(b) Verify proper operation of cabin door proximity sensor.

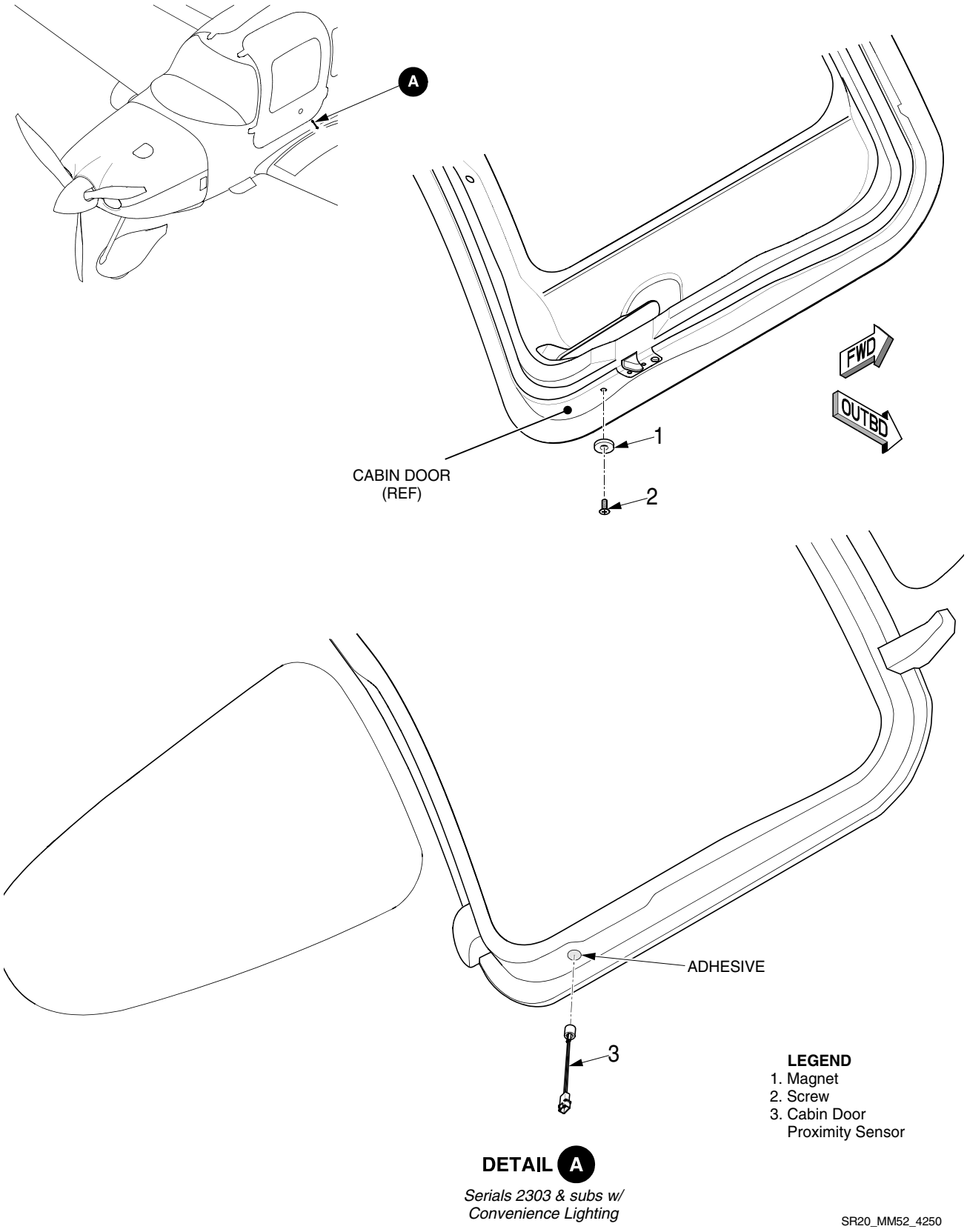


Figure 52-1015
Cabin Door Proximity Sensor and Magnet Installation - Serials 2303 & subs w/ Convenience Lighting

EFFECTIVITY:
Serials 2303 & subs w/ Convenience Lighting

O. Wireless Key Fob - *Serials 2303 & subs w/ Convenience Lighting*

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and

2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. l'appareil ne doit pas produire de brouillage;

2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAUTION: Changes or modifications not expressly approved by Cirrus Design could void the user's authority to operate the equipment.

Note: Perform the following procedure to pair a key fob with the aircraft.

Up to six key fobs can be paired based on a FIFO queue.

(1) Adjustment/Test - Key Fob Pairing
- (a) Ensure dome light switch is in AUTO.
- (b) Open pilot door.
- (c) Open baggage door.
- (d) Set BAT 1 switch to ON, OFF, ON positions within 3 seconds.
- (e) Press a key fob button and hold. Verify cabin light flashes three times.
- (f) Set BAT 1 switch to OFF position. Verify no response from aircraft.

P. Cabin Door Seal

For maintenance practices pertinent to the cabin door seal, see Attach Fittings. (Refer to 53-40)

BAGGAGE DOOR

1. DESCRIPTION AND OPERATION

The baggage door is located on the left side of the fuselage, just aft of the wing. This door allows easy access to the baggage compartment. The baggage door contains a molded storage pocket for storing small lightweight items. The baggage door is hinged on the forward edge and latched on the rear edge. The door is locked from the outside with a key. The baggage compartment key will also open the cabin doors.

Serials 2303 & subs w/ Convenience Lighting: A magnetic proximity sensor installed on the fuselage above the baggage door is connected to the convenience system controller. When the cabin light switch is in the ON and AUTO positions, the baggage lights turn on when the baggage door is opened and turn off when the baggage door is closed.

For information regarding convenience lighting, see Lights. (Refer to 33-00)

2. MAINTENANCE PRACTICES

A. Baggage Door - *Serials 1005 thru 1422* (See Figure 52-301)

(1) Removal - Baggage Door

(a) Remove the inner panel from the baggage door by, removing fasteners and then pull outward on the panel.

(b) Remove screws and washers securing the door to the hinges and remove the door assembly and shims (if applicable).

(2) Installation - Baggage Door

(a) Place the baggage door and shims (if applicable) into position and loosely secure the door to the hinges with screws.

(b) Center the door inside the baggage door opening and secure screws and washers.

B. Baggage Door - *Serials 1423 & subs* (See Figure 52-301)

(1) Removal - Baggage Door

(a) Remove screw and washer securing lanyard to standoff on back of baggage door.

(b) Cut safety wire used to secure lower section of hinge on the baggage door to the hinge rod.

(c) Support baggage door and pull hinge rod downward to remove the hinge rod from the baggage door assembly.

(2) Installation - Baggage Door

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire, 0.032 Inch	MS20995	Any Source	Secure fasteners.
Safety Wire Pliers	M-84	Genair Ltd.	Tension safety wire.

(b) Place the baggage door into position and install the hinge rod upward between the door and fuselage at the hinge.

(c) Safety wire hinge rod to unused rivet hole on lower section of hinge attached to the baggage door.

(d) Install screw and washer securing lanyard to standoff on back of baggage door.

C. Baggage Door Lock

(1) Removal - Baggage Door Lock

(a) *Serials 1005 thru 1422:* Remove the screws securing the latch cover.

(b) Remove fasteners securing the lock to baggage door.

(c) Remove the lock from the baggage door.

(2) Installation - Baggage Door Lock

(a) Secure the lock to the baggage door with fasteners.

(b) *Serials 1005 thru 1422:* Secure the latch cover to the baggage door and fuselage.

D. Baggage Door Lanyard - *Serials 1423 & subs*

(1) Removal - Baggage Door Lanyard

(a) Remove screw and washer securing lanyard to standoff on back of baggage door.

(b) Remove screw, spacer, washer, and nut securing opposite end of lanyard to fuselage.

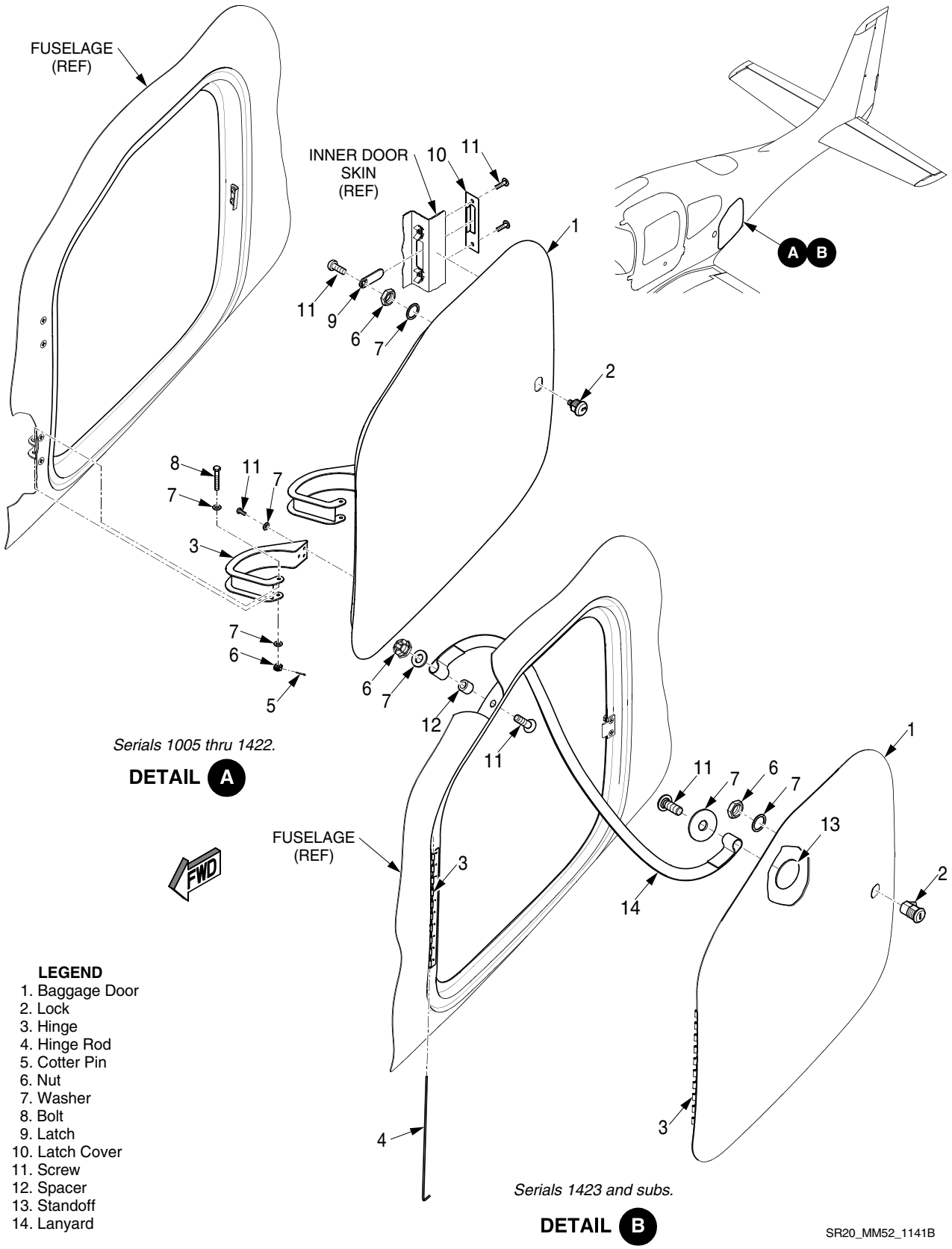
(2) Installation - Baggage Door Lanyard

(a) Secure lanyard to fuselage with screw, spacer, washer, and nut.

(b) Secure opposite end of lanyard to standoff on back of baggage door with screw and washer.

E. Baggage Door Seal

For maintenance practices pertinent to the baggage door seal, see Attach Fittings. (Refer to 53-40)



LEGEND

1. Baggage Door
2. Lock
3. Hinge
4. Hinge Rod
5. Cotter Pin
6. Nut
7. Washer
8. Bolt
9. Latch
10. Latch Cover
11. Screw
12. Spacer
13. Standoff
14. Lanyard

Figure 52-301
Baggage Door Installation

F. Baggage Door Proximity Sensor - *Serials 2303 & subs w/ Convenience Lighting* **(See Figure 52-302)**

(1) Removal - Baggage Door Proximity Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Heat Gun	-	Any Source	Remove adhesive.
Sandpaper	60-grit to 120-grit	Any source	Remove adhesive.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull CONV LIGHTS circuit breaker.

(d) Remove left rear headliner trim. (Refer to 25-10)

(e) Disconnect baggage door proximity sensor from wire harness.

CAUTION: Adhesive securing sensor to fuselage does not require a high degree of heat to disbond. Do not exceed 175 °F (79 °C).

Do not cut or gouge laminate when removing adhesive.

(f) Apply heat to adhesive bonding sensor to fuselage. As adhesive heats and softens, pull sensor free from fuselage. Discard sensor.

(g) Using sandpaper, remove adhesive from fuselage.

(h) Solvent clean with isopropyl alcohol to remove adhesive residue. (Refer to 20-30)

(2) Installation - Baggage Door Proximity Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Adhesive, Methacrylate, 2-Part	14165	Devcon	Install sensor.

(b) Solvent clean faying surface on fuselage with isopropyl alcohol. (Refer to 20-30)

(c) Mix adhesive in accordance with the manufacturer's instructions.

(d) Apply adhesive to faying surface in accordance with the manufacturer's instructions.

(e) Secure sensor to fuselage ensuring that pressure is applied uniformly.

(f) Carefully remove any excess adhesive from edges of sensor with cloth dampened with isopropyl alcohol.

(g) Cure bond in accordance with the manufacturer's instructions.

(h) Connect baggage door proximity sensor to wire harness.

(i) Reset CONV LIGHTS circuit breaker.

(j) Verify proper operation of sensor.

(k) Install install left rear headliner trim. (Refer to 25-10)

G. Baggage Door Magnet - *Serials 2303 & subs w/ Convenience Lighting* **(See Figure 52-302)**

(1) Removal - Baggage Door Magnet

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Heat Gun	-	Any Source	Remove adhesive.
Sandpaper	60-grit to 120-grit	Any source	Remove adhesive.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Remove baggage door interior trim. (Refer to 25-10)

CAUTION: Adhesive securing magnet to baggage door interior trim does not require a high degree of heat to disbond. Do not exceed 175 °F (79 °C).

Do not cut or gouge trim when removing adhesive.

(d) Apply heat to adhesive bonding magnet to trim. As adhesive heats and softens, pull magnet free from trim. Discard magnet.

(e) Using sandpaper, remove adhesive from trim.

(f) Solvent clean with isopropyl alcohol to remove adhesive residue. (Refer to 20-30)

(2) Installation - Baggage Door Magnet

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Adhesive, Methacrylate, 2-Part	14165	Devcon	Install sensor.

(b) Solvent clean faying surface on baggage door interior trim with isopropyl alcohol. (Refer to 20-30)

(c) Mix adhesive in accordance with the manufacturer's instructions.

(d) Apply adhesive to faying surface in accordance with the manufacturer's instructions.

(e) Secure magnet to trim ensuring that pressure is applied uniformly.

(f) Carefully remove any excess adhesive from edges of magnet with cloth dampened with isopropyl alcohol.

(g) Cure bond in accordance with the manufacturer's instructions.

(h) Install baggage door interior trim. (Refer to 25-10)

(i) Verify proper operation of baggage door proximity sensor.

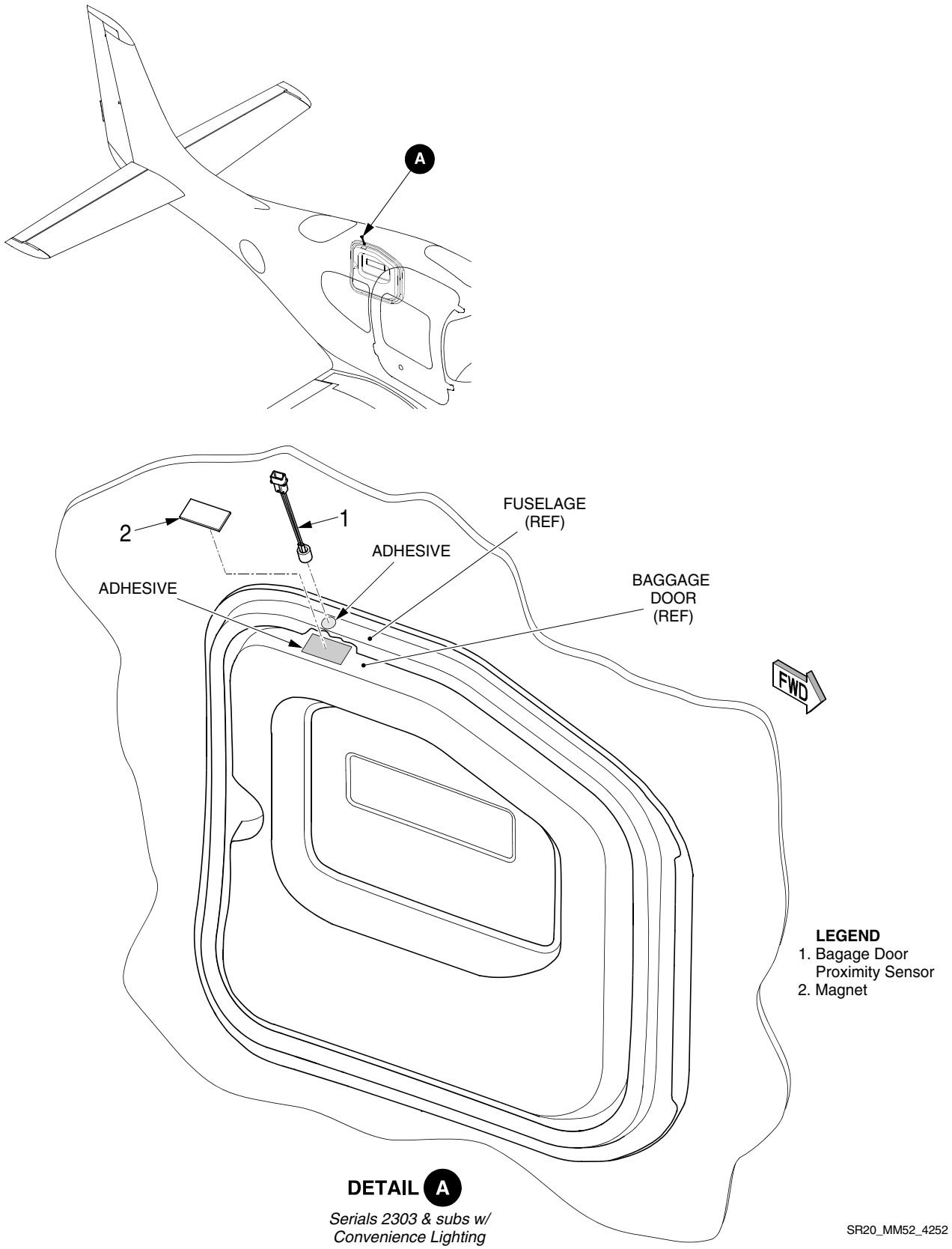


Figure 52-302
Baggage Door Proximity Sensor and Magnet - Serials 2303 & subs w/ Convenience Lighting

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CHAPTER

53

FUSELAGE

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All

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53-50	10	19 SEP 2017
53-50	11	19 SEP 2017
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FUSELAGE

1. GENERAL

The SR20 fuselage is a semi monocoque structure made primarily of composite materials. The fuselage structure is comprised of two halves fabricated from fiberglass laminate bonded along a centerline lap-joint. The vertical stabilizer, door frames, window frames, and recess channel for the forward parachute risers, are all integral to the fuselage structure.

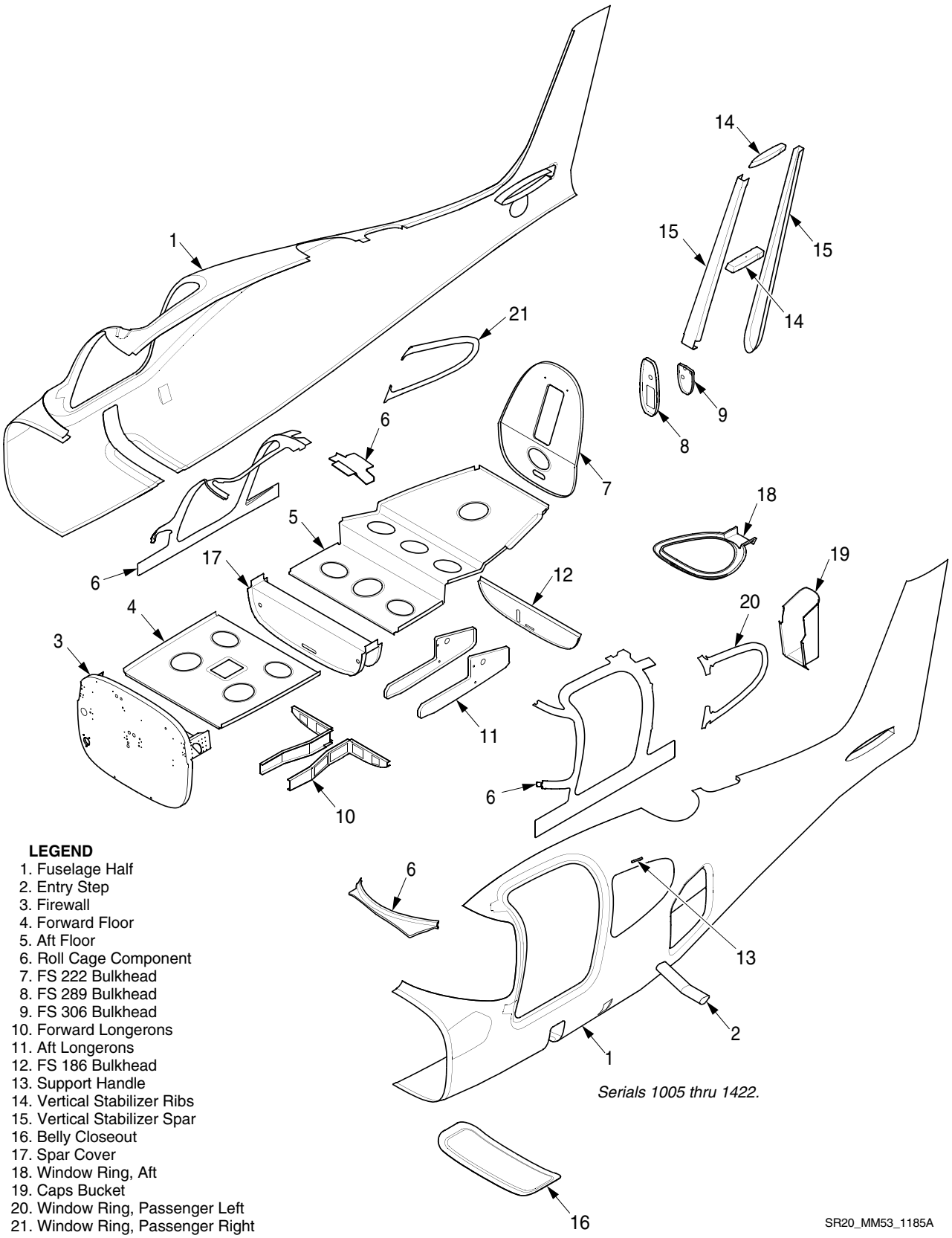
Serials 1005 thru 1422: The cabin area is limited by the forward firewall at FS 100, and the cargo compartment bulkhead at FS 222. A composite roll cage bonded to the fuselage structure provides protection for the cabin occupants. (See Figure 53-001)

Serials 1423 & subs: The cabin area is limited by the forward beveled firewall at FS 100, and the cargo compartment bulkhead at FS 222. A cast core roll cage provides protection for the cabin occupants. (See Figure 53-001)

The forward and aft fuselage floors are constructed of composite sandwich panels with access to underfloor components.

Serials 1423 & subs: The forward longerons are straightened to provide additional strength and stability to the forward floor and the lower engine mount attachment.

The fuselage skin is composed primarily of fiberglass and foam core with some areas fabricated of solid laminate (no foam) construction. Cockpit seats are secured to the forward floor through the use of aluminum T-tracks mounted to the wing spar box.



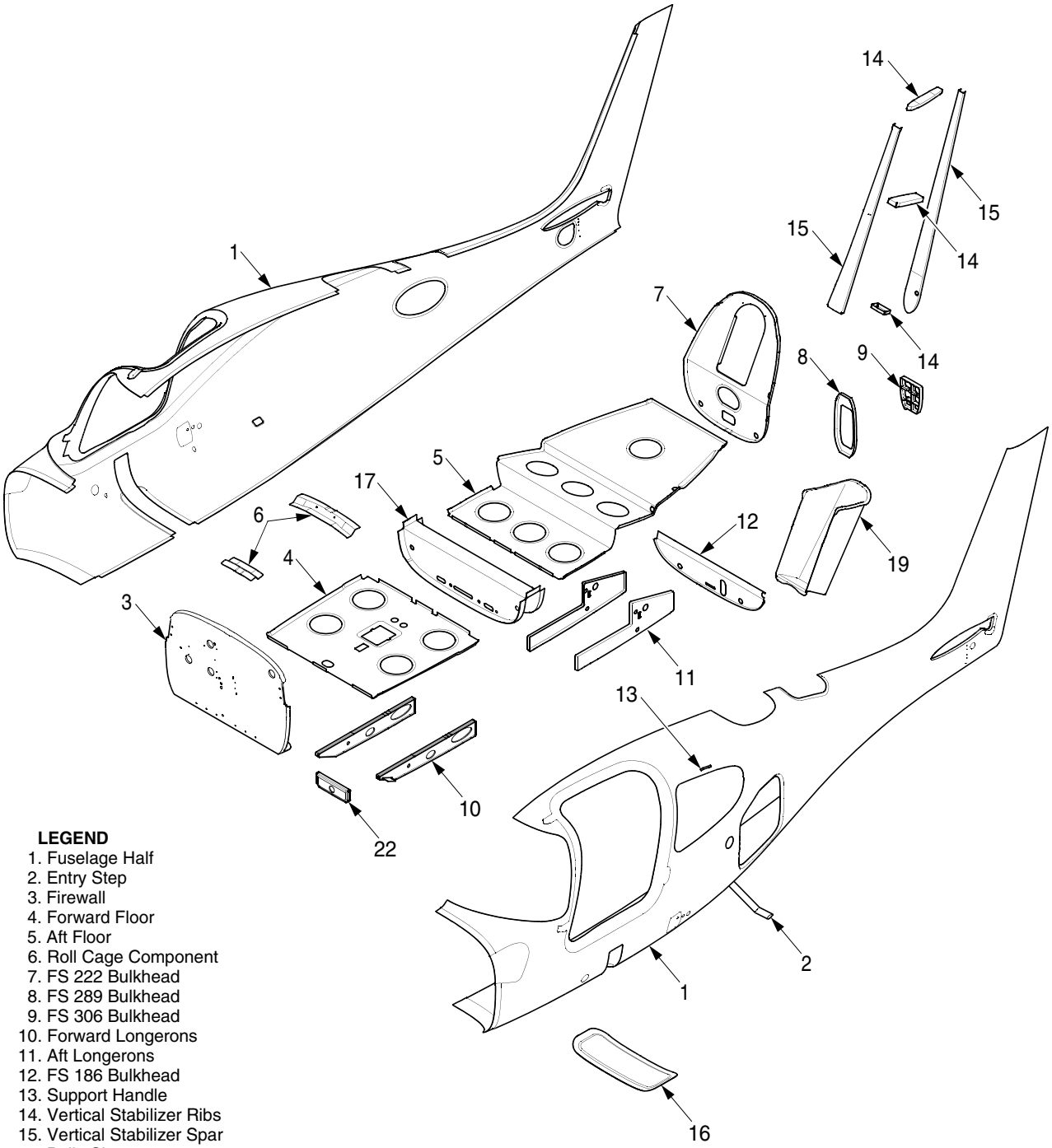
LEGEND

1. Fuselage Half
2. Entry Step
3. Firewall
4. Forward Floor
5. Aft Floor
6. Roll Cage Component
7. FS 222 Bulkhead
8. FS 289 Bulkhead
9. FS 306 Bulkhead
10. Forward Longerons
11. Aft Longerons
12. FS 186 Bulkhead
13. Support Handle
14. Vertical Stabilizer Ribs
15. Vertical Stabilizer Spar
16. Belly Closeout
17. Spar Cover
18. Window Ring, Aft
19. Caps Bucket
20. Window Ring, Passenger Left
21. Window Ring, Passenger Right

Serials 1005 thru 1422.

Figure 53-001
Fuselage Components - Serials 1005 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1422



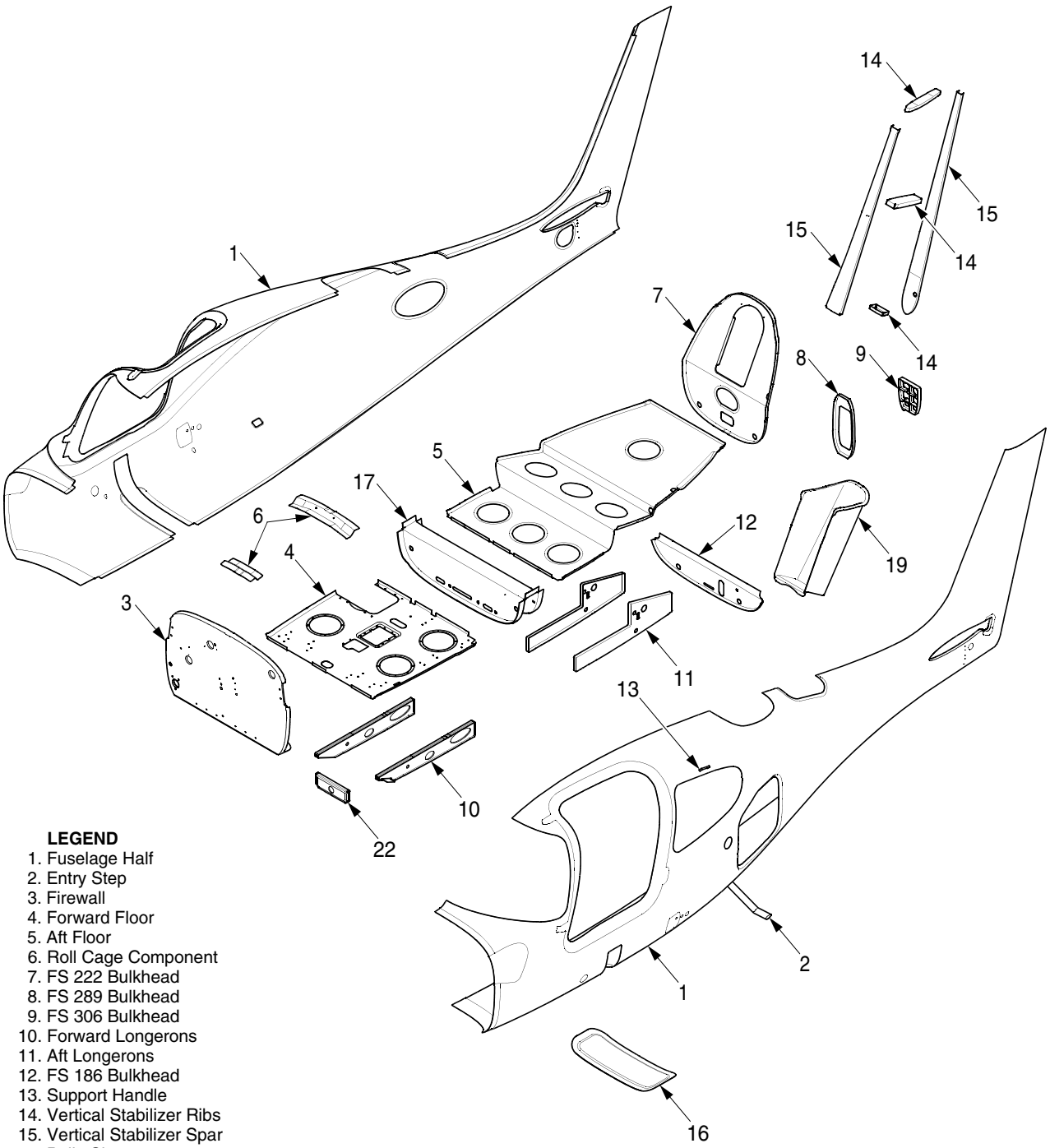
LEGEND

1. Fuselage Half
2. Entry Step
3. Firewall
4. Forward Floor
5. Aft Floor
6. Roll Cage Component
7. FS 222 Bulkhead
8. FS 289 Bulkhead
9. FS 306 Bulkhead
10. Forward Longerons
11. Aft Longerons
12. FS 186 Bulkhead
13. Support Handle
14. Vertical Stabilizer Ribs
15. Vertical Stabilizer Spar
16. Belly Closeout
17. Spar Cover
19. Caps Bucket
22. Forward Intercostal

Serials 1423 thru 1632, 1634 thru 1638.

SR20_MM53_1819A

Figure 53-001
Fuselage Components - Serials 1423 thru 1632, 1634 thru 1638 (Sheet 2 of 3)



LEGEND

1. Fuselage Half
2. Entry Step
3. Firewall
4. Forward Floor
5. Aft Floor
6. Roll Cage Component
7. FS 222 Bulkhead
8. FS 289 Bulkhead
9. FS 306 Bulkhead
10. Forward Longerons
11. Aft Longerons
12. FS 186 Bulkhead
13. Support Handle
14. Vertical Stabilizer Ribs
15. Vertical Stabilizer Spar
16. Belly Closeout
17. Spar Cover
19. Caps Bucket
22. Forward Intercostal

Serials 1633, 1639 & subs.

SR20_MM53_2300

Figure 53-001
Fuselage Components - Serials 1633, 1639 and subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 1633, 1639 and subs

MAIN FRAME

1. DESCRIPTION

This section describes those structural components which make up the main frame including vertical stabilizer, firewall, bulkheads, spar cover, and roll cage.

A. Firewall

The firewall is designed to separate the engine compartment from the rest of the fuselage and support various airplane components on both the forward and aft sides. The firewall, constructed of a fiberglass composite sandwich, includes metal fittings for supporting the engine mount, and incorporates several hardpoints for support of various engine components. In addition the firewall assembly also supports the compression tube that is used to absorb CAPS deployment loads. Fire protection is provided by a layer of aluminum foil, FiberFrax paper, and a stainless steel sheet mounted on the bulkhead's forward side.

Serials 1423 & subs: The lower firewall is beveled aft about 20° from the bottom of the floor to improve crashworthiness.

B. FS 222 Bulkhead

The FS 222 bulkhead is constructed of fiberglass composite sandwich and solid laminate. The upper portion of the bulkhead is reinforced with additional fiberglass to support reaction loads during CAPS deployment and to support passenger seat shoulder harness attachments. The bulkhead also contains hardpoints which support cargo attachment loads.

C. FS 289 Bulkhead

The bulkhead at FS 289 is fabricated from fiberglass laminate. This bulkhead provides buckling support to the empennage.

D. FS 306 Bulkhead

The FS 306 bulkhead, located below the horizontal stabilizer, is fabricated from either fiberglass laminate *(Serials 1005 thru 1300, 1302 thru 1306)* or machined aluminum *(Serials 1301, 1307 & subs)* to carry loads generated by the attached rudder/elevator actuation system.

E. Spar Cover

The spar cover is comprised of solid laminate and supports wing reaction loads. In addition, seat track attachment channels are mounted to the front and rear face of the spar box.

F. Roll Cage

The roll cage is composed primarily of bi-directional fiberglass but also contains unidirectional fiberglass to add bending strength.

Serials 1005 thru 1422: The main structural components of the roll cage are side longerons, which support in-flight bending loads, and hoop sections surrounding the right and left doors.

Serials 1423 & subs: The main structural components of the roll cage are incorporated into the fuselage skin by using a cast core to create the desired shape in the laminate.

The remaining components provide local stiffening to cutout regions of the fuselage.

2. MAINTENANCE PRACTICES

A. Repair - Vertical Spar Bond (See Figure 53-101)

(1) Repair - Vertical Spar Bond

In the event of a tail strike, a visual inspection of the airframe and the components involved must be accomplished to determine the type and extent of damage. The Unscheduled Maintenance Check for Hard/Overweight Landings should be completed. (Refer to 05-50)

The Vertical Spar Bond Repair may be used to repair disbonding between lower vertical spar and empennage skin. Bond depressions are filled with filler paste to ensure a smooth layup transition. Glass fabric repair plies are then wet-layed over area where disbonding has occurred.

(a) Determine type and extent of damage. If necessary, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(b) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Serials 1005 thru 1422: Tin Plated Copper Tape, 4 Inch	8271-0400-76	Instrument Specialties Euless,TX 76040 817-267-2651	General repair.
Serials 1423 & subs: Expanded Metal Mesh (EMM)	(Refer to 51-30)	(Refer to 51-30)	Lightning protection.
Tie Down Bracket	20111-003	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down eye bolt attachment.
Tie Down Eye Bolt	12403-001	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down airplane.
Nut	50831-375	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down eye bolt attachment.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Orbital Sander	39825A12	Any Source	Prepare repair surface.
Angle Grinder	80-grit	Any Source	Remove laminate from vertical spar.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Protect lay-up surface.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Makes smooth and contaminate free repair surface.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair composite structures.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Bond plies over puncture.
Sandpaper	120-grit or finer	Any Source	Paint and primer removal.

Description	P/N or Spec.	Supplier	Purpose
Sandpaper	60 to 80-grit	Any Source	Abrade bonding surfaces.
Aerosil	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Sil-Cell	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Diamond Coated Hole Saw	0.75 inch (19.05 mm)	Any Source	Drill aft tie down installation hole.

(c) Remove rudder. (Refer to 55-40)

(d) Remove lower top and bottom vertical hinge. (Refer to 55-50)

(e) Remove aft tie down. (Refer to 53-20)

(f) Remove aft tie down bracket. (Refer to 53-20)

(g) *Serials 1005 thru 1422:* Remove copper tape from vertical spar.

CAUTION: Never use a grinder for removal of outer surface coats. A grinder will gouge the surface creating more damage. Chemical strippers should not be used as they may become trapped, damage the laminate, or leave a residue.

Note: Multi-action orbital type sanders or simple hand-sanding are the preferred methods of paint removal. Fine-grit paper (120-grit or finer) should be selected to minimize the potential for accidental damage.

(h) Remove paint finish from repair area. (Refer to 51-20)

(i) *Serials 1423 & subs:* Remove Expanded Metal Mesh (EMM) lightning protection from repair area. (Refer to 51-20)

Note: *Serials 1423 & subs:* Remove lip of aft vertical spar to tangent at least 0.5 inch (12.7 mm) beyond damaged area.

(j) *Serials 1423 & subs:* Carefully trim away lip of aft vertical spar using a small angle grinder with 80-grit or similar disk to remove the laminate from the fuselage skin.

(k) Solvent clean with isopropyl alcohol. (Refer to 20-30)

(l) Mix MGS L418-based filler paste. (Refer to 51-30)

Note: At junction between vertical spar and fuselage skin, ensure filler paste does not exceed maximum radius of 0.5 inch (12.7 mm).

(m) Using a clean spatula or wooden applicator, fill bond depressions with filler paste to ensure smooth layup transition.

Note: Ensure plies extend at least 1.0 inch (2.54 cm) beyond dis-bond.

Note: Ensure each ply overlaps the previous ply by at least 0.5 inch (12.7 mm).

(n) Cut three glass-fiber repair plies at ±45°. (Refer to 51-20)

(o) Mix MGS L418-based structural resin. (Refer to 51-30)

(p) Layup glass fabric repair plies. (Refer to 51-20)

(q) Cure repair plies. (Refer to 51-20)

(r) *Serials 1423 & subs:* Install Expanded Metal Mesh (EMM) lightning protection. (Refer to 51-20)

(s) Match drill hinge installation holes covered by glass fabric repair layup.

(t) Match drill aft tie down installation hole covered by glass fabric repair layup.

(u) Using 0.75 inch (19.05 mm) hole saw, cut aft tie down installation hole through skin and centered on BL0.

(v) *Serials 1423 thru 1472:* From aft tangent of tie down installation hole to aft edge of empennage skin, cut a 0.18 inch (4.57 mm) wide slot centered on BL0.

(w) Prepare the surface for primer and paint. (Refer to 51-20)

(x) Paint repair area. (Refer to 51-20)

(y) *Serials 1005 thru 1422:* Apply copper tape to vertical spar.

Note: Increase bolt length as required to ensure correct grip requirements. Threads not allowed in load bearing structure.

Note: It is permissible to remove up to 0.063 inch (1.600 mm) at a 45° angle to improve tie down bracket fit.

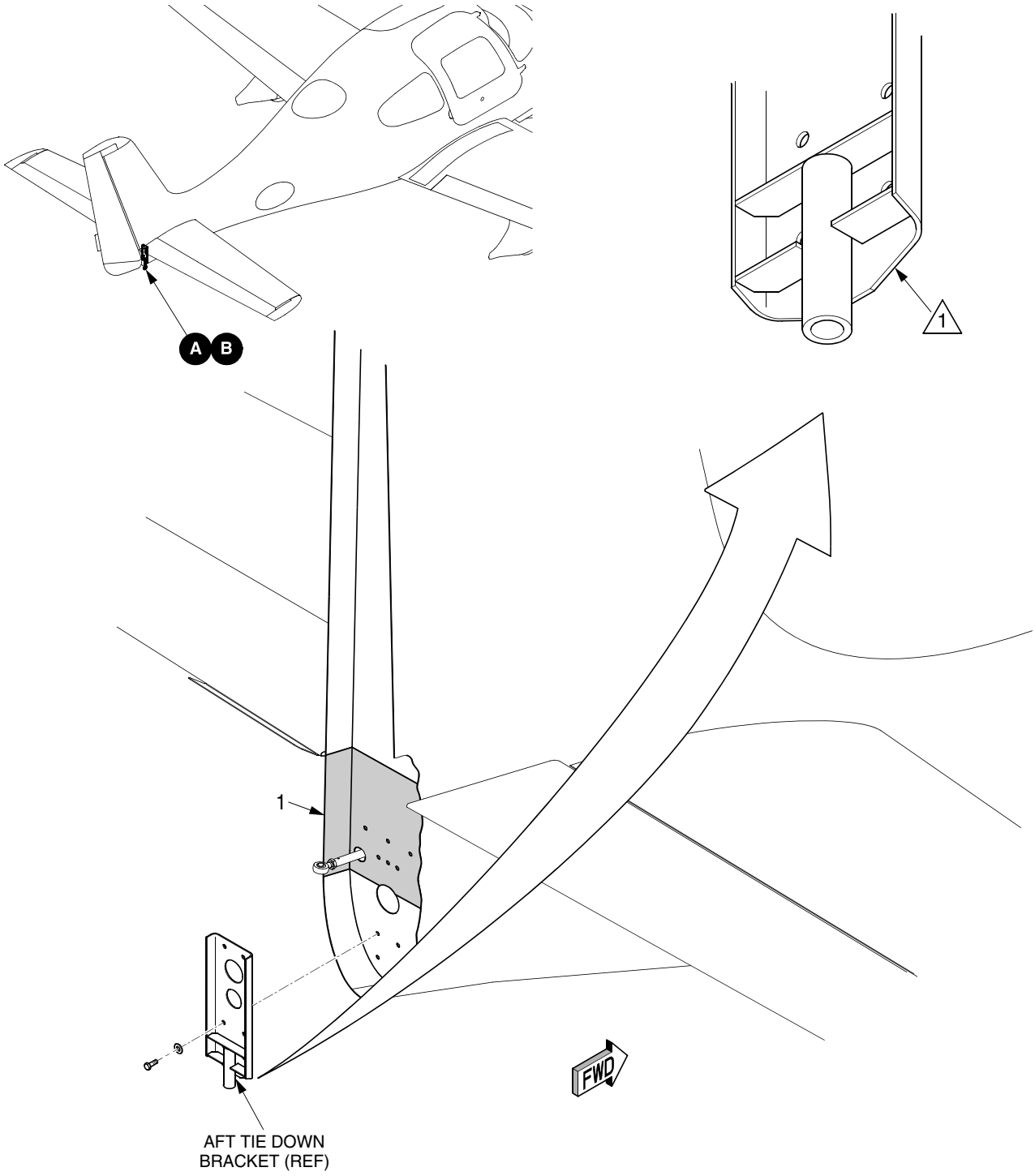
(z) Install aft tie down bracket. (Refer to 53-20)

(aa) Install aft tie down. (Refer to 53-20)

(ab) *Serials 1423 & subs:* To ensure electrical contact, sand or burnish EMM where sides of upper vertical hinge contact the vertical spar. (Refer to 51-20)

(ac) Install lower top and bottom vertical hinge. (Refer to 55-50)

(ad) Install rudder. (Refer to 55-40)



LEGEND
1. Copper Tape

NOTE

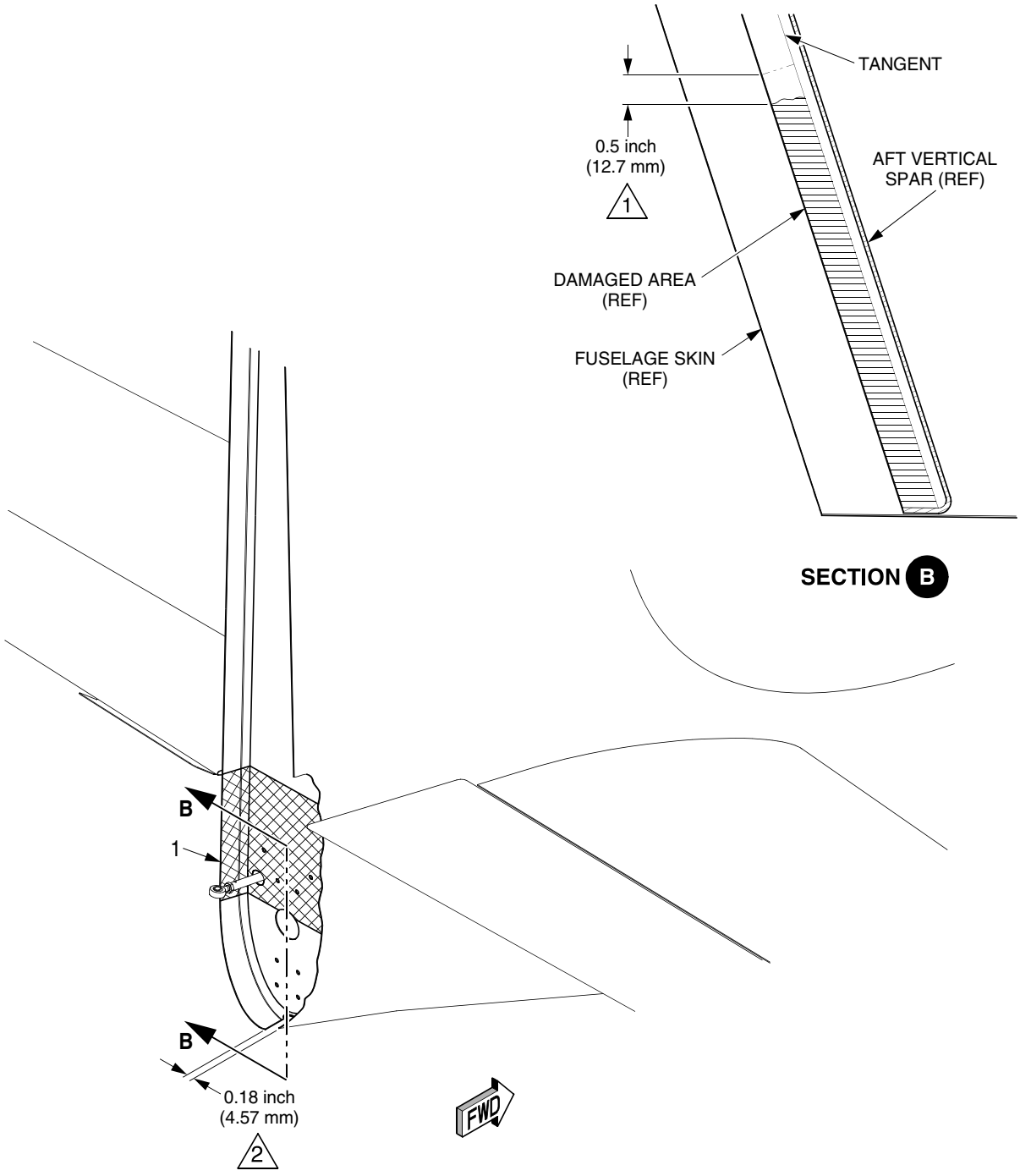
1 It is permissible to remove up to 0.063 inch (1.600 mm) at a 45° angle to improve tie down bracket fit.

DETAIL A

Serials 1005 thru 1422.

SR20_MM53_1797D

Figure 53-101
Vertical Spar Bond Repair - Serials 1005 thru 1422 (Sheet 1 of 4)



NOTE

1. Remove lip of aft vertical spar to tangent at least 0.5 inch (12.7 mm) beyond damaged area.

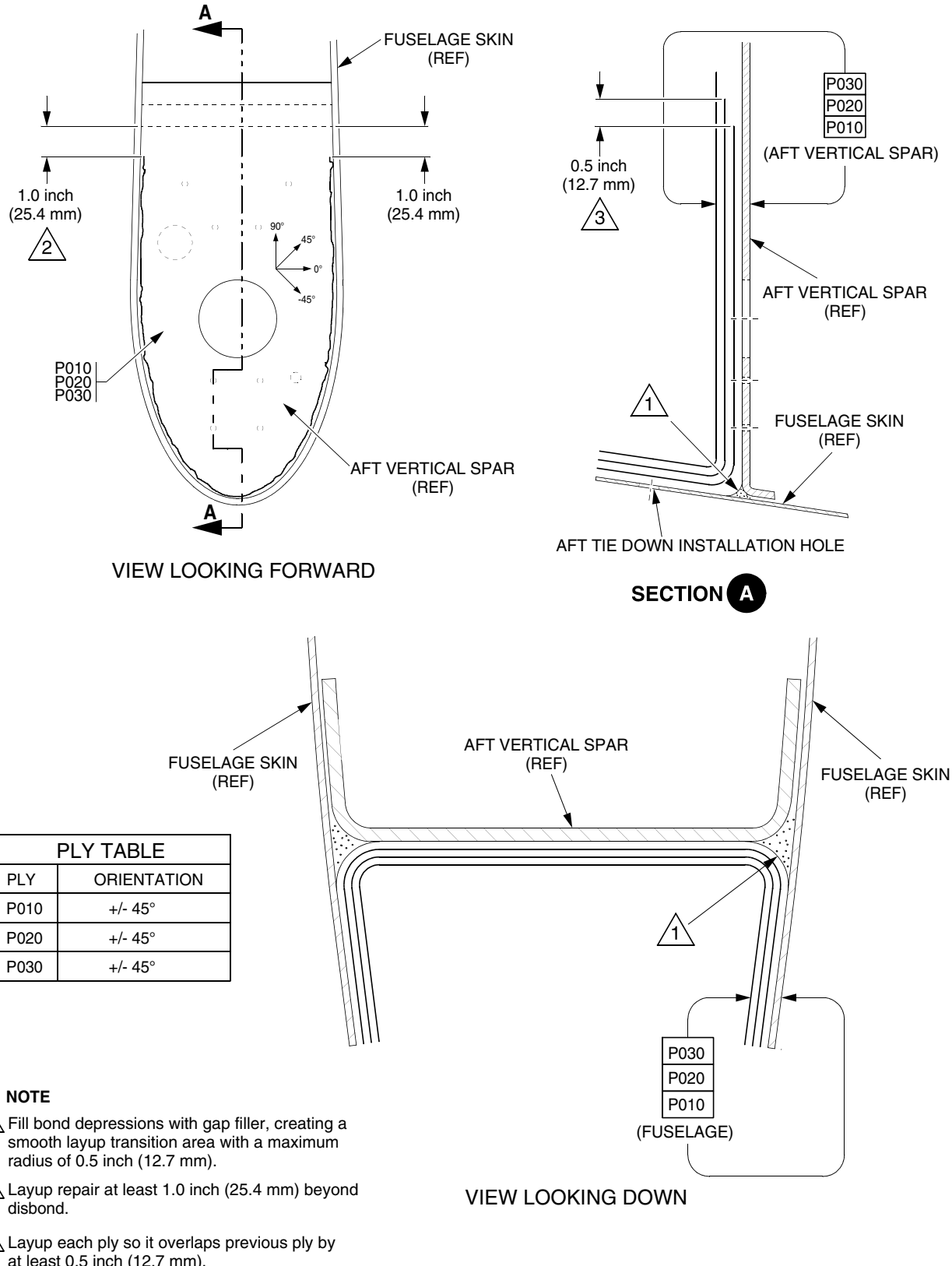
2. *Serials 0821 thru 1153:* From aft tangent of tie down installation hole to aft edge of empennage skin, cut a 0.18 inch (4.57 mm) wide slot centered on BL0.

LEGEND
1. EMM

DETAIL B

SR20_MM53_1770C

Figure 53-101
Vertical Spar Bond Repair - Serials 1423 & subs (Sheet 2 of 4)



PLY TABLE	
PLY	ORIENTATION
P010	+/- 45°
P020	+/- 45°
P030	+/- 45°

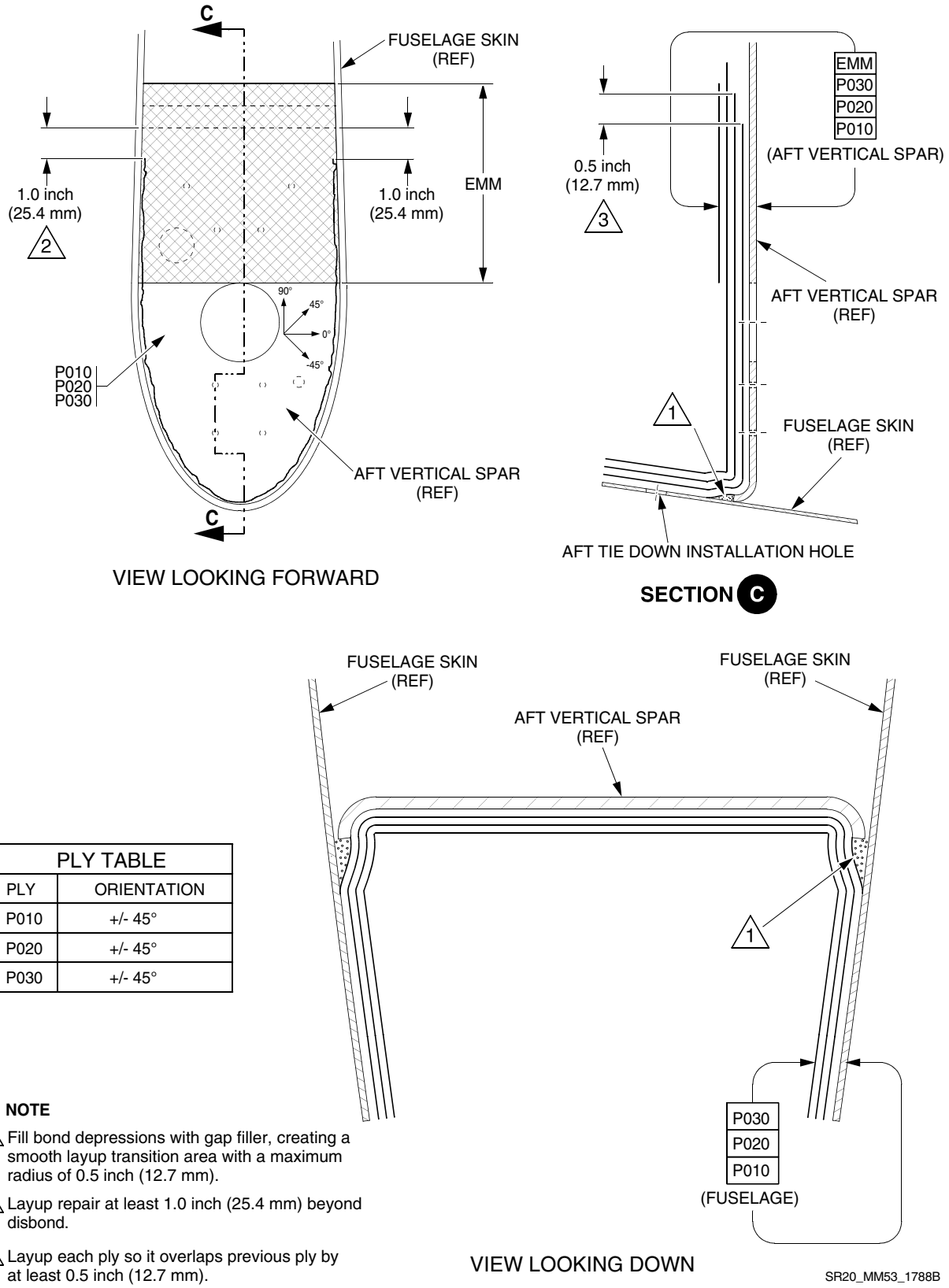
NOTE

1. Fill bond depressions with gap filler, creating a smooth layup transition area with a maximum radius of 0.5 inch (12.7 mm).
2. Layup repair at least 1.0 inch (25.4 mm) beyond disbond.
3. Layup each ply so it overlaps previous ply by at least 0.5 inch (12.7 mm).

Serials 1005 thru 1422.

SR20_MM53_1530C

Figure 53-101
Vertical Spar Bond Repair - Serials 1005 thru 1422 (Sheet 3 of 4)



PLY TABLE	
PLY	ORIENTATION
P010	+/- 45°
P020	+/- 45°
P030	+/- 45°

NOTE

1. Fill bond depressions with gap filler, creating a smooth layup transition area with a maximum radius of 0.5 inch (12.7 mm).
2. Layup repair at least 1.0 inch (25.4 mm) beyond disbond.
3. Layup each ply so it overlaps previous ply by at least 0.5 inch (12.7 mm).

Figure 53-101
Vertical Spar Bond Repair - Serials 1423 & subs (Sheet 4 of 4)

EFFECTIVITY:
Serials 1423 & subs

B. Repair - Vertical Spar Patch - *Serials 1423 & subs* (See Figure 53-102)

(1) Repair - Vertical Spar Patch - *Serials 1423 & subs*

The Vertical Spar Patch Repair may be used to replace a portion of the lower vertical spar damaged by the tie down eye bolt pulling back through empennage skin. The damaged area of the vertical spar is cut away and removed. A repair patch is created from a replacement vertical spar and bonded over the damaged area. Glass fabric repair plies are then wet-layed over repair patch area.

CAUTION: If damage to vertical spar extends above inspection hole, the airplane is not repairable and Cirrus Design must be contacted for disposition. (Refer to AMM-Intro-)

Note: If damage has also occurred to outer fuselage skin aft of the lower vertical spar, perform Repair - Fuselage Skin when completing the Vertical Spar Patch Repair. (Refer to 53-10)

(a) Determine type and extent of damage. If necessary, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(b) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Vertical Spar	20083-003 *or* 20083-004	Cirrus Design Duluth, MN 55811 218-727-2737	Create repair patch for damaged portion of vertical spar.
Backing Plate	20112-001	Cirrus Design Duluth, MN 55811 218-727-2737	Bridge damage cutout area in the vertical spar.
Lower Vertical Hinge	20104-001	Cirrus Design Duluth, MN 55811 218-727-2737	Rudder attachment.
Tie Down Bracket	20111-003	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down eye bolt attachment.
Tie Down Eye Bolt	12403-001	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down airplane.
Nut	50831-375	Cirrus Design Duluth, MN 55811 218-727-2737	Tie down eye bolt attachment.
Expanded Metal Mesh (EMM)	(Refer to 51-30)	(Refer to 51-30)	Lightning protection.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Orbital Sander	39825A12	Any Source	Prepare repair surface.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Protect lay-up surface.

Description	P/N or Spec.	Supplier	Purpose
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Makes smooth and contaminate free repair surface.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair composite structures.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Bond plies over puncture.
Sandpaper	120-grit or finer	Any Source	Paint and primer removal.
Sandpaper	60 to 80-grit	Any Source	Abrade bonding surfaces.
Aerosil	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Sil-Cell	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Angle Grinder	80-grit	Any Source	Remove laminate from aft vertical spar.
Diamond Coated Hole Saw	0.75 inch (19.05 mm)	Any Source	Drill aft tie down installation hole.

(c) Remove rudder. (Refer to 55-40)

(d) Remove lower top and bottom vertical hinge. (Refer to 55-50)

(e) Remove aft tie down. (Refer to 53-20)

(f) Remove aft tie down bracket. (Refer to 53-20)

CAUTION: Never use a grinder for removal of outer surface coats. A grinder will gouge the surface creating more damage. Chemical strippers should not be used as they may become trapped, damage the laminate, or leave a residue.

Note: Multi-action orbital type sanders or simple hand-sanding are the preferred methods of paint removal. Fine-grit paper (120-grit or finer) should be selected to minimize the potential for accidental damage.

(g) Remove paint finish from repair area. (Refer to 51-20)

(h) Remove Expanded Metal Mesh (EMM) lightning protection from repair area. (Refer to 51-20)

(i) Use rivets to attach tiedown backing plate to vertical spar repair patch. (See Figure 53-102)

(j) Remove damaged portion of lower vertical spar. (See Figure 53-102)

Note: A new tiedown backing plate will be attached to the vertical spar repair patch. The damage cutout area in the vertical spar must be large enough to allow insertion of the tiedown backing plate.

1 Use tiedown backing plate to determine size and shape of vertical spar damage cut-out area.

2 Ensure minimum radius of 0.5 inch (1.3 cm) at all corners of damage cutout area.

3 Maintain maximum amount of bonding surface possible between damage cutout area and vertical spar radius tangent.

4 Carefully cut and remove damaged portion of lower vertical spar.

(k) If necessary, use sand paper to remove any delaminated, loose, or damaged plies on the vertical spar. (Refer to 51-20)

(l) Prepare vertical spar repair patch. (See Figure 53-102)

1 From lower radius of replacement vertical spar, measure 7.4 inches (18.8 cm) up vertical spar and mark horizontal line across face of vertical spar.

2 Cut vertical spar at mark to create repair patch.

3 Remove flange from repair patch by cutting along tangent line +0.0, -0.1 inch (+0.0, -2.5 mm) on all sides.

4 Verify patch does not interfere with upper vertical hinge. If necessary, trim top edge of patch.

5 Bevel outer edges of patch to approximately 60 degrees.

(m) Bond repair patch into position.

1 Solvent clean with isopropyl alcohol. (Refer to 20-30)

2 Mix MGS L418-based structural adhesive. (Refer to 51-30)

3 Using a clean spatula or wooden applicator, apply adhesive to repair area to obtain bond thickness of 0.005 to 0.060 inch (0.13 to 1.50 mm).

CAUTION: Movement during cure may cause bond voids. Do not move or pull repair patch away from the vertical spar after squish-out is achieved or voids will form.

4 Place repair patch into position by aligning lower vertical hinge holes in patch with lower vertical hinge holes in existing spar. Secure with fixturing as required to prevent movement during cure.

5 Cure repair patch bond. (Refer to 51-20)

(n) Mix MGS L418-based filler paste. (Refer to 51-30)

Note: Ensure filler paste does not exceed maximum radius of 0.5 inch (12.7 mm).

(o) Using a clean spatula or wooden applicator, apply filler paste to corner between repair patch and vertical spar flanges.

(p) Cut three glass-fiber repair plies based on the following criteria:

1 Ply orientation is ±45°. (Refer to 51-20)

2 Plies butt to upper edge of repair patch and extend aft to trailing edge of vertical spar on all sides except for bottom.

3 At bottom, plies extend to trailing edge of fuselage skin 1.0 inch (2.54 cm) minimum on either side of BL0.

(q) Mix MGS L418-based structural resin. (Refer to 51-30)

(r) Layup glass fabric repair plies. (Refer to 51-20)

(s) Cure repair plies. (Refer to 51-20)

(t) Install Expanded Metal Mesh (EMM) lightning protection over repair area. (Refer to 51-20)

CAUTION: Use caution when drilling tie down bracket installation holes to avoid damage to backing plate nutplates on back of patch.

(u) Match drill tie down bracket installation holes covered by glass fabric repair layup.

(v) Match drill hinge installation holes covered by glass fabric repair layup.

(w) Match drill pass-through hole covered by glass fabric repair layup.

(x) Match drill inspection hole covered by glass fabric repair layup.

Note: Increase bolt length as required to ensure correct grip requirements. Threads not allowed in load bearing structure.

(y) Install aft tie down bracket. (Refer to 53-20)

(z) To ensure electrical contact, sand or burnish EMM where sides of upper vertical hinge contact the vertical spar. (Refer to 51-20)

(aa) Install lower top and bottom vertical hinge. (Refer to 55-50)

(ab) Match drill rudder installation hole in lower vertical hinge.

(ac) Trim profile of lower vertical hinge to profile of upper vertical hinge to allow for proper rudder clearance.

(ad) Using 0.75 inch (19.05 mm) hole saw, cut aft tie down installation hole through skin and centered on BL0.

(ae) *Serials 1423 thru 1472:* From aft tangent of tie down installation hole to aft edge of empennage skin, cut a 0.18 inch (4.57 mm) wide slot centered on BL0.

(af) Prepare the surface for primer and paint. (Refer to 51-20)

(ag) Paint repair area. (Refer to 51-20)

(ah) Install aft tie down. (Refer to 53-20)

(ai) Install rudder. (Refer to 55-40)

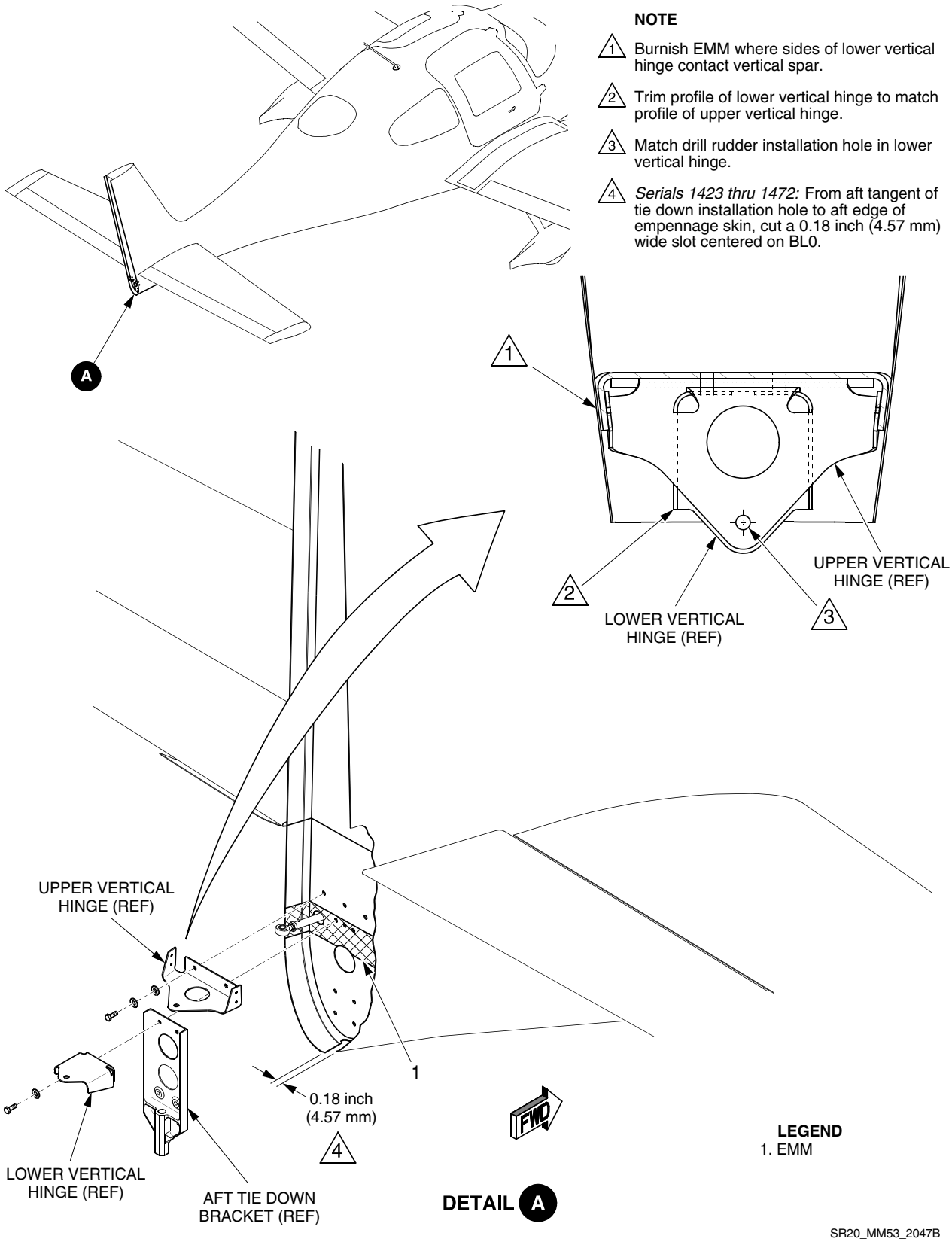
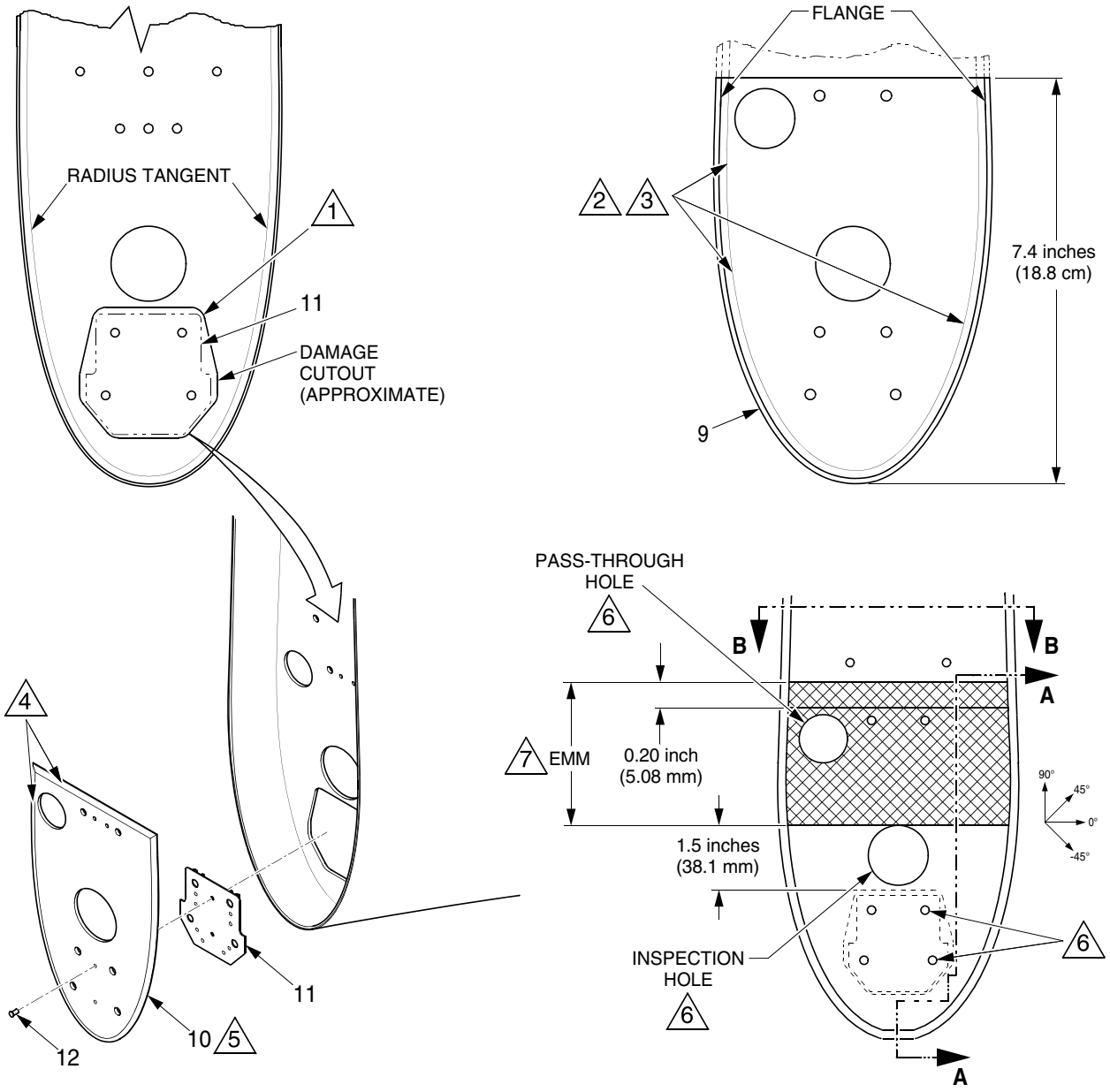


Figure 53-102
Vertical Spar Patch Repair - Serials 1423 & subs (Sheet 1 of 3)



VIEW LOOKING FORWARD

NOTE

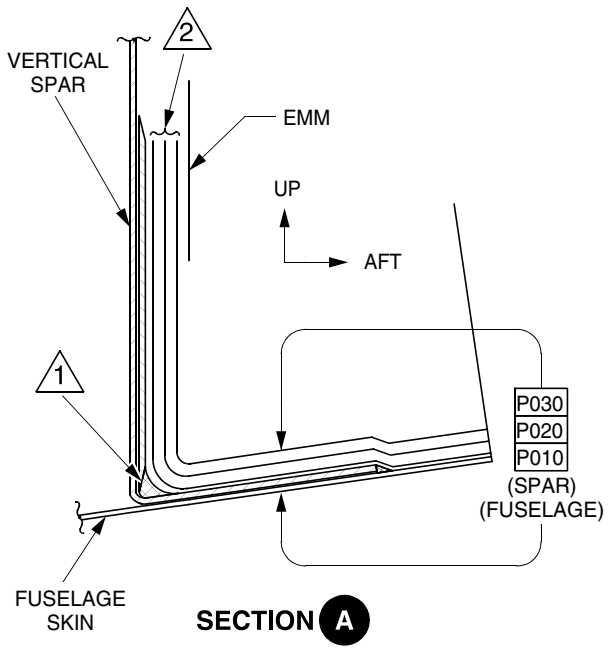
1. Remove damaged portion of lower vertical spar. Ensure minimum radius of 0.5 inch (1.3 cm) at all corners of damage cutout area.
2. Cut repair patch from new vertical spar.
3. Remove flange from repair patch by cutting along tangent line +0.0, -0.10 inch (+0.0, -2.54 mm) on all sides.
4. Bevel repair patch edges to 60 degrees.
5. Bond repair patch to vertical spar.
6. After repair plies have cured, match drill lower vertical hinge, inspection, and pass-through holes.
7. Apply EMM from upper tangent of inspection hole to 0.20 inch (5.08 mm) beyond upper edge of repair patch.

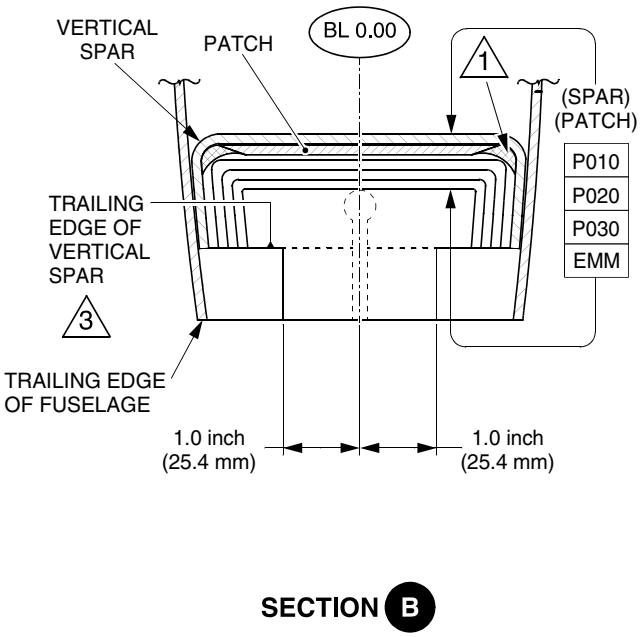
LEGEND

9. Vertical Spar
10. Repair Patch
11. Tiedown Backing Plate
12. Rivet

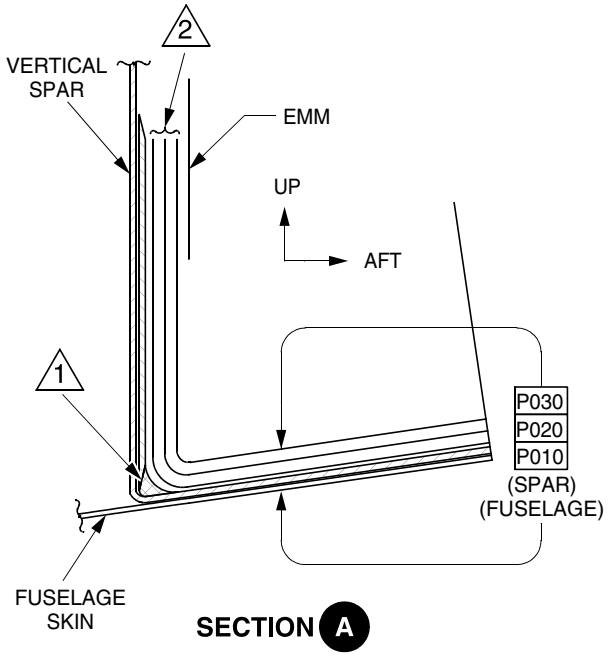
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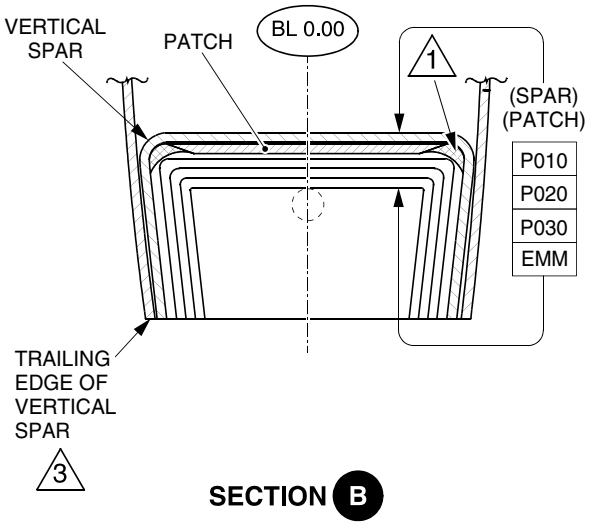
Figure 53-102
Vertical Spar Patch Repair - Serials 1423 & subs (Sheet 2 of 3)





Serials 1423 thru 1472.





Serials 1473 & subs.

NOTE

1. Fill bond depressions with gap filler, creating a smooth layup transition area with a maximun radius of 0.5 inch (12.7 mm).
2. Extend plies to top edge of repair patch.
3. Extend plies to trailing edge of vertical spar.

PLY TABLE	
PLY	ORIENTATION
P010	± 45°
P020	± 45°
P030	± 45°

SR20_MM53_2049A

Figure 53-102
Vertical Spar Patch Repair - Serials 1423 & subs (Sheet 3 of 3)

C. Repair - Fuselage Skin (See Figure 53-103)

(1) Repair - Fuselage Skin

The Fuselage Skin Repair may be used to replace a damaged portion of the outer fuselage skin aft of the lower vertical spar. Glass fabric repair plies are wet-layed over area where disbonding has occurred. Any other damage to the empennage skin is not field repairable and Cirrus Design must be contacted for disposition. (Refer to AMM-Intro-)

(a) Determine type and extent of damage. If necessary, contact Cirrus Design for disposition.

(b) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Serials 1423 & subs: Expanded Metal Mesh (EMM)	(Refer to 51-30)	(Refer to 51-30)	Lightning protection.
Tie Down Bracket	20111-003	Cirrus Design	Tie down eye bolt attachment.
Tie Down Eye Bolt	12403-001	Cirrus Design	Tie down airplane.
Nut	50831-375	Cirrus Design	Tie down eye bolt attachment.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Orbital Sander	39825A12	Any Source	Prepare repair surface.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Protect lay-up surface.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Makes smooth and contaminate free repair surface.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair composite structures.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Bond plies over puncture.
Sandpaper	120-grit or finer	Any Source	Paint and primer removal.
Sandpaper	60 to 80-grit	Any Source	Abrade bonding surfaces.
Aerosil	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Sil-Cell	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Diamond Coated Hole Saw	0.75 inch (19.05 mm)	Any Source	Drill aft tie down installation hole.

(c) Remove rudder. (Refer to 55-40)

(d) Remove lower top and bottom vertical hinge. (Refer to 55-50)

(e) Remove aft tie down. (Refer to 53-20)

(f) Remove aft tie down bracket. (Refer to 53-20)

CAUTION: Never use a grinder for removal of outer surface coats. A grinder will gouge the surface creating more damage. Chemical strippers should not be used as they may become trapped, damage the laminate, or leave a residue.

Note: Multi-action orbital type sanders or simple hand-sanding are the preferred methods of paint removal. Fine-grit paper (120-grit or finer) should be selected to minimize the potential for accidental damage.

(g) Remove paint finish from repair area. (Refer to 51-20)

(h) *Serials 1423 & subs:* If affected by repair area, remove Expanded Metal Mesh (EMM) lightning protection. (Refer to 51-20)

Note: Sand outboard fuselage skin at least 0.5 inch (12.7 mm) beyond damaged area.

(i) If necessary, use sandpaper to remove any delaminated, loose, or damaged plies on the fuselage skin. (Refer to 51-20)

(j) Solvent clean with isopropyl alcohol. (Refer to 20-30)

Note: On contoured surfaces it will be necessary to apply enough pressure to maintain contact between skin portions. Small weights may be used to apply enough pressure to maintain contact.

(k) Lightly clamp skin portions together, ensuring that pressure is applied uniformly.

Note: Do not release clamping pressure until initial cure is complete.

(l) Allow resin to initial cure. (Refer to 51-20)

Note: Ensure plies extend at least 1.0 inch (2.54 cm) beyond dis-bond.

Note: Ensure each ply overlaps the previous ply by at least 0.5 inch (12.7 mm).

(m) Cut three glass-fiber repair plies at ±45°. (Refer to 51-20)

(n) Mix MGS L418-based structural resin. (Refer to 51-30)

(o) Layup glass fabric repair plies. (Refer to 51-20)

(p) Cure repair plies. (Refer to 51-20)

(q) *Serials 1423 & subs:* If affected by repair area, install Expanded Metal Mesh (EMM) lightning protection. (Refer to 51-20)

(r) Match drill aft tie down installation hole covered by glass fabric repair layup.

(s) Using 0.75 inch (19.05 mm) hole saw, cut aft tie down installation hole through skin and centered on BL0.

(t) *Serials 1423 thru 1472:* From aft tangent of tie down installation hole to aft edge of empennage skin, cut a 0.18 inch (4.57 mm) wide slot centered on BL0.

(u) Prepare the surface for primer and paint. (Refer to 51-20)

(v) Paint repair area. (Refer to 51-20)

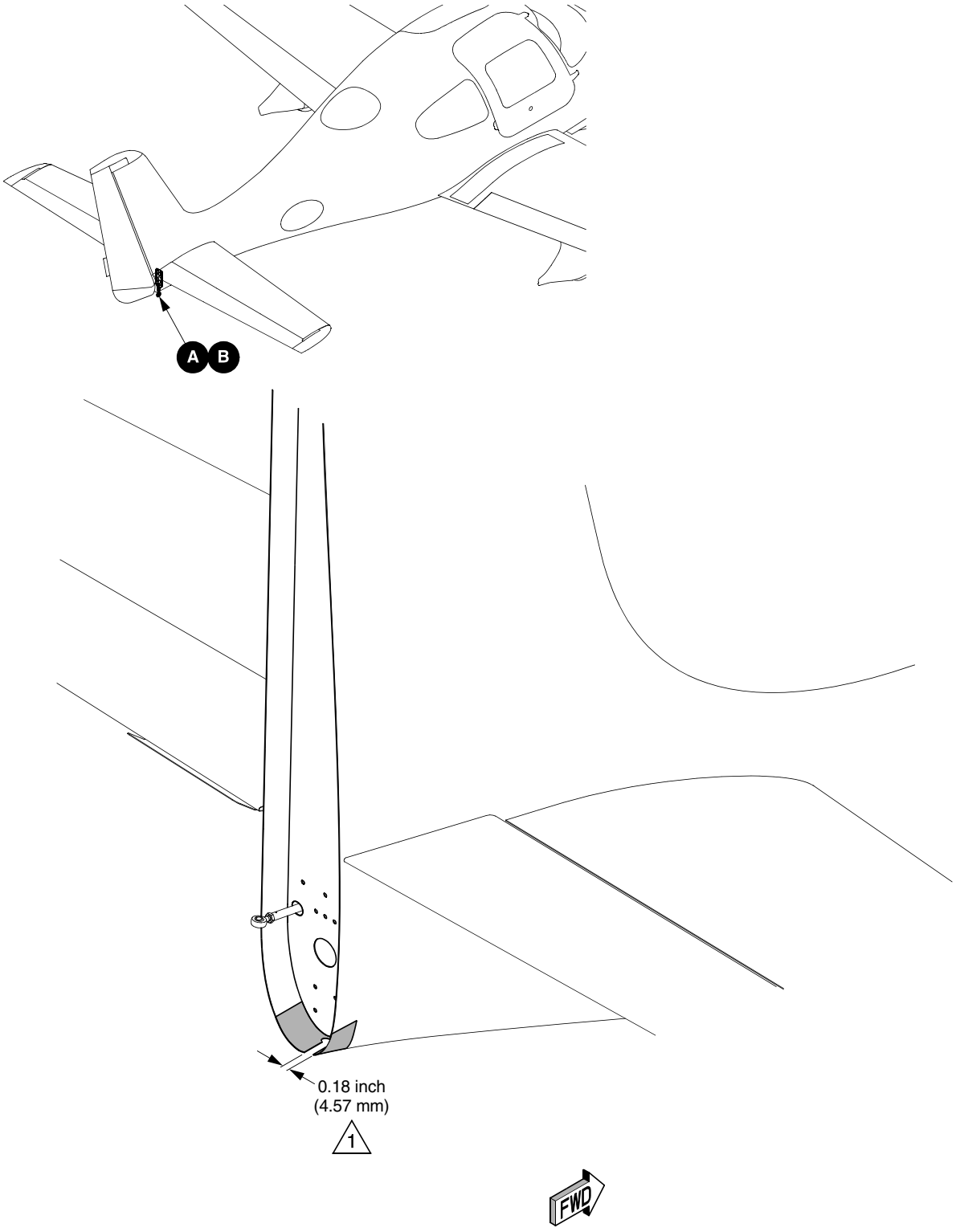
(w) Install aft tie down bracket. (Refer to 53-20)

(x) Install aft tie down. (Refer to 53-20)

(y) *Serials 1423 & subs:* If EMM was replaced, to ensure electrical contact, sand or burnish EMM where sides of upper vertical hinge contact the vertical spar. (Refer to 51-20)

(z) Install lower top and bottom vertical hinge. (Refer to 55-50)

(aa) Install rudder. (Refer to 55-40)



NOTE

1 *Serials 1423 thru 1472:* From aft tangent of tie down installation hole to aft edge of empennage skin, cut a 0.18 inch (4.57 mm) wide slot centered on BL0.

DETAIL A

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Figure 53-103
Fuselage Skin Repair (Sheet 1 of 2)

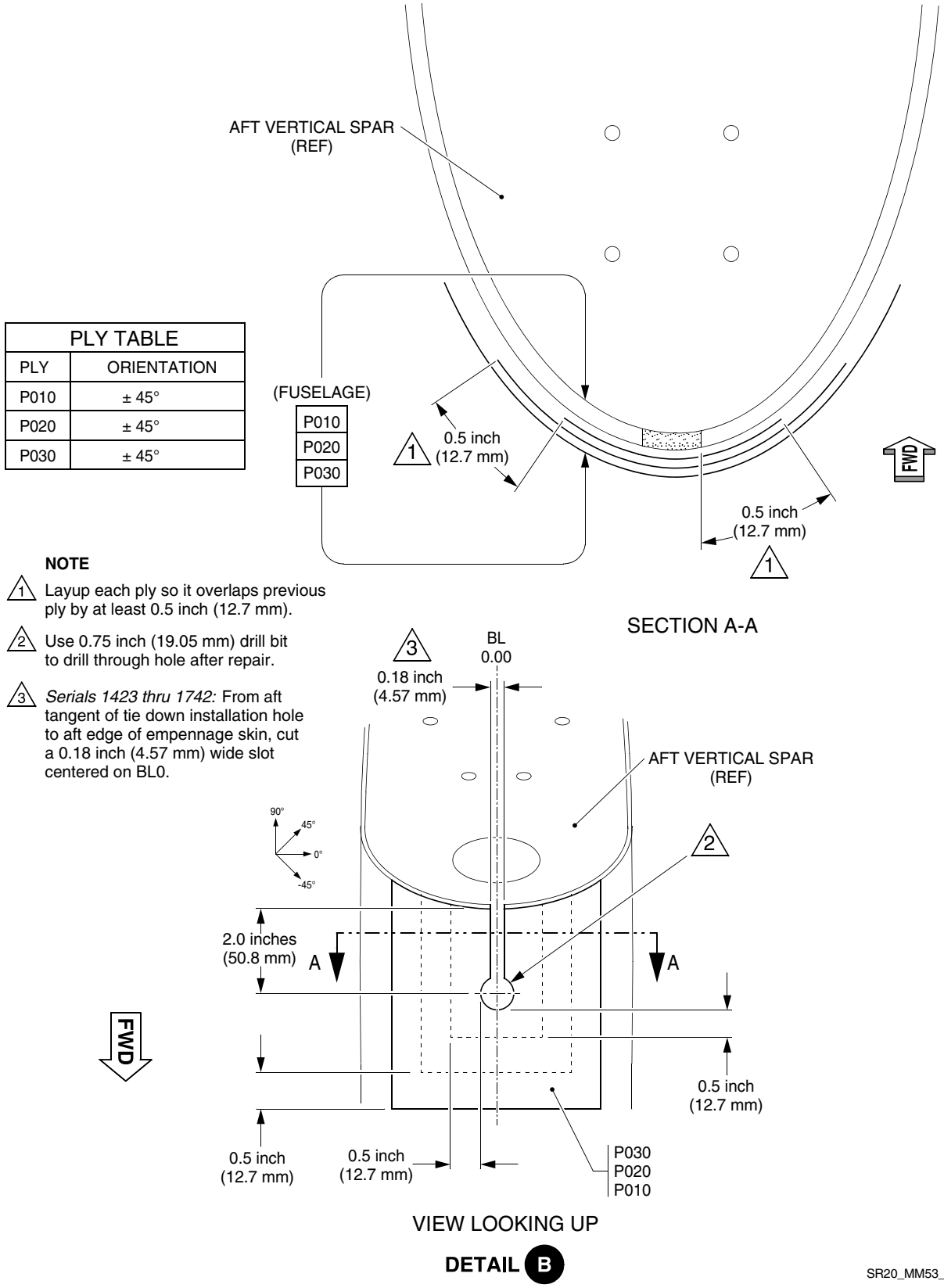


Figure 53-103
Fuselage Skin Repair (Sheet 2 of 2)

D. Repair - Belly Burn (See Figure 53-104)

(1) Repair - Belly Burn

Belly burn is defined as burn damage that occurs to the fuselage belly due to incorrect adjustment of the exhaust system. The affected area lies just aft of the tail pipe and occurs when the tail pipe is positioned too close to the fuselage. Visually inspect for discoloration and perform a coin tap test to determine the type and extent of damage. The fuselage skin may be restored using standard composite repair techniques.

(a) Remove tail pipe. (Refer to 78-20)

(b) Determine type and extent of damage. If necessary, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(c) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressed Air (contaminate free)	-	Any Source	General repair.
Liquid Dish Soap	-	Any Source	General cleaning.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Orbital Sander	39825A12	Any Source	Prepare repair surface.
Masking Tape	2.0 inches (5.0 cm)	Any Source	Limit repair area.
Permanent Marker	(Refer to 51-30)	(Refer to 51-30)	Identify repair area.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Protect lay-up surface and make template of repair ply.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Makes smooth and contaminate free repair surface.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair composite structures.
Structural Resin Repair System	(Refer to 51-30)	(Refer to 51-30)	Bond plies over puncture.
Sandpaper	120-grit or finer	Any Source	Paint and primer removal.
Sandpaper	60 to 80-grit	Any Source	Abrade bonding surfaces.
Rigid Closed Cell Foam	(Refer to 51-30)	(Refer to 51-30)	Stiffen laminate.
Aerosil	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Sil-Cell	(Refer to 51-30)	(Refer to 51-30)	Resin filler.

(d) To prevent water from contaminating composite, cover damaged area with release film and seal edges with tape.

(e) Clean the area surrounding the damage with hot soapy water. Rinse with clean water and dry. Remove release film from damaged area.

(f) Solvent clean damaged area with isopropyl alcohol. (Refer to 20-30)

(g) Determine repair area through visible inspection and coin tap test. (Refer to 51-10)

(h) Mark perimeter of repair area.

(i) Determine and mark 0^{o} axis.

(j) Carefully trim away damaged laminate using a small angle grinder with 80-grit. Grind edge of damaged laminate to a 50:1 taper.

(k) Remove paint, primer, and body filler from area surrounding damage. (Refer to 51-20)

(l) Perform core replacement repair. (Refer to 51-20)

Note: Ensure each ply overlaps the previous ply by at least 0.5 inch (12.7 mm).

(m) Cut two glass-fiber repair plies at ±45°. (Refer to 51-20)

(n) Mix MGS L418-based structural resin. (Refer to 51-30)

(o) Layup glass fabric repair plies. (Refer to 51-20)

(p) Cure repair plies. (Refer to 51-20)

(q) Prepare the surface for primer and paint. (Refer to 51-20)

(r) Paint repair area. (Refer to 51-20)

(s) Install tail pipe. (Refer to 78-20)

(t) Perform Adjustment/Test - Forward Ball Joints to ensure correct tail pipe orientation. (Refer to 78-20)

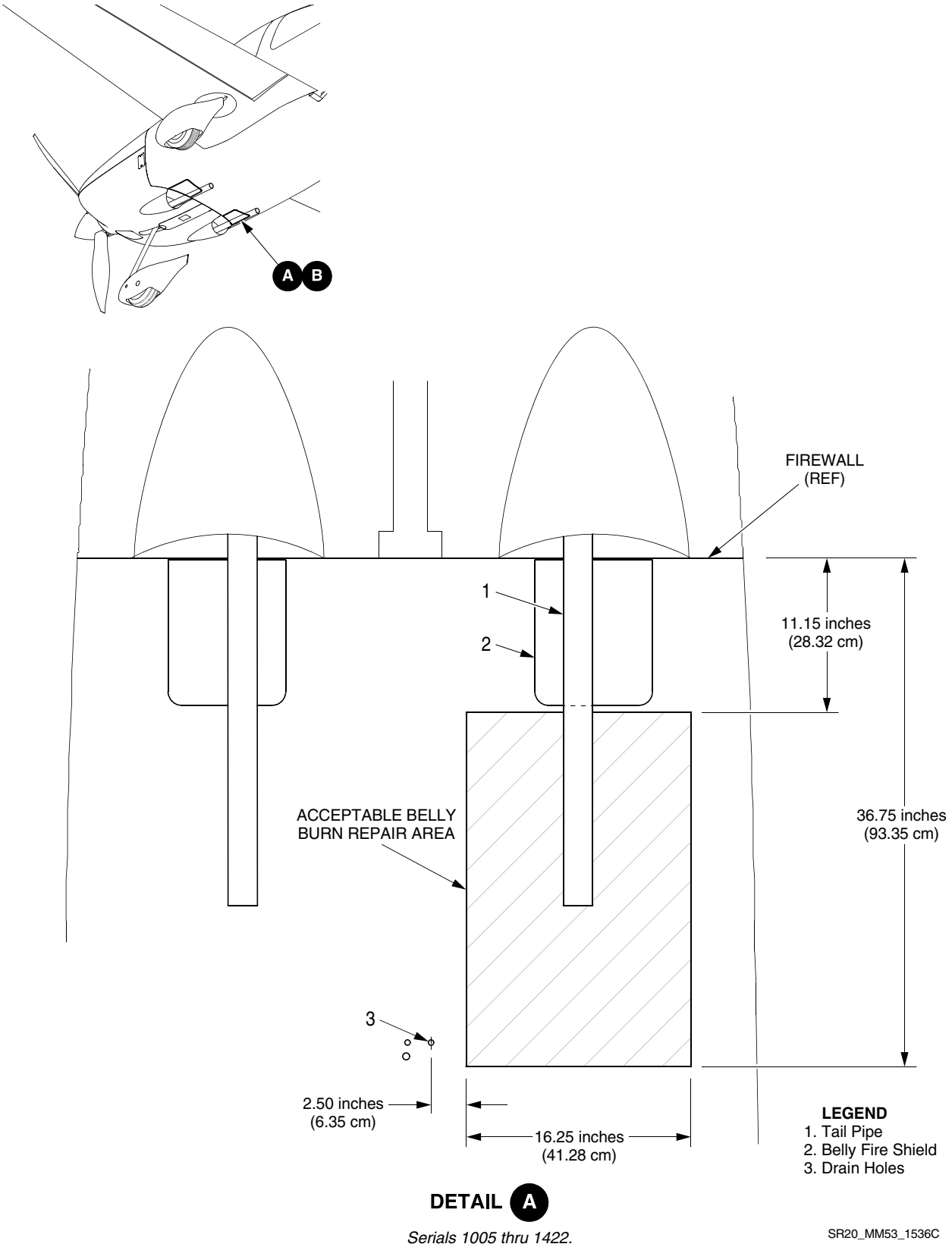
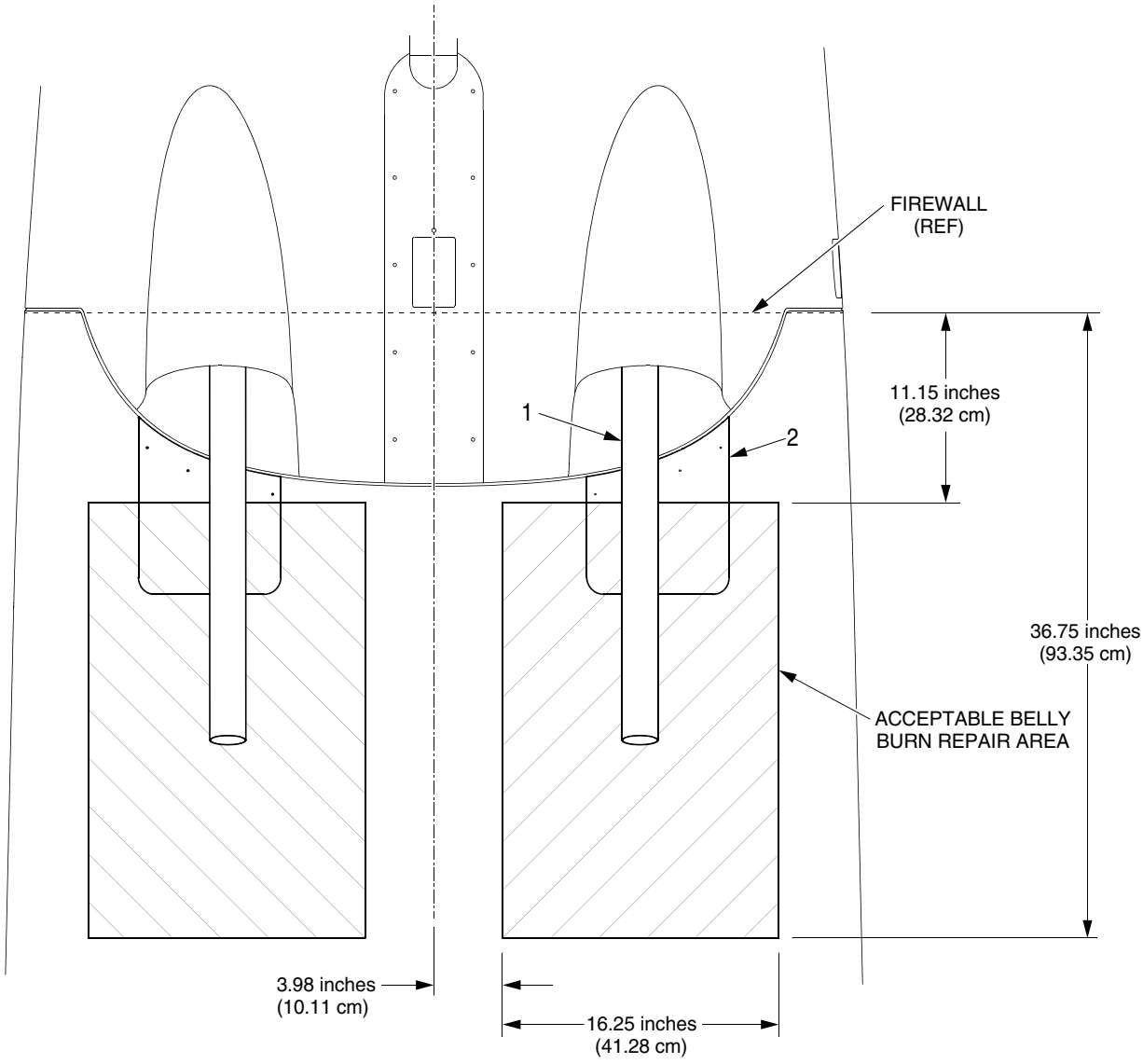


Figure 53-104
Belly Burn Repair - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422



LEGEND
1. Tail Pipe
2. Belly Fire Shield

DETAIL B

SR20_MM53_1790A

Figure 53-104
Belly Burn Repair - Serials 1423 & subs (Sheet 2 of 2)

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AUXILIARY STRUCTURE

1. DESCRIPTION

This section describes those structural components which make up the auxiliary structure including fuselage floor structure, floor access panels, entry step, and support handle.

A. Fuselage Floor Structure

The floor structure of the airplane consists of a forward floor and an aft floor. Both are foam core composite laminate panels designed to support flight and user loads. The front floor supports forward and aft console structures, rudder pedals, and a pulley gang assembly. The aft floor supports aft wing attachment loads, aft passenger seat loads, and cargo loads. The front floor is bonded to the sides of the fuselage and is supported by two longerons, firewall, and spar box. The aft floor is bonded to the sides of the fuselage and is supported by two longerons, the spar box, bulkhead 186, and bulkhead 222.

B. Entry Step and Support Handle

The entry step is constructed 0.049 inch gage streamline steel tubing. The entry step has 0.09 inch gage flanges that are welded to the tubing and secured to the fuselage belly and the aft floor. The support handle is constructed of 0.38 inch solid aluminum and secured to the top of the fuselage by screws.

C. Aft Tie Down and Bracket

The aft tie down is used to secure the airplane for parking, mooring, and maintenance operations that require the airplane to remain in a fixed position. It is located on the underside of the empennage directly below the horizontal stabilizer. (Refer to 10-10)

Serials 1005 thru 1541 before SB 2X-53-03: The aft tie down consists of an eyebolt used to attach the aft empennage to a weighted tail stand or mooring ring.

Serials 1542 & subs, Serials 1005 thru 1541 after SB 2X-53-03: The aft tie down consists of a contoured rubber bumper with a hole used to attach the aft empennage to a weighted tail stand or mooring ring.

The aft tie down bracket secures the aft tie down to the underside of the empennage. It is constructed of solid aluminum and secured to the aft spar of the vertical stabilizer by screws.

2. MAINTENANCE PRACTICES

A. Fuselage Floor Access Panels (See Figure 53-201)

(1) Removal - Fuselage Floor Access Panels

(a) *Serials 1005 thru 1267 after SB2X-95-20:* If removing access panel CB6, disconnect battery 1 from both positive and negative terminals. (Refer to 24-30)

(b) Remove carpeting covering access panel. (Refer to 25-10)

(c) Remove seat covering access panel, if necessary. (Refer to 25-10)

(d) Remove fasteners securing access panel to fuselage floor.

(e) Remove access panel.

(2) Installation - Fuselage Floor Access Panels

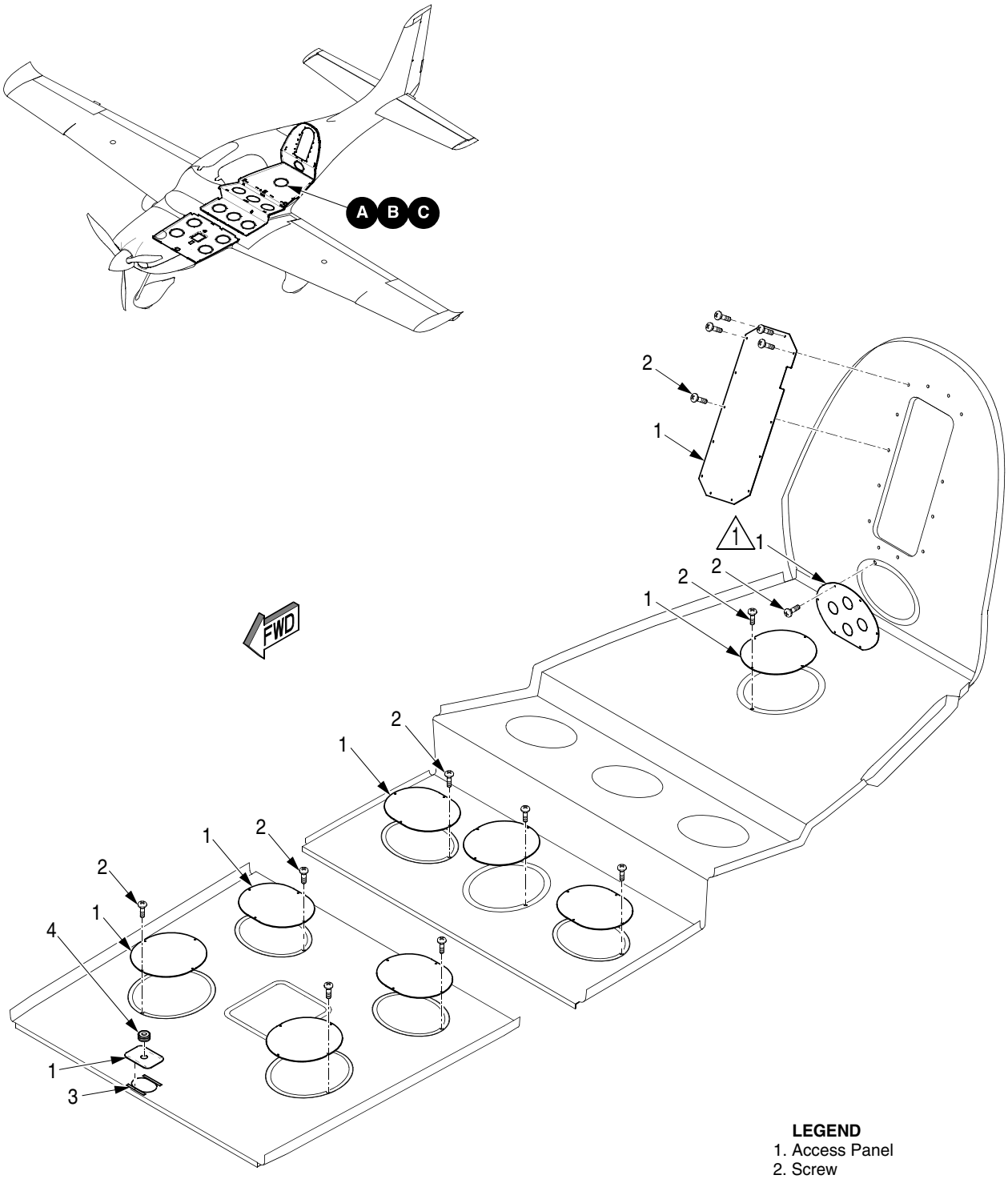
(a) Position access panel to floor access hole.

(b) Install fasteners securing access panel to fuselage floor.

(c) Install seat, if necessary. (Refer to 25-10)

(d) Install carpeting. (Refer to 25-10)

(e) *Serials 1005 thru 1267 after SB2X-95-20:* If installing access panel CB6, connect battery 1 to both positive and negative terminals. (Refer to 24-30)



LEGEND
1. Access Panel
2. Screw
3. Hook and Loop Fastener
4. Grommet

NOTE

1 *Serials 1005 thru 1267 after SB2X-95-20*: If removing access panel CB6, disconnect battery 1 from both terminals.

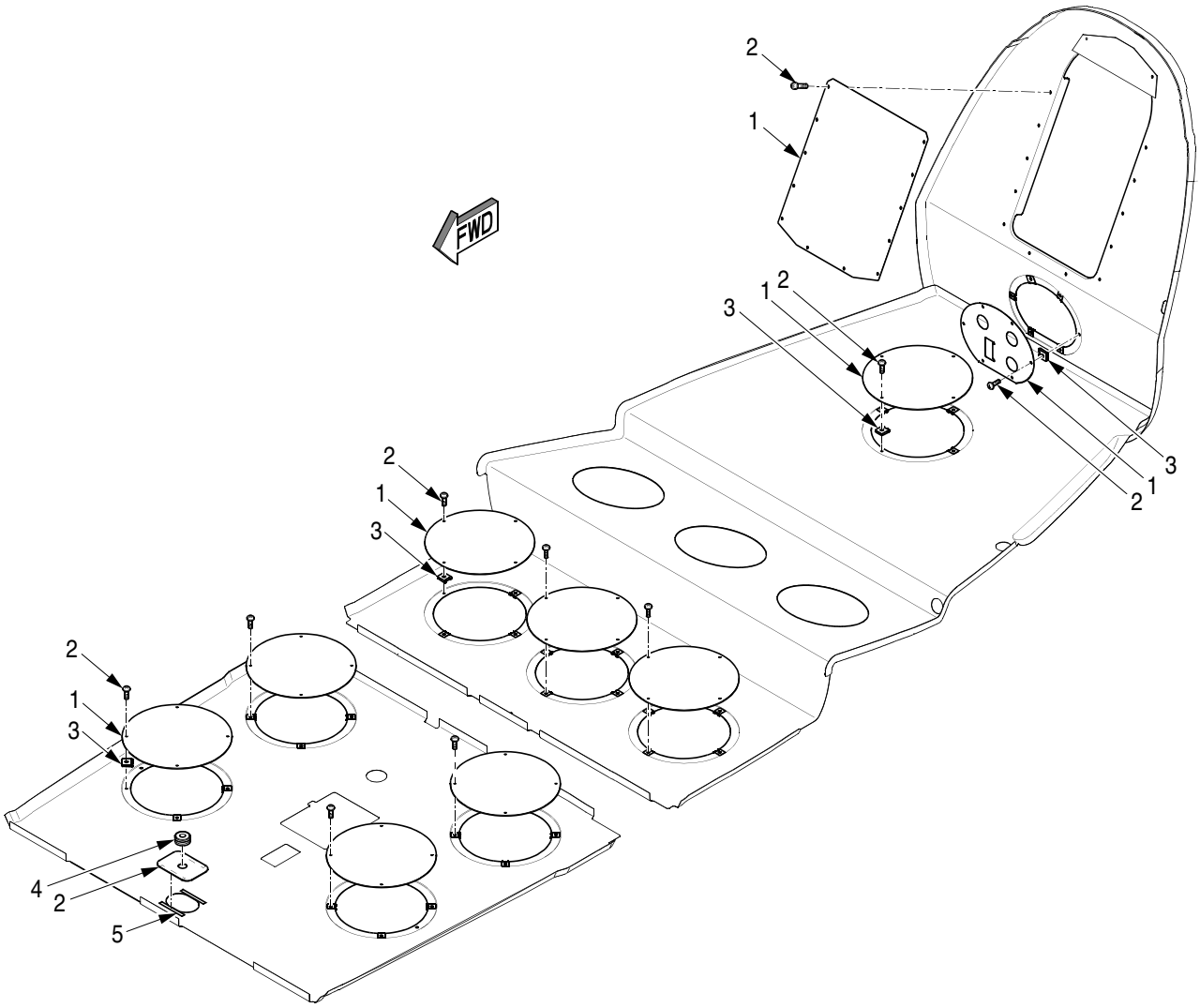
DETAIL A

Serials 1005 thru 1422.

SR20_MM53_1743B

Figure 53-201
Access Panels, Cabin - Serials 1005 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1422



LEGEND
1. Access Panel
2. Screw
3. Fastener
4. Grommet
5. Hook & Loop

Serials 1423 thru 1632, 1634 thru 1638.

DETAIL B

SR20_MM53_1813B

Figure 53-201
Access Panels, Cabin - Serials 1423 thru 1638 (Sheet 2 of 3)

EFFECTIVITY:
Serials 1423 thru 1638

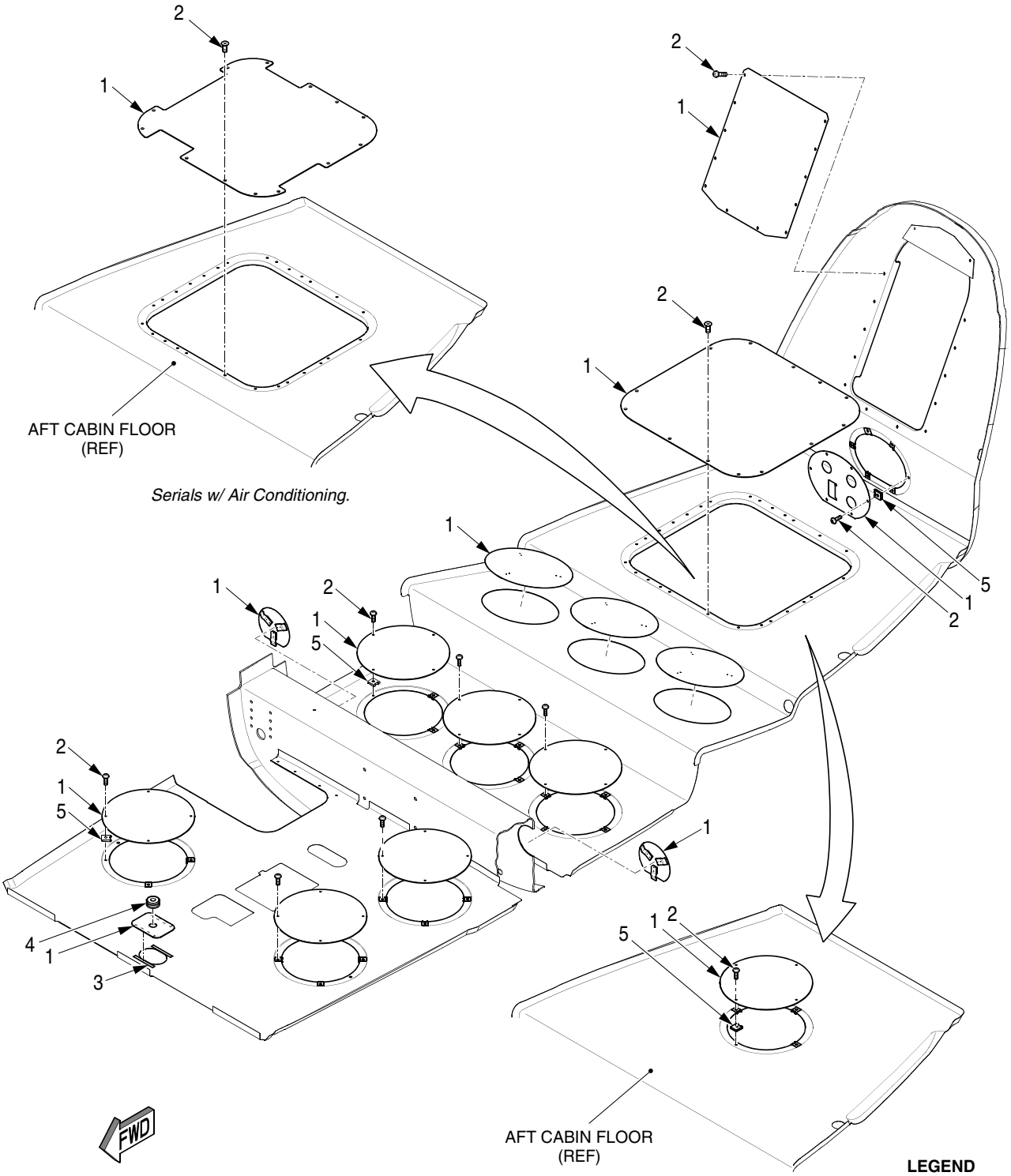


Figure 53-201
Access Panels, Cabin - Serials 1639 and subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 1639 and subs

B. Entry Step (See Figure 53-202)

(1) Removal - Entry Step

(a) Remove access panel CF5. (Refer to 06-00)

(b) *Serials 2303 & subs:* Disconnect connector from step assembly LED assembly. (Refer to 33-40)

(c) *Serials 1005 thru 2302:* Remove nuts, washers, and bolts securing entry step to baggage compartment floor.

(d) *Serials 2303 & subs:* Remove washers and bolts securing entry step to baggage compartment floor.

(e) Remove nuts, washers, and screws securing step to fuselage belly.

(f) Remove entry step from airplane.

(2) Installation - Entry Step

(a) Position entry step to baggage compartment floor and fuselage belly.

(b) Install screws, washers, and nuts securing step to fuselage belly.

(c) *Serials 1005 thru 2302:* Install bolts, washers, and nuts securing entry step to baggage compartment floor.

(d) *Serials 2303 & subs:* Install bolts and washers securing entry step to baggage compartment floor.

(e) *Serials 2303 & subs:* Connect connector to step assembly LED assembly. (Refer to 33-40)

(f) Install access panel CF5. (Refer to 06-00)

C. Support Handle (See Figure 53-202)

(1) Removal - Support Handle

(a) Remove cabin headliner. (Refer to 25-10)

(b) Remove screws and washers securing support handle to fuselage. Remove support handle from airplane.

(2) Installation - Support Handle

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite	242 Blue	Loctite Corp Newington, CT	Sealant.

(b) Apply Loctite to support handle studs.

(c) Position support handle to fuselage and secure with screws and washers.

(d) Install cabin headliner. (Refer to 25-10)

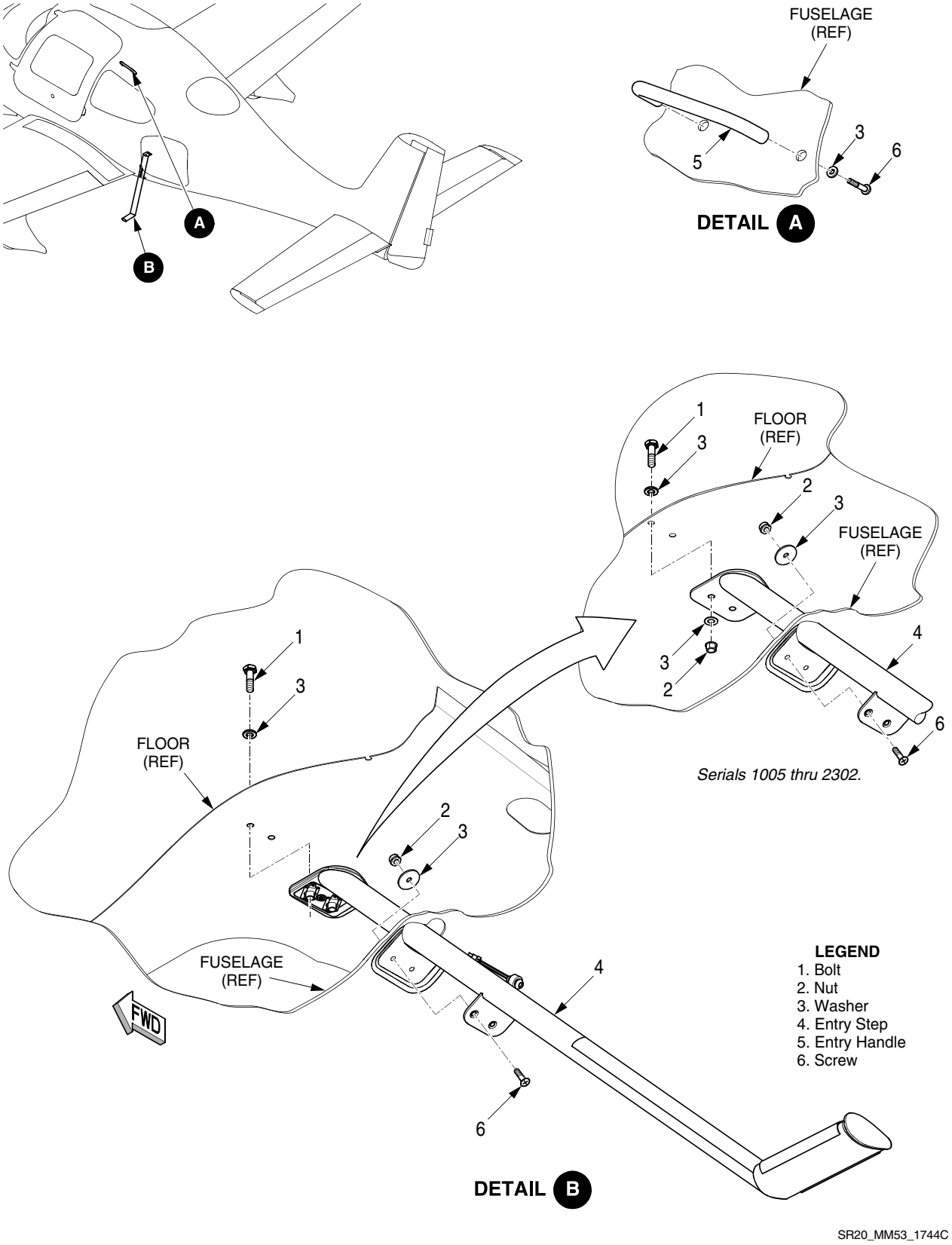


Figure 53-202
Entry Step and Support Handle Installation

D. Aft Tie Down (See Figure 53-203)

(1) Removal - Aft Tie Down

(a) *Serials 1005 thru 1541 before SB 2X-53-03:* At aft bottom of fuselage, remove eyebolt and jam nut secured to aft tie down bracket.

(b) *Serials 1542 & subs, Serials 1005 thru 1541 after SB 2X-53-03:* Remove aft tie down bumper.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Blunt-Edged Non-Metallic Chisel	-	Any Source	Removal
Plastic Wedge	5 inches (13 cm)	Any Source	Removal
Plastic Scraper	-	Any Source	Removal
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaning

2 At aft bottom of fuselage, remove bolt securing aft tie down bumper to aft tie down bracket.

3 Use chisel to carefully cut seam between aft tie down bumper and empennage.

4 Position cutting end of wedge at seam.

5 Strike back of wedge until aft tie down bumper is loosened from the empennage.

6 Use plastic scraper to remove adhesive residue.

7 Solvent clean faying surface on empennage. (Refer to 20-30)

(2) Installation - Aft Tie Down

(a) *Serials 1005 thru 1541 before SB 2X-53-03:* At aft bottom of fuselage, install eyebolt and jam nut to aft tie down bracket.

(b) *Serials 1542 & subs, Serials 1005 thru 1541 after SB 2X-53-03:* Install aft tie down bumper.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape 3.0 inches (7.6 cm)	-	Any Source	Masking/ Sealing
Aluminum Oxide Paper	60 to 80 grade	Any Source	Abrasion
Cotton Cloth (clean, lint free)	-	Any Source	Cleaning
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaning

Description	P/N or Spec.	Supplier	Purpose
Adhesion Promoter	94	3M Company St. Paul, MN 55144 888-364-3577	Bonding
Adhesion Promoter (*alternate*)	AC-145	AC TECH Garden Grove, CA 92841 714-373-2837	
Sealant, Epoxy Cured Polythioether	PR-1829 CLASS B, 1/2	PRC-DeSoto International Glendale, CA 91209 818-240-2060	Adhesive
Sealant, Polysulfide (*alternate*)	MIL-S-8802F or AMS-S-8802 Type II, Class B	Any Source	
Tie-Down Strap (ratcheted, vinyl coated hooks)	-	Any Source	Fixture

2 Remove LH and RH empennage access panels. (Refer to 53-30)

3 To determine fuselage faying surface, position tie down bumper to fuselage at aft tie down bracket and align along BL 0.00 ±1°. Apply masking tape to fuselage skin surrounding tie down bumper. Remove tie down bumper.

CAUTION: Do not abrade outside of fuselage faying surface.

4 At fuselage faying surface, remove surface protection by abrasion. (Refer to 51-20)

5 Abrade faying surface of tie down bumper. (Refer to 51-20)

6 Solvent clean both faying surfaces. (Refer to 20-30)

7 Apply adhesion promoter to both faying surfaces. Wipe off excess adhesion promoter and allow to dry for 30 minutes prior to bonding.

8 Follow manufacturer's instructions for mixing sealant.

9 Apply sealant to faying surface of tie down bumper with a bondline thickness 0.005 to 0.080 inch (0.130 to 2.030 mm).

10 Position tie down bumper to fuselage at aft tie down bracket and align along BL 0.00 ±1°.

CAUTION: Do not over-ratchet tie-down strap. Excessive tension may damage fuselage structure where tie-down strap hooks are attached.

To prevent chafing, ensure tie-down strap hooks are vinyl coated or protect hook contact point at access panel hole edges with padding material.

11 Secure tie down bumper to fuselage using a racheted tie-down strap with hooks secured to access panel holes.

CAUTION: Do not over-torque tie down bumper installation bolt. Excessive torque may misalign tie down bumper such that front of tie down bumper could pull away from the fuselage.

12 Install bolt to secure tie down bumper to aft tie down bracket. Torque bolt to 15.0 - 20.0 in-lb (1.7 - 2.3 Nm).

13 Carefully wipe off any excess adhesive from edges of tie down bumper.

14 After cure cycle is completed, remove tie-down strap.

15 Install LH and RH empennage access panels. (Refer to 53-30)

E. Aft Tie Down Bracket (See Figure 53-203)

(1) Removal - Aft Tie Down Bracket

(a) *Serials 1542 & subs, Serials 1005 thru 1541 after SB 2X-53-03:* Remove aft tie down. (Refer to 53-20)

(b) Remove rudder. (Refer to 55-40)

(c) Remove lower vertical bottom hinge. (Refer to 55-50)

(d) Remove bolts and washers securing aft tie down bracket to aft spar of vertical stabilizer. Remove aft tie down bracket.

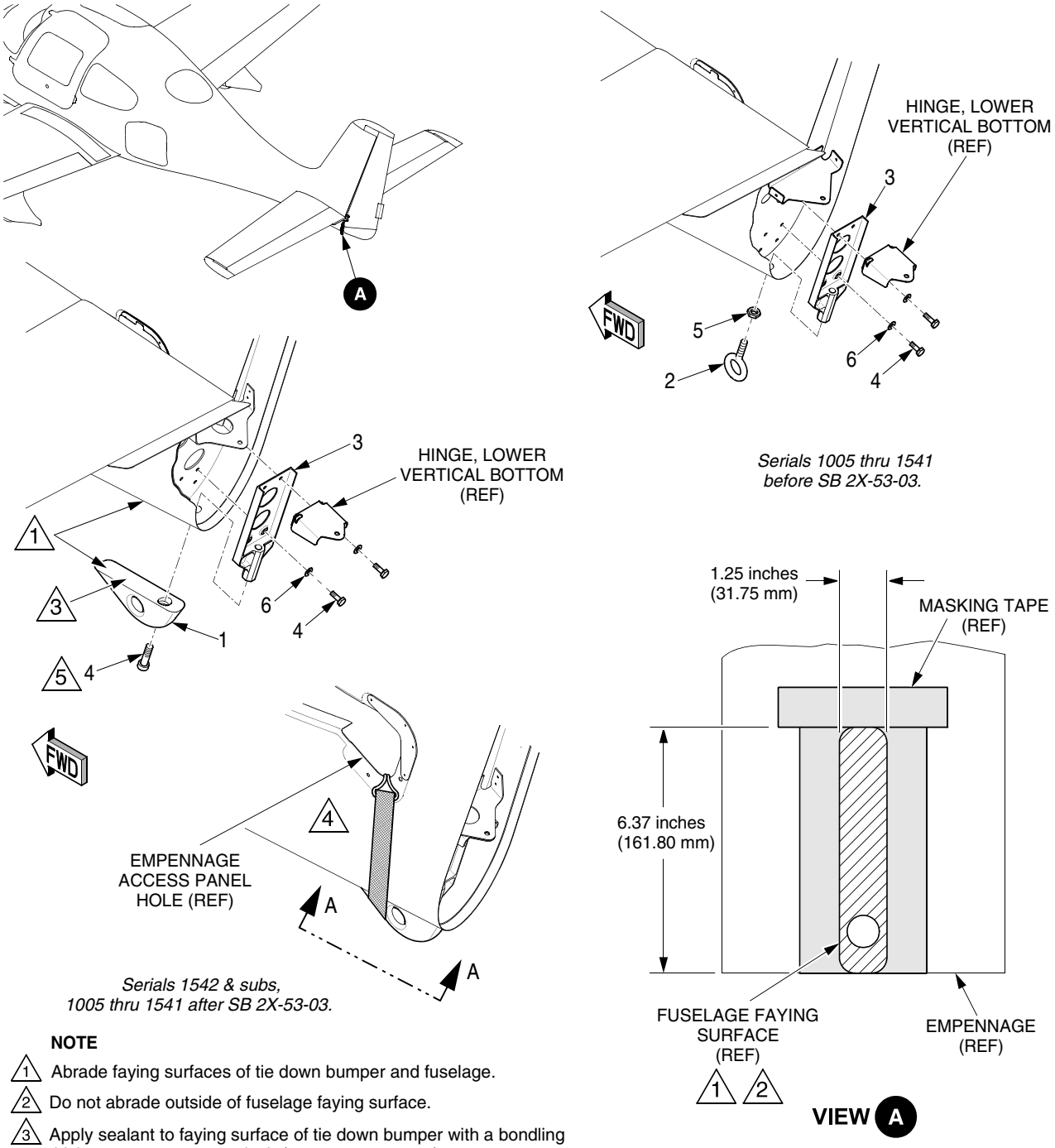
(2) Installation - Aft Tie Down Bracket

(a) Position and install bolts and washers securing aft tie down bracket to aft spar of vertical stabilizer.

(b) Install lower vertical bottom hinge. (Refer to 55-50)

(c) Install rudder. (Refer to 55-40)

(d) *Serials 1542 & subs, Serials 1005 thru 1541 after SB 2X-53-03:* Install aft tie down. (Refer to 53-20)



NOTE

1. Abrade faying surfaces of tie down bumper and fuselage.
2. Do not abrade outside of fuselage faying surface.
3. Apply sealant to faying surface of tie down bumper with a bondling thickness 0.005 to 0.080 inch (0.130 to 2.030 mm).
4. Do not over-ratchet tie down strap. Excessive tension may damage fuselage structure where tie down strap hooks are attached. To prevent chafing, ensure tie down strap hooks are vinyl coated or protect hook contact point at access panel hole edges with padding material.
5. Torque bolt to 15.0 - 20.0 in-lb (1.7 - 2.3 Nm). Do not over-torque tie down bumper installation bolt. Excessive torque may misalign tie down bumper such that front of tie down bumper could pull away from the fuselage.

DETAIL A

LEGEND

1. Bumper
2. Eyebolt
3. Aft Tie Down Bracket
4. Bolt
5. Nut
6. Washer

SR20_MM53_2282A

Figure 53-203
Aft Tie Down Installation

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PLATES AND SKIN

1. DESCRIPTION

This section describes the exterior covering of the fuselage which makes up the skin. Also included are the empennage access panels and belly fire shields.

A. Fuselage Skin

The fuselage skin is composed primarily of bi-directional E-glass fiberglass with a PVC foam core. Some areas are of solid laminate construction. Areas around the passenger door are reinforced with unidirectional fiberglass.

2. MAINTENANCE PRACTICES

A. Empennage Access Panels (See Figure 53-301)

(1) Removal - Empennage Access Panels

(a) Serials 2222 & subs - if removing Access Panel RE3:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Suction Cup Handle	-	Any Source	Secure access panel.

2 Secure suction cup handle to access panel.

(b) Remove screws securing access panel to empennage.

(c) Remove access panel.

(2) Installation - Empennage Access Panels

Note: Ensure contour of access panel matches fuselage.

(a) Serials 2222 & subs - if installing Access Panel RE3:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Suction Cup Handle	-	Any Source	Secure access panel.

2 Secure suction cup handle to access panel.

(b) Position access panel to empennage.

WARNING: Installation of incorrect length screw in access panel may cause interference with pitch control system.

(c) Install screws securing access panel to empennage.

(3) Removal - Empennage Access Panel RE3 Seal

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for adhesive cleaner.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

CAUTION: Prolonged exposure to adhesive cleaner can damage the exterior paint finish. Wipe up any excess cleaner immediately.

(b) Apply masking tape to perimeter of installation area to protect exterior paint finish.

(c) Remove residue from installation area using scraper and cleaner.

(d) Remove masking tape, and solvent clean installation area. (Refer to 20-30)

(4) Installation - Empennage Access Panel RE3 Seal

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Vacuum	-	Any Source	Clean installation area.
Utility Knife	-	Any Source	Cut/score foam seal.
Pin Gage	0.190-inch	Any Source	Puncture seal at hole locations.

(b) Solvent clean installation area with isopropyl alcohol. (Refer to 20-30)

(c) Place one end of seal into position at installation area, maintaining seal 0.00 to 0.13 inch from edge of installation perimeter.

(d) Press seal firmly to installation area making sure that the ends of the seal butt together, and cut seal to length.

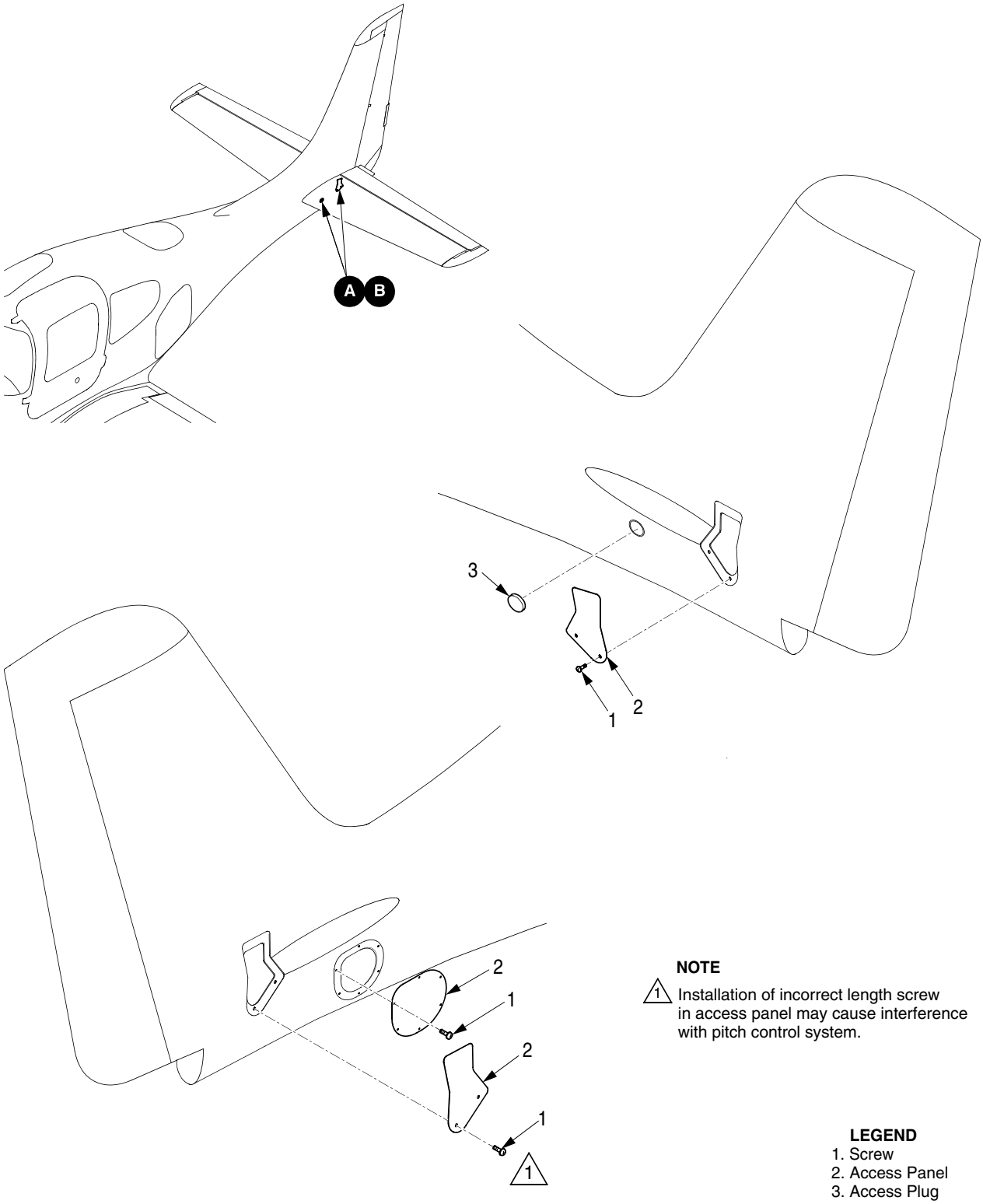
(e) Score foam seal at hole locations with utility knife.

(f) Using pin gage, remove excess portions of seal at hole locations.

(g) Using vacuum cleaner, remove all debris from installation area.

(5) Cleaning - Empennage Access Panel RE3 Seal

Periodically clean seal with isopropyl alcohol to ensure proper seal.



NOTE

1 Installation of incorrect length screw in access panel may cause interference with pitch control system.

LEGEND

1. Screw
2. Access Panel
3. Access Plug

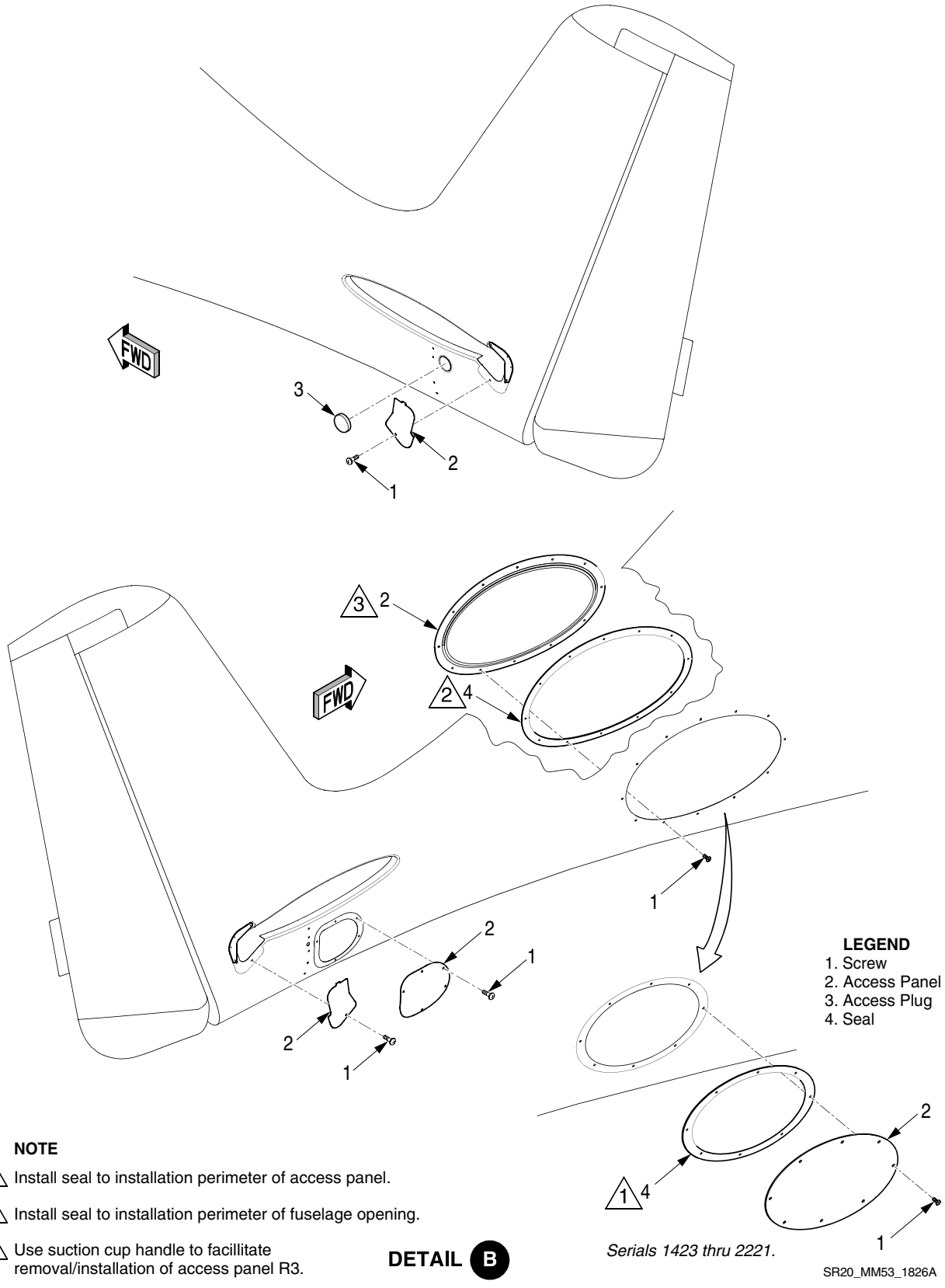
DETAIL A

Serials 1005 thru 1422.

SR20_MM53_1825A

Figure 53-301
Empennage Access Panels Installation - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422



NOTE

1. Install seal to installation perimeter of access panel.
2. Install seal to installation perimeter of fuselage opening.
3. Use suction cup handle to facillitate removal/installation of access panel R3.

DETAIL B

Figure 53-301
Empennage Access Panels Installation - Serials 1423 & subs (Sheet 2 of 2)

B. Belly Fire Shield (See Figure 53-302)

(1) Removal - Belly Fire Shield

(a) Remove tail pipe. (Refer to 78-20)

(b) Drill out rivets securing fire shield to fuselage.

(c) *Serials 1423 & subs:* Using a utility knife, carefully cut through firewall sealant securing forward edge of fire shield to fuselage.

(d) Remove fire shield and mounting tape from fuselage.

(2) Installation - Belly Fire Shield

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaner.
Tape, Two-Sided Foam, 0.45" X 0.50" Wide	4951 Synthetic	3M	Adhesive.
Firewall Sealant	DAPCO-2200	D Aircraft Products Anaheim, CA 92807 714-632-8444	Sealant.
Rivet, Blind Stainless	CR3523-4	Any Source	Fastener.

(b) Clean bonding surfaces with isopropyl alcohol.

(c) Apply tape to left, right, and aft edges of fire shield. At aft corners, leave a 0.15 inch (3.81 mm) gap between tape pieces to allow for moisture drainage. Align fire shield with fuselage rivet holes.

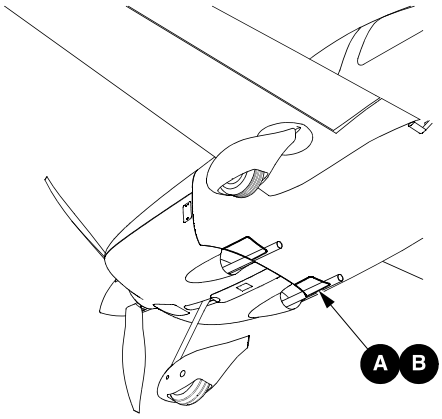
(d) Position fire shield to fuselage and secure with rivets.

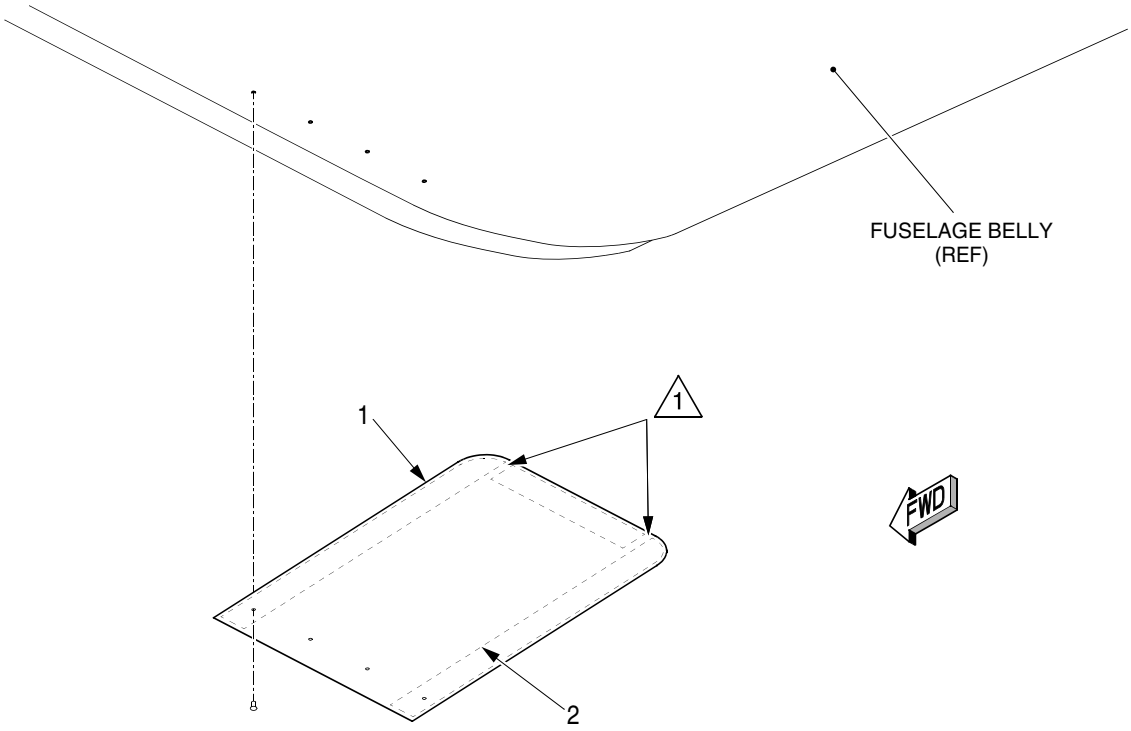
(e) Smooth surface of fire shield with hands until tape is firmly adhered and no air pockets exist between fire shield and fuselage.

(f) *Serials 1423 & subs:* Using firewall sealant, seal forward edge of fire shield to fuselage.

(g) *Serials 1423 & subs:* Remove excess sealant from fire shield and fuselage.

(h) Install tail pipe. (Refer to 78-20)





NOTE

1 Leave 0.15 inch gap between edges of tape for drainage of moisture.

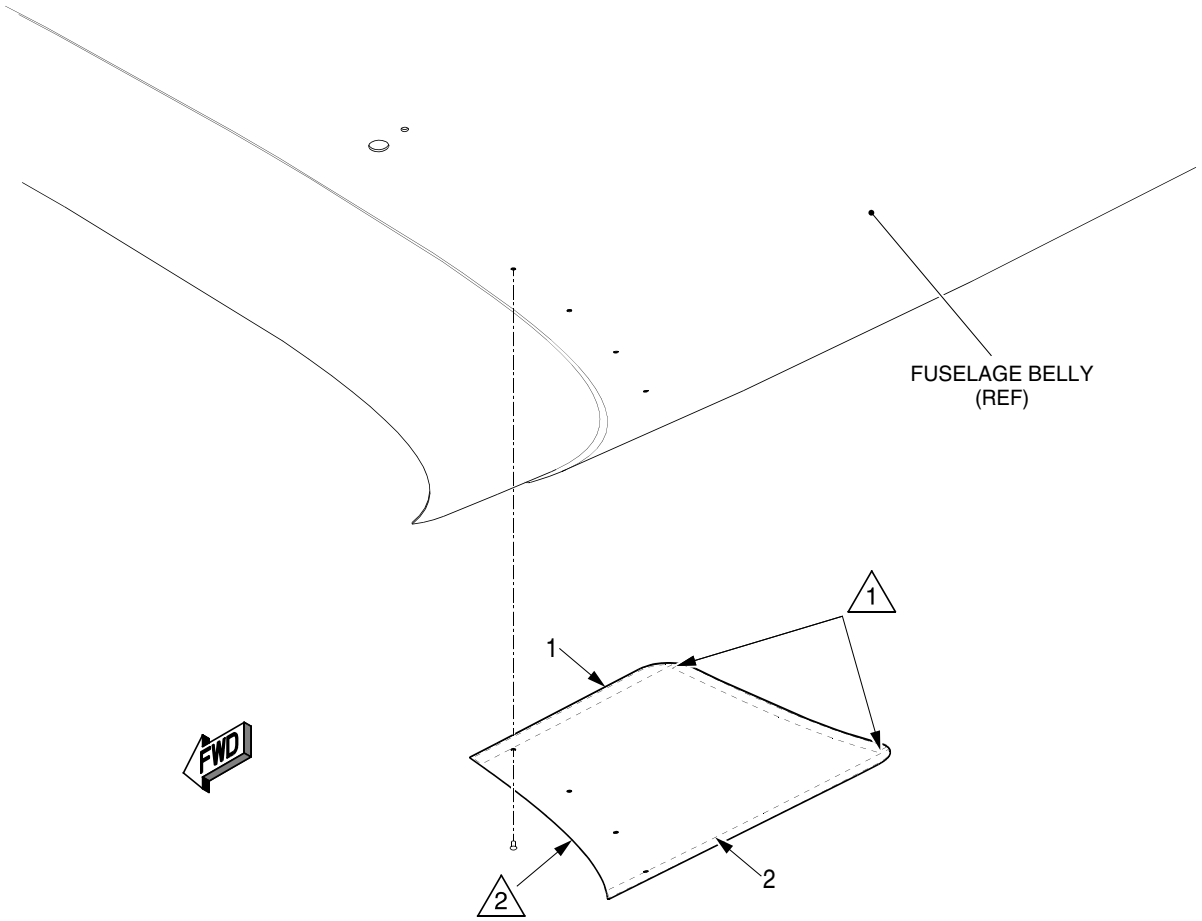
LEGEND
1. Fire Shield
2. Tape

DETAIL A

Serials 1005 thru 1422.

SR20_MM53_1532A

Figure 53-302
Belly Fire Shield Installation - Serials 1005 thru 1422 (Sheet 1 of 2)



NOTE

1. Leave 0.15 inch gap between edges of tape for drainage of moisture.
2. Seal leading edge with firewall sealant.

DETAIL B

LEGEND
1. Fire Shield
2. Tape

SR20_MM53_1823

Figure 53-302
Belly Fire Shield Installation - Serials 1423 & subs (Sheet 2 of 2)

ATTACH FITTINGS

1. DESCRIPTION

Attach fittings are provided for attachment of the seats (Refer to 25-10), baggage straps (Refer to 53-40), rear seat harnesses (Refer to 25-10), cargo net straps (Refer to 25-10), cabin doors (Refer to 52-10), baggage door (Refer to 52-30), engine (Refer to 72-00), battery (Refer to 24-30), pitch servo (Refer to 22-12) (Refer to 22-13), roll servo (Refer to 22-13), and relays (Refer to 27-10) (Refer to 27-30) (Refer to 27-50).

Cockpit seats are secured to the airplane through the use of aluminum tracks mounted to the wing spar tunnel. The track assemblies are installed at a 10° angle which allows the seat to rise as it is moved forward. Steel clamps and locking pins secure the seat to the track.

Rear seats are secured to the aft fuselage floor through the use of integral seat frame studs which insert into floor fittings and fastened with cotter pins. For additional maintenance practices pertinent to airplane seats refer to Chapter 25, Equipment and Furnishings. (Refer to 25-10)

2. MAINTENANCE PRACTICES

A. Seat Track Attach Fittings (See Figure 53-401)

(1) Removal - Seat Track Attach Fittings

(a) Remove seat from seat track. (Refer to 25-10)

(b) Remove side-duct-cover trim panel. (Refer to 25-10)

(c) Remove aft-console trim panel. (Refer to 25-10)

(d) Remove nuts, washers, and bolts, securing track assembly to spar tunnel.

(e) Remove seat track assembly from airplane.

(f) Remove nuts, washers, and screws securing T-track to track doubler, if necessary.

(2) Installation - Seat Track Attach Fittings

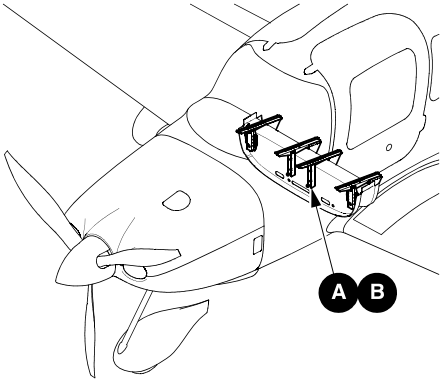
(a) If removed, install screws, washers, and nuts securing seat track to track doubler.

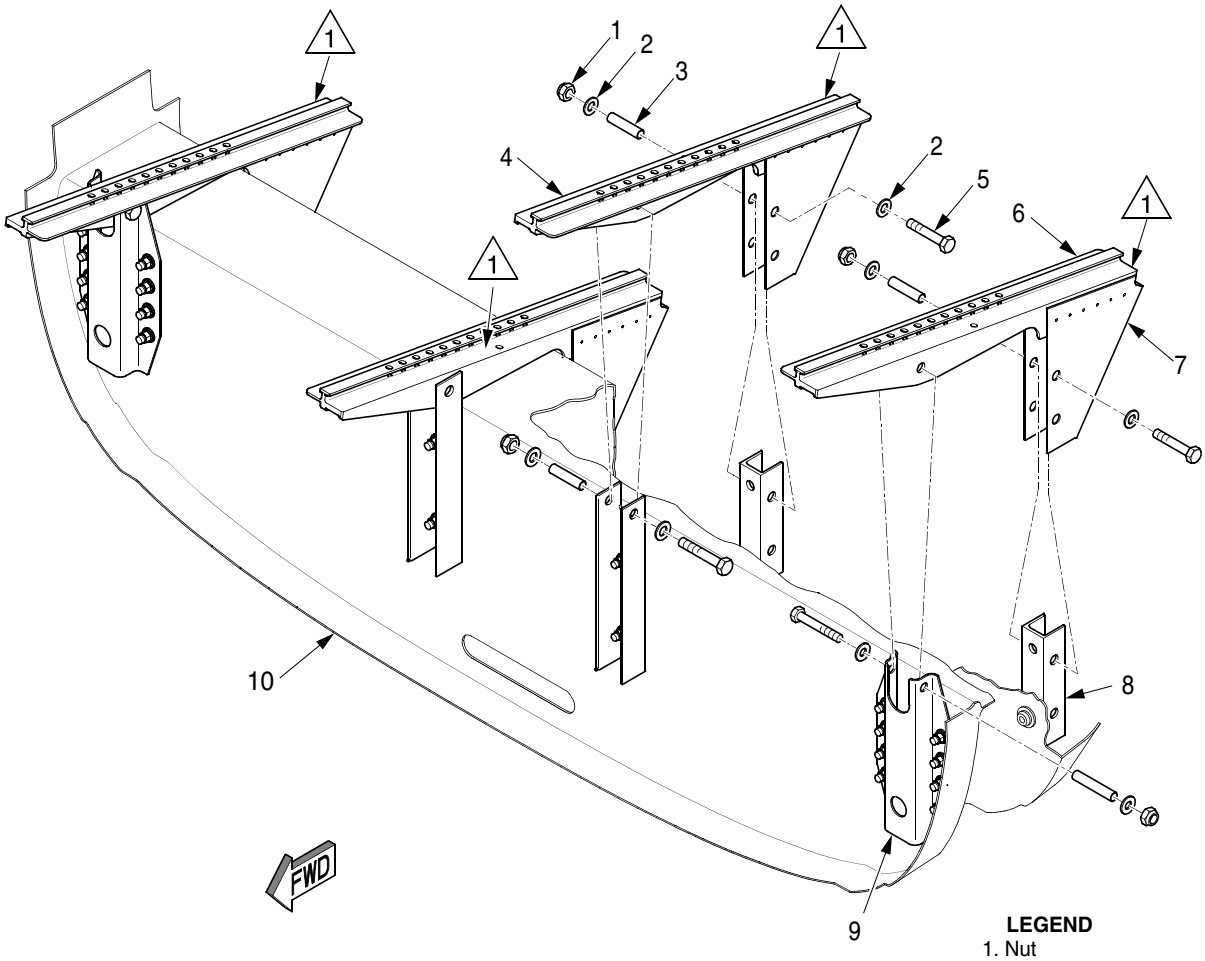
(b) Position track assembly to spar tunnel, ensuring rail section of assembly is oriented on inboard side of assembly relative to seat, and install bolts, washers, and nuts.

(c) Install aft-console trim panel. (Refer to 25-10)

(d) Install side-duct-cover trim panel. (Refer to 25-10)

(e) Install seat. (Refer to 25-10)





LEGEND

1. Nut
2. Washer
3. Spacer
4. L.H. Inboard Seat Track
5. Bolt
6. L.H. Outboard Seat Track
7. Gusset
8. Aft Attach Bracket
9. Forward Attach Bracket
10. Spar Cover

NOTE

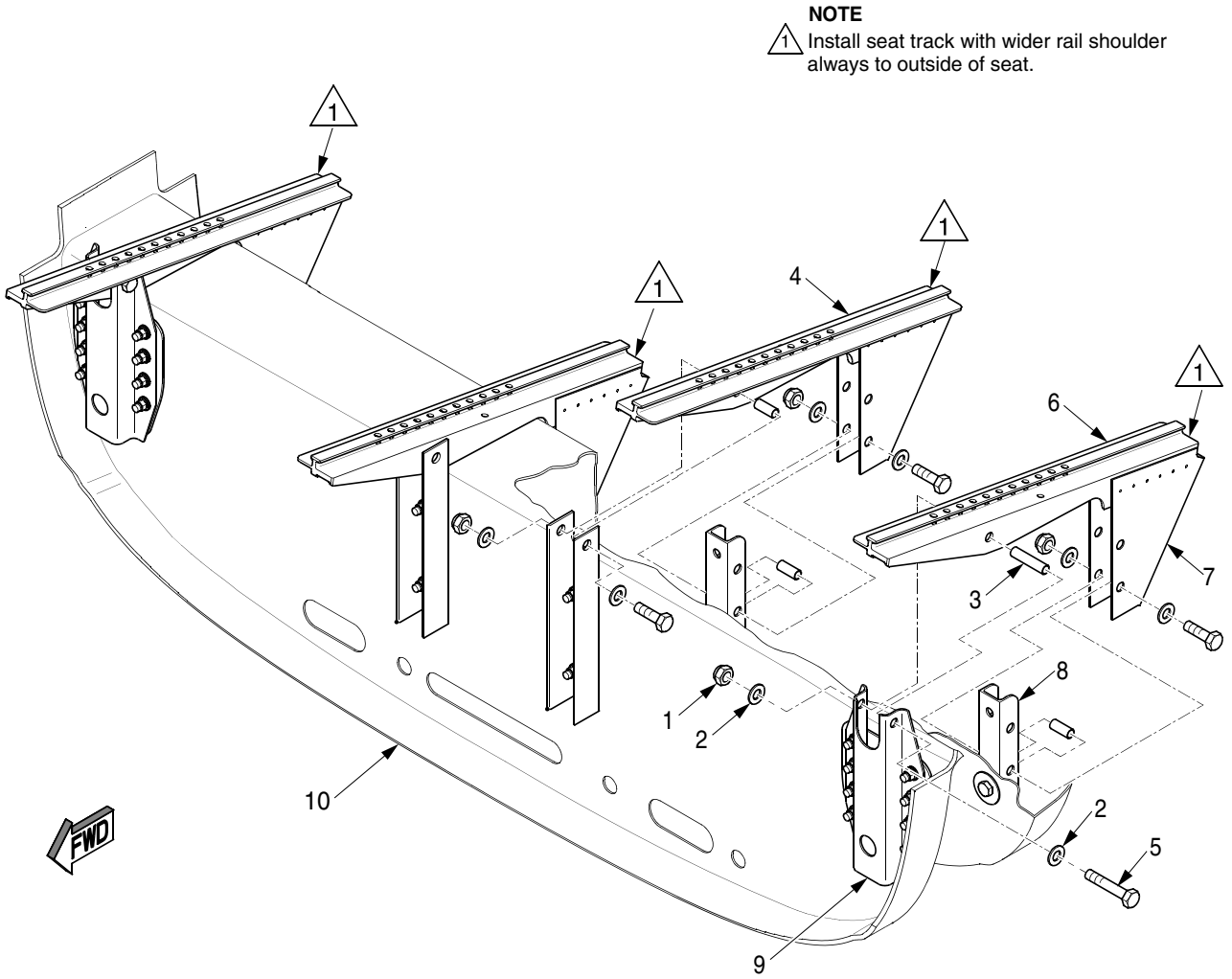
1 Install seat track with wider rail shoulder always to outside of seat.

DETAIL A

Serials 1005 thru 1422.

SR20_MM53_1186B

Figure 53-401
Seat Track Attach Fittings - Serials 1005 thru 1422 (Sheet 1 of 2)



LEGEND

1. Nut
2. Washer
3. Spacer
4. L.H. Inboard Seat Track
5. Bolt
6. L.H. Outboard Seat Track
7. Gusset
8. Aft Attach Bracket
9. Forward Attach Bracket
10. Spar Cover

DETAIL B

SR20_MM53_1821

Figure 53-401
Seat Track Attach Fittings - Serials 1423 & subs (Sheet 2 of 2)

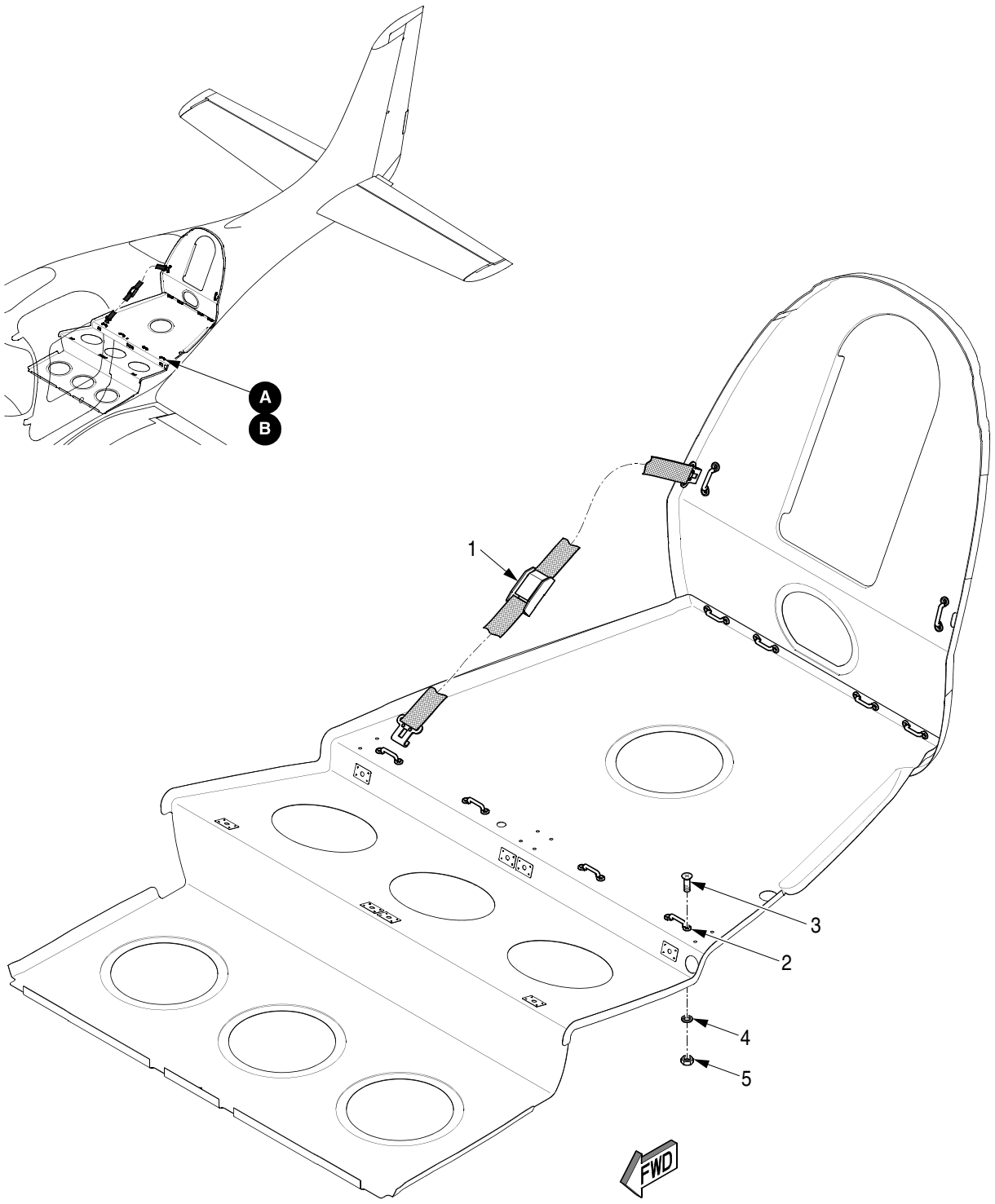
EFFECTIVITY:
Serials 1423 & subs

B. Footman Loop Attach Fittings (See Figure 53-402)

Note: Footman loops are located on baggage compartment floor and FS 222 bulkhead.

(1) Removal - Footman Loop Attach Fittings
  (a) Remove baggage compartment carpet. (Refer to 25-10)
  (b) Remove access panel CF5 and CB6. (Refer to 06-00)
  (c) *Serials 1005 & subs w/o 2+1 Rear Seat:* Remove screws, washers, and nuts securing footman loop to fuselage floor/bulkhead.
  (d) *Serials 2127 & subs w/ 2+1 Rear Seat:* Remove bolts, washers, and nuts securing footman loop to fuselage floor/bulkhead.

(2) Installation - Footman Loop Attach Fittings
  (a) *Serials 1005 & subs w/o 2+1 Rear Seat:* Position footman loop to fuselage floor/bulkhead and secure with screws, washers, and nuts.
  (b) *Serials 2127 & subs w/ 2+1 Rear Seat:* Position footman loop to fuselage floor/bulkhead and secure with bolts, washers, and nuts.
  (c) Install access panel CF5 and CB6. (Refer to 06-00)
  (d) Install baggage compartment carpet. (Refer to 25-10)



LEGEND
1. Baggage Strap
2. Footman Loop
3. Screw
4. Washer
5. Nut

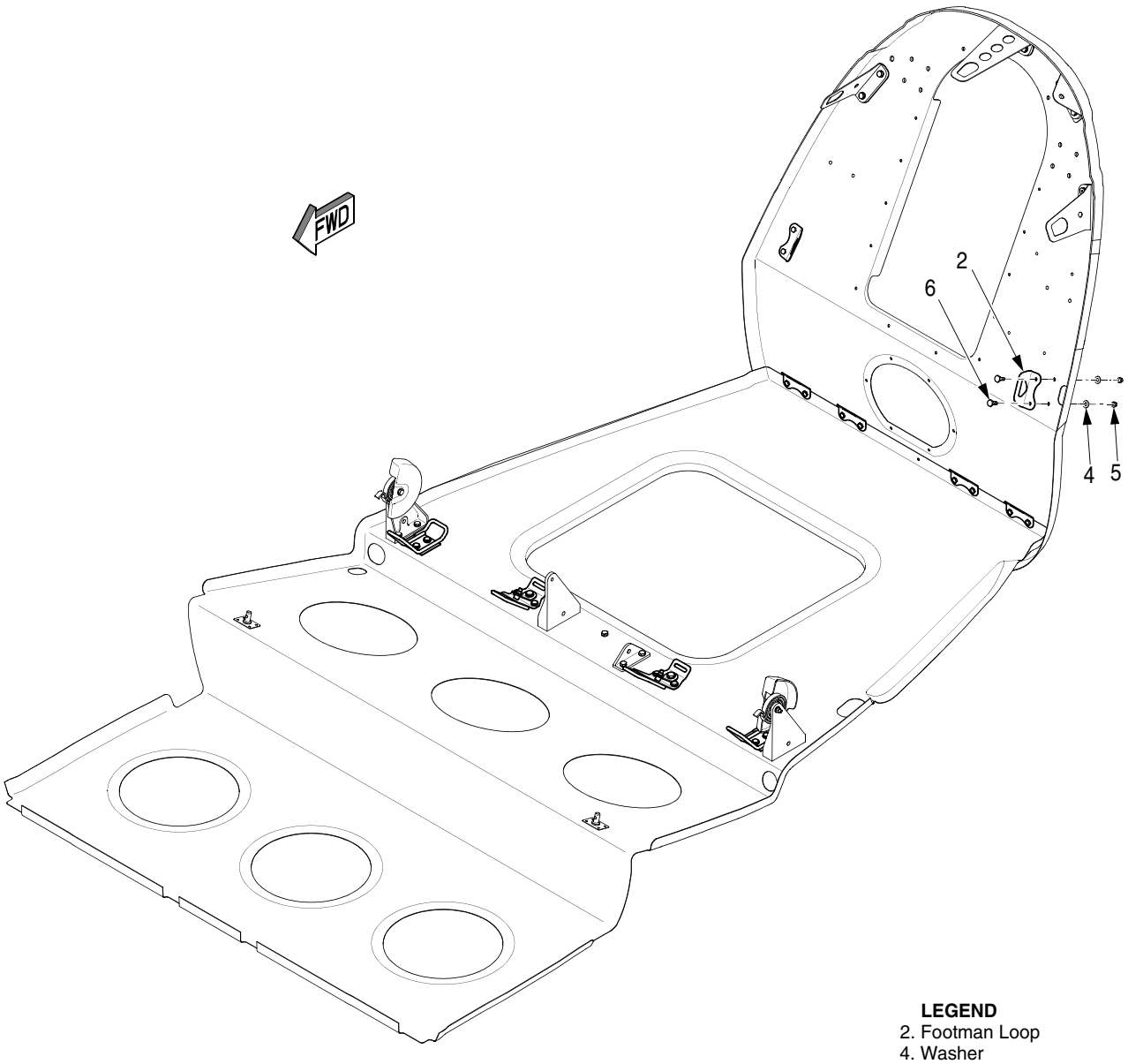
DETAIL A

Serials 1005 & subs w/o 2+1 Rear Seat.

SR20_MM53_1854A

Figure 53-402
Footman Loop Attach Fittings - Serials 1005 & subs w/o 2+1 Rear Seat (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 & subs w/o 2+1 Rear Seat



LEGEND
2. Footman Loop
4. Washer
5. Nut
6. Bolt

DETAIL B

Serials 2127 & subs w/ 2+1 Rear Seat.

SR20_MM53_3494

Figure 53-402
Footman Loop Attach Fittings - Serials 2127 & subs w/ 2+1 Rear Seat (Sheet 2 of 2)

C. Seat Belt Attach Fittings (See Figure 53-403)

(1) Removal - Seat Belt Attach Fittings

(a) Remove baggage compartment carpet. (Refer to 25-10)

(b) Remove access panel CF5. (Refer to 06-00)

(c) *Serials 2127 & subs w/ 2+1 Rear Seat:* Remove passenger seat back. (Refer to 25-10)

(d) Remove the bolts, washers, and nuts securing fittings to fuselage floor.

(2) Installation - Seat Belt Attach Fittings

(a) Place fitting into position and secure with bolts, washers, and nuts.

(b) *Serials 2127 & subs w/ 2+1 Rear Seat:* Install passenger seat back. (Refer to 25-10)

(c) Secure access panel CF5. (Refer to 06-00)

(d) Install baggage compartment carpet. (Refer to 25-10)

D. Shoulder Harness Attach Fittings (See Figure 53-403)

(1) Removal - Shoulder Harness Attach Fittings

(a) Remove baggage compartment carpet. (Refer to 25-10)

(b) Remove access panel CB6. (Refer to 06-00)

(c) Remove the bolts, washers, and nuts securing fittings to bulkhead.

(2) Installation - Shoulder Harness Attach Fittings

(a) Place fittings into position and secure with bolts, washers, and nuts.

(b) Install access panel CB6. (Refer to 06-00)

(c) Install baggage compartment carpet. (Refer to 25-10)

E. Cargo Net Attach Fittings - *Serials 2127 & subs w/ 2+1 Rear Seat* **(See Figure 53-403)**

(1) Removal - Cargo Net Attach Fittings

(a) Remove bulkhead 222 trim. (Refer to 25-10)

(b) Remove access panel CB6. (Refer to 06-00)

(c) Remove the bolts, washers, and nuts securing fittings to bulkhead.

(2) Installation - Cargo Net Attach Fittings

(a) Place fittings into position and secure with bolts, washers, and nuts.

(b) Install access panel CB6. (Refer to 06-00)

(c) Install bulkhead 222 trim. (Refer to 25-10)

F. Seat Recline Lock Fittings - *Serials 2127 & subs w/ 2+1 Rear Seat* **(See Figure 53-403)**

(1) Removal - Seat Recline Lock Fittings

(a) With no pressure on seat back, rotate passenger seat recline lever to recline position and fold seat back forward.

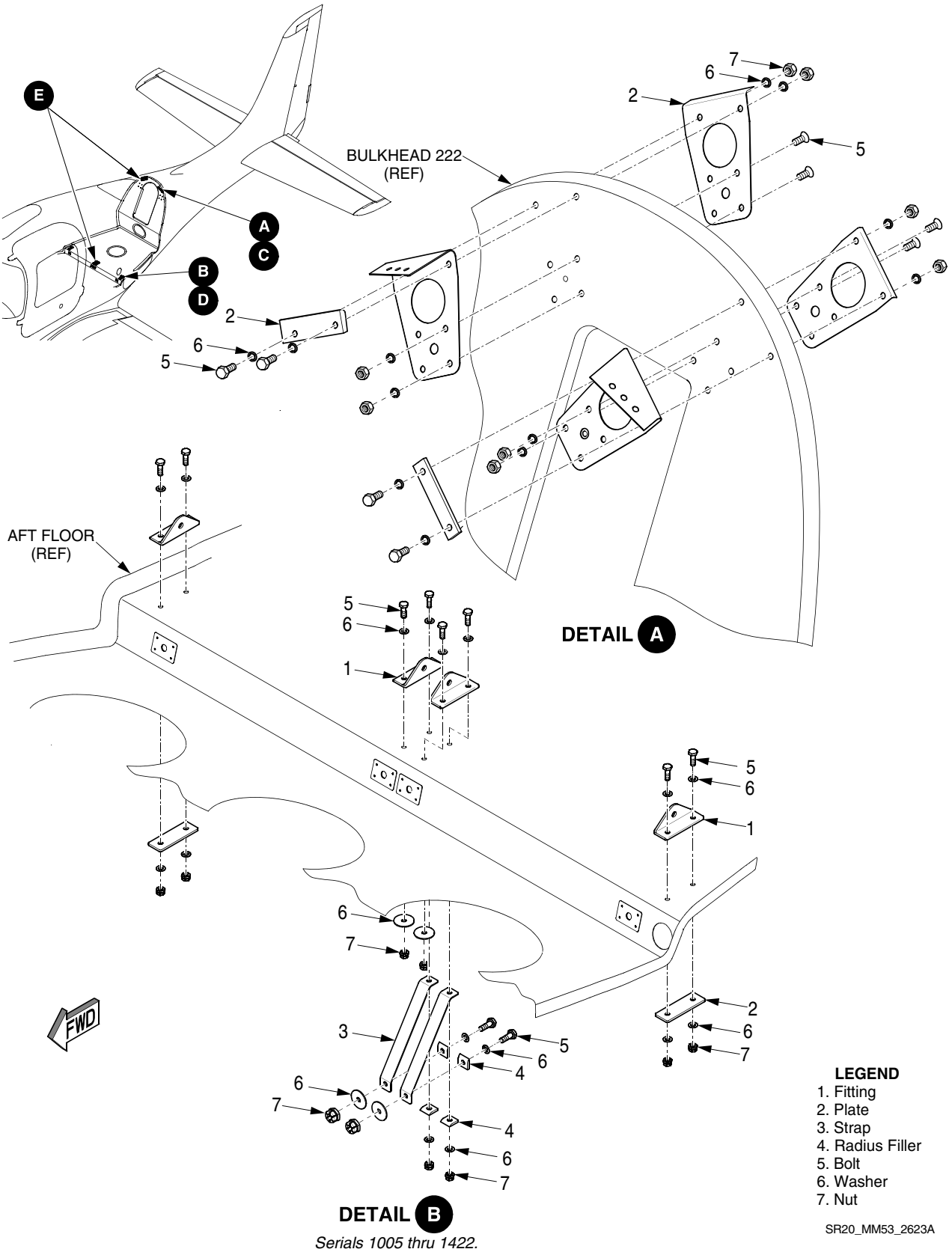
(b) Remove screws securing plate and seat recline lock fitting to rear cabin side trim.

(2) Installation - Seat Recline Lock Fittings

(a) Place seat recline lock fitting and plate into position on rear cabin side trim and secure with screws.

(b) Fold passenger seat to upright position.

EFFECTIVITY:
Serials 2127 & subs w/ 2+1 Rear Seat



Serials 1005 thru 1422.

Figure 53-403
Seat Belt and Shoulder Harness Attach Fittings - Serials 1005 thru 1422 (Sheet 1 of 3)

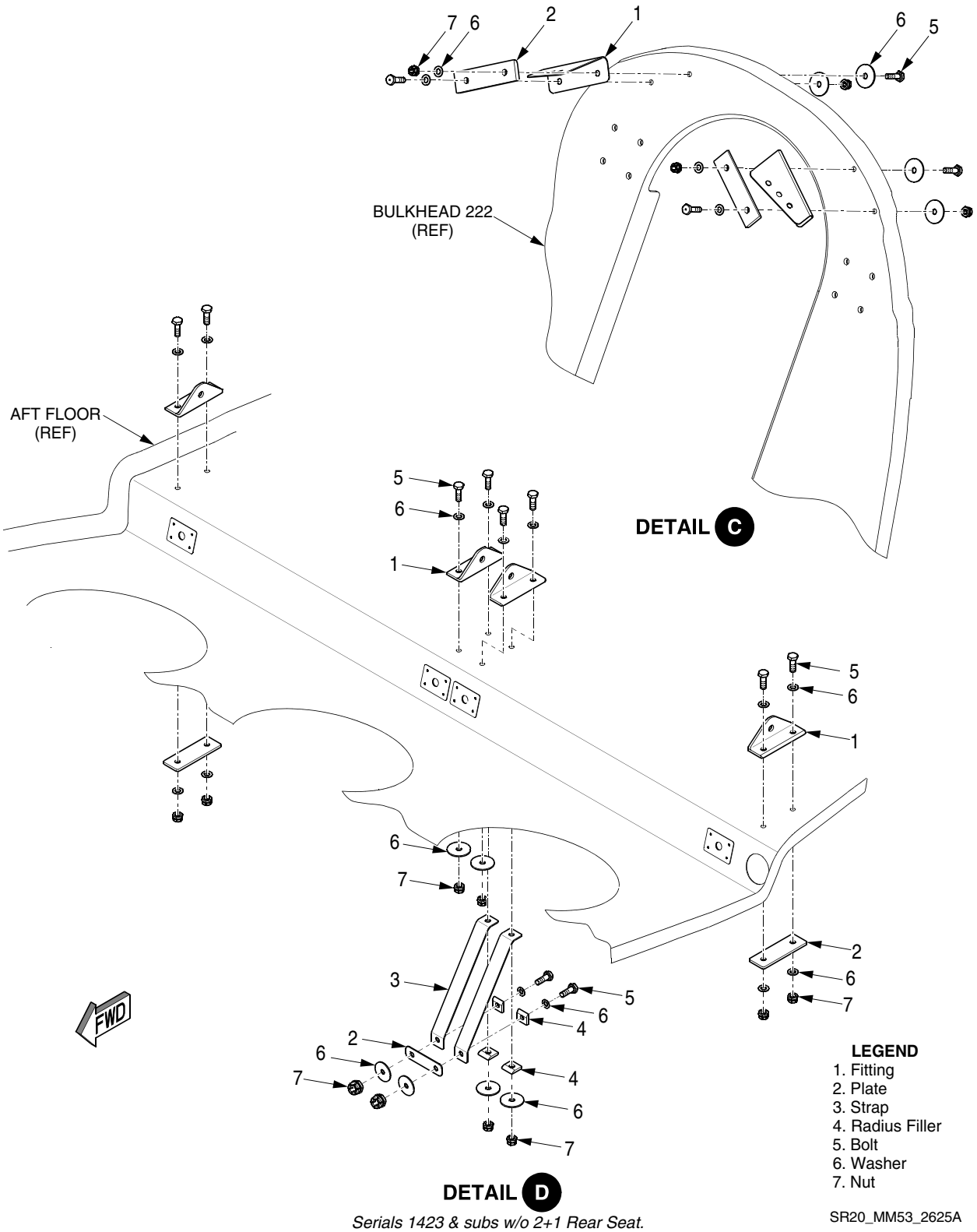
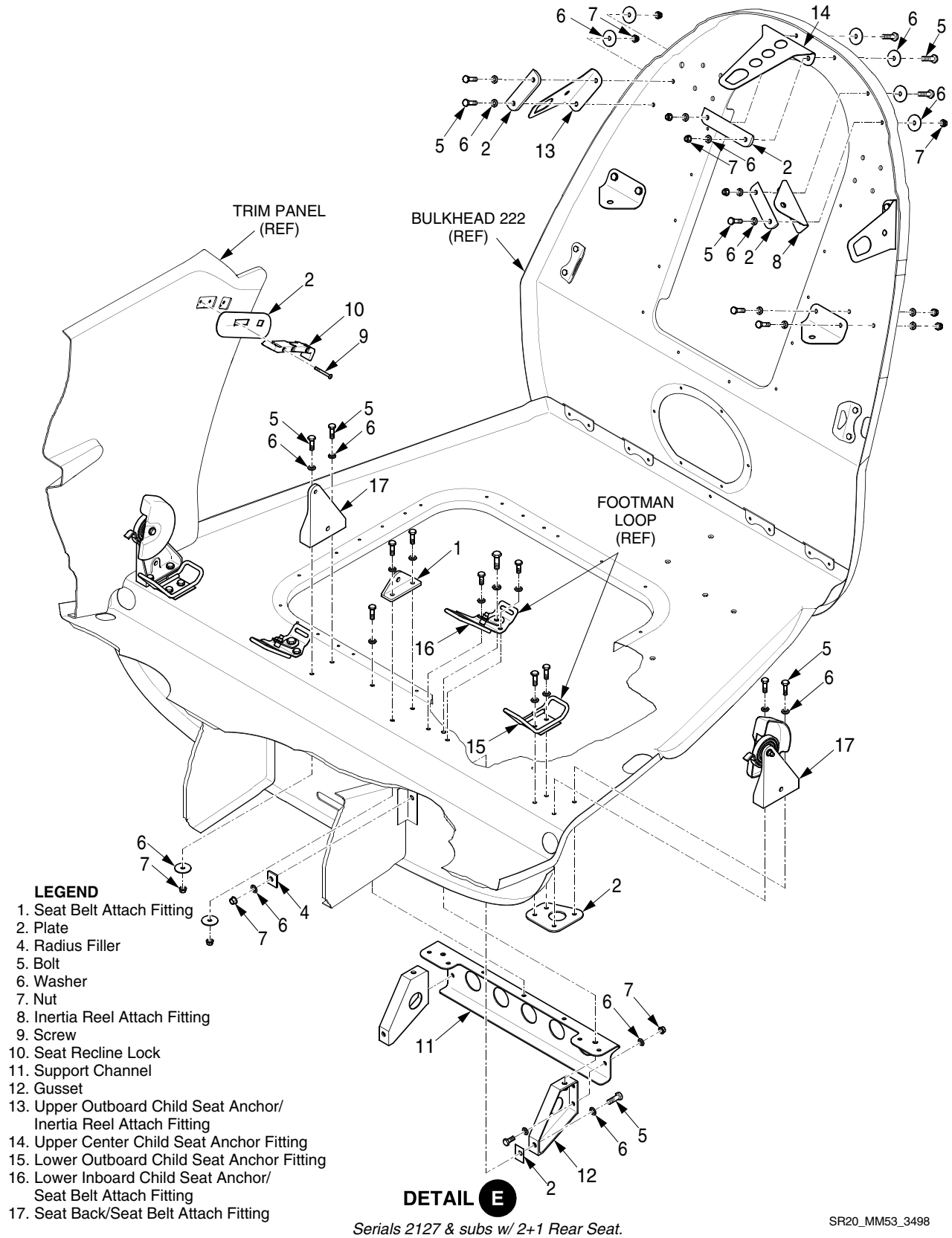


Figure 53-403
Seat Belt and Shoulder Harness Attach Fittings - Serials 1423 & subs w/o 2+1 Rear Seat (Sheet 2 of 3)

EFFECTIVITY:
Serials 1423 & subs w/o 2+1 Rear Seat



LEGEND

1. Seat Belt Attach Fitting
2. Plate
4. Radius Filler
5. Bolt
6. Washer
7. Nut
8. Inertia Reel Attach Fitting
9. Screw
10. Seat Recline Lock
11. Support Channel
12. Gusset
13. Upper Outboard Child Seat Anchor/ Inertia Reel Attach Fitting
14. Upper Center Child Seat Anchor Fitting
15. Lower Outboard Child Seat Anchor Fitting
16. Lower Inboard Child Seat Anchor/ Seat Belt Attach Fitting
17. Seat Back/Seat Belt Attach Fitting

Serials 2127 & subs w/ 2+1 Rear Seat.

Figure 53-403
Seat Belt and Harness Attach Fittings - Serials 2127 & subs w/ 2+1 Rear Seat (Sheet 3 of 3)

G. Cabin Door Attach Fittings - *Serials 1005 thru 1422* **(See Figure 53-404)**

(1) Removal - Cabin Door Hinge

(a) Remove screws, washers, and nuts securing upper door hinge to fuselage.

(b) Remove screws, shims, washers, and nuts securing lower door hinge to fuselage and side attach bracket.

(c) Remove screws, washers, and nuts securing side attach bracket to console bolster.

(2) Installation - Cabin Door Hinge

(a) Install screws, washers, and nuts securing side attach bracket to console bolster.

(b) Install screws, shims, washers, and nuts securing lower door hinge to fuselage and side attach bracket.

(c) Install screws, washers, and nuts securing upper door hinge to fuselage.

(3) Removal - Cabin Door Pin Receiver

The pin receiver has four wear surfaces available. The pin receiver can be rotated to the new wear surface and then resealed with a white latex caulk.

Note: An alternate pin receiver is available. The alternate pin receiver has the receiver hole offset to one side. This offset pin receiver can be used if it's impossible to latch the door with the standard pin receiver.

(a) Remove the cabin headliner. (Refer to 25-10)

(b) Remove the screw, washer, spring, and washer from the pin receiver.

(c) Push pin receiver out.

(4) Installation - Cabin Door Pin Receiver

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sealant w/ Semkit Applicator	(Refer to 51-30)	(Refer to 51-30)	Seal pin receiver.

(b) Solvent clean pin receiver mating surfaces with isopropyl alcohol. (Refer to 20-30)

(c) Apply a thin coat of sealant on the pin receiver mating surfaces.

CAUTION: Never overtighten the pin receiver. Overtightening of the pin receiver may cause the pin receiver to break.

(d) Place the pin receiver into position and secure with washer, spring, washer, and screw.

Note: If the pin receiver is of the eccentric type, the pin receiver can be rotated to allow the door skin to fit flush with the fuselage skin.

(e) Install cabin headliner. (Refer to 25-10)

(5) Removal - Cabin Door Gas Strut Bracket

(a) Remove screws, spacers, washers, and nuts securing gas strut bracket to fuselage.

(6) Installation - Cabin Door Gas Strut Bracket

(a) Install screws, spacers, washers, and nuts securing gas strut bracket to fuselage.

(7) Removal - Cabin Door Seals

(a) Remove the seal from the fuselage by pulling them up and away from the fuselage.

(8) Installation - Cabin Door Seals

(a) Solvent clean the seal mating area with isopropyl alcohol. (Refer to 20-30)

(b) Starting at the center of the lower door frame, place one end of the seal into position.

(c) Press seal firmly over the door frame making sure that the ends of the seal butt together.

Note: If the door seal doesn't seal tight against the door, shim the door seal by applying teflon tape under the door seal in the appropriate area.

(d) After installation, clean door seals with a cloth slightly dampened with isopropyl alcohol.

(9) Cleaning - Cabin Door Seals

Periodically clean door seals with isopropyl alcohol to ensure proper seal.

(10) Inspection/Check - Cabin Door Seals (See Figure 53-405)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Utility Knife	-	Any Source	Cut slits in door seal.

(b) Open and close cabin door.

Note: Trapped, unvented air in cabin door seal bulb may prevent cabin door seal from flexing under closed spacing between door and jam, interfering with cabin door closure.

(c) If door closure is difficult, vent existing cabin door trim.

1 On outside perimeter of installed cabin door seal, use utility knife to cut eleven 1.0 inch (2.5 cm) slits in cabin door seal bulb (three on upper side, three on forward side, three on aft side, and three on lower side).

Note: Existing slits may be present.

2 Verify cabin door closure is improved.

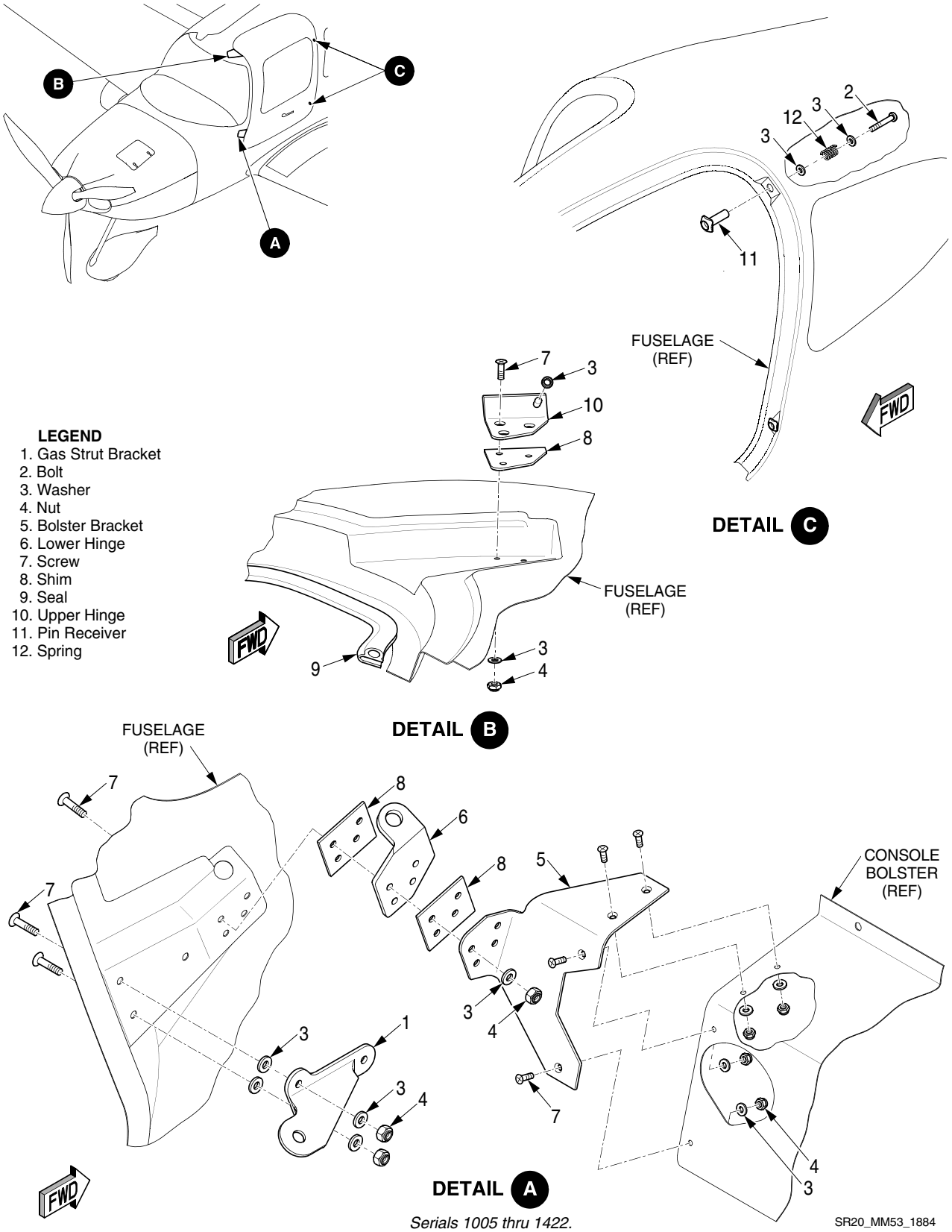
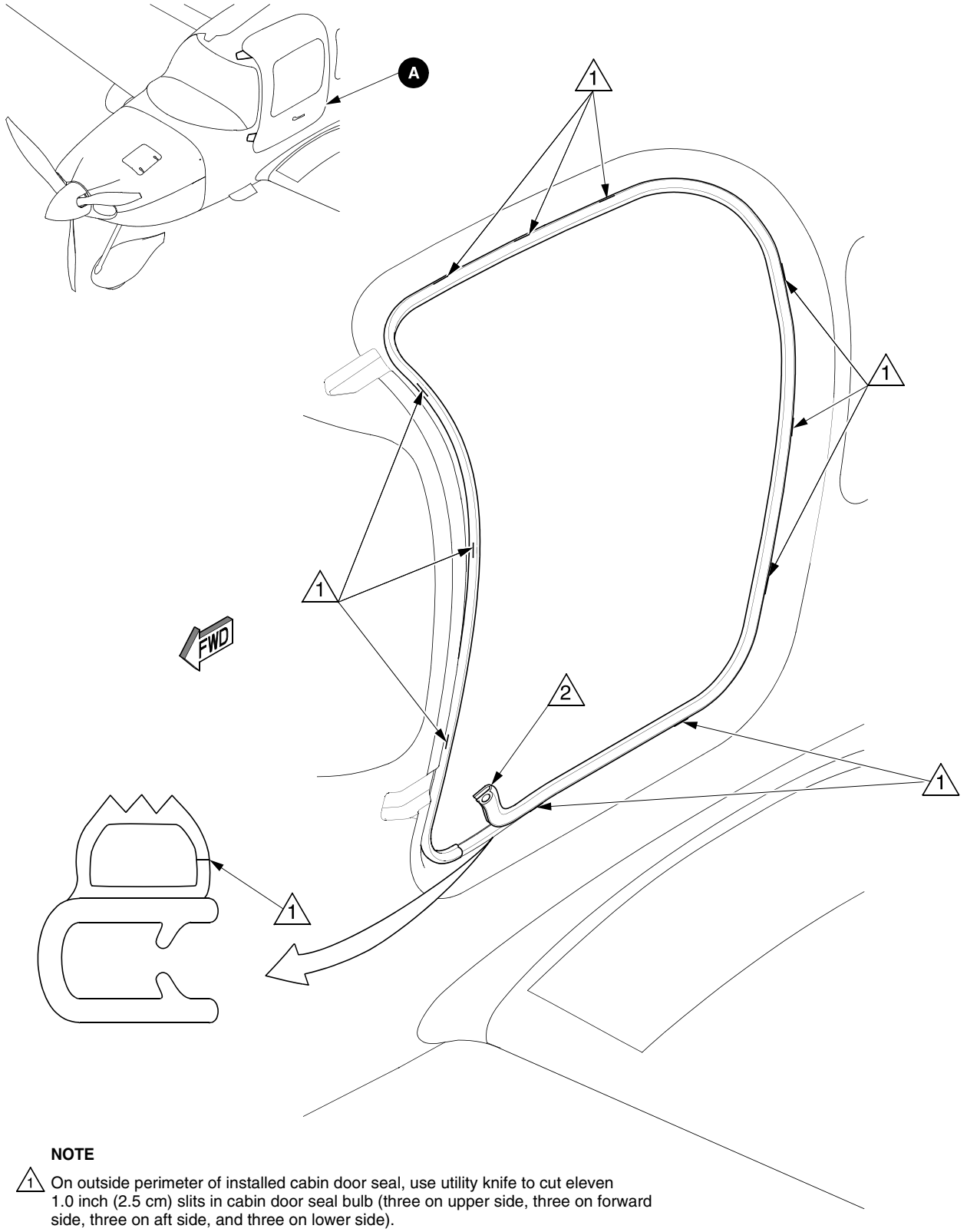


Figure 53-404
Cabin Door Attach Fittings - Serials 1005 thru 1422

EFFECTIVITY:
Serials 1005 thru 1422



NOTE

1. On outside perimeter of installed cabin door seal, use utility knife to cut eleven 1.0 inch (2.5 cm) slits in cabin door seal bulb (three on upper side, three on forward side, three on aft side, and three on lower side).

2. Door seal shown removed for clarity only.

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Figure 53-405
Cabin Door Seal Inspection/Check - Serials 1005 thru 1422

H. Cabin Door Attach Fittings - *Serials 1423 & subs* (See Figure 53-406)

(1) Removal - Cabin Door Hinge
  (a) Remove screws securing upper door hinge to fuselage.
  (b) Remove screws securing lower door hinge to fuselage.
(2) Installation - Cabin Door Hinge
  (a) Install screws securing upper door hinge to fuselage.
  (b) Install screws securing lower door hinge to fuselage.
(3) Removal - Cabin Door Striker Pin
  (a) Loosen edges of sidewall air duct and rear cabin side trim from door jamb. (Refer to 25-10)
  (b) For upper installation, remove bolt, washer, and bushings securing striker pin to fuselage.
  (c) For lower installation, remove bolt, washers, and bushing securing striker pin to fuselage.
  (d) Carefully remove spacer from striker pin.
(4) Installation - Cabin Door Striker Pin
  (a) Slide spacer over right angled post of striker pin and press grooved section of spacer onto base of striker pin.

    CAUTION: Verify bolt has threaded engagement on striker pin a minimum of five full turns.

  (b) For lower installation, secure striker pin to fuselage with bolt, washers, and bushing. Torque to 25.0-30.0 in-lb (2.8-3.3 Nm).
  (c) For upper installation, secure striker pin to fuselage with bolt, washer, and bushings. Torque to 25.0-30.0 in-lb (2.8-3.3 Nm).
  (d) Perform Adjustment - Cabin Door Striker Pin. (Refer to 53-40)
(5) Adjustment - Cabin Door Striker Pin (See Figure 53-407)
  (a) Loosen edges of sidewall air duct and rear cabin side trim from door jamb. (Refer to 25-10)
  (b) From inside the cabin, slowly close the cabin door and note the alignment of the striker pin with the door latch.
  (c) If the striker pin is centered with the door latch, pull the door to a closed position to verify that the latch engages normally.
  (d) If the striker pin is off-center with the door latch, adjust the striker pin.

    Note: To facilitate striker pin alignment, it is not necessary to disassemble and remove striker pin.

    1 Loosen bolt securing striker pin to fuselage enough to allow adjustment of striker pin.

      CAUTION: Ensure that the striker pin retains its orientation during adjustment.

    2 Rotate bushings to align the striker pin with the door latch.
    3 Tighten bolt securing striker pin to fuselage.
  (e) Secure edges of sidewall air duct and rear cabin side trim to door jamb. (Refer to 25-10)
(6) Removal - Cabin Door Gas Strut Bracket
  (a) Remove cabin door gas strut. (Refer to 52-10)
  (b) Remove screws, washers, and nuts securing gas strut bracket to fuselage.
(7) Installation - Cabin Door Gas Strut Bracket
  (a) Install screws, washers, and nuts securing gas strut bracket to fuselage.
  (b) Install cabin door gas strut. (Refer to 52-10)
(8) Removal - Cabin Door Seals

EFFECTIVITY:
Serials 1423 & subs

(a) Remove the seal from the fuselage by pulling them up and away from the fuselage.

(9) Installation - Cabin Door Seals

(a) Solvent clean the seal mating area with isopropyl alcohol. (Refer to 20-30)

(b) Starting at the center of the lower door frame, place one end of the seal into position.

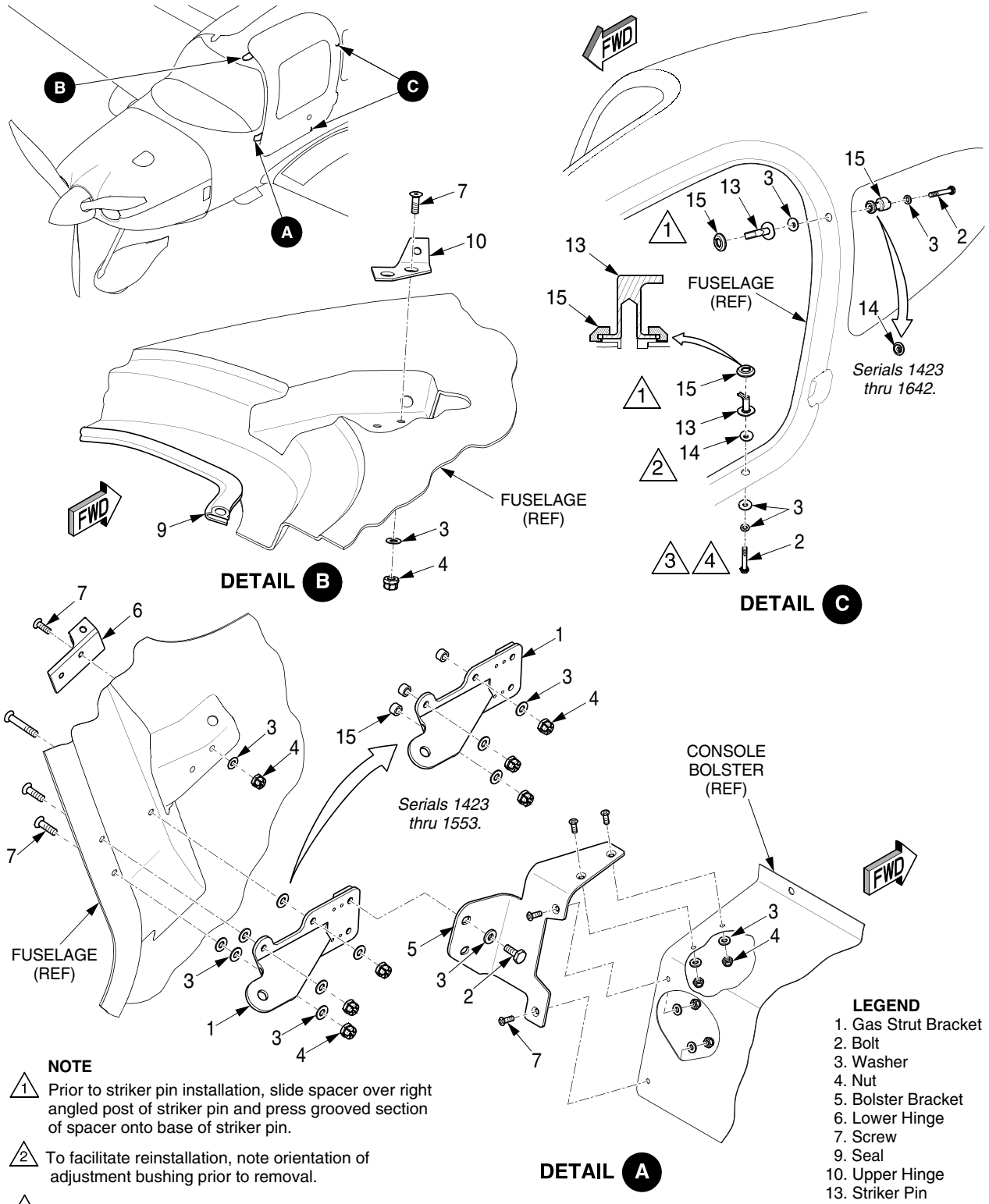
(c) Press seal firmly over the door frame making sure that the ends of the seal butt together.

Note: If the door seal doesn't seal tight against the door, shim the door seal by applying teflon tape under the door seal in the appropriate area.

(d) After installation, clean door seals with a cloth slightly dampened with isopropyl alcohol.

(10) Cleaning - Cabin Door Seals

Periodically clean door seals with isopropyl alcohol to ensure proper seal.



NOTE

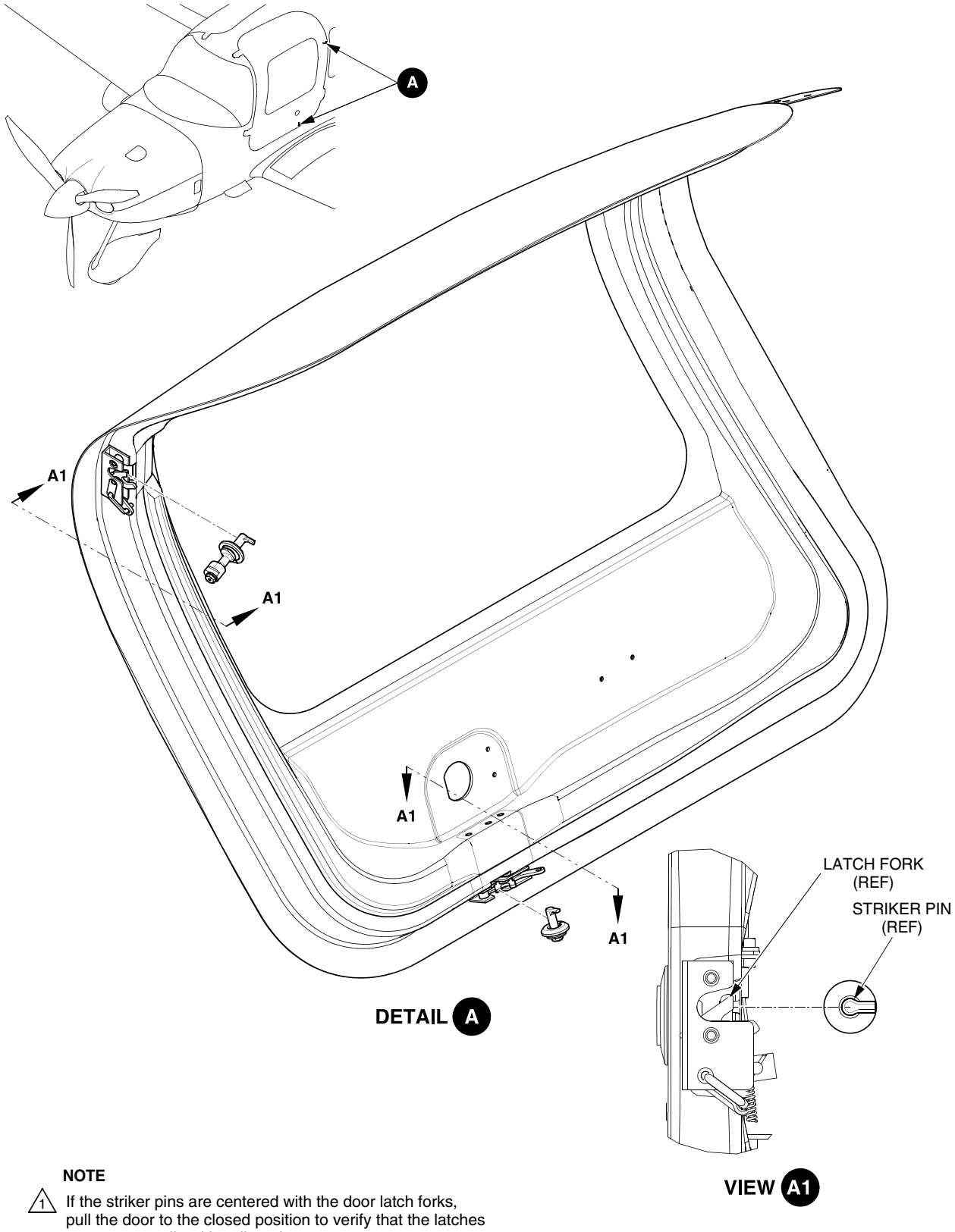
1. Prior to striker pin installation, slide spacer over right angled post of striker pin and press grooved section of spacer onto base of striker pin.
2. To facilitate reinstallation, note orientation of adjustment bushing prior to removal.
3. Use clean brushes to apply primer and Loctite on striker pin bolt threads.
4. Verify bolt has threaded engagment on striker pin a minimum of five full turns. Torque to 25.0 - 30.0 in-lb (2.8 - 3.3 Nm).

LEGEND

1. Gas Strut Bracket
2. Bolt
3. Washer
4. Nut
5. Bolster Bracket
6. Lower Hinge
7. Screw
9. Seal
10. Upper Hinge
13. Striker Pin
14. Bushing
15. Spacer

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Figure 53-406
Cabin Door Attach Fittings - Serials 1423 & subs



NOTE

1 If the striker pins are centered with the door latch forks, pull the door to the closed position to verify that the latches engage normally with striker pins.

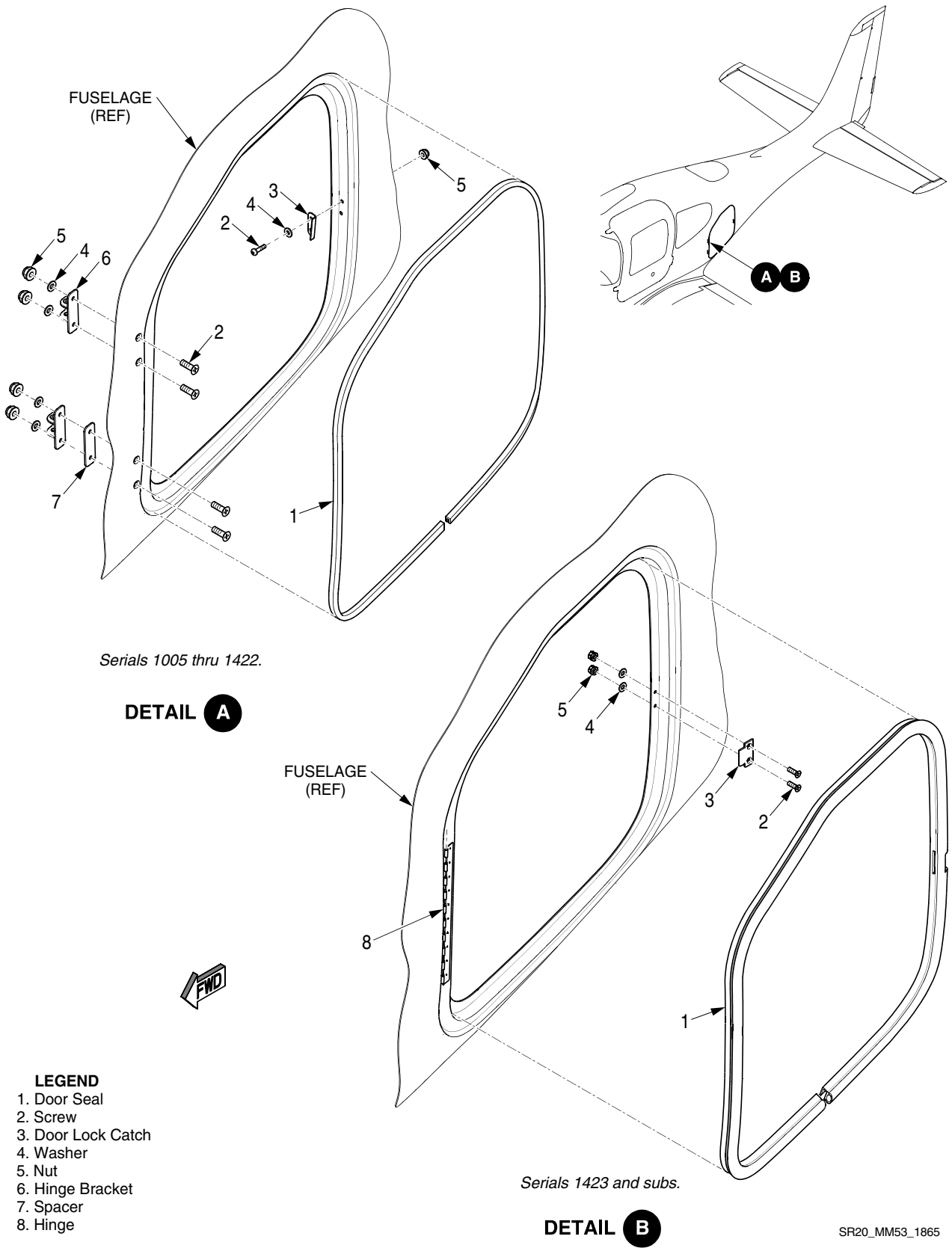
Figure 53-407
Cabin Door Striker Pin Adjustment - Serials 1423 & subs

I. Baggage Door Attach Fittings (See Figure 53-408)

Note: For maintenance practices pertinent to the baggage door seal, refer to cabin door seal procedures previously described in “Cabin Door Attach Fittings”. (Refer to 53-40)

(1) Removal - Baggage Door Attach Fittings
   (a) Serials 1005 thru 1422: Remove screws, washers, and nuts securing hinge brackets to the fuselage.
   (b) *Serials 1423 & subs:* Remove aft section of door seal to uncover baggage door lock catch.
   (c) Remove screws, washers, and nuts securing baggage door lock catch to the fuselage.

(2) Installation - Baggage Door Attach Fittings
   (a) Install screws, washers, and nuts securing baggage door lock catch to the fuselage.
   (b) *Serials 1423 & subs:* Align slot in aft section of the door seal over the baggage door lock catch, and install aft section of door seal to conceal baggage door lock catch.
   (c) *Serials 1005 thru 1422:* Install screws, washers, and nuts securing hinge brackets to the fuselage.



LEGEND
1. Door Seal
2. Screw
3. Door Lock Catch
4. Washer
5. Nut
6. Hinge Bracket
7. Spacer
8. Hinge

Figure 53-408
Baggage Door Attach Fittings

J. Lower Mount Attach Fittings - *Serials 1423 thru 2064* **(See Figure 53-409)**

(1) Removal - Lower Mount Attach Fittings

(a) Remove bolts, washers, and nuts securing bridge to fire barrier and firewall.

(b) Remove bolts, washers, and nuts securing plate, fire barrier, and insulation to firewall.

(2) Installation - Lower Mount Attach Fittings

CAUTION: Make sure insulation is not between fire barrier and firewall where bolts, washers, and nuts secure bridge to the fire barrier and firewall.

(a) Position insulation between fire barrier and firewall.

CAUTION: Position plate so that exhaust hanger holes are located outboard.

(b) Install bolts, washers, and nuts securing plate, fire barrier, and insulation to firewall.

(c) Install bolts, washers, and nuts securing bridge to fire barrier and firewall.

(3) Inspection/Check - Attach Fitting Corrosion

(a) Remove engine cowling. (Refer to 71-10)

(b) Inspect Lower Mount Attach Fittings for corrosion.

(c) If corrosion present:

1 Remove corroded part. (Refer to 53-40)

2 Measure thickness of uncorroded part near corroded area to determine baseline measurement.

3 Remove corrosion using mechanical means.

4 Measure material thickness and compare to baseline measurement.

Allowable Corrosion Limits:

- Plate, Lower Engine Attach: 10% of material thickness
- Bridge, Lower Engine Attach: 20% of material thickness on mating surfaces to the firewall and engine mount attach plate. 10% material thickness on all other surfaces of the part.

5 If thickness falls within allowables, mask all holes and apply paint to inspection area. (Refer to 51-20)

6 If thickness falls within allowables, replace part.

7 Install refurbished/replaced part. (Refer to 53-40)

(d) If corrosion not present, no further action required.

(e) Install engine cowling. (Refer to 71-10)

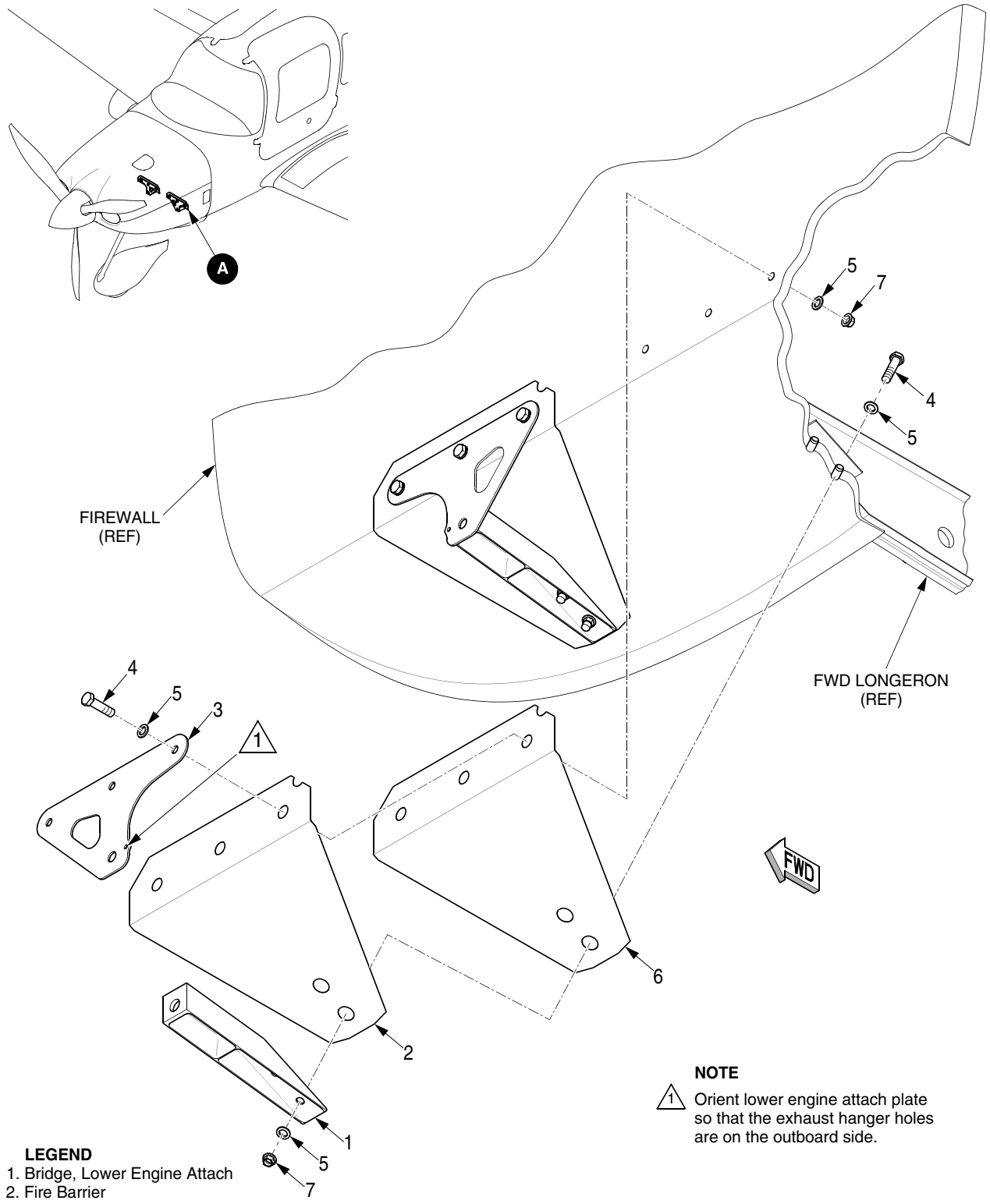


Figure 53-409
Lower Mount Attach Fittings - Serials 1423 thru 2064

K. Lower Mount Attach Fittings - *Serials 2065 & subs* **(See Figure 53-4010)**

(1) Removal - Lower Mount Attach Fittings

(a) Remove cabin access panels CF1L and CF1R. (Refer to 06-00)

(b) Remove engine mount weldment. (Refer to 71-20)

(c) Remove bolt, radius filler, washers, and nuts securing lower mount attach fitting to firewall and bridge.

(d) Remove bolts, washers, and nuts securing bridge to fuselage floor.

(2) Installation - Lower Mount Attach Fittings

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.

(b) Position bridge to fuselage floor and secure with bolts, washers, and nuts.

(c) Apply thin coat of sealant to faying surface of lower mount attach fitting.

(d) Position lower mount attach fitting to firewall and secure to bridge with bolt, radius filler, washers, and nuts. Torque upper nut to 100 - 140 in-lb (11.3 - 15.8 Nm). Torque lower nut to 150 - 170 in-lb (16.9 - 19.2 Nm).

(e) Install engine mount weldment. (Refer to 71-20)

(f) Install cabin access panels CF1L and CF1R. (Refer to 06-00)

L. Exhaust Hanger Brackets - *Serials 2065 & subs* (See Figure 53-4010)

(1) Removal - Exhaust Hanger Brackets

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove extension spring securing tailpipe to exhaust hanger bracket.

(c) Remove bolts and washers securing exhaust hanger bracket to firewall.

(2) Installation - Exhaust Hanger Brackets

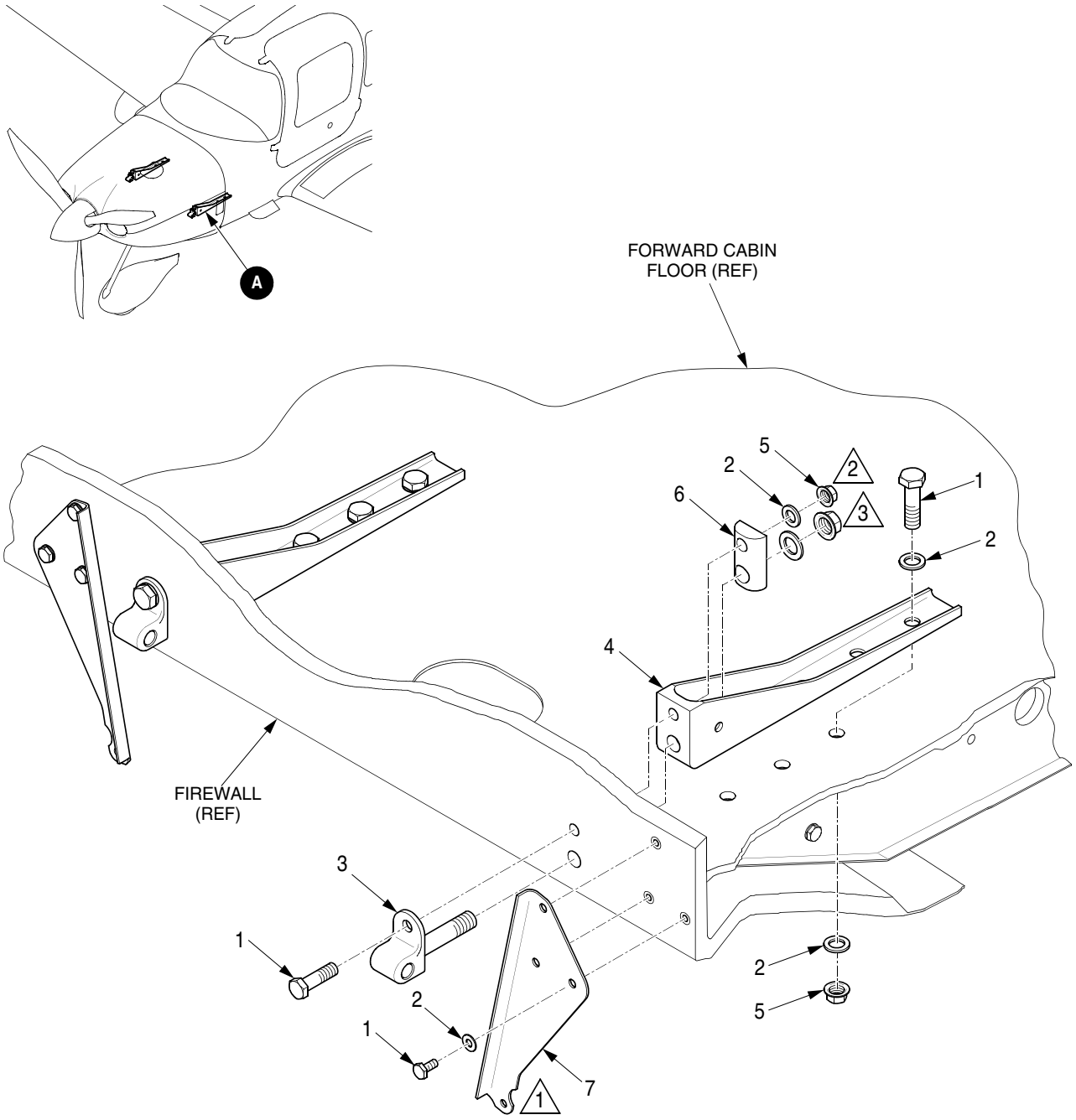
(a) Install bolts and washers securing exhaust hanger bracket to firewall.

Note: Exhaust hanger bracket may be bent as required to provide minimum clearance of 0.3 inch (7.6 mm) from cowling, muffler, heat exchanger, and tailpipes.

(b) Install extension spring securing tailpipe to exhaust hanger bracket.

(c) Adjust tailpipe on muffler or heat exchanger port as required to ensure at aft end of tailpipe there is 2.0 - 3.5 inch (5.1 - 8.9 cm) of clearance between top of tailpipe and belly of airplane. (See Figure 78-202)

(d) Install engine cowling. (Refer to 71-10)



NOTE

1. Exhaust hanger bracket may be bent as required to provide minimum clearance of 0.3 inch (7.6 mm) from cowling, muffler, heat exchanger, and tailpipes.
2. Torque upper nut to 100 - 140 in-lb (11.3 - 15.8 Nm).
3. Torque lower nut to 150 - 170 in-lb (16.9 - 19.2 Nm).

LEGEND

1. Bolt
2. Washer
3. Lower Mount Attach Fitting
4. Bridge
5. Nut
6. Radius Filler
7. Exhaust Hanger Bracket

DETAIL A

SR20_MM53_3371A

Serials 2065 & subs w/ Perspective Avionics.

Figure 53-4010
Lower Mount Attach Fittings - Serials 2065 & subs

EFFECTIVITY:
Serials 2065 & subs

M. Battery 1 Bracket (See Figure 53-4011)

(1) Removal - Battery 1 Bracket

(a) Remove battery 1. (Refer to 24-30)

(b) Remove bolts, washers, and clamps securing battery cable to battery bracket.

(c) Remove screw, washers, and nut securing relay to battery bracket.

(d) Remove bolts, washers, and nuts securing battery bracket to firewall. Remove battery bracket from airplane.

(2) Installation - Battery 1 Bracket

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Sealant	(Refer to 51-30)	(Refer to 51-30)	Sealant.

(b) Position battery bracket to firewall and secure with bolts, washers, and nuts.

(c) Position relay to battery bracket and secure with screw, washers, and nut.

(d) Position battery cable and clamps to battery bracket and secure with bolts and washers.

(e) Install battery 1. (Refer to 24-30)

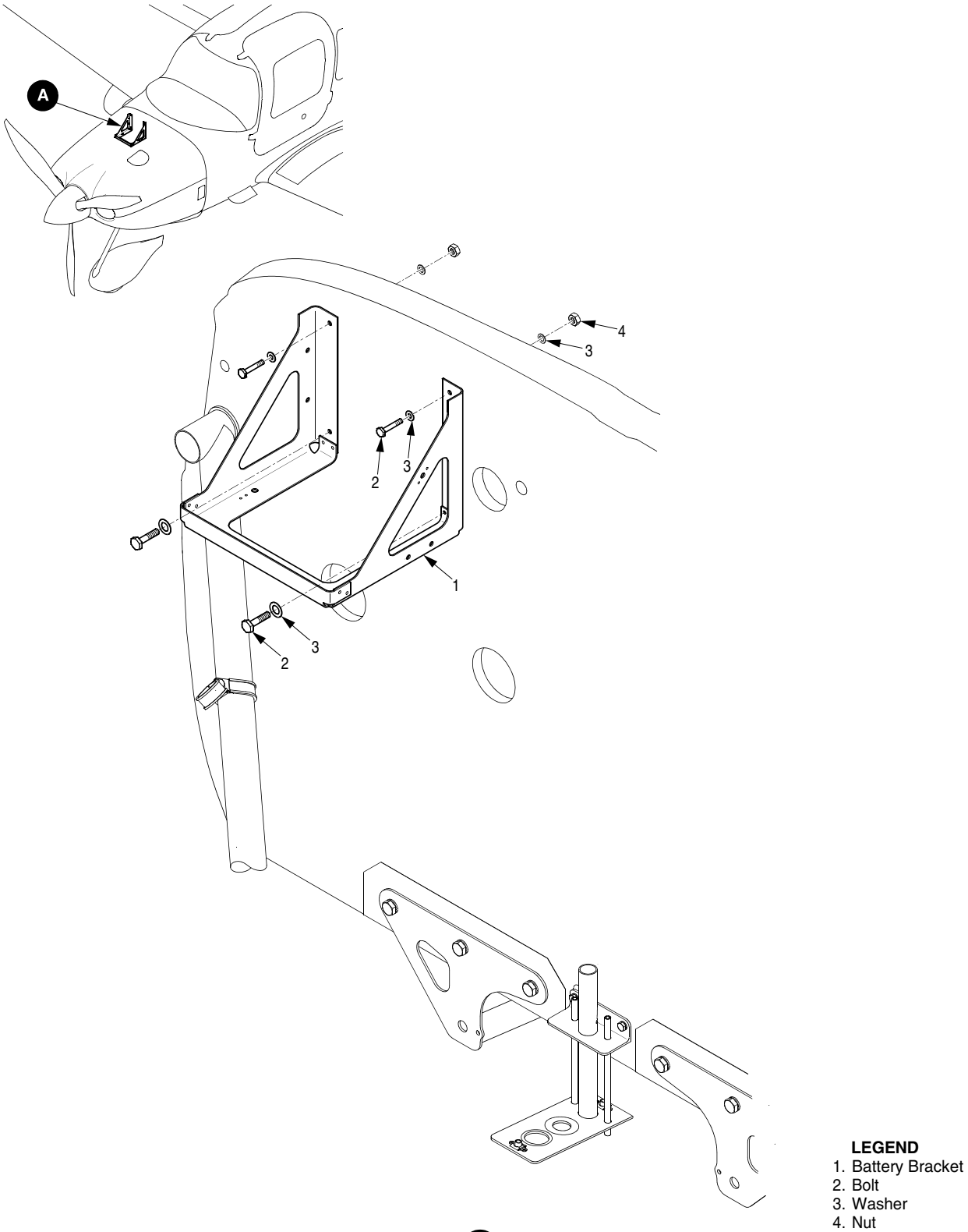


Figure 53-4011
Battery Bracket Installation

N. Pitch Servo Attach Fittings - *Serials 1886 & subs* **(See Figure 53-4012)**

(1) Removal - Pitch Servo Attach Fittings

(a) Remove pitch servo. (Refer to 22-12)

(b) Remove access panel CF4C. (Refer to 06-00)

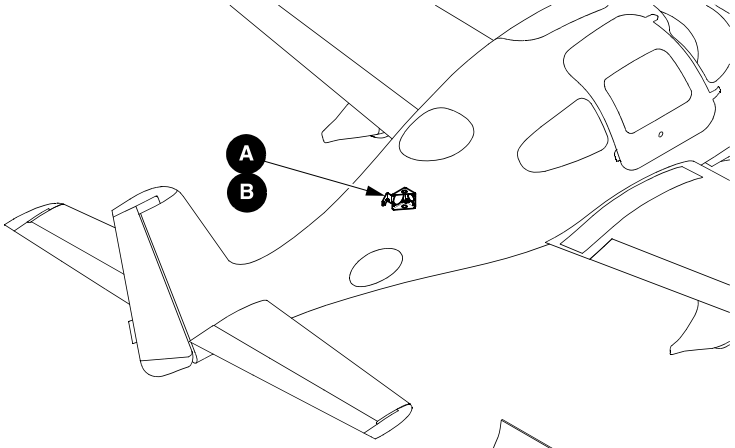
(c) Remove bolts and washers securing pitch servo bracket to FS 186 bulkhead.

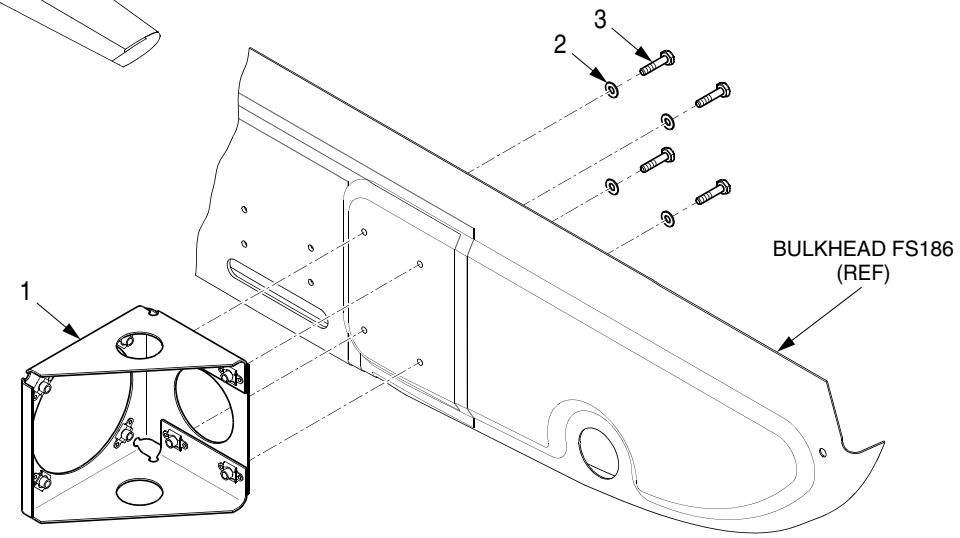
(2) Installation - Pitch Servo Attach Fittings

(a) Position pitch servo bracket to FS 186 bulkhead and secure with bolts and washers.

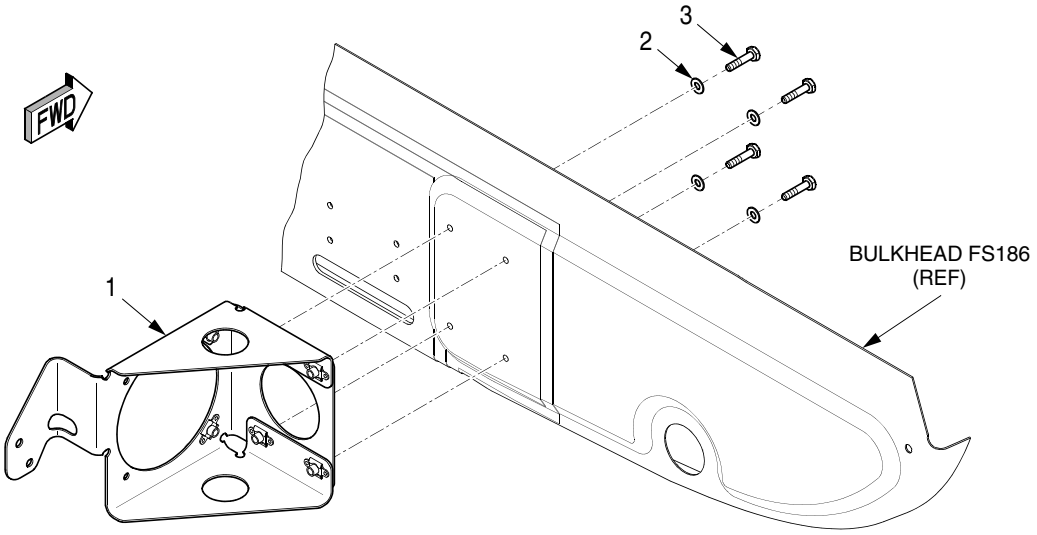
(b) Install access panel CF4C. (Refer to 06-00)

(c) Install pitch servo. (Refer to 22-12)





Serials 1878, 1886 & subs
w/o Air Conditioning & w/ System 55.



Serials 2065 & subs
w/ Air Conditioning & w/ System 55.

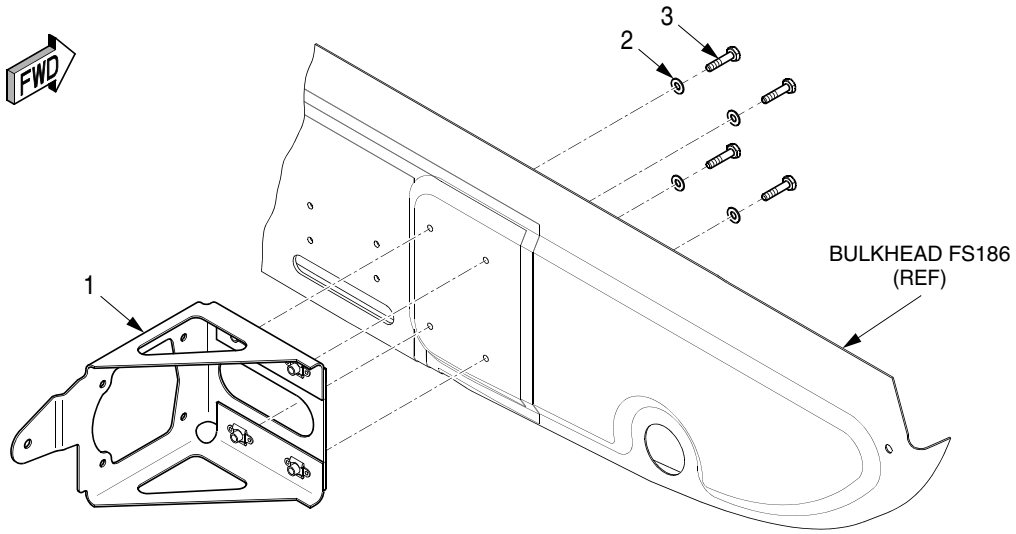
DETAIL A

LEGEND
1. Bracket
2. Washer
3. Bolt

SR20_MM53_2845B

Figure 53-4012
Pitch Servo Attach Fittings - Serials 1886 & subs w/ System 55 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1886 & subs w/ System 55



LEGEND
1. Bracket
2. Washer
3. Bolt

DETAIL B

Serials 2016 & subs w/ GFC 700.

SR20_MM53_2850A

Figure 53-4012
Pitch Servo Attach Fittings - Serials 2016 & subs w/ GFC 700 (Sheet 2 of 2)

O. Roll Servo Attach Fittings - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 53-4013)**

(1) Removal - Roll Servo Attach Fittings

(a) Remove roll servo. (Refer to 22-13)

(b) Remove adel clamp and cable ties securing wire harness to roll servo brackets.

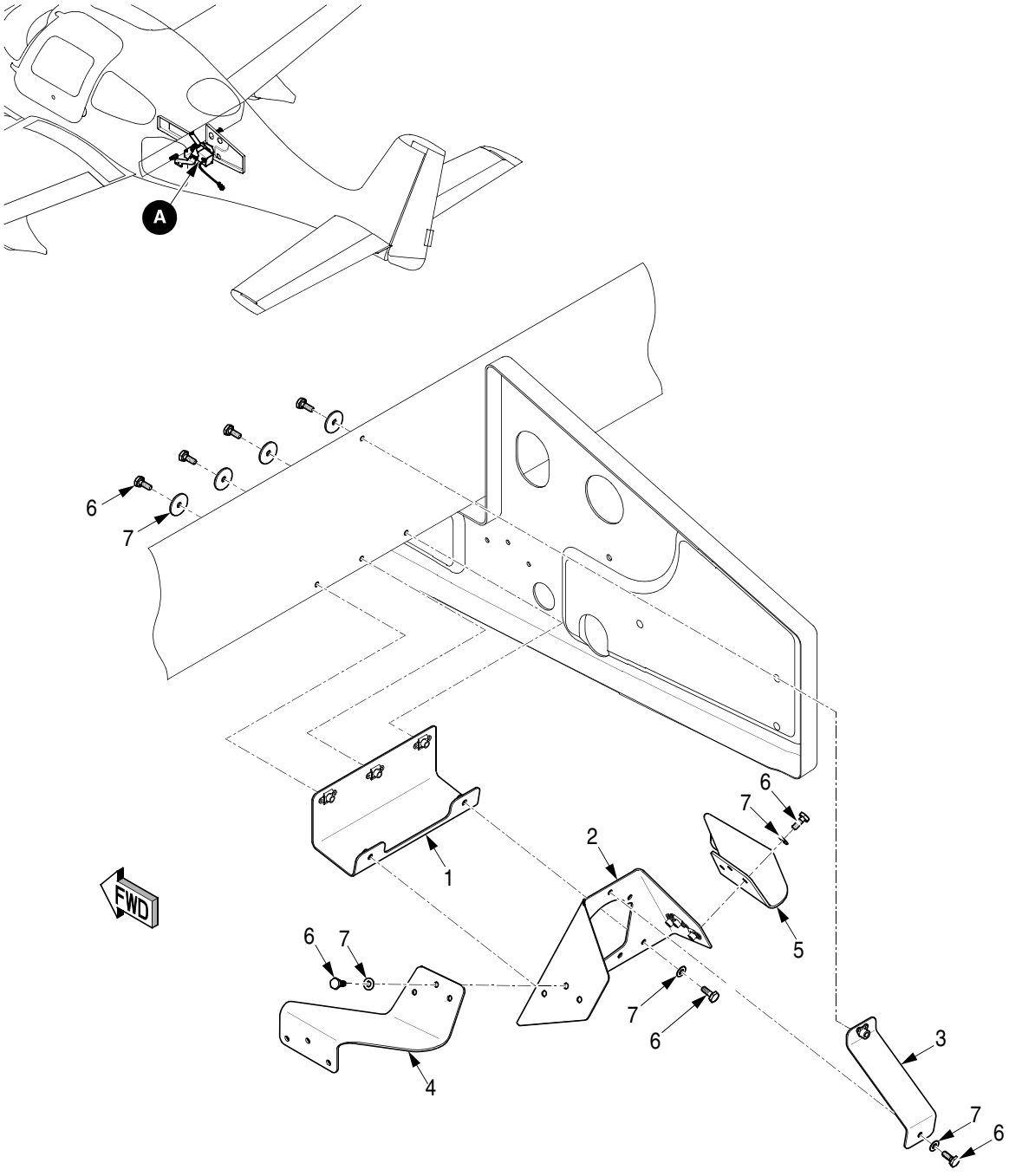
(c) Remove bolts and washers securing roll servo brackets to LH and RH aft longeron and vertical face of aft floor.

(2) Installation - Roll Servo Attach Fittings

(a) Position and secure roll servo brackets to LH and RH aft longeron and vertical face of aft floor with bolts and washers.

(b) Install adel clamp and cable ties securing wire harness to roll servo brackets.

(c) Install roll servo. (Refer to 22-13)



LEGEND
1. Bracket, Bottom
2. Bracket, Main
3. Forward Strap
4. Bracket, Left Side Pulley
5. Bracket, Right Side Pulley
6. Bolt
7. Washer

DETAIL A

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM53_2847

Figure 53-4013
Roll Servo Attach Fittings - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

P. Relay Mounting Plate (See Figure 53-4014)

(1) Removal - Flap Relay Mounting Plate

(a) Pull FLAPS, ROLL TRIM, and PITCH TRIM circuit breakers.

(b) Remove rear passenger seats. (Refer to 25-10)

(c) *Serials 1005 thru 1422:* Remove access panels CF4C and CF4R. (Refer to 06-00)

(d) *Serials 1423 & subs:* Remove access panels CF3C, CF3R, CF4C, and CF4R. (Refer to 06-00)

(e) Disconnect flap CCA connector.

(f) *Serials 1005 thru 1422:* Remove bolts, spacers, washers, and nuts securing mounting plate to trailing edge of RH inboard longeron.

(g) *Serials 1423 & subs:* Remove bolts, spacers, washers, and nuts securing aft mounting plate to trailing edge of RH inboard longeron.

(h) *Serials 1423 & subs:* Remove bolts, spacers, washers, and nuts securing forward mounting plate to leading edge of RH inboard longeron.

(2) Install - Flap Relay Mounting Plate

(a) *Serials 1005 thru 1422:* Position mounting plate to trailing edge of RH inboard longeron and install bolts, spacers, washers, and nuts securing mounting plate to longeron.

(b) *Serials 1423 & subs:* Position aft mounting plate to trailing edge of RH inboard longeron and install bolts, spacers, washers, and nuts securing aft mounting plate to longeron.

(c) *Serials 1423 & subs:* Position forward mounting plate to leading edge of RH inboard longeron and install bolts, spacers, washers, and nuts securing forward mounting plate to longeron.

(d) Connect flap CCA connector.

(e) *Serials 1005 thru 1422:* Install access panels CF4C and CF4R. (Refer to 06-00)

(f) *Serials 1423 & subs:* Install access panels CF3C, CF3R, CF4C and CF4R. (Refer to 06-00)

(g) Install rear passenger seats. (Refer to 25-10)

(h) Reset FLAPS, ROLL TRIM, and PITCH TRIM circuit breaker.

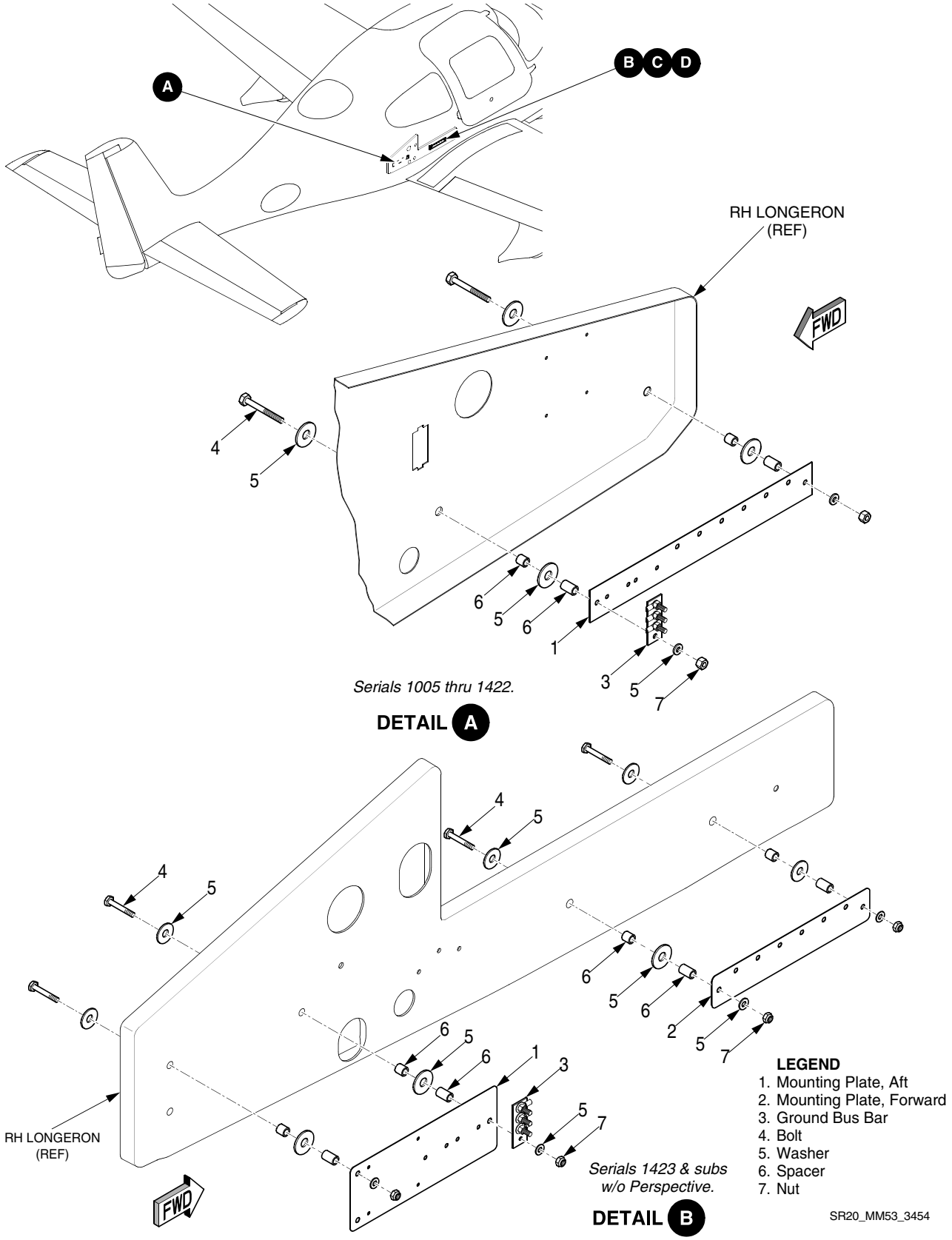
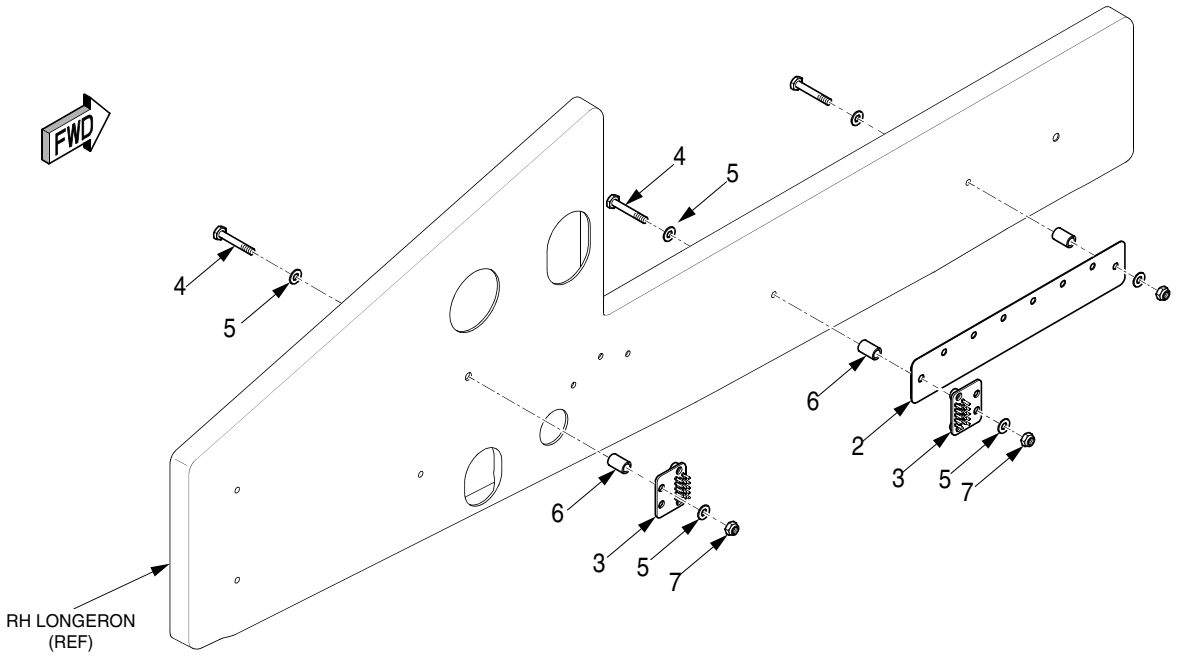


Figure 53-4014
Relay Mounting Plate - Serials 1005 & subs w/o Perspective (1 of 3)

EFFECTIVITY:
Serials 1005 & subs w/o Perspective



LEGEND
2. Mounting Plate, Forward
3. Ground Bus Bar
4. Bolt
5. Washer
6. Spacer
7. Nut

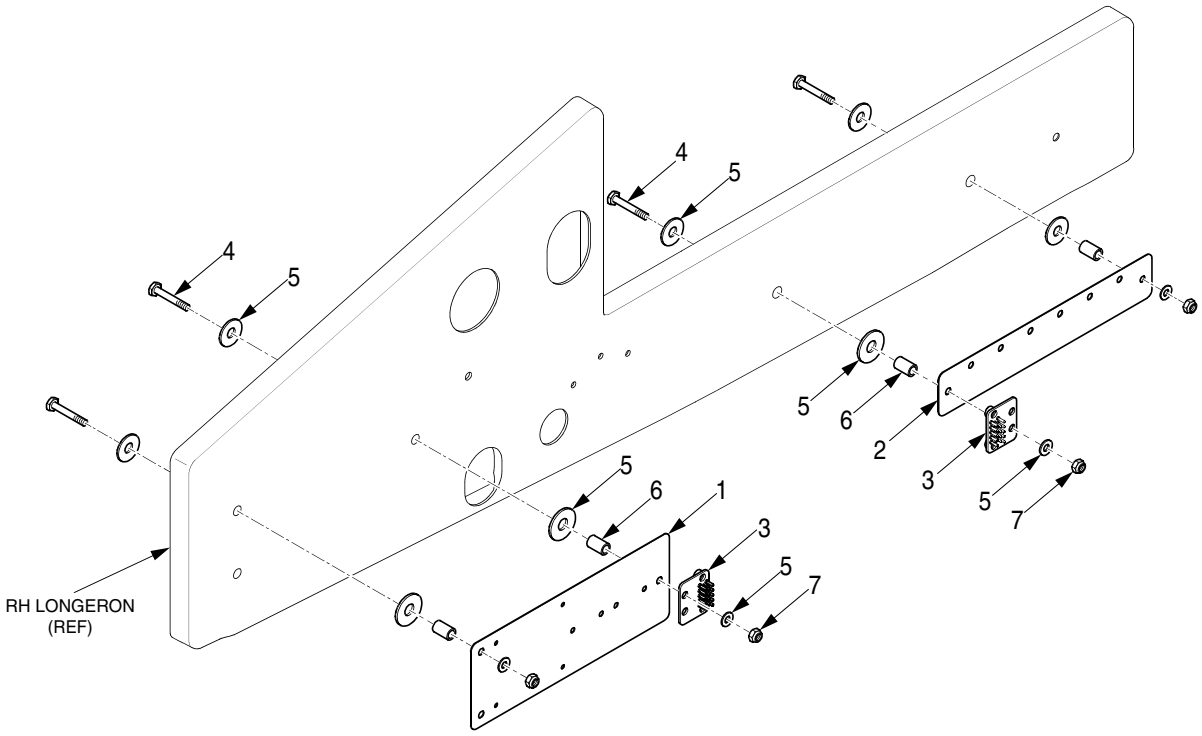
DETAIL C

Serials 2016 & subs w/ Perspective.

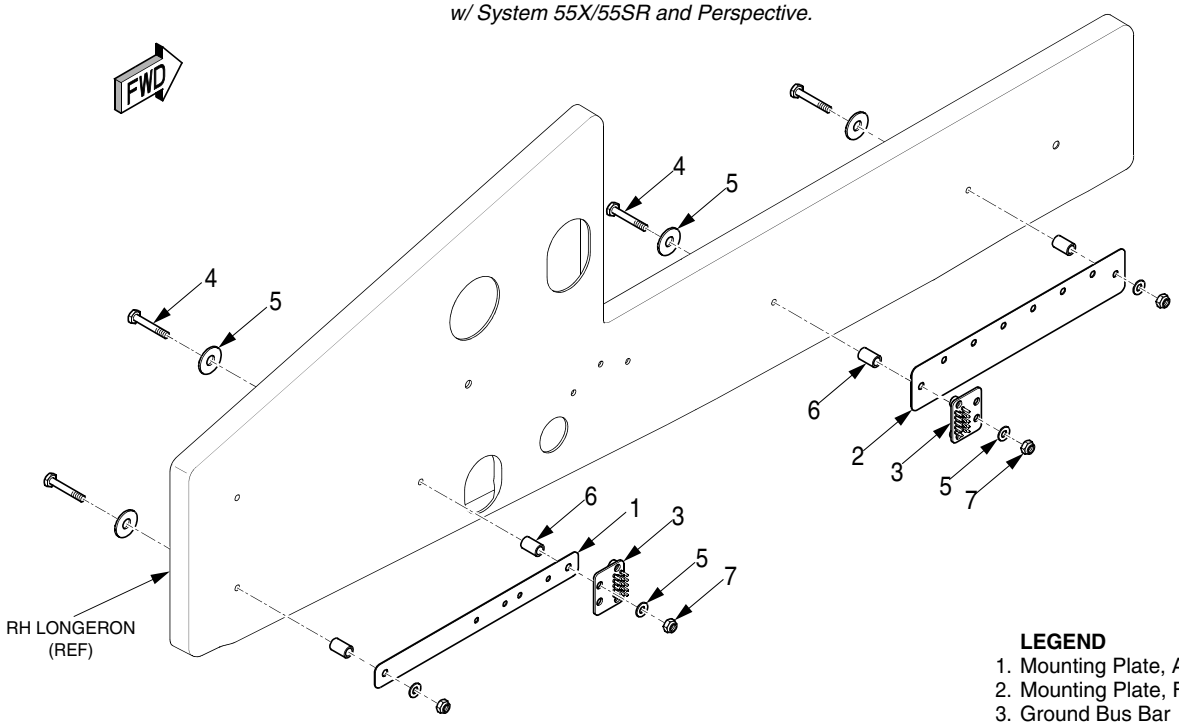
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Figure 53-4014
Relay Mounting Plate - Serials 2016 & subs w/ Perspective (2 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective



Serials 2016 thru 2076
w/ System 55X/55SR and Perspective.



Serials 2077 & subs
w/ System 55X/55SR and Perspective.

DETAIL D

LEGEND
1. Mounting Plate, Aft
2. Mounting Plate, Forward
3. Ground Bus Bar
4. Bolt
5. Washer
6. Spacer
7. Nut

SR20_MM53_3458

Figure 53-4014
Relay Mounting Plate - Serials 2016 & subs w/ System 55X/55SR and Perspective (3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ System 55X/55SR and Perspective

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AERODYNAMIC FAIRINGS

1. DESCRIPTION

This section describes those components which make up the aerodynamic fairings. A fixed, composite wing root fairing is installed around the wing root, enclosing the space between the wing and fuselage. The fairing is installed with sealant and closeout is installed with two-sided tape.

A fixed, composite horizontal stabilizer root fairing is installed around the horizontal stabilizer root, enclosing the space between the horizontal stabilizer and tail. The fairing is installed with two-sided tape.

2. MAINTENANCE PRACTICES

A. Wing Root Fairing - *Serials 1005 thru 1885* (See Figure 53-501)(See Figure 53-502)

(1) Removal - Wing Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Die Grinder	-	Any Source	*Serials 1005 thru 1147 w/o closeout:* Cut wing root fairing at leading edge.
Metal Cut-Off Wheel and Arbor	2.0 inches (50.8 mm)	Any Source	*Serials 1005 thru 1147 w/o closeout:* Cut wing root fairing at leading edge.
Plastic Scraper	-	Any Source	Remove residue.
Wood Stirring Stick	1.0 inch (25.4 mm) wide x 0.25 inch (6.35 mm) thick	Any Source	Pry wing root fairing from wing.
Sandpaper	100 grit	Any Source	Sand beveled edge on stick.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for adhesive cleaner.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

CAUTION: When cutting wing root fairing, verify blade does not penetrate too far and damage leading edge of wing or fuselage skin.

Do not damage fuselage painted finish or laminate when removing fairing.

Prolonged exposure to adhesive cleaner can damage the exterior paint finish. Wipe up any excess cleaner immediately.

(b) Sand edges at end of wood stirring stick to a blunt, beveled edge.

(c) *Serials 1005 thru 1147 w/o closeout:* At wing root, use die grinder and cut-off wheel to cut wing root fairing along chord line to fairing outboard edge.

(d) *Serials 1148 & subs, 1005 & subs w/ closeout:* Remove closeout.

1 Apply small amount of cleaner to edge of stick.

2 Carefully press wood stirring stick edge into seam between closeout and wing root fairing. Apply cleaner to edge of stick when necessary and continue to pry along seam until closeout is separated from fairing.

CAUTION: Avoid applying any adhesive cleaner at the contact point between the fairing and wing walk as the cleaner may break down adhesive securing wing walk to wing.

(e) Apply masking tape to wing walk edge along fairing seam to protect wing walk.

(f) Apply small amount of cleaner to edge of stick.

(g) Beginning at leading edge of wing, carefully press wood stirring stick edge into seam between fairing and airplane and slowly pry fairing away from wing. Apply cleaner to edge of stick when necessary and continue to pry along seam until fairing is separated from airplane.

(h) Remove residue from fairing installation areas using scraper and cleaner.

(i) Solvent clean installation areas on fairing and wing root. (Refer to 20-30)

(2) Installation - Wing Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Die Grinder	-	Any Source	Cut wing root fairing at leading edge.
Metal Cut-Off Wheel and Arbor	2.0 inches (50.8 mm)	Any Source	Cut wing root fairing at leading edge.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Two-Sided Tape 0.5 inch (1.3 cm) wide 0.025 inch (0.064 cm) thick	4932	3M Company	Secure wing root fairing.
Two-Sided Tape 0.5 inch (1.3 cm) wide 0.045 inch (1.143 cm) thick	4951	3M Company	Secure wing root closeout.
Primer	94	3M Company	Promote tape adhesion at fairing installation areas.
Adhesion Promoter	AP111	3M Company	Promote tape adhesion at wing installation areas.
Paper Towels	-	Any Source	Apply primer to installation areas.
90° Bent Tip Pick	-	Any Source	Remove tape backing from fairing.
Sealant w/ Semkit Applicator	(Refer to 51-30)	(Refer to 51-30)	Seal fairing to wing root.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for sealant.
Plastic Film Tape	0.5 inch (12.7 mm)	Any Source	Restrict working area for sealant and caulk.
Wax Paper	6 × 6 inches (15 × 15 cm)	Any Source	Facilitate closeout placement.
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal closeout and aft lower fairing seam.

CAUTION: Fairing must be cut at leading edge to facilitate installation.

(b) At leading edge of fairing, use die grinder and cut-off wheel to cut wing root fairing along chord line.

(c) Solvent clean installation areas on fairing and wing root. (Refer to 20-30)

Note: Fairing may be secured with either tape, sealant, or any combination of tape and sealant.

(d) With paper towel, apply tape primer 4 inches (10 cm) outboard and 4 inches (10 cm) up from wing root.

(e) Repeat tape primer application below wing root, except apply to only 10 inches (25 cm) from leading edge and 6 inches (15 cm) from trailing edge of wing.

(f) For upper fairing surfaces, apply two-sided tape (0.025 inch thick) to backside of fairing against lip on outboard and vertical edges.

(g) Repeat two-sided tape application for lower fairing surfaces, except apply to only 10 inches (25 cm) from leading edge and 6 inches (15 cm) from trailing edge of wing.

(h) Install fairing.

CAUTION: To facilitate positioning fairing correctly, leave tape backing in place.

1 Position fairing against trailing edge of wing root and press firmly into place.

CAUTION: Verify that fairing is tightly positioned vertically against the fuselage and horizontally against the wing.

2 Remove tape backing from upper, flat section of fairing.

3 Press upper fairing section firmly against length of wing root.

4 Using 90° bent tip pick, snag end of tape backing from upper, vertical surface of fairing section and pull tape backing from fairing.

5 Press upper, vertical surface of fairing firmly against length of wing root.

6 At lower fairing surfaces not secured by tape, apply film tape along edges of seam.

7 Apply masking tape to area around film tape to prevent sealant from making contact with painted finish.

8 Position fairing against trailing edge of wing root and firmly press into place vertically against the fuselage and horizontally against the wing.

9 At lower, trailing edge, use semkit applicator to gradually apply sealant approximately 0.5 inch (1.3 cm) wide to lower, vertical and horizontal surfaces, and press fairing against length of wing root while working towards leading edge.

10 Remove masking and film tape.

(i) Solvent clean installation areas on closeout. (Refer to 20-30)

(j) With paper towel, apply tape primer 4 inches (10 cm) outboard from closeout installation area.

(k) Apply two-sided tape (0.045 inch thick) to backside of closeout against lip on edges.

(l) Install closeout.

1 Cut leading edge of wing root profile from wax paper.

2 Remove tape backing from surface of closeout section.

3 Position wax paper against fuselage at leading edge of wing root.

4 Position closeout against leading edge of wing root fairing.

5 Press outboard surface of closeout firmly against wing root leading edge.

6 Press inboard surface of closeout firmly against wing root leading edge while pulling wax paper away from wing root.

(m) Apply film tape 0.1 inch (2.5 mm) from both edges of seam around closeout.

(n) Apply film tape 0.1 inch (2.5 mm) from both edges of lower aft fairing seam approximately 0.75 inch (19.0 mm) in length.

(o) Apply caulk to seam around closeout and use finger to smooth caulk uniformly in seam.

(p) Apply caulk to lower aft fairing seam and use finger to smooth caulk uniformly in seam.

(q) Allow caulk to dry overnight for best results.

(r) Install forward and aft access panels on lower fairing section.

(s) Remove film tape.

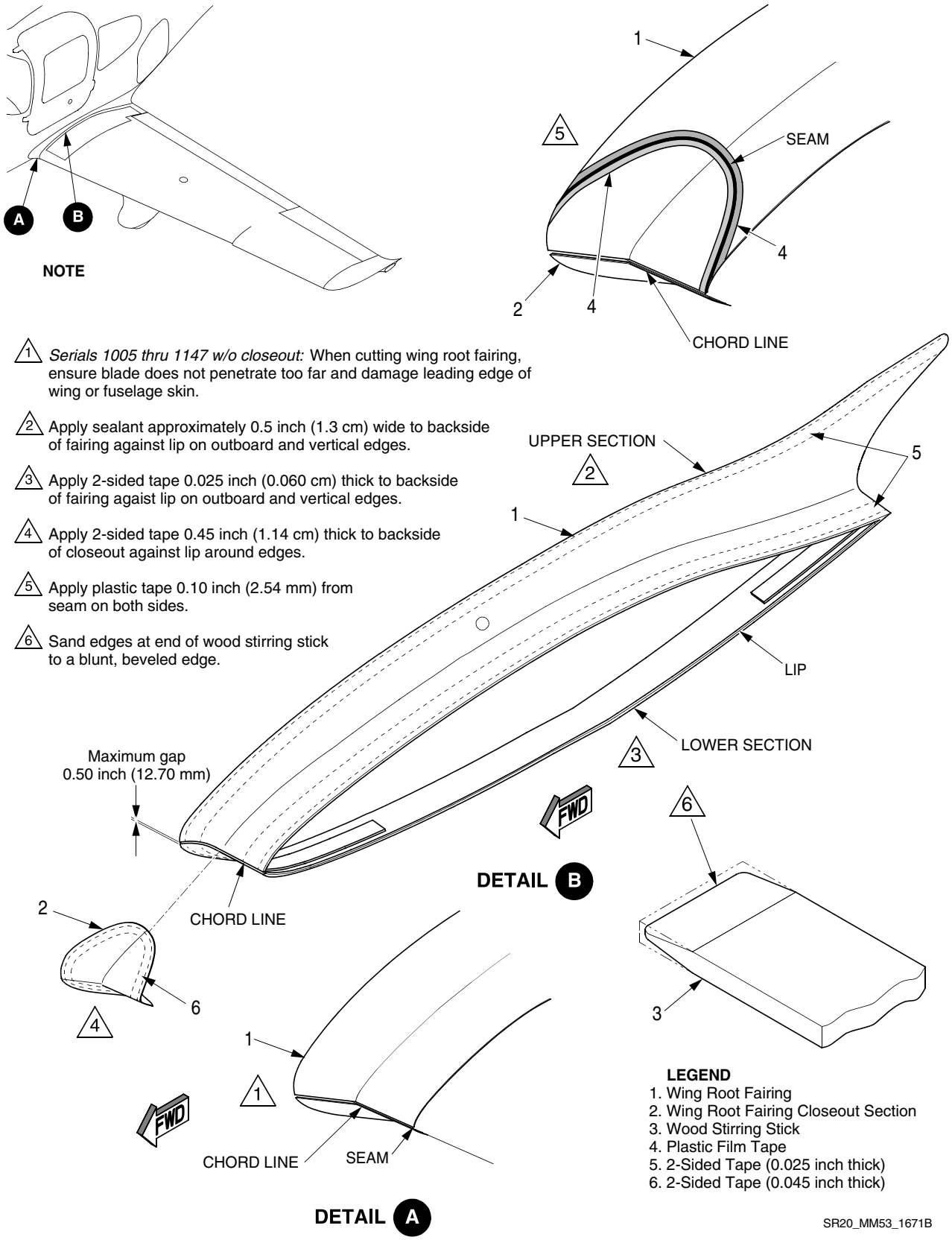
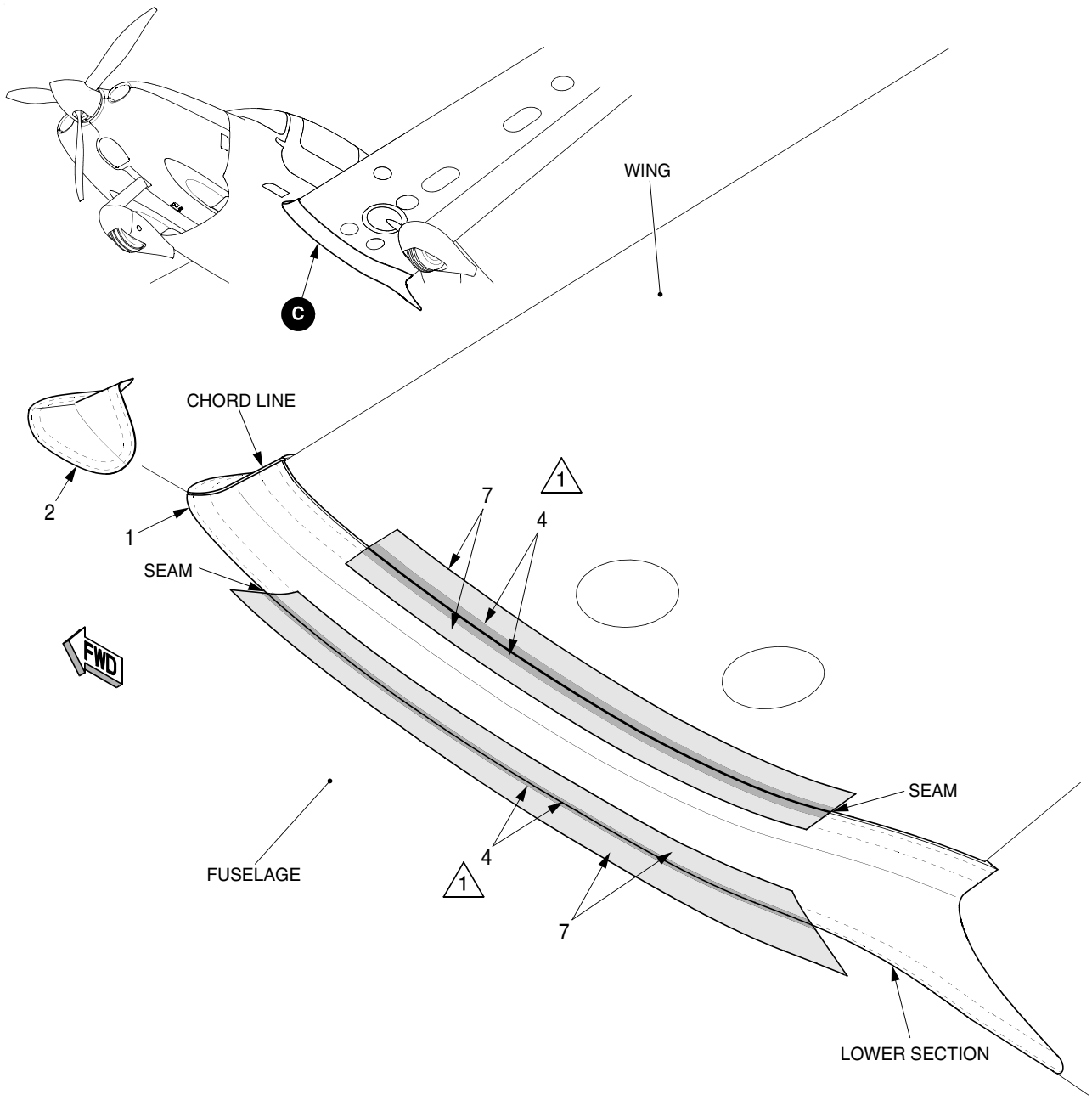


Figure 53-501
Wing Root Fairing and Closeout Installation - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885



NOTE

1 Apply plastic tape 0.10 inch (2.54 mm) from seam at fairing and wing on both sides.

LEGEND

1. Wing Root Fairing
2. Wing Root Fairing Closeout Section
4. Plastic Tape
7. Masking tape

DETAIL C

SR20_MM53_2036

Figure 53-502
Wing Root Fairing and Closeout Protective Taping - Serials 1005 thru 1885

B. Wing Root Fairing - *Serials 1886 & subs* (See Figure 53-503)

(1) Removal - Wing Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove residue.
Wood Stirring Stick	1.0 inch (25.4 mm) wide x 0.25 inch (6.35 mm) thick	Any Source	Pry wing root fairing from wing.
Sandpaper	100 grit	Any Source	Sand beveled edge on stick.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for adhesive cleaner.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

CAUTION: Do not damage fuselage painted finish or laminate when removing fairing.

Prolonged exposure to adhesive cleaner can damage the exterior paint finish. Wipe up any excess cleaner immediately.

(b) Remove screws securing access panel to fairing. Remove access panel from airplane.

(c) Remove screws securing fairing to wing.

CAUTION: Avoid applying any adhesive cleaner at the contact point between the fairing and wing walk as the cleaner may break down adhesive securing wing walk to wing.

(d) Apply masking tape to wing walk edge along fairing seam to protect wing walk.

(e) Sand edges at end of wood stirring stick to a blunt, beveled edge. (See Figure 53-503)

(f) Apply small amount of cleaner to edge of stick.

(g) Beginning at trailing edge of wing, carefully press wood stirring stick edge into seam between fairing and airplane and slowly pry fairing away from wing. Apply cleaner to edge of stick when necessary and continue to pry along seam until fairing is separated from airplane.

(h) Remove residue from fairing installation areas using scraper and cleaner.

(i) Solvent clean installation areas on fairing and wing root. (Refer to 20-30)

(2) Installation - Wing Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Primer	94	3M Company	Promote tape adhesion at fairing installation areas.
Adhesion Promoter	AP111	3M Company	Promote tape adhesion at wing installation areas.
Paper Towels	-	Any Source	Apply adhesive promoter.
Two-Sided Tape 0.5 inch (1.3 cm) wide 0.045 inch (0.114 cm) thick	4946	3M Company	Secure wing root fairing.
Rubber Roller	-	Any Source	Install two-sided tape.
Sealant w/ Semkit Applicator	(Refer to 51-30)	(Refer to 51-30)	Seal fairing to wing root.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for sealant.
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Seal gaps along fairing seams.
Drill Bit, 13/64	0.203 inch (5.159 mm)	Any Source	Match drill.

(b) Position fairing access panel to lower fairing. (Refer to 57-30)

(c) Match drill holes in fairing access panel to fairing and secure with screws.

(d) Solvent clean installation areas on fairing and wing root. (Refer to 20-30)

(e) With paper towel, apply primer to installation area on wing root fairing.

(f) Using rubber roller with moderate pressure, apply two-sided tape around perimeter of fairing.

CAUTION: To facilitate correct positioning of fairing, leave tape backing in place.

Note: To prevent creasing at tightly rounded corners, cut small (0.25 inch) widthwise slit at outer radius of tape as required while applying tape.

(g) Position fairing against leading edge of wing root and firmly press into place vertically against the fuselage and horizontally against the wing.

(h) Loosely install aft screws securing lower seam of wing root fairing to itself.

(i) Verify that fairing fits vertically against the fuselage and horizontally against the wing.

Note: During fit-up verification, gaps between faying surfaces of fairing and wing/fuselage are acceptable.

(j) With paper towel, apply adhesive promoter to tape installation areas on wing root.

CAUTION: Sealant does not adhere well to surfaces where adhesive promoter is applied. Restrict adhesive promoter application to tape installation areas.

(k) Remove screws securing lower seam of wing root fairing to itself.

CAUTION: During sealant application, maintain adhesive bead of approximately 0.25 inch (0.65 cm).

Maintain approximate gap of 0.25 inch (0.65 cm) between sealant and tape.

(l) At outboard fairing, apply sealant to forward perimeter from lower edge seam to forward 4 inches (10 cm) of upper edge.

(m) At inboard fairing, apply sealant to forward perimeter from lower edge seam to entire upper edge except for aft 40 inches (100 cm).

(n) Remove tape backing from inboard and outboard edges of upper fairing.

(o) Press upper fairing against length of wing root while working towards trailing edge.

(p) Remove tape backing from inboard and outboard edges of lower fairing.

(q) Press lower fairing against length of wing root while working towards trailing edge.

(r) Install aft screws securing lower seam of wing root fairing to itself.

(s) Using rubber roller with moderate pressure, press fairing at all faying surfaces against wing/fuselage.

(t) If excess sealant exists, solvent clean painted surfaces. (Refer to 20-30)

(u) Allow sealant to cure. (Refer to 51-20)

Note: For aesthetic purposes, caulk may be used to fill gaps along fairing seams.

(v) If necessary, fill gaps along fairing seams with caulk.

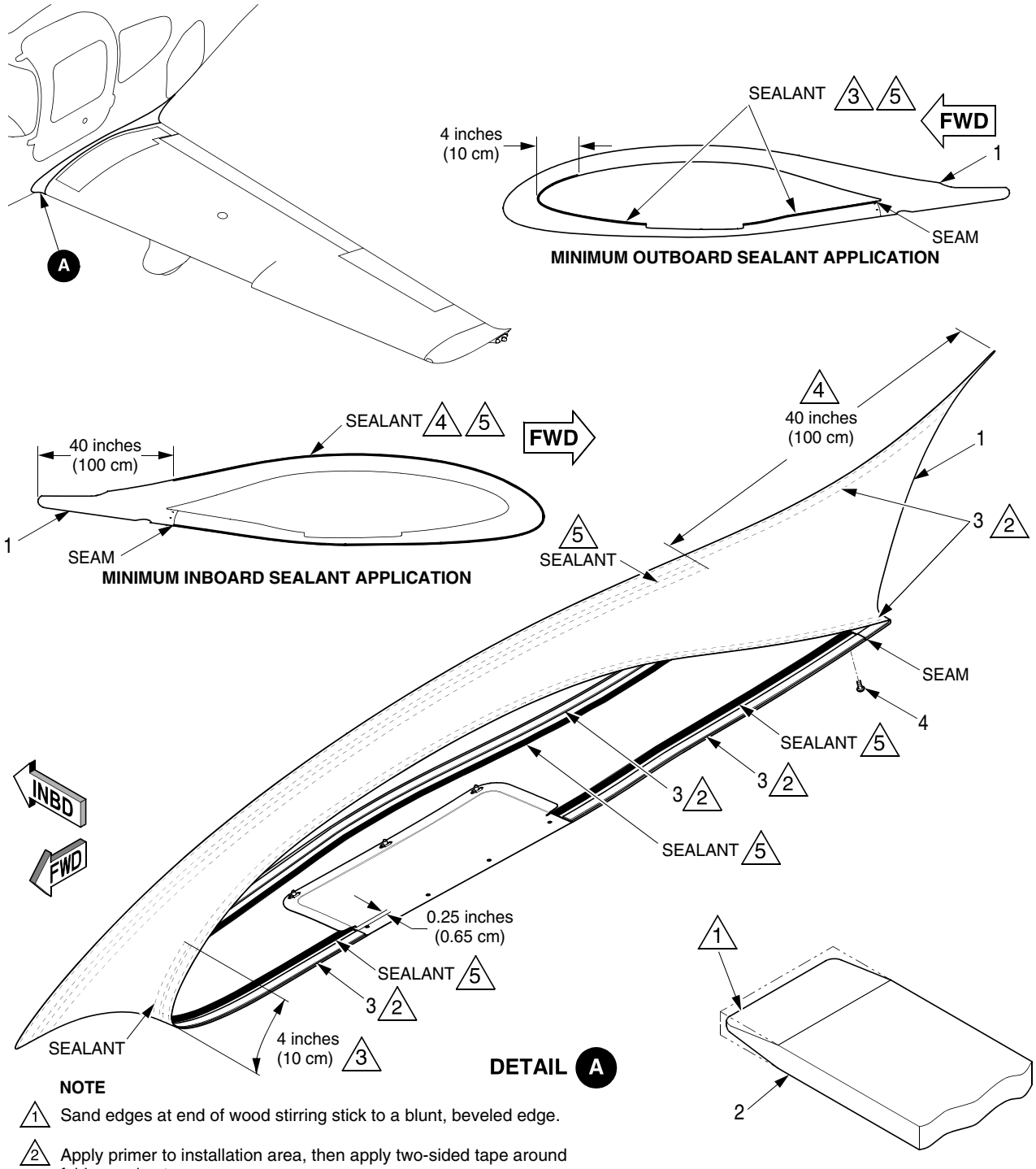
1 Apply masking tape 0.1 inch (2.5 mm) from edge of fairing seam.

2 Apply caulk to fairing seam and use finger to smooth caulk uniformly in seam.

3 Allow caulk to dry overnight for best results.

4 Remove masking tape.

(w) Match drill holes in fairing access panel to lower wing and secure with screws. (Refer to 57-30)



NOTE

1. Sand edges at end of wood stirring stick to a blunt, beveled edge.
2. Apply primer to installation area, then apply two-sided tape around fairing perimeter.
3. At outboard fairing, apply sealant to forward perimeter from lower edge seam to forward 4 inches (10 cm) of upper edge.
4. At inboard fairing, apply sealant to forward perimeter from lower edge seam to entire upper edge except for aft 40 inches (100 cm).
5. During sealant application, maintain adhesive bead of approximately 0.25 inch (0.65 cm). Maintain approximate gap of 0.25 inch (0.65 cm) between sealant and tape.

LEGEND

1. Wing Root Fairing
2. Wood Stirring Stick
3. 2-Sided Tape
4. Screw

SR20_MM53_2543A

Figure 53-503
Wing Root Fairing Installation - Serials 1886 & subs

C. Repair

(1) Repair - Wing Root Fairing

If a bubble forms between the fairing and any wing root surface, perform the following procedure.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Remove any residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Sealant w/ Semkit Applicator	(Refer to 51-30)	(Refer to 51-30)	Seal fairing to wing root.
Masking Tape	2.0 inches (50.8 mm)	Any Source	Restrict working area for sealant.
Plastic Film Tape	0.5 inch (12.7 mm)	Any Source	Restrict working area for sealant.
Wood Stirring Stick	1.0 inch (25.4 mm) wide x 0.25 inch (6.35 mm) thick	Any Source	Pry wing root fairing from wing.

(b) Apply film tape along edges of seam.

(c) Apply masking tape to area around film tape to prevent sealant from making contact with painted finish.

(d) Sand edges at end of wood stirring stick to a blunt, beveled edge.

(e) Carefully press wood stirring stick edge into seam between fairing and wing root at bubble location to create a working area for sealant application.

CAUTION: When removing excess tape with putty knife, verify blade does not penetrate too far and damage wing or fuselage skin.

(f) If necessary, use putty knife at working area where bubble has occurred to remove tape between fairing and wing root surface.

(g) Apply sealant between working area of fairing and wing root surface.

(h) Press fairing firmly to wing root at working area.

(i) Remove masking and film tape.

D. Horizontal Stabilizer Root Fairing (See Figure 53-504)

(1) Removal - Horizontal Stabilizer Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove tape residue.
General Purpose Adhesive Cleaner	(Refer to 51-30)	(Refer to 51-30)	Remove tape residue.
Cotton Cloth (clean and lint free)	-	Any Source	Remove tape residue.

Note: Fairing is not re-usable.

CAUTION: Do not damage the empennage painted finish or laminate when removing fairing.

(b) Beginning at trailing edge of horizontal stabilizer, pull fairing away from stabilizer and remove fairing from airplane.

(c) Remove tape residue from fairing installation areas using scraper and solvent.

(2) Installation - Horizontal Stabilizer Root Fairing

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.
Two-Sided Tape 0.5 inch (1.3 cm) wide 0.045 inch (1.143 cm) thick	4951	3M Company	Secure horizontal stabilizer fairing.
Adhesion Promoter	AP111	3M Company	Promote tape adhesion at stabilizer and stabilizer fairing installation areas.
Paper Towels	-	Any Source	Apply primer to installation areas.
Awl Straight Pick	-	Any Source	Create pilot hole in fairing.
Drill Bit	#7 (5.08 mm)	Any Source	Drill hole in fairing for drainage.
90° Bent Tip Pick	-	Any Source	Remove tape backing from fairing.

(b) Solvent clean installation areas on fairing and horizontal stabilizer. (Refer to 20-30)

(c) With paper towel, apply adhesion promoter 4 inches (10 cm) outboard and 4 inches (10 cm) up from stabilizer root.

(d) With paper towel, apply adhesion promoter to installation area on stabilizer fairing.

(e) Apply two-sided tape to backside of fairing against lip on outboard and vertical edges.

(f) Drill drain hole location on fairing.

CAUTION: To facilitate positioning fairing correctly, remove 3 inches (76 mm) of tape backing from the leading edge of fairing. Leave remaining tape backing in place.

1 At 3 inches (76 mm) from leading edge, score and remove tape backing from leading edge of fairing.

CAUTION: Verify that fairing is tightly positioned vertically against the tail and horizontally against the stabilizer.

2 Position fairing against leading edge of horizontal stabilizer root and firmly press into place.

3 At horizontal trailing edge, slightly pull trailing edge of fairing away from stabilizer to determine drain location and punch through fairing with awl so that hole is within ± 0.20 inch (5.08 mm) of stabilizer drain hole.

4 Using #7 (5.08 mm) bit, drill hole in fairing.

(g) Secure fairing.

1 Remove tape backing from lower, flat section of fairing.

CAUTION: Verify drilled hole is aligned with stabilizer drain hole and that no tape is obstructing drain hole.

2 Align drain holes and press lower fairing section firmly against length of horizontal stabilizer root.

3 Using 90° bent tip pick, snag end of tape backing from lower, vertical surface of fairing section and pull tape backing from fairing.

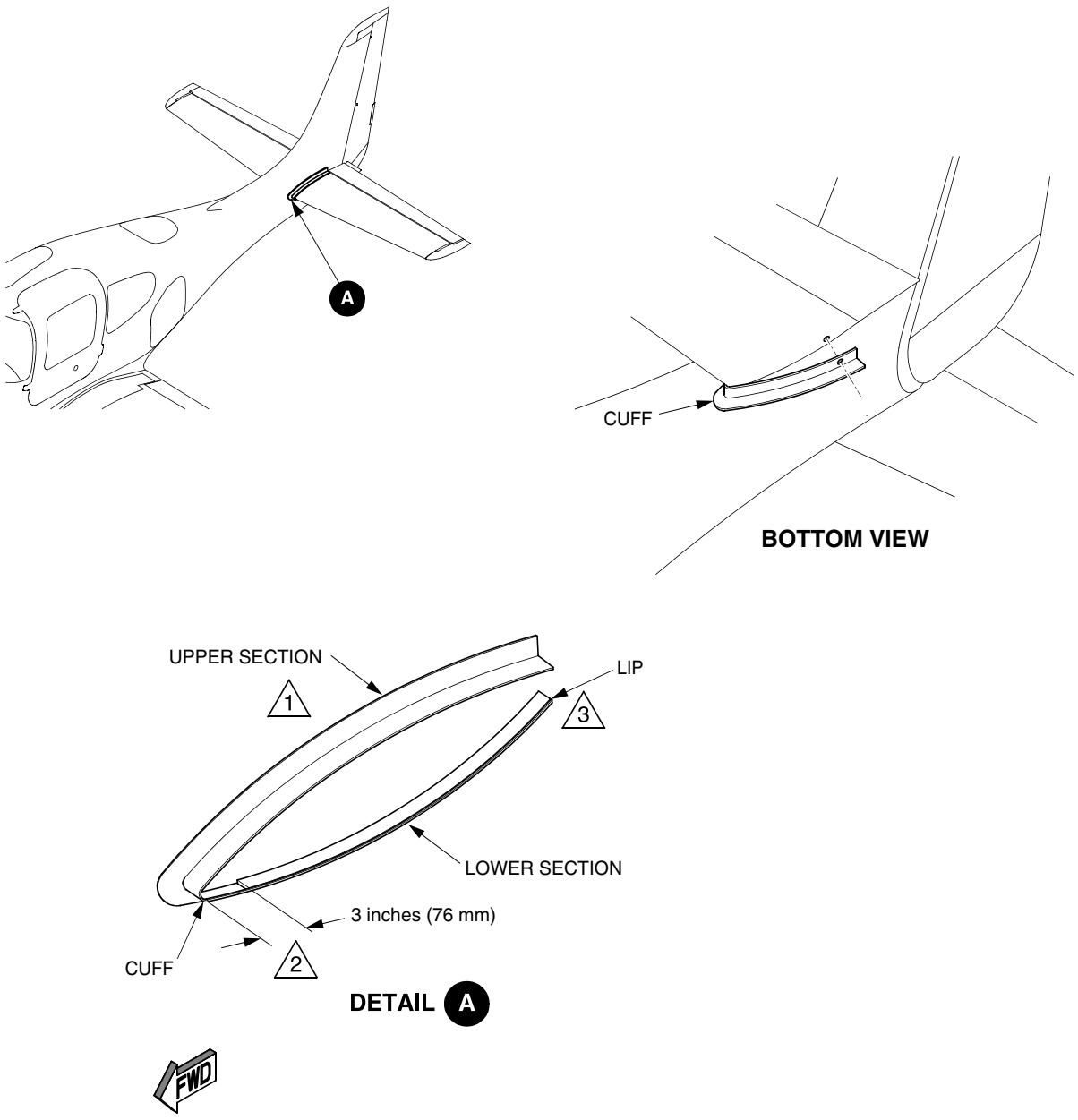
4 Press lower, vertical surface of fairing firmly against length of horizontal stabilizer root.

5 Remove tape backing from upper, flat section of fairing.

6 Press upper fairing section firmly against length of horizontal stabilizer root.

7 Using 90° bent tip pick, snag end of tape backing from upper, vertical surface of fairing section and pull tape backing from fairing.

8 Press upper, vertical surface of fairing firmly against length of horizontal stabilizer root.



NOTE

1. Do not remove tape backing from upper and lower sections prior to match drilling drainage hole.
2. At 3 inches (76 mm) from leading edge, score tape backing at upper and lower sections of fairing.
3. Apply 2-sided tape to backside of fairing against lip on outboard and vertical edges.

LEGEND

1. Horizontal Stabilizer Fairing

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Figure 53-504
Horizontal Stabilizer Fairing

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CHAPTER 55

STABILIZERS

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STABILIZERS

1. GENERAL

The horizontal stabilizer and vertical stabilizers are fully cantilever, semi-monocoque design consisting of spars, ribs, and skin. The skin is bonded to the supporting structure.

The horizontal stabilizer is a single composite structure from tip to tip. The two-piece elevator, attached to the horizontal stabilizer, is aluminum.

The vertical stabilizer is composite structure integral to the main fuselage shell for smooth transfer of flight loads. The rudder is aluminum and is attached to the vertical stabilizer rear shear web at three hinge points.

The empennage consists of a horizontal stabilizer, a two-piece elevator, a vertical fin and a rudder. All of the empennage components are conventional spar (shear web), rib, and skin construction.

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HORIZONTAL STABILIZER

1. DESCRIPTION

This section covers the horizontal airfoil of the tail section to which the elevator is attached.

2. MAINTENANCE PRACTICES

A. Horizontal Stabilizer

CAUTION: Installation and removal of the horizontal stabilizer may only be performed at an approved Cirrus Design Repair Station.

(1) Removal - Horizontal Stabilizer (See Figure 55-101), (See Figure 55-102)

Two methods of horizontal stabilizer removal are explained. Method #1 contains a removal procedure that salvages the existing horizontal stabilizer. The Method #2 procedure explains how to cut the horizontal stabilizer from the airplane where reuse of the horizontal stabilizer is not possible.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Oscillating Tool, Blade	FSN400E	C. & E. FEIN GMBH D-70176 Stuttgart +49 (0)711 / 66 65-0	Cutting Method #1
Blade (Metal)	6-35-02-147-01-5		
Oscillating Tool, 90°	12L2240-90	Cooper Power Tools Sales and Service Lexington, SC 29071 800-845-5629	Cutting Method #1
Cutting Disc and Arbor	14-1746		
Compressed Air	-	Any Source	Cooling Method #1
Reciprocating Saw	-	Any Source	Cutting Method #2
Blade (Bi-Metal)	6 inch (15 cm)	Any Source	Cutting Method #2
Blunt-Edged Chisel	-	Any Source	Cutting Method #2
Plastic Wedge (2)	5 inches (13 cm)	Any Source	Cutting Method #2
90° Die Grinder	-	Any Source	Removal
Metal Cut-Off Wheel and Arbor	2.0 inches (5.1 cm)	Any Source	Removal
Sanding Drum	80-grit	Any Source	Abrasion
Low-Profile Orbital Sander	-	Any Source	Abrasion
Sandpaper	80-grit	Any Source	Abrasion
Vacuum	-	Any Source	Cleaning
Low-Tack Tape	M-0071 AST Black Protective Tape	Any Source	Protection
Plastic Tape, 2-inch	-	Any Source	Protection
Aluminum Tape, 4-inch	-	Any Source	Protection Method #1

Description	P/N or Spec.	Supplier	Purpose
Bagging Film Breather	(Refer to 51-30)	(Refer to 51-30)	Protection

(b) Remove pitch trim motor assembly. (Refer to 27-30)

(c) Remove elevator bellcrank. (Refer to 55-20)

CAUTION: During horizontal stabilizer removal, do not damage bonding flange on fuselage or vertical fin.

(d) Remove horizontal stabilizer root fairings. (Refer to 53-50)

CAUTION: Verify horizontal stabilizer serial number is recorded prior to cutting horizontal stabilizer to ensure that traceability of component is recorded.

(e) Record horizontal stabilizer serial number.

(f) Remove bolt securing ground wire to elevator hinge bracket on aft horizontal stabilizer and stow ground wire.

(g) Using low-tack tape, secure rudder into a fixed position.

(h) If performing Horizontal Stabilizer Removal Method #1, verify bond gap measurement facilitates cutting procedures.

CAUTION: To facilitate Method #1 removal of the horizontal stabilizer, a bond void must exist at the leading edge, extending aft approximately 3 inches (8 cm).

1 Verify bond void exists at leading edge of fuselage flange. Repeat verification on opposite side of fuselage flange.

CAUTION: To facilitate salvageable removal of the horizontal stabilizer, the bond gap at the fuselage flange must be 0.05 inch (1.27 mm) or greater.

2 Measure bond gap along upper and lower flange. Repeat measurement on opposite side of fuselage flange.

3 If measurement is less than 0.05 inch (1.27 mm), Horizontal Stabilizer Removal Method #1 may **not** be performed.

4 If required bond voids exist and bond gap measurement is 0.05 inch (1.27 mm) or greater, Horizontal Stabilizer Removal Method #1 may be performed.

(i) *Horizontal Stabilizer Removal Method #1:* Remove horizontal stabilizer. (See Figure 55-101)

1 At empennage perimeter of bonding flange, apply plastic tape to upper and lower empennage surfaces.

2 At horizontal stabilizer perimeter of bonding flange, apply aluminum tape to upper and lower horizontal stabilizer surfaces.

CAUTION: When cutting bonding flanges, another technician should support the horizontal stabilizer to minimize any shifting of weight that could stress the flanges at remaining bond lines.

Also, the second technician should apply compressed air to bond line during cutting procedure to prevent heat build-up from potentially scorching the airplane surfaces, and provide debris clean-up.

Use caution when cutting to not cause excessive damage to the horizontal stabilizer and/or fuselage bonding flange. If damage exceeds repair specifications, contact Cirrus Design for disposition.

To prevent binding during the removal process, begin cutting with 90° oscillating tool at the bottom bond line.

3 Using 90° oscillating tool with cutting disc at bond line, position disc flush with surface of horizontal stabilizer. Apply compressed air simultaneously to bond line when cutting. Cut horizontal stabilizer section from empennage.

4 If necessary, use blade oscillating tool to cut remaining bond line. Once bond line has been separated, repeat both cutting procedures on upper bond line.

5 Repeat cutting procedures on opposite side.

6 Remove horizontal stabilizer from airplane.

(j) *Horizontal Stabilizer Removal Method #2:* Remove horizontal stabilizer. (See Figure 55-102)

1 Draw an offset line 1.0 inch (2.54 cm) from horizontal stabilizer root around entire surface of horizontal stabilizer. Repeat on opposite side.

CAUTION: Use caution when cutting to not cause excessive damage to the fuselage bonding flange. If damage exceeds repair specifications, contact Cirrus Design for disposition.

2 Using reciprocating saw with 6 inch (15 cm) blade at offset line, cut horizontal stabilizer section from empennage. Repeat on opposite side.

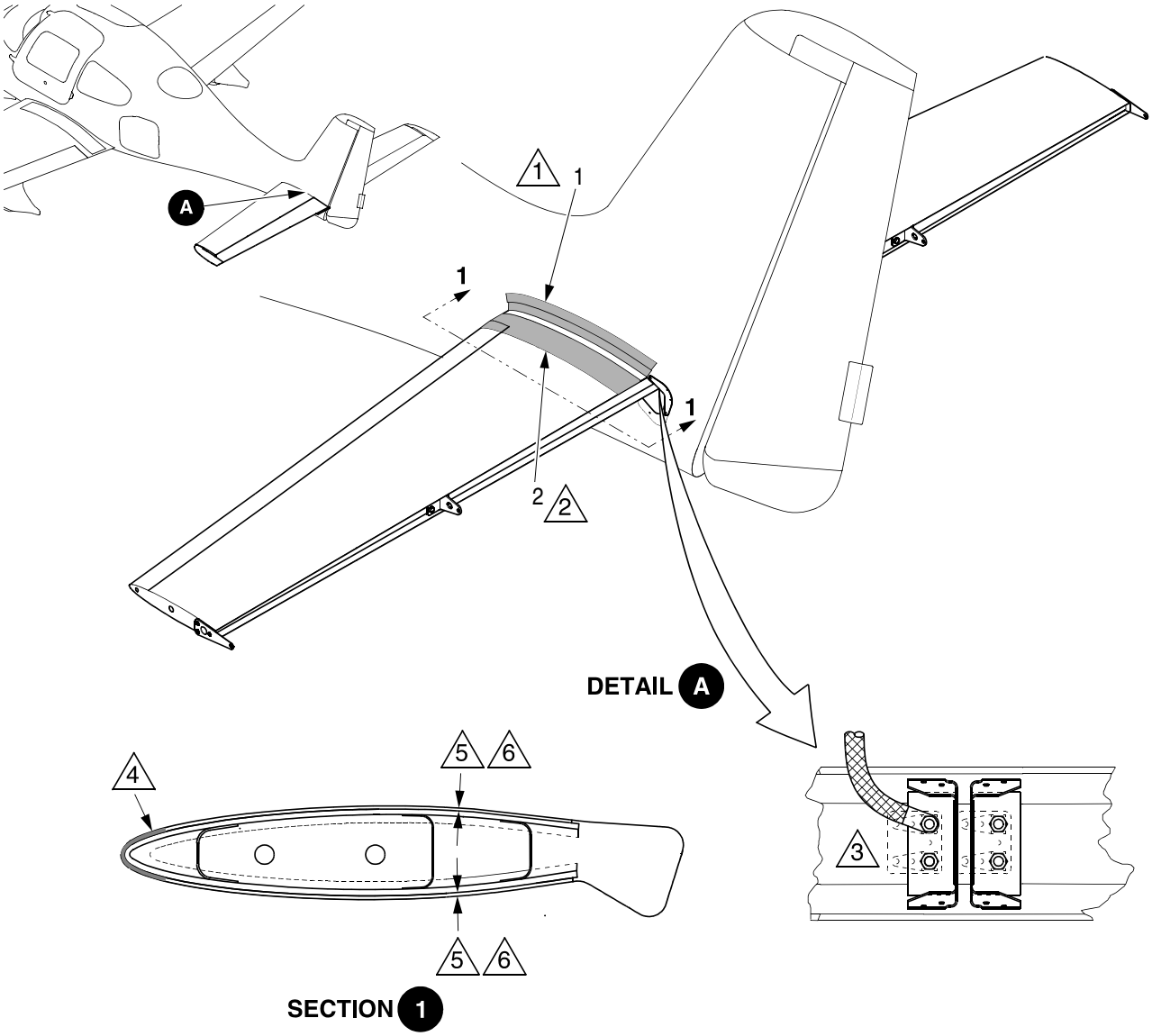
3 Using reciprocating saw, cut through spar of remnant to remove core.

4 Position cutting end of wedge between aft remnant and upper fuselage flange.

5 Strike back of wedge forward to leading edge of remnant.

6 Position second wedge at same position on opposite side of empennage and repeat striking action. Alternate between driving both wedges forward to leading edge of remnant. Repeat remnant separation at lower flange surfaces.

7 If leading edge of remnant is still adhered to fuselage flange, alternately position flat end of wedge to sides of remnant and strike with hammer until remnant is loosened. Remove horizontal stabilizer composite remnant.



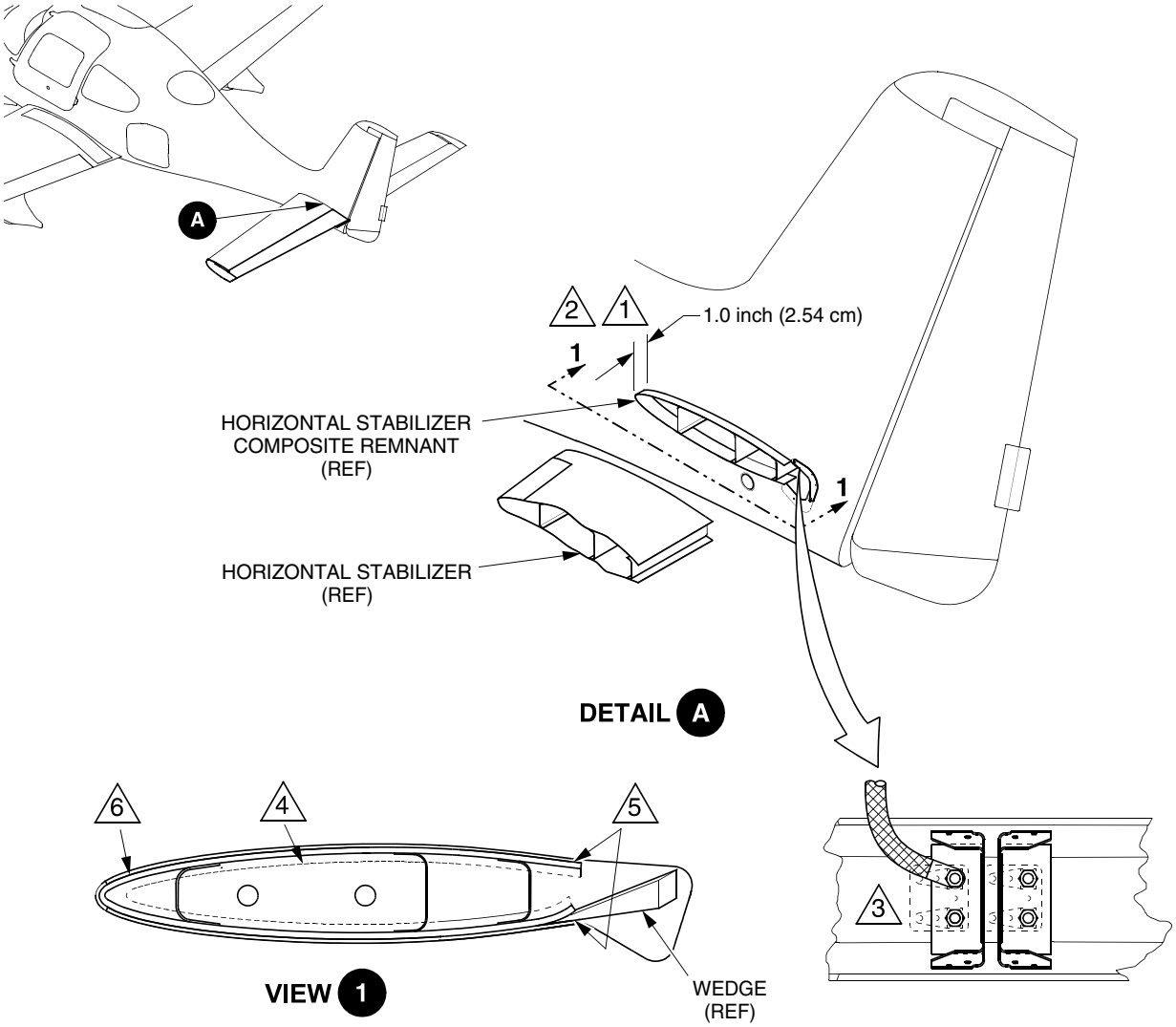
NOTE

1. At empennage perimeter of bonding flange, apply plastic tape to upper and lower empennage surfaces.
2. At horizontal stabilizer perimeter of bonding flange, apply aluminum tape to upper and lower horizontal stabilizer surfaces.
3. Remove bolt and washer securing ground wire to elevator hinge bracket on aft horizontal stabilizer and stow ground wire.
4. To facilitate non-destructive removal of the horizontal stabilizer, a bond void must exist at the leading edge, extending aft approximately 3 inches (8 cm) at upper and lower surfaces.
5. To facilitate non-destructive removal of the horizontal stabilizer, the bond gap at the fuselage flange must be 0.05 inch (1.27 mm) or greater.
6. Using 90° oscillating tool with cutting disc at bond line, cut horizontal stabilizer section from empennage. If necessary, use blade oscillating tool to cut remaining bond line.

LEGEND
1. Plastic Tape
2. Aluminum Tape

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Figure 55-101
Horizontal Stabilizer Removal - Method #1



NOTE

1. Draw an offset line 1.0 inch (2.54 cm) from the horizontal stabilizer root around entire surface of horizontal stabilizer. Repeat on opposite side.
2. Using reciprocating saw with 6 inch (15 cm) blade, at offset line, cut horizontal stabilizer section from empennage. Repeat on opposite side.
3. Remove bolt and washer securing ground wire to elevator hinge bracket on aft horizontal stabilizer and stow ground wire.
4. Using reciprocating saw with 6 inch (15 cm) blade, cut through spar of remnant to remove core.
5. Position cutting end of wedge between aft remnant and fuselage flange. Strike back of wedge forward to leading edge of remnant.
6. If leading edge of remnant is still adhered to fuselage flange, alternately position flat end of wedge to sides of remnant and strike with hammer until remnant is loosened.

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Figure 55-102
Horizontal Stabilizer Removal - Method #2

(k) Remove residue. (See Figure 55-103)

1 Apply low-tack tape over LH access panel opening to restrict debris from entering empennage.

2 Plug inside of empennage with breather material to contain debris during residue removal.

CAUTION: Protect skin of airplane from scuffing against vacuum nozzle using low-tack tape as barrier between structures.

3 Apply low-tack tape to airplane skin below fuselage flange where vacuum nozzle will be positioned. Position vacuum nozzle upward and secure to empennage with tape. Turn vacuum on.

CAUTION: If installed, do not remove shims from bonding flange on fuselage. Removal of shims will require reinstallation of shim and additional adjustments.

Do not damage the bonding flange when removing residual material.

4 Using 90° die grinder with 80-grit sanding drum, remove remaining composite and adhesive from bonding flange on fuselage.

5 Use low-profile orbital sander for more controlled adhesive removal as majority of residue is removed. Hand sand when necessary at leading edge until at least 70% of original laminate surface is exposed.

6 Solvent clean bonding flange on fuselage. (Refer to 20-30)

7 Repeat residue removal at remaining fuselage flange surfaces.

(l) *Horizontal Stabilizer Removal Method #1:* Inspect horizontal stabilizer for damage and repair as necessary.

1 If extent of damage does not exceed 2 plies, perform Laminating - In Place Method installing twice as many plies as the original lay-up. (Refer to 51-20)

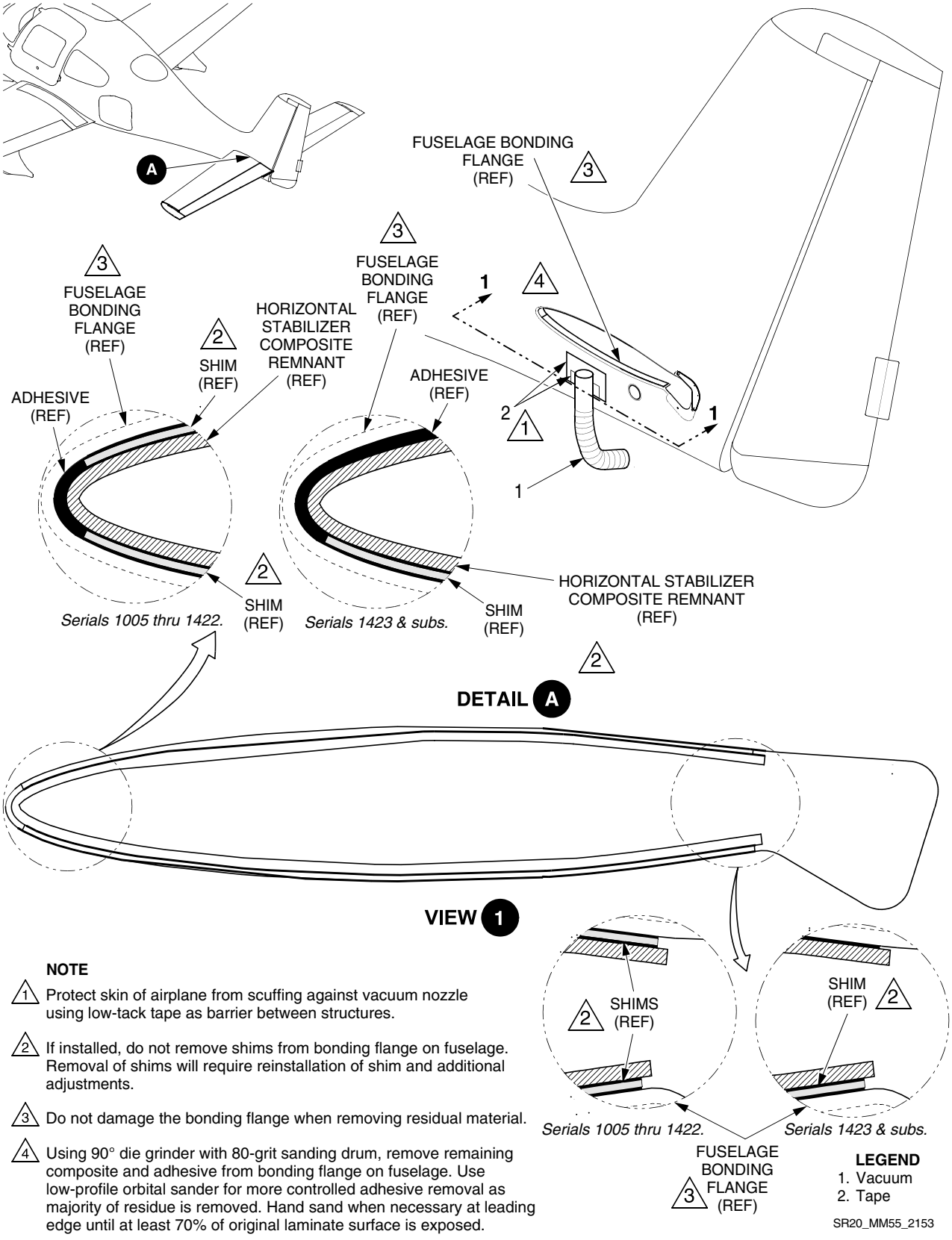
2 If extent of damage is greater than 2 plies, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(m) Inspect fuselage flange for damage and repair as necessary.

1 If extent of damage does not exceed 2 plies, no repair is necessary.

2 If extent of damage is equal to 3 - 6 plies, perform Laminating - In Place Method installing one ply for each ply replaced in the original lay-up. (Refer to 51-20)

3 If extent of damage is greater than 6 plies, contact Cirrus Design for disposition. (Refer to AMM-Intro-)



NOTE

1. Protect skin of airplane from scuffing against vacuum nozzle using low-tack tape as barrier between structures.
2. If installed, do not remove shims from bonding flange on fuselage. Removal of shims will require reinstallation of shim and additional adjustments.
3. Do not damage the bonding flange when removing residual material.
4. Using 90° die grinder with 80-grit sanding drum, remove remaining composite and adhesive from bonding flange on fuselage. Use low-profile orbital sander for more controlled adhesive removal as majority of residue is removed. Hand sand when necessary at leading edge until at least 70% of original laminate surface is exposed.

Figure 55-103
Residue Removal

EFFECTIVITY:
All

(2) Installation - Horizontal Stabilizer

Two methods of horizontal stabilizer installation are explained. Method #1 uses a permanent floor mounted fixture during bonding procedures. Method #2 uses a portable tool.

WARNING: **Installation of the horizontal stabilizer assembly requires a test flight performed by a Cirrus Design certified test pilot. Contact Cirrus Design prior to performing maintenance to schedule test flight.**

CAUTION: Proper application of PTM&W ES6292-Based Structural Adhesive is critical to obtaining full bond strength. The application procedure defined in this procedure differs from commonly used MGS L418-Based Structural Adhesive and should be fully understood prior to performing the installation.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permanent Floor Mounted Fixture - using Method #1	T6693	Cirrus Design Duluth, MN 55811 218-727-2737	Bond Horizontal to Fuselage
Portable Tool w/ Horizontal Stands - using Method #2	T11011	Cirrus Design Duluth, MN 55811 218-727-2737	Bond Horizontal to Fuselage
Ruler Gauge (Pegged), Forward and Aft - using Method #2	T6320	Cirrus Design Duluth, MN 55811 218-727-2737	Leveling
Tail Jack Stand - using Method #2	-	Any Source	Leveling
Aircraft Hydraulic Jack (2) - using Method #2	-	Any Source	Leveling
Transit w/ Base	-	Any Source	Leveling
Digital Level	-	Any Source	Leveling
Tape Measure	-	Any Source	Leveling
Tail Cross Pin	T6149	Cirrus Design Duluth, MN 55811 218-727-2737	Leveling
Horizontal Incidence Template, HS36, LH	T1835	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Horizontal Incidence Template, HS36, RH	T1836	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Horizontal Incidence Template, HS72, LH	T1837	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement

Description	P/N or Spec.	Supplier	Purpose
Horizontal Incidence Template, HS72, RH	T1838	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Feeler Gauge	0.140-inch	Any Source	Bond line Tolerance
Pastry Bag	DPBR-18	Bakery Crafts West Chester, OH 45071 800-543-1673	Application
Flexible Spreader	2-inch	Any Source	Application
Thermocouple Monitor With Infrared-RS232 adaptor, serial adaptor, and 2 Type J Thermocouple Probes	600-1050/ 600-0092	Telatemp Corporation Fullerton, California 92831 800-321-5160	Indicating and Recording
Insulation Material	AR04044	Mac ARTHUR CO. St. Paul, Mn. 55114 800-777-7507	Post Curing
Sheet Metal	-	Any Source	Post Curing
Curing, Empennage Heat Shield	T7102	Cirrus Design Duluth, MN 55811 218-727-2737	Curing
Initial Curing Enclosure (w/ Slit), LH	T6856-1	Cirrus Design Duluth, MN 55811 218-727-2737	Initial Curing
Initial Curing Enclosure (w/ Slit), RH	T6856-2	Cirrus Design Duluth, MN 55811 218-727-2737	Initial Curing
Post Curing Enclosure (w/o Slit), LH	T6857-1	Cirrus Design Duluth, MN 55811 218-727-2737	Post Curing
Post Curing Enclosure (w/o Slit), RH	T6857-2	Cirrus Design Duluth, MN 55811 218-727-2737	Post Curing
Electronic Temperature Control Unit	A419ABG-3C (for 120 VAC) A419ABC-1C (for 240 VAC)	Johnson Controls Milwaukee, WI 53201 414-524-1200	Temperature Control
Infrared Thermometer	MiniTemp MT4 w/ laser point	Raytek Corporation Santa Cruz, CA 95061 800-866-5478	Measurement
Bagging Film Breather	(Refer to 51-30)	(Refer to 51-30)	Curing

Description	P/N or Spec.	Supplier	Purpose
Flashbreaker Tape 2.0 inches (5.0 cm)	(Refer to 51-30)	(Refer to 51-30)	Protection
Masking Tape (2 Rolls)	3.0 inches (7.6 cm)	Any Source	Sealing
Blow Dryer (2)	1500 - 1875 Watt	Any Source	Curing
250 W Heat Lamp(s)	-	Any Source	Curing
Hammer	-	Any Source	Break Sample
Chisel	-	Any Source	Break Sample

(b) Remove rudder assembly. (Refer to 55-40)

(c) *Horizontal Stabilizer Installation Method #1:* Mount fuselage into permanent floor mounted fixture. (See Figure 55-104)

1 Remove wing assembly. (Refer to 57-10)

2 Remove nose gear strut. (Refer to 32-20)

3 Hoist airplane. (Refer to 07-20)

CAUTION: Verify all primary support points on fuselage and bonding fixture are aligned with one another and no fixture obstructions contact the fuselage while lowering the fuselage onto the bonding fixture.

4 Position fuselage above bonding fixture.

5 At aft section of fixture, pivot middle elevator hinge arm outboard.

6 At forward section of fixture, center engine support base assembly.

7 Lower fuselage to fixture until nose landing gear mounts and tail cross pin hole are within 6 inches (15 cm) of final mounting positions.

8 At RH spar tunnel, install T-bolt to secure male cone datum to bottom of fuselage spar tunnel.

9 At LH and RH nose gear strut mounting locations on engine mount frame assembly, insert tethered engine support pins.

10 At aft fuselage, insert tail cross pin through aft tooling hole of LH and RH empennage access panels. Ensure pin passes through hole of both access panels.

CAUTION: Verify tail cross pin is installed at aft fuselage and engine support pins are installed at forward fuselage before lowering fuselage onto bonding fixture.

Note: Mating of the cone datum at the spar tunnel should determine location and engine support base assembly should shift as necessary.

11 Lower fuselage into V-blocks of engine support base assembly and onto tail cross pin support.

12 Ensure male upper cone surface is mated with female lower cone surface.

13 At aft section of fuselage, insert lower rudder pin into position.

14 Verify fuselage is still correctly positioned at support V-blocks and pin locations.

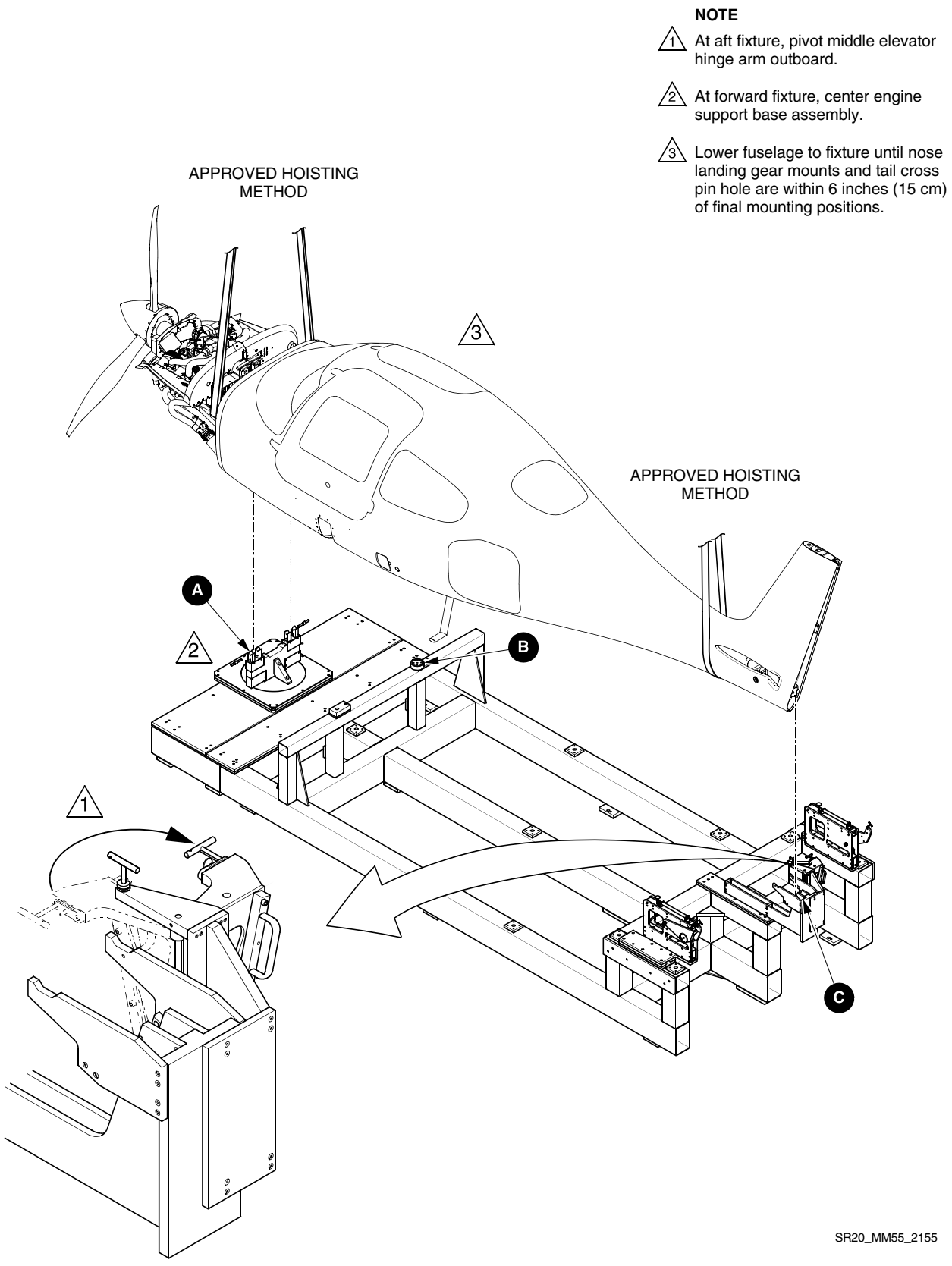
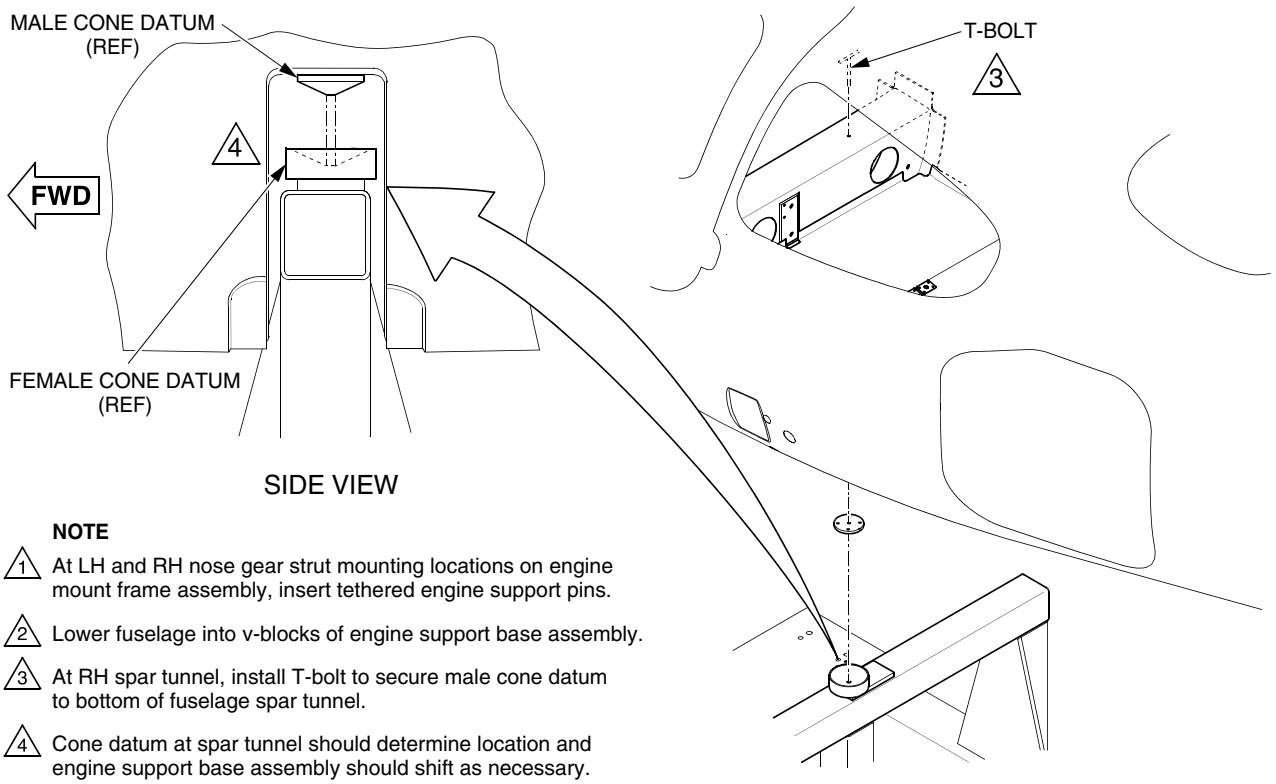


Figure 55-104
Mounting Fuselage To Permanent Floor Mounted Fixture - Method #1 (Sheet 1 of 3)



NOTE

1. At LH and RH nose gear strut mounting locations on engine mount frame assembly, insert tethered engine support pins.
2. Lower fuselage into v-blocks of engine support base assembly.
3. At RH spar tunnel, install T-bolt to secure male cone datum to bottom of fuselage spar tunnel.
4. Cone datum at spar tunnel should determine location and engine support base assembly should shift as necessary.

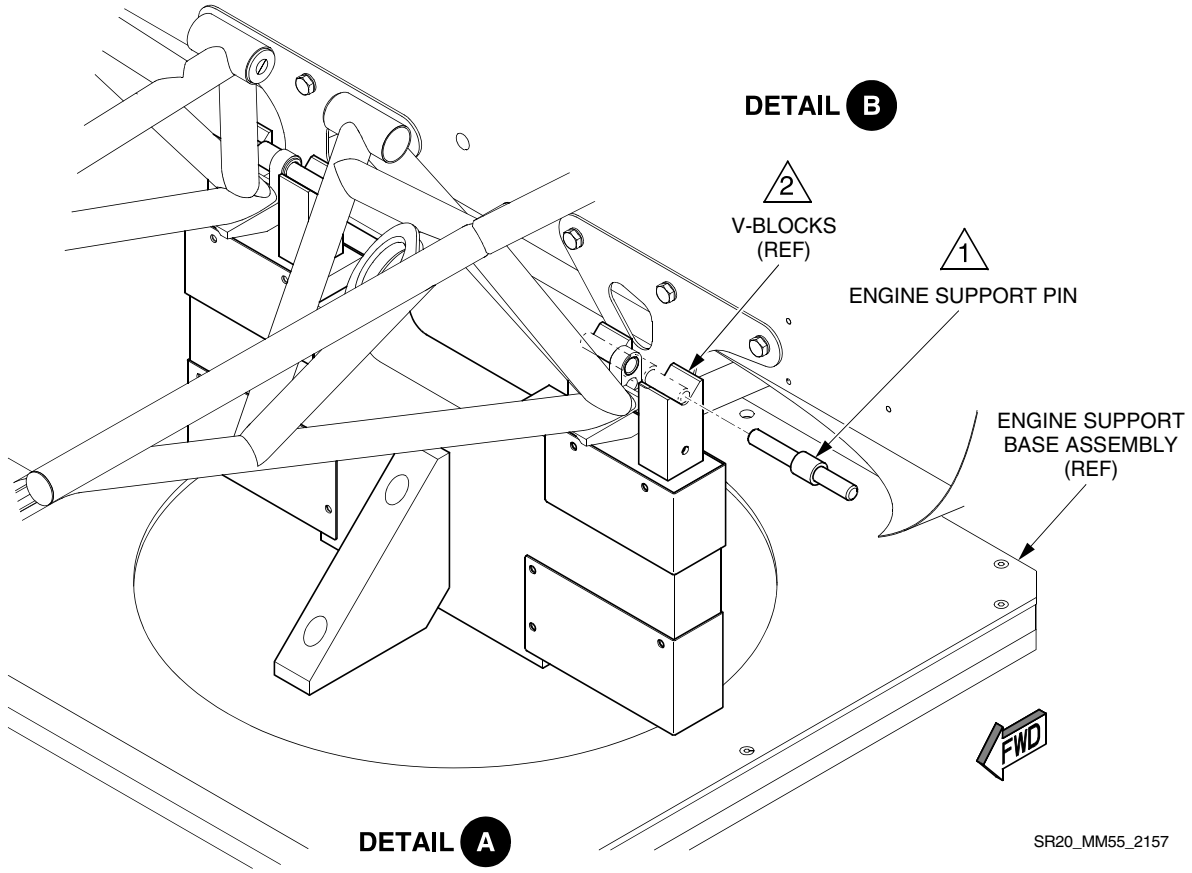
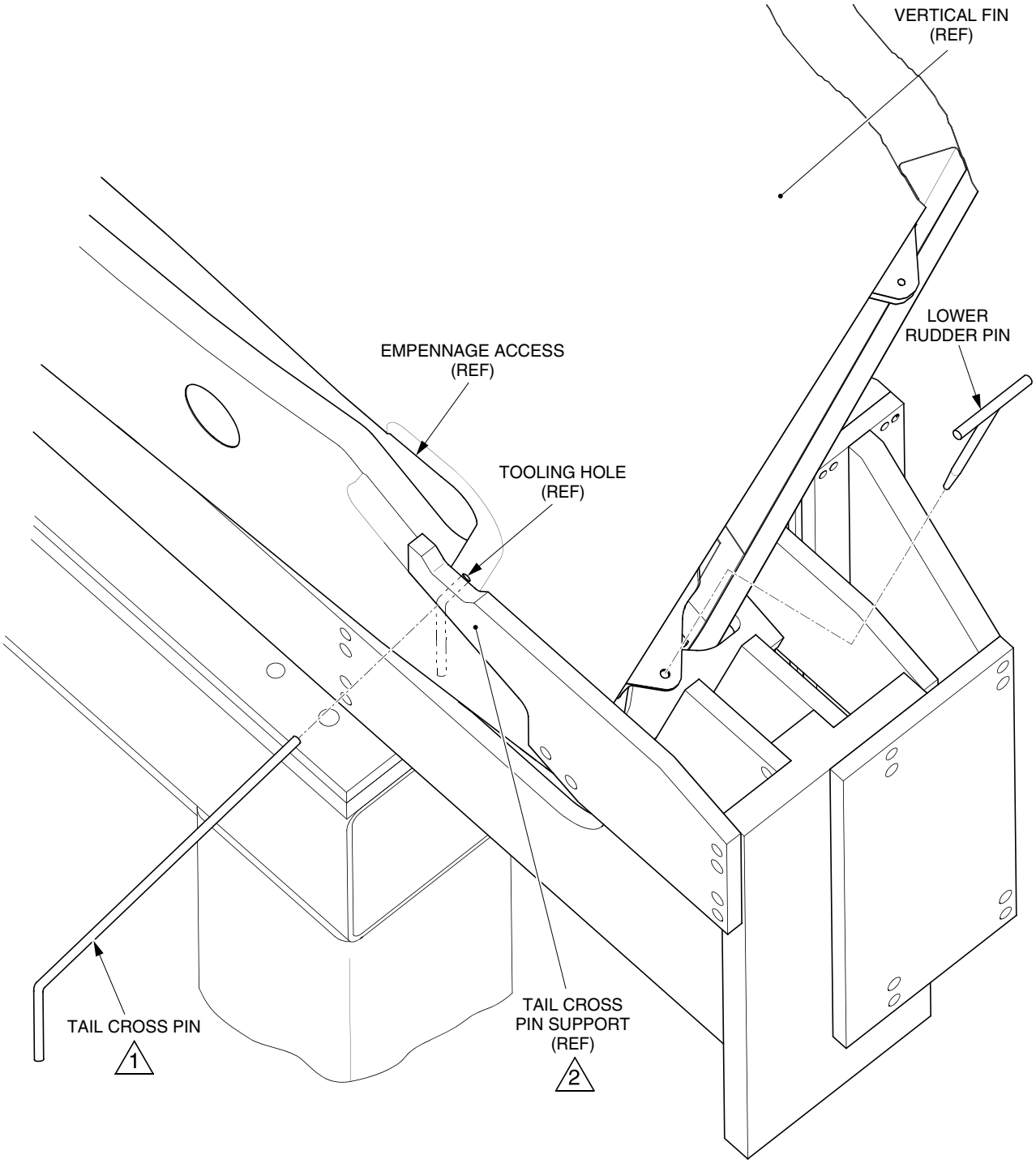


Figure 55-104
Mounting Fuselage To Permanent Floor Mounted Fixture - Method #1 (Sheet 2 of 3)



LH, BIRDSEYE VIEW OF EMPENNAGE & FIXTURE

NOTE

1. At aft fuselage, insert tail cross pin through aft tooling hole of LH and RH empennage access panels. Ensure pin passes through hole of both access panels.

2. Lower fuselage onto tail cross pin support.

DETAIL C

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Figure 55-104
Mounting Fuselage To Permanent Floor Mounted Fixture - Method #1 (Sheet 3 of 3)

(d) *Horizontal Stabilizer Installation Method #1:* Mount horizontal stabilizer into permanent floor mounted fixture. (See Figure 55-105)

1 Record serial number of new horizontal stabilizer and update log book.

New Horizontal Stabilizer Serial Number

2 At aft section of fixture, pivot LS 36 and RS 36 elevator hinge arms down.

3 Rotate trailing edge adjustment clamp lever clockwise to lower clamp.

4 Position horizontal stabilizer assembly in opening at aft fuselage.

5 At mid-span elevator hinge, pivot LS 36 arm up and position arm on horizontal stabilizer hinge pin.

6 Install threaded locking pin securing LS 36 arm to horizontal stabilizer hinge pin.

7 At middle elevator hinge arm, remove threaded locking pin.

8 Pull release pin to unlock spacer on middle elevator arm.

9 Pivot middle elevator arm inboard and position arm to elevator hinge bracket.

10 Position spacer between elevator hinge bracket.

11 Rotate spacer up and engage release pin into locking position between elevator hinge bracket.

12 Install threaded locking pin securing middle elevator arm to elevator hinge bracket.

13 At mid-span elevator hinge, pivot RS 36 arm up and position arm on horizontal stabilizer hinge pin.

14 Install threaded locking pin securing RS 36 arm to horizontal stabilizer hinge pin.

15 At outboard section LS 36 arm, raise locking handle for leading edge adjustment clamp until rubber foot is in contact with the horizontal stabilizer.

If rubber foot is pressed firmly against horizontal stabilizer before locking handle can be fully engaged, lower locking handle and rotate rubber foot bolt clockwise as required until foot does not exceed contact requirements when locking handle is fully engaged.

If gap exists between rubber foot and horizontal stabilizer with locking handle fully engaged, lower locking handle and rotate rubber foot bolt counter-clockwise as required until foot meets contact requirements when locking handle is fully engaged.

Repeat on leading edge adjustment clamp at outboard section of RS 36 arm.

(e) *Horizontal Stabilizer Installation Method #2:* Mount horizontal stabilizer into portable tool. (See Figure 55-105)

1 Using tail jack stand and ruler gauge set, longitudinally level airplane with transit using fuselage leveling points. (Refer to 08-10)

2 Position horizontal stabilizer assembly in opening at aft fuselage.

3 Position portable tool into fuselage.

4 At vertical spar tooling hole, install lower rudder pin securing aft side of portable tool to vertical spar.

5 At RH empennage panel, install tail cross pin through RH and LH empennage access tooling holes securing outboard sides of portable tool to empennage.

6 Install mounting bolt to forward side of portable tool.

7 Position pass-through hole of mounting bolt to elevator hinge bracket.

8 Install locking pin to secure mounting bolt to elevator hinge bracket.

9 Place aircraft hydraulic jack under LH and RH wing at jack points. (Refer to 07-10)

10 Place horizontal stands under LH and RH horizontal stabilizer approximately 12 inches (30 cm) from outboard edge.

11 Use feeler gauge to verify horizontal is centered within opening.

12 For yaw adjustment, measure with tape measure from HS72 hinge pin to forward longitudinal leveling point on the same side. Adjust yaw position of horizontal stabilizer so that distances are equal.

13 For roll adjustment, rotate rubber foot bolt on horizontal stands clockwise or counter-clockwise as required to eliminate roll. Verify that each side of horizontal stabilizer is perpendicular to the vertical spar.

(f) Determine angle of incidence at bonding flange on fuselage.

CAUTION: Apply masking tape to template feet to protect contact locations on wing surface.

1 At LH and RH sides of horizontal stabilizer, identify horizontal incidence templates for HS36 and HS72 and position templates to horizontal stabilizer as marked.

2 Position digital level at each template and measure angle of incidence.

3 Verify angle of incidence at all template locations is measured at 0.60°+/-0.20°.

CAUTION: Ensure adjustment to rubber foot positions does not bring upper or lower gaps outside of maximum bond thickness tolerances.

Using Permanent Floor Mounted Fixture: If angle of incidence is not within tolerance, lower locking handle and rotate rubber foot bolt clockwise or counter-clockwise as required to attempt adjustment for angle of incidence. Ensure template is positioned flush with the horizontal stabilizer. Repeat verification for angle of incidence tolerance.

Using Portable Tool: If angle of incidence is not within tolerance, rotate knurled adjustment knob on portable tool clockwise (to raise angle of incidence value) or counter-clockwise (to lower angle of incidence value) as required to attempt adjustment for angle of incidence.

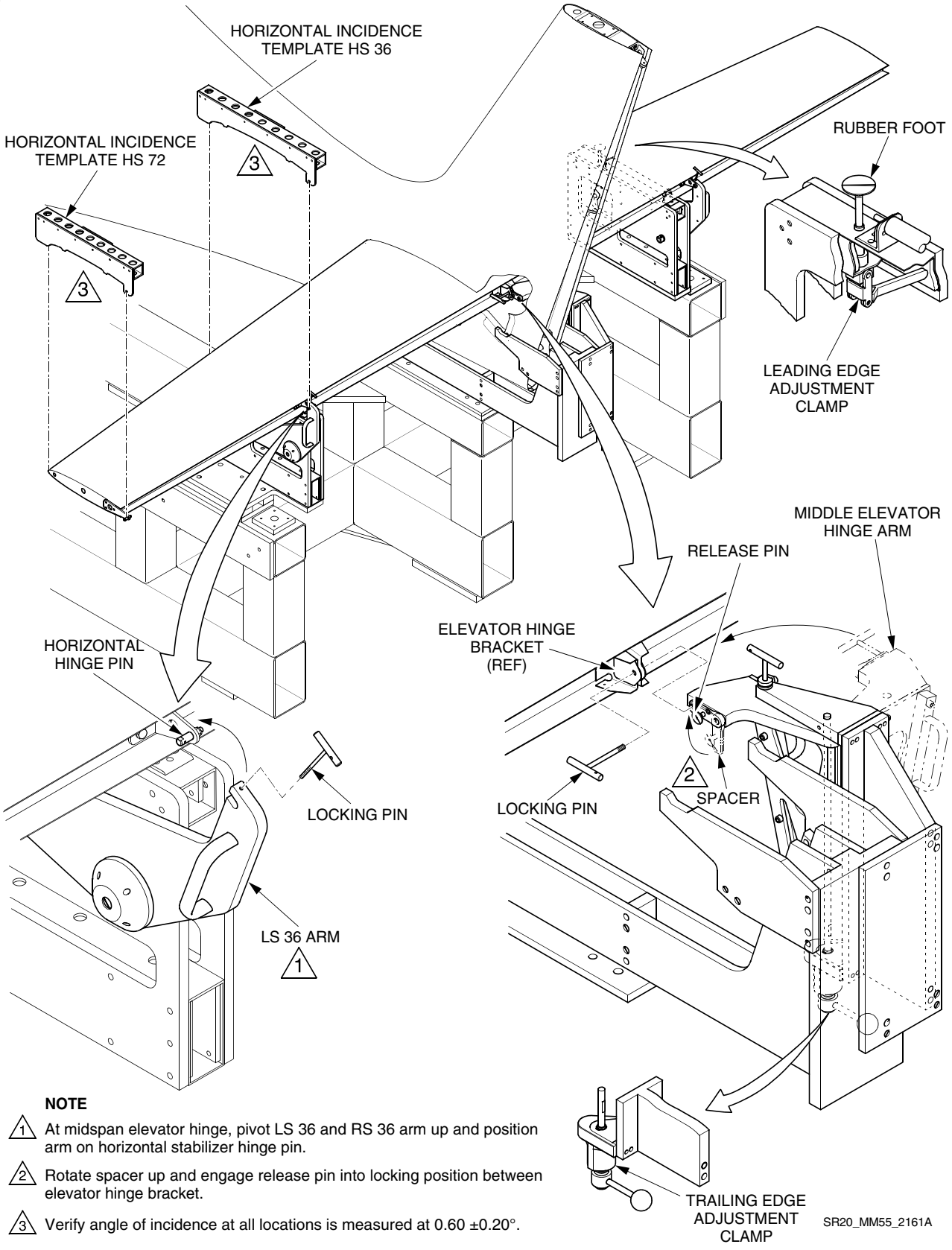
Using Weighted Average Horizontal Incidence Equation:

Note: The equation below is only applicable for incidence measurements taken at Horizontal Station 36 and 72.

$$\Theta_{HT} = 0.3417(\Theta_{HS36L} + \Theta_{HS36R}) + 0.1583(\Theta_{HS72L} + \Theta_{HS72R})$$

Θ_{HT} = Angle of incidence to set
Θ_{HS36L} = Angle of incidence measured at Left Horizontal Station 36.
Θ_{HS36R} = Angle of incidence measured at Right Horizontal Station 36.
Θ_{HS72L} = Angle of incidence measured at Left Horizontal Station 72.
Θ_{HS72R} = Angle of incidence measured at Right Horizontal Station 72.

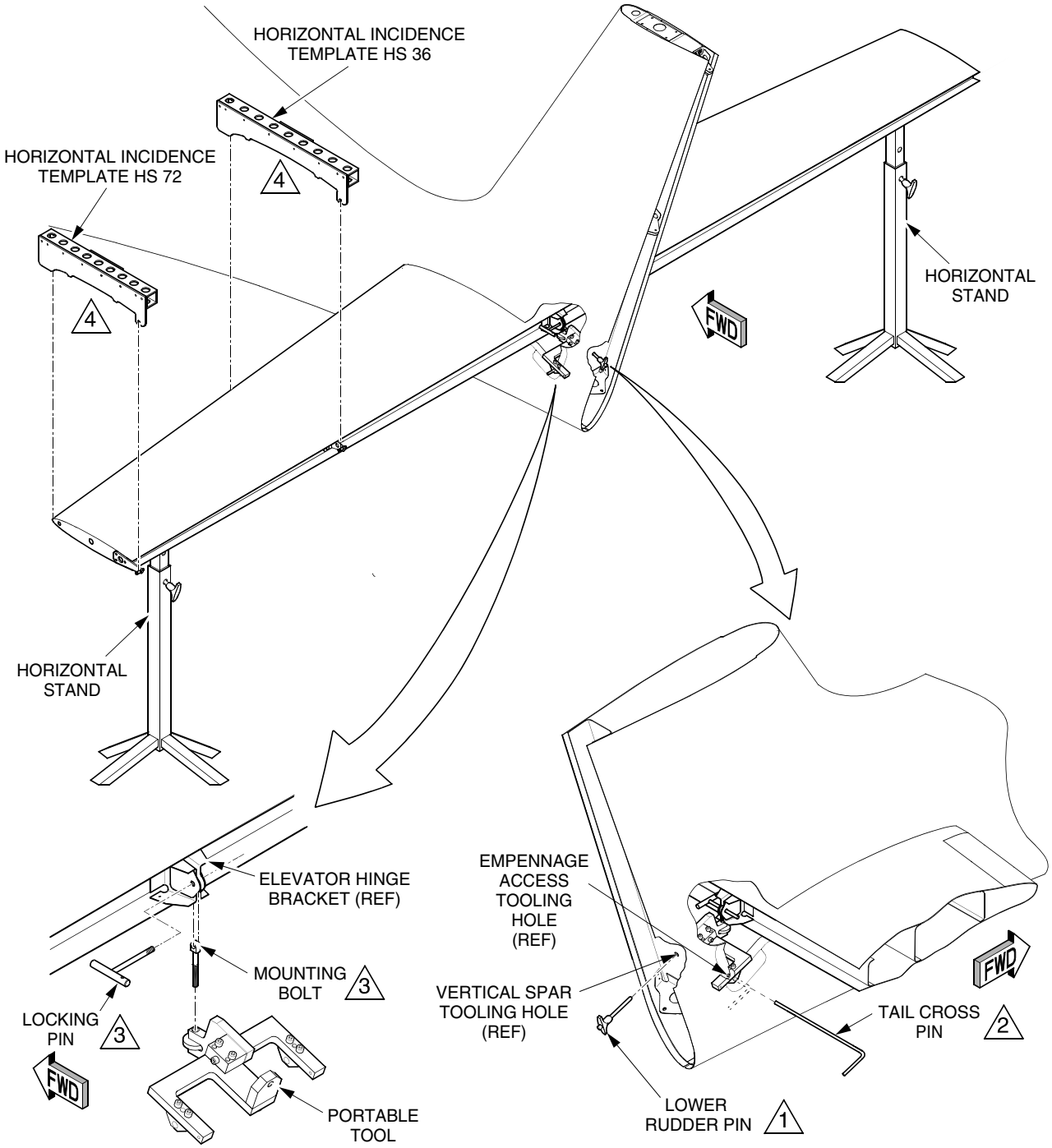
If angle of incidence cannot be brought within tolerance (0.60°+/-0.20°), contact Cirrus Design for disposition.



NOTE

1. At midspan elevator hinge, pivot LS 36 and RS 36 arm up and position arm on horizontal stabilizer hinge pin.
2. Rotate spacer up and engage release pin into locking position between elevator hinge bracket.
3. Verify angle of incidence at all locations is measured at 0.60 ±0.20°.

Figure 55-105
Mounting Horizontal Stabilizer To Permanent Floor Mounted Fixture - Method #1 (Sheet 1 of 2)



NOTE

1. At vertical spar tooling hole, install lower rudder pin securing aft side of portable tool to vertical spar.
2. At RH empennage panel, install tail cross pin through RH and LH empennage access tooling holes securing outboard sides of portable tool to empennage.
3. Position pass-through hole of mounting bolt to elevator hinge bracket. Install locking pin to secure mounting bolt to elevator hinge bracket.
4. Verify angle of incidence at all locations is measured at 0.60 ±0.20°.

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Figure 55-105
Mounting Horizontal Stabilizer To Portable Tool - Method #2 (Sheet 2 of 2)

(g) At upper and lower gaps between horizontal stabilizer and bonding flange on fuselage, verify gaps do not exceed 0.140 +0.0/-0.120 inch (3.556 +0.0/-3.048 mm) between 6.0 inches from leading edge to 4.0 inches from trailing edge. (See Figure 55-107)

Note: At upper and lower gaps of horizontal stabilizer, bond line thickness requirements do not apply to forward 3.0 inches of leading edge and aft 1.0 inch of trailing edge.

Bond line thickness requirements between 3.0 to 6.0 inches from leading edge and between 1.0 to 4.0 inches from trailing edge must not exceed 0.200 +0.0/-0.180 inch (5.080 +0.0/-4.572 mm).

If re-positioning is required, measure gaps periodically between adjustments.

Horizontal Stabilizer Installation Method #1: If upper or lower gap exceeds maximum bond thickness tolerances, rotate trailing edge adjustment clamp lever. (See Figure 55-105)

1 Slowly rotate lever counter clockwise to raise trailing edge adjustment clamp as required.

2 Verify gaps do not exceed 0.140 +0.0/-0.120 inch (3.556 +0.0/-3.048 mm).

3 Repeat angle of incidence measurements at bonding flange on fuselage.

Horizontal Stabilizer Installation Method #2: If upper or lower gap exceeds maximum bond thickness tolerances, lower horizontal stands (to reduce excessive lower gap) or raise horizontal stands (to reduce excessive upper gap) as required to attempt adjustment for bond thickness. Following horizontal stands adjustment, re-adjust angle of incidence using knurled adjustment knob on portable tool.

(h) *Serials 1005 thru 1422:* If out-of-tolerance measurements cannot be corrected, shim upper and lower bonding flange on fuselage as follows. (See Figure 55-106)

Note: If shimming at leading edge, custom shim modification is required to match curvature of fuselage flange and horizontal stabilizer. Contact Cirrus Design for disposition.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Pre-Cure Shim	12012-001	Cirrus Design Duluth, MN 55811 218-727-2737	Meet Bond line Requirements
90° Die Grinder	-	Any Source	Cutting/Abrasion
Sandpaper	80-grit	Any Source	Reduce Shim Thickness
Metal Cut-Off Wheel and Arbor	2.0 inches (5.1 cm)	Any Source	Cutting
Sanding Drum	80-grit	Any Source	Abrasion

2 Detach horizontal stabilizer assembly from fixture/tool and remove from opening at aft fuselage.

CAUTION: Shims may not be installed on top of existing shims. Verify all residual shim material has been removed before installing shims.

Do not damage the bonding flange when removing residual material.

3 Using 90° die grinder with 80-grit sanding drum, remove any residual shim material existing on bonding flange.

4 Using sandpaper, reduce shim thickness as required to maintain bond line requirements.

Note: Shims to be installed within 3.0 inches (7.6 cm) of the horizontal stabilizer leading edge may be cut 0.25 - 1.0 inch (0.64 - 2.54 cm) wide.

5 Using 90° die grinder with cut-off wheel, cut shim into 2.0 inches (5.1 cm) wide pieces.

6 Pre-fit faying surfaces of shims to upper and lower fuselage flanges (rough-side to bonding surface, tapered inboard) to ensure the bond fixture/tool used will bring the bonded surfaces into an allowable tolerance during adhesive curing. Trim shims as required to fit fuselage flange.

7 Prepare PTM&W ES6292-Based Structural Adhesive. (Refer to 51-30)

Note: The adhesive bead should have a high point near the center of the bead to avoid entrapped air.

8 Apply approximately 0.13 - 0.25 inch (3.18 - 6.35 mm) bead of adhesive down the center of the bond width on the faying surface of the shims. Repeat adhesive application to faying surface of the upper and lower fuselage flanges.

CAUTION: Avoid applying, removing, and re-applying clamping pressure, as this will cause air to become entrapped in the bond gap.

Verify bond gap thickness of 0.060 +0.020/-0.055 inch between faying surfaces of horizontal stabilizer and fuselage flanges.

9 Position shims rough-side to bond, tapered inboard and place at faying surface of the upper and lower fuselage flanges. Verify bond gap between individual shims does not exceed 0.2 inch (0.51 cm).

10 Secure parts ensuring that pressure is applied uniformly.

11 Check edge of bond line for excess adhesive. Remove excess adhesive with cloth dampened with isopropyl alcohol.

12 Cure bond. (Refer to 51-20)

13 Position horizontal stabilizer assembly in opening at aft fuselage and secure into bonding position with fixture/tool.

14 Repeat angle of incidence measurements at bonding flange on fuselage.

15 Repeat gap inspection to verify upper and lower bond gap is within tolerance.

If installation of shims does not bring gaps within tolerance, contact Cirrus Design for disposition.

(i) *Serials 1423 & subs:* If out-of-tolerance measurements cannot be corrected, shim lower bonding flange on fuselage as follows. (See Figure 55-106)

Note: If shimming at leading edge, custom shim modification is required to match curvature of fuselage flange and horizontal stabilizer. Contact Cirrus Design for disposition.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Pre-Cure Shim, Tapered	12013-001	Cirrus Design Duluth, MN 55811 218-727-2737	Meet Bond line Requirements
90° Die Grinder	-	Any Source	Cutting/Abrasion
Metal Cut-Off Wheel and Arbor	2.0 inches (5.1 cm)	Any Source	Cutting
Sanding Drum	80-grit	Any Source	Abrasion

2 Detach horizontal stabilizer assembly from fixture/tool and remove from opening at aft fuselage.

CAUTION: Shims may not be installed on top of existing shims. Verify all residual shim material has been removed before installing shims.

Do not damage the bonding flange when removing residual material.

3 Using 90° die grinder with 80-grit sanding drum, remove any residual shim material existing on bonding flange.

Note: Shim is installed with tapered end positioned forward. Verify installation positioning prior to cutting.

4 Position shim rough-side to bond, tapered end forward to fuselage flange at bonding location to transfer cutout arc on fuselage flange.

5 Transfer mark on shim where overlap occurs with fuselage flange cutout arc.

6 Using 90° die grinder with cut-off wheel, remove marked cutout portion from shim.

7 Pre-fit faying surfaces of shim to fuselage flange to ensure the bond fixture used will bring the bonded surfaces into an allowable tolerance during adhesive curing. Trim length of shim as required to fit fuselage flange.

8 Prepare PTM&W ES6292-Based Structural Adhesive. (Refer to 51-30)

Note: The adhesive bead should have a high point near the center of the bead to avoid entrapped air.

9 Apply approximately 0.13 - 0.25 inch (3.18 - 6.35 mm) bead of adhesive down the center of the bond width on the faying surface of the shim. Repeat adhesive application to faying surface of the fuselage flange.

CAUTION: Avoid applying, removing, and re-applying clamping pressure, as this will cause air to become entrapped in the bond gap.

10 Position shim rough-side to bond, tapered end forward and place at faying surface of the fuselage flange.

11 Secure parts for bonding ensuring that pressure is applied uniformly.

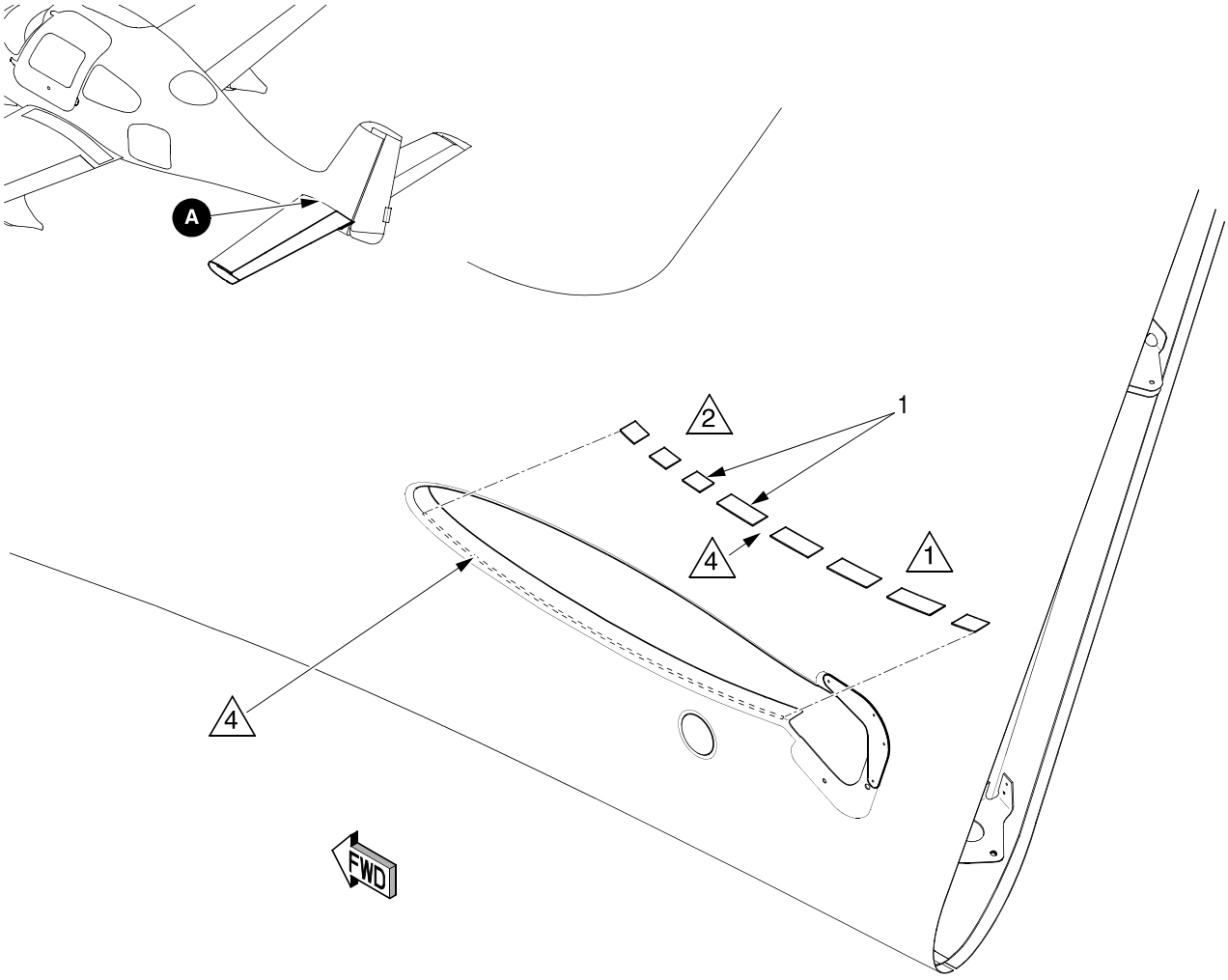
12 Check edge of bond line for excess adhesive. Remove excess adhesive with cloth dampened with isopropyl alcohol.

13 Cure bond. (Refer to 51-20)

14 Position horizontal stabilizer assembly in opening at aft fuselage and secure into bonding position with fixture/tool.

15 Repeat angle of incidence measurements at bonding flange on fuselage.

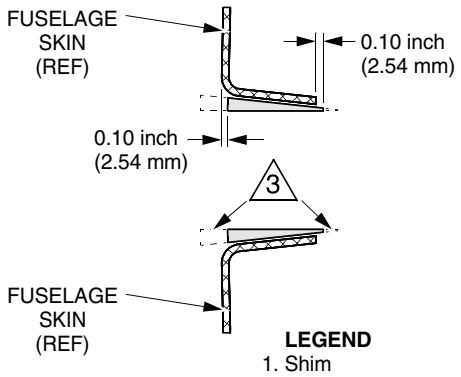
16 Repeat gap inspection to verify upper and lower bond gap is within tolerance.
If shims do not bring gaps within tolerance, contact Cirrus Design for disposition.



DETAIL A

NOTE

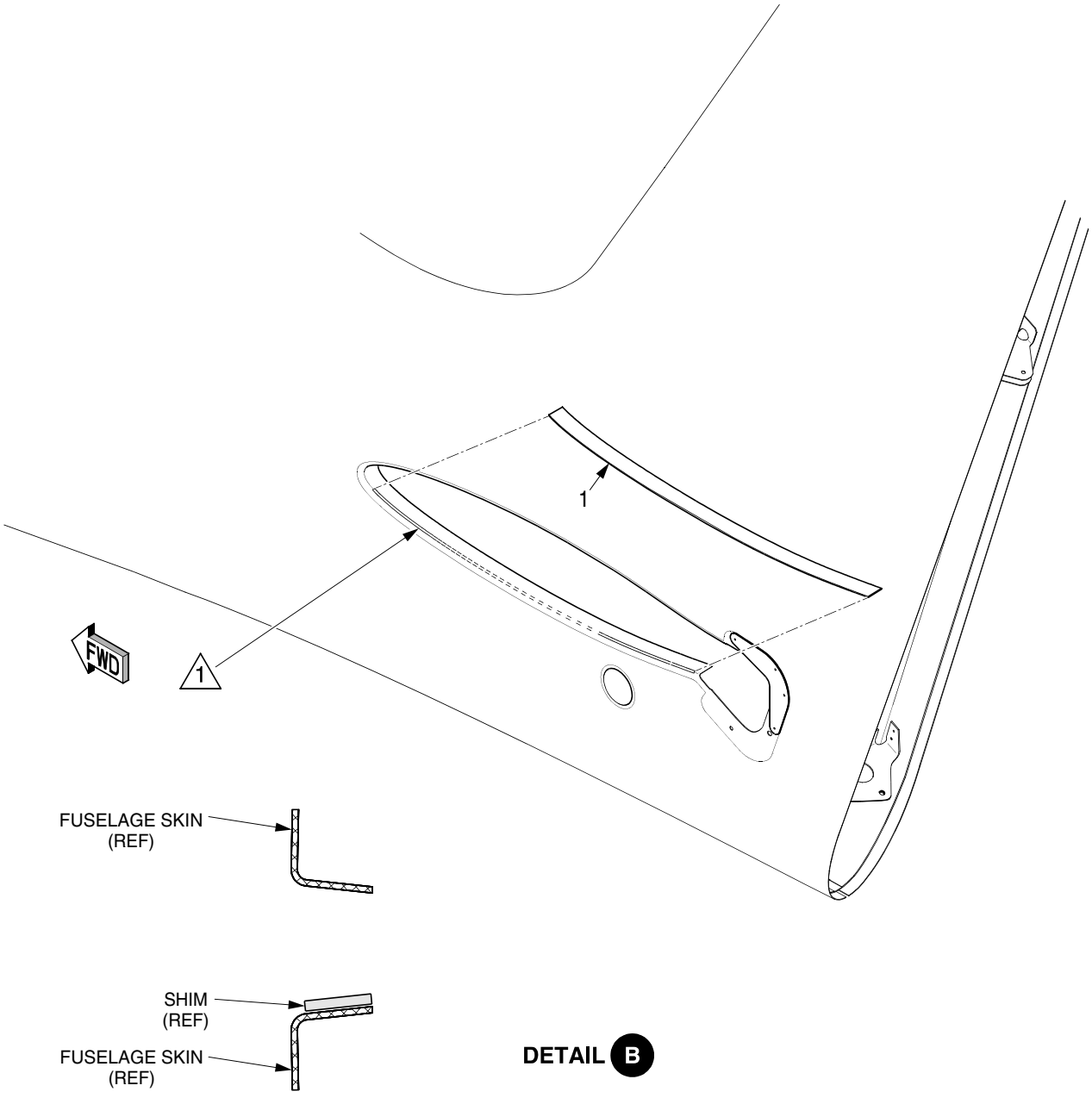
1. Using 90° die grinder with cutting wheel, cut shim into pieces 2.0 inches (5.08 cm) wide.
2. Shims to be installed within 3.0 inches (7.6 cm) of the horizontal stabilizer leading edge may be cut 0.25 - 1.0 inch (0.64 - 2.54 cm) wide.
3. Pre-fit faying surfaces of shims to upper and lower fuselage flanges (rough-side to bonding surface, tapered inboard) to ensure the bond fixture used will bring the bonded surfaces into an allowable tolerance during adhesive curing. Trim shims as required to fit fuselage flange.
4. Apply approximately 0.13 - 0.25 inch (3.18 - 6.35 mm) bead of adhesive down the center of the bond width on the faying surface of the shims. Repeat adhesive application to faying surface of the upper and lower fuselage flanges.



Serials 1005 thru 1422.

SR20_MM55_2176B

Figure 55-106
Fuselage Flange Shim - Serials 1005 thru 1422 (Sheet 1 of 2)



NOTE

1 Apply a bead of adhesive down the center of the bond width, approximately 0.13 - 0.25 inch (3.18 - 6.35 mm) bead for each 1.0 inch (25.4 mm) of bond width.

LEGEND

1. Shim

SR20_MM55_2165A

Figure 55-106
Fuselage Flange Shim - Serials 1423 & subs (Sheet 2 of 2)

(j) Prepare repair surfaces of bonding flange on fuselage and horizontal stabilizer. (Refer to 51-20)

(k) Verify proper surface preparation of bond (no shiny areas, free of contaminants, and wiped clean) at fuselage flange, horizontal stabilizer, and shims.

(l) Mask off bonding flange on fuselage as required. Protect flight control cables with masking tape.

(m) Prepare PTM&W ES6292-based Structural Adhesive. (Refer to 51-30)

CAUTION: Apply material in a continuous operation to minimize entrapped air.

Do not move the fixture or apply pressure after injection of adhesive.

(n) Record part A and B quantities mixed, ambient air temperature and humidity at time of repair, technician name, and aircraft information and store per 14 CFR 145.219.

(o) Create inspection sample.

CAUTION: Ensure that container material is non-waxy to avoid contaminating the adhesive.

1 Place sample of adhesive into a container (small shallow dish or mylar paper).

2 Verify sample is approximately 0.5 inch (1.27 cm) thick and 2.0 inches (5.0 cm) in diameter.

3 Label bottom of container with airplane serial number.

(p) Bond horizontal stabilizer to fuselage. (See Figure 55-107)

CAUTION: Do not apply any pressure to the horizontal stabilizer prior to completing the cure cycle. Disturbing the horizontal stabilizer may create bond voids.

1 Pour adhesive into pastry bag.

CAUTION: Injecting adhesive into bond area may create voids in bond line. If this is suspected, use spreader to push out voids to opposite end of bond joint.

Do not move the fixture/tool or apply pressure after injection of adhesive.

2 At upper and lower gaps between horizontal stabilizer and bonding flange on fuselage, use pastry bag to squeeze a sufficient amount of adhesive into the pre-fixtured bond gap until it is visible extruding from the opposite end of the bond joint. Repeat on opposite side.

CAUTION: Slowly apply pressure to seam when scraping adhesive. If seam is quickly scraped or too much force is applied, air may be introduced to the bond line and promote the formation of bubbles.

3 Use spreader to carefully apply slow pressure to adhesive at seam.

CAUTION: Fill any gaps or voids immediately and remove any excess material.

4 Use inspection mirror at RH empennage access panel to verify adhesive at entire bond area is continuous and free of gaps.

5 If voids or bubbles are identified from inside of empennage, use spreader at exterior to carefully apply more pressure slowly at seam. Re-inspect to verify void is eliminated.

6 Verify no voids or bubbles exist at bond line between horizontal stabilizer and fuselage flange.

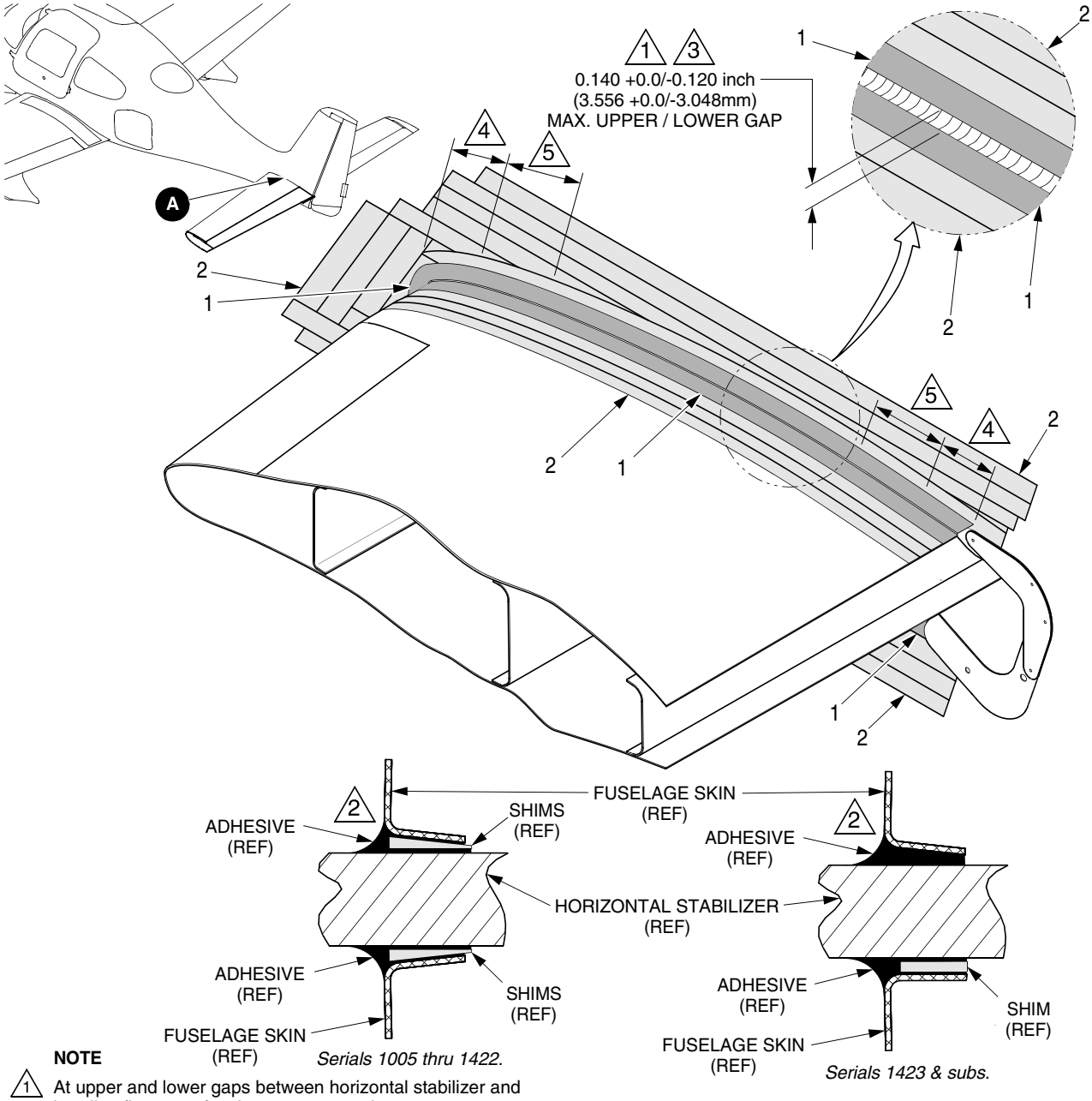
7 Check edge of bond line for excess adhesive and remove excess adhesive with cloth dampened with isopropyl alcohol.

8 Use spreader to smooth out adhesive at seam to reduce transition between adhesive and composite surfaces.

9 Verify excess adhesive at bond line between horizontal stabilizer and fuselage flange has been removed inside and outside of empennage.

CAUTION: Do not allow inspection sample adhesive to contact any surfaces within the empennage.

10 Place inspection sample inside empennage near bond area to be cured.



NOTE

1. At upper and lower gaps between horizontal stabilizer and bonding flange on fuselage, use pastry bag to squeeze a sufficient amount of adhesive into the pre-fixtured bond gap until it is visible extruding from the opposite end of the bond joint.
2. Use spreader to smooth out adhesive at seam to reduce transition between adhesive and composite surfaces.
3. Do not move the fixture or apply pressure after injection of adhesive.
4. At upper and lower gaps of horizontal stabilizer, bondline thickness requirements do not apply to forward 3.0 inches of leading edge and aft 1.0 inch of trailing edge.
5. Bondline thickness requirements between 3.0 to 6.0 inches from leading edge and between 1.0 to 4.0 inches from trailing edge must not exceed 0.200 +0.0/-0.180 inch (5.080 +0.0/-4.572 mm).

LEGEND
1. Transfer Tape
2. Masking Tape

SR20_MM55_2163A

Figure 55-107
Bonding Horizontal Stabilizer To Fuselage

(q) Attach thermocoupling probes. (See Figure 55-108)

1 At aft RH side of airplane, attach thermocouple monitor and electronic temperature control unit probes near repair area.

2 At interior of empennage near middle of LH bonding flange, place masking tape on the lower bottom of the bonding flange for the first thermocouple probe location.

3 At upper RH surface of horizontal stabilizer immediately aft of the leading edge, place masking tape on the horizontal stabilizer for the second thermocouple probe location.

CAUTION: Do not allow Flashbreaker tape to contact airplane finish during cure process.

4 Place Flashbreaker tape on top of the thermocouple probe masking tape locations.

5 Place thermocouple on top of Flashbreaker tape.

6 To prevent the thermocouple from coming loose, place Flashbreaker tape on top of the thermocouple.

7 Place breather insulation on top of the Flashbreaker tape.

8 To prevent direct air from making contact with the thermocouple, place Flashbreaker tape on top of the thermocouple.

(r) Fabricate air flow enclosures. (See Figure 55-108)

1 Using sheet metal, fabricate baffle for LE1 and RE1 access panel holes to prevent heat loss into vertical stabilizer cavity.

2 Using insulation material and flame-retardant tape, fabricate void block for inner empennage to displace heated air volume beneath stabilizer.

(s) Install enclosures for initial cure cycle. (See Figure 55-108)

1 Remove all tape installed around perimeter of bond line.

2 Solvent clean area where enclosures will be attached. (Refer to 20-30)

3 Between LE1 and RE1 access panel holes, position baffle across upper and aft gaps to restrict air flow.

4 At inner empennage through RE3 access panel hole, position void block between bulkhead FS289 and FS306.

5 Wrap empennage heat shield with breather to improve seal between shield and fuselage.

6 Position empennage heat shield to forward opening of bulkhead FS289. Compress excess breather material towards shield to further insulate.

7 Plug all openings with breather material to minimize heat loss.

8 Position LH enclosure (w/ slit) aft over width of horizontal stabilizer. Secure enclosure at horizontal stabilizer root to empennage and horizontal stabilizer with masking tape.

9 Attach masking tape at slit, at any open seams between enclosure and airplane surfaces, and over any holes in the aft vertical shear web to minimize heat loss.

10 Use masking tape to secure blow dryer nozzle to hot air inlet at aft section of enclosure.

11 Repeat enclosure installation on RH side of horizontal stabilizer using RH enclosure (w/ slit).

(t) Cure bond. (Refer to 51-20)

1 Connect the probes to the thermocouple monitor.

2 Connect RS232C cable from thermocouple monitor to computer.

3 Turn thermocouple monitor ON. Make sure the channels connected are indicating properly and the monitor indicates the correct thermocouple type.

4 Set thermocouple monitoring system to record temperatures once per minute.

5 Connect electronic temperature control unit to power.

6 Connect hot air dryer to electronic temperature control unit.

7 Connect thermocouple probes to the electronic temperature control unit.

8 Turn electronic temperature control unit ON. Set electronic temperature control unit to desired shut-off temperature. Turn blow dryer on.

9 When cure temperature is stabilized, press the PRINT button on the thermocouple monitor to begin recording cure cycle temperatures.

Note: If temperature readings fall below specified cure temperature, that time cannot be counted as part of the cure time.

10 Initial cure repair for specified time and temperature. (See Figure 51-2011)

11 Stop temperature recording, and turn off blow dryer.

12 Print recorded temperatures from computer. Title, copy, and retain temperature printouts.

(u) Check inspection sample.

1 Remove cured inspection sample from empennage.

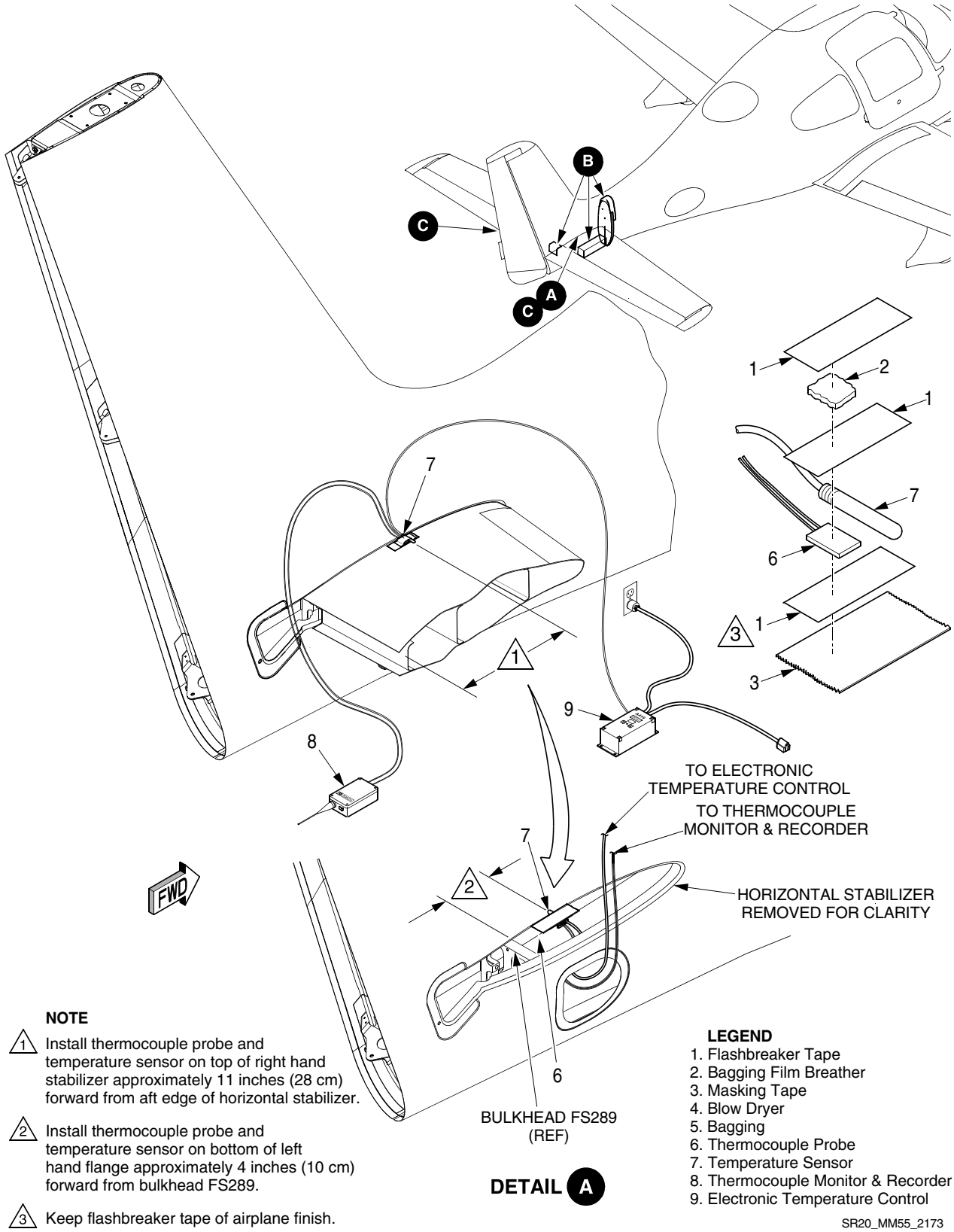
2 Remove inspection sample from container. Retain container for records.

3 Place inspection sample on hard, clean surface suitable for breaking with chisel.

CAUTION: To avoid shattering inspection sample into fragments too small to analyze, use care when breaking inspection sample to slowly tap chisel with hammer.

4 Use hammer and chisel to break inspection sample.

5 Verify cross-sectional fragments are homogenous. If dark or swirling colors are present in the sample, the resin was not mixed properly. Contact Cirrus Design for disposition.



NOTE

1. Install thermocouple probe and temperature sensor on top of right hand stabilizer approximately 11 inches (28 cm) forward from aft edge of horizontal stabilizer.
2. Install thermocouple probe and temperature sensor on bottom of left hand flange approximately 4 inches (10 cm) forward from bulkhead FS289.
3. Keep flashbreaker tape of airplane finish.

LEGEND

1. Flashbreaker Tape
2. Bagging Film Breather
3. Masking Tape
4. Blow Dryer
5. Bagging
6. Thermocouple Probe
7. Temperature Sensor
8. Thermocouple Monitor & Recorder
9. Electronic Temperature Control

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Figure 55-108
Curing Horizontal Stabilizer Bond (Sheet 1 of 3)

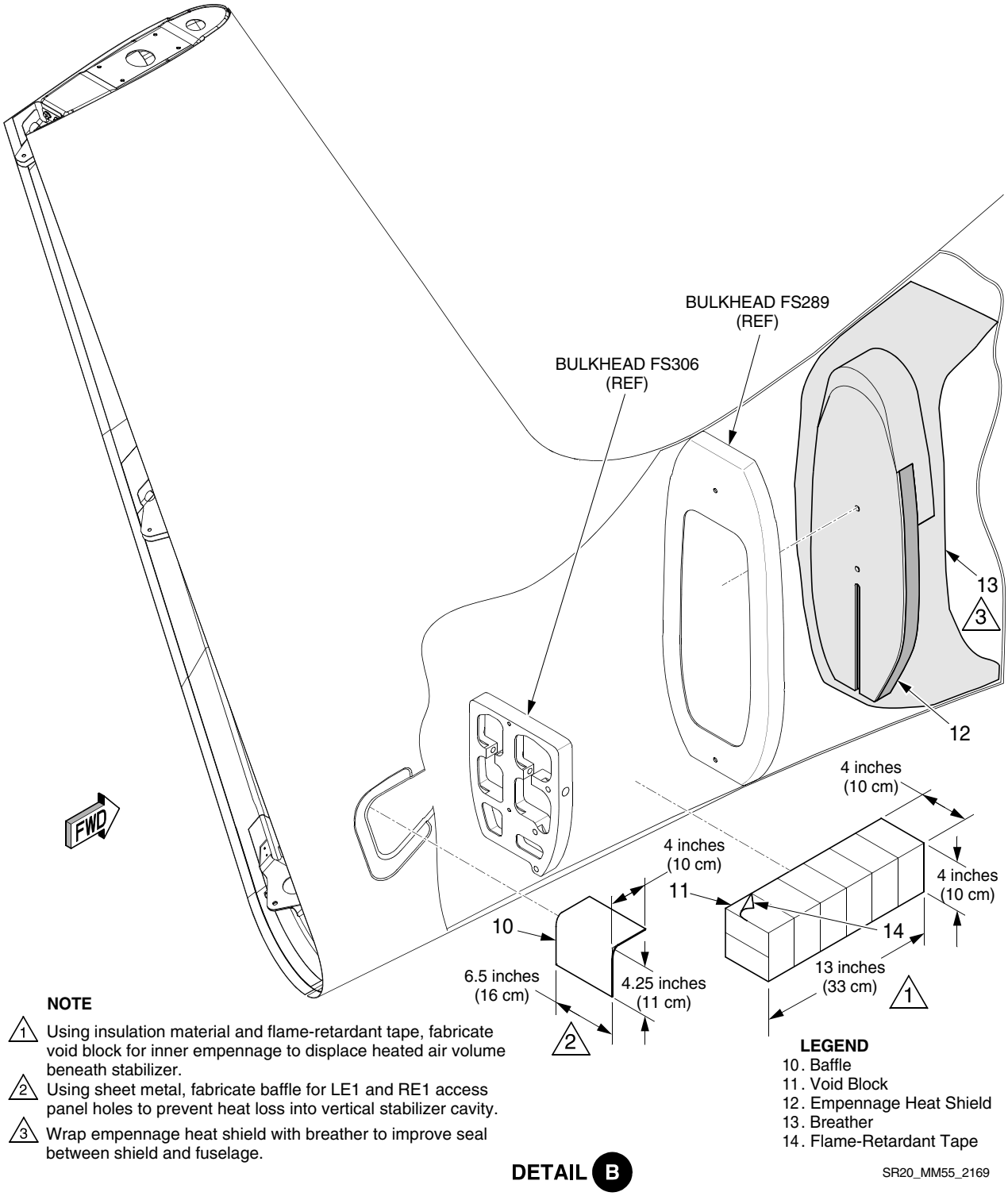
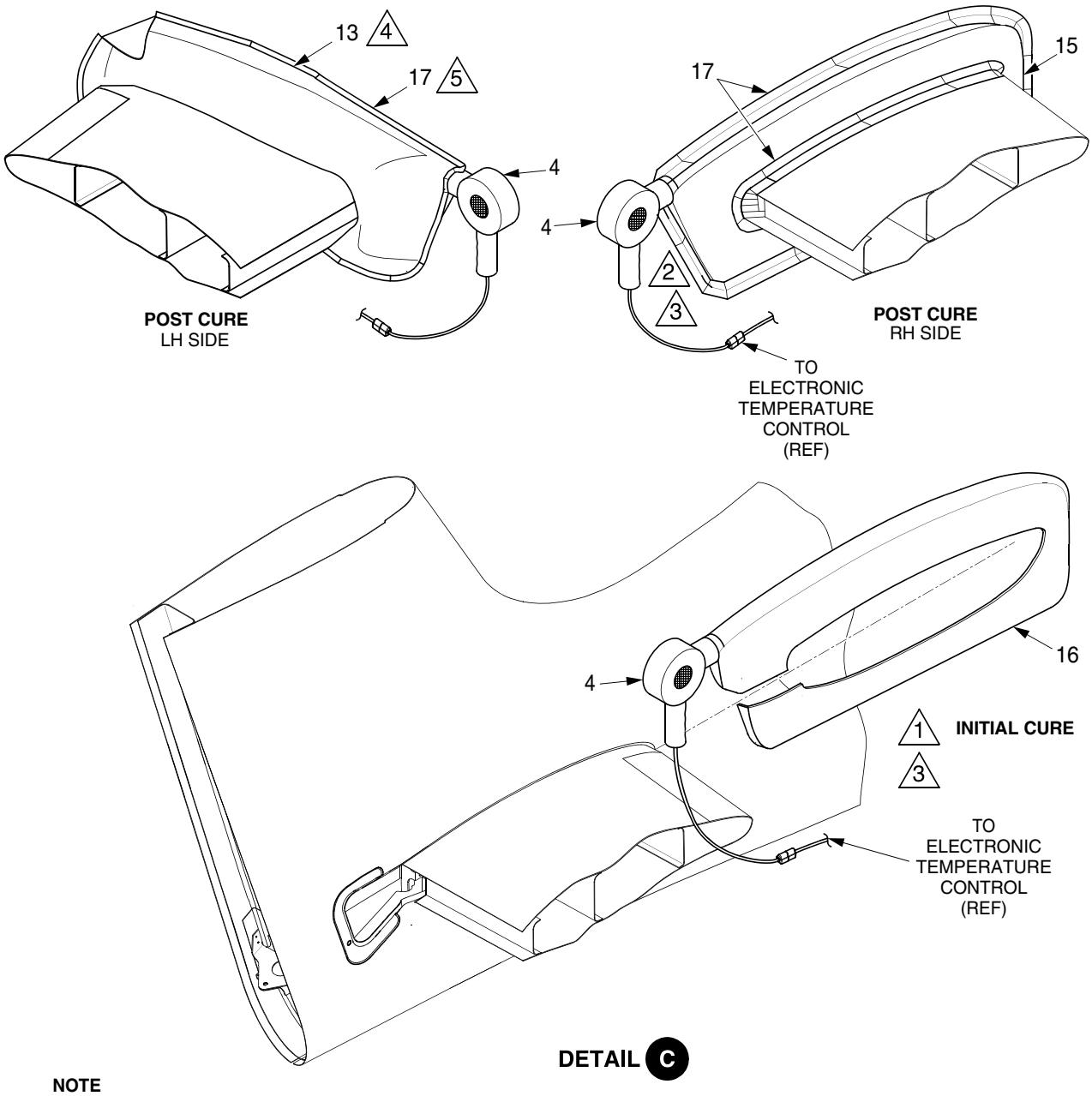


Figure 55-108
Curing Horizontal Stabilizer Bond (Sheet 2 of 3)



NOTE

1. With fuselage in bonding fixture/tool, position enclosure (w/ slit) aft over width of horizontal stabilizer. Secure enclosure at horizontal stabilizer root to empennage and horizontal stabilizer with masking tape.
2. With fuselage removed from bonding fixture/tool, position enclosure (w/o slit) inboard over length of horizontal stabilizer. Secure enclosure at horizontal stabilizer root to empennage and horizontal stabilizer with masking tape.
3. Secure enclosure to empennage with masking tape.
4. Wrap empennage heat shield with breather to improve seal between shield and fuselage.
5. On LH side, use masking tape to secure layer of breather material above and below seam of stabilizer.

LEGEND

4. Blow Dryer
13. Breather
15. Post Cure Enclosure (w/o Slit)
16. Initial Cure Enclosure (w/ Slit)
17. Masking Tape

SR20_MM55_2167A

Figure 55-108
Curing Horizontal Stabilizer Bond (Sheet 3 of 3)

(v) *Horizontal Stabilizer Installation Method #1:* Detach fuselage from permanent floor mounted fixture.

Note: Do not remove baffle, empennage heat shield, and breather enclosures following initial cure cycle. They are also required for post cure cycle.

1 Remove LH and RH enclosures from horizontal stabilizer.

Note: Leave thermocoupling attached to airplane and insulation installed for post cure cycle to follow fuselage removal from bonding fixture.

2 To facilitate hoisting, disconnect the probes from the thermocouple monitor.
3 Remove elevator locating pin and pivot LS 36 arm down.
4 Remove locating pin and pivot middle elevator arm outboard.
5 Remove elevator locating pin and pivot RS 36 arm down.
6 To ensure bonding operations have not altered fixtured position of horizontal stabilizer, repeat horizontal angle of incidence measurements at all template locations. (Refer to 55-10)
7 At aft fuselage, remove lower rudder pin.
8 Hoist fuselage from fixture. (Refer to 07-20)
9 At aft fuselage, remove tail cross pin from lower installation hole of LH and RH empennage access panels.
10 At LH and RH nose gear strut mounting locations on engine mount frame assembly, remove tethered engine support pins.
11 Detach male cone datum from fuselage spar tunnel.
12 Connect probes to thermocouple monitor.

(w) *Horizontal Stabilizer Installation Method #2:* Detach portable tool from fuselage.

Note: Do not remove baffle, empennage heat shield, and breather enclosures following initial cure cycle. They are also required for post cure cycle.

1 Remove LH and RH enclosures from horizontal stabilizer.

Note: Leave thermocoupling attached to airplane and insulation installed for post cure cycle to follow fuselage removal from bonding fixture.

2 To ensure bonding operations have not altered fixtured position of horizontal stabilizer, repeat horizontal angle of incidence measurements at all template locations. (Refer to 55-10)
3 Remove horizontal stands from LH and RH horizontal stabilizer.
4 Remove aircraft hydraulic jacks from wing. (Refer to 07-10)
5 At aft fuselage, remove locking pin securing mounting bolt to elevator hinge bracket.
6 At aft fuselage, remove lower rudder pin.
7 At aft fuselage, remove tail cross pin from lower installation hole of LH and RH empennage access panels.
8 Remove portable tool from fuselage.
9 Remove tail jack stand from aft tie down.

(x) Install enclosures for post cure cycle. (See Figure 55-108)

1 Between LE1 and RE1 access panel holes, position baffle across upper and aft gaps to restrict air flow.

2 At inner empennage through RE3 access panel hole, position void block between bulkhead FS289 and FS306.

3 Wrap empennage heat shield with breather to improve seal between shield and fuselage.

4 Position empennage heat shield to forward opening of bulkhead FS289. Compress excess breather material towards shield to further insulate.

5 Plug all openings with breather material to minimize heat loss.

6 Position LH enclosure (w/o slit) inboard over length of horizontal stabilizer. Secure enclosure at horizontal stabilizer root to empennage and horizontal stabilizer with masking tape.

7 Attach masking tape at any open seams between enclosure and airplane surfaces, and over any holes in the aft vertical shear web to minimize heat loss.

8 Use masking tape to secure blow dryer nozzle to hot air inlet at aft section of enclosure.

Note: *For the LH side only:* Due to thermocouple placement on the RH side of horizontal stabilizer, it is important to ensure overall part temperature is maintained by insulating the LH side with breather material.

9 On LH side, use masking tape to secure layer of breather material above and below seam of stabilizer.

10 Repeat enclosure installation on RH side of horizontal stabilizer using RH enclosure (w/o slit).

Note: During the post cure cycle, re-assembly of airplane may continue outside of post cure area.

11 Repeat cure bond procedure for specified time and temperature required of post cure repair. (Refer to 55-10) (See Figure 51-2011)

12 Following post cure cycle, remove all enclosures, thermocouple probes and electronic temperature control unit, tape, and insulation from empennage.

(y) At aft elevator hinge bracket, remove LH upper bolt and washer. Secure stowed ground wire to elevator hinge bracket with bolt and washer.

(z) *Horizontal Stabilizer Installation Method #1:* Install wing assembly. (Refer to 57-10)

(aa) *Horizontal Stabilizer Installation Method #1:* Install nose gear strut. (Refer to 32-20)

(ab) Paint horizontal stabilizer root. (Refer to 51-20)

(ac) Install horizontal stabilizer root fairings. (Refer to 53-50)

(ad) Install rudder assembly. (Refer to 55-40)

(ae) Install elevator bellcrank. (Refer to 55-20)

(af) Install pitch trim motor assembly. (Refer to 27-30)

(ag) Perform Adjustment/Test - Aileron System Rigging and record values. (Refer to 27-10)

Control Surface	Degree Deflection and Cable Tension	
Aileron Up	Nominal:	Trim:
Aileron Down	Nominal:	Trim:
Aileron Cable Tension		

(ah) Perform Adjustment/Test - Rudder System Rigging and record values. (Refer to 27-20)

Control Surface	Degree Deflection and Cable Tension	
Max Rudder	Right:	Left:

(ai) Perform Adjustment/Test - Elevator System Rigging and record values. (Refer to 27-30)

Control Surface	Degree Deflection and Cable Tension	
Elevator Up	Nominal:	Trim:
Elevator Down	Nominal:	Trim:
Elevator Cable Tension		

(aj) Perform Adjustment/Test - Flap Travel and record values. (Refer to 27-50)

Control Surface	Degree Deflection and Cable Tension
Flap Up	
Flap 50%	
Flap 100%	

WARNING: **The airplane may not be returned to service until a Cirrus Design certified test pilot has performed a flight test. Flight test may only be performed by Cirrus Design authorized personnel.**

(ak) Perform Functional Test - Flight Test.

(3) Adjustment/Test - Horizontal Stabilizer Angle of Incidence (See Figure 55-109)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape	-	Any Source	Protection
Serials 1005 thru 1885: Horizontal Incidence Template, HS36, LH	T1835	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1005 thru 1885: Horizontal Incidence Template, HS36, RH	T1836	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1005 thru 1885: Horizontal Incidence Template, HS72, LH	T1837	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1005 thru 1885: Horizontal Incidence Template, HS72, RH	T1838	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement

Description	P/N or Spec.	Supplier	Purpose
Serials 1886 & subs: Horizontal Incidence Template, HS36, LH	T10100	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1886 & subs: Horizontal Incidence Template, HS36, RH	T10101	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1886 & subs: Horizontal Incidence Template, HS72, LH	T7733	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Serials 1886 & subs: Horizontal Incidence Template, HS72, RH	T10102	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Digital Level, 0.25 Resolution	-	Any Source	Measurement

CAUTION: Apply masking tape to template feet to protect contact locations on wing surface.

(b) At LH and RH sides of horizontal stabilizer, identify horizontal stabilizer incidence templates for HS72 and HS36 and position templates to horizontal stabilizer as marked.

Note: To ensure consistent and accurate readings, position digital level so that the display faces one direction at all template locations (for example, outboard on RH side and inboard on LH side).

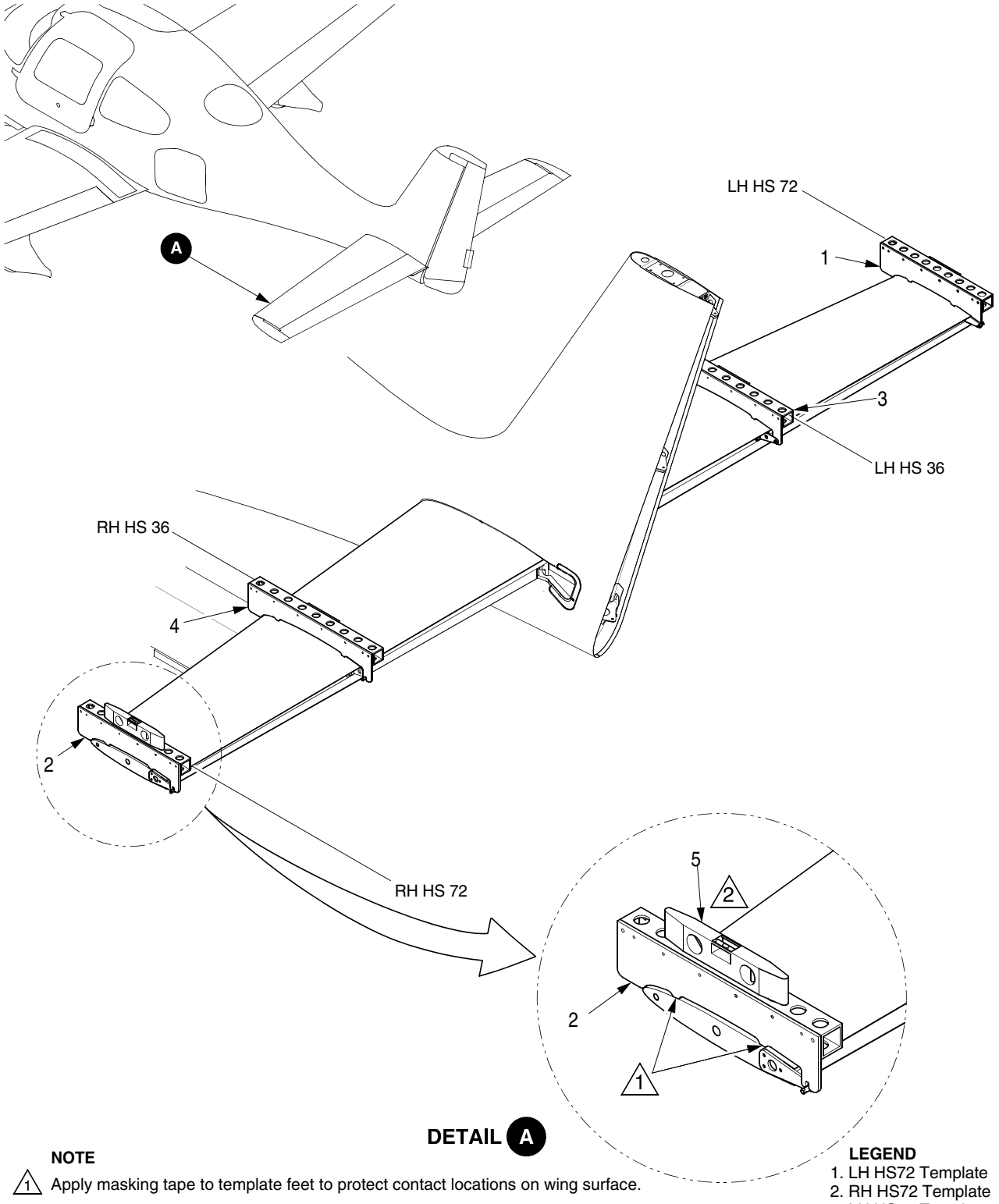
(c) Position digital level at each template and measure angle of incidence.

Note: Negative readings indicate leading edge down. Positive readings indicate leading edge up.

(d) Verify angle of incidence at all template locations is measured at 0.6°+/-0.20°. Record obtained values.

LH HS 72	RH HS 72	LH HS 36	RH HS 36

If obtained values are not within tolerance, contact Cirrus Design for disposition.



NOTE

1. Apply masking tape to template feet to protect contact locations on wing surface.
2. To ensure consistent and accurate readings, position digital level so that the display faces one direction at all template locations (for example, outboard on RH side and inboard on LH side).

LEGEND

1. LH HS72 Template
2. RH HS72 Template
3. LH HS36 Template
4. RH HS36 Template
5. Digital Level

SR20_MM55_2207A

Figure 55-109
Horizontal Stabilizer Angle of Incidence

B. Horizontal Stabilizer Inspection Hole Covers

(1) Removal - Horizontal Stabilizer Inspection Hole Covers (See Figure 55-1010)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cotton Cloth (clean and lint free)	-	Any Source	Cleaning
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaning

(b) For the horizontal stabilizer forward inspection hole:

1 Remove forward inspection hole cover.

2 Solvent clean area surrounding inspection hole to remove any remaining adhesive residue. (Refer to 20-30)

(c) For the horizontal stabilizer aft inspection hole:

1 Remove aft inspection hole cover.

2 Solvent clean area surrounding inspection hole to remove any remaining adhesive residue. (Refer to 20-30)

(2) Installation - Horizontal Stabilizer Inspection Hole Covers (See Figure 55-1010)

(a) For the horizontal stabilizer forward inspection hole:

1 Remove protective backing from new inspection hole cover using care not to contaminate adhesive surface.

Note: Ensure all edges are firmly adhered.

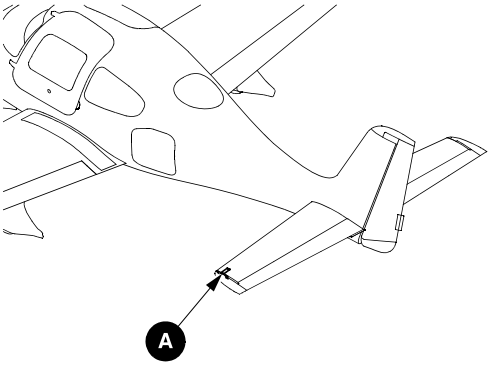
2 Position and install inspection hole cover over forward inspection hole.

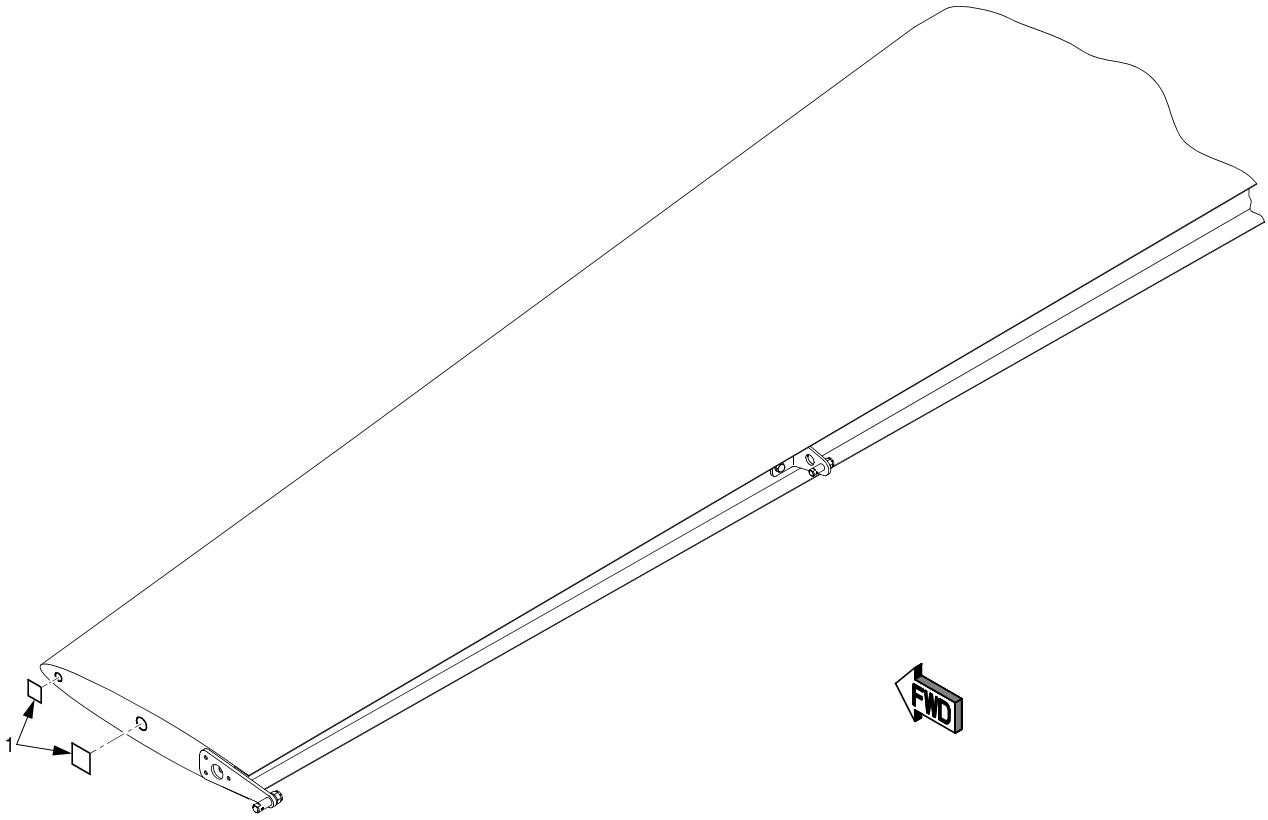
(b) For the horizontal stabilizer aft inspection hole:

1 Remove protective backing from new inspection hole cover using care not to contaminate adhesive surface.

Note: Ensure all edges are firmly adhered.

2 Position and install inspection hole cover over aft inspection hole.





LEGEND
1. Inspection Hole Cover

DETAIL A

SR20_MM55_2290

Figure 55-1010
Horizontal Stabilizer Inspection Hole Covers

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ELEVATOR

1. GENERAL

The elevator is a horizontal movable control surface on the tail of the airplane. The elevator is mounted to the horizontal stabilizer. The elevator is used to rotate the airplane about its lateral axis and includes an elevator trim tab used for pitch trim adjustment. The elevator is made from aluminum. The elevator tips are made from composite materials.

The elevator assembly is a conventional sheet metal control surface made of riveted aluminum skins, ribs and spar. A lead balance weight is fastened to the inboard and outboard horn ribs at BL 72. The elevator is attached to the horizontal stabilizer at five hinge locations, BL 0, BL ±36, and BL ±72. The elevator is attached to a torque tube at BL ±3.33 and BL ±20. This torque tube is attached to a bellcrank.

Serials 1005 thru 1300, 1302 thru 1306: The elevator bellcrank is actuated by a pushrod that is attached to a pulley in the empennage area of the fuselage. (Refer to 27-30)

Serials 1301, 1307 & subs: The elevator bellcrank is actuated by a pushrod that is attached to a bellcrank in the empennage area of the fuselage. (Refer to 27-30)

The pilot controls the actuation of this system.

2. MAINTENANCE PRACTICES

A. Elevator Assembly (See Figure 55-201)

(1) Removal - Elevator Assembly

(a) Remove access panels LE1 and RE1 to gain access to the bellcrank/elevator mounting bolts. (Refer to 06-00)

(b) Remove cotter pin, nut, washers, and bolt securing trim cartridge to aft elevator bellcrank.

(c) Remove the mounting bolts, washers, shims, and self-locking nuts securing the RH and LH elevator sections to bellcrank.

(d) Remove cotter pin and washers from each elevator hinge pin.

(e) Slide the elevator sections off of the horizontal stabilizer hinge pins by sliding the elevator sections away from the fuselage.

(f) Remove remaining washers installed to horizontal stabilizer hinge pins.

(2) Disassembly - Elevator Assembly

Elevator assembly may be further disassembled through removal of elevator tip and trim tab.

(a) To disassemble elevator tip, remove screws securing elevator tip to outboard elevator.

(b) To disassemble elevator trim tab, perform the following steps:

WARNING: The airplane may not be flown when the elevator trim tab is removed. Installation of elevator trim tab requires a maintenance check flight.

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit 0.0980 inch (2.489 mm)	#40	Any Source	Drilling

2 Drill out rivets securing trim tab to LH aft inboard elevator.

(3) Assembly - Elevator Assembly

(a) To assemble elevator trim tab, perform the following steps:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion Protection
Blind Rivet	NAS9301B4	Cirrus Design Duluth, MN 55811 218-727-2737	Fastener
White Hobby Paint	Testers (or equivalent)	Any Source	Paint Rivet Heads

2 Using Alodine pen, apply corrosion protection to edge of each rivet hole.

3 Install rivets securing trim tab to LH aft inboard elevator. (Refer to 20-70)

4 Apply thin coat of paint to each rivet head.

5 Perform Adjustment/Test - Elevator Balancing. (Refer to 55-20)

Note: If installed elevator tip is new or different from previously installed elevator tip, perform Elevator Tip Replacement. (Refer to 55-20)

(b) To assemble existing elevator tip, position elevator tip to elevator, ensuring tip flange is inserted between upper and lower layers of elevator surface, and secure with screws.

(c) Elevator Tip Replacement

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permanent Marker	-	Any Source	Mark
Drill bit	0.196 inch (0.498 cm)	Any Source	Match Drill

2 Position elevator tip to elevator ensuring tip flange is inserted between upper and lower layers of elevator surface.

3 Using straight edge, align elevator tip with inboard edge of elevator.

4 Verify reveal line between elevator tip and elevator is consistent along length of seam, and trailing edge of elevator tip is flush with trailing edge of elevator.

5 Use marker to mark match drill locations in elevator tip.

6 Remove elevator tip from elevator.

7 Using 0.196 inch (0.498 cm) drill bit, drill at marked locations on elevator tip.

8 Position elevator tip to elevator, ensuring tip flange is inserted between upper and lower layers of elevator surface, and secure with screws.

9 Perform Adjustment/Test - Elevator Balancing. (Refer to 55-20)

(4) Installation - Elevator Assembly

WARNING: **The airplane may not be flown when the elevator trim tab is removed.**

CAUTION: Ensure a flat washer remains on the outboard side of each horizontal stabilizer hinge pin before installing the elevator sections. Installing the elevator sections onto the hinge pins without a flat washer in place can cause the elevator assembly to bind.

(a) Install washers onto horizontal stabilizer hinge pins.

(b) Position and slide LH and RH elevator sections onto hinge pins.

(c) Install washer over each hinge pin. Secure LH and RH mid elevator sections to each hinge pin with new cotter pins.

(d) Install bolts, washers, shims, and self-locking nuts securing LH and RH inboard elevator sections to elevator bellcrank. Torque to 160 - 190 in-lb (17.6 - 20.9 Nm).

(e) Install cotter pin and washer on outboard hinge pin. Secure outboard elevator hinge to hinge pin with washer and nut. Dry torque to 25 - 30 in-lb (2.8 - 3.3 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

Note: Do not rotate hinge pin once nut is torqued.

(f) Align trim cartridge to mounting hole on aft elevator bellcrank and install bolt, washers, nut, and new cotter pin.

(g) Install access panels LE1 and RE1. (Refer to 06-00)

(h) Perform Inspection/Check - Elevator Gap and Overlap. (Refer to 55-20)

(i) Perform Inspection/Check - Elevator Assembly. (Refer to 55-20)

(j) If elevator trim tab was replaced, perform Adjustment/Test - Elevator Trim Tab. (Refer to 55-20)

(5) Inspection/Check - Elevator Assembly

(a) Verify proper hinge bolt torque.

(b) Remove access panels LE1 and RE1. (Refer to 06-00)

(c) Verify proper hinge bolt installation and torque on inboard hinge.

(d) Ensure elevator skin is smooth and free of any defects or irregularities.

(e) Inspect rivets and elevator skin for tightness.

(f) Verify proper installation of safety wire and for use of new cotter pins on all fasteners.

(g) Install access panels LE1 and RE1. (Refer to 06-00)

(h) Operate elevator controls and inspect for any abnormal resistance.

(6) Adjustment/Test - Elevator Trim Tab

WARNING: **Maintenance check flight must be performed by a qualified pilot.**

CAUTION: Ballast must be secured during flight.

(a) Add and secure ballast to obtain an aft CG of 147.4 to 148.1 inches (30 to 31.5% MAC).

(b) After airplane is in flight and clear of all traffic, turbulence, and wake, set throttle to cruise power.

(c) Input full down elevator trim, wait for airspeed to stabilize, and verify knots indicated air speed (KIAS) of at least 180, and no greater than Vne.

Note: Support trim tab at the bend when adjusting to ensure trim tab does not bend at the rivets and pull away from elevator.

Do not bend trailing edge of elevator trim tab more than 25° from straight.

(d) If airplane speed is less than 180 KIAS, bend elevator trim tab up in small increments (approximately 1-2°) and repeat maintenance check flight.

(e) If airplane speed approaches Vne, bend elevator trim tab down in small increments (approximately 1-2°) and repeat maintenance check flight.

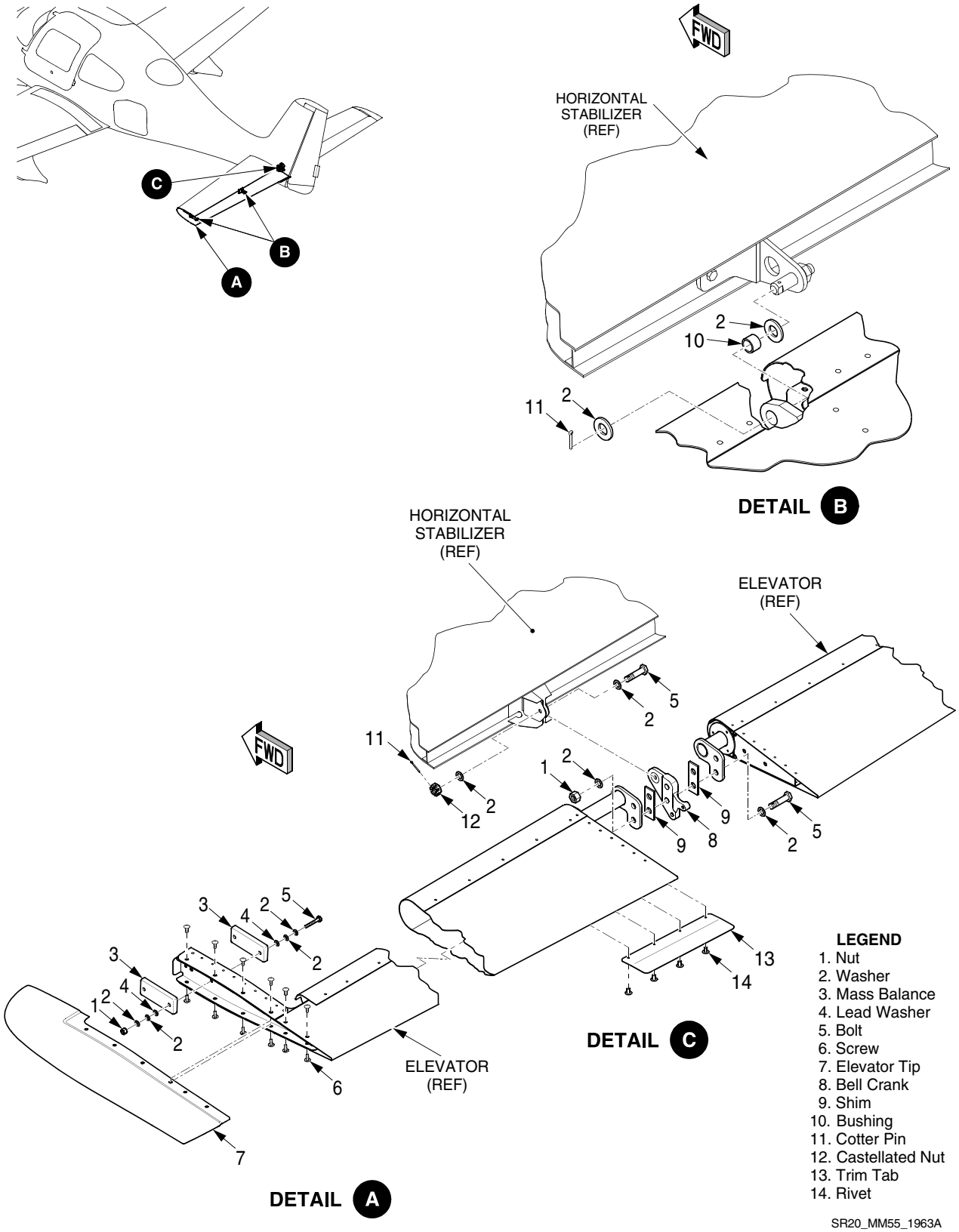


Figure 55-201
Elevator Assembly

(7) Inspection/Check - Elevator Gap and Overlap (See Figure 55-202)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

CAUTION: Allowable gap between elevator tip and horizontal stabilizer is 0.10 inch (2.54 mm) or greater.

(b) At elevator tip, verify gap between elevator tip and horizontal stabilizer is 0.10 inch (2.54 mm) or greater.

If gap between elevator tip and horizontal stabilizer is less than 0.10 inch (2.54 mm), subtract gap measurement from 0.10 inch (2.54 mm) to determine minimum shim thickness to reduce and perform Inspection/Check - Elevator Shimming. (Refer to 55-20)

Note: The following gap and overlap inspections need only be performed after the installation of a *replacement (new or different) elevator*. If elevator leading edge gap and overlap inspections do not fall within the specified clearances, contact Cirrus Design Customer Service Department for disposition.

(c) *Replacement Elevator Installation Only:* Verify gap between elevator leading edge and trailing edge of horizontal stabilizer has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.200 inch (5.080 mm) clearance when elevator is fully deflected up and down.

(d) *Replacement Elevator Installation Only:* Verify overlap between elevator and horizontal stabilizer has a minimum of 0.00 inch (0.00 mm) and a maximum of 0.125 inch (3.175 mm) clearance. Elevator may be deflected downward 0 - 5° to achieve upper overlap, and may be deflected upward 0 - 5° to achieve lower overlap.

(8) Inspection/Check - Elevator Shimming

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shim: 0.125 inch (3.175 mm)	11508-001	Cirrus Design Duluth, MN 55811 218-727-2737	Adjust shim thickness at bellcrank.
Shim: 0.141 inch (3.581 mm)	11508-002		
Shim: 0.016 inch (0.406 mm)	11508-003		
Shim: 0.032 inch (0.813 mm)	11508-004		
Shim: 0.063 inch (1.600 mm)	11508-005		

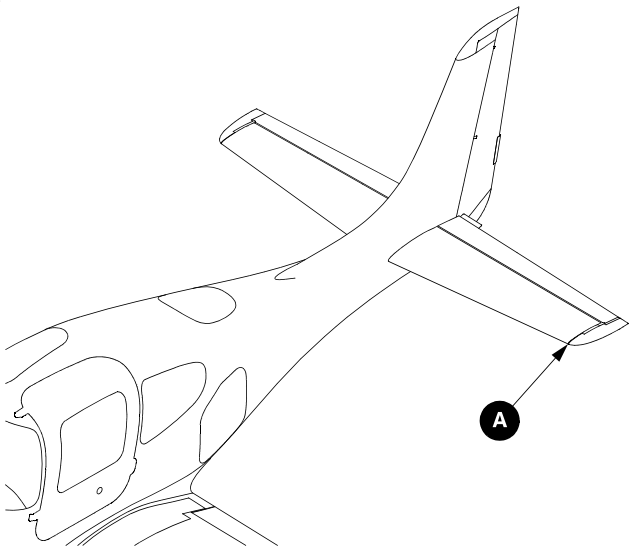
(b) Remove elevator assembly. (Refer to 55-20)

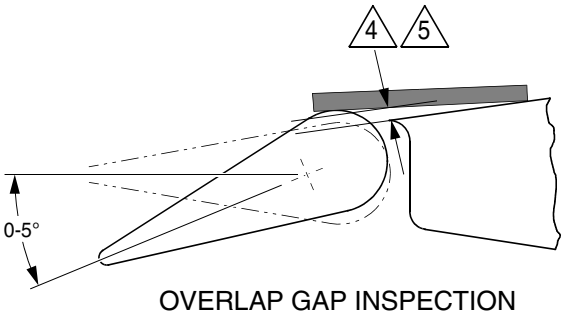
(c) At bellcrank, subtract value obtained in Inspection/Check - Elevator Gap and Overlap from thickness of shim(s).

CAUTION: Maximum thickness of shim(s) is 0.063 inch (1.600 mm).

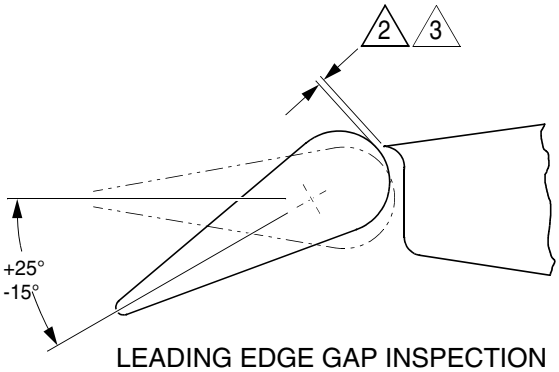
(d) Reduce thickness of shim(s) as required.

(e) Install elevator assembly. (Refer to 55-20)





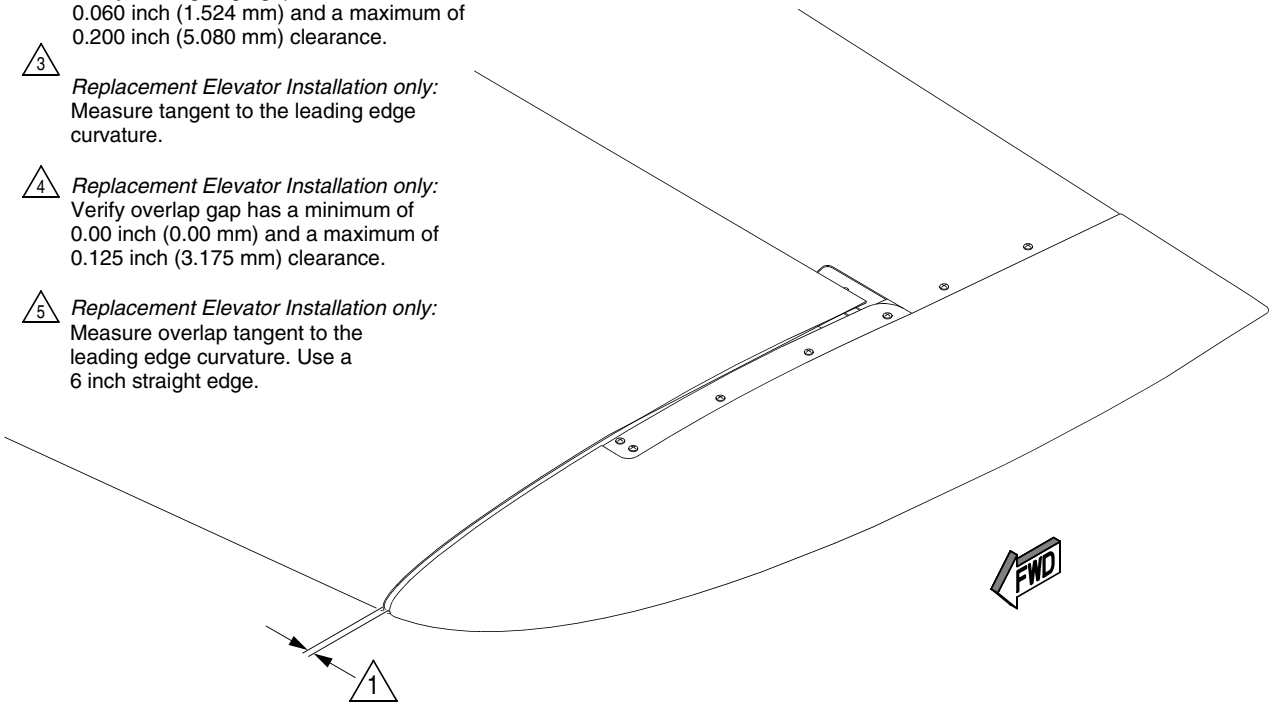
OVERLAP GAP INSPECTION



LEADING EDGE GAP INSPECTION

NOTE

1. Verify gap between elevator tip and horizontal stabilizer is 0.10 inch (2.54 mm) or greater.
2. *Replacement Elevator Installation only:* Verify leading edge gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.200 inch (5.080 mm) clearance.
3. *Replacement Elevator Installation only:* Measure tangent to the leading edge curvature.
4. *Replacement Elevator Installation only:* Verify overlap gap has a minimum of 0.00 inch (0.00 mm) and a maximum of 0.125 inch (3.175 mm) clearance.
5. *Replacement Elevator Installation only:* Measure overlap tangent to the leading edge curvature. Use a 6 inch straight edge.



DETAIL A

SR20_MM55_2085

Figure 55-202
Elevator Gap and Overlap

(9) Adjustment/Test - Elevator Balancing (See Figure 55-203)

CAUTION: When balancing the elevator, the elevator assembly must be complete including paint, composite elevator tip, and all attaching hardware. The bench used to support the knife edge supports must be level. Maximum mass balance weight is 1.67 pounds (0.76 kg).

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease Pencil	-	Any Source	Mark chord line.
Close Tolerance Balance Pins	-	Any Source	Support elevator.
Knife Edge Supports	-	Any Source	Support elevator.
Balance Arm Assembly	-	Any Source	Verify position of elevator chord line.
String	-	Any Source	Attach cup to elevator.
Tape	-	Any Source	Attach cup to elevator.
Paper Cup	-	Any Source	Determine required weight for balance.
Scale	-	Any Source	Determine required weight for balance.
Lead Washers	12682-001	Cirrus Design Duluth, MN 55811 218-727-2737	Add weight to elevator.

(b) Verify workbench is level in all directions.

(c) Ensure knife edge supports and balance arm assembly are parallel to workbench top.

(d) Remove elevator. (Refer to 55-20)

Note: The chord line is defined as the line extending from the trailing edge through the hinge line. It is perpendicular to the spar.

(e) Mark the chord line on the inboard rib shear web.

(f) Place elevator assembly on knife edge supports.

(g) Determine if a static imbalance exists.

1 The elevator is balanced if elevator chord line mark is parallel to balance arm.

2 A static overbalance exists if elevator is leading edge heavy.

3 A static underbalance exists if elevator is trailing edge heavy.

(h) Determine the amount of static imbalance.

Note: Ensure paper cup hangs centered and vertical with no contact with elevator.

1 Attach paper cup to one end of string.

2 For static underbalance condition attach string to leading edge of elevator. For static overbalance condition attach string to trailing edge of elevator.

3 Add attaching hardware to paper cup.

4 Add lead washers to cup until elevator chord line mark is parallel to balance arm.

(i) Calculate the elevator static balance.

In overbalance conditions, the static balance (M) is defined as

M = D × W.

In underbalance conditions, the static balance (M) is defined as

M = D × W × -1

where

D = distance perpendicular from hinge line to center of gravity (C.G.) of added mass,

W = weight required to balance the elevator.

Note: The value of M is positive for overbalance conditions and negative for underbalance conditions.

Static balance must be within +3.0 in-lb overbalance and 0.0 in-lb underbalance. Assuming a deviation of ±0.5 in-lb exists due to measurement error, calculated static balance must therefore fall within 0.5 - 2.5 in-lb overbalance and 0.0 in-lb underbalance.

1 Measure distance perpendicular from hinge line to C.G. of added mass in cup.

2 Weigh string, cup, and contents with a calibrated scale.

3 Using obtained measurements, solve formula to determine elevator static balance.

4 Verify static balance, is within 0.5 - 2.5 in-lb overbalance and 0.0 in-lb underbalance.

Example:

Assume an elevator is underbalanced. If balance is achieved by adding 0.07 pounds, 13.13 inches forward of the hinge line, the elevator static balance is:

W = 0.07 pound

D = 13.13 inches

M = (0.07 × 13.13) × -1 = -0.92 ± 0.5 in-lb

In the example, -0.92 in-lb exceeds the tolerance for a static underbalance condition. To obtain elevator balance, 0.92 in-lb must be added forward of the hinge line. The balance must be rechecked to ensure static balance tolerance is not exceeded.

CAUTION: Do not exceed a maximum of four washers per bolt or nut. Always place steel washer next to nut.

(j) Add or remove weight as necessary to balance the elevator.

1 An underbalanced condition is corrected by adding lead washers under the bolts securing the mass balances.

2 An overbalance condition is corrected by removing small amounts of material from the lead mass balance in equal quantities. Typically this is done by drilling or other means.

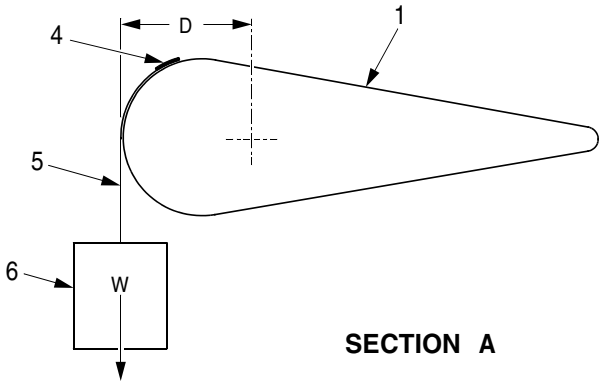
(k) Tighten mass balance bolts to 20 - 25 in-lb (2.3 - 2.8 Nm).

(l) Install elevator. (Refer to 55-20)

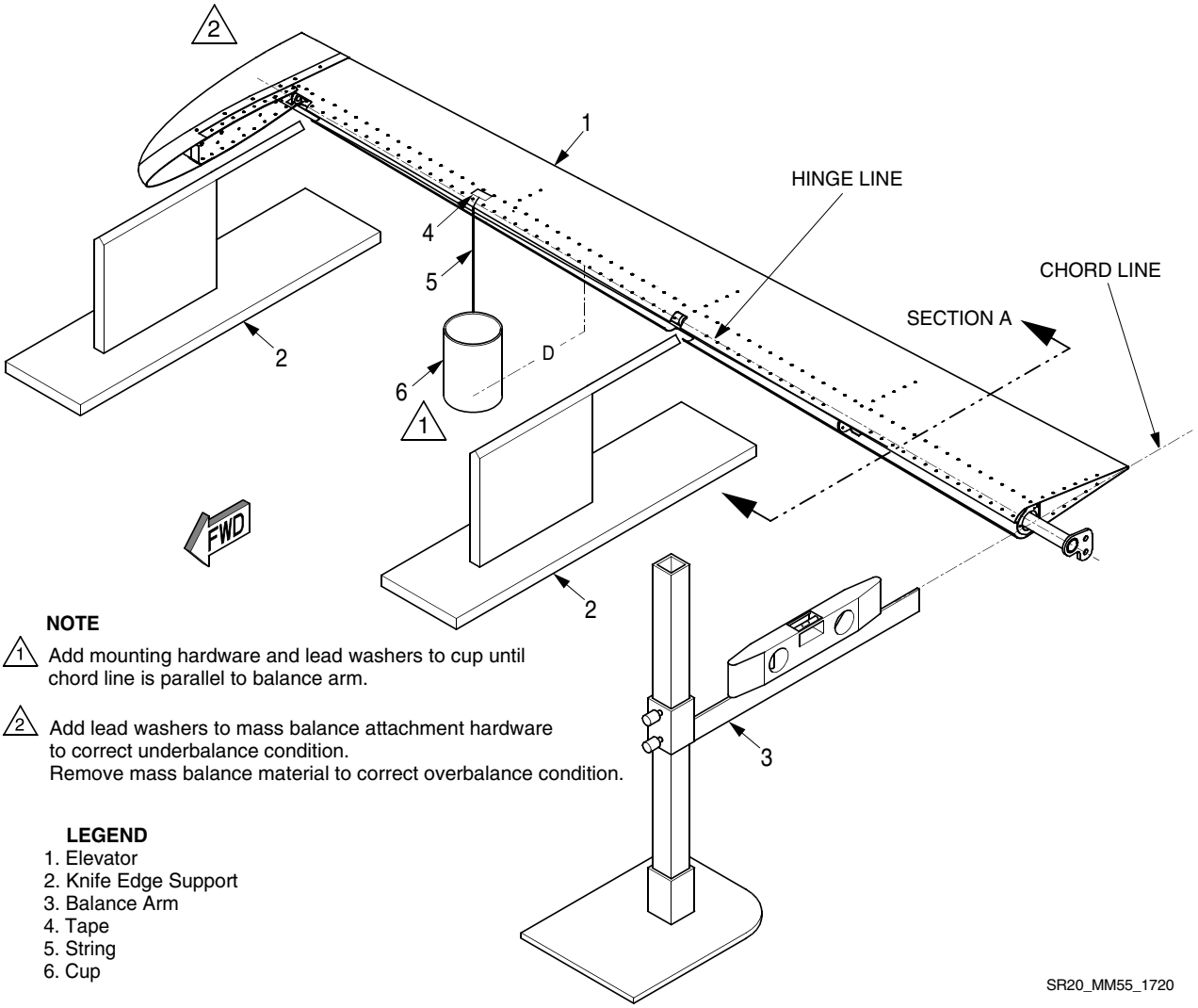
In overbalance conditions, the static balance (M) = D x W.
In underbalance conditions, the static balance (M) = D x W x -1.

D = Distance perpendicular from hinge line
to center of gravity of added mass.

W = Weight required to balance the elevator.



SECTION A



NOTE

1 Add mounting hardware and lead washers to cup until chord line is parallel to balance arm.

2 Add lead washers to mass balance attachment hardware to correct underbalance condition.
Remove mass balance material to correct overbalance condition.

LEGEND

1. Elevator
2. Knife Edge Support
3. Balance Arm
4. Tape
5. String
6. Cup

SR20_MM55_1720

Figure 55-203
Elevator Balancing

B. Elevator Bellcrank

(1) Removal - Elevator Bellcrank

(a) Remove elevator. (Refer to 55-20)

(b) Remove cotter pin, nut, washers, and bolt securing elevator bellcrank to horizontal stabilizer hinges.

(2) Installation - Elevator Bellcrank

(a) Position elevator bellcrank between horizontal stabilizer hinges and secure with bolt, washers, nut, and cotter pin.

(b) Install elevator. (Refer to 55-20)

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VERTICAL STABILIZER

1. DESCRIPTION

The vertical stabilizer is the fixed vertical surface on the airplane empennage in which the rudder is hinged to. The vertical stabilizer consists of two C-channel spars fabricated from S2 uni-directional and 7781 bi-directional fiberglass. Two ribs are bonded to the spars at WL 131.25 and WL 159.50 and the right and left fuselage skins cover the ribs and spars to form a two cell box beam structure that resists bending and torsion created by air loads (wind gust and aircraft maneuvers). The right and left fuselage skins cover the ribs and spars forming the torsion box. Three hinges attached to the aft spar support the rudder and rudder horn.

Because the vertical stabilizer is made from composite laminate materials and is molded to the empennage, no servicing is required.

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RUDDER

1. GENERAL

The rudder provides airplane directional (yaw) control and includes a rudder trim tab used for yaw trim adjustment. The rudder is of conventional design with skin, spar and ribs manufactured of aluminum. The rudder is attached to the aft vertical stabilizer shear web at three hinge points and to the fuselage tailcone at the rudder control bellcrank.

Rudder motion is transferred from conventional rudder pedals to the rudder by a single cable system under the cabin floor to the rudder sector pulley in the aft fuselage. A push-pull tube from the sector to the rudder bellcrank translates cable motion to the rudder. Springs connected to the rudder pedal assembly close the loop and provide centering force.

2. MAINTENANCE PRACTICES

A. Rudder Assembly (See Figure 55-401)

(1) Removal - Rudder Assembly

(a) Remove cotter pin, nut, washers, and bolt securing rudder push/pull rod to rudder.

(b) Remove cotter pins from bolts securing rudder to vertical stabilizer.

(c) Remove lower bolt, washers, and castellated nut securing rudder to vertical stabilizer.

(d) While supporting rudder assembly, remove upper and center bolts, washers, and castellated nuts securing rudder assembly to vertical stabilizer. Remove rudder assembly from vertical stabilizer.

(2) Disassembly - Rudder Assembly

Rudder assembly may be further disassembled through removal of trim tab and rudder bottom.

(a) Rudder Trim Tab

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit	#40	Any Source	Drill out rivets.

2 Drill out rivets securing trim tab to rudder.

(b) Rudder Bottom

1 Remove screws securing rudder bottom to rudder.

(3) Assembly - Rudder Assembly

(a) Rudder Trim Tab

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion protection.

2 Using an Alodine pen, apply corrosion protection to edge of each rivet hole.

3 Install rivets securing trim tab to rudder.

4 Apply thin coat of paint to each rivet head. (Refer to 51-30)

5 Perform Adjustment/Test - Rudder Balancing. (Refer to 55-40)

(b) Rudder Bottom

1 Position rudder bottom to rudder and install screws securing rudder bottom to rudder.

(c) *Serials 1005 thru 1541:* Rudder Bottom Replacement

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permanent Marker	-	Any Source	Mark
Drill bit	0.191 inch (0.485 cm)	Any Source	Match Drill

2 Position rudder bottom to rudder and ensure gap is equal to or less than 0.5 inch (1.27 cm). Verify reveal line between rudder bottom and rudder are consistent along

length of seam, and trailing edge of rudder bottom is flush with trailing edge of rudder.

CAUTION: Verify marked locations for match drilling obtain the proper edge margin required for hole and nutplate installation.

3 Use marker to mark match drill locations in rudder bottom.
4 Using 0.191 inch (0.485 cm) drill bit, drill at marked locations on rudder bottom.
5 Install rivets and nutplates at drilled hole locations on rudder bottom inboard flange.
6 Apply thin coat of paint to each rivet head. (Refer to 51-30)
7 Install screws securing rudder bottom to rudder.

(4) Installation - Rudder Assembly

Note: Verify threaded end of bolts are installed downward.

(a) Position rudder assembly to vertical stabilizer. Install bolts, washers, and new castellated nuts to upper and center hinges securing rudder assembly to vertical stabilizer.
(b) Torque bolts at upper and center hinges to 20 - 25 in-lb (2.3 - 2.8 Nm).

Note: Maximum of two washers are added between bottom hinge and rudder assembly to obtain proper clearance.

(c) Install bolt, washers, and castellated nut to lower hinge securing rudder assembly to vertical stabilizer.
(d) Tighten bolt at lower hinge to 50 - 70 in-lb (5.6 - 7.9 Nm).
(e) Secure all bolts with cotter pins.
(f) Position rudder push/pull rod to rudder and secure with bolt, washers, nut, and cotter pin.
(g) Perform Inspection/Check - Rudder Gap and Overlap. (Refer to 55-40)
(h) Perform Inspection/Check - Rudder Assembly. (Refer to 55-40)
(i) If rudder trim tab was replaced, perform Adjustment/Test - Rudder Trim Tab. (Refer to 55-40)

(5) Inspection/Check - Rudder Assembly

(a) Verify hinge bolts for proper torque and installation. (Refer to 55-40)
(b) Verify proper installation of safety wire and cotter pins on all fasteners.
(c) Ensure rudder skin is smooth and free of any defects or irregularities.
(d) Inspect rivets and rudder skin for tightness.
(e) Operate rudder controls and inspect for any abnormal resistance.

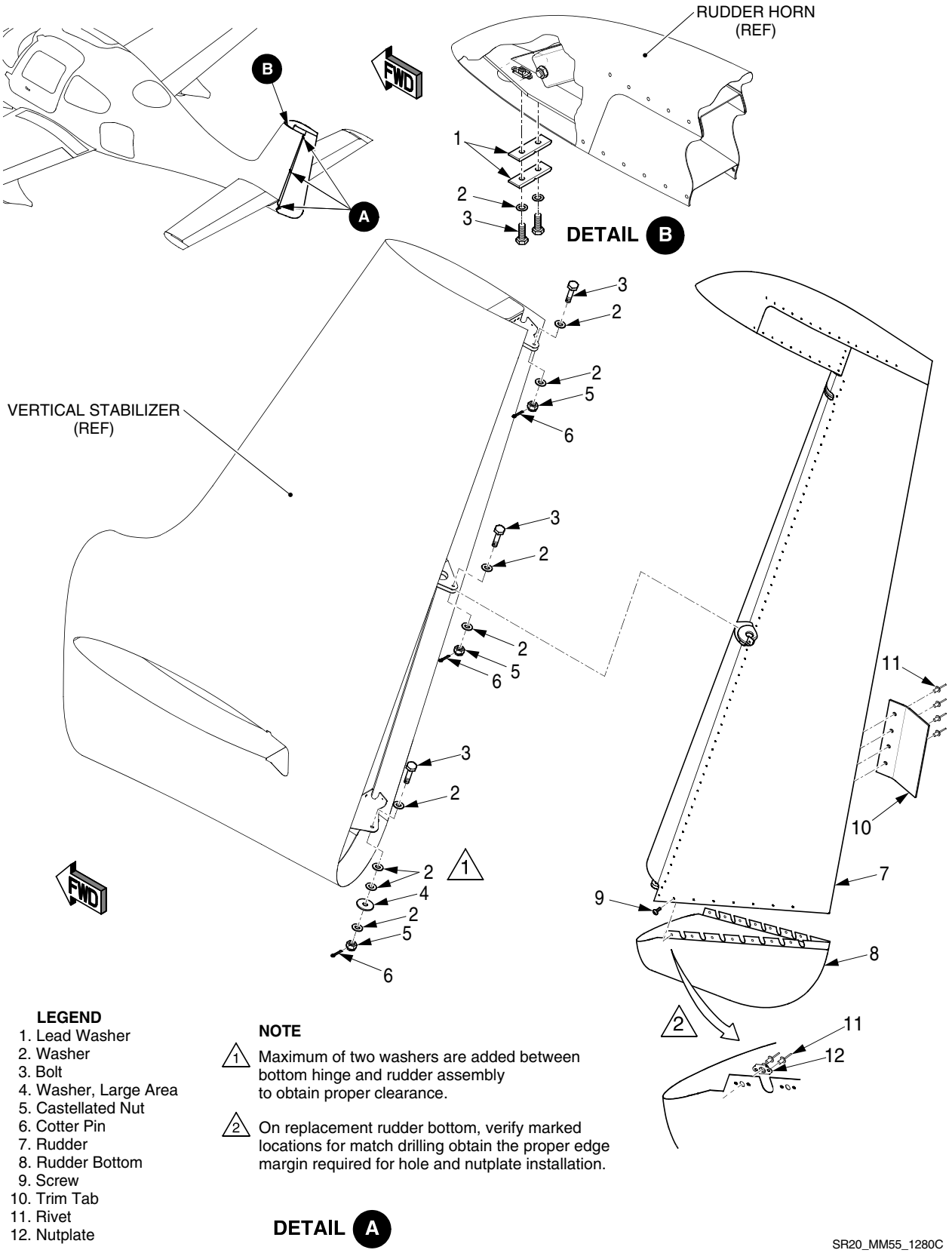


Figure 55-401
Rudder Assembly

EFFECTIVITY:
All

(6) Inspection/Check - Rudder Gap and Overlap (See Figure 55-402)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle determination.

(b) Adjust rudder to the fully left-most position.

CAUTION: Allowable gap between rudder horn and vertical stabilizer is between 0.150 and 0.300 inch (3.81 and 7.62 mm).

(c) At rudder horn, verify gap between rudder horn and vertical stabilizer is between 0.150 and 0.300 inch (3.81 and 7.62 mm).

If gap between rudder horn and vertical stabilizer does not fall within the specified clearance, contact Cirrus Design Customer Service Department for disposition.

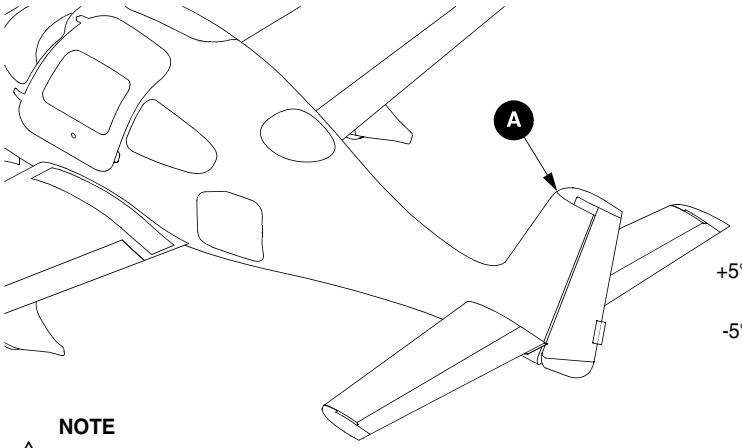
(d) Repeat gap measurement with rudder to the fully right-most position.

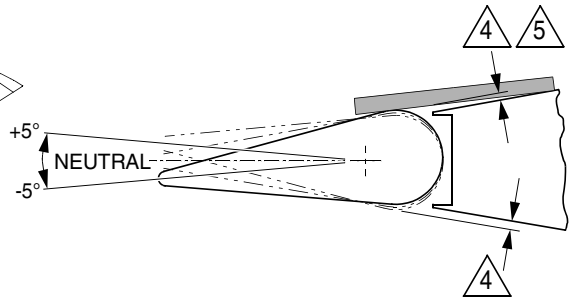
Note: The following gap and overlap inspections need only be performed after the installation of a *replacement (new or different) rudder* or after repairing the lower rudder hinge. If rudder leading edge gap and overlap inspections do not fall within the specified clearances, contact Cirrus Design Customer Service Department for disposition.

(e) *Replacement Rudder Installation Only:* Verify gap between rudder leading edge and trailing edge of vertical stabilizer has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.350 inch (8.890 mm) clearance when rudder is fully deflected right and left.

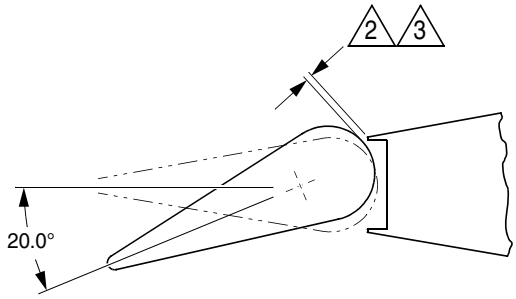
Note: The rudder overlap inspection applies only to the area between the waterline of the horizontal stabilizer to the tip of the vertical stabilizer.

(f) *Replacement Rudder Installation Only:* Verify overlap between rudder and vertical stabilizer has a minimum of -0.125 inch (-3.175 mm) and a maximum of 0.125 inch (3.175 mm) clearance. Rudder may be deflected left 0 - 5° to achieve right overlap, and may be deflected right 0 - 5° to achieve left overlap.





OVERLAP GAP INSPECTION



LEADING EDGE GAP INSPECTION

NOTE

1. Verify gap between rudder horn and vertical stabilizer is between 0.150 and 0.300 (3.81 and 7.62 mm).
2. *Replacement Rudder Installation only:* Verify leading edge gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.350 inch (8.890 mm) clearance.
3. *Replacement Rudder Installation only:* Measure tangent to the leading edge curvature.
4. *Replacement Rudder Installation only:* Verify overlap gap has a minimum of -0.125 inch (-3.175 mm) and a maximum of 0.125 inch (3.175 mm) clearance.
5. *Replacement Rudder Installation only:* Measure overlap tangent to the leading edge curvature. Use a 6 inch straight edge.

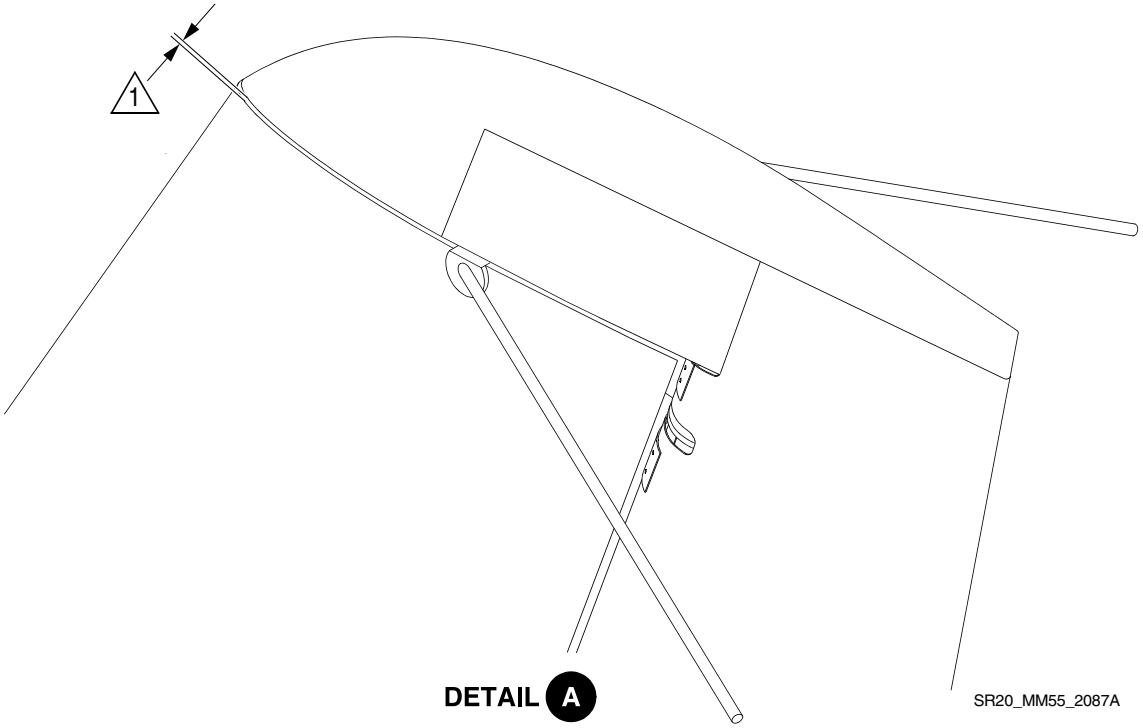


Figure 55-402
Rudder Gap and Overlap

(7) Adjustment/Test - Rudder Balancing (See Figure 55-403)

CAUTION: When balancing, the rudder assembly must be complete including mounting brackets, paint, stripes, rudder bottom, and rudder tip. The bench used to support knife edge supports must be level. Maximum mass balance weight is 2.5 pounds (1.13 kg).

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Close Tolerance Balance Pins	-	Any Source	Support rudder assembly.
Balance Fixture	-	Any Source	Balance rudder assembly.
Straight Edge	-	Any Source	Mark chord line and hinge centerline.
Grease Pencil	-	Any Source	Make reference marks.

(b) Remove rudder. (Refer to 55-40)

Note: The chord line is defined as the line extending from the trailing edge through the hinge line. This line runs perpendicular to the rudder spar.

(c) Using reference holes in rib, mark chord line on inboard rib shear web.

(d) Place straight edge directly on center of each rivet head used to secure rudder skin to rudder spar (not hinge mount rivet heads).

(e) With straight edge in place, mark reference line to indicate rivet head centerline.

(f) Mark reference line 4.0 inches (10.16 cm) aft (towards trailing edge of rudder) of rivet head centerline mark previously made. This line must run parallel to centerline of all three hinges.

(g) Using rivet head centerline as a reference, mark reference line 0.75 inch (1.91 cm) forward (towards hinges). This reference line is referred to as the hinge centerline.

Note: The area between hinge centerline mark and line 4.0 inches (10.16 cm) aft of rivet head centerline is referred to as the balance zone.

(h) Place close tolerance balance pins into upper and lower hinge mounts.

(i) Level work bench (in all directions) using spirit level.

(j) Using rudder assembly as a temporary locator, place balancing fixtures into position on level work bench.

(k) Ensure each knife edge support is parallel to bench top by placing spirit level on each of the knife edge supports.

(l) If required, shim base of knife edge support fixtures to ensure that knife edges are parallel to bench top.

(m) Ensure balance arm is parallel to bench top by placing spirit level on balance arm.

(n) If required, shim base of balance arm to ensure balance arm is parallel to bench top.

Note: If chord line mark is parallel to balance arm without any additional weight, rudder assembly is balanced.

If balance arm and chord line mark can be made parallel by placing a 10 ounce (0.28 kg) weight on or within the balance zone reference lines, rudder assembly is balanced. No further action is necessary.

(o) Carefully place rudder assembly onto knife edge supports and determine if a static over-balance (leading edge heavy) or static underbalance (trailing edge heavy) condition exists.

(p) To balance rudder that is under balanced (trailing edge heavy), proceed to the following steps.

CAUTION: When balancing, the rudder assembly must be complete including mounting brackets, paint, stripes, rudder bottom, and rudder tip. The bench used to support knife edge supports must be level. Maximum mass balance weight is 2.5 pounds (1.13 kg).

1 Place weight directly above the lead washer mount in the rudder horn until the chord line and balance arm marks are parallel.

2 Remove safety wire and lead washer mounting bolts along with all balance material.

3 Place all required balance material into position and secure lead washer mounting bolts.

4 Safety wire lead washer mounting bolts. (Refer to 20-50)

(q) To balance a rudder that is over balanced (leading edge heavy), proceed with the following steps.

CAUTION: When balancing, the rudder assembly must be complete including mounting brackets, paint, stripes, rudder bottom, and rudder tip. The bench used to support knife edge supports must be level. Maximum mass balance weight is 2.5 pounds (1.13 kg).

1 Remove balance material from lead washer mounting bolts as required to achieve alignment of chord line to balance arm.

2 Place all required balance material into position and secure lead washer mounting bolts.

3 Safety wire lead washer mounting bolts. (Refer to 20-50)

(r) Install rudder. (Refer to 55-40)

(s) Operate rudder and inspect for proper operation.

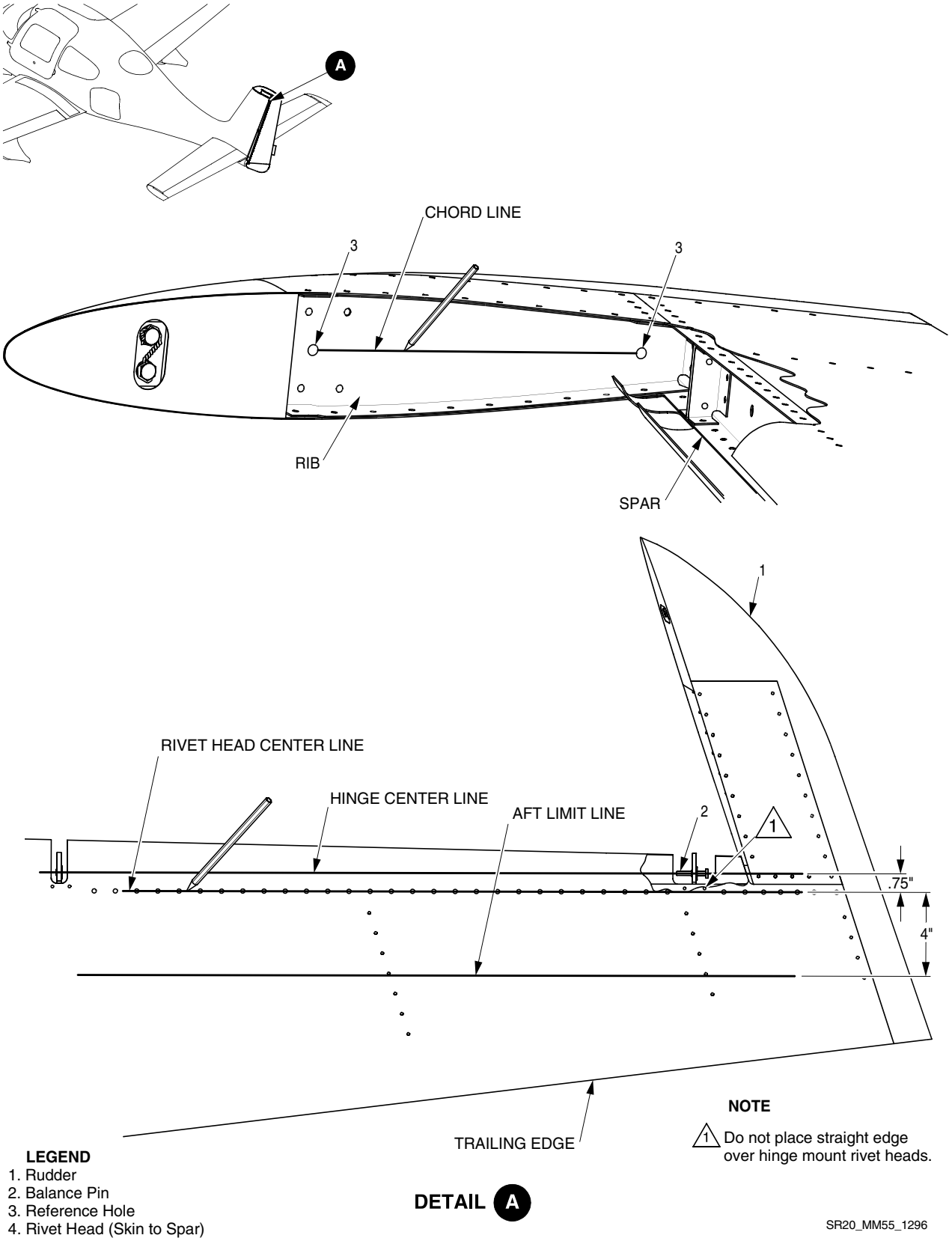


Figure 55-403
Rudder Balancing (Sheet 1 of 3)

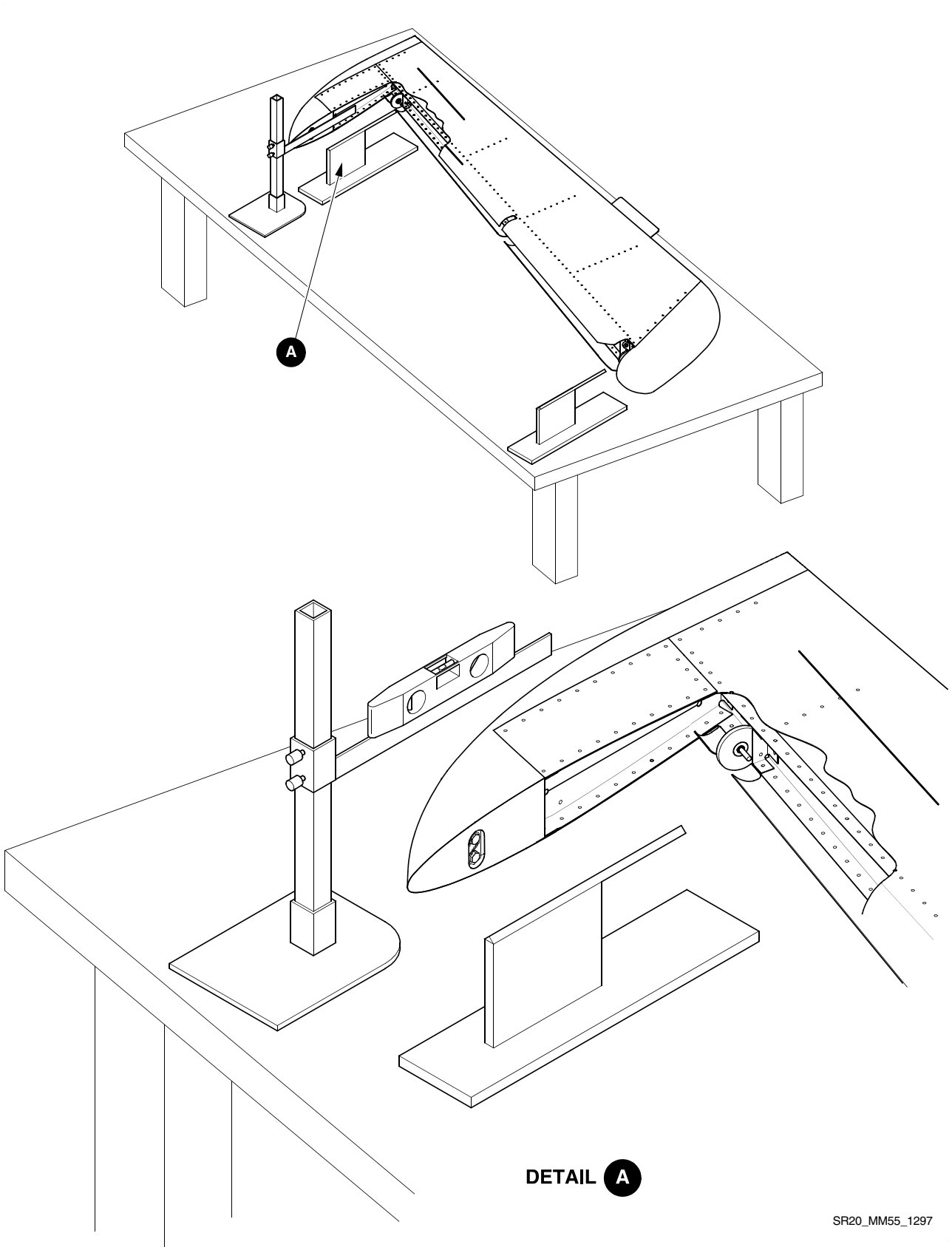


Figure 55-403
Rudder Balancing (Sheet 2 of 3)

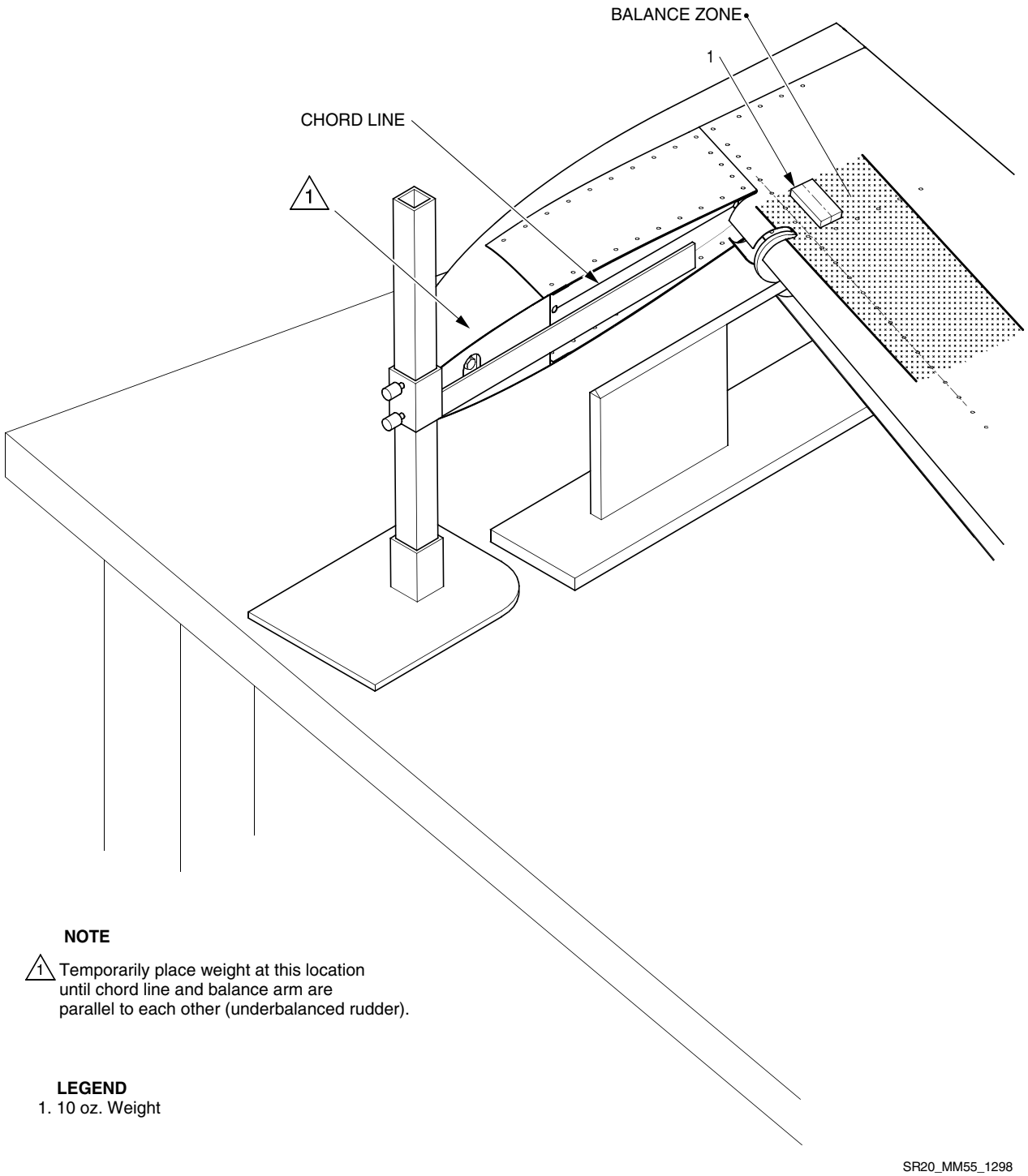


Figure 55-403
Rudder Balancing (Sheet 3 of 3)

(8) Adjustment/Test - Rudder Trim Tab

WARNING: **Maintenance check flight must be performed by a licensed pilot.**

Note: Both fuel tanks must contain equal amounts of fuel. Do not bend trailing edge of rudder trim tab right more than 25° or left more than 10°.

(a) After airplane is in flight and clear of all traffic, turbulence, and wake, at altitude between 4,000 and 6,000 MSL, set throttle to 75% power. Allow airplane time to accelerate and stabilize at cruise speed.

Note: It is recommended to use the autopilot in HDG and ALT hold modes during this procedure. Aileron input will be maintained as needed to hold constant heading but will apply no rudder input.

(b) Trim ailerons and elevator for steady heading level flight and release any rudder pressure.

(c) Observe and note the deflection of the ball inclinometer; the ball should be centered.

Note: Support trim tab at the bend when adjusting to ensure trim tab does not bend at the rivets and pull away from rudder.

(d) If required, bend rudder trim tab in small increments (approximately 1 - 2°) in opposite direction as ball deflection and repeat maintenance check flight.

ATTACH FITTINGS

1. DESCRIPTION

Attach fittings are provided for the mounting of control surfaces to the vertical and horizontal stabilizers.

The elevator is attached to the aft horizontal stabilizer shear web at three hinge points and on the elevator control bellcrank at the empennage area of the fuselage.

The rudder is attached to the aft vertical stabilizer shear web at three hinge points and on the rudder control bellcrank at the fuselage tailcone.

2. MAINTENANCE PRACTICES

A. Elevator Attach Fittings (See Figure 55-501)

(1) Removal - Elevator Attach Fittings

(a) Remove elevator. (Refer to 55-20)

(b) For inboard elevator hinge:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit	#40	Any Source	Drill (if rivets are installed)

2 Remove bolts and washers securing inboard elevator hinge to aft spar of horizontal stabilizer.

Note: Alternate installation uses rivets to secure inboard elevator hinge to aft flange of horizontal stabilizer.

3 If attaching hardware is installed, remove screws, washers, and nuts securing inboard elevator hinge to aft flange of horizontal stabilizer.

4 If rivets are installed, use #40 drill bit to remove rivets securing inboard elevator hinge to aft flange of horizontal stabilizer.

Note: Note orientation and thickness of existing top and bottom shims before removing shims.

5 Remove inboard elevator hinge and shims from horizontal stabilizer.

(c) For midspan elevator hinge:

1 Remove bolts and washers securing midspan elevator hinge to aft spar of horizontal stabilizer.

2 Remove midspan elevator hinge from horizontal stabilizer.

(d) For outboard elevator hinge:

1 Remove screws securing outboard elevator hinge and shim (if installed) to outboard spar of horizontal stabilizer.

2 Remove outboard elevator hinge from horizontal stabilizer.

(2) Disassembly - Elevator Attach Fittings

(a) For midspan elevator hinge:

1 Remove cotter pin securing hinge pin, washers, and nut to midspan elevator hinge.

(b) For outboard elevator hinge:

1 Remove cotter pin securing hinge pin, washer, and nut to outboard elevator hinge.

(3) Assembly - Elevator Attach Fittings

(a) For midspan elevator hinge:

1 Install new cotter pin securing hinge pin, washers, and nut to midspan elevator hinge.

(b) For outboard elevator hinge:

1 Install new cotter pin securing hinge pin, washer, and nut to outboard elevator hinge.

(4) Installation - Elevator Attach Fittings

(a) For inboard elevator hinge:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion Protection (if rivets are to be installed)

2 If shims are damaged, perform Adjustment/Test - Shim Replacement. (Refer to 55-50)

3 Position inboard elevator hinge and shims to installation area on horizontal stabilizer.

Note: Alternate installation uses rivets to secure inboard elevator hinge to aft flange of horizontal stabilizer.

4 If attaching hardware is to be installed, install screws, washers, and nuts securing inboard elevator hinge to aft flange of horizontal stabilizer.

5 If rivets are to be installed, use Alodine pen to apply corrosion protection to edge of each rivet hole. Install rivets securing inboard elevator hinge to aft flange of horizontal stabilizer. Apply thin coat of paint to each rivet head. (Refer to 51-30)

6 Install bolts and washers securing inboard elevator hinge to aft spar of horizontal stabilizer.

(b) For midspan elevator hinge:

1 Position midspan elevator hinge to installation area on horizontal stabilizer.

2 Install bolts and washers securing midspan elevator hinge to aft spar of horizontal stabilizer.

(c) For outboard elevator hinge:

1 Position outboard elevator hinge and shim (if required) to installation area on horizontal stabilizer.

2 Install screws securing outboard elevator hinge and shim (if installed) to outboard spar of horizontal stabilizer.

(d) Install elevator. (Refer to 55-20)

(e) Perform Inspection/Check - Elevator System Rigging. (Refer to 27-30), (Refer to 27-30)

(5) Adjustment/Test - Shim Replacement

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caliper	-	Any Source	Measure
Shim	Refer to IPC, Elevator Attach Fittings for approved shim	Cirrus Design	Shim
Grinder w/ 80-grit Disc	-	Any Source	Adhesive Removal
90° Bent Tip Pick	-	Any Source	Adhesive Removal

(b) Remove elevator. (Refer to 55-20)

(c) Remove cotter pin, nut, washers, and bolt securing trim cartridge to elevator bellcrank. (Refer to 27-30)

(d) Remove cotter pin, nut, washers, and bolt securing elevator push/pull rod to elevator bellcrank. (Refer to 27-20)

CAUTION: Use care to not damage the BL0 hinge during adhesive removal.

(e) At aft horizontal stabilizer, use grinder to remove adhesive to expose screws. Use pick to remove adhesive in screw head slots.

Note: Note orientation and thickness of existing shim(s) before removing shim(s).

(f) Remove bolts, washers, and nuts securing shim(s) to BL0 hinge. Remove shim(s) from airplane.

(g) Using caliper, measure thickness of existing shim(s) requiring replacement.

(h) Position replacement shim(s) to BL0 hinge at horizontal stabilizer. Use marker to indicate approximate match drill locations on shim(s). Ensure proper edge margin of 0.170 inch (4.320 mm) is maintained when marking shim for match drilling.

Note: To facilitate accurate match drilling, use the hole pattern of existing shim as a template for the new shim.

(i) If installation hole pattern on existing shim is still intact, position existing shim holes to marked locations on replacement shim. Fixture shims together with masking tape.

(j) Using the hole pattern on the existing shim(s), match drill 0.170 inch (4.320 mm) holes in replacement shim(s). Remove tape fixturing and discard existing shims.

Note: If adhesive removal damaged attaching hardware, install new screws, washers, and/or nuts as required.

To facilitate reinstallation of BL0 hinge shim(s), two technicians are recommended to position and secure attaching hardware.

(k) Install bolts, washers, and nuts securing replacement shim(s) to BL0 hinge. Torque to 15 - 20 in-lb (1.7 - 2.2 Nm).

(l) Install bolt, washers, nut, and cotter pin securing elevator push/pull rod to elevator bellcrank. (Refer to 27-20)

(m) Insert spacer and align trim cartridge with mounting hole on elevator bellcrank and install bolt, washers, nut, and cotter pin. (Refer to 27-30)

(n) Install elevator. (Refer to 55-20)

(o) Perform Inspection/Check - Elevator System Rigging. (Refer to 27-30), (Refer to 27-30)

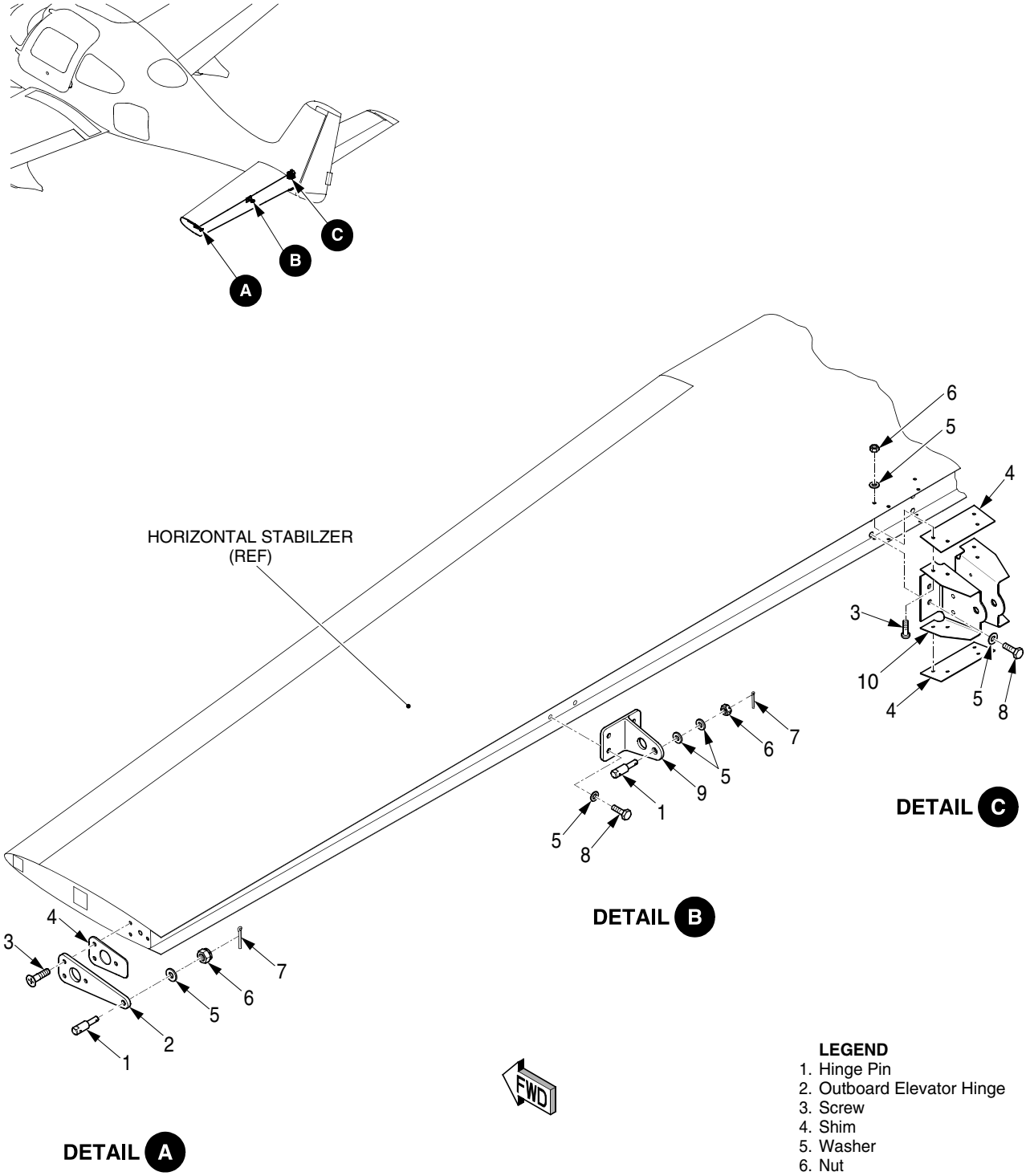


Figure 55-501
Elevator Attach Fittings

B. Rudder Attach Fittings (See Figure 55-502)

(1) Removal - Rudder Attach Fittings

(a) Remove rudder. (Refer to 55-40)

(b) Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit	#40	Any Source	Drill (if rivets are installed)

(c) For upper rudder hinges:

1 Remove bolts and washers securing upper rudder hinges to aft spar of vertical stabilizer.

2 *Serials 1005 thru 2270 before SB2X-55-12:* Use #40 drill bit to remove rivets securing upper rudder hinges to side flanges of vertical stabilizer.

3 *Serials 1005 thru 2270 after SB2X-55-12, 2271 & subs:* Remove nuts, washers, and screws securing upper rudder hinges to side flanges of vertical stabilizer.

4 Remove upper rudder hinges from vertical stabilizer.

(d) For midspan rudder hinges:

1 Remove bolts and washers securing midspan rudder hinges and radius fillers to aft spar of vertical stabilizer.

2 Use #40 drill bit to remove rivets securing midspan rudder hinges to aft flange of vertical stabilizer.

3 Remove midspan elevator hinges and radius fillers from horizontal stabilizer.

(e) For lower rudder hinges:

1 Remove bolts, washers, and nuts securing lower rudder hinges to aft spar of vertical stabilizer.

Note: Alternate installation uses rivets to secure lower rudder hinges to aft flange of vertical stabilizer.

2 If attaching hardware is installed, remove screws, washers, and nuts securing lower rudder hinges to aft flange of vertical stabilizer.

If rivets are installed, use #40 drill bit to remove rivets securing lower rudder hinges to aft flange of vertical stabilizer.

3 Remove lower rudder hinges from vertical stabilizer.

(2) Installation - Rudder Attach Fittings

(a) Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion Protection (if rivets or screws are to be installed)

(b) *Serials 1005 thru 2270 before SB2X-55-12:* For upper rudder hinges:

1 Position upper rudder hinges to vertical stabilizer.

2 Use Alodine pen to apply corrosion protection to edge of each rivet hole.

3 Install rivets securing upper rudder hinges to side flanges of vertical stabilizer.

4 Apply thin coat of paint to each rivet head. (Refer to 51-30)

5 Install bolts and washers securing upper rudder hinges to aft spar of vertical stabilizer.

(c) *Serials 1005 thru 2270 after SB2X-55-12, 2271 & subs:* For upper rudder hinges:

1 Position upper rudder hinges to vertical stabilizer.

2 Install bolts and washers securing upper rudder hinges to aft spar of vertical stabilizer.

3 Use Alodine pen to apply corrosion protection to edge of each hinge screw hole.

4 Install screws, shim(s) (if installed), washers, and nuts securing upper rudder hinges to side flanges of vertical stabilizer.

5 Apply thin coat of paint to each screw head. (Refer to 51-30)

(d) For midspan rudder hinges:

1 Position mid-span elevator hinges and radius fillers to horizontal stabilizer.

2 Use Alodine pen to apply corrosion protection to edge of each rivet hole.

3 Install rivets securing midspan rudder hinges to aft flange of vertical stabilizer.

4 Apply thin coat of paint to each rivet head. (Refer to 51-30)

5 Install bolts and washers securing midspan rudder hinges and radius fillers to aft spar of vertical stabilizer.

(e) For lower rudder hinges:

1 Position lower rudder hinges to installation area on vertical stabilizer.

Note: Alternate installation uses rivets to secure lower rudder hinges to aft flange of vertical stabilizer.

2 If attaching hardware is to be installed, install screws, washers, and nuts securing lower rudder hinges to aft flange of vertical stabilizer.

If rivets are to be installed, use Alodine pen to apply corrosion protection to edge of each rivet hole. Install rivets securing lower rudder hinges to aft flange of vertical stabilizer. Apply thin coat of paint to each rivet head. (Refer to 51-30)

3 Install bolts, washers, and nuts securing lower rudder hinges to aft spar of vertical stabilizer.

(f) Install rudder. (Refer to 55-40)

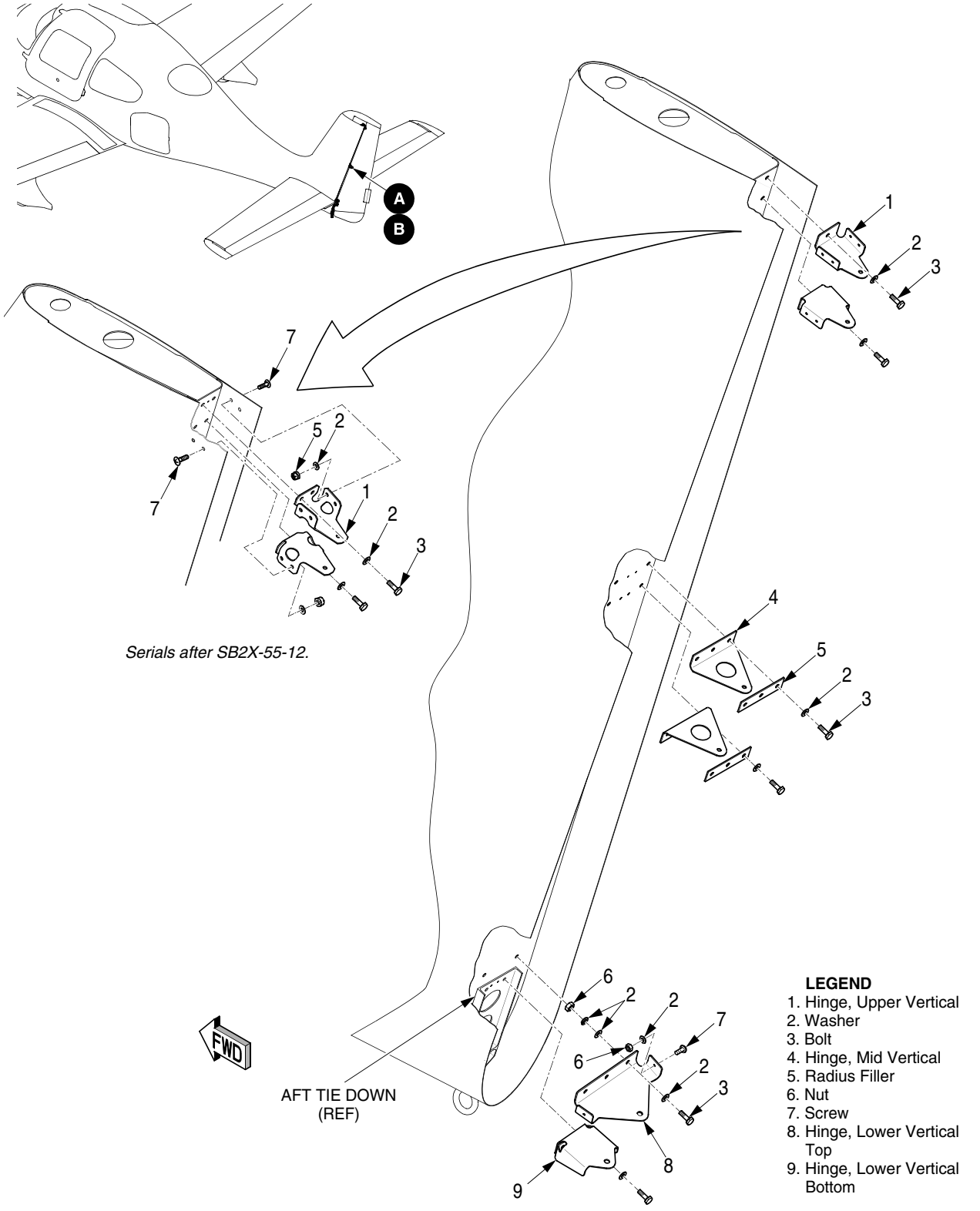


Figure 55-502
Rudder Attach Fittings - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422

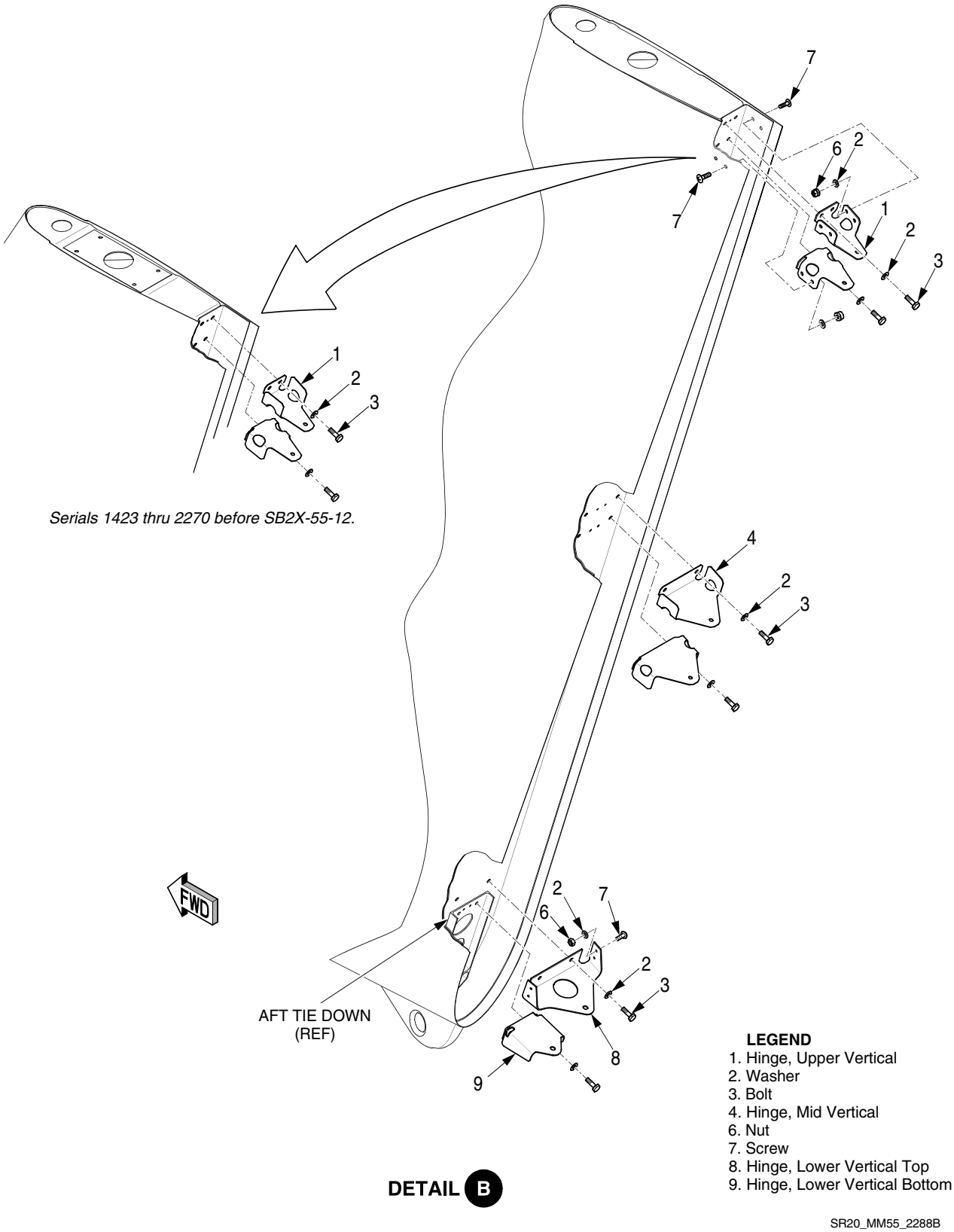


Figure 55-502
Rudder Attach Fittings - Serials 1423 & subs (Sheet 2 of 2)

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CHAPTER 56

WINDOWS

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CHAPTER 56 - WINDOWS
LIST OF EFFECTIVE PAGES

Chapter-Section	Page	Date
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56-00	2	15 JUN 2010
56-10	1	15 JUN 2010
56-10	2	04 SEP 2018
56-10	3	15 JUN 2010
56-10	4	15 JUN 2010
56-10	5	15 DEC 2014
56-10	6	15 JUN 2010
56-10	7	15 JUN 2010
56-10	8	15 JUN 2010
56-10	9	15 JUN 2010
56-10	10	15 DEC 2014
56-10	11	15 JUN 2010
56-10	12	15 JUN 2010
56-20	1	15 JUN 2010
56-20	2	04 SEP 2018
56-20	3	15 JUN 2010
56-20	4	15 DEC 2014
56-20	5	15 JUN 2010
56-20	6	15 JUN 2010
56-20	7	15 JUN 2010
56-20	8	15 JUN 2010
56-20	9	15 JUN 2010
56-20	10	15 JUN 2010
56-30	1	15 JUN 2010
56-30	2	04 SEP 2018
56-30	3	15 JUN 2010
56-30	4	15 DEC 2014
56-30	5	15 JUN 2010
56-30	6	15 JUN 2010
56-30	7	15 JUN 2010
56-30	8	15 JUN 2010
56-30	9	15 DEC 2014
56-30	10	15 JUN 2010

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CHAPTER 56 - WINDOWS

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WINDOWS

1. GENERAL

The airplane is equipped with a windshield, cabin door windows, and aft passenger windows. The windows are manufactured of acrylic and adhesive bonded to the fuselage or door structure. All windows are fixed and cannot be opened.

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FLIGHT COMPARTMENT

1. DESCRIPTION AND OPERATION

The windshield is manufactured of acrylic and is adhesive bonded to the fuselage. Replacement is accomplished by removing the interior trim around the windshield, removing the four retaining clips (*Serials 1005 thru 1422*), removing sealant around the windshield, and then removing the windshield from the fuselage. In general, the reverse process is used to install a replacement windshield. This method is literally seamless, and the fuselage will show no marks or evidence of maintenance.

2. MAINTENANCE PRACTICES

A. Windshield

(1) Removal - Windshield (See Figure 56-101), (See Figure 56-102)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Die Grinder (1-inch cut-off disk)	-	Any Source	Cut windshield.
Masking Tape	2-inch	Any Source	Prevent damage to the windshield.
Drop Cloth	-	Any Source	Prevent contamination.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Aluminum Oxide Sandpaper	80-grit	Any Source	Sealant removal.
Utility Knife	-	Any Source	Sealant removal.

(b) Remove crew seats. (Refer to 25-10)

(c) Remove MFD. (Refer to 31-60)

(d) Remove interior trim from around windshield. (Refer to 25-10)

(e) Disconnect and remove interior light harness.

(f) Cover interior and instrument panel with drop cloth to prevent foreign material from contaminating interior and instruments. Tape drop cloth to fuselage, under windshield bonding flange.

(g) *Serials 1005 thru 1422:* Remove four windshield retaining clips. (See Figure 56-101)

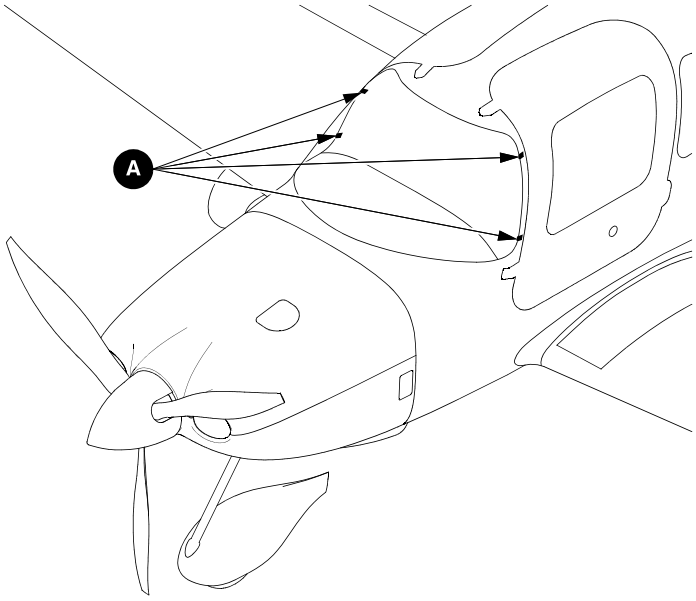
(h) Using several pieces of duct tape, make handles on exterior of windshield.

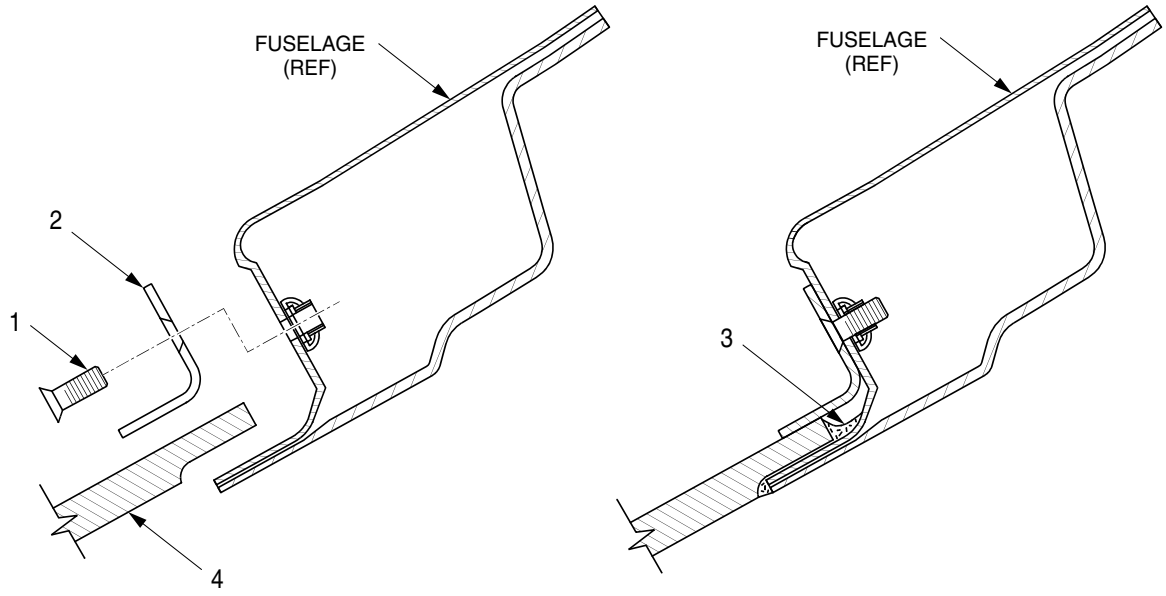
CAUTION: Exercise care to prevent the removal of laminate from the fuselage when cutting and removing the sealant from between the fuselage and windshield. If laminate is damaged, it must be repaired prior to installing the new windshield.

Note: If windshield is being replaced, it will be easier to use a die grinder and a cut-off disk to cut out the inner portion of the windshield to gain access to the bonding flange. The windshield should be cut as close as possible to the fuselage. Use care to prevent damage to the fuselage and instruments.

(i) Cut sealant loose from between fuselage and windshield using utility knife. While pushing in on windshield, follow edge of fuselage with blade tip, then back cut in towards fuselage to clean out sealant. (See Figure 56-102)

(j) Using utility knife, isopropyl alcohol and aluminum oxide sandpaper (80-grit), remove all remaining sealant from fuselage bonding flange.





LEGEND
1. Screw
2. Transparency Clip
3. Sealant
4. Windshield

DETAIL A

Serials 1005 thru 1422.

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Figure 56-101
Windshield Clips - Serials 1005 thru 1422

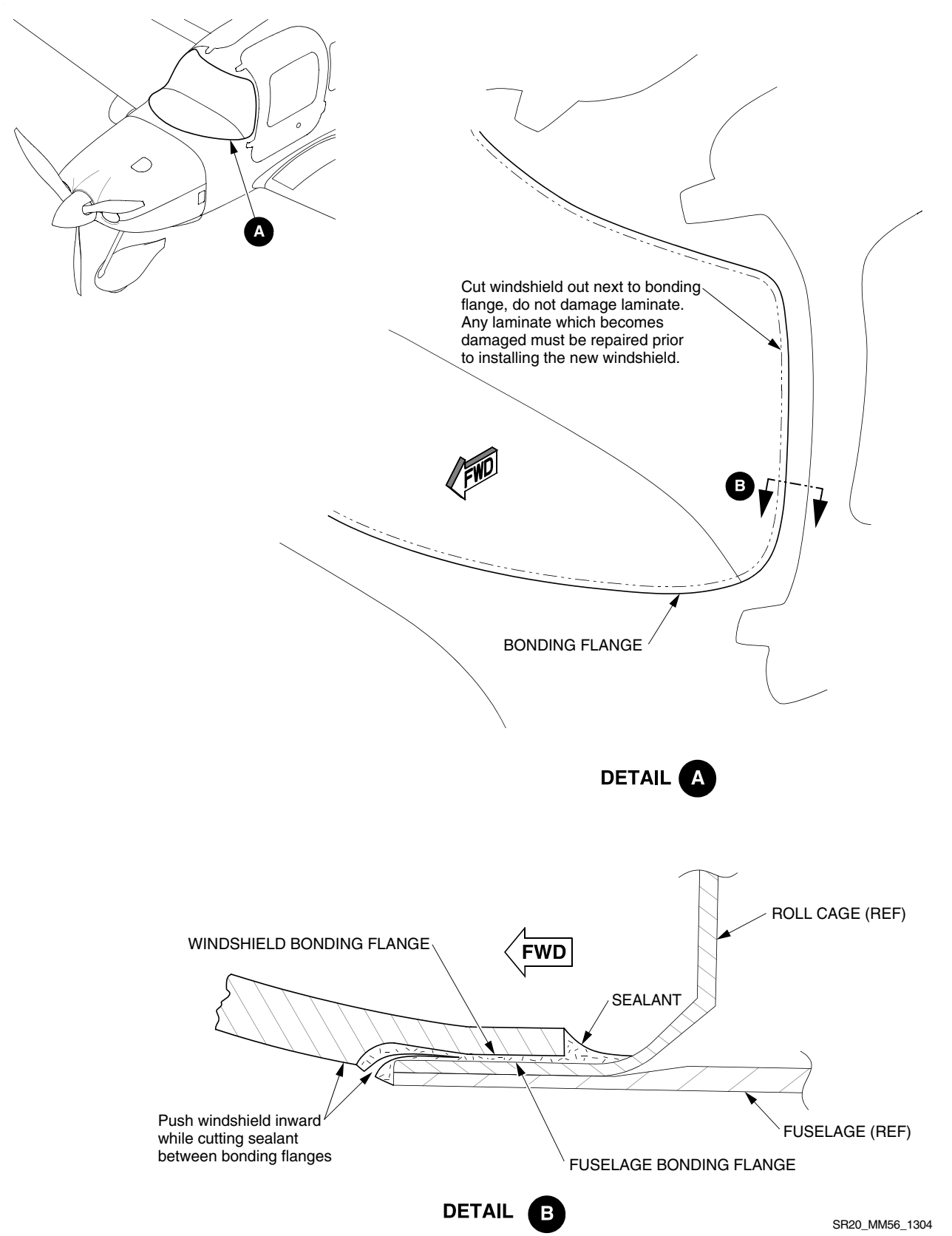


Figure 56-102
Windshield Removal

(2) Installation - Windshield (See Figure 56-103), (See Figure 56-104)

Windshield sealant is intended to provide a seal between the windshield and fuselage and to prevent the leakage of air through the airframe structure. Window sealant is used in the installation of all windows in the aircraft.

Isopropyl alcohol, kerosene, white alptha naptha, mineral spirits, and cotton are acceptable for cleaning acrylic windows. Residue left behind by the “Spraylat” protective coating may be removed by soaking the area with isopropyl alcohol and rubbing with an alcohol soaked soft flannel cloth. Residue left behind by the adhesive backed paper covering can also be removed by the above method. If, however, the paper covering has been stored on the windshield for an extended period of time, soak paper with kerosene and keep it wet for several hours. Remove any remaining adhesive by using a mixture of equal parts of kerosene and isopropyl alcohol. Soak a soft flannel cloth with this mixture and rub the windshield with the cloth. The windshield should be cleaned after this procedure with a dish washing liquid and plenty of water.

WARNING: **Never use organic solvents such as Methyl Ethyl Ketone (MEK), acetone, or lacquer thinner. Do not use jewelry cleaner or paper towels to remove any contaminates. Never use ice scrapers on acrylic windows. Do not store any window outdoors while the protective covering is still on the window. The covering will become very difficult, if not impossible, to remove without damaging the windshield.**

CAUTION: It is very important to keep the windshield well supported at all times. Warm temperatures are not required during these operations; however, acrylic will take much more abuse at 80 degrees than at 30 degrees.

Note: Before final installation, always inspect the windshield for imperfections. Use care to prevent staining or scratching the windshield.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Padded Cargo Rods	-	Any Source	Temporarily secure windshield.
Masking Tape	2-inch	Any Source	Prevent damage to the windshield.
Temperature-Resistant Sealing Compound	MIL-S-8802 Type II, Class B	(Refer to 20-10)	Seal windows.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Cotton Gloves (clean, lint free)	-	Any Source	Protect hands.
Cotton Cloth (clean, lint free)	-	Any Source	Clean sealing surface.
Application Spatula (non-nylon)	1-inch	Any Source	Smooth adhesive.

Description	P/N or Spec.	Supplier	Purpose
Primer	MC-145	LP Aero Plastics Rd#1 Box 201-B Jeannette, PA 15644	Aid in adhesion.
Protective Coating	AC-940 Blue	AC Products, Inc. 172 Ela Jolla St., Placentia CA 92670	Prevent damage to the windshield.
Fine Line Tape (pin striping)	1/4-inch	3-M	Allow smooth transition between fuselage and windshield.
Aluminum Oxide Paper	80-grit or finer	Any Source	Abrade acrylic surface prior to adhesion.

Note: Exercise care to protect the inner and outer windshield surfaces from damage during the installation process. The stepped area on the edge of the windshield (which is bonded to the fuselage) is called the bonding flange.

(b) Verify that sealant is within storage-life requirements.

(c) Inspect fuselage bonding flange for any remaining sealant or contaminates, remove and clean as necessary.

(d) Remove the protective covering from the windshield and inspect the windshield for damage or defects, never install a defective windshield.

(e) Install a continuous piece of fine line tape on the edge of the fuselage windshield opening (next to the bonding flange). (See Figure 56-103)

Note: The masking tape will provide a smooth and continuous parting line at the bonding flange.

(f) Working in one direction on the fuselage window opening, place 2-inch masking tape on top of the outer edge (the edge furthest away from the bonding flange) of the fine line tape.

(g) Make a directional mark on the masking tape to indicate the proper direction for removal. (See Figure 56-104)

CAUTION: Do not apply protective coating on the windshield bonding flange.

(h) Apply three coats (in opposing directions) of protective coating (AC-940 Blue) on the outer windshield surface.

(i) Using several pieces of duct tape, make handles on the exterior of the windshield after the protective coating has fully cured.

Note: Five or more padded cargo rods may be necessary to hold the windshield into the proper position. Padded cargo rods may be placed on each corner of the windshield and in the center of the windshield. Additional padded cargo rods may be required to prevent the windshield from sliding down.

(j) Place windshield into position and secure the windshield into the fuselage using padded cargo rods. (See Figure 56-104)

(k) Inspect the windshield for proper fit. The windshield must have equal amounts of space around the perimeter of the windshield. The exterior surface of the windshield should be flush with exterior surface of fuselage skin.

CAUTION: The windshield bonding flange must never be trimmed to a thickness less than 0.080 of an inch. The windshield bonding flange must never be less than ½-inch wide.

Note: The windshield bonding flange should have equal amounts of space around it. If the windshield doesn't fit into the fuselage with equal amounts of space around it, the windshield and/or bonding flange will need to be trimmed accordingly.

The windshield should be flush with the exterior surface of the fuselage skin. If the windshield cannot be made flush by adding moderate pressure on the padded cargo rods, the thickness of the windshield bonding flange must be trimmed accordingly. Aluminum oxide sandpaper (80-grit) on a sanding board may be used to trim the windshield.

(l) Mark and trim the windshield as required to ensure a perfect fit.

Note: Five or more padded cargo rods may be necessary to hold the windshield into the proper position. Padded cargo rods may be placed on each corner of the windshield and in the center of the windshield. Additional padded cargo rods may be required to prevent the windshield from sliding down.

(m) Place the prefit windshield into position and clamp the windshield into position using padded cargo rods.

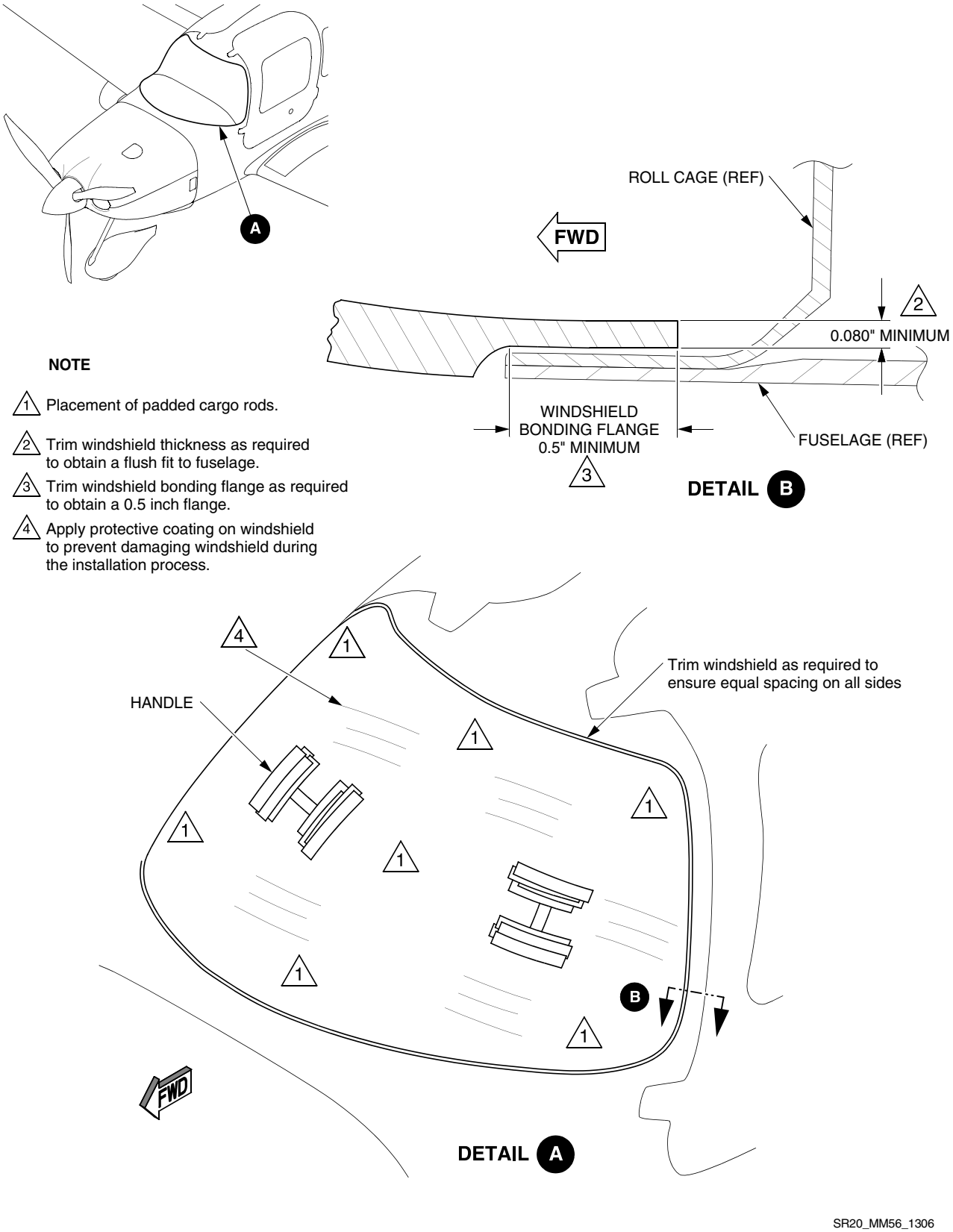


Figure 56-103
Windshield Alignment

(n) Remove a small amount (approximately 2-inches wide) of protective coating from around edge of windshield.

(o) Install a continuous piece of fine line tape (pinstripe tape) around the edge of the windshield (next to the bonding flange). The fine line tape should be adhered to the windshield with equal amounts of space between the fine line tape on the fuselage and the fine line tape on the windshield.

(p) Working in one direction on the windshield, place 2-inch masking tape on top of the inner edge (the edge furthest away from the bonding flange) of the fine line tape.

Note: The alignment marks will be used to ensure that the windshield will be installed into the exact location in which it was during prefit.

(q) Using a straight edge, make several alignment marks around the edges of the masking tape on the fuselage to the masking tape on the windshield.

(r) Carefully remove windshield from fuselage.

(s) Using aluminum oxide 80-grit paper, abrade the bonding flange of the windshield in a random pattern. Remove all surface gloss.

CAUTION: Wax or grease pencil markings on any part are not allowed. Any such markings inadvertently occurring must be removed prior to application of primer. All surfaces shall be thoroughly cleaned and dried before application of primer.

Immediately prior to applying any primer on the windshield bonding flange, solvent clean the flange with isopropyl alcohol. When handling cleaned surfaces, wear clean cotton gloves to prevent surface contamination. Surfaces must be re-cleaned in the event of contamination.

Note: Fold cloth in such a manner to eliminate raw edges to reduce the possibility of lint. Always clean an area larger than the application area.

(t) Remove contaminates from the windshield bonding flange and the immediate work area using a vacuum and a clean brush attachment.

CAUTION: Do not apply primer to the composite bonding surface.

(u) Ensure that all surfaces adjacent to the windshield bonding flange are masked to prevent them from coming into contact with any primer or sealant.

(v) Using isopropyl alcohol, solvent clean the bonding flange in the fuselage.

(w) Verify all required materials are present and all parts have been prepared and pre-fit.

(x) Wearing clean gloves, lightly dampen a cloth with primer. Fold the cloth in such a manner to eliminate raw edges to reduce the possibility of lint.

(y) Apply primer to the acrylic bonding flange. Wipe the cloth over the prepared area. Apply as little primer as possible while still wetting the entire surface.

CAUTION: Keep primed area clean and free from contaminates while primer is drying. Seal windshield as soon as practical after primer drying period to minimize contamination.

(z) Allow the primer to dry for thirty to sixty minutes.

(aa) Mix sealant per manufacturer's instructions. Mix the required quantity in the ratio specified in the adhesive manufacturer's instructions. (Refer to 20-10)

CAUTION: Do not apply sealant to windshield bonding flange. The sealant must be applied to the fuselage bonding flange.

(ab) Apply a thin layer of sealant to the outer edge of the fuselage bonding flange. Spread the sealant out using an application spatula.

CAUTION: When spreading the sealant, ensure all air pockets are removed.

Note: If more than one bead is required, apply it immediately adjacent to the prior bead to form one large bead.

Glass beads may be applied in the bond line to ensure that minimum sealant thickness is maintained. Add up to 2.3 grams of glass beads per 3 fluid ounces of mixed adhesive. (Refer to 51-30)

(ac) Directly on top of the sealant previously spread, apply a 1/4-inch to 3/8-inch bead of sealant down the center of the bond area.

Note: Five or more padded cargo rods may be necessary to hold the windshield into the proper position. Padded cargo rods may be placed on each corner of the windshield and in the center of the windshield. Additional padded cargo rods may be required to prevent the windshield from sliding down.

(ad) Using padded cargo rods, secure the windshield into position making sure the reference marks made earlier are perfectly aligned and that the contour of the windshield matches the contour of the fuselage.

(ae) Using a 1-inch application spatula, push sealant into the gap between the windshield and the fuselage.

Note: To prevent sealant from becoming damaged, pull tape towards sealant while the sealant is still damp.

(af) Remove masking tape and fine line tape from the perimeter of the windshield and the fuselage.

CAUTION: Overheating windshield can cause windshield damage.

(ag) Allow the sealant to air dry. Following the manufacturer's instructions, the sealant can be heat cured using a heat gun.

(ah) *Serials 1005 thru 1422:* Install and secure the four windshield retaining clips.

(ai) Remove cargo rods.

(aj) Route and secure the interior light wiring harness.

(ak) Using a vacuum cleaner, remove all debris from the cabin and fuselage.

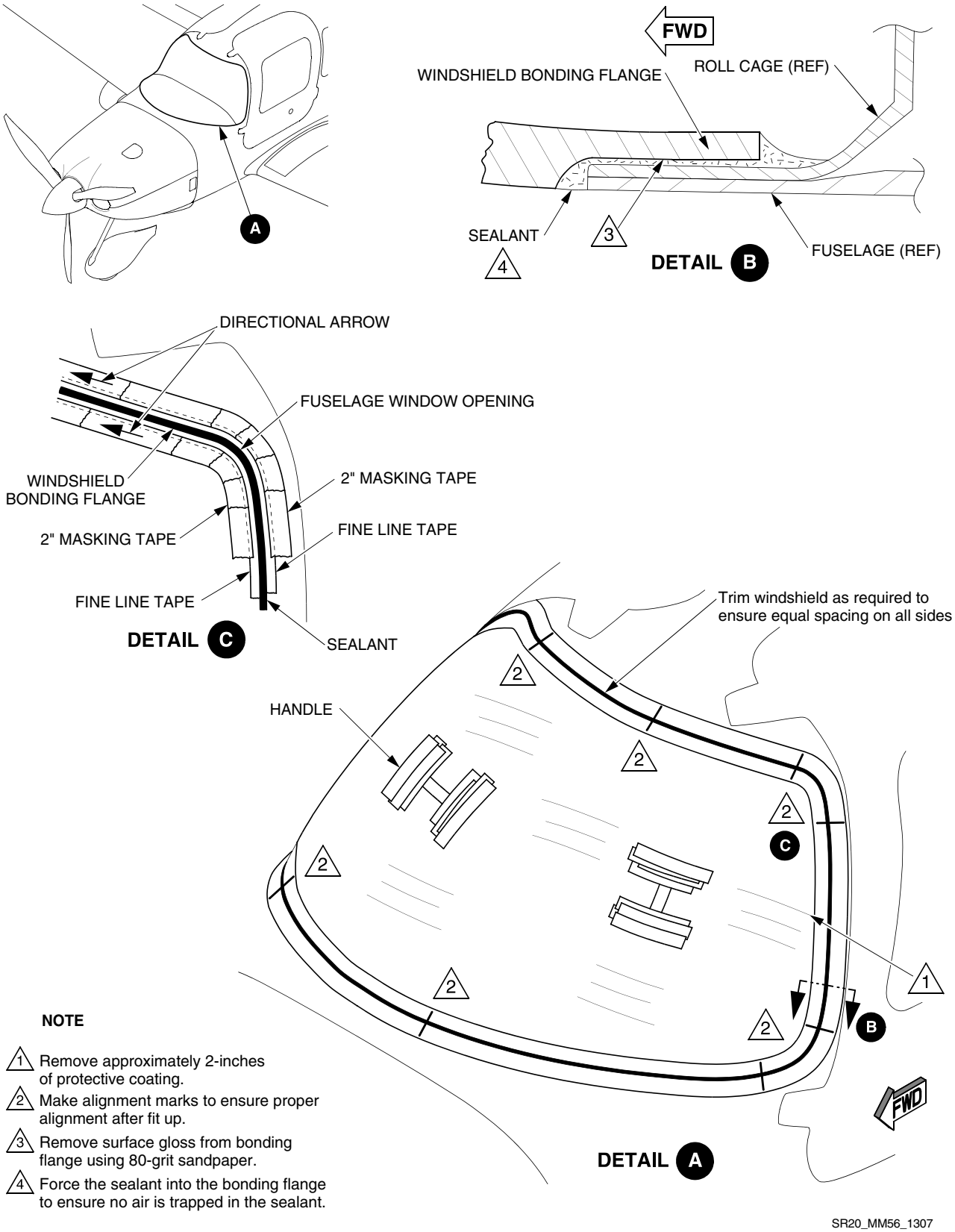
(al) Remove the drop cloth.

(am) Install and secure interior trim. (Refer to 25-10)

(an) Install crew seats. (Refer to 25-10)

(ao) Install MFD. (Refer to 31-60)

(ap) Clean windshield. (Refer to 56-10)



NOTE

1. Remove approximately 2-inches of protective coating.
2. Make alignment marks to ensure proper alignment after fit up.
3. Remove surface gloss from bonding flange using 80-grit sandpaper.
4. Force the sealant into the bonding flange to ensure no air is trapped in the sealant.

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Figure 56-104
Windshield Installation

(3) Windshield - Cleaning (Refer to 12-20)

Acrylic windows should be cleaned using the following chemicals, and by following the manufactures instructions for each individual product.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Acrylic Polish and Sealant	SP-PL16	LP Aero Plastics, Inc.	Polish acrylic.
Plastic Cleaner and Polish	SP-210A	LP Aero Plastics, Inc.	Clean acrylic.
Plastic Scratch Remover	SP-210P	LP Aero Plastics, Inc.	Remove fine scratches in acrylic.

CABIN

1. DESCRIPTION AND OPERATION

The aft passenger windows are manufactured of acrylic and adhesive bonded to the fuselage. Replacement is accomplished by removing the interior trim around the window, removing the sealant around the window, and then removing the window from the fuselage. In general, the reverse process is used to install a replacement window. This method is literally seamless, and the fuselage will show no marks or evidence of maintenance.

2. MAINTENANCE PRACTICES

A. Aft Passenger Window

(1) Removal - Aft Passenger Window (See Figure 56-201)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Die Grinder (1-Inch Cut-Off Disk)	-	Any Source	Cut window.
Masking Tape	2-inch	Any Source	Prevent damage to the window.
Drop Cloth	-	Any Source	Prevent contamination.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Aluminum Oxide Sandpaper	80-grit	Any Source	Sealant removal.
Utility Knife	-	Any Source	Sealant removal.

(b) Remove interior trim panels from around window. (Refer to 25-10)

(c) Cover interior and instrument panel with drop cloth to prevent foreign material from contaminating interior and instruments.

(d) Using several pieces of duct tape, make handles on exterior of window.

CAUTION: Exercise care to prevent the removal of laminate from the fuselage when cutting and removing the sealant from between the fuselage and window. If laminate is damaged, it must be repaired prior to installing the window.

Note: If window is being replaced, it will be easier to use a die grinder and a cut-off disk to cut out the inner portion of the window to gain access to the bonding flange. The window should be cut as close as possible to the fuselage.

(e) Cut sealant loose from between fuselage and window using utility knife. While pushing in on window, follow edge of fuselage with blade tip, then back cut in towards fuselage to clean out sealant. (See Figure 56-201)

(f) Using utility knife, isopropyl alcohol and aluminum oxide sandpaper (80-grit), remove all remaining sealant from fuselage bonding flange.

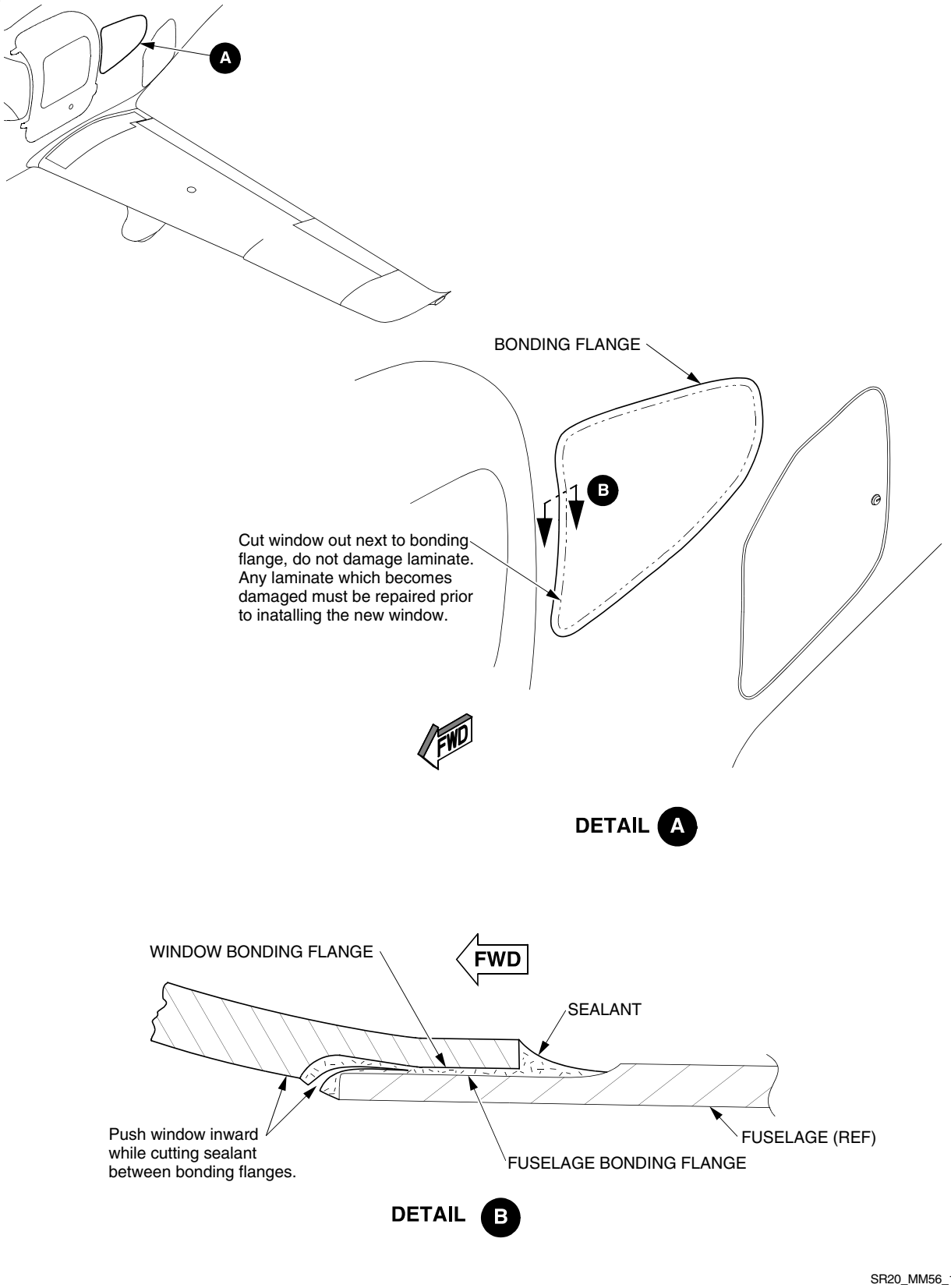


Figure 56-201
Window Removal

(2) Installation - Aft Passenger Window (See Figure 56-202), (See Figure 56-203)

Window sealant is intended to provide an acceptable seal between the window and fuselage and to prevent the leakage of air through the airframe structure. Window sealant is used in the installation of all windows in the aircraft.

Isopropyl alcohol, kerosene, white alptha naptha, mineral spirits, and cotton are acceptable for cleaning acrylic windows. Residue left behind by the “Spraylat” protective coating may be removed by soaking the area with isopropyl alcohol and rubbing with an alcohol soaked soft flannel cloth. Residue left behind by the adhesive backed paper covering can also be removed by the above method. If, however, the paper covering has been stored on the window for an extended period of time, soak paper with kerosene and keep it wet for several hours. Remove any remaining adhesive by using a mixture of equal parts of kerosene and isopropyl alcohol. Soak a soft flannel cloth with this mixture and rub the window with the cloth. The window should be cleaned after this procedure with a dish washing liquid and plenty of water.

WARNING: **Never use organic solvents such as Methyl Ethylketone (MEK), acetone, or lacquer thinner. Do not use jewelry cleaner or paper towels to remove any contaminates. Never use ice scrapers on acrylic windows. Do not store any window outdoors while the protective covering is still on the window. The covering will become very difficult, if not impossible, to remove without damaging the window.**

CAUTION: It is very important to keep the window well supported at all times. Warm temperatures are not required during these operations; however, acrylic will take much more abuse at 80 degrees than at 30 degrees.

Note: Always inspect the window before final installation. Use care to prevent staining or scratching the window.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Padded Cargo Rods	-	Any Source	Temporarily secure window.
Masking Tape	2-inch	Any Source	Prevent damage to the window.
Temperature-Resistant Sealing Compound	MIL-S-8802 Type II, Class B	(Refer to 20-10)	Seal windows.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Cotton Gloves (clean, lint free)	-	Any Source	Protect hands.
Cotton Cloth (clean, lint free)	-	Any Source	Clean sealing surface.
Application Spatula (non-nylon)	1-inch	Any Source	Smooth adhesive.

Description	P/N or Spec.	Supplier	Purpose
Primer	MC-145	LP Aero Plastics Rd#1 Box 201-B Jeannette, PA 15644	Aid in adhesion.
Protective Coating	AC-940 Blue	AC Products, Inc. 172 Ela Jolla St., Placentia CA 92670	Prevent damage to the window.
Fine Line Tape (pin striping)	1/4-inch	3-M	Allow smooth transition between fuselage and window.
Aluminum Oxide Paper	80-grit or finer	Any Source	Abrade acrylic surface prior to adhesion.

Note: Exercise care to protect the inner and outer window surfaces from damage during the installation process. The stepped area on the edge of the window (which is bonded to the fuselage) is called the bonding flange.

(b) Verify that sealant is within storage-life requirements.

(c) Inspect fuselage bonding flange for any remaining sealant or contaminates, remove and clean as necessary.

(d) Remove the protective covering from the window and inspect the window for damage or defects, never install a defective window.

(e) Install a continuous piece of fine line tape on the edge of the fuselage window opening (next to the bonding flange). (See Figure 56-202)

Note: The masking tape will provide a smooth and continuous parting line at the bonding flange.

(f) Working in one direction on the fuselage window opening, place 2-inch masking tape on top of the outer edge (the edge furthest away from the bonding flange) of the fine line tape.

(g) Make a directional mark on the masking tape to indicate the proper direction for removal. (See Figure 56-203)

CAUTION: Do not apply protective coating on the window bonding flange.

(h) Apply three coats (in opposing directions) of protective coating (AC-940 Blue) on the outer window surface.

(i) Using several pieces of duct tape, make handles on the exterior of the window after the protective coating has fully cured.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(j) Place window into position and secure the window into the fuselage using padded cargo rods. (See Figure 56-203)

(k) Inspect the window for proper fit. The window must have equal amounts of space around the perimeter of the window. The exterior surface of the window should be flush with exterior surface of fuselage.

CAUTION: The window bonding flange must never be trimmed to a thickness less than 0.080 of an inch. The window bonding flange must never be less than ½-inch wide.

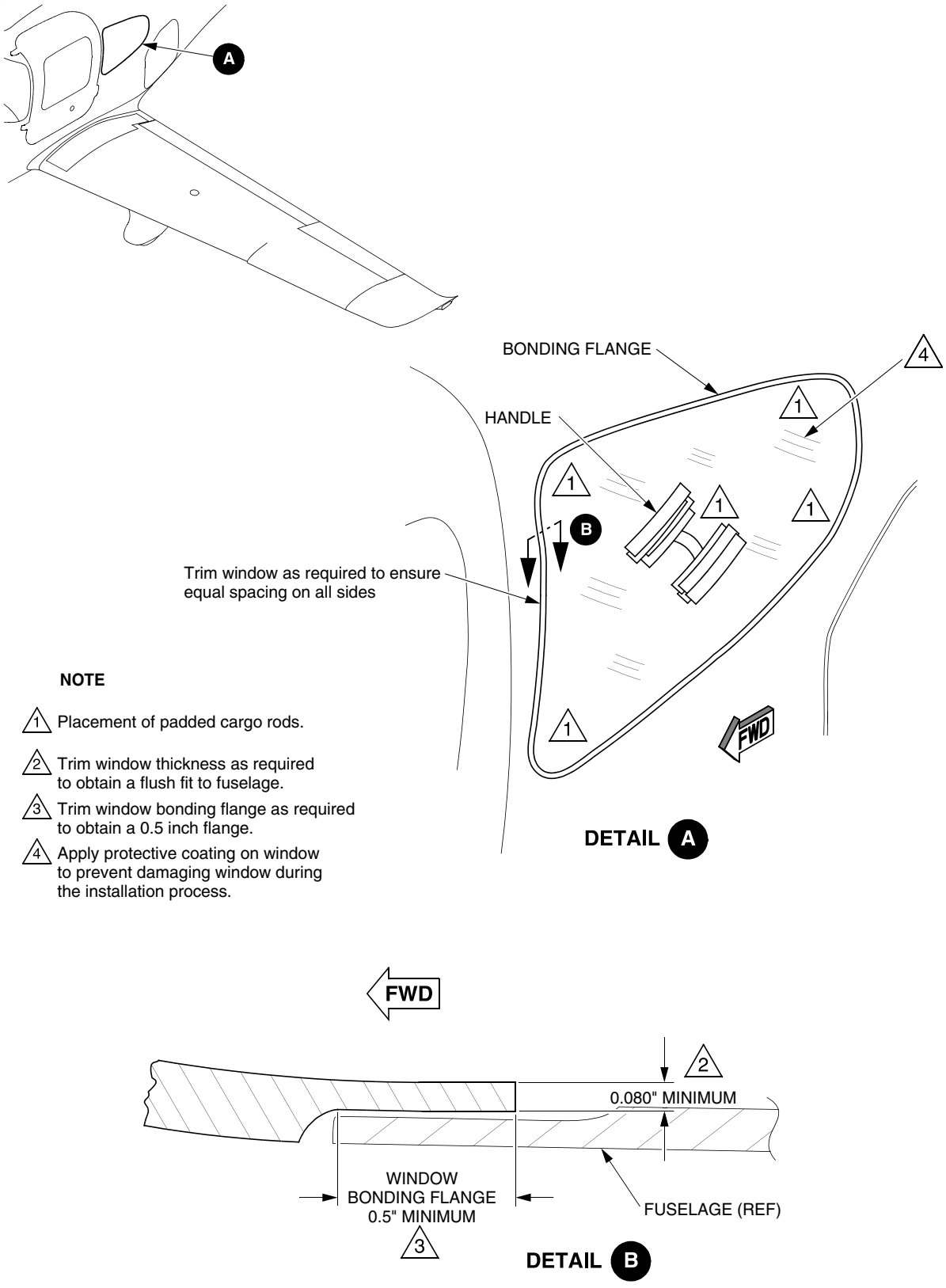
Note: The window bonding flange should have equal amounts of space around it. If the window doesn't fit into the fuselage with equal amounts of space around it, the window and/or bonding flange will need to be trimmed accordingly.

The window should be flush with the exterior surface of the fuselage. If the window cannot be made flush by adding moderate pressure on the cargo rods, the thickness of the window bonding flange must be trimmed accordingly. Aluminum oxide sandpaper (80-grit) on a sanding board may be used to trim the window.

(l) Mark and trim the window as required to ensure a perfect fit.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(m) Place the prefit window into position and clamp the window into position using padded cargo rods.



NOTE

1. Placement of padded cargo rods.
2. Trim window thickness as required to obtain a flush fit to fuselage.
3. Trim window bonding flange as required to obtain a 0.5 inch flange.
4. Apply protective coating on window to prevent damaging window during the installation process.

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Figure 56-202
Window Alignment

(n) Remove a small amount (approximately 2-inches wide) of protective coating from around edge of window.

(o) Install a continuous piece of fine line tape (pinstripe tape) around the edge of the window (next to the bonding flange). The fine line tape should be adhered to the window with equal amounts of space between the fine line tape on the fuselage and the fine line tape on the window.

(p) Working in one direction on the window, place 2-inch masking tape on top of the inner edge (the edge furthest away from the bonding flange) of the fine line tape.

Note: The alignment marks will be used to ensure that the window will be installed into the exact location in which it was during prefit.

(q) Using a straight edge, make several alignment marks around the edges of the masking tape on the fuselage to the masking tape on the window.

(r) Carefully remove window from fuselage.

(s) Using aluminum oxide 80-grit paper, abrade the bonding flange of the window in a random pattern. Remove all surface gloss.

CAUTION: Wax or grease pencil markings on any part are not allowed. Any such markings inadvertently occurring must be removed prior to application of primer. All surfaces shall be thoroughly cleaned and dried before application of primer.

Immediately prior to applying any primer on the window bonding flange, solvent clean the flange with isopropyl alcohol. When handling cleaned surfaces, wear clean cotton gloves to prevent surface contamination. Surfaces must be re-cleaned in the event of contamination.

Note: Fold cloth in such a manner to eliminate raw edges to reduce the possibility of lint. Always clean an area larger than the application area.

(t) Remove contaminates from the window bonding flange and the immediate work area using a vacuum and a clean brush attachment.

CAUTION: Do not apply primer to the composite bonding surface.

(u) Ensure that all surfaces adjacent to the window bonding flange are masked to prevent them from coming into contact with any primer or sealant.

(v) Using isopropyl alcohol, solvent clean fuselage bonding flange.

(w) Verify all required materials are present and all parts have been prepared and pre-fit.

(x) Wearing clean gloves, lightly dampen a cloth with primer. Fold the cloth in such a manner to eliminate raw edges to reduce the possibility of lint.

(y) Apply primer to the acrylic bonding flange. Wipe the cloth over the prepared area. Apply as little primer as possible while still wetting the entire surface.

CAUTION: Keep primed area clean and free from contaminates while primer is drying. Seal window as soon as practical after primer drying period to minimize contamination.

(z) Allow the primer to dry for thirty to sixty minutes.

(aa) Mix sealant per manufacturer's instructions. Mix the required quantity in the ratio specified in the adhesive manufacturer's instructions. (Refer to 20-10)

CAUTION: Do not apply sealant to window bonding flange. The sealant must be applied to the fuselage bonding flange.

(ab) Apply a thin layer of sealant to the outer edge of the fuselage bonding flange. Spread the sealant out using an application spatula.

CAUTION: When spreading the sealant, ensure all air pockets are removed.

Note: If more than one bead is required, apply it immediately adjacent to the prior bead to form one large bead.

(ac) Directly on top of the sealant previously spread, apply a 1/4-inch to 3/8-inch bead of sealant down the center of the bond area.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(ad) Using padded cargo rods, secure the window into position making sure the reference marks made earlier are perfectly aligned and that the contour of the window matches the contour of the fuselage.

(ae) Using a 1-inch application spatula, push sealant into the gap between the window and the fuselage.

Note: To prevent sealant from becoming damaged, pull tape towards sealant while the sealant is still damp.

(af) Remove masking tape and fine line tape from the perimeter of the window and the fuselage.

CAUTION: Overheating windshield can cause window damage.

(ag) Allow the sealant to air dry. Following the manufacture's instructions, the sealant can be heat cured using a heat gun.

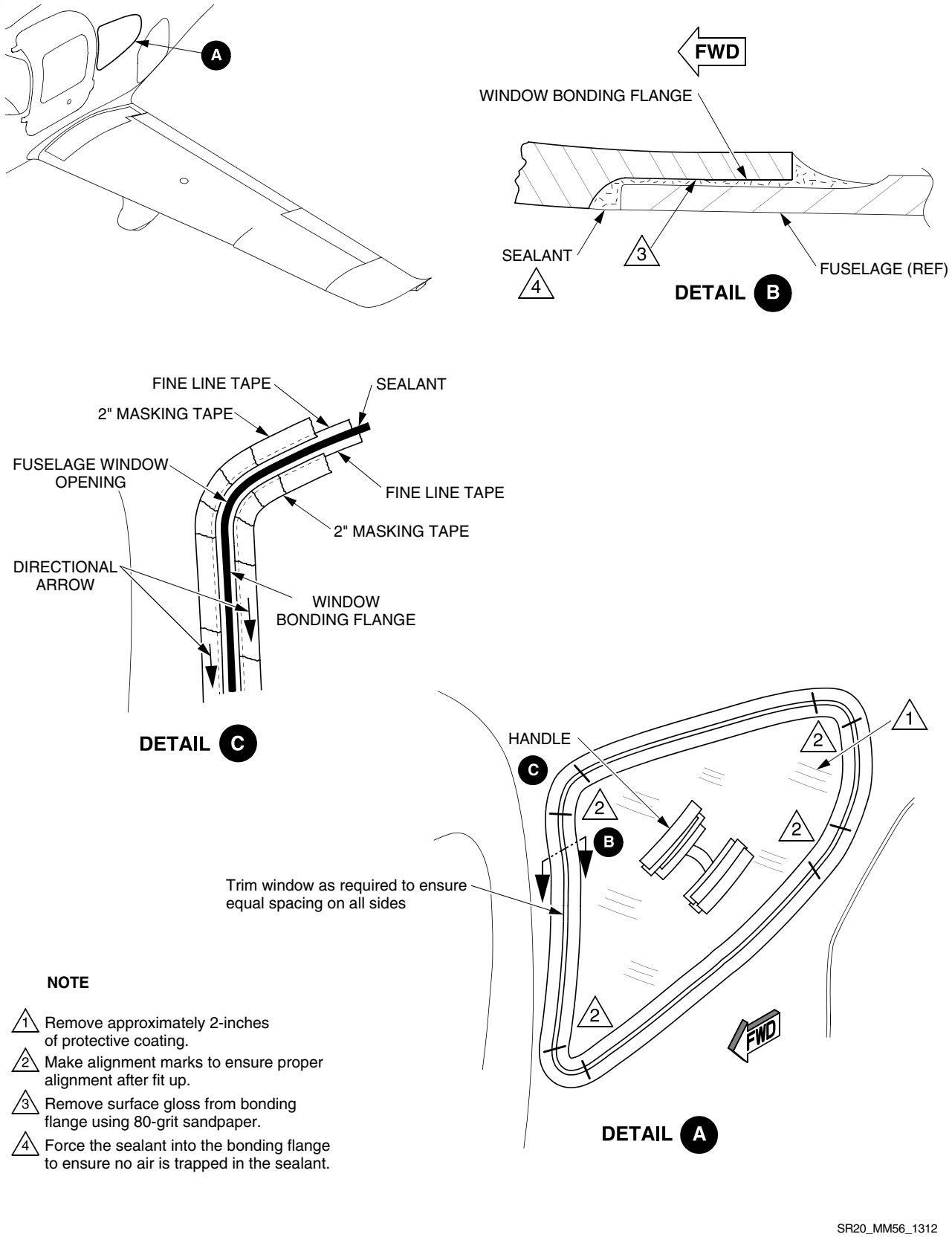
(ah) Remove cargo rods.

(ai) Remove the drop cloth.

(aj) Using a vacuum cleaner, remove all debris.

(ak) Install and secure interior trim panels. (Refer to 25-10)

(al) Clean window. (Refer to 56-10)



NOTE

1. Remove approximately 2-inches of protective coating.
2. Make alignment marks to ensure proper alignment after fit up.
3. Remove surface gloss from bonding flange using 80-grit sandpaper.
4. Force the sealant into the bonding flange to ensure no air is trapped in the sealant.

SR20_MM56_1312

Figure 56-203
Window Installation

DOOR

1. DESCRIPTION AND OPERATION

The cabin door windows are manufactured of acrylic and adhesive bonded to the door structure. Replacement is accomplished by removing the interior trim around the window, removing the sealant around the window, and then removing the window from the door structure. In general, the reverse process is used to install a replacement window. This method is literally seamless, and the door will show no marks or evidence of maintenance.

2. MAINTENANCE PRACTICES

A. Door Window

(1) Removal - Door Window (See Figure 56-301)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Die Grinder (1-Inch Cut-Off Disk)	-	Any Source	Cut window.
Masking Tape	2-inch	Any Source	Prevent damage to the window.
Drop Cloth	-	Any Source	Prevent contamination.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Aluminum Oxide Sandpaper	80-grit	Any Source	Sealant removal.
Utility Knife	-	Any Source	Sealant removal.

(b) Remove interior trim panels from around window. (Refer to 25-10)

(c) Cover interior and instrument panel with drop cloth to prevent foreign material from contaminating interior and instruments.

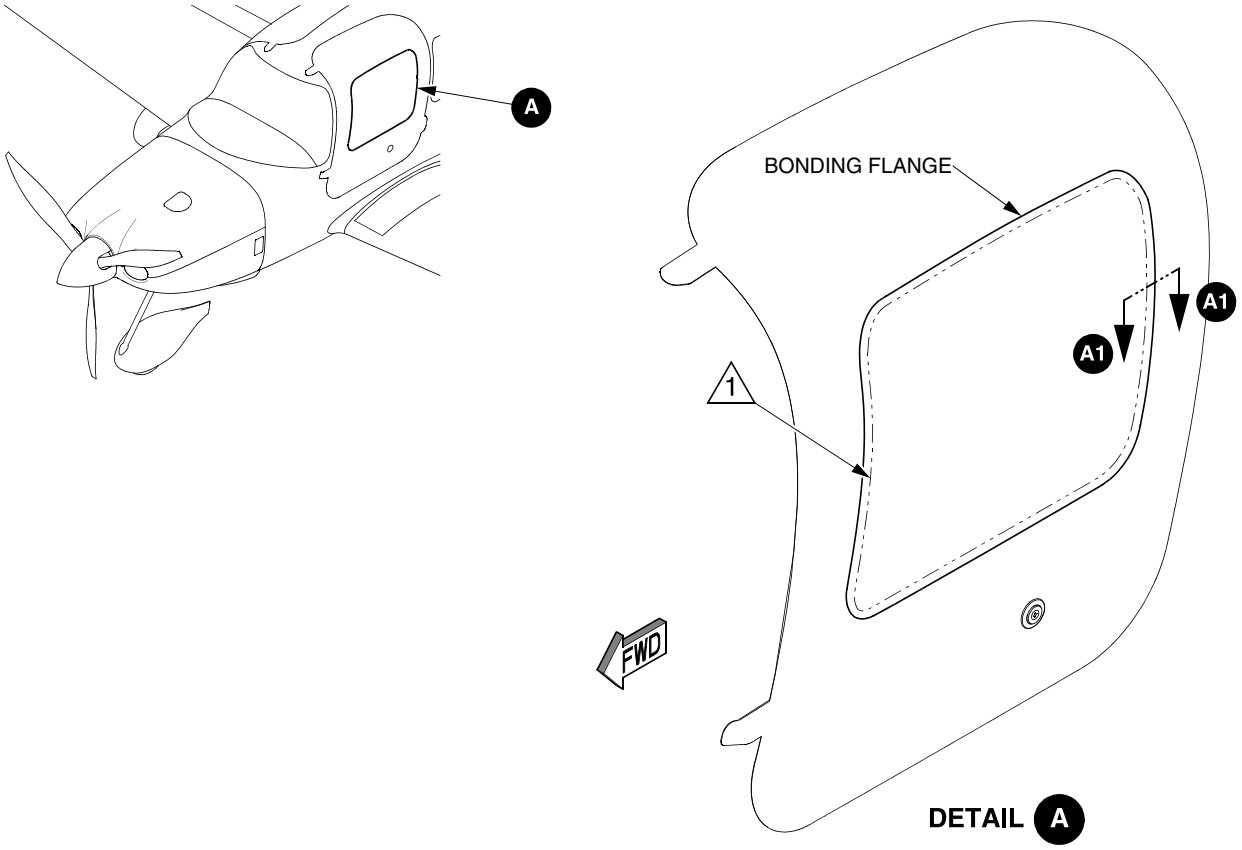
(d) Using several pieces of duct tape, make handles on exterior of window.

CAUTION: Exercise care to prevent the removal of laminate from the door when cutting and removing the sealant from between the door and window. If laminate is damaged, it must be repaired prior to installing the window.

Note: If window is being replaced, it will be easier to use a die grinder and a cut-off disk to cut out the inner portion of the window to gain access to the bonding flange. The window should be cut as close as possible to the door.

(e) Cut sealant loose from between door and window using utility knife. While pushing in on window, follow edge of door with blade tip, then back cut in towards door to clean out sealant. (See Figure 56-301)

(f) Using utility knife, isopropyl alcohol and aluminum oxide sandpaper (80-grit), remove all remaining sealant from bonding flange area on door.



NOTE

1. Cut window out next to bonding flange, do not damage laminate. Any laminate which becomes damaged must be repaired prior to installing the new window.

2. Push window inward while cutting sealant between bonding flanges.

SR20_MM56_1305B

Figure 56-301
Window Removal

(2) Installation - Door Window (See Figure 56-302), (See Figure 56-303)

Window sealant is intended to provide an acceptable seal between the window and door and to prevent the leakage of air through the airframe structure. Window sealant is used in the installation of all windows in the aircraft.

WARNING: **Never use organic solvents such as Methyl Ethylketone (MEK), acetone, or lacquer thinner. Do not use jewelry cleaner or paper towels to remove any contaminates. Never use ice scrapers on acrylic windows. Do not store any window outdoors while the protective covering is still on the window. The covering will become very difficult, if not impossible, to remove without damaging the window.**

CAUTION: It is very important to keep the window well supported at all times. Warm temperatures are not required during these operations; however, acrylic will take much more abuse at 80° F (176° C) than at 30° F (86° C).

Note: Always inspect the window before final installation. Use care to prevent staining or scratching the window.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Padded Cargo Rods	-	Any Source	Temporarily secure window.
Masking Tape	2-inch	Any Source	Prevent damage to the window.
Temperature-Resistant Sealing Compound	MIL-S-8802 Type II, Class B OR PRC 1829, Class B 1/2	(Refer to 20-10)	Seal windows.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Cotton Gloves (clean, lint free)	-	Any Source	Protect hands.
Cotton Cloth (clean, lint free)	-	Any Source	Clean sealing surface.
Application Spatula (non-nylon)	1-inch	Any Source	Smooth adhesive.
Primer	50710-101	Cirrus Design	Aid in adhesion.
Fine Line Tape (pin stripping)	1/4-inch	3M	Allow smooth transition between door and window.
Aluminum Oxide Paper	80-grit or finer	Any Source	Abrade acrylic surface prior to adhesion.

Note: Exercise care to protect the inner and outer window surfaces from damage during the installation process. The stepped area on the edge of the window (which is bonded to the door) is called the bonding flange.

(b) Verify that sealant is within storage-life requirements.

(c) Inspect bonding flange area on the door for any remaining sealant or contaminates, remove and clean as necessary.

(d) Remove the protective covering from the window and inspect the window for damage or defects, never install a defective window.

(e) Install a continuous piece of fine line tape on the edge of the door window opening (next to the bonding flange). (See Figure 56-302)

Note: The masking tape will provide a smooth and continuous parting line at the bonding flange.

(f) Working in one direction on the door window opening, place 2-inch masking tape on top of the outer edge (the edge furthest away from the bonding flange) of the fine line tape.

(g) Make a directional mark on the masking tape to indicate the proper direction for removal. (See Figure 56-303)

(h) Using several pieces of duct tape, make handles on the exterior of the window after the protective coating has fully cured.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(i) Place window into position and secure the window into the door using padded cargo rods. (See Figure 56-303)

(j) Inspect the window for proper fit. The window must have equal amounts of space around the perimeter of the window. The exterior surface of the window should be flush with exterior surface of door skin.

CAUTION: The window bonding flange must never be trimmed to a thickness less than 0.080 of an inch. The window bonding flange must never be less than ½-inch wide.

Note: The window bonding flange should have equal amounts of space around it. If the window doesn't fit into the door with equal amounts of space around it, the window and/or bonding flange will need to be trimmed accordingly.

The window should be flush with the exterior surface of the door skin. If the window cannot be made flush by adding moderate pressure on the cargo rods, the thickness of the window bonding flange must be trimmed accordingly. Aluminum oxide sandpaper (80-grit) on a sanding board may be used to trim the window.

(k) Mark and trim the window as required to ensure a perfect fit.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(l) Place the prefit window into position and clamp the window into position using padded cargo rods.

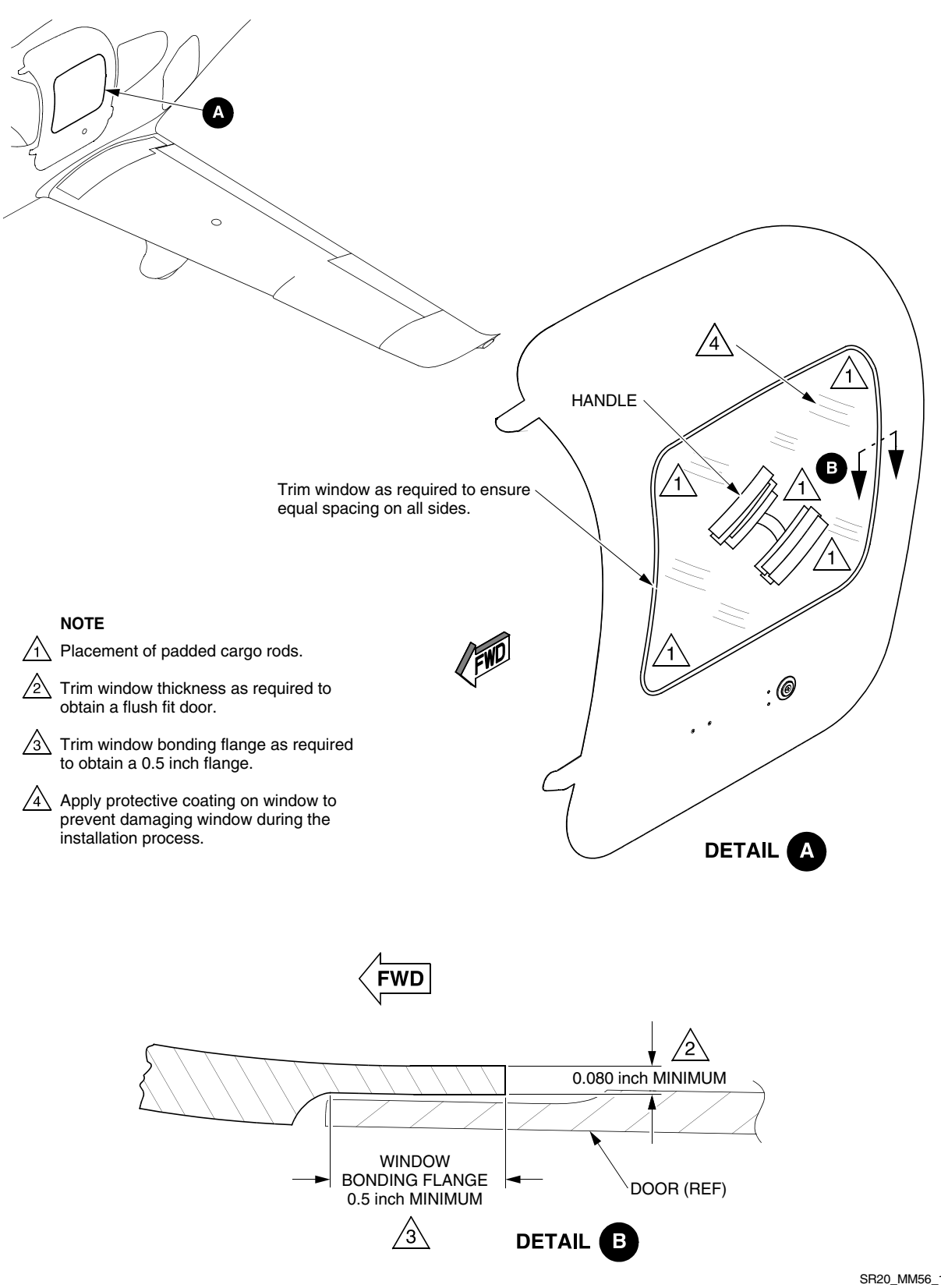


Figure 56-302
Window Alignment

(m) Remove a small amount (approximately 2-inches wide) of protective coating from around edge of window.

(n) Install a continuous piece of fine line tape (pinstripe tape) around the edge of the window (next to the bonding flange). The fine line tape should be adhered to the window with equal amounts of space between the fine line tape on the door and the fine line tape on the window.

(o) Working in one direction on the window, place 2-inch masking tape on top of the inner edge (the edge furthest away from the bonding flange) of the fine line tape.

Note: The alignment marks will be used to ensure that the window will be installed into the exact location in which it was during prefit.

(p) Using a straight edge, make several alignment marks around the edges of the masking tape on the door to the masking tape on the window.

(q) Carefully remove window from door.

(r) Using aluminum oxide 80-grit paper, abrade the bonding flange of the window in a random pattern. Remove all surface gloss.

CAUTION: Wax or grease pencil markings on any part are not allowed. Any such markings inadvertently occurring must be removed prior to application of primer. All surfaces shall be thoroughly cleaned and dried before application of primer.

Immediately prior to applying any primer on the window bonding flange, solvent clean the flange with isopropyl alcohol. When handling cleaned surfaces, wear clean cotton gloves to prevent surface contamination. Surfaces must be re-cleaned in the event of contamination.

Note: Fold cloth in such a manner to eliminate raw edges to reduce the possibility of lint. Always clean an area larger than the application area.

(s) Remove contaminates from the window bonding flange and the immediate work area using a vacuum and a clean brush attachment.

CAUTION: Do not apply primer to the composite bonding surface.

(t) Ensure that all surfaces adjacent to the window bonding flange are masked to prevent them from coming into contact with any primer or sealant.

(u) Using isopropyl alcohol, solvent clean the bonding flange in the door.

(v) Verify all required materials are present and all parts have been prepared and pre-fit.

(w) Wearing clean gloves, lightly dampen a cloth with primer. Fold the cloth in such a manner to eliminate raw edges to reduce the possibility of lint.

(x) Apply primer to the acrylic bonding flange. Wipe the cloth over the prepared area. Apply as little primer as possible while still wetting the entire surface.

CAUTION: Keep primed area clean and free from contaminates while primer is drying. Seal window as soon as practical after primer drying period to minimize contamination.

(y) Allow the primer to dry for thirty to sixty minutes.

(z) Mix sealant per manufacturer's instructions. Mix the required quantity in the ratio specified in the adhesive manufacturer's instructions. (Refer to 20-10)

CAUTION: Do not apply sealant to window bonding flange. The sealant must be applied to the door bonding flange.

(aa) Apply a thin layer of sealant to the outer edge of the door bonding flange. Spread the sealant out using an application spatula.

CAUTION: Use light pressure to insure a consistent sealant bondline with no thin areas.

CAUTION: When spreading the sealant, ensure all air pockets are removed.

Note: If more than one bead is required, apply it immediately adjacent to the prior bead to form one large bead.

(ab) Directly on top of the sealant previously spread, apply a 1/4-inch to 3/8-inch bead of sealant down the center of the bond area.

Note: Five or more padded cargo rods may be necessary to hold the window into the proper position. Padded cargo rods may be placed on each corner of the window and in the center of the window. Additional padded cargo rods may be required to prevent the window from sliding down.

(ac) Using padded cargo rods, secure the window into position making sure the reference marks made earlier are perfectly aligned and that the contour of the window matches the contour of the door.

(ad) Using a 1-inch application spatula, push sealant into the gap between the window and the door.

Note: To prevent sealant from becoming damaged, pull tape towards sealant while the sealant is still damp.

(ae) Remove masking tape and fine line tape from the perimeter of the window and the door.

CAUTION: Overheating windshield can cause window damage.

(af) Allow the sealant to air dry. Following the manufacturer's instructions, the sealant can be heat cured using a heat gun.

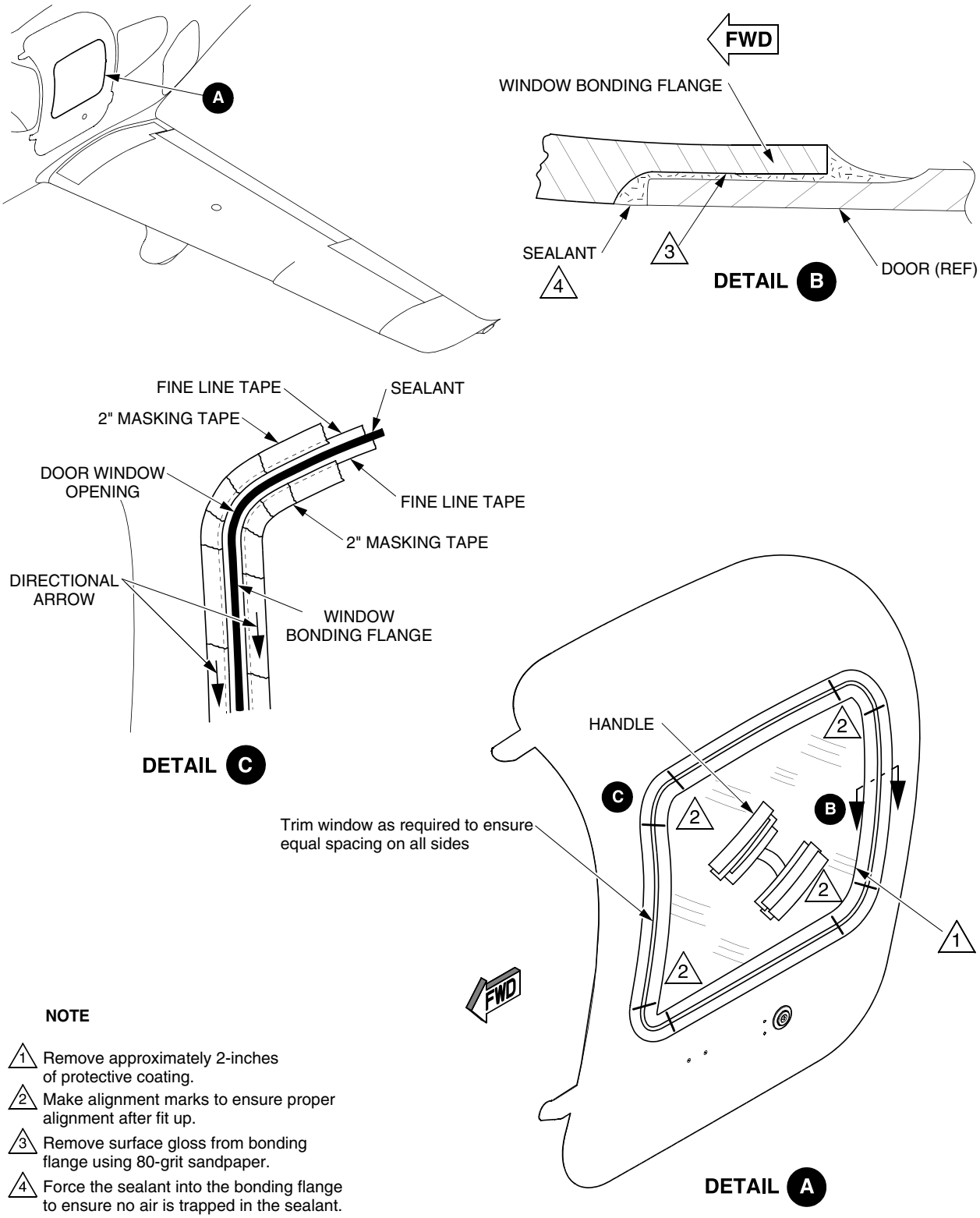
(ag) Remove cargo rods.

(ah) Remove the drop cloth.

(ai) Using a vacuum cleaner, remove all debris.

(aj) Install interior trim. (Refer to 25-10)

(ak) Clean window. (Refer to 56-10)



NOTE

1. Remove approximately 2-inches of protective coating.
2. Make alignment marks to ensure proper alignment after fit up.
3. Remove surface gloss from bonding flange using 80-grit sandpaper.
4. Force the sealant into the bonding flange to ensure no air is trapped in the sealant.

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Figure 56-303
Window Installation

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WINGS

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WINGS

1. GENERAL

The wing is manufactured from composite materials, which produce smooth and seamless flight surfaces. The wings provide attachment structure for the main landing gear. Each wing contains an integral fuel tank.

Serials 1886 & subs: Each wing contains an integral fuel collector tank.

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WING STRUCTURE

1. DESCRIPTION

The wing is constructed in a conventional spar, rib, and shear section arrangement. The upper and lower skins are bonded to the spar, ribs, and aft shear web forming a torsion box that carries all of the wing bending and torsion loads. The rear shear webs are similar in construction but do not carry through the fuselage.

The wing spar is manufactured in one piece and is continuous from wing tip to wing tip. The wing spar passes under the fuselage below the two front seats and is attached to the fuselage in two locations. Lift and landing loads are carried by the single carry-through spar, plus a pair of rear shear webs (one on each wing) attached to the fuselage. The wing spar is laminated epoxy/glass fiber *(Serials 1005 thru 1885)* or laminated epoxy/carbon fiber (*Serials 1886 & subs*) in a C-section.

The wing's belly closeout panel is bonded (*Serials 1005 thru 1422*) or bolted (*Serials 1423 & subs*) to the fuselage structure after wing attachment and provides a continuous load path along the bottom of the fuselage.

2. MAINTENANCE PRACTICES

A. Wing Assembly

(1) Removal - Wing Assembly

(a) Switch BAT 1, BAT 2, and AVIONICS master switches to OFF position.

(b) Pull all circuit breakers.

(c) Ensure parking brake is in OFF position and wheels are blocked.

(d) Remove engine cowling. (Refer to 71-10)

(e) Disconnect battery 1. (Refer to 24-30)

(f) Set fuel selector valve to OFF position.

(g) De-fuel airplane. (Refer to 12-10)

(h) Remove ailerons. (Refer to 57-50)

(i) Remove flaps. (Refer to 57-50)

(j) Perform Inspection/Check - Tip-to-Tip Measurement. Retain obtained values for comparison following reassembly. (Refer to 57-10)

(k) Perform Inspection/Check - Wing Angle of Incidence and Decalage Measurement. Retain obtained values for comparison following reassembly. (Refer to 57-10)

(l) Remove main gear fairings. (Refer to 32-10)

(m) Remove nose gear fairing. (Refer to 32-20)

CAUTION: Ensure hands are clean while working with interior components.

(n) Remove crew and passenger seats. (Refer to 25-10)

(o) Remove cabin floor covering. (Refer to 25-10)

(p) Remove access panels CF2L, CF2R, CF3R, CF3C, CF3L, and CF5. (Refer to 06-00)

(q) Remove screws securing circuit breaker panel closed.

(r) *Serials 1148 thru 1422 w/ Century HSI:* Disconnect HSI gyro slaving amplifier. (Refer to 34-50)

1 Disconnect HSI gyro slaving amplifier wire from gyro slaving amplifier mounted to access panel CF2R.

2 Stow HSI gyro slaving amplifier wire forward.

(s) Remove kick plates. (Refer to 25-10)

(t) Remove cabin trim panels from spar tunnel forward. (Refer to 25-10)

(u) Drain brake hydraulic fluids. (Refer to 12-10)

(v) Remove wing root fairings. (Refer to 53-50)

(w) Disassemble aileron connections. (Refer to 27-10)

1 At access hole CF4C, disconnect aft aileron cable turnbuckle.

2 At access hole CF4C, remove cotter pin, washer, and cable retainer clevis pin from LH and RH kickout pulley assembly and remove cable from pulley.

Note: To facilitate re-installation, mark location of interconnect bungee clamps on RH aileron cable.

3 *Serials 1005 thru 1885:* At access hole CF3C, disconnect rudder/aileron interconnect bungee from RH aileron cable at forward and aft locations. (Refer to 27-20)

4 At access hole CF3C, disconnect forward LH and RH aileron turnbuckles.

5 Stow disconnected cables to wing and forward of wing spar tunnel.

(x) Disassemble rudder connections. (Refer to 27-20)

1 At access hole CF5, disconnect LH and RH rudder cable turnbuckles.

Note: *Serials 1005 thru 1885:* To facilitate re-installation, mark location of interconnect bungee clamps on RH rudder cable.

2 *Serials 1005 thru 1885:* At access hole CF3C, disconnect rudder/aileron interconnect bungee from RH rudder cable. (Refer to 27-20)

3 Stow disconnected cables aft and forward of wing spar tunnel.

(y) Disassemble elevator connections. (Refer to 27-30) (Refer to 27-30)

1 At access hole CF5, disconnect LH and RH elevator cable turnbuckles.

2 Stow disconnected cables aft and forward of wing spar tunnel.

(z) Remove flap torque tubes. (Refer to 27-50)

1 At access hole CF4C, remove bolt, washers, spacer, and nut securing torque tubes to torque tube coupler.

2 At wing root, remove bolt, washers, spacer, and nut securing thrust collar and torque tube end fitting to torque tube. Repeat on opposite side.

3 Remove LH and RH torque tubes.

(aa) *Serials 1005 thru 1885:* Disconnect aft fuselage wiring harness.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

1 At access hole CF2R, disconnect J666, J667, and J697.

2 At access hole CF2R, locate ground wire PG650-12N terminal ring and remove attaching hardware.

3 *Serials 1005 thru 1422:* At access holes CF2R and CF3R, use a mirror to locate and remove adel clamps and cable ties securing aft fuselage wiring harness forward and aft of the wing spar tunnel.

4 Stow disconnected wires forward and aft of the wing spar tunnel.

(ab) *Serials 1886 & subs:* Disconnect aft fuselage wiring harness.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

1 At access hole CF3R, disconnect J666, J667, and J1049.

2 At access hole CF3R, locate ground wire PG650-12N terminal ring and remove attaching hardware.

3 Stow disconnected wires forward and aft of the wing spar tunnel.

(ac) *Serials 1337 thru 1422 w/ PFD:* Disconnect magnetometer cable.

1 At access hole CF3R, disconnect jack J729 for magnetometer cabling and remove cable ties.

2 De-pin plug P729 to enable magnetometer cabling to pass forward through spar tunnel bulkhead connector.

3 De-pin jack J729 to enable magnetometer cabling to pass aft through fuselage bulkhead connector.

4 Stow disconnected wires forward of the wing spar tunnel and at wing.

(ad) *Serials 1423 & subs:* Disconnect magnetometer cable.

1 At access hole CF3R, disconnect jack J729 for magnetometer cabling and remove cable ties.

2 Route plug P729 on magnetometer cabling forward of wing spar tunnel.

3 Remove backshell from jack J729 to enable magnetometer cabling to pass aft through fuselage bulkhead connector.

4 Stow disconnected wires forward of the wing spar tunnel and at wing.

(ae) *Serials 2065 & subs w/ Air Conditioning:* Disconnect wiring harness for condenser.

1 At access hole CF3R, disconnect plug P1005 for condenser cabling and remove cable ties.
2 Remove backshell from plug P1005 to enable condenser cabling to pass forward through spar tunnel bulkhead connector.
3 Stow disconnected wires forward and aft of the wing spar tunnel.

(af) *Serials 1005 thru 1885:* Disconnect wiring harnesses for wing.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

1 At access hole CF4L, disconnect J300 from connector on LH longeron and remove cable ties.
2 At access hole CF4R, disconnect J400 from connector on RH longeron and remove cable ties.
3 De-pin J300 and J400 to enable wires to pass through fuselage bulkhead connector.
4 Stow disconnected wires at each wing and forward of the wing spar tunnel.

(ag) *Serials 1886 & subs:* Disconnect wiring harnesses for wing.

CAUTION: Label all wires and pins before disconnecting to facilitate re-installation.

1 At access hole CF2L, disconnect J300 from connector and remove cable ties.
2 At access hole CF2R, disconnect J400 from connector and remove cable ties.
3 De-pin J300 and J400 to enable wires to pass through fuselage bulkhead connector.
4 Stow disconnected wires at each wing and forward of the wing spar tunnel.

(ah) *Serials 1005 & subs w/ Stormscope System:* Disconnect wiring harness for Stormscope.

1 At access hole CF2R, disconnect J668 and remove cable ties.
2 *Serials 1337 & subs w/o PFD*: At access hole CF2R, disconnect J557 and remove cable ties.
3 *Serials 1337 & subs w/o PFD*: At access hole CF2R, disconnect P698 and remove cable ties.
4 Stow disconnected wires aft and forward of the wing spar tunnel.

(ai) Disassemble Pitot-Static System. (Refer to 34-10)

1 Remove fittings on pitot-static lines to enable lines to pass through fuselage grommet.
2 At access hole CF3L, disconnect Pitot-Static System lines.
3 Stow pitot line aft of wing spar tunnel and to wing.
4 Stow static line aft of wing spar tunnel.

(aj) *Serials 1005 thru 1885:* Disconnect ELT remote control panel indicator connection.

1 On circuit breaker panel, disconnect ELT remote control panel indicator connector and grounding terminal ring. (Refer to 25-60)
2 Remove cable ties and stow ELT remote control panel indicator cable aft of wing spar tunnel.

(ak) *Serials 1268 thru 1885*: Disconnect battery 2.

1 On circuit breaker panel, disconnect battery 2 power cable. (Refer to 24-30)
2 On RH side of forward longerons, disconnect battery 2 ground wire from P602 connector secured to firewall. (Refer to 24-30)
3 Remove cable ties and stow battery 2 power cable and ground wire aft of wing spar tunnel.

(al) *Serials 1886 & subs:* Disconnect battery 2.

1 At access panel CF3R, disconnect jack J847 for battery 2 and remove cable ties.

2 At access panel CF3R, de-pin jack J847 to enable battery 2 wiring to pass through spar tunnel bulkhead connector.

3 Stow disconnected wires aft and forward of the wing spar tunnel.

(am) *Serials 1005 thru 1885:* Disconnect marker beacon antenna.

1 Below radio rack, disconnect marker beacon antenna cable. (Refer to 34-30)

2 Remove cable ties and stow marker beacon antenna cable aft of wing spar tunnel.

(an) *Serials 1005 thru 1885:* Disconnect COM2 antenna.

1 At access panel CF5, disconnect COM 2 antenna cable from COM 2 antenna. (Refer to 34-50)

2 Remove cable ties and stow COM 2 antenna cable forward of wing spar tunnel.

(ao) *Serials 1005 thru 1885:* Disconnect VOR/LOC antenna.

Note: Ensure VOR/LOC antenna cable is retained above tail when removing antenna.

1 Remove VOR/LOC antenna. (Refer to 34-50)

2 Tie string to VOR/LOC antenna cable and route down tail. Tie upper end of string to upper tail. Untie string at RH empennage access panel and stow in area to facilitate re-installation of antenna cable.

3 Remove cable ties and stow VOR/LOC antenna cable forward of wing spar tunnel.

(ap) Center-aft of main wing spar, disconnect fuel supply and return lines. (Refer to 28-20)

(aq) Disassemble Stall Warning System connections. (Refer to 27-31)

1 At access hole CF2R, disconnect stall warning line to wing.

2 Remove fitting on stall warning line to enable line to pass through fuselage bulkhead connector.

3 Remove cable ties and stow stall warning line into the wing.

(ar) *Serials 1005 thru 1885:* Disconnect environmental ducts. (Refer to 21-20)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Prying
Utility Knife	-	Any Source	Cutting

2 *Serials 1005 thru 1632, 1634 thru 1636:* Adjacent to CF2L and CF2R access holes, pry and remove adhesive securing environmental duct to fresh air inlet tee on LH and RH fuselage wall.

3 Serials 1005 thru 1632, 1634 thru 1636: Disconnect environmental ducts from fresh air inlet tee(s).

4 *Serials 1633, 1637 & subs:* Adjacent to CF2R access hole, pry and remove adhesive securing environmental duct to RH fuselage wall.

(as) *Serials 1005 thru 1422 w/ Sandel HSI*: Disconnect HSI gyro slaving amplifier and remote gyro. (Refer to 34-50)

1 At access hole CF2R, disconnect data cable from HSI gyro slaving amplifier.

2 At access hole CF3R, disconnect data cable HSI remote gyro.

3 Stow data cables forward of wing spar tunnel.

(at) *Serials 1005 thru 1422:* Remove belly closeout panel. (See Figure 57-101)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Chalk Snap Line	-	Any Source	Locate Cut Lines
Die Grinder	-	Any Source	Cutting
Metal Cut-Off Wheel and Arbor	2.0 inches (5.1 cm)	Any Source	Cutting
Magnet	-	Any Source	Locate Hard-ware
Blunt-Edged Chisel	-	Any Source	Cutting
Sandpaper	400-grit	Any Source	Abrasion

2 From beneath the airplane looking up through the gap between LH wing root and fuselage, determine where the forward and aft plane of the wing spar intersects with the belly closeout panel and mark. Repeat on RH side.

3 To prevent possible damage to main spar, offset forward mark 0.25 inch (0.64 cm) forward, and aft cut line 0.25 inch (0.64 cm) aft.

4 At offset marks, use chalk snap line to locate cut lines across width of belly closeout panel.

CAUTION: Ensure all cabling, wires, and tubes routed through wing spar are removed before cutting into belly closeout panel.

Damage to the main spar may render the wing unusable. Do not cut into the wing spar, wing spar tunnel, or bonding flanges.

If spar is damaged, contact Cirrus Design Customer Service for disposition.

5 Using die grinder, cut belly closeout panel at marked lines.

Note: If screws are embedded in adhesive, it may be necessary to cut screws and drill them out.

6 Use magnet to locate mounting hardware and chisel to expose screw heads.

7 At determined screw head locations, sand paint and bodywork off.

8 Remove hardware fastening belly closeout panel to fuselage.

CAUTION: Do not damage underlying laminate.

9 Using chisel, remove remaining portion of belly closeout panel from fuselage.

(au) *Serials 1423 thru 2029:* Remove belly closeout panel. (See Figure 57-101)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Blunt-Edged Chisel	-	Any Source	Cutting
Die Grinder	-	Any Source	Cutting

Description	P/N or Spec.	Supplier	Purpose
Metal Cut-Off Wheel and Arbor	2.0 inches (5.1 cm)	Any Source	Cutting
Sandpaper	80-grit	Any Source	Abrasion

Note: The two middle mounting screws on the forward and aft sides of belly closeout panel are covered by a strip of expanded metal mesh (EMM) for lightning protection. The screw heads must be located and exposed prior to belly closeout panel removal.

2 At forward and aft belly closeout panel seam, sand at seam along row of installation screws to locate adjacent screws covered by EMM.

3 Mark cut lines on EMM where EMM overlaps the space between belly closeout panel and fuselage.

CAUTION: Ensure all cabling, wires, and tubes routed through wing spar are removed before cutting through EMM.

Damage to the main spar may render the wing unusable. Do not cut into the wing spar, wing spar tunnel, or bonding flanges.

If spar is damaged, contact Cirrus Design Customer Service for disposition.

4 Using die grinder, carefully cut through EMM at marked lines.

5 Remove screws, washers, and nuts securing belly closeout panel to fuselage.

(av) *Serials 2030 & subs:* Remove screws, washers, and nuts securing belly closeout panel to fuselage. (See Figure 57-101)

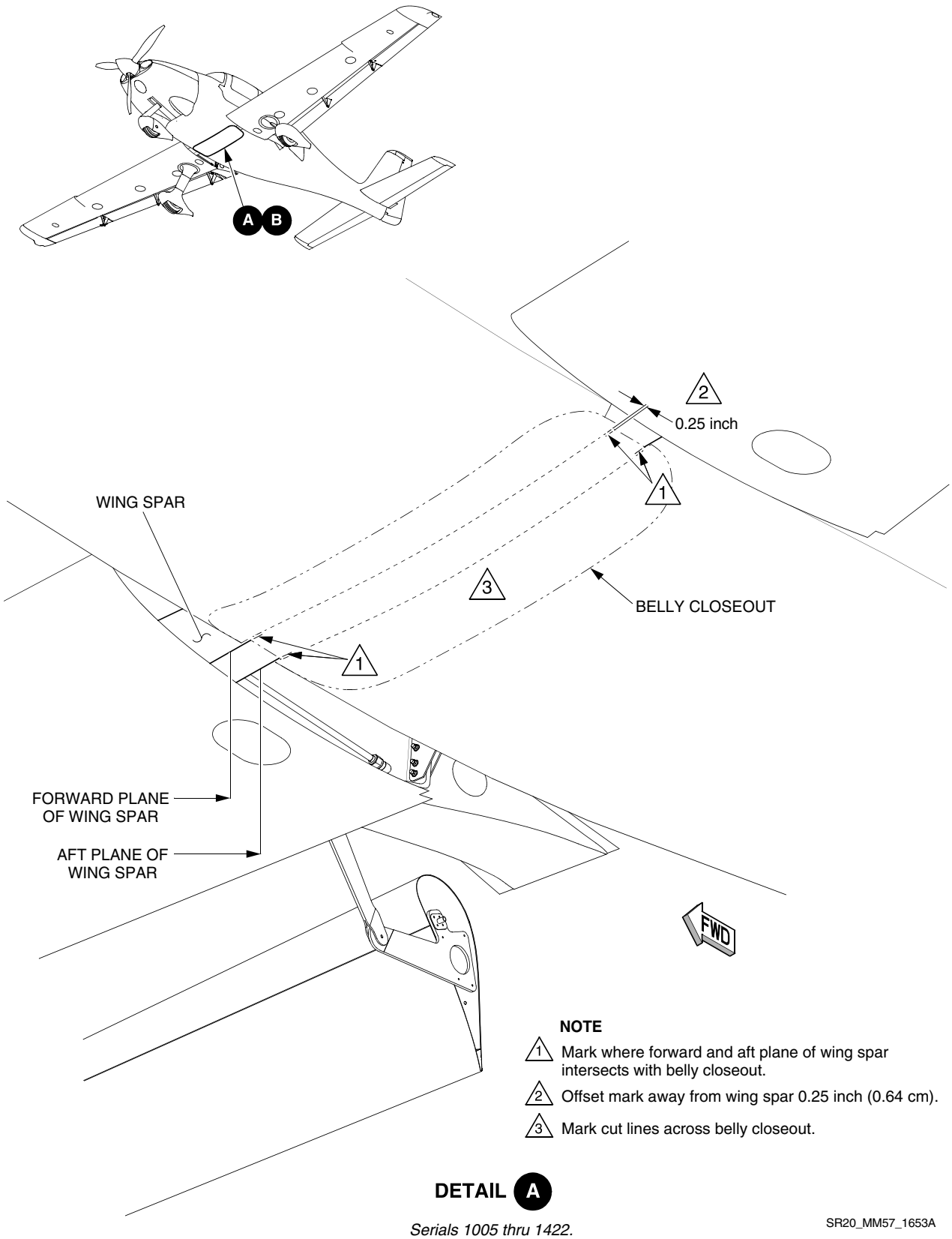
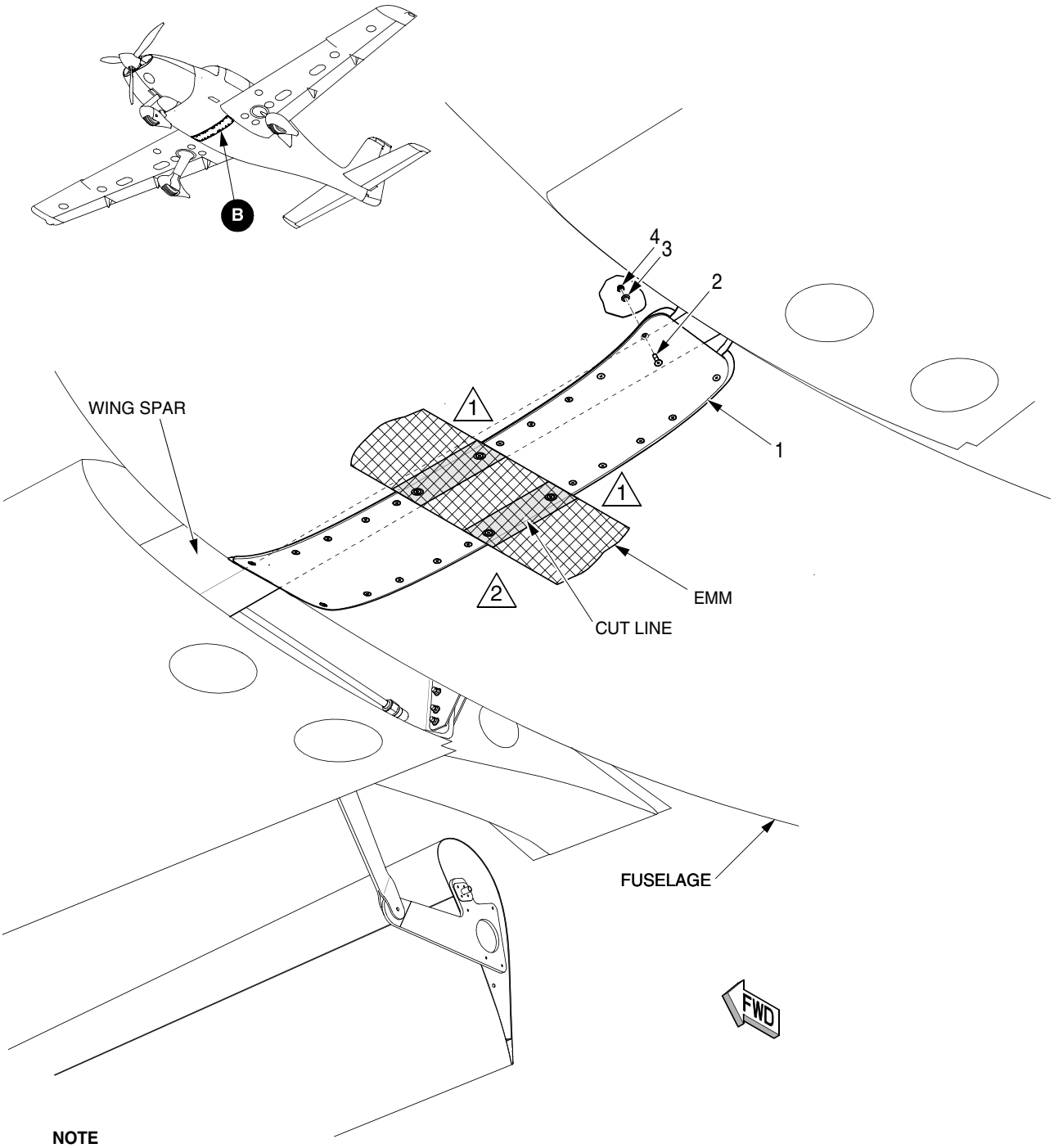


Figure 57-101
Belly Closeout Panel Removal - Serials 1005 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1422



NOTE

1. Sand at belly closeout panel seam along row of installation screws to locate adjacent screws covered by EMM.

2. Mark cut lines where EMM overlaps space between belly closeout panel and fuselage.

LEGEND

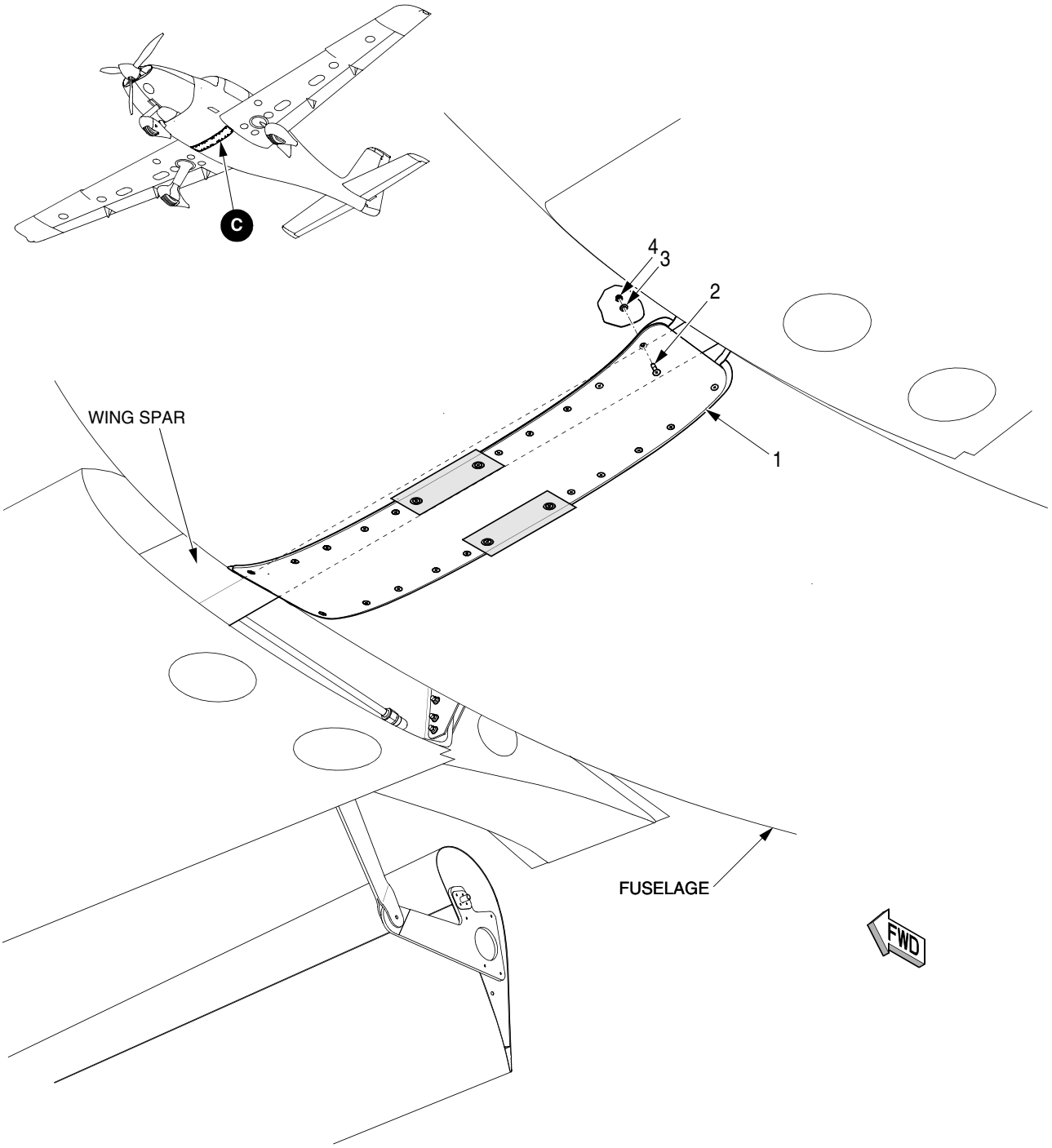
1. Belly Closeout Panel
2. Screw
3. Washer
4. Nut

DETAIL B

Serials 1423 thru 2029.

SR20_MM57_1875B

Figure 57-101
Belly Closeout Panel Removal - Serials 1423 thru 2029 (Sheet 2 of 3)



LEGEND
1. Belly Closeout Panel
2. Screw
3. Washer
4. Nut

DETAIL C

Serials 2030 & subs.

SR20_MM57_3188

Figure 57-101
Belly Closeout Panel Removal - Serials 2030 & subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 2030 & subs

(aw) Support wing and fuselage. (See Figure 57-102)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Saw Horses	-	Any Source	Support
High Density Foam Padding	-	Any Source	Protection

2 Prepare airplane for hoisting. (Refer to 07-20)

CAUTION: To assure stability and safety during hoisting operations, raise airplane slowly.

3 Raise airplane enough to place saw horses with foam padding at LH and RH wing support locations.

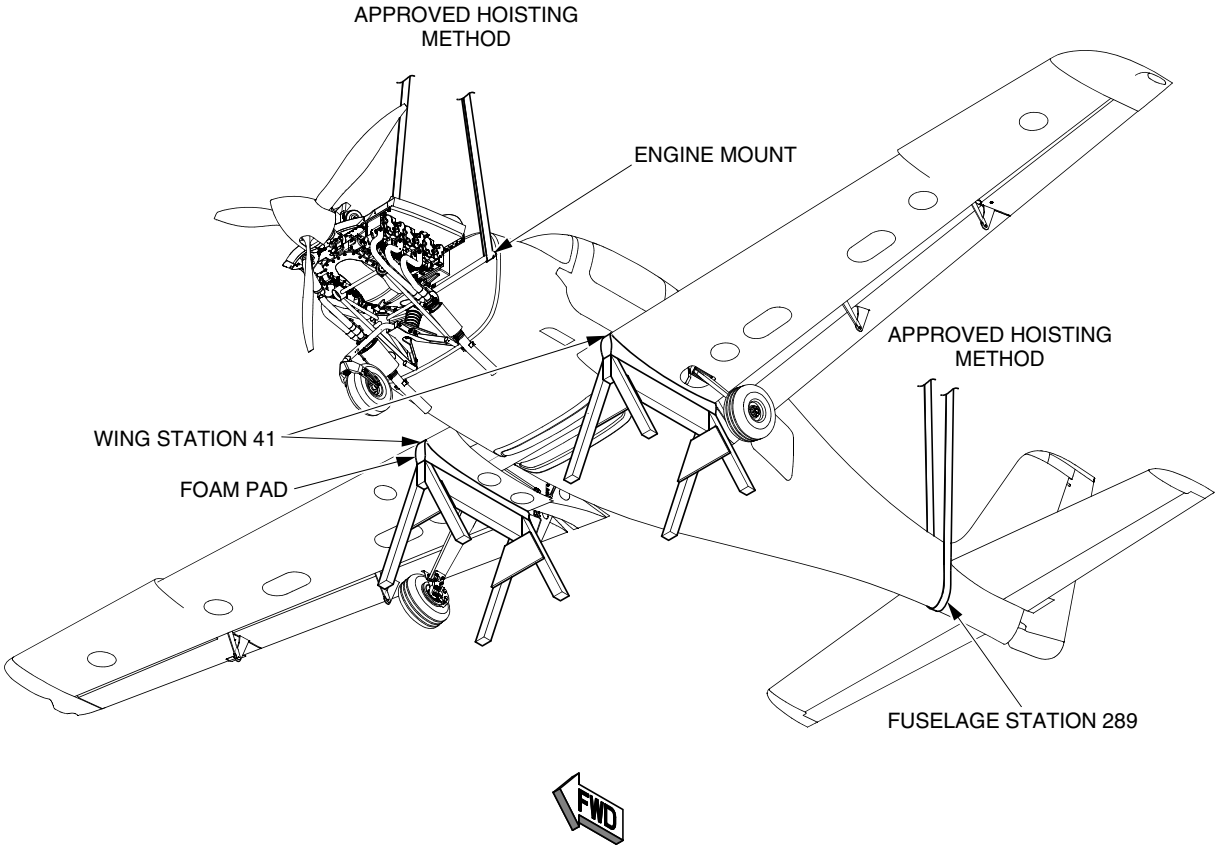


Figure 57-102
Fuselage Hoist and Wing Support Stands

(ax) Detach wing assembly. (See Figure 57-104)

CAUTION: Verify all components routed underneath wing main spar have been disconnected and removed.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Tailstand	300 pounds (136 kg) minimum weight	Any Source	Support
Fuselage Cradle	2000 pounds (907 kg) capacity	Any Source	Support
Casters	-	Any Source	Mobility
High Density Foam Padding	-	Any Source	Protection

2 *Serials 1005 thru 1636 w/ SKYWATCH:* Remove SKYWATCH cover panel. (Refer to 34-40)

3 *Serials 1637 & subs w/o Fan:* Remove bolts and washers securing vent assembly cover to fuselage. (Refer to 21-20)

4 *Serials 1637 & subs w/ Fan:* Remove bolts and washers securing fan assembly cover and fan assembly to fuselage. Position fan assembly as required to permit access to attach fittings. (Refer to 21-20)

5 *Serials 2065 & subs w/ Air Conditioning:* Remove bolts and washers securing evaporator cover and evaporator to fuselage. Position evaporator as required to permit access to attach fittings. (Refer to 21-50)

6 At aft attach fittings, remove bolt, washer, nut, and cotter pin securing wing to fuselage.

7 At forward attach fittings, remove bolt, washers, spacer, and nut wing to fuselage. Discard bolt.

CAUTION: When raising fuselage, align wing and fuselage at bolt locations so as to take tension off bolts and facilitate the wing sliding off smoothly.

While separating wing from fuselage, observe and assist in routing of wiring and tubing between wing and fuselage.

8 Slowly raise hoist to detach fuselage from wing structure assembly. (See Figure 57-103)

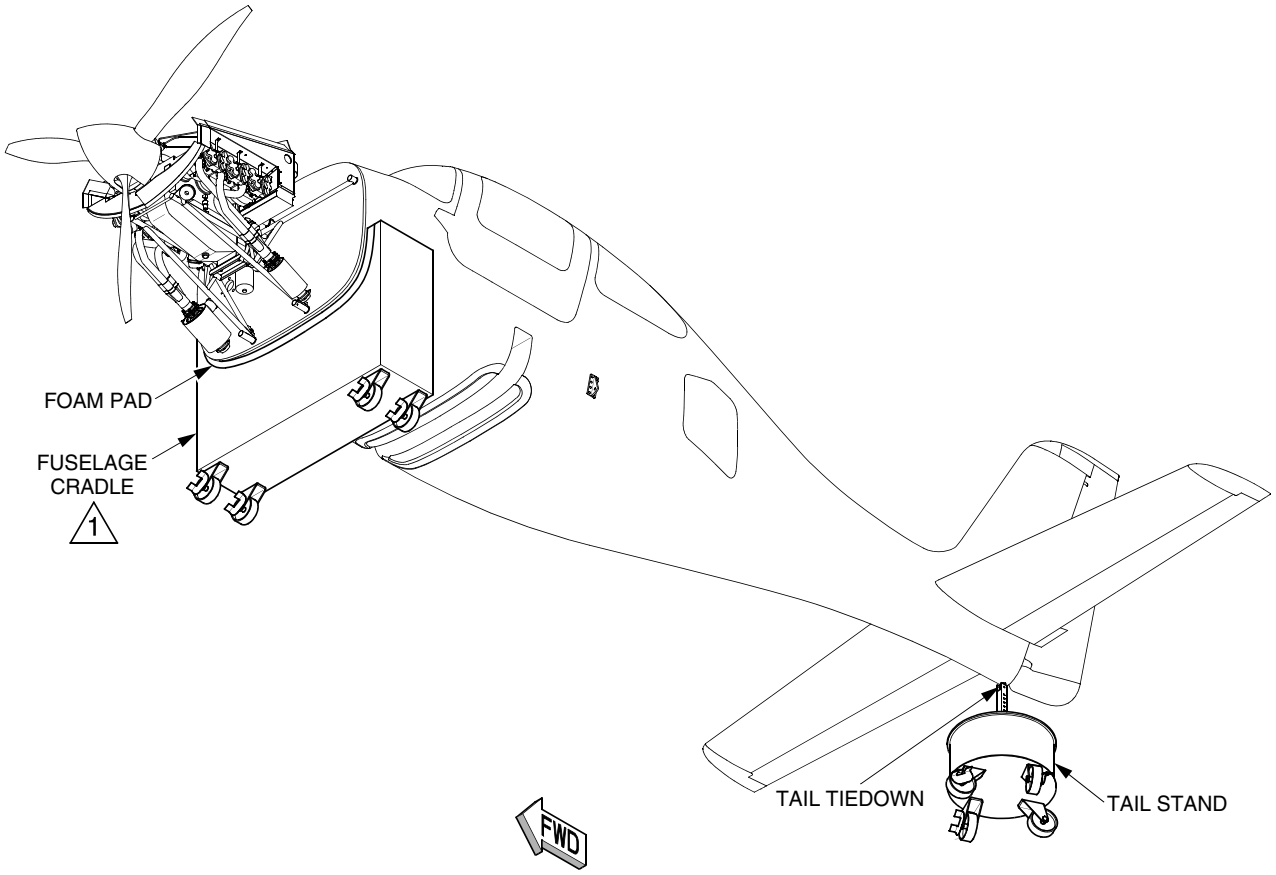
9 Cover fuselage cradle with foam padding to protect the fuselage surface.

CAUTION: Verify clearance exists at fuselage cradle for transponder antenna prior to lowering fuselage onto cradle.

10 If necessary for fuselage cradle clearance, remove transponder antenna. (Refer to 34-50)

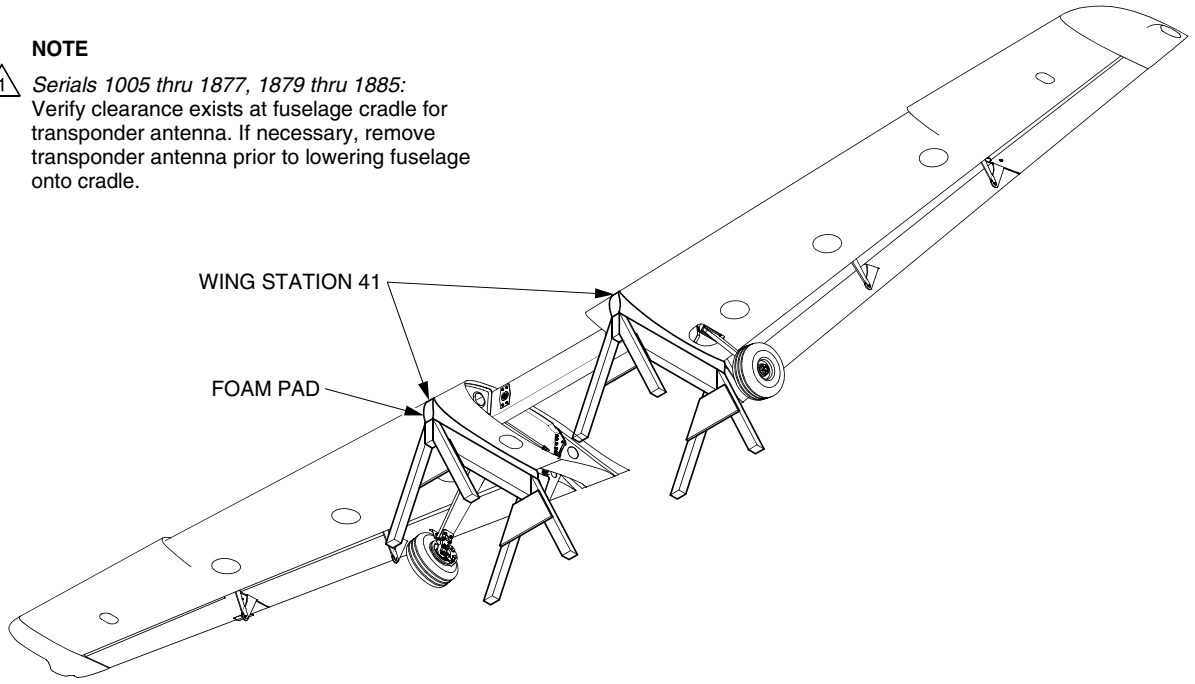
11 Lower fuselage onto fuselage cradle and tailstand.

12 Secure tailstand to tail tiedown. (Refer to 07-10)



NOTE

1 *Serials 1005 thru 1877, 1879 thru 1885:* Verify clearance exists at fuselage cradle for transponder antenna. If necessary, remove transponder antenna prior to lowering fuselage onto cradle.



SR20_MM57_1694B

Figure 57-103
Fuselage and Wing Separation

(2) Installation - Wing Assembly (See Figure 57-104)

WARNING: **Installation of the wing assembly requires a test flight performed by a Cirrus Design certified test pilot. Contact Cirrus Design prior to performing maintenance to schedule test flight.**

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Wing Attach Guide Pins	T6859-1	Cirrus Design	Alignment
Bolts, Forward Wing Attach	MS20014-46 *alternate for* NAS6614D46	Any Source	Replacement

(b) Position wing assembly under fuselage.

CAUTION: While lowering fuselage, verify clearance and route wiring and tubing from wing through fuselage bulkhead fittings. (See Figure 57-105)

(c) Lower fuselage onto wing assembly.

(d) Install wing attach guide pins at the forward wing attach location to facilitate alignment of wing and fuselage attach points.

(e) Secure forward wing attach hardware.

CAUTION: Ensure Belleville washers are installed in correct orientation. Position washer next to bolt head with beveled cut towards bolt head.

1 Remove wing attach guide pins.

2 Install new bolts with existing washers, spacers, and nuts securing wing to fuselage.

3 Tighten nut to 400 - 500 in-lb (45 - 56 Nm).

4 Verify bolt shows at least one thread past end of nut when installed.

5 *Serials 1005 thru 1636 w/ SKYWATCH:* Install SKYWATCH cover panel. (Refer to 34-40)

6 *Serials 1637 & subs w/o Fan:* Install bolts and washers securing vent assembly cover to fuselage. (Refer to 21-20)

7 *Serials 1637 & subs w/ Fan:* Install bolts and washers securing fan assembly cover and fan assembly to fuselage. (Refer to 21-20)

8 *Serials 2065 & subs w/ Air Conditioning:* Install bolts and washers securing evaporator cover and evaporator to fuselage. (Refer to 21-50)

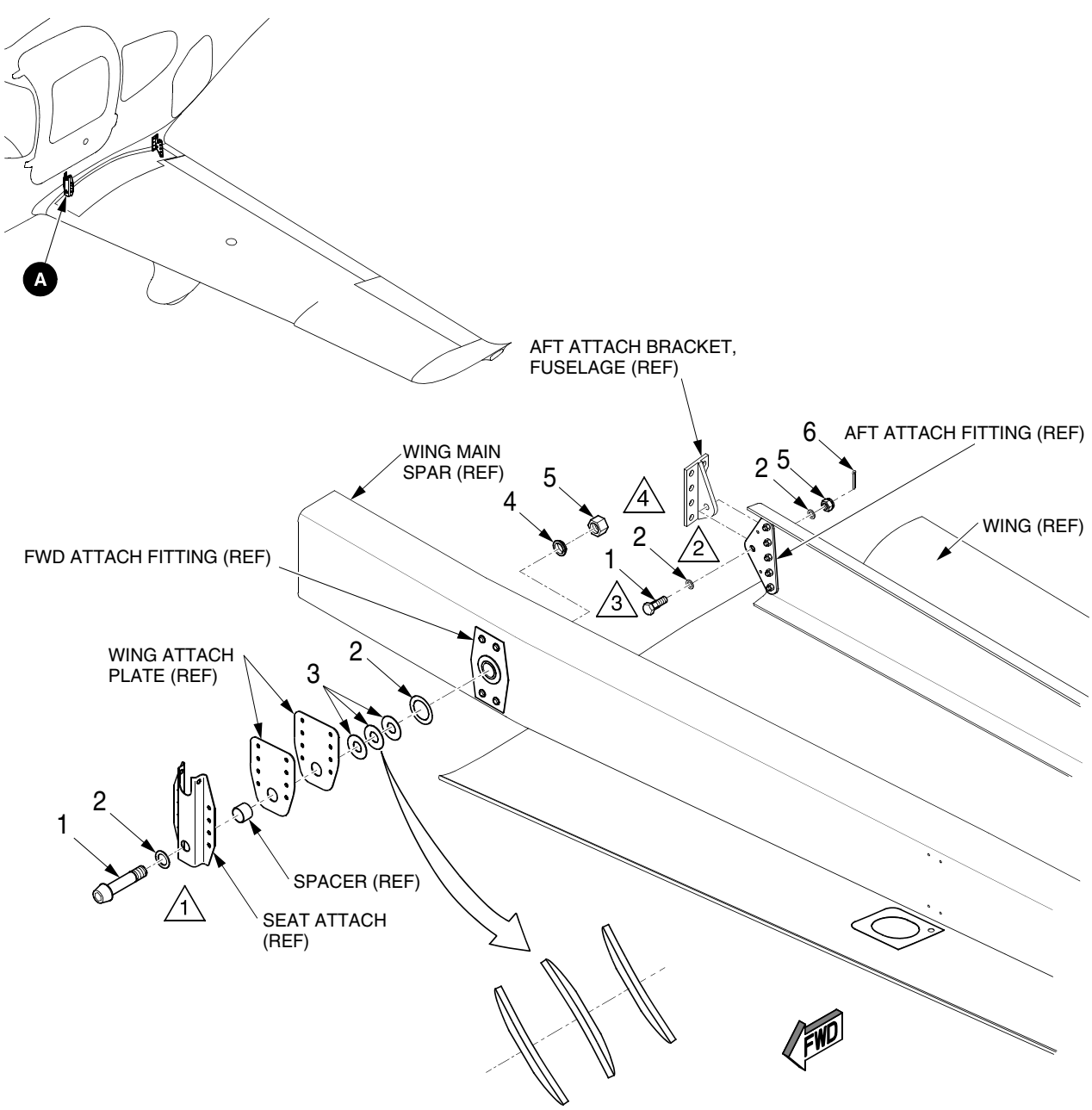
(f) Secure aft wing attach hardware.

CAUTION: Hard contact between aft wing attach fitting and bracket is not allowed on forward side of bracket. Do not compress aft wing attach fittings by overtightening.

1 Install bolts, washers, and nuts securing wing to fuselage.

2 Tighten nut until snug then loosen nut enough to install new cotter pin.

3 Verify gap under bolt head or nut does not exceed 0.10 inch (2.54 mm).



NOTE

1. Position washer with beveled cut towards bolt head.
2. Hard contact between attach fitting and bracket not allowed on forward side of bracket. Do not compress attach fittings.
3. Verify gap under bolt head or nut does not exceed 0.10 inch.
4. *Serials 1005 thru 1267:* Washer installation optional. *Serials 1268 & subs:* Washer installation required.

LEGEND

1. Bolt
2. Washer
3. Belleville Washer
4. Spacer
5. Nut
6. Cotter Pin

DETAIL A

SR20_MM57_1247B

Figure 57-104
Wing Attach

EFFECTIVITY:
All

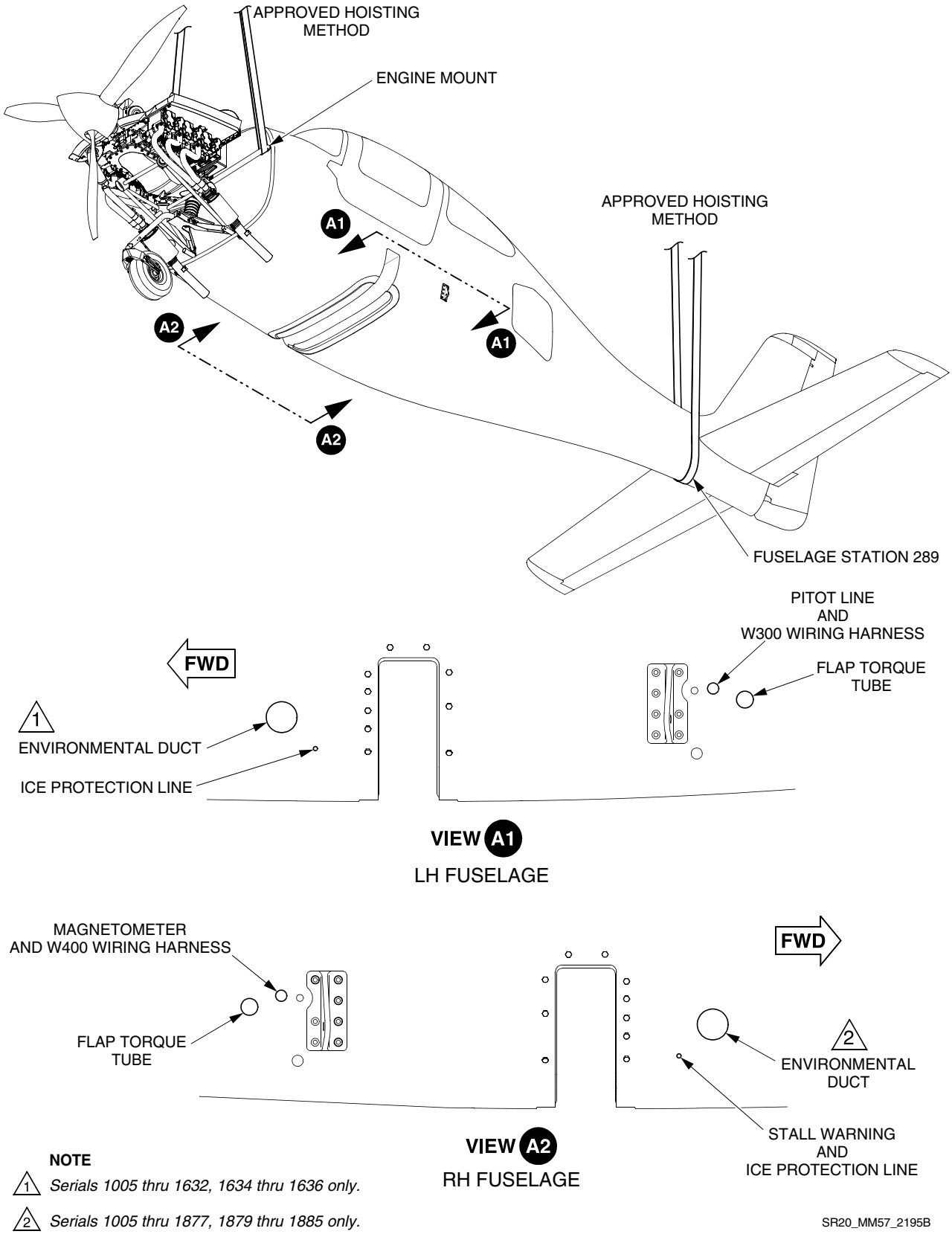


Figure 57-105
Fuselage to Wing Connectivity

(g) Remove wing supports and hoisting straps.

(h) Perform Inspection/Check - Tip-to-Tip Measurement. Compare with values obtained previously. (Refer to 57-10)

(i) Perform Inspection/Check - Wing Angle of Incidence and Decalage Measurement. Compare with values obtained previously. (Refer to 57-10)

(j) *Serials 1005 thru 1422 w/ Sandel HSI*: Connect HSI gyro slaving amplifier and remote gyro. (Refer to 34-50)

1 Route HSI remote gyro wire aft to access hole CF3R and connect to remote gyro.

2 Route HSI gyro slaving amplifier wire aft to access hole CF2R and connect to gyro slaving amplifier.

(k) *Serials 1005 thru 1885:* Connect environmental ducts. (Refer to 21-20)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Caulking Gun	-	Any Source	Application
Latex Caulk *alternative for* RTV Sealant	151-8273	Sherwin Williams Company Ashland, KY 41101 606-324-3179	Sealing
	736 RTV	Dow Corning Corporation Midlands, MI 48686 517-496-6000	

2 *Serials 1005 thru 1636:* Adjacent to CF2L and CF2R, connect environmental ducts to LH and RH fresh air inlet tee.

3 *Serials 1637 thru 1885:* Adjacent to CF2R, connect environmental duct to RH fuselage wall.

4 Secure ducts and tees to fuselage wall with latex caulk or RTV sealant.

(l) Assemble Stall Warning System connections. (Refer to 27-31)

1 Route Stall Warning System line to access hole CF2R from right wing.

2 At access hole CF2R, install fitting and connect wing stall warning line.

3 Secure lines with cable ties as required.

(m) Center-aft of main wing spar, connect fuel supply and return lines. (Refer to 28-20)

(n) *Serials 1005 thru 1885:* Connect VOR/LOC antenna.

1 Route VOR/LOC antenna cable aft of wing spar tunnel.

2 Replace cable ties for line as required.

3 Tie lower string end stowed in empennage to VOR/LOC antenna cable. Carefully pull upper string end to route VOR/LOC antenna cable up tail.

4 Connect antenna cable to VOR/LOC antenna and discard string. Install VOR/LOC antenna. (Refer to 34-50)

(o) *Serials 1005 thru 1885:* Connect COM2 antenna.

1 Route COM 2 antenna cable aft of wing spar tunnel.

2 Replace cable ties for line as required.

3 At COM 2 antenna, connect COM 2 antenna connector. (Refer to 34-50)

(p) *Serials 1005 thru 1885:* Connect marker beacon antenna.

1 Route marker beacon antenna cable forward of wing spar tunnel.

2 Replace cable ties for line as required.

3 Below radio rack, connect marker beacon antenna cable. (Refer to 34-30)

(q) *Serials 1005 thru 1885:* Connect battery 2.

1 Route battery 2 cable forward of wing spar tunnel.
2 Replace cable ties for lines as required.
3 On circuit breaker panel, connect battery 2 power cable. (Refer to 24-30)
4 *Serials 1268 & subs:* On RH side of forward longerons, connect battery 2 ground wire to P602 connector secured to firewall. (Refer to 24-30)

(r) *Serials 1886 & subs:* Connect battery 2.

1 Route secondary battery power/ground forward of wing spar tunnel.
2 Replace cable ties for lines as required.
3 At access panel CF3R, re-pin jack J847 to enable battery 2 wiring to pass through spar tunnel bulkhead connector.
4 At access panel CF3R, connect jack J847 for battery 2.

(s) *Serials 1005 thru 1885:* Connect ELT remote control panel indicator connection.

1 Route ELT remote control panel indicator cable forward of wing spar tunnel.
2 On circuit breaker panel, connect ELT remote control panel indicator connector and grounding terminal ring. (Refer to 25-60)
3 Replace cable ties for line as required.

(t) Assemble Pitot-Static System. (Refer to 34-10)

1 Route pitot line from left wing and forward to access hole CF3L.
2 Route static line forward to access hole CF3L.
3 At access hole CF3L, install fittings and connect Pitot-Static lines.
4 Secure lines with cable ties as required.

(u) *Serials 1005 & subs w/ StormScope System:* Assemble wiring harness for Stormscope.

1 Route Stormscope wires to access hole CF2R.
2 At access hole CF2R, connect J668.
3 *Serials 1337 & subs w/o PFD*: At access hole CF2R, connect J557 and P698.
4 Secure wire harnesses with cable ties as required.

(v) *Serials 1005 thru 1885:* Assemble wiring harnesses for wing.

1 Route wiring harness from LH wing to access hole CF4L.
2 Route wiring harness from RH wing to access hole CF4R.
3 Re-pin J300 and J400.
4 At access hole CF4L, connect J300 to connector on LH longeron.
5 At access hole CF4R, connect J400 to connector on RH longeron.
6 Secure wire harnesses with cable ties as required.

(w) *Serials 1886 & subs:* Assemble wiring harnesses for wing.

1 At access hole CF2L, connect J300 connector.
2 At access hole CF2R, connect J400 connector.
3 Secure wire harnesses with cable ties as required.

(x) *Serials 2065 & subs w/ Air Conditioning:* Connect wiring harness for condenser.

1 Route condenser cabling forward to access hole CF3R.
2 Assemble P1005 connector.
3 At access hole CF3R, connect plug P1005 for condenser cabling.
4 Secure wire harnesses with cable ties as required.

(y) *Serials 1337 thru 1422 w/ PFD:* Assemble magnetometer cable.

1 Route magnetometer cables to access hole CF3R.
2 At access hole CF3R, re-pin J729 and P729.
3 Connect J729 to P729.

(z) *Serials 1423 & subs:* Assemble magnetometer cable.

1 Route magnetometer cables to access hole CF3R.

2 At access hole CF3R, install backshell onto J729.

3 Connect J729 to P729.

(aa) *Serials 1005 thru 1885:* Assemble aft fuselage wiring harness.

1 Route aft fuselage wiring harness to access hole CF2R.

2 At access hole CF2R, secure ground wire PG650-12N terminal ring with attaching hardware and cover with heatshrink material.

3 At access hole CF2R, connect J666, J667, and J697.

CAUTION: Only secure wiring bundles with adel clamps. Ensure control cables for rudder, elevator, and aileron are not secured by adel clamps.

4 *Serials 1005 thru 1422:* Install adel clamps and cable ties securing aft fuselage wiring harness forward and aft of the wing spar tunnel.

(ab) *Serials 1886 & subs:* Assemble aft fuselage wiring harness.

1 Route aft fuselage wiring harness to access hole CF3R.

2 At access hole CF3R, secure ground wire PG650-12N terminal ring with attaching hardware and cover with heat shrink material.

3 At access hole CF3R, connect J666, J667, and J1049.

4 Only secure wiring bundles with adel clamps. Ensure control cables for rudder, elevator, and aileron are not secured by adel clamps.

(ac) Assemble flap torque tubes. (Refer to 57-50)

1 Install LH and RH torque tubes.

2 At wing root, position thrust collar and torque tube end fitting to torque tube and secure with bolt, washers, spacer, and nut. Repeat on opposite side

3 At access hole CF4C, torque tubes to torque tube coupler and secure with bolt, washers, spacer, and nut.

(ad) Install flaps. (Refer to 57-50)

(ae) Assemble aileron connections. (Refer to 27-10)

1 Route disconnected cables stowed from wing to access hole CF3C.

2 At access hole CF3C, connect LH and RH aileron cable turnbuckles.

3 Route disconnected cables stowed in aft area to access hole CF4C.

4 At access hole CF4C, connect aft aileron cable turnbuckle.

5 *Serials 1005 thru 1885:* At access hole CF3C, connect rudder/aileron interconnect bungee to RH aileron cable at forward and aft locations. (Refer to 27-20)

6 At access hole CF4C, install cable retainer pins, washers, and cotter pins to LH and RH kickout pulley assemblies.

(af) Install ailerons. (Refer to 57-50)

(ag) Assemble elevator connections. (Refer to 27-30)

1 Route disconnected cables to access hole CF5.

2 Connect LH and RH elevator cables turnbuckles.

(ah) Assemble rudder connections. (Refer to 27-20)

1 Route disconnected cables to access hole CF5.

2 At access hole CF5, connect LH and RH elevator cable turnbuckles.

3 *Serials 1005 thru 1885:* At access hole CF3C, connect rudder/aileron interconnect bungee to RH rudder cable. (Refer to 27-20)

(ai) Inspect fuel system for leaks. (Refer to 28-10)

(aj) Bleed brake system. (Refer to 32-42)

(ak) Verify correct orientation of wiring harnesses, tubing, and flight control cables from belly closeout panel opening. (See Figure 57-106)

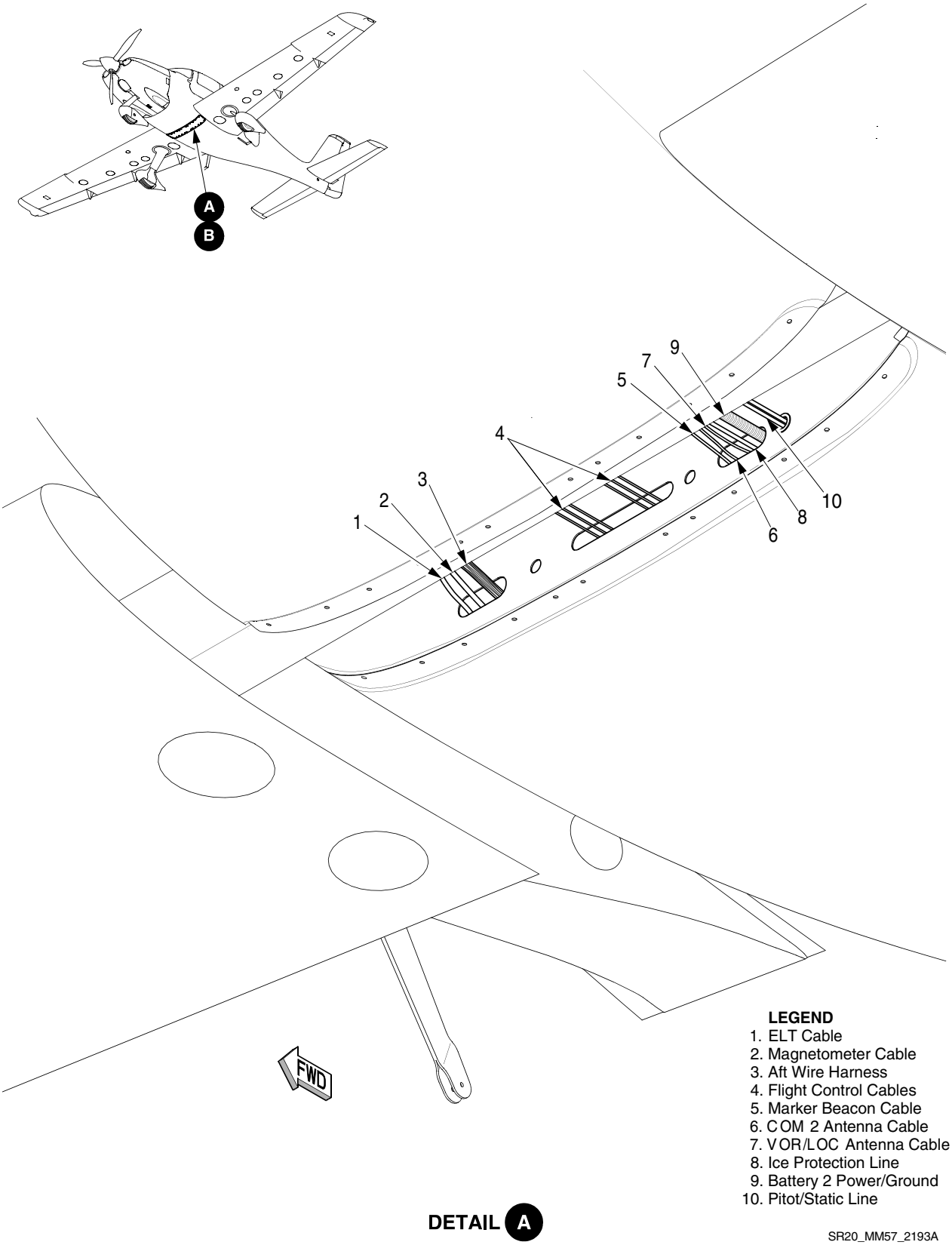
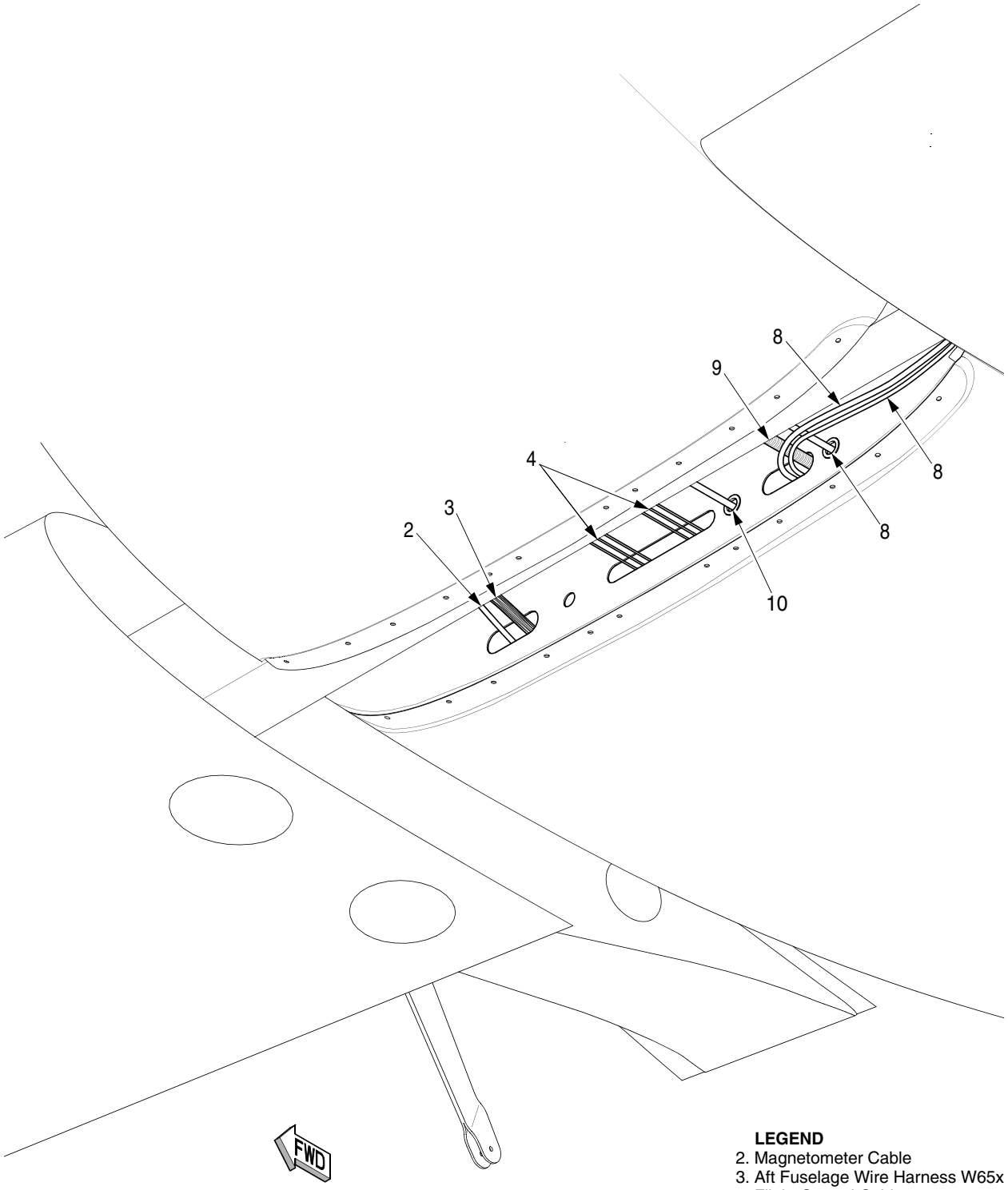


Figure 57-106
Fuselage Spar Tunnel Routing - Serials 1005 thru 1885 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1885



LEGEND
2. Magnetometer Cable
3. Aft Fuselage Wire Harness W65x
4. Flight Control Cables
8. Ice Protection Line
9. Battery 2 Power/Ground
10. Pitot/Static Line

DETAIL B

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Figure 57-106
Fuselage Spar Tunnel Routing - Serials 1886 & subs (Sheet 2 of 2)

(al) *Serials 1005 thru 1422:* Install belly closeout panel. (See Figure 57-107)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill Bit	0.25 inch (0.64 cm)	Any Source	Drilling
Countersunk Drill Bit	0.50 inch (1.27 cm)	Any Source	Drilling
Die Grinder	-	Any Source	Trimming
Drum Bit	0.5 inch (1.3 cm)	Any Source	Trimming
Sharpie® Permanent Fine Point Marker	30001 (Black)	Sanford Bellwood, IL 60104 800-323-0749	Marking
Compressed Air (contaminate free)	-	Any Source	Cleaning
Vacuum Cleaner	-	Any Source	Cleaning
Isopropyl Alcohol	99% or higher purity	Any Source	Cleaning
Cotton Cloth (clean and lint free)	-	Any Source	Cleaning
V-Notch Trowel	0.4 × 0.4 inch (1.0 × 1.0 cm)	Any Source	Application
Caulk Gun	-	Any Source	Application
Structural Resin Repair System (Type 1, Class 1)	L418/H418	MGS Kunstharzprodukte GmbH D-70309 Stuttgart +49-711-38 98 00-0	Adhere
Bottle Jacks (Two)	-	Any Source	Clamping
Concave Support	-	Any Source	Clamping

2 Sand and prepare fuselage offset and belly closeout panel perimeter for installation. (Refer to 51-20)

3 Fit belly closeout panel to fuselage belly opening.

4 If necessary, trim edges of belly closeout panel that do not fit flush.

5 Fit belly closeout panel into fuselage belly opening and observe exposed seam.

6 Ensure that exposed seam does not make hard contact with spar.

7 Carefully trim belly closeout panel edges with die grinder as necessary to correctly fit belly closeout panel into the fuselage belly opening.

8 Transfer location of mounting holes on fuselage belly opening to new belly closeout panel.

9 Mark location on belly closeout panel.

10 Using 0.25 inch (0.64 cm) bit, match drill holes in belly closeout panel.

CAUTION: Ensure outboard countersunk holes are drilled flush with belly closeout panel. Inboard countersunk holes may be drilled flush or up to 0.005 inch (0.013 cm) below flush.

11 Using 0.5 in (1.27 cm) countersunk bit, drill holes so installation screws will be flush with belly closeout panel.

CAUTION: Before applying epoxy, test that belly closeout panel attaches correctly without resin.

12 Fit belly closeout panel to fuselage belly opening.

13 If drilled holes are oversized, match with appropriate bolts.

14 Perform Adjustment/Test - Belly Closeout Panel Bondline Thickness Test (Refer to 57-10)

15 Prepare resin. (Refer to 51-30)

16 Add filler paste. (Refer to 51-20)

17 Apply resin.

CAUTION: Never pour isopropyl alcohol directly onto laminate. Moisten cloth with isopropyl alcohol.

18 Absorb moisture and contamination visible on laminated areas. Using a clean, wipe affected area with isopropyl alcohol.

19 Using vacuum cleaner and compressed air, clean installation area.

CAUTION: Prior to resin application, protect any area that should not come into contact with resin (fittings, bolts, exterior surfaces, etc.)

Resin application to fuselage belly opening and belly closeout panel should occur simultaneously to synchronize cure times.

20 Apply resin to installation areas on fuselage belly opening and belly closeout panel from edges to 5.5 inches (14.0 cm) inboard. (See Figure 57-107)

CAUTION: Use trowel perpendicular to surface to distribute resin at the sufficient depth. Angular trowel application will result in flatter distribution and a weaker bond.

21 Use trowel to apply resin uniformly.

22 Position belly closeout panel to fuselage belly opening.

CAUTION: Raise jacks on either side of belly closeout panel with a concave support surface in place. Failure to use a concave support surface will result in improper clamping that could cause structural damage from applying too much pressure at a single location.

23 Position and raise two jacks and a concave support surface under the belly closeout panel. (See Figure 57-107)

24 Torque bolts to 25 - 30 in-lb (3.0 - 3.4 Nm) to secure belly closeout panel underneath fuselage before the adhesive begins to set.

25 Complete curing procedure for belly closeout panel. (Refer to 51-20) (See Figure 57-107)

(am) *Serials 1423 & subs w/ originally installed belly closeout panel:* Install belly closeout panel.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sandpaper	80-grit	Any Source	Abrasion

2 To remove residual adhesive, carefully sand edges of belly closeout panel and mating surfaces of fuselage.

3 Position belly closeout panel to fuselage and secure with screws, washers, and nuts. (See Figure 57-107)

(an) *Serials 1423 & subs w/ new belly closeout panel:* Install belly closeout panel.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Mylar Template	T10178 S/N 10716	Cirrus Design Duluth, MN 55811 218-727-2737	Transfer
Masking Tape	-	Any Source	Adhere
Spray Adhesive	50606-001	Unlimited Quality Products Mesa, AZ 85210 800-528-8219	Adhere
Drill Bit	0.25 inch (0.64 cm)	Any Source	Drilling
Countersunk Drill Bit	0.50 inch (1.27 cm)	Any Source	Drilling
Citrus Base Cleaner	51292-001	3M Company St. Paul, MN 55144 651-737-6501	Cleaning

2 To facilitate template alignment, backlight tooling holes of belly closeout panel.

3 Position template to belly closeout panel by aligning tooling hole markings on template with tooling holes on belly closeout panel.

4 Tape down one end of template to belly closeout panel.

5 Lift up free end of template and evenly apply adhesive over surface of belly closeout panel.

6 Carefully lay template down on belly closeout panel, aligning tooling hole markings with tooling holes on belly closeout panel.

7 Using 0.25 inch (0.64 cm) bit, match drill installation holes from template to belly closeout panel.

CAUTION: Ensure countersunk holes are drilled flush with belly closeout panel.

8 Using 0.5 in (1.27 cm) countersunk bit, drill holes so installation screws will be flush with belly closeout panel.

9 Remove template from belly closeout panel.

10 Solvent clean belly closeout panel to remove residual adhesive. (Refer to 20-30)

11 Position belly closeout panel to fuselage and secure with screws, washers, and nuts.

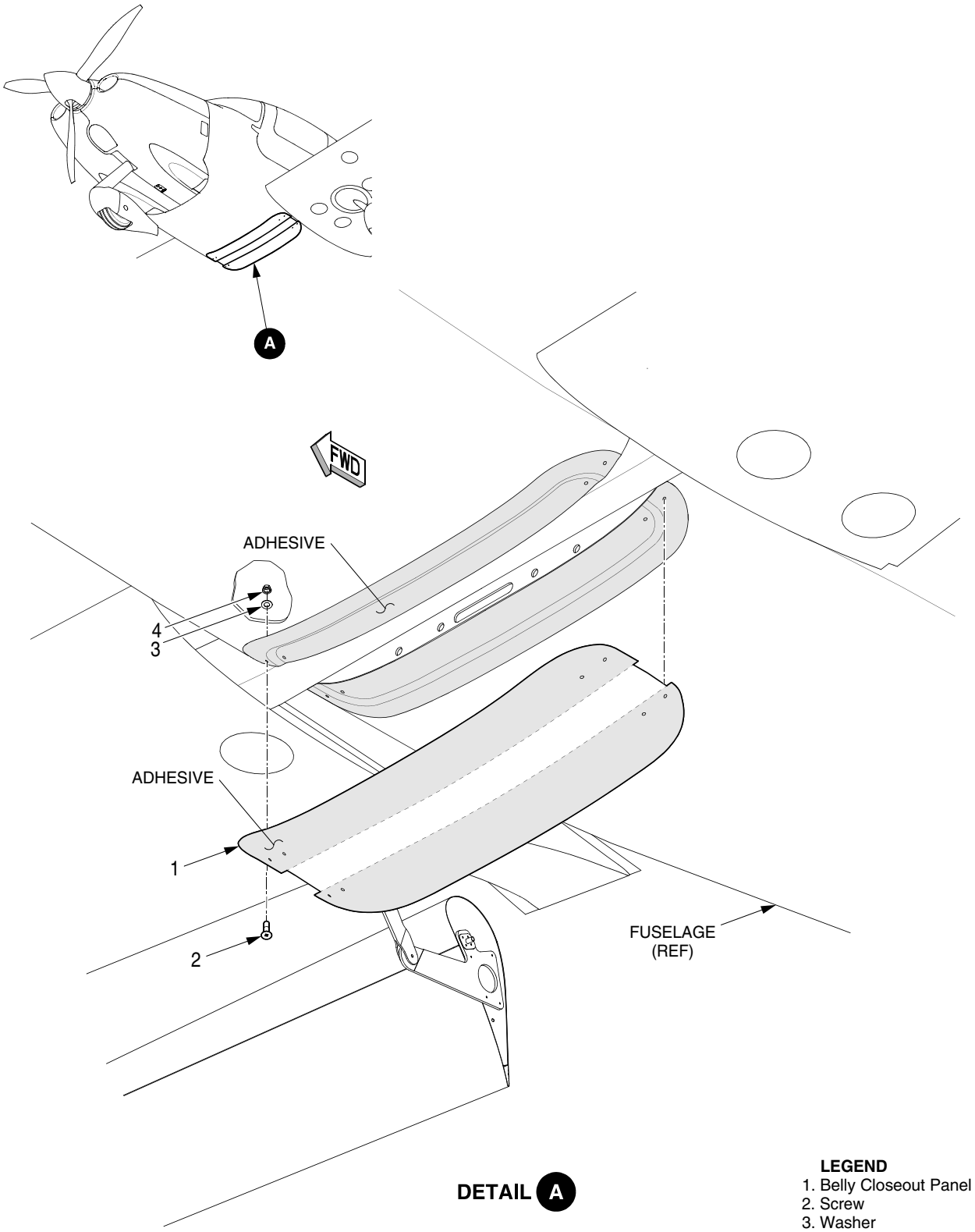
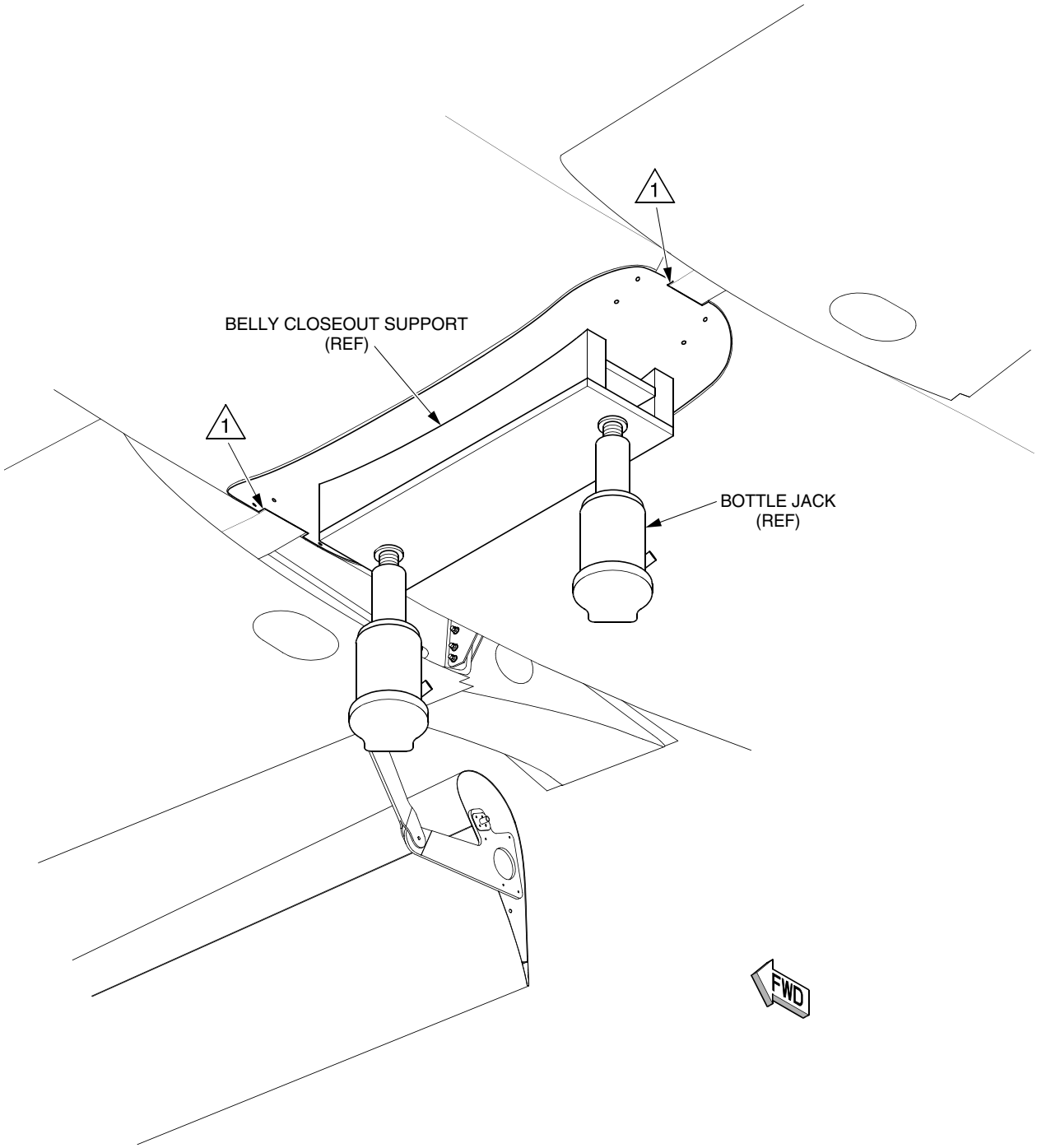


Figure 57-107
Belly Closeout Panel Installation - Serials 1005 thru 1422 (Sheet 1 of 4)

EFFECTIVITY:
Serials 1005 thru 1422



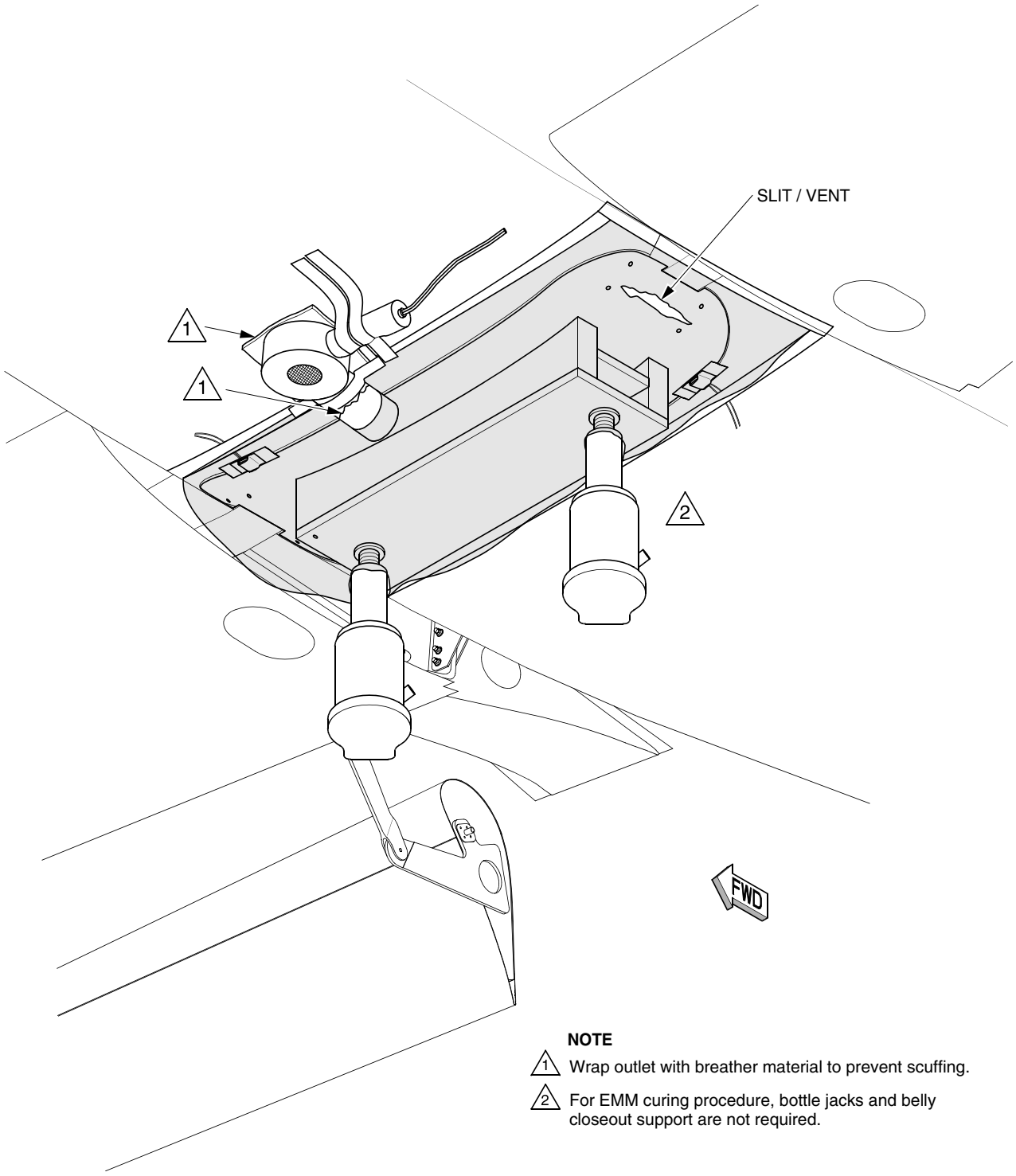
NOTE

1 No hard contact with wing spar.

Serials 1005 thru 1422.

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Figure 57-107
Belly Closeout Panel Installation - Serials 1005 thru 1422 (Sheet 2 of 4)



NOTE

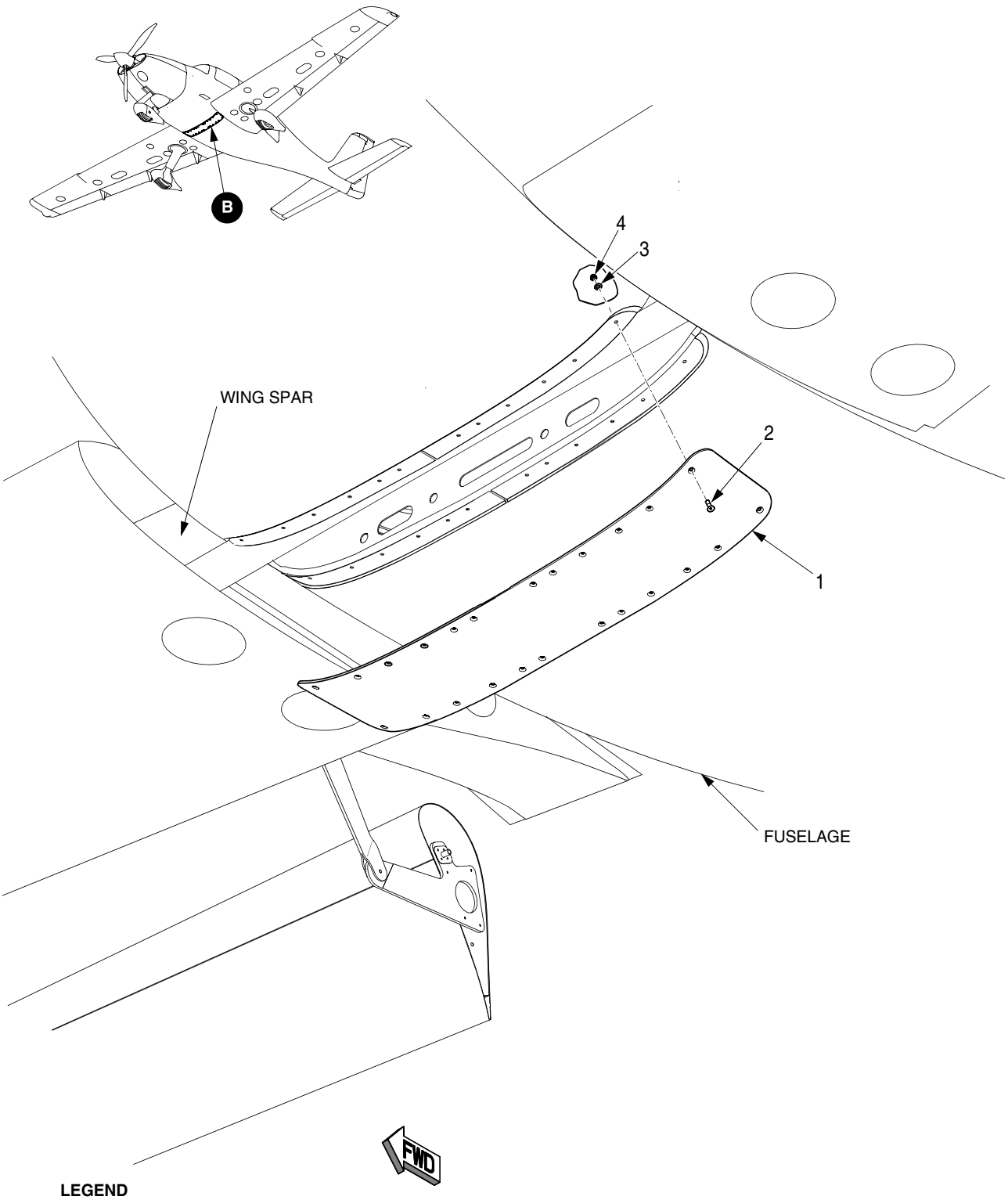
1. Wrap outlet with breather material to prevent scuffing.
2. For EMM curing procedure, bottle jacks and belly closeout support are not required.

Serials 1005 thru 1422.

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Figure 57-107
Belly Closeout Panel Installation - Serials 1005 thru 1422 (Sheet 3 of 4)

EFFECTIVITY:
Serials 1005 thru 1422



LEGEND
1. Belly Closeout
2. Screw
3. Washer
4. Nut

DETAIL B

SR20_MM57_1888

Figure 57-107
Belly Closeout Panel Installation - Serials 1423 & subs (Sheet 4 of 4)

(ao) *Serials 1005 thru 2029:* Install Expanded Metal Mesh (EMM) lightning protection. (See Figure 57-108)

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Sandpaper	80-grit	Any Source	Abrasion
Isopropyl Alcohol	-	Any Source	Cleaning
Cotton Cloth (clean and lint free)	-	Any Source	Cleaning
Vacuum	-	Any Source	Cleaning
Paint Brush	-	Any Source	Cleaning
Expanded Metal Mesh	AL060CX	Astroseal Products Chester, CT 06412 860-526-8605	Protection
Structural Resin Repair System (Type 1, Class 1) or Non-Structural Resin Repair System	L418/H418 Epon 862	MGS Kunstharzprodukte GmbH D-70309 Stuttgart +49-711-38 98 00-0 Resolution Performance Products Houston, TX 77210-4500 877-859-2800	Adhere
Peel-Ply Tape	-	Any Source	Protection

2 *Serials 1005 thru 1422:* Sand installation area to remove residual adhesive.

3 Sand forward and aft of the installation area to expose original edge of EMM.

4 Using 80-grit sandpaper or finer, burnish existing EMM until shiny. Frequently clean surface of contaminants using vacuum and paint brush to ensure EMM is not damaged.

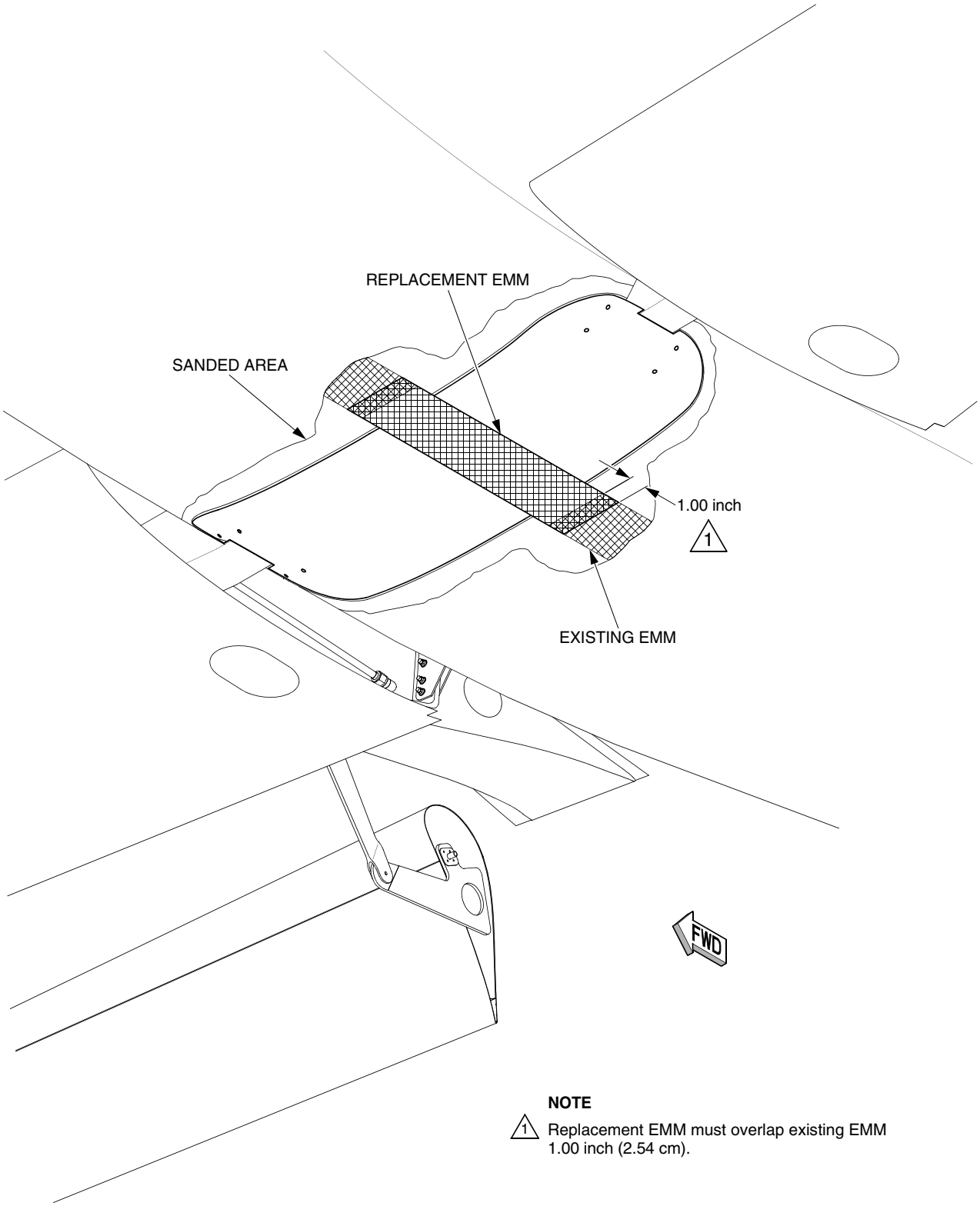
5 Using 80-grit sandpaper or finer, burnish replacement EMM until shiny.

6 Vacuum repair area.

7 Solvent clean installation area with isopropyl alcohol. (Refer to 20-30)

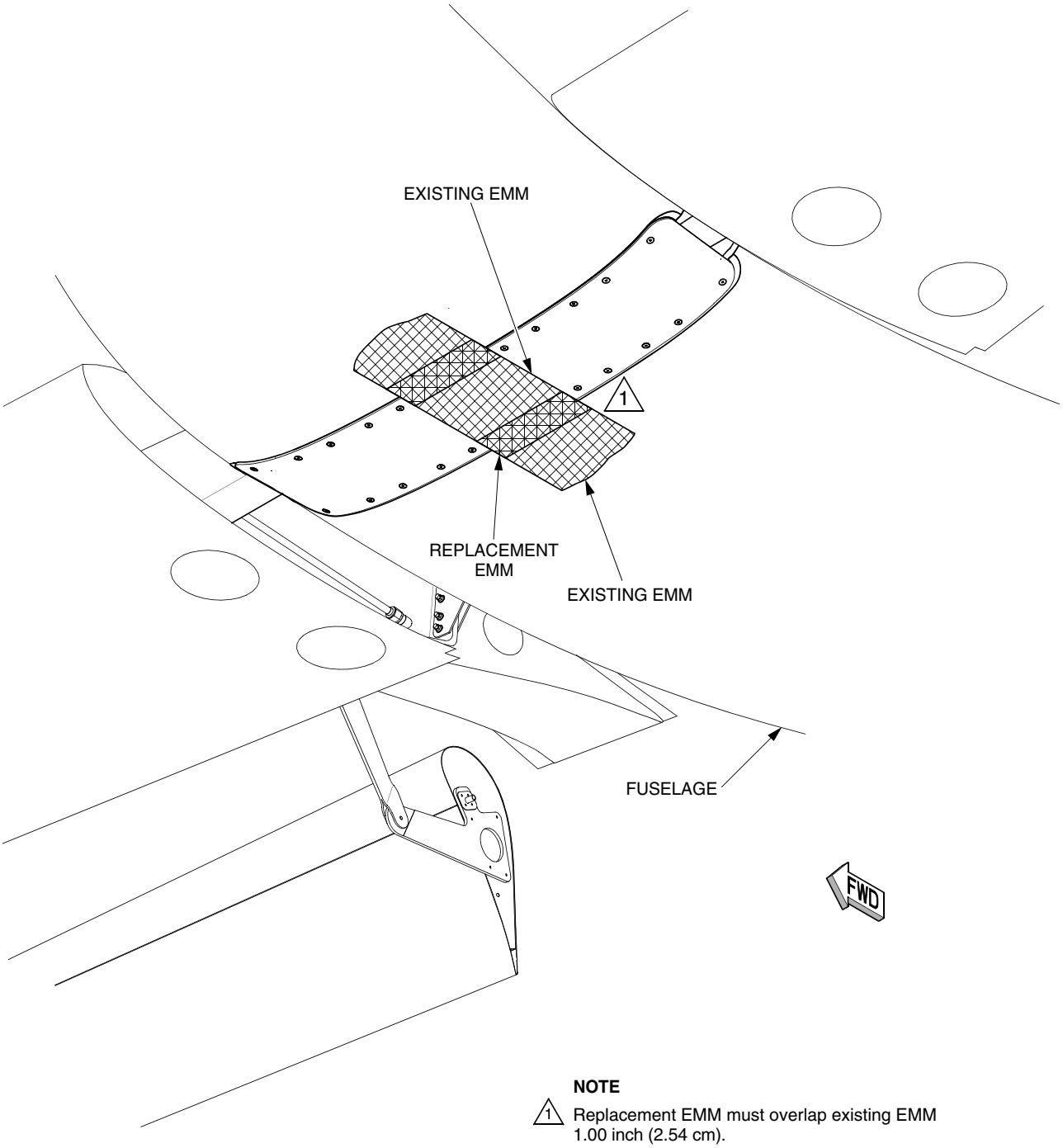
CAUTION: Replacement EMM must overlap existing EMM by 1.0 inch (2.5 cm) and feature no breaks in continuity.

8 Prepare, apply, and cure Expanded Metal Mesh (EMM) repair system over forward and aft seam at belly closeout panel. (Refer to 51-20)



Serials 1005 thru 1422.

Figure 57-108
EMM Installation - Serials 1005 thru 1422 (Sheet 1 of 2)



NOTE

1 Replacement EMM must overlap existing EMM 1.00 inch (2.54 cm).

Serials 1423 thru 2029.

SR20_MM57_1876A

Figure 57-108
EMM Installation - Serials 1423 thru 2029 (Sheet 2 of 2)

(ap) *Serials 1005 thru 2029:* Paint installation area. (Refer to 51-20)
(aq) Install wing root fairings. (Refer to 53-50)
(ar) Install main gear fairings. (Refer to 32-10)
(as) Install nose gear fairing.(Refer to 32-20)
(at) If removed for fuselage cradle clearance, install transponder antenna. (Refer to 34-50)
(au) Install kick plates. (Refer to 25-10)
(av) *Serials 1148 thru 1422 w/ Century HSI:* Connect HSI gyro slaving amplifier. (Refer to 34-50)
1 Route HSI gyro slaving amplifier wire aft to access hole CF2R.
2 Connect HSI gyro slaving amplifier wire to gyro slaving amplifier mounted to access panel CF2R.
(aw) Install access panels CF2L, CF2R, CF3R, CF3C, CF3L, and CF5. (Refer to 53-20)
(ax) Install cabin floor covering. (Refer to 25-10)
(ay) Install screws securing circuit breaker panel closed.
(az) Install cabin trim panels. (Refer to 25-10)
(ba) Install crew and passenger seats. (Refer to 25-10)
(bb) Connect battery 1. (Refer to 24-30)
(bc) Install engine cowling. (Refer to 71-10)
(bd) Reset all circuit breakers.
(be) Fuel airplane. (Refer to 12-10)
(bf) Replenish brake system. (Refer to 12-10)
(bg) Perform Adjustment/Test - Flap Force Limitation. (Refer to 57-50)
(bh) Perform Operational Inspection - Flap System. (Refer to 57-50)
(bi) Perform Inspection/Check - Empennage Pulley Gang. (Refer to 27-20)
(bj) *Serials 1005 thru 1885:* Perform Adjustment/Test - Rudder-Aileron Interconnect. (Refer to 27-20)
(bk) Perform Functional Test - Static System Leak Test. (Refer to 34-10)
(bl) Perform Functional Test - Pitot System Leak Test. (Refer to 34-10)
(bm) Perform Inspection/Check - Aileron Assembly. (Refer to 57-50)
(bn) Perform Inspection/Check - Aileron System Rigging. (Refer to 27-10)
(bo) Perform Inspection/Check - Rudder System Rigging. (Refer to 27-20)
(bp) Perform Inspection/Check - Elevator System Rigging. (Refer to 27-30)
(bq) Perform Inspection/Check - Roll Trim Cartridge (Refer to 27-10)
(br) Perform Inspection/Check - Torque Tube Gap Tolerance. (Refer to 27-20)
(bs) Perform ELT functional inspection in accordance with 14 CFR 91.207.

WARNING: **Installation of the wing assembly requires a maintenance check flight performed by a Cirrus Design authorized test pilot. Contact Cirrus Design prior to performing maintenance to schedule check flight.**

(bt) Perform Cirrus Design-Authorized Flight Test.

(3) Adjustment/Test - Belly Closeout Panel Bondline Thickness Test - *Serials 1005 thru 1422*

This procedure is a test for bondline thickness that precedes the actual belly closeout panel installation. The resin is applied between plastic sheets, which provide a barrier for the installation surfaces. The belly closeout panel is installed and resin allowed to cure. The cured resin is measured to fall within an acceptable range.

CAUTION: Ensure that bonding and curing procedures are followed exactly as defined for actual belly closeout panel installation. Any variance in completing these procedures will result in testing failure.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Release Film	WL5200 (Red or Blue)	Airtech Int'l Inc. Huntington Beach,CA 92647 714-899-8100	Protection
Structural Resin Repair System (Type 1, Class 1)	L418/H418	MGS Kunstharzprodukte GmbH D-70309 Stuttgart +49-711-38 98 00-0	Adhere
Compressed Air (Contaminate free)	-	Any Source	Cleaning
Vacuum Cleaner	-	Any Source	Cleaning
V-Notch Trowel	0.4 × 0.4 inch (1.0 × 1.0 cm)	Any Source	Application
Caliper	-	Any Source	Measure

(b) Using vacuum cleaner and compressed air, clean installation area.

(c) Apply release film to installation area for belly closeout panel.

CAUTION: Prior to resin application, protect any area that should not come into contact with resin (fittings, bolts, exterior surfaces, etc.)

(d) Prepare resin. (Refer to 51-30)

(e) Add filler paste. (Refer to 51-20)

CAUTION: Only apply resin to release film.

CAUTION: Use trowel perpendicular to surface to distribute resin at the sufficient depth. Angular trowel application will result in flatter distribution and a weaker bond.

(f) Apply and trowel resin to belly closeout panel installation areas covered by release film.

(g) Apply another release film to prevent resin from contacting the belly fuselage opening during installation.

(h) Position belly closeout panel to fuselage belly opening.

CAUTION: Only raise jacks on either side of belly closeout panel with a concave support surface in place. Failure to use a concave support surface will result in improper clamping that could cause structural damage from applying too much pressure at a single location.

(i) Position and raise two jacks and a concave support board under the belly closeout panel. (See Figure 57-107)

(j) Torque bolts to 25 - 30 in-lb (3.0 - 3.4 Nm) to secure belly closeout panel underneath fuselage before the resin begins to set.

(k) Complete curing procedure for belly closeout panel. (Refer to 51-20), (See Figure 57-107)

(l) Lower jacks and disassemble belly closeout panel.

(m) Remove belly closeout panel from belly fuselage opening.

CAUTION: Ensure that orientation of release film sheets is marked in some manner to correctly transfer locations of bondline to belly closeout panel.

(n) Remove release film with resin bondline cured within.

(o) Cut release film near outline of bondline.

(p) Inspect and record results bondline thickness at perimeter with caliper every few inches. Acceptable bondline thickness tolerance range is 0.005 - 0.080 inch (0.013 - 0.203 cm).

(q) If bondline is below minimum requirements, install shims as required.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Compressed Air (Contaminate free)	-	Any Source	Cleaning
Vacuum Cleaner	-	Any Source	Cleaning
Glass Cloth Shim	7781-F16	Hexcel Anderson, SC 29622 864-225-7028	Shimming
Non-Structural Resin Repair System (Type 2, Class 1)	Epon 862/ Heloxy 68 & Teta 3234	Resolution Performance Products Houston, TX 77210-4500 800-832-3766	Adhere
Brush	2.0 inches (5.1 cm)	Any Source	Applica-tion

2 Using vacuum cleaner and compressed air, clean installation area.

3 Identify bondline point above tolerance and transfer location to belly closeout panel.

4 Determine height required to bring measurement into acceptable tolerance range.

5 Apply shim and resin as required.

6 Cure shims for one hour at 150° - 195° F (66° - 91° C).

7 Complete curing procedure for shims. (Refer to 51-20)

8 Allow belly closeout panel to cool to room temperature.

(4) Adjustment/Test - Tip-to-Tip Measurement (See Figure 57-109)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ruler Gauges (Block), LH and RH	T6859-7	Cirrus Design Duluth, MN 55811 218-727-2737	Leveling
Transit Level	-	Any Source	Leveling

(b) Level airplane laterally with digital level using engine mount weldment. (Refer to 08-10)

(c) Locate 25% chord at WS 197.5 on both wings. (See Figure 06-004)

(d) At LH and RH wing, position ruler gauge blocks on WS 197.5 with ruler edge aligned with 25% chord.

(e) Position transit level approximately 10 feet (3 m) forward from propeller.

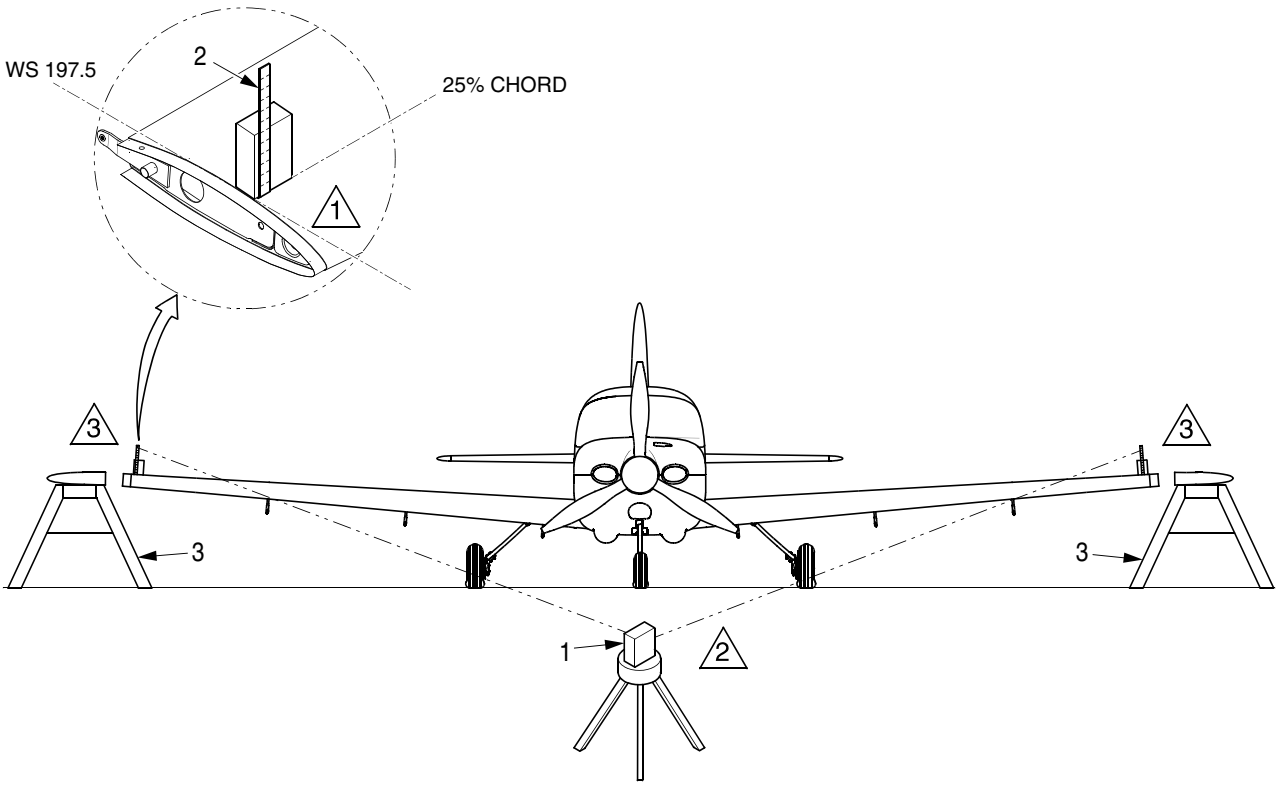
(f) Using transit level, locate ruler gauge block. Note location on ruler at which crosshair intersects ruler measurement.

(g) Repeat measurement location on opposite ruler gauge block.

(h) Verify difference in measurement locations at LH and RH ruler gauge blocks is within tolerance of 2.0 inches (5.0 cm). Record obtained values.

LH 25% Chord	RH 25% Chord	Variance

If measurement difference is not within tolerance, contact Cirrus Design for disposition.



NOTE

1. Position ruler gauge block on WS 197.5 with ruler edge aligned with 25% chord.
2. Position transit level approximately 10 feet (3 m) forward from propeller.
3. Verify difference in measurement location at LH and RH ruler gauge blocks is within tolerance of 2.0 inches (5.0 cm).

LEGEND

1. Transit Level
2. Ruler Gauge (Block)
3. Saw Horse

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Figure 57-109
Tip-to-Tip Measurement

(5) Adjustment/Test - Wing Angle of Incidence and Decalage Measurement - *Serials 1005 thru 1885* (See Figure 57-1010)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape	-	Any Source	Protection
Horizontal Incidence Template, HS36, LH HS36, RH	 T1835 T1836	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Wing Incidence Template, WS41, LH WS197.5, LH WS41, RH WS197.5, RH	 T0167 T0169 T0166 T0168	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Digital Level, 0.25 Resolution	-	Any Source	Measurement

CAUTION: Apply masking tape to template feet to protect contact locations on wing surface.

(b) At LH and RH sides of wing, identify wing incidence templates for WS197.5 and WS41 and position templates to wing as marked.

(c) At LH and RH sides of horizontal stabilizer, identify horizontal incidence templates for HS36 and position templates to horizontal stabilizer as marked.

Note: To ensure consistent and accurate readings, position digital level so that the display faces one direction at all template locations (for example, outboard on RH side and inboard on LH side).

(d) Position digital level at each template and measure angle of incidence.

Note: Negative readings indicate leading edge down. Positive readings indicate leading edge up.

(e) Verify angle of incidence at all template locations is measured at 0.25 ±0.20°. Record obtained values.

LH WS 197.5	LH WS 41.0	RH WS 197.5	RH WS 41.0	LH HS 36.0	RH HS 36.0

(f) Determine decalage by adding absolute value obtained at HS36 template to actual value obtained at WS41 template.

For example:

(|LH HS36|) + (LH WS41) = Decalage

(|-0.79|) + (0.20) = Decalage

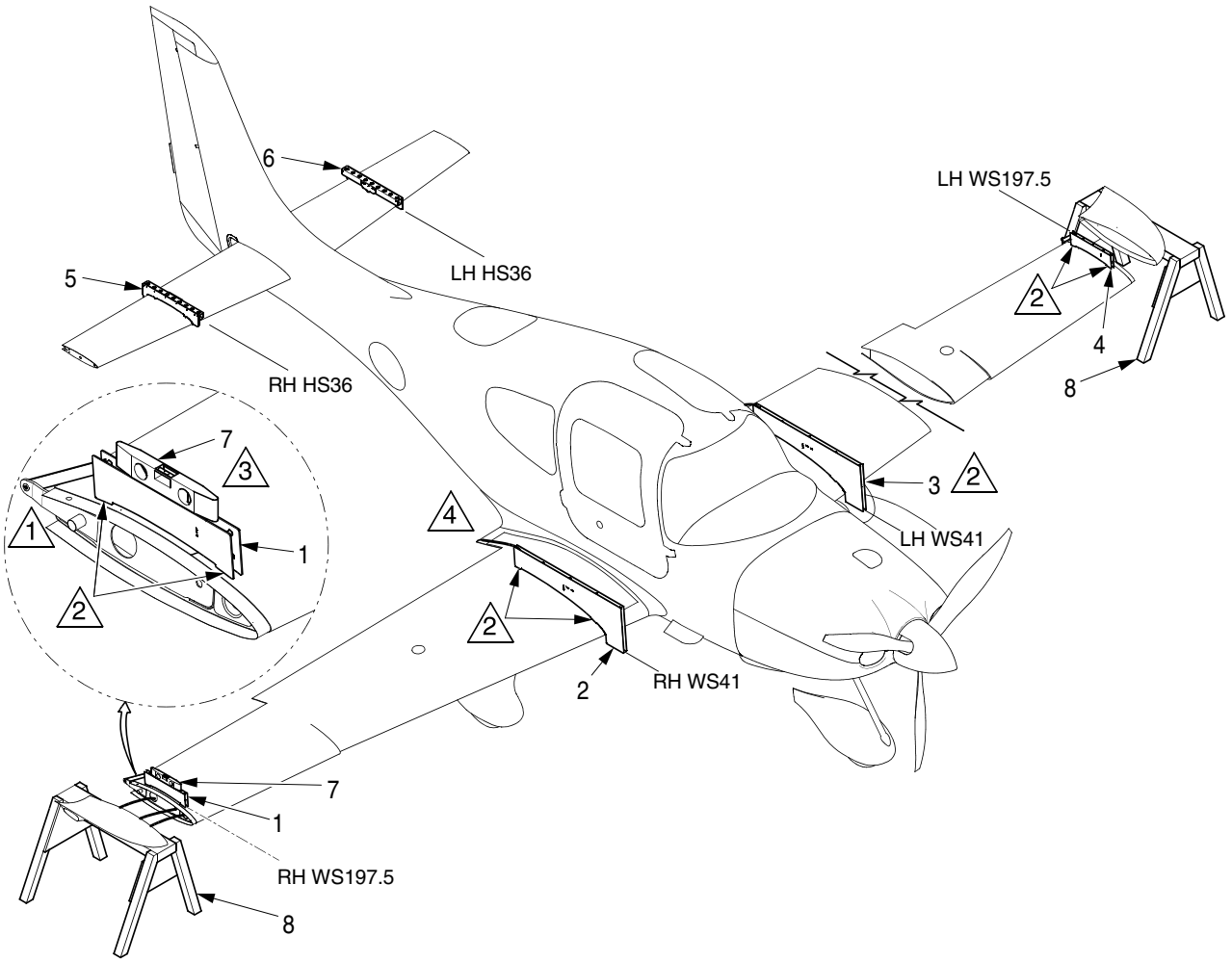
0.79 + 0.20 = Decalage

0.99 = Decalage

(g) Verify decalage is within tolerance (0.85 ± 0.4°). Record obtained values.

Decalage

If decalage is not within tolerance, contact Cirrus Design for disposition.



NOTE

1. Install pin on WS197.5 template arm to outboard aileron hinge.
2. Apply masking tape to template feet to protect contact locations on wing surface.
3. To ensure consistent and accurate readings, position digital level so that the display faces one direction at all template locations (for example, outboard on RH side and inboard on LH side).
4. Clip vinyl hook on WS41 template bungee cord to aft wing.

LEGEND

1. RH WS197.5 Template
2. RH WS41 Template
3. LH WS41 Template
4. LH WS197.5 Template
5. RH HS36 Template
6. LH HS36 Template
7. Digital Level
8. Saw Horse

SR20_MM57_2187

Figure 57-1010
Wing Angle of Incidence and Decalage Measurement - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885

(6) Adjustment/Test - Wing Angle of Incidence and Decalage Measurement - *Serials 1886 & subs*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape	-	Any Source	Protection
Horizontal Incidence Templates HS36, LH HS36, RH	 T10100 T10101	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Wing Incidence Templates WS40, LH WS40, RH WS130, LH WS130, RH WS213, LH WS213, RH	 T10072 T10073 T7508 T10007 T10145 T10146	Cirrus Design Duluth, MN 55811 218-727-2737	Measurement
Digital Level, 0.25 Resolution	-	Any Source	Measurement

CAUTION: Apply masking tape to template feet to protect contact locations on wing surface.

(b) At LH and RH sides of wing, identify wing incidence templates for WS213, WS130, and WS40 and position templates to wing as marked.

(c) At LH and RH sides of horizontal stabilizer, identify horizontal incidence templates for HS36 and position templates to horizontal stabilizer as marked.

Note: To ensure consistent and accurate readings, position digital level so that the display faces one direction at all template locations (for example, outboard on RH side and inboard on LH side).

(d) Position digital level at each template and measure angle of incidence.

Note: Negative readings indicate leading edge down. Positive readings indicate leading edge up.

(e) Verify angle of incidence at all template locations is measured at 0.25 ±0.20°. Record obtained values.

LH WS 213.0	LH WS 130.0	LH WS 40.0	RH WS 213.0	RH WS 130.0	RH WS 40.0	LH HS 36.0	RH HS 36.0

(f) Determine decalage by adding absolute value obtained at HS36 template to actual value obtained at WS40 template.

For example:

(|LH HS36|) + (LH WS40) = Decalage

(|-0.79|) + (0.20) = Decalage

0.79 + 0.20 = Decalage

0.99 = Decalage

(g) Record obtained values.

Decalage

There are no explicit requirements for decalage. The limits of wing and horizontal stabilizer incidence implicitly define the limits of decalage. If angle of incidence is not within tolerance, contact Cirrus Design for disposition.

(7) Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap (See Figure 57-1011)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Check resistance.
Sandpaper	80-grit	Any Source	Paint/primer removal and EMM burnishing.
Countersunk Screw	MS24693S28 (or equivalent)	Any Source	Main wing attach ground strap installation.
Countersunk Washer	NAS1169-6L (or equivalent)	Any Source	Main wing attach ground strap installation.
Washer	NAS1149FN616P (or equivalent)	Any Source	Main wing attach ground strap installation.
Self-Locking Nut	MS21042-06 (or equivalent)	Any Source	Main wing attach ground strap installation.

CAUTION: Remove only paint and bodywork necessary to expose rivets/screws and countersunk washers that secure main wing attach ground strap to upper wing skin.

(b) Remove ground path between main wing attach ground strap and wing skin EMM.

1 Remove paint and bodywork exposing wing skin EMM. (Refer to 51-20)

2 Remove and discard rivets and countersunk washers securing main wing attach ground strap to upper wing skin.

CAUTION: Do not damage wing skin EMM while burnishing the surface.

Note: Gradual loosening of ground strap hardware may cause chafing of countersunk washer on wing skin EMM; repair wing skin EMM as required to re-establish ground path. (Refer to 51-20)

3 Burnish exposed wing skin EMM to ensure adequate electrical bonding connection to washers.

4 Burnish mating surface of each countersunk washer to ensure adequate electrical bonding to wing skin EMM.

(c) Replace ground path between main wing attach ground strap and wing skin EMM.

1 Install countersunk screws, countersunk washers, washers, and self-locking nuts securing main wing attach ground strap to wing skin EMM.

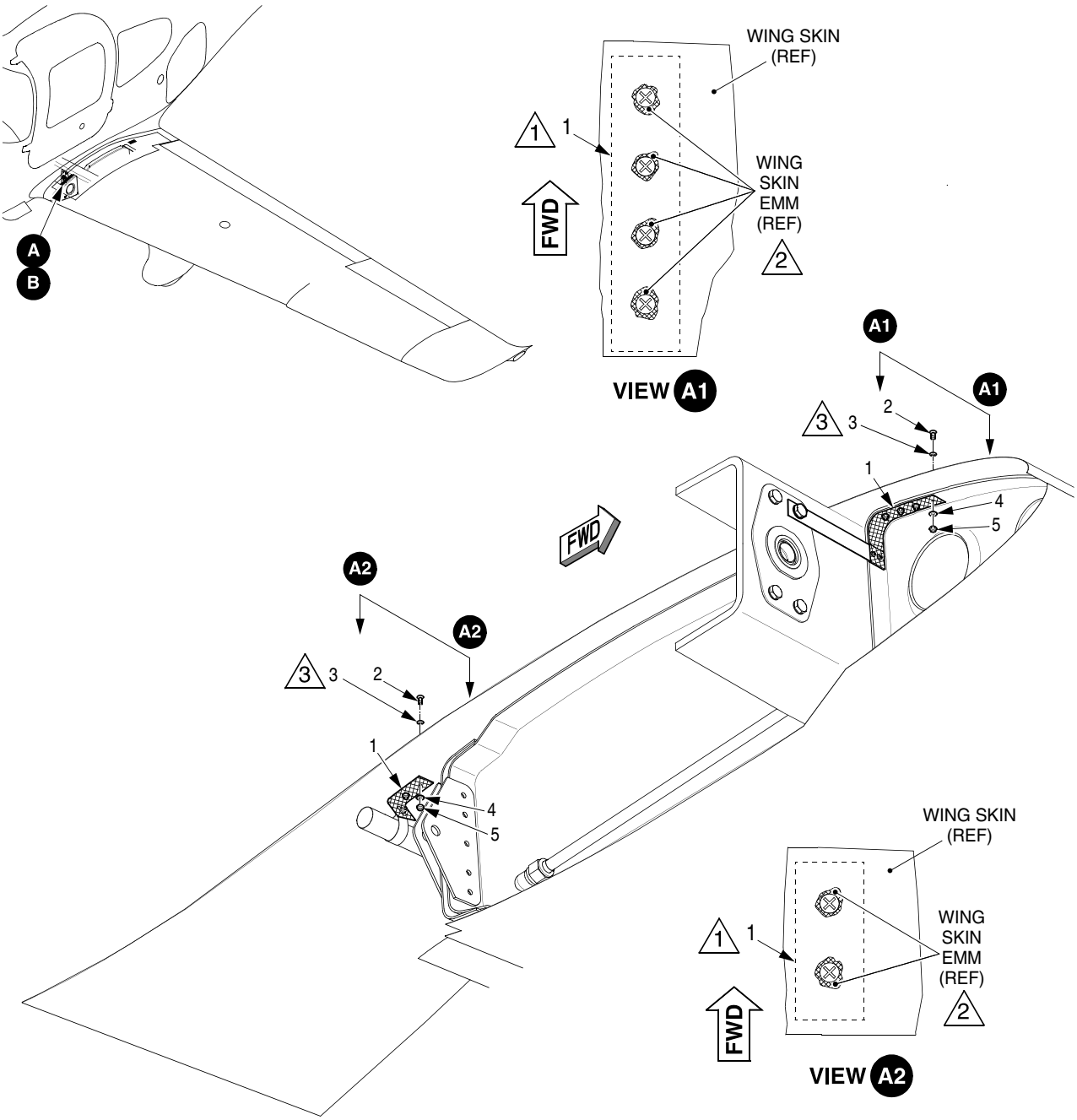
2 Measure resistance between main wing attach ground strap and wing skin EMM to ensure ground path has been successfully reestablished.

(d) *Serials 1005 thru 1877, 1879 thru 1885:* It is permissible to repeat Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap for aft, inboard conduit grounding strap to reduce resistance of fuel cap assembly ground path between wing skin EMM and fuselage.

(e) *Serials 1878, 1886 & subs:* It is permissible to repeat Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap for aft, inboard wing attach grounding strap to reduce resistance of fuel cap assembly ground path between wing skin EMM and fuselage.

(f) Perform Functional Test - Fuel Cap Assembly Ground Resistance. (Refer to 28-10)

(g) Repair wing skin and paint. (Refer to 51-20)



Serials 1005 thru 1877, 1879 thru 1885.

DETAIL A

NOTE

1. Remove only paint and body work necessary to expose rivets and countersunk washers that secure main wing attach ground strap to upper wing skin.
2. Burnish exposed wing skin EMM to ensure proper connection to washers.
3. Burnish mating surface of each countersunk washer to ensure adequate electrical bonding to wing skin EMM.

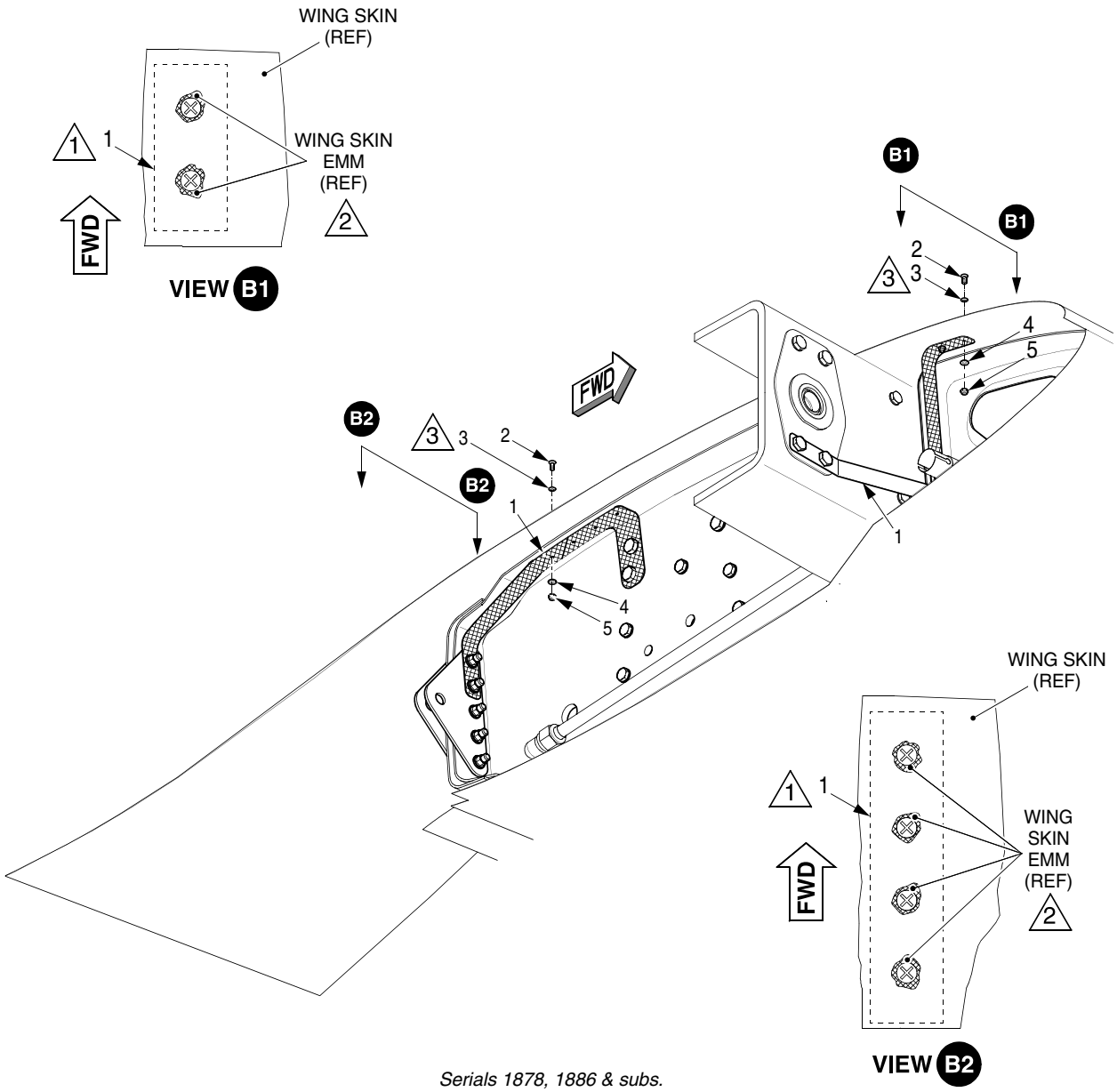
LEGEND

1. Grounding Strap
2. Screw
3. Countersunk Washer
4. Washer
5. Nut

SR20_MM57_3288

Figure 57-1011
Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap (Sheet 1 of 2)

EFFECTIVITY:
All



Serials 1878, 1886 & subs.

DETAIL B

NOTE

1. Remove only paint and body work necessary to expose rivets and countersunk washers that secure main wing attach ground strap to upper wing skin.
2. Burnish exposed wing skin EMM to ensure proper connection to washers.
3. Burnish mating surface of each countersunk washer to ensure adequate electrical bonding to wing skin EMM.

LEGEND

1. Grounding Strap
2. Screw
3. Countersunk Washer
4. Washer
5. Nut

SR20_MM57_3290

Figure 57-1011
Approved Repair - Ground Path Between Wing Skin EMM and Main Wing Attach Ground Strap (Sheet 2 of 2)

(8) Approved Repair - Ground Path Between Wing Skin EMM and Fuel Cap Assembly (See Figure 57-1012)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Carbon Uni Tape, Prepreg	(Refer to 51-30)	(Refer to 51-30)	Ground path.
Serials 1005 thru 1877, 1879 thru 1885: Copper Tape, Tin Plated	(Refer to 51-30)	(Refer to 51-30)	Ground path at fuel cap assembly off-set.
Serials 1878, 1886 & subs: Expanded Metal Mesh, Aluminum, 0.028 lb-ft² (0.137 kg-m²)	(Refer to 51-30)	(Refer to 51-30)	Ground path at fuel cap assembly off-set.
Expanded Metal Mesh, Aluminum, 0.060 lb-ft² (0.293 kg-m²)	(Refer to 51-30)	(Refer to 51-30)	Repair wing skin EMM and ground path.
Expanded Metal Mesh, Copper, 0.029 lb-ft² (0.142 kg-m²)	(Refer to 51-30)	(Refer to 51-30)	Ground path.

(b) *Serials 1005 thru 1877, 1879 thru 1885:* Remove ground path between wing skin EMM and fuel cap assembly.

CAUTION: Remove only paint and bodywork necessary to expose fuel cap assembly ground path between wing skin EMM and fuel cap assembly.

1 Remove paint and bodywork exposing wing skin EMM, copper mesh EMM, carbon uni tape, and copper tape. (Refer to 51-20)

CAUTION: Do not damage underlying composite structure.

2 Completely remove copper mesh EMM, carbon uni tape, and copper tape.

(c) *Serials 1878, 1886 & subs:* Remove ground path between wing skin EMM and fuel cap assembly.

CAUTION: Remove only paint and bodywork necessary to expose fuel cap assembly ground path between wing skin EMM and fuel cap assembly.

Minimize wing skin EMM removal as much as possible while removing paint and bodywork.

1 Remove paint and bodywork exposing wing skin EMM, copper mesh EMM, carbon uni tape, and aluminum mesh EMM. (Refer to 51-20)

CAUTION: Do not damage underlying composite structure.

2 Completely remove copper mesh EMM, carbon uni tape, and aluminum mesh EMM.

(d) *Serials 1005 thru 1877, 1879 thru 1885:* Repair ground path between wing skin EMM and fuel cap assembly.

1 Burnish all mating surfaces to ensure adequate electrical bonding.

2 Fabricate one (1) approximately 2 foot (0.6 m) length of 0.75 ±0.25 inch (1.91 ±0.64 cm) wide replacement carbon uni tape.

3 Fabricate one (1) square of 2.0 × 2.0 inches (5.1 × 5.1 cm) replacement copper mesh EMM.

Note: Ensure length of carbon uni tape extends onto fuel cap assembly offset and continues full distance to inner diameter of fuel cap assembly hole.

4 Install carbon uni tape and copper mesh EMM. (Refer to 51-20)

5 Repair wing skin EMM. (Refer to 51-20)

6 Fabricate replacement copper tape to fit fuel cap assembly offset.

7 Solvent clean fuel cap assembly offset area. (Refer to 20-30)

8 Position and press copper tape to fuel cap assembly offset area.

Note: Minor wrinkling is allowed but ensure copper tape is pressed flat.

Copper tape may be darted or sliced to allow it to lie flat.

9 Trim copper tape and carbon uni tape to match inner diameter of fuel cap assembly hole.

Note: It is permissible to burnish wing skin EMM in order to form a suitable test point. (Refer to 51-20)

10 Measure resistance between copper tape and wing skin EMM to ensure ground path has been successful re-established.

(e) *Serials 1878, 1886 & subs:* Repair ground path between wing skin EMM and fuel cap assembly.

1 Burnish all mating surfaces to ensure adequate electrical bonding.

2 Fabricate one (1) approximately 4 inch (10 cm) length of 0.75 ±0.25 inch (1.91 ±0.64 cm) wide replacement carbon uni tape.

3 Fabricate two (2) squares of 2.0 × 2.0 inches (5.1 × 5.1 cm) replacement copper mesh EMM.

4 Trim aluminum mesh EMM to match inner diameter of fuel cap assembly hole.

5 Install carbon uni tape, copper mesh EMM, and aluminum mesh EMM. (Refer to 51-20)

6 Repair wing skin EMM. (Refer to 51-20)

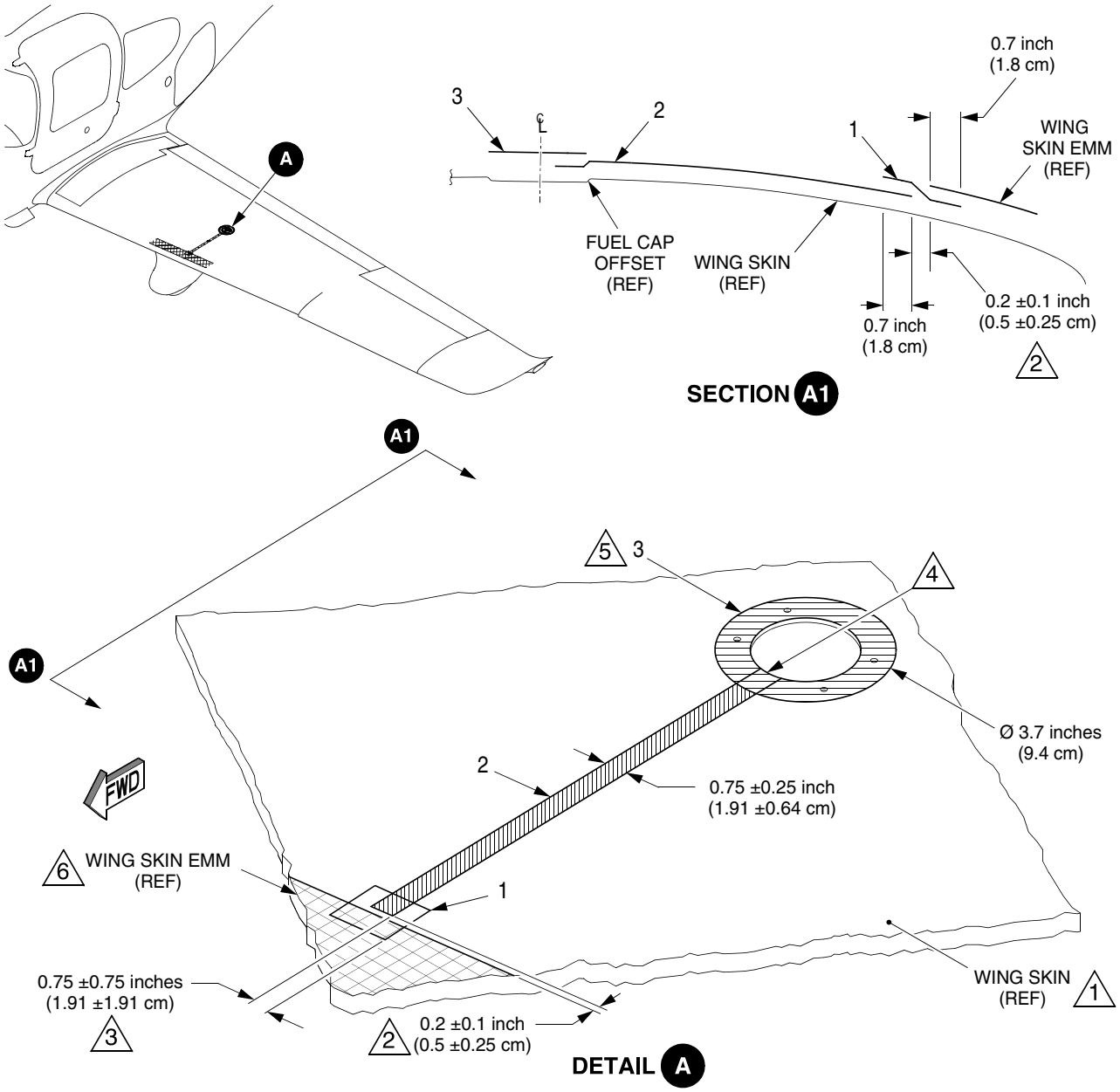
Note: It is permissible to burnish wing skin EMM to facilitate a suitable test point. (Refer to 51-20)

7 Measure resistance between aluminum mesh EMM and wing skin EMM to ensure ground path has been successful re-established.

(f) Perform Functional Test - Fuel Cap Assembly Ground Resistance. (Refer to 28-10)

(g) Repair wing skin and paint. (Refer to 51-20)

(h) Install fuel cap assembly. (Refer to 28-10)



Serials 1005 thru 1877, 1879 thru 1885.

NOTE

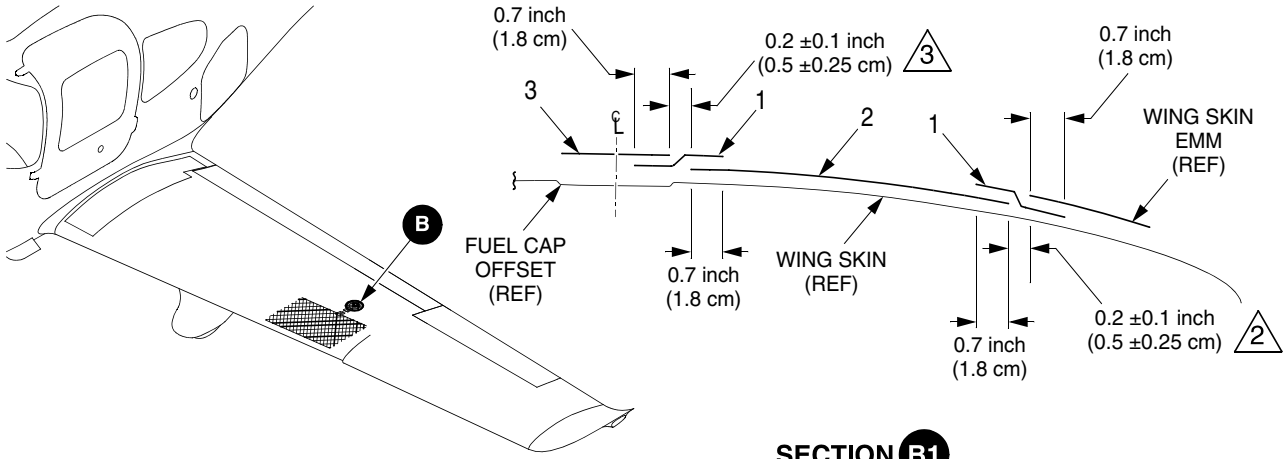
1. Remove only paint and body work necessary to expose fuel cap assembly ground path between wing skin EMM and fuel cap assembly.
2. Ensure 0.2 ±0.1 inch (0.5 ±0.25 cm) gap exists between carbon uni tape and wing skin EMM.
3. Ensure forward end of carbon uni tape is centered with copper mesh EMM by inboard/outboard overlap of 0.75 ±0.75 inches.
4. Ensure carbon uni tape extends onto fuel cap assembly offset and continues full distance to inner diameter of fuel cap assembly hole, and trim to match.
5. Press copper tape into place. Minor wrinkling is allowed but ensure copper tape is pressed flat. Copper tape may be darted or sliced to allow it to lie flat. Trim copper tape to match inner diameter of fuel cap assembly hole.
6. It is permissible to burnish wing skin EMM to facillitate a suitable test point.

LEGEND

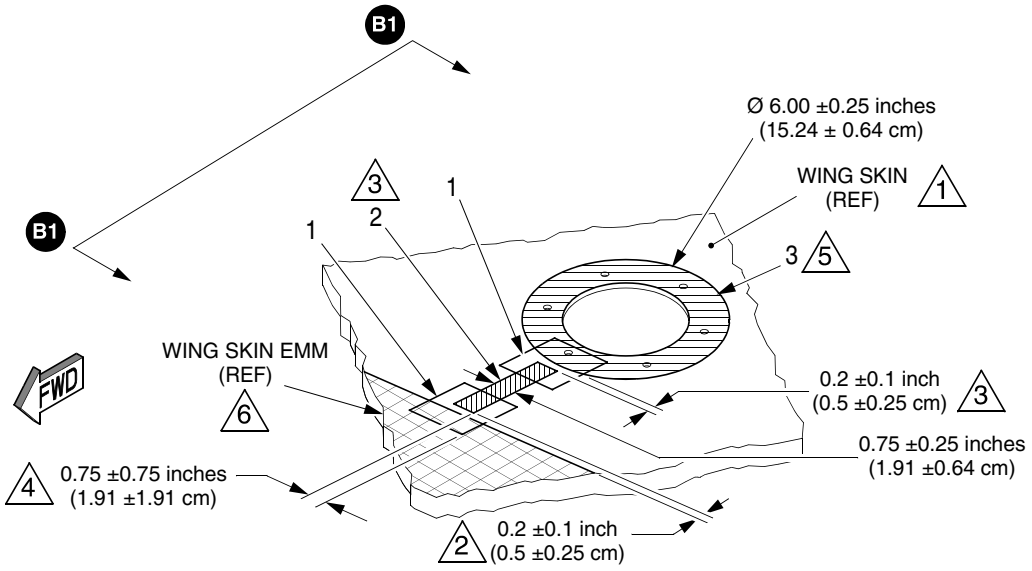
1. Copper Mesh EMM
2. Carbon Uni Tape
3. Copper Tape

SR20_MM57_3298

Figure 57-1012
Approved Repair - Ground Path Between Wing Skin EMM and Fuel Cap Assembly (Sheet 1 of 2)



SECTION B1



DETAIL B

Serials 1878, 1886 & subs.

NOTE

1. Remove only paint and body work necessary to expose fuel cap assembly ground path between wing skin EMM and fuel cap assembly.
2. Ensure 0.2 ±0.1 inch (0.5 ±0.25 cm) gap exists between carbon uni tape and wing skin EMM.
3. Ensure 0.2 ±0.1 inch (0.5 ±0.25 cm) gap exists between carbon uni tape and aluminum mesh EMM.
4. Ensure forward and aft ends of carbon uni tape is centered with copper mesh EMM by inboard/outboard overlap of 0.75 ±0.75 inches.
5. Press copper tape into place. Minor wrinkling is allowed but ensure copper tape is pressed flat. Copper tape may be darted or sliced to allow it to lie flat. Trim copper tape to match inner diameter of fuel cap assembly hole.
6. It is permissible to burnish wing skin EMM to facillitate a suitable test point.

LEGEND

1. Copper Mesh EMM
2. Carbon Uni Tape
3. Aluminum Mesh EMM

SR20_MM57_3292

Figure 57-1012
Approved Repair - Ground Path Between Wing Skin EMM and Fuel Cap Assembly (Sheet 2 of 2)

(9) Approved Repair - Aft Wing Attachment (See Figure 57-1013)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill	-	Any Source	Enlarge hardware holes.
Sandpaper	-	Any Source	Fit spacer flush to fuselage.
Primer	(Refer to 51-30)	(Refer to 51-30)	Prepare surface.
5-minute Epoxy	(Refer to 51-30)	(Refer to 51-30)	Install spacer.
Bolt	AN5-7A	Cirrus	Larger replacement hardware.
Washer	NAS1149D0463J or alternate NAS1149F0463P	Cirrus	Replace hardware.
Nut	MS21042-4 or alternate MS21044C4	Cirrus	Replace hardware.
Screw	MS24694S106	Cirrus	Replace hardware.
Washer	NAS1149D0463J or alternate NAS1149F0463P	Cirrus	Replace hardware.
Bushing	NAS75-04-006	Cirrus	Install into enlarge fuselage skin holes.
Nut	MS21042-4 or alternate MS21044C4	Cirrus	Replace hardware.

(b) Perform Removal - Wing Root Fairing. (Refer to 53-50)

(c) Perform Removal - Passenger Seats. (Refer to 25-10)

(d) Remove floor covering. (Refer to 25-10)

(e) Remove CF4L and CF4R access panels. (Refer to 06-00)

(f) Remove and discard existing nuts, washers, and bolts securing aft wing attachment clips to fuselage and aft floor.

CAUTION: Only enlarge holes in the fuselage skin, aft attach clip holes that correspond to aft floor holes, and aft floor. DO NOT enlarge holes on aft wing attach bracket, radius fills or the aft attach clip holes that correspond to the radius fills.

(g) Measure holes in fuselage skin, aft attach clips, and aft floor to determine which holes need to be enlarged.

CAUTION: Drill through aft attach clips and aft floor separately.

1 Using drill, enlarge any holes 0.225 inch (5.715 mm) or greater in diameter to 0.377 inch (9.576 mm).

(h) Install bushing to enlarged fuselage skin holes.

1 Wet install bushing into enlarged fuselage skin hole with 5-minute epoxy.

Note: bushing may be up to 0.005 inch (0.127 mm) underflush on both toolside and bagside fuselage.

2 Sand bushing if necessary to ensure it is flush with the bagside and toolside fuselage.

3 If bushing is sanded, prime all exposed fuselage surfaces. (Refer to 51-30)

(i) Install new larger bolt washer and nut through clips and aft floor.

1 Torque fastener to 80 to 95 in-lb (9.04 to 10.73 Nm). Apply torque stripe.

(j) Install replacement hardware through aft wing attach brackets, fuselage skin, clip, and radius fills.

1 Torque fastener to 80 to 95 in-lb (9.04 to 10.73 Nm). Apply torque stripe.

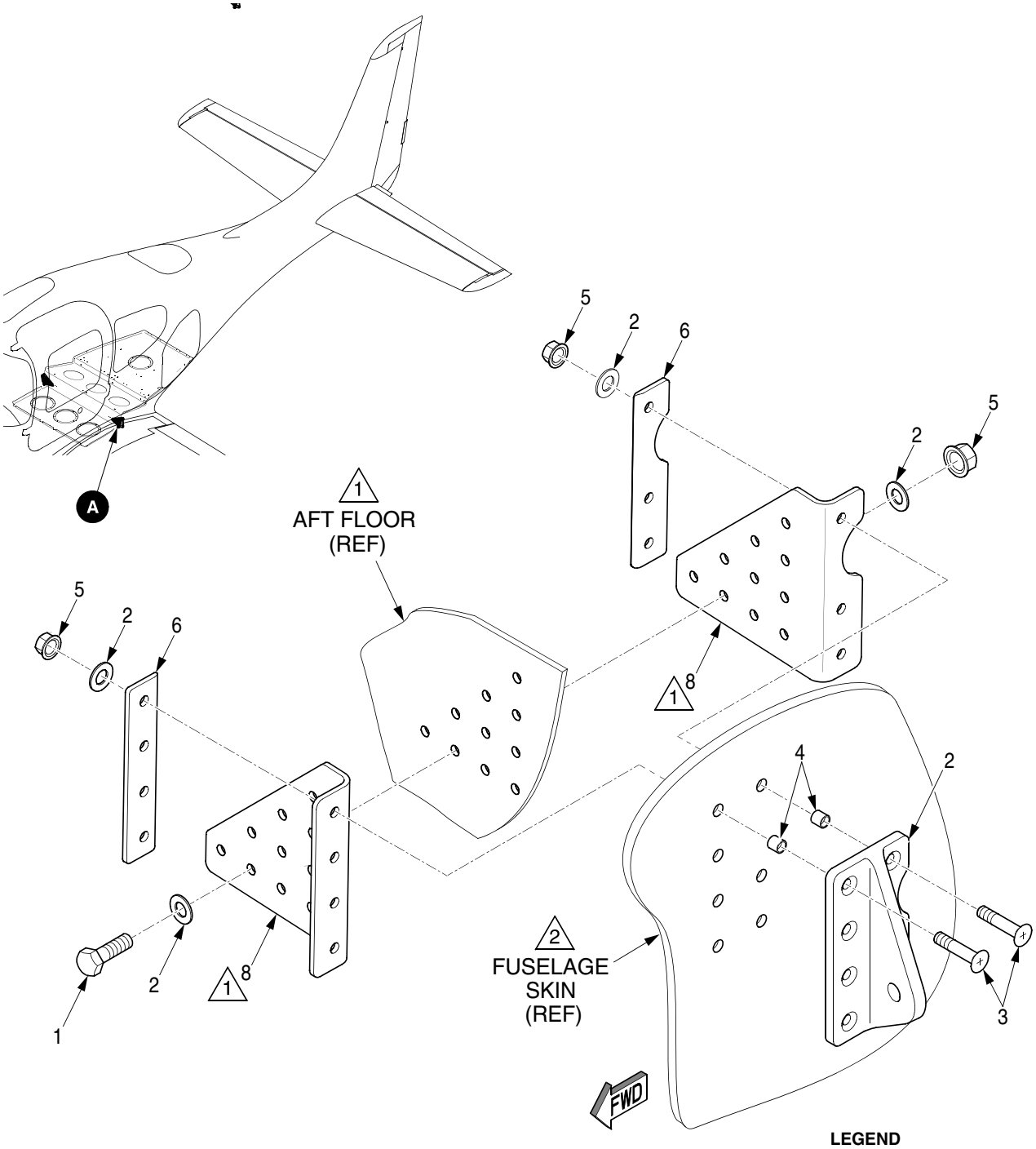
(k) Install CF4L and CF4R access panels. (Refer to 06-00)

(l) Install floor covering. (Refer to 25-10)

(m) Perform Removal - Passenger Seats. (Refer to 25-10)

(n) Perform Removal - Wing Root Fairing. (Refer to 53-50)

(o) Note repair in Aircraft Logbook.



NOTE

1. Drill through aft attach clips and aft floor seperately.
2. Only enlarge holes in fuselage skin. DO NOT enlarge holes on aft wing attach bracket, radius fill, or aft attach clip holes corresponding to holes on radius fills.

LEGEND

1. Bolt
2. Washer
3. Screw
4. Bushing
5. Nut
6. Radius Fill
7. Bracket, Aft Wing Attach
8. Clip, Aft atach

DETAIL A

SR20_MM57_5471

Figure 57-1013
Approved Repair - Aft Wing Attachment

EFFECTIVITY:
All

AUXILIARY STRUCTURE

1. DESCRIPTION

The leading edge of the wing is manufactured from composite materials. This airplane has a one-piece wing with individual wing tips. The wing tips are manufactured from composite materials. Each strobe light power supply is secured inside the corresponding wing tip. Stall strips are installed along the inboard leading edge of wing cuffs on both wings and promote a more gradual stall, prolonging aileron effectivity under stall conditions.

Serials 1886 & subs: A white recognition light is installed on the leading edge of each wing tip.

2. MAINTENANCE PRACTICES

A. Wing Tip - *Serials 1005 thru 1885* (See Figure 57-201)

(1) Removal - Wing Tip

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

Note: Place a pad between wing tip and top of wing to avoid damaging paint.

(c) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.

(d) Remove clamp securing braided ground strap to wing wire harness conduit.

(e) Disconnect wire harnesses.

1 Remove cable ties securing braided ground strap to wing wire harness.

2 Disconnect navigation light connector.

3 Disconnect power connector from strobe light power supply.

4 *Serials 1005 thru 1316:* Remove strobe light power supply mounting screw securing wire harness terminal ring.

5 *Serials 1317 thru 1885:* Disconnect terminal ring connector and remove cable tie securing wires together.

(f) Remove wing tip from airplane.

(2) Installation - Wing Tip

(a) Connect wire harnesses.

1 Connect power connector to strobe light power supply.

2 *Serials 1005 thru 1316:* Position terminal ring between strobe light power supply and shear web and secure with screw.

3 *Serials 1317 thru 1885:* Connect terminal ring connector and install cable tie securing wires together.

4 Connect navigation light connector.

(b) Wrap braided ground cable around wire harness and secure with cable ties.

(c) Burnish wing conduit to ensure proper contact between braided ground strap and conduit.

(d) Position braided ground strap to wing conduit and secure with clamp.

(e) Verify resistance from anti-collision strobe light assembly to airplane ground is less than 4 ohms. If resistance is greater than 4 ohms, remove braided ground strap and repeat conduit burnishing.

(f) Position wing tip to wing and secure with screws.

(g) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.

(h) Verify proper anti-collision strobe light operation.

B. Wing Tip - *Serials 1886 & subs* **(See Figure 57-201)**

(1) Removal - Wing Tip

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull NAV LIGHTS and STROBE LIGHTS circuit breakers.

Note: Place a pad between wing tip and top of wing to avoid damaging paint.

(c) Remove screws securing wing tip to wing and slide wing tip outboard to remove. Carefully flip wing tip upside down and rest wing tip on top of wing.

(d) Disconnect wire harnesses.

1 Disconnect recognition light connector.

2 Disconnect navigation light connector.

3 Disconnect power connector from strobe light power supply.

4 Disconnect terminal ring connector and remove cable tie securing wires together.

(e) Remove wing tip from airplane.

(2) Installation - Wing Tip

(a) Connect wire harnesses.

1 Connect power connector to strobe light power supply.

2 Connect terminal ring connector and install cable tie securing wires together.

3 Connect navigation light connector.

4 Connect recognition light connector.

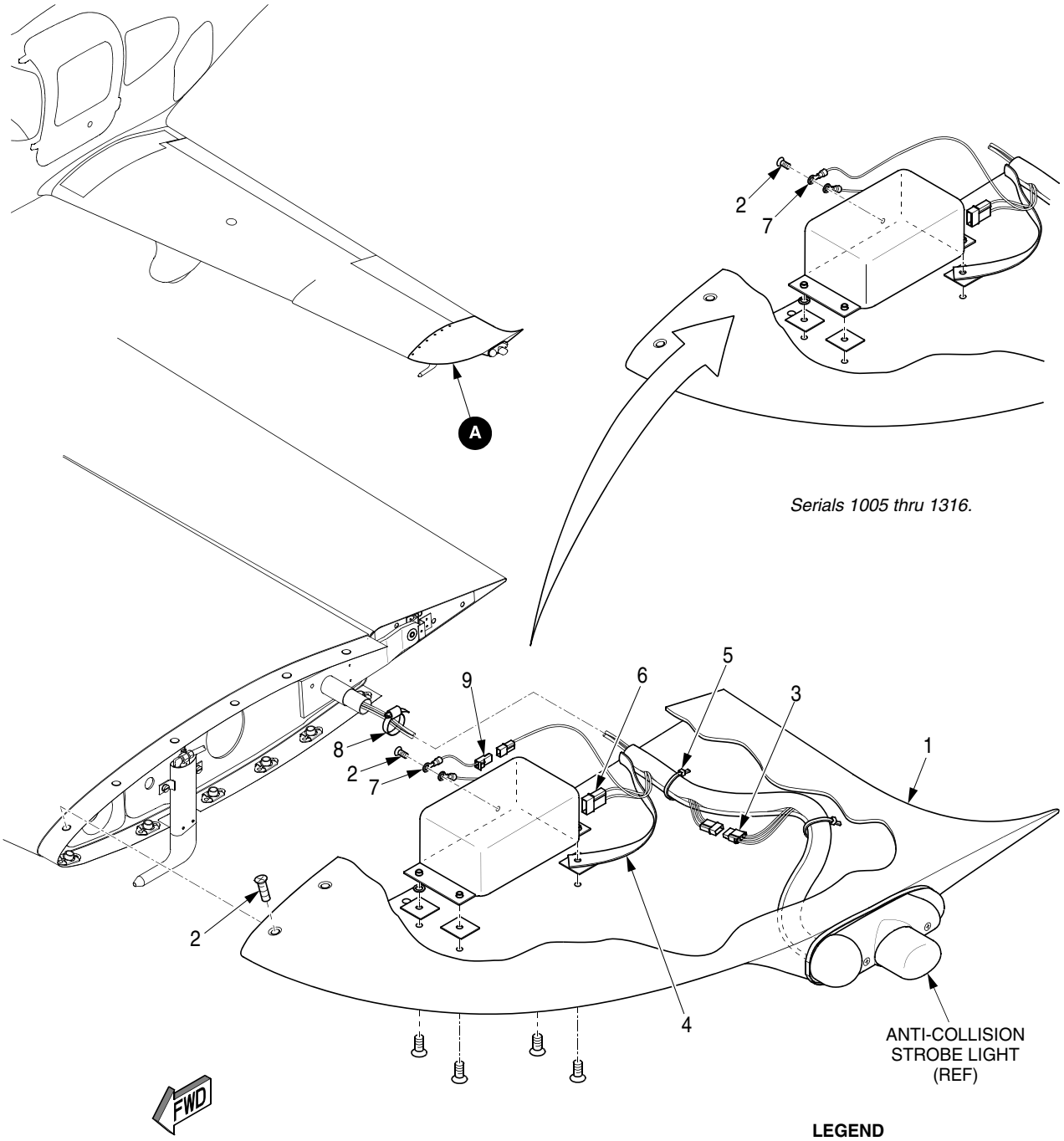
(b) Position wing tip to wing and ensure wing tip fully engages mounting clips on wing.

(c) Install screws securing wing tip to wing.

(d) Reset NAV LIGHTS and STROBE LIGHTS circuit breakers.

(e) Verify proper anti-collision strobe light operation.

(f) Verify proper recognition light operation.



LEGEND

1. Wing Tip
2. Screw
3. Navigation Light Connector
4. Braided Ground Cable
5. Cable Tie
6. Strobe Light Power Connector
7. Terminal Ring
8. Clamp
9. Terminal Ring Connector

DETAIL A

Serials 1005 thru 1877, 1879 thru 1885.

SR20_MM57_1676C

Figure 57-201
Wing Tip Installation - Serials 1005 thru 1885 (Sheet 1 of 2)

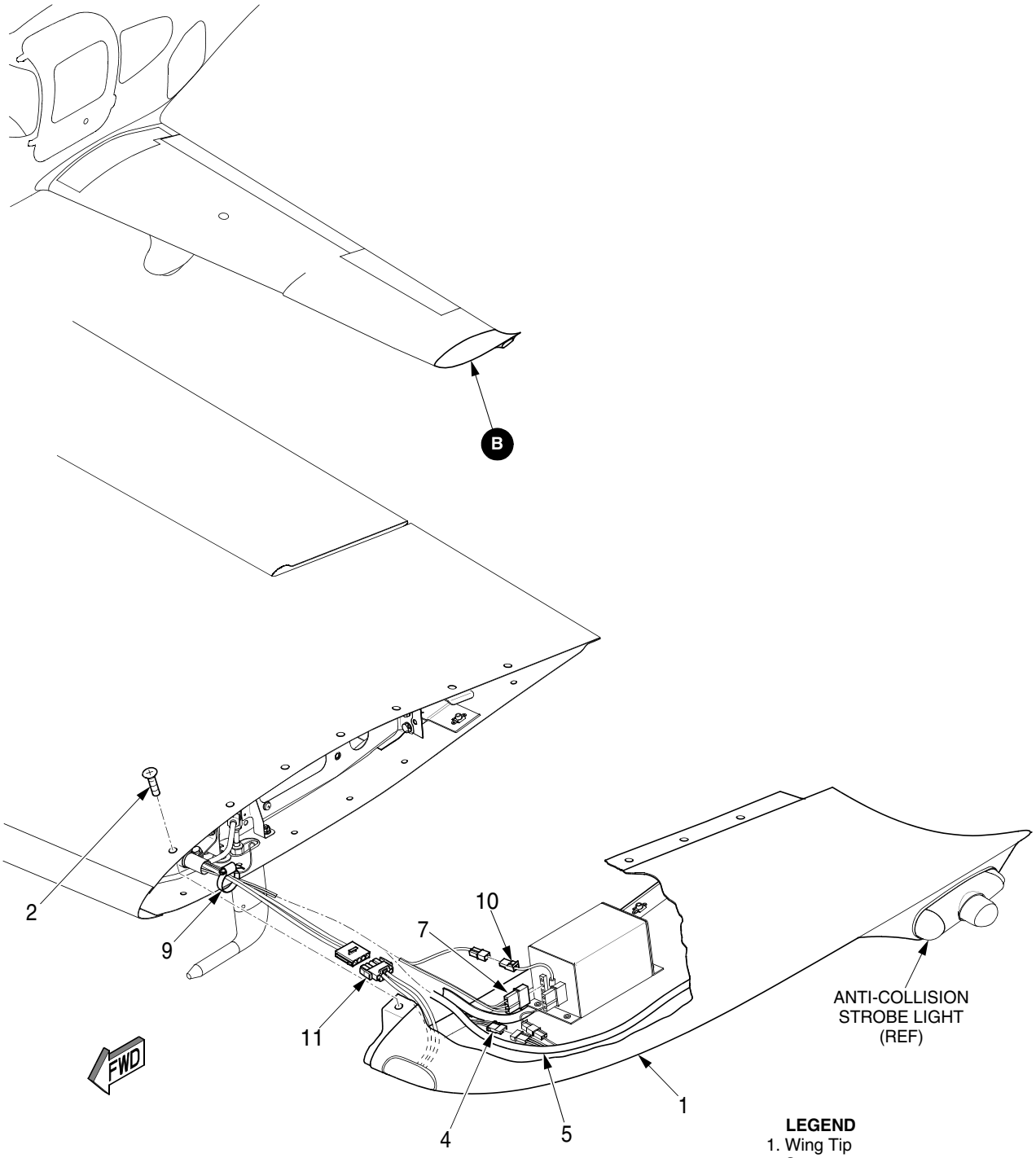


Figure 57-201
Wing Tip Installation - Serials 1886 & subs (Sheet 2 of 2)

C. Stall Strips - *Serials 1005 thru 1885* (See Figure 57-202)

WARNING: **Airplane is rendered unairworthy and may not be flown with stall strip(s) removed.**

(1) Removal - Stall Strips

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Blunt-Edged Chisel	-	Any Source	Stall strip removal.
Sandpaper	400-grit	Any Source	Adhesive removal.
Isopropyl Alcohol	-	Any Source	Solvent cleaning.

(b) Using chisel, remove stall strips from wing.

(c) Lightly sand wing to remove residual adhesive.

(d) Solvent clean wing surface with isopropyl alcohol.

(2) Installation - Stall Strips

CAUTION: When reinstalling a stall strip that has become dislodged from wing leading edge, if exact location of previously installed stall strip is not apparent, i.e. through the lack of adhesive remnant or discoloration in area of previous installation location, install the stall strip in accordance with the following steps and contact Cirrus Design to schedule a test flight by a Cirrus certified test pilot.

If location of previously installed stall strip is readily apparent, install the stall strip in same location in accordance with the following steps. No test flight is required.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	-	Any Source	Solvent cleaning.
5-Minute Epoxy	14240	Devcon Danvers,MA 01923 800-626-7226	Bonding stall strip to wing.
Mounting Fixtures: LH Outboard RH Outboard RH Inboard LH Inboard	 T1087 T1088 T0780 T0779	Cirrus Design	Stall strip installation.

(b) Solvent clean bonding surfaces of wing and stall strip.

(c) If exact location of previously installed stall strip ***is not*** readily apparent:

1 Apply adhesive to back of outboard stall strip.

CAUTION: Ensure gap between stall strip and wing cuff does not exceed 0.05 inch (1.27 mm).

2 Position outboard stall strip adjacent to wing cuff. Verify gap between stall strip and wing cuff does not exceed 0.05 inch (1.27 mm) and press firmly into place.

3 Using mounting fixture, clamp outboard stall strip against wing.
4 Apply adhesive to back of inboard stall strip.
5 Position outboard end of inboard stall strip 70.6 inches (179.3 cm) from wing cuff.
6 Using mounting fixture, clamp inboard stall strip against wing.

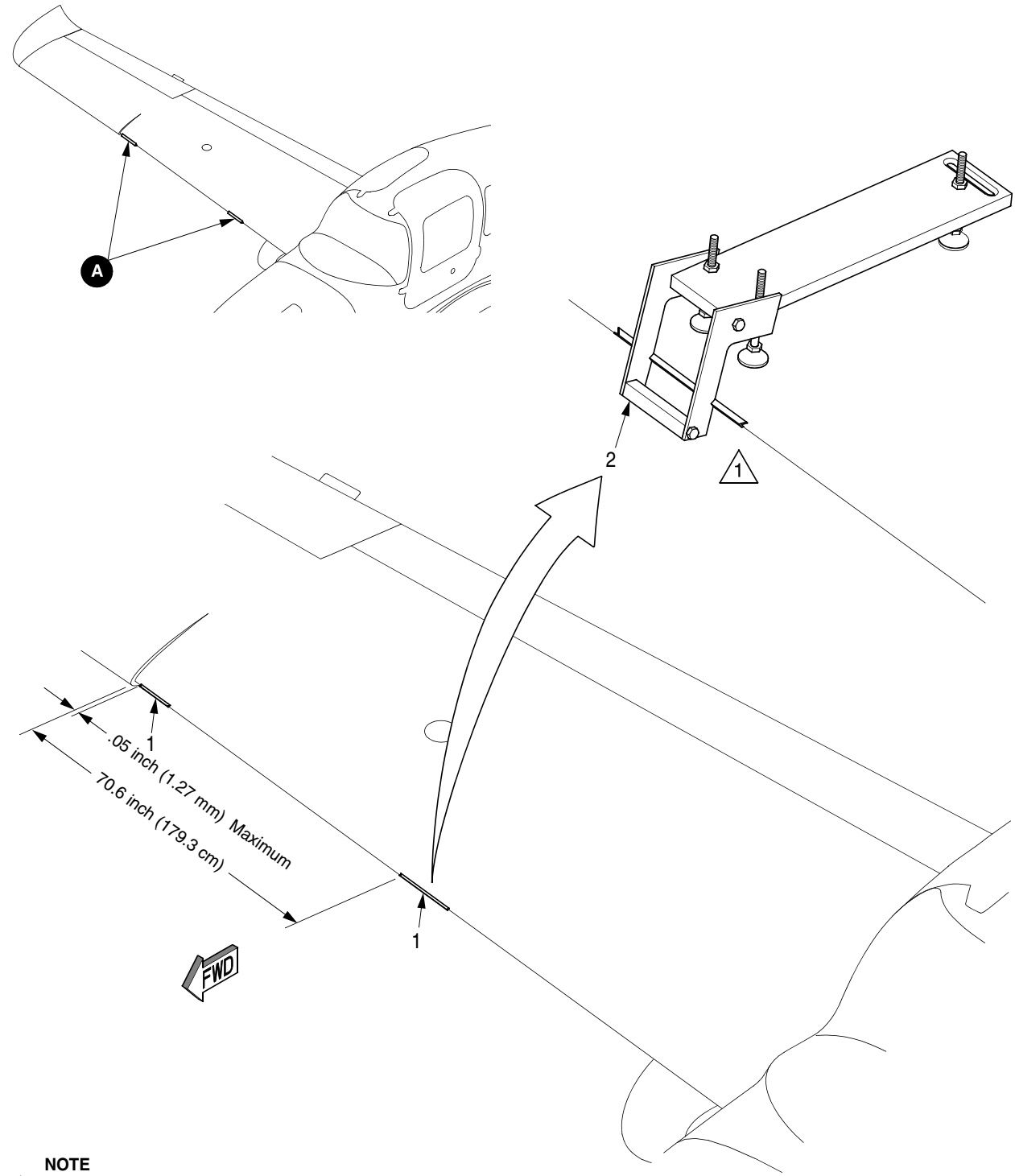
(d) If exact location of previously installed stall strip ***is*** readily apparent:
1 Apply adhesive to back of outboard stall strip.
2 Position outboard stall strip over previous installation area and press firmly into place.
3 Using mounting fixture, clamp outboard stall strip against wing.
4 Apply adhesive to back of inboard stall strip.
5 Position inboard stall strip over previous installation area and press firmly into place.
6 Using mounting fixture, clamp inboard stall strip against wing.

(e) Fill stall strip ends flush with adhesive.
(f) Wipe excess adhesive from edge of stall strips.
(g) Allow adhesive to cure.
(h) Remove mounting fixtures.
(i) If necessary, ensure test flight is performed by a Cirrus Design authorized test pilot before return to service.

D. Stall Strips - *Serials 1886 & subs*

WARNING: Airplane is rendered unairworthy and may not be flown with stall strip(s) removed.

(1) Removal - Stall Strips
  (a) Contact Cirrus Design for disposition.
(2) Installation - Stall Strips
  (a) Contact Cirrus Design for disposition.



NOTE

1 Fill stall strip ends flush with adhesive.

LEGEND

1. Stall Strip
2. Mounting Fixture

DETAIL A

Serials 1005 thru 1877, 1879 thru 1885.

SR20_MM57_1811B

Figure 57-202
Stall Strip Installation - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885

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PLATES/SKIN

1. DESCRIPTION

Access openings with covers are provided between ribs to allow access to the integral fuel tanks, fuel lines, aileron cove, aileron hinge (*Serials 1886 & subs*), and wing electrical components. The fuel tank access panels allow access for servicing the integral fuel tank components. The access panels located next to the fuselage on the aft wing allow access to the fuel collector tanks.

2. MAINTENANCE PRACTICES

A. Collector and Fuel Tank Access Panels

(1) Removal - Collector and Fuel Tank Access Panels

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fiber Chisel	-	Any Source	Sealant removal.
Sandpaper	200-grit	Any Source	Sealant removal.

(b) Determine access panel(s) to be removed. (Refer to 06-00)

(c) Ground airplane exhaust pipe to the earth and a suitable fuel drainage container.

(d) Disconnect battery. (Refer to 24-30)

(e) Drain fuel tank. (Refer to 12-10)

(f) Remove screws securing fuel tank panel.

(g) Using fiber chisel and 200-grit sandpaper, remove all sealant from access panel and fuel tank.

(2) Installation - Collector and Fuel Tank Access Panels

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Gasket Sealant	AC-240 B-1/2	Dynamold, Inc. Fort Worth, TX. 76107 817-335-0862	Sealant.

(b) Solvent clean access panel and opening. (Refer to 20-30)

(c) Seal fuel tank access panel using access panel sealant. (Refer to 20-10)

(d) Position fuel tank access panel to wing and secure with screws.

(e) After sealant has cured, fill fuel tank. (Refer to 12-10)

(f) Inspect fuel system for any signs of leakage. Repair as needed. (Refer to 28-10)

(g) Connect battery. (Refer to 24-30)

(h) Remove ground from airplane exhaust pipe.

B. Wing Access Panels

(1) Removal - Wing Access Panels

(a) Determine access panel to be removed. (Refer to 06-00)

(b) Remove screws securing access panel to wing.

(c) Remove access panel.

(2) Installation - Wing Access Panels

(a) Determine access panel to be installed. (Refer to 06-00)

(b) Position access panel to wing and secure with screws.

C. Aileron Cove Cover

(1) Removal - Aileron Cove Cover

(a) Remove screws securing aileron cove cover to wing. Remove aileron cove cover from airplane.

(2) Installation - Aileron Cove Cover

(a) Position aileron cove cover to wing and gently push upward to engage mounting clips.

(b) Install screws securing aileron cove cover to wing.

D. Wing Skin

The wing is manufactured from composite laminate materials. Refer to Chapter 51 for composite repair procedures. (Refer to 51-00)

ATTACH FITTINGS

1. DESCRIPTION

Wing loads are transferred to the fuselage through four wing-attach points, two which are located under each front seat and the remaining two on either sidewall just aft of the rear seats. The forward attach points transfer load into the spar tunnel. The aft attach points transfer load into the fuselage skin and aft floor.

2. MAINTENANCE PRACTICES

A. Wing Attachments

For maintenance practices pertinent to wing attach fittings, see Wing Structure. (Refer to 57-10)

B. Outboard Aileron Hinge - *Serials 1005 thru 1885* (See Figure 57-401)

(1) Removal - Outboard Aileron Hinge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill Bit	#30	Any Source	Remove conduit bracket rivet.

(b) Pull PITOT HEAT circuit breaker.

(c) Remove aileron assembly. (Refer to 57-50)

(d) If removing LH outboard aileron hinge, disconnect pitot line and pitot heat electrical connector from pitot tube assembly. (Refer to 34-10)

(e) Remove bolts and washers securing hinge bracket of outboard aileron hinge to aft shear web of wing assembly.

(f) Use #30 drill bit to drill out rivet securing conduit bracket to conduit tube sheath.

(g) Remove bolts and washers securing conduit bracket, outboard aileron hinge, and any shims to wing assembly.

(h) Remove outboard aileron hinge from wing assembly.

(2) Installation - Outboard Aileron Hinge

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Air Riveter	HUCAK175A	Huck International, Inc. Tucson, AZ 85714 800-234-4825	Install conduit bracket rivet.
Rivet	NAS9301B4-2	Any Source	Replace conduit bracket rivet.

(b) Position outboard aileron hinge and any shims into position.

(c) Install bolts and washers securing conduit bracket, outboard aileron hinge, and any shims to rib of wing assembly. Tighten conduit bracket bolts to 20 - 25 in-lb (2.26 - 2.82 Nm).

(d) Install bolts and washers securing hinge bracket, and outboard aileron hinge to aft shear web of wing assembly. Tighten hinge bracket bolts to 50 - 70 in-lb (5.65 - 7.91 Nm).

(e) Secure conduit bracket on outboard aileron hinge to conduit tube sheath with rivet.

(f) If installing LH outboard aileron hinge, connect pitot line and pitot heat electrical connector to pitot tube assembly. (Refer to 34-10)

(g) Reset PITOT HEAT circuit breaker.

(h) If LH outboard aileron hinge was installed, perform Functional Test - Pitot System Leak Test. (Refer to 34-10)

(i) If LH outboard aileron hinge was installed, perform Operational Test - Pitot Heat. (Refer to 34-10)

(j) Install aileron assembly. (Refer to 57-50)

(3) Inspection/Check - Outboard Aileron Hinge Shimming

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shim: 0.020 - 0.040 inch (0.508 - 1.016 mm)	17105-001	Cirrus Design	Shim.
Shim: 0.040 - 0.060 inch (1.016 - 1.524 mm)	17105-002	Cirrus Design	Shim.
Shim: 0.060 - 0.080 inch (1.524 - 2.032 mm)	17105-003	Cirrus Design	Shim.
Shim: 0.080 - 0.100 inch (2.032 - 2.540 mm)	17105-004	Cirrus Design	Shim.
Shim: 0.080 - 0.120 inch (2.032 - 3.048 mm)	17105-005	Cirrus Design	Shim.

(b) Remove aileron assembly. (Refer to 57-50)

(c) Remove bolts and washers securing conduit bracket, outboard aileron hinge, and any shims to rib of wing assembly.

Note: Up to two tapered shims may be required to obtain allowable tolerance.

(d) Align shim(s) such that thickest edge of shim(s) are oriented forward and position shim(s) to conduit bracket installation area on rib of wing assembly.

CAUTION: Shimming may require longer grip bolts. If so, call Cirrus Design Customer Service.

(e) Install bolts and washers securing conduit bracket, outboard aileron hinge, and any shims to rib of wing assembly. Tighten conduit bracket bolts to 20 - 25 in-lb (2.26 - 2.82 Nm).

(f) Install aileron assembly. (Refer to 57-50)

C. Outboard Aileron Hinge - *Serials 1886 & subs* (See Figure 57-402)

(1) Removal - Outboard Aileron Hinge

(a) Remove aileron assembly. (Refer to 57-50)

(b) Remove bolts and washers securing hinge outboard flange to aft shear web of wing assembly.

(c) Remove bolts, washers, and nuts securing hinge inboard flange to aft shear web of wing assembly.

(d) Remove outboard aileron hinge from wing assembly.

(2) Installation - Outboard Aileron Hinge

(a) Position hinge to aft shear web of wing assembly and secure hinge inboard flange with bolts, washers, and nuts.

(b) Install bolts and washers securing hinge outboard flange to aft shear web of wing assembly.

(c) Visually inspect hinge is flush with aft shear web. Verify maximum gap of 0.005 inch (0.127 mm) does not occur over more than 40% of mating surface.

(d) Install aileron assembly. (Refer to 57-50)

D. Inboard Aileron Hinge (See Figure 57-401) (See Figure 57-402)

(1) Removal - Inboard Aileron Hinge

(a) Remove aileron assembly. (Refer to 57-50)

(b) Remove aileron actuation pulley from pulley bracket on wing assembly. (Refer to 27-10)

(c) Remove bolts, washers, and nuts securing pulley bracket and inboard aileron hinge to wing assembly.

(d) Remove inboard aileron hinge from wing assembly.

(2) Installation - Inboard Aileron Hinge

(a) Position inboard aileron hinge and pulley bracket to wing assembly and secure with bolts, washers, and nuts.

(b) Install aileron actuation pulley to pulley bracket on wing assembly. (Refer to 27-10)

(c) Safety wire aileron hinge bolts to safety wire clips. (Refer to 20-50)

(d) Install aileron assembly. (Refer to 57-50)

(e) Perform Adjustment/Test - Aileron System Rigging. (Refer to 27-10)

E. Outboard Flap Hinge Assembly - *Serials 1005 thru 1885* (See Figure 57-401)

(1) Removal - Outboard Flap Hinge Assembly
- (a) Remove aileron assembly. (Refer to 57-50)
- (b) Remove flap assembly. (Refer to 57-50)
- (c) Remove inboard aileron hinge. (Refer to 57-40)
- (d) Remove flap hinge from wing assembly.

(2) Disassembly - Outboard Flap Hinge Assembly
- (a) Remove retaining ring from fairlead on outboard flap hinge.
- (b) Slide fairlead from outboard flap hinge.
- (c) Remove bolts, washers, and nuts securing hinge brackets to wing assembly.

(3) Assembly - Outboard Flap Hinge Assembly
- (a) Install bolts, washers, and nuts securing hinge brackets to wing assembly.
- (b) Install fairlead to outboard side of outboard flap hinge.
- (c) Install retaining ring securing fairlead to outboard flap hinge.

(4) Installation - Outboard Flap Hinge Assembly
- (a) Position outboard flap hinge between brackets secured to wing assembly.
- (b) Install inboard aileron hinge. (Refer to 57-40)
- (c) Install flap assembly. (Refer to 57-50)
- (d) Install aileron assembly. (Refer to 57-50)

F. Outboard Flap Hinge Assembly - *Serials 1886 & subs* **(See Figure 57-402)**

(1) Removal - Outboard Flap Hinge Assembly

(a) Drain fuel tank. (Refer to 12-10)

(b) Remove wing access panel LW8 and LW10 or RW8 and RW10. (Refer to 06-00)

(c) Remove aileron assembly. (Refer to 57-50)

(d) Remove flap assembly. (Refer to 57-50)

(e) Remove inboard aileron hinge. (Refer to 57-40)

(f) Remove bolts, washers, and nuts securing flap hinge to aft shear web of wing assembly. Remove flap hinge from airplane.

(2) Installation - Outboard Flap Hinge Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fuel Sealant	MIL-S-8802 Type II, Class B	Any Source	Seal hinge bolts in fuel tank.

Note: Wet install inboard bolts with bolt heads facing forward. (Refer to 20-10)

(b) Position flap hinge to aft shear web of wing assembly and secure with bolts, washers, and nuts.

(c) Visually inspect hinge is flush with aft shear web. Verify maximum gap of 0.005 inch (0.127 mm) does not occur over more than 40% of mating surface.

(d) Install inboard aileron hinge. (Refer to 57-40)

(e) Install flap assembly. (Refer to 57-50)

(f) Install aileron assembly. (Refer to 57-50)

(g) Install wing access panel LW8 and LW10 or RW8 and RW10. (Refer to 06-00)

(h) Replenish fuel tank. (Refer to 12-10)

EFFECTIVITY:
Serials 1886 & subs

G. Mid Flap Hinge Assembly - *Serials 1005 thru 1885* (See Figure 57-401)

(1) Removal - Mid Flap Hinge Assembly
- (a) Remove aileron assembly. (Refer to 57-50)
- (b) Remove flap assembly. (Refer to 57-50)
- (c) Remove bolts, washers, and nuts securing conduit bracket and fairlead clip to brackets.
- (d) Remove mid flap hinge from wing assembly.

(2) Disassembly - Mid Flap Hinge Assembly
- (a) Remove retaining ring from fairlead on mid flap hinge.
- (b) Slide fairlead from mid flap hinge.
- (c) Remove bolts, washers, and nuts securing hinge brackets and backing plates to wing assembly.
- (d) Remove retaining ring from conduit bracket.
- (e) Slide fairlead from fairlead clip and conduit bracket.
- (f) Remove screw securing clamp to conduit bracket.

(3) Assembly - Mid Flap Hinge Assembly
- (a) Install screw securing clamp to conduit bracket.
- (b) Install fairlead to outboard side of fairlead clip and conduit bracket.
- (c) Install retaining ring securing fairlead clip to conduit bracket.
- (d) Install bolts, washers, and nuts securing hinge brackets and backing plates to wing assembly.
- (e) Install fairlead to outboard side of mid flap hinge.
- (f) Install retaining ring securing fairlead to mid flap hinge.

(4) Installation - Mid Flap Hinge Assembly
- (a) Position mid flap hinge and brackets to wing assembly.
- (b) Install bolts, washers, and nuts securing conduit bracket and fairlead clip to brackets.
- (c) Install flap assembly. (Refer to 57-50)
- (d) Install aileron assembly. (Refer to 57-50)

H. Mid Flap Hinge Assembly - *Serials 1886 & subs* (See Figure 57-402)

(1) Removal - Mid Flap Hinge Assembly

(a) Drain fuel tank. (Refer to 12-10)

(b) Remove wing access panel LW7 or RW7. (Refer to 06-00)

(c) Remove flap assembly. (Refer to 57-50)

(d) Remove bolts, washers, and nuts securing flap hinge to aft shear web.

(e) Remove mid flap hinge from wing assembly.

(2) Installation - Mid Flap Hinge Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fuel Sealant	MIL-S-8802 Type II, Class B	Any Source	Seal hinge bolts in fuel tank.

Note: Wet install bolts with bolt heads facing forward. (Refer to 20-10)

(b) Position flap hinge to aft shear web of wing assembly and secure with bolts, washers, and nuts.

(c) Visually inspect hinge is flush with aft shear web. Verify maximum gap of 0.005 inch (0.127 mm) does not occur over more than 40% of mating surface.

(d) Install flap assembly. (Refer to 57-50)

(e) Install wing access panel LW7 or RW7. (Refer to 06-00)

(f) Replenish fuel tank. (Refer to 12-10)

I. Inboard Flap Hinge Assembly - *Serials 1005 thru 1885* **(See Figure 57-401)**

(1) Removal - Inboard Flap Hinge Assembly
- (a) Remove aileron assembly. (Refer to 57-50)
- (b) Remove flap assembly. (Refer to 57-50)
- (c) Remove bolts, washers, and nuts securing conduit bracket and fairlead clip to bracket and inboard flap hinge.
- (d) Remove inboard flap hinge from wing assembly.

(2) Disassembly - Inboard Flap Hinge Assembly
- (a) Remove retaining ring from fairlead on inboard flap hinge.
- (b) Slide fairlead from inboard flap hinge.
- (c) Remove bolts, washers, and nuts securing hinge bracket to wing assembly.
- (d) Remove retaining ring from fairlead clip on conduit bracket.
- (e) Slide fairlead from fairlead clip and conduit bracket.
- (f) Remove screw securing clamp to conduit bracket.

(3) Assembly - Inboard Flap Hinge Assembly
- (a) Install screw securing clamp to conduit bracket.
- (b) Install fairlead to inboard side of conduit bracket and fairlead clip.
- (c) Install retaining ring securing fairlead clip to conduit bracket.
- (d) Install bolts, washers, and nuts securing hinge bracket to wing assembly
- (e) Install fairlead to outboard side of inboard flap hinge.
- (f) Install retaining ring securing fairlead to inboard flap hinge.

(4) Installation - Inboard Flap Hinge Assembly
- (a) Position inboard flap hinge to outboard side of bracket.
- (b) Install bolts, washers, and nuts securing conduit bracket and fairlead clip to bracket and inboard flap hinge.
- (c) Install flap assembly. (Refer to 57-50)
- (d) Install aileron assembly. (Refer to 57-50)

J. Inboard Flap Hinge Assembly - *Serials 1886 & subs* **(See Figure 57-402)**

(1) Removal - Inboard Flap Hinge Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Fuel Sealant	MIL-S-8802 Type II, Class B	Any Source	Seal hinge bolts in fuel tank.

(b) Drain fuel tank. (Refer to 12-10)

(c) Remove wing access panel LW3 or RW3. (Refer to 06-00)

(d) Remove flap assembly. (Refer to 57-50)

(e) Remove bolt, washers, and nuts securing flap hinge to aft shear web of wing assembly.

(f) Remove inboard flap hinge from wing assembly.

(2) Installation - Inboard Flap Hinge Assembly

Note: Wet install bolts with bolt heads facing forward. (Refer to 20-10)

(a) Position flap hinge to aft shear web of wing assembly and secure with bolts, washers, and nuts.

(b) Visually inspect hinge is flush with aft shear web. Verify maximum gap of 0.005 inch (0.127 mm) does not occur over more than 40% of mating surface.

(c) Install flap assembly. (Refer to 57-50)

(d) Install wing access panel LW3 or RW3. (Refer to 06-00)

(e) Replenish fuel tank. (Refer to 12-10)

EFFECTIVITY:
Serials 1886 & subs

K. Lower Landing Gear Attach Bracket - *Serials 1005 thru 1885* **(See Figure 57-401)**

(1) Removal - Lower Landing Gear Attach Bracket

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Slide Hammer	-	Any Source	Remove lower attach bracket.
Female-To-Female Threaded Adapter	0.375 inch (0.953 cm)	Any Source	Remove lower attach bracket.

(b) Remove main gear fairings. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

CAUTION: When strut clamp is removed, exercise caution to prevent strut assembly from coming into contact with wing skin.

(d) At main gear assembly, remove clamp securing strut assembly to canted rib. (Refer to 32-10)

(e) Allow strut assembly to swing gently downward.

(f) Install slide hammer to female-to-female threaded adapter. Attach 0.375 inch (0.953 cm) female end of adapter to one of the lower attach bracket bolts.

CAUTION: Use care to not delaminate wing skin when removing bracket assembly.

(g) Use sharp, rapid movements with slide hammer until end of bracket assembly is loosened from wing skin.

(h) Detach slide hammer assembly from bolt and repeat on opposite bolt. Alternate as necessary until bracket becomes detached from wing skin.

(i) Remove the lower gear attach bracket bolts and washers. Remove lower attach bracket.

(2) Installation - Lower Landing Gear Attach Bracket

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Frekote NC700 Release Agent or Release Tape, Teflon, 1 inch	50862-001 or 50614-001	Cirrus Design	Installation.

(b) Remove existing liquid shim material.

(c) Solvent clean attach bracket with isopropyl alcohol. (Refer to 20-30)

(d) Apply release agent (Frekote NC700 or release tape) to inner surfaces of attach bracket.

(e) Prepare liquid shim. (Refer to 51-30)

(f) Inject a 0.375 inch (9.50 mm) wide bead of liquid shim across the entire width (inner surface) of the attach bracket.

CAUTION: Do not torque attach bracket bolts to final torque value of 60 in-lb (6.8 Nm) plus drag torque until after the liquid shim has fully cured. If bolts are torqued before liquid shim is allowed to fully cure, the attach bracket may become deformed and allow the bolts to become improperly torqued after liquid shim has fully cured.

(g) Slide attach bracket up into position and loosely secure bolts and washers until fitting is properly seated.

(h) Allow liquid shim to post-cure. (Refer to 51-20)

(i) Final torque bolts to 60 in-lb (6.8 Nm) plus drag torque.

(j) At main gear assembly, install clamp securing strut assembly to canted rib. (Refer to 32-10)

(k) Install main gear fairings. (Refer to 32-10)

L. Lower Landing Gear Attach Bracket - *Serials 1886 & subs* **(See Figure 57-402)**

(1) Removal - Lower Landing Gear Attach Bracket

(a) Remove main landing gear. (Refer to 32-10)

(b) Remove bolts, washers, and nuts securing lower landing gear attach bracket to wing.

(2) Installation - Lower Landing Gear Attach Bracket

(a) Position lower landing gear attach bracket to wing and secure with bolts, washers, and nuts.

(b) Install main landing gear. (Refer to 32-10)

M. Upper Landing Gear Attach Bracket - *Serials 1005 thru 1885* (See Figure 57-401)

(1) Removal - Upper Landing Gear Attach Bracket

(a) Remove main landing gear. (Refer to 32-10)

(b) Remove collector tank. (Refer to 28-10)

(c) Remove bolts, washers, and locknuts securing attach bracket to wing.

(2) Installation - Upper Landing Gear Attach Bracket

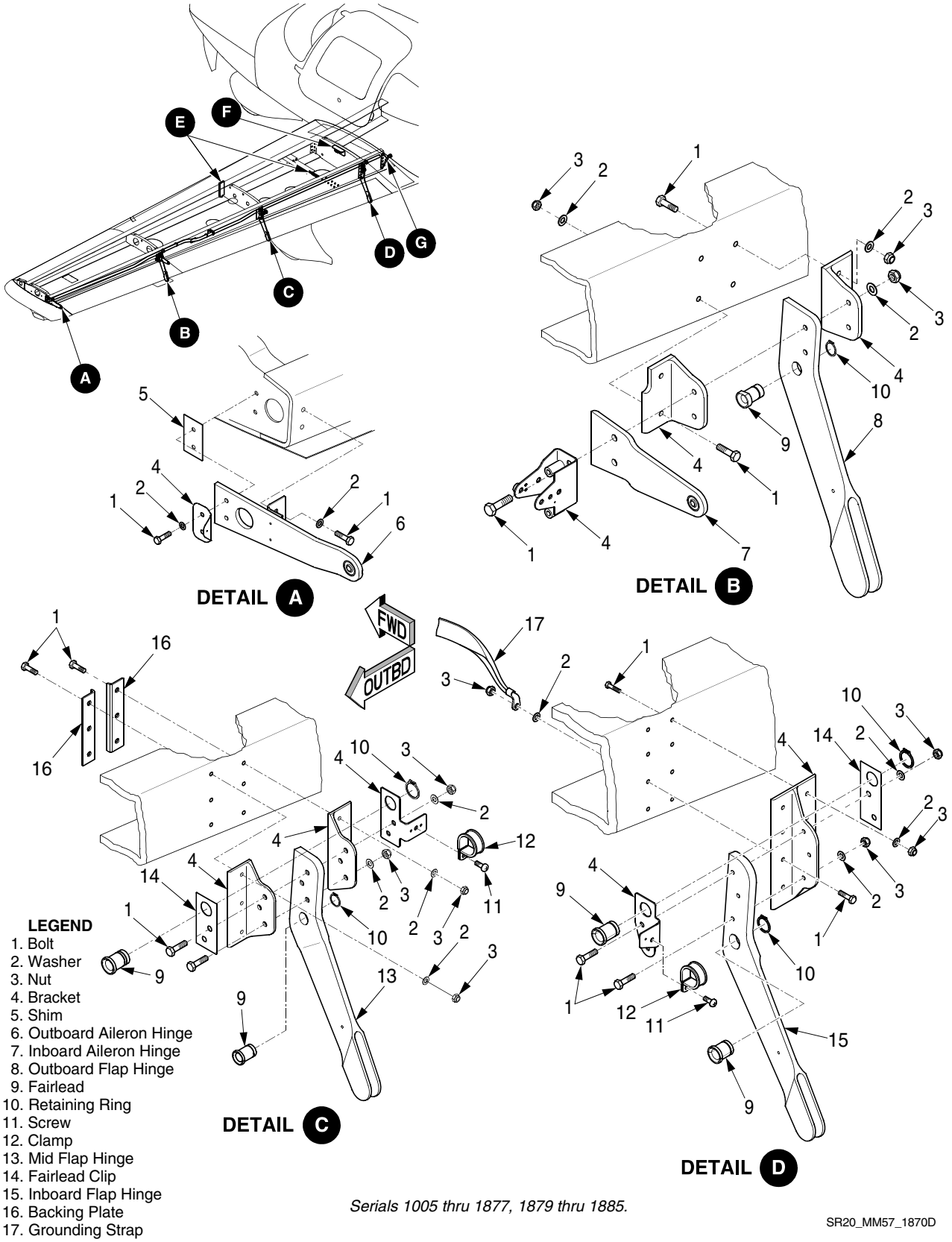
(a) Position attach bracket to wing and secure with bolts, washers, and new locknuts.

(b) Install collector tank. (Refer to 28-10)

(c) Install main landing gear. (Refer to 32-10)

N. Upper Landing Gear Attach Bracket - *Serials 1886 & subs* (See Figure 57-402)

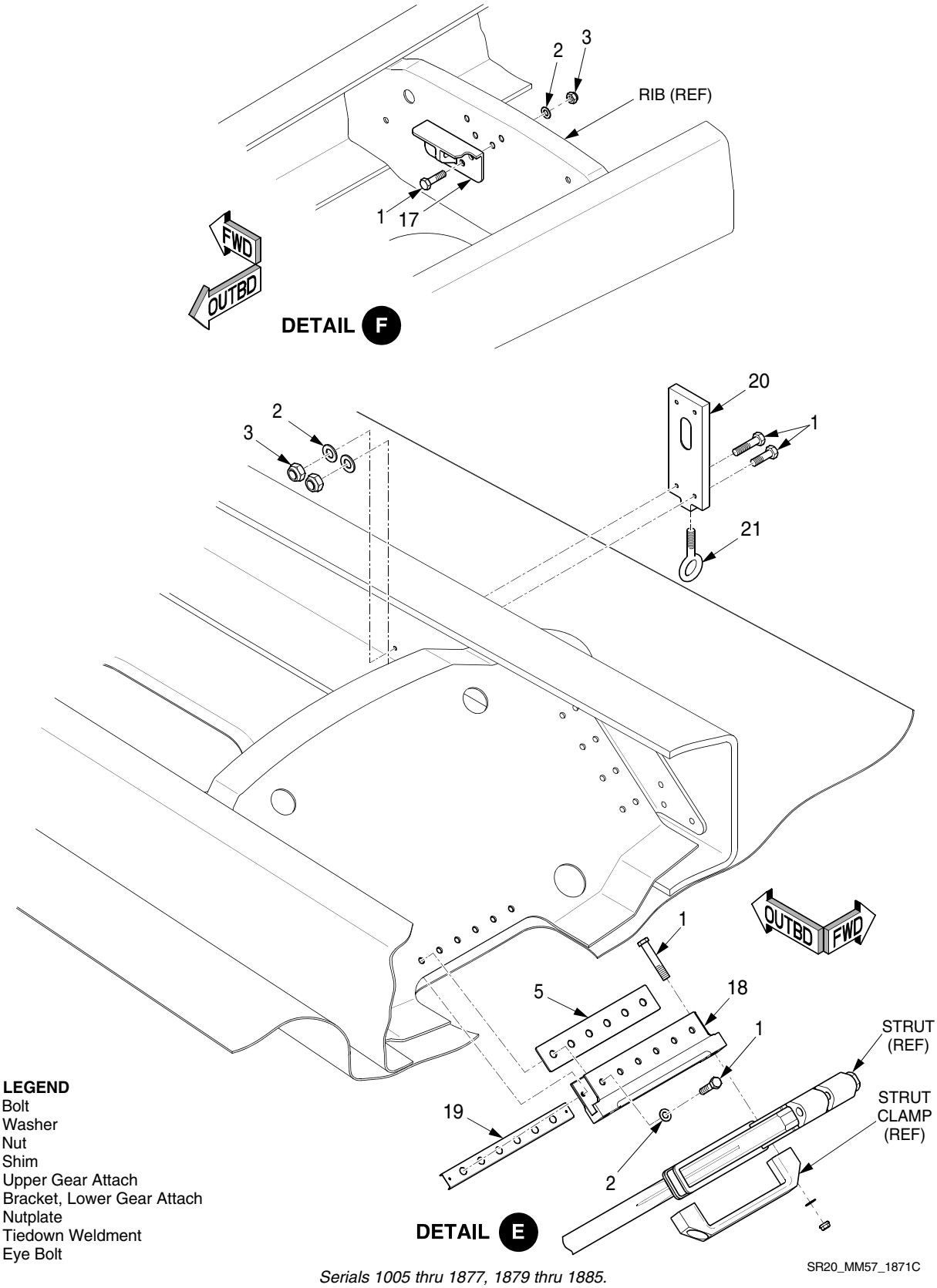
For maintenance practices related to the upper landing gear attach bracket refer to 32-10, Main Landing Gear. (Refer to 32-10)



Serials 1005 thru 1877, 1879 thru 1885.

SR20_MM57_1870D

Figure 57-401
Wing Attach Fittings Installation - Serials 1005 thru 1885 (Sheet 1 of 2)



Serials 1005 thru 1877, 1879 thru 1885.

Figure 57-401
Wing Attach Fittings Installation - Serials 1005 thru 1885 (Sheet 2 of 2)

EFFECTIVITY:
Serials 1005 thru 1885

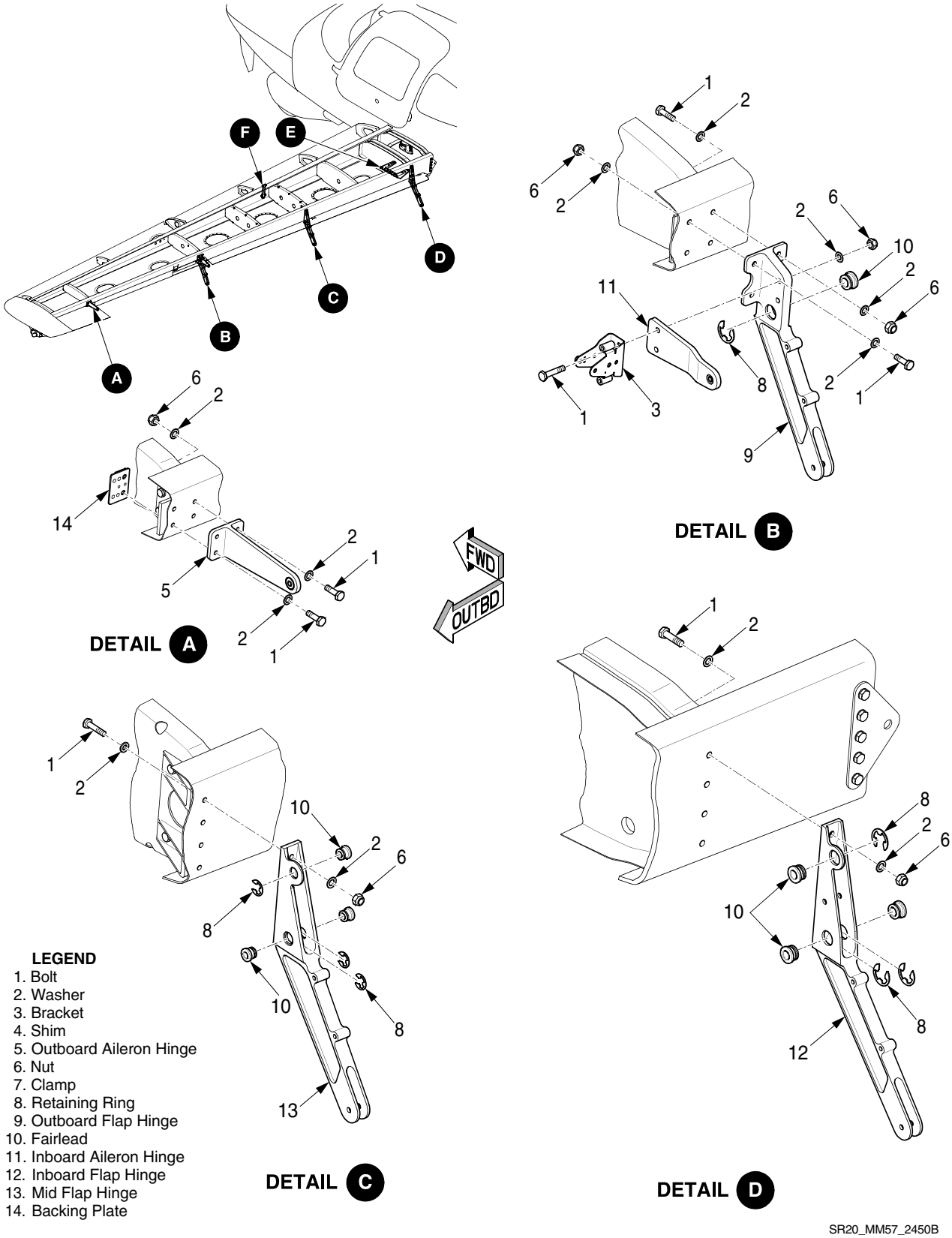


Figure 57-402
Wing Attach Fittings Installation - Serials 1886 & subs (Sheet 1 of 2)

EFFECTIVITY:
Serials 1886 & subs

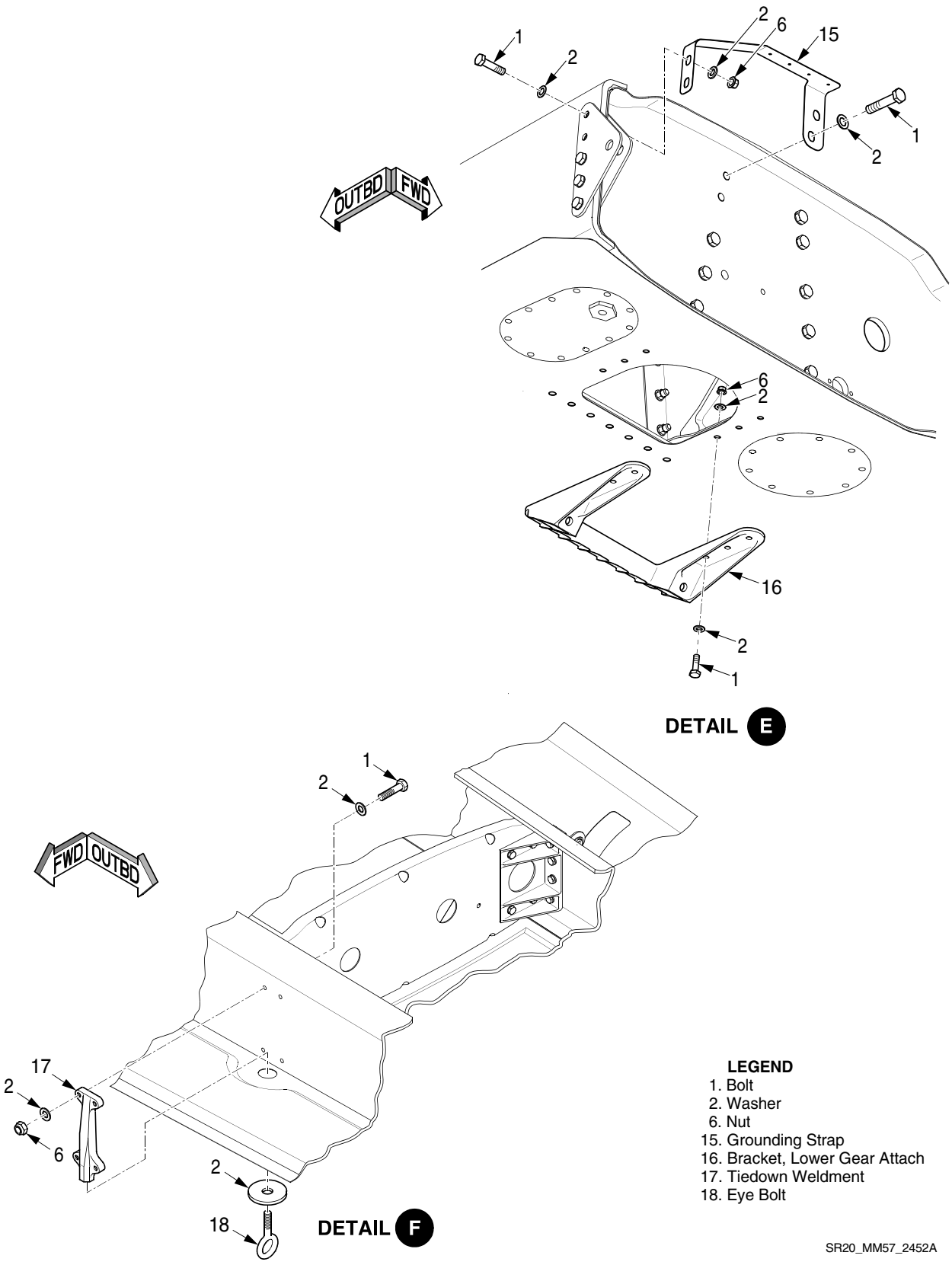


Figure 57-402
Wing Attach Fittings Installation - Serials 1886 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1886 & subs

FLIGHT SURFACES

1. DESCRIPTION

The flaps are mounted to the trailing edge of each wing between the inboard end of the ailerons and the fuselage. The ailerons are located near the wing tips and hinge to the aileron spar to become part of the trailing edge of the wing. The RH aileron includes an aileron trim tab used for roll trim adjustment. The ailerons and flaps are made from aluminum.

Aileron gap seals are located between the aileron and the wing trailing edge to increase aileron efficiency at high speeds and turbulent conditions.

Flap rub strips are located along the length of the flaps at the wing trailing edge to protect flap and wing surfaces from chafing one another.

2. MAINTENANCE PRACTICES

A. Aileron Assembly - *Serials 1005 thru 1885* (See Figure 57-501)

(1) Removal - Aileron Assembly

(a) Remove wing tip. (Refer to 57-20)

CAUTION: When removing aileron hinge bolts, exercise caution to prevent aileron from falling and becoming damaged.

Prevent the aileron from being supported by only one bolt, as this could damage the bolt, hinge, and aileron.

Note: Note washer stackup to facilitate aileron re-installation.

(b) Cut safety wire and remove bolt and washer(s) securing aileron to outboard aileron hinge.

(c) Cut safety wire and remove bolt, washer(s), and spacer securing aileron to inboard aileron hinge. Remove aileron from airplane.

(2) Disassembly - Aileron Assembly

(a) To disassemble aileron trim tab, perform the following steps:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit 0.098 inch (2.489 mm)	#40	Any Source	Drill out rivets.

2 Drill out rivets securing trim tab to RH aileron.

(3) Assembly - Aileron Assembly

(a) To assemble aileron trim tab, perform the following steps:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion protection.
Blind Rivet	NAS9301B4-1	Cirrus Design Duluth, MN 55811 218-727-2737	Fastener.
White Hobby Paint	Testers (or equivalent)	Any Source	Paint rivet heads.

2 Using an Alodine pen, apply corrosion protection to edge of each rivet hole.

3 Install rivets securing trim tab to RH aileron.

4 Apply thin coat of paint to each rivet head.

5 Perform Adjustment/Test - Aileron Balancing. (Refer to 57-50)

(4) Installation - Aileron Assembly

(a) Insert aileron actuation pin into spherical rod end on actuation pulley.

(b) Install bolt, washer(s), and spacer securing aileron to inboard aileron hinge.

(c) Finger tighten bolt and washer(s) securing aileron to outboard aileron hinge.

(d) *Serials 1007 thru 1885:* Perform Inspection/Check - Aileron Gap and Overlap. (Refer to 57-50)

EFFECTIVITY:
Serials 1005 thru 1885

(e) Tighten both aileron hinge bolts to 20 - 25 in-lb (2.3 - 2.8 Nm).
(f) Safety wire aileron hinge bolts to safety wire clips. (Refer to 20-50)
(g) Perform Inspection/Check - Aileron Assembly. (Refer to 57-50)
(h) Install wing tip. (Refer to 57-20)
(i) If aileron trim tab was replaced, perform Adjustment/Test - Aileron Trim Tab. (Refer to 57-50)

(5) Inspection/Check - Aileron Assembly
(a) Verify hinge bolts for proper torque and installation. (Refer to 57-50)
(b) Verify proper installation of safety wire on all fasteners.
(c) Ensure aileron skin is smooth and free of any defects or irregularities.
(d) Inspect rivets and aileron skin for tightness.
(e) Operate aileron controls and inspect for any abnormal resistance.

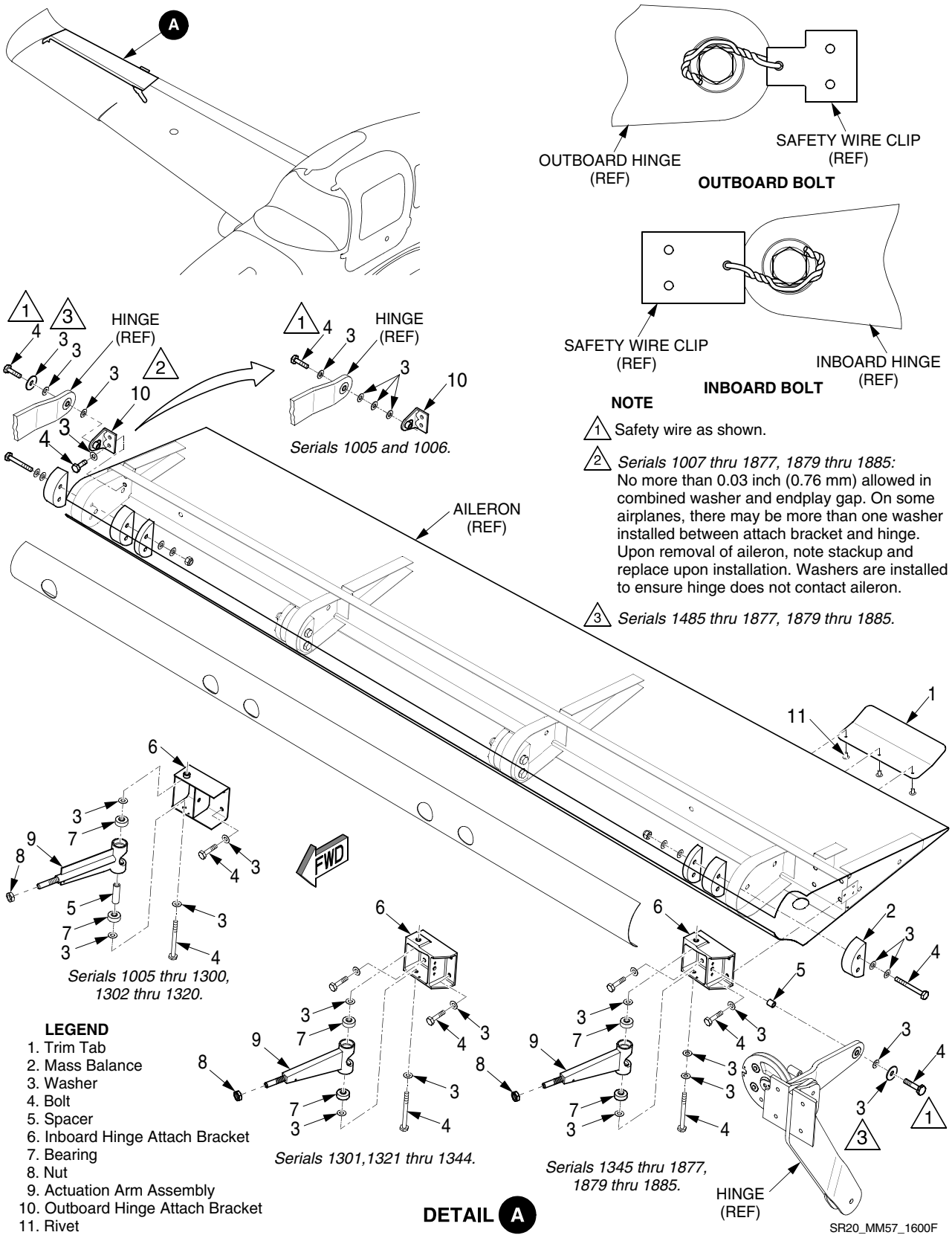


Figure 57-501
Aileron Installation - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885

(6) Inspection/Check - Aileron Gap and Overlap - *Serials 1007 thru 1885* (See Figure 57-502)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Feeler Gauge	-	Any Source	Measure aileron hinge clearance.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle.

(b) Lower flaps to full down position.

(c) To facilitate gap inspection, slide aileron inboard and measure maximum endplay gap on outboard end of aileron.

CAUTION: If existing washer installed between the outboard aileron hinge and aileron attach bracket is 0.016 inch (0.406 mm) thick, it may be replaced with one 0.032 inch (0.813 mm) washer to prevent contact between trailing edge of hinge and aileron attach bracket.

(d) At outboard and inboard aileron hinges, verify bearing is fully seated with bearing face flush with aileron hinge surface.

CAUTION: Gap between outboard aileron hinge and washer must not exceed 0.03 inch (0.76 mm).

Ensure aileron hinge bolts are only finger-tightened before measuring gap.

(e) At outboard LH and RH aileron hinge bearings, use feeler gauge to verify gap between aileron hinge and washer does not exceed maximum endplay of 0.03 inch (0.76 mm).

(f) If gap between aileron hinge and washer exceeds maximum endplay of 0.03 inch (0.76 mm), perform Inspection/Check - Outboard Aileron Hinge Shimming. (Refer to 57-40)

(g) Raise flaps to full up position.

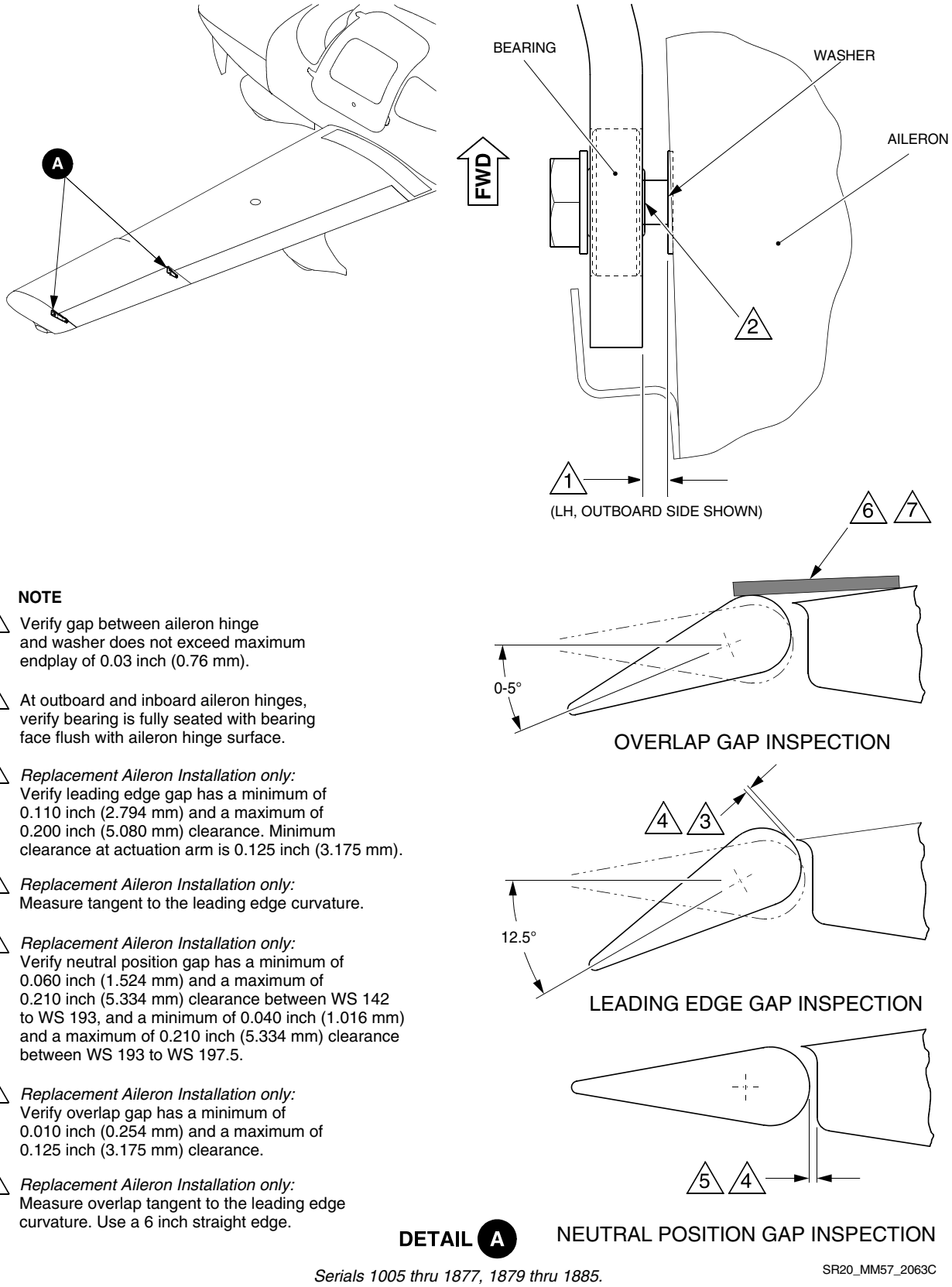
WARNING: **The following gap and overlap inspections need only be performed after the installation of a *replacement (new or different) aileron*. If aileron leading edge gap, neutral position gap, and overlap inspections do not fall within the specified clearances, contact Cirrus Design Customer Service Department for disposition.**

(h) *Replacement Aileron Installation Only:* Verify gap between aileron leading edge and trailing edge of wing has a minimum of 0.110 inch (2.794 mm) and a maximum of 0.200 inch (5.080 mm) clearance before installation of flexible gap seal, when aileron is fully deflected, trailing edge down. In area near aileron actuation arm where there is no leading edge cover, the minimum shall be 0.125 inch (3.175 mm).

(i) *Replacement Aileron Installation Only:* Verify overlap between aileron and wing has a minimum of 0.010 inch (0.254 mm) and a maximum of 0.125 inch (3.175 mm) clearance. Aileron may be deflected downward 0 - 5° to achieve upper overlap, and may be deflected upward 0 - 5° to achieve lower overlap.

(j) *Replacement Aileron Installation Only:* Secure ailerons in neutral position by placing a lockout pin in aileron actuation pulley in center console. Verify neutral position gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.210 inch (5.334 mm) clearance

between WS 142 to WS 193, and a minimum of 0.040 inch (1.016 mm) and a maximum of 0.210 inch (5.334 mm) clearance between WS 193 to WS 197.5.



NOTE

1. Verify gap between aileron hinge and washer does not exceed maximum endplay of 0.03 inch (0.76 mm).
2. At outboard and inboard aileron hinges, verify bearing is fully seated with bearing face flush with aileron hinge surface.
3. *Replacement Aileron Installation only:* Verify leading edge gap has a minimum of 0.110 inch (2.794 mm) and a maximum of 0.200 inch (5.080 mm) clearance. Minimum clearance at actuation arm is 0.125 inch (3.175 mm).
4. *Replacement Aileron Installation only:* Measure tangent to the leading edge curvature.
5. *Replacement Aileron Installation only:* Verify neutral position gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.210 inch (5.334 mm) clearance between WS 142 to WS 193, and a minimum of 0.040 inch (1.016 mm) and a maximum of 0.210 inch (5.334 mm) clearance between WS 193 to WS 197.5.
6. *Replacement Aileron Installation only:* Verify overlap gap has a minimum of 0.010 inch (0.254 mm) and a maximum of 0.125 inch (3.175 mm) clearance.
7. *Replacement Aileron Installation only:* Measure overlap tangent to the leading edge curvature. Use a 6 inch straight edge.

Serials 1005 thru 1877, 1879 thru 1885.

Figure 57-502
Aileron Gap and Overlap - Serials 1005 thru 1885

EFFECTIVITY:
Serials 1005 thru 1885

B. Aileron Assembly - *Serials 1886 & subs* **(See Figure 57-503)**

(1) Removal - Aileron Assembly

(a) Remove wing access panel LW13 or RW13. (Refer to 06-00)

CAUTION: When removing aileron hinge bolts, exercise caution to prevent aileron from falling and becoming damaged.

Prevent the aileron from being supported by only one bolt, as this could damage the bolt, hinge, and aileron.

Note: Note washer stackup to facilitate aileron re-installation.

(b) Cut safety wire and remove bolt and washers securing aileron to outboard aileron hinge.

(c) Cut safety wire and remove bolt, washers, and spacer securing aileron to inboard aileron hinge. Remove aileron from airplane.

(2) Disassembly - Aileron Assembly

(a) To disassemble aileron trim tab, perform the following steps:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drill bit 0.098 inch (2.489 mm)	#40	Any Source	Drill out rivets.

2 Drill out rivets securing trim tab to RH aileron.

(3) Assembly - Aileron Assembly

(a) To assemble aileron trim tab, perform the following steps:

1 Acquire necessary parts, tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Alodine Pen	-	Any Source	Corrosion protection.
Blind Rivet	NAS9301B4-1	Cirrus Design Duluth, MN 55811 218-727-2737	Fastener.
White Hobby Paint	Testers (or equivalent)	Any Source	Paint rivet heads.

2 Using an Alodine pen, apply corrosion protection to edge of each rivet hole.

3 Install rivets securing trim tab to RH aileron.

4 Apply thin coat of paint to each rivet head.

5 Perform Adjustment/Test - Aileron Balancing. (Refer to 57-50)

(4) Installation - Aileron Assembly

(a) Insert aileron actuation pin into spherical rod end on actuation pulley.

(b) Install bolt, washers, and spacer securing aileron to outboard aileron hinge. Torque bolt to 20 - 25 in-lb (2.3 - 2.8 Nm).

(c) Install bolt, washers, and spacer securing aileron to inboard aileron hinge. Finger tighten bolt.

(d) Perform Inspection/Check - Aileron Gap and Overlap. (Refer to 57-50)

(e) Safety wire aileron hinge bolts to safety wire clips. (Refer to 20-50)
(f) Perform Inspection/Check - Aileron Assembly. (Refer to 57-50)
(g) Install wing access panel LW13 or RW13. (Refer to 06-00)
(h) If aileron trim tab was replaced, perform Adjustment/Test - Aileron Trim Tab. (Refer to 57-50)

(5) Inspection/Check - Aileron Assembly
(a) Verify hinge bolts for proper torque and installation. (Refer to 57-50)
(b) Verify proper installation of safety wire on all fasteners.
(c) Ensure aileron skin is smooth and free of any defects or irregularities.
(d) Inspect rivets and aileron skin for tightness.
(e) Operate aileron controls and inspect for any abnormal resistance.

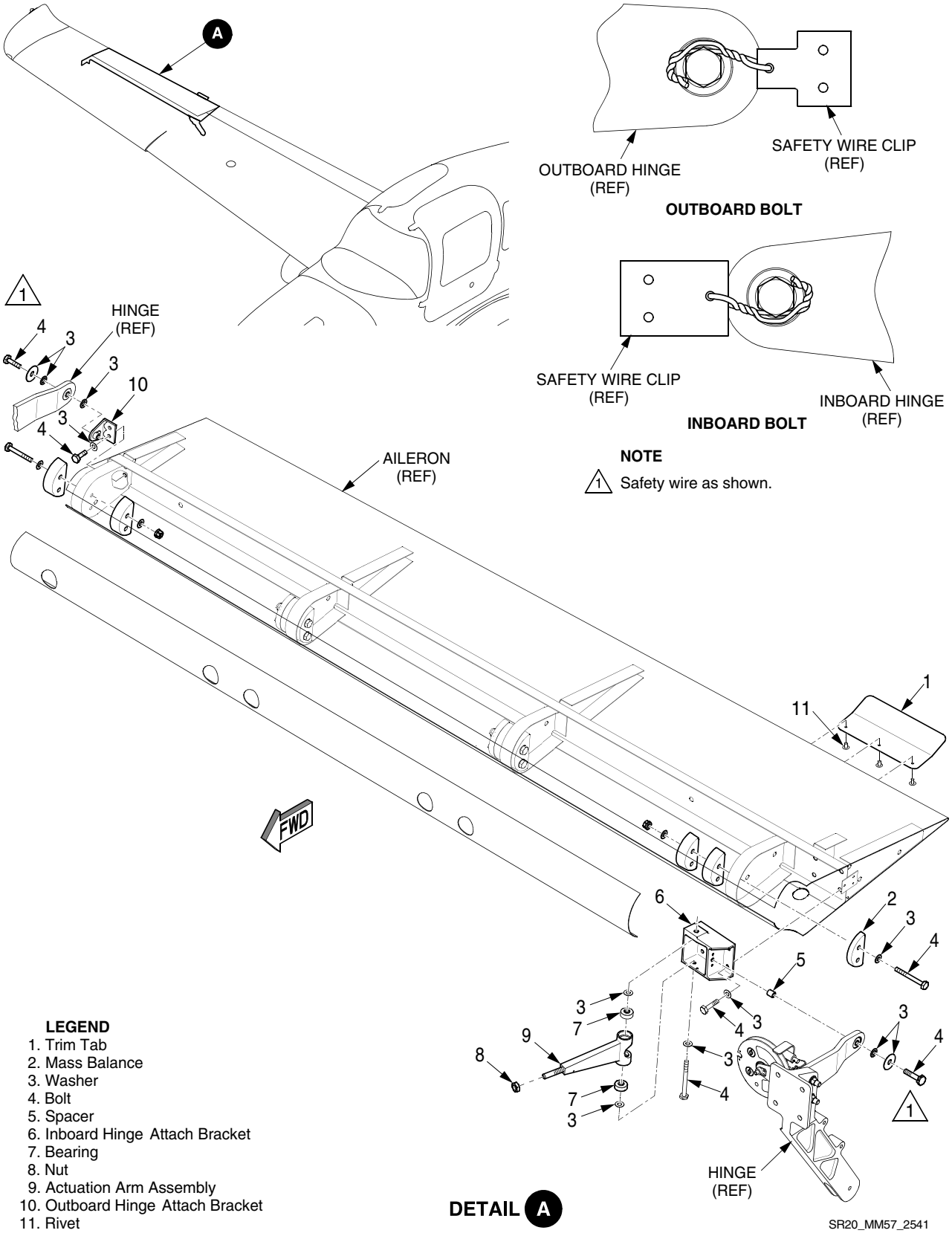


Figure 57-503
Aileron Installation - Serials 1886 & subs

EFFECTIVITY:
Serials 1886 & subs

(6) Inspection/Check - Aileron Gap and Overlap (See Figure 57-504)

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Feeler Gauge	-	Any Source	Measure aileron hinge clearance.
Inclinometer	PRO360	Macklanburg Duncan Oklahoma City, OK 73125 800-654-0007	Deflection angle.

(b) Lower flaps to full down position.

Note: To obtain gap tolerance, it is permissible to use a different length spacer. In addition to the spacer, two washers may also be installed.

(c) Prior to final torque, verify minimum gap between aileron inboard end and spacer equals 0.001 inch (0.025 mm) and maximum gap equals 0.063 inch (1.600 mm).

(d) Torque inboard aileron hinge bolt to 20 - 25 in-lb (2.3 - 2.8 Nm).

(e) After final torque, verify minimum distance between aileron inboard end and aileron hinge equals 0.100 inch (2.540 mm) and maximum distance equals 0.313 inch (7.950 mm).

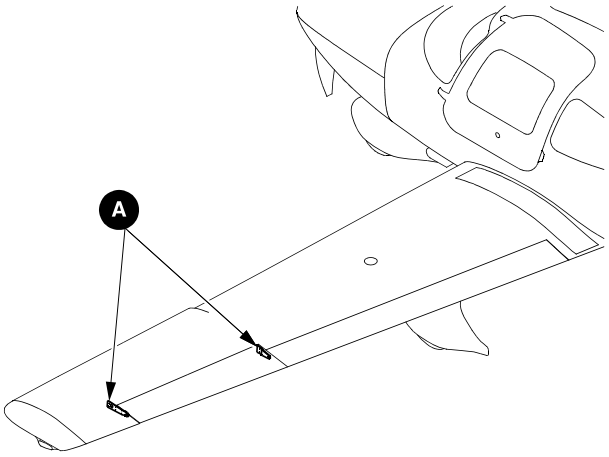
(f) Raise flaps to full up position.

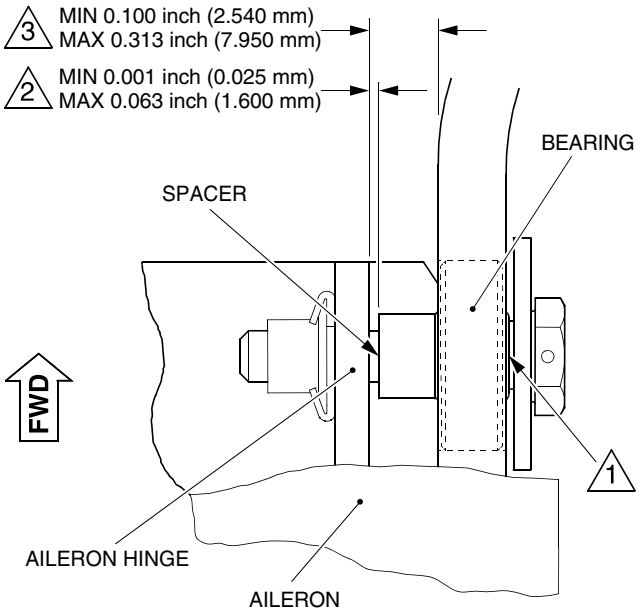
WARNING: **The following gap and overlap inspections need only be performed after the installation of a *replacement (new or different) aileron*. If aileron leading edge gap, neutral position gap, and overlap inspections do not fall within the specified clearances, contact Cirrus Design Customer Service Department for disposition.**

(g) *Replacement Aileron Installation Only:* Verify gap between aileron leading edge and trailing edge of wing has a minimum of 0.110 inch (2.794 mm) and a maximum of 0.200 inch (5.080 mm) clearance before installation of flexible gap seal, when aileron is fully deflected, trailing edge down. In area near aileron actuation arm where there is no leading edge cover, the minimum shall be 0.125 inch (3.175 mm).

(h) *Replacement Aileron Installation Only:* Verify overlap between aileron and wing has a minimum of 0.010 inch (0.254 mm) and a maximum of 0.125 inch (3.175 mm) clearance. Aileron may be deflected downward 0 - 5° to achieve upper overlap, and may be deflected upward 0 - 5° to achieve lower overlap.

(i) *Replacement Aileron Installation Only:* Secure ailerons in neutral position by placing a lockout pin in aileron actuation pulley in center console. Verify neutral position gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.210 inch (5.334 mm) clearance between WS 142 to WS 193, and a minimum of 0.040 inch (1.016 mm) and a maximum of 0.210 inch (5.334 mm) clearance between WS 193 to WS 197.5.

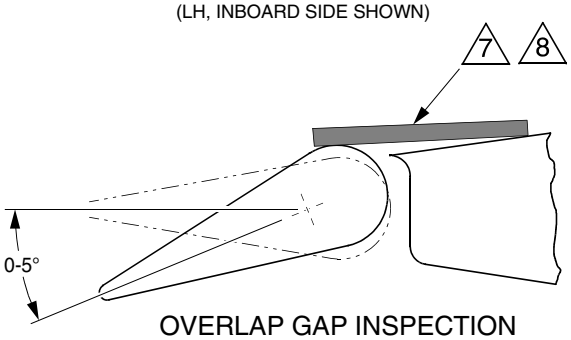




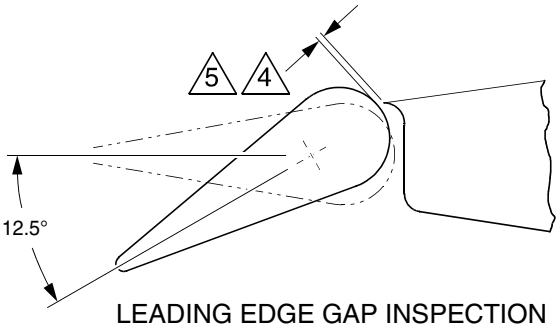
(LH, INBOARD SIDE SHOWN)

NOTE

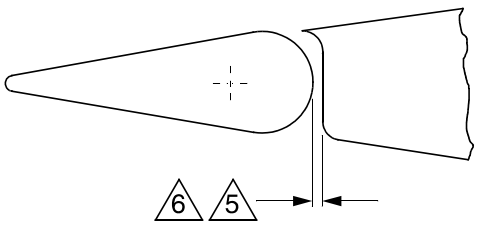
1. At outboard and inboard aileron hinges, verify bearing is fully seated with bearing face flush with aileron hinge surface.
2. Prior to final torque, verify minimum gap between aileron inboard end and spacer equals 0.001 inch (0.025 mm) and maximum gap equals 0.063 inch (1.600 mm).
3. After final torque, verify minimum distance between aileron inboard end and aileron hinge equals 0.100 inch (2.540 mm) and maximum distance equals 0.313 inch (7.950 mm).
4. *Replacement Aileron Installation only:* Verify leading edge gap has a minimum of 0.110 inch (2.794 mm) and a maximum of 0.500 inch (12.700 mm) clearance. Minimum clearance at actuation arm is 0.125 inch (3.175 mm).
5. *Replacement Aileron Installation only:* Measure tangent to the leading edge curvature.
6. *Replacement Aileron Installation only:* Verify neutral position gap has a minimum of 0.060 inch (1.524 mm) and a maximum of 0.220 inch (5.588 mm) clearance between WS 142 to WS 193, and a minimum of 0.040 inch (1.016 mm) and a maximum of 0.220 inch (5.588 mm) clearance between WS 193 to WS 197.5.
7. *Replacement Aileron Installation only:* Verify overlap gap has a minimum of 0.010 inch (0.254 mm) and a maximum of 0.140 inch (3.556 mm) clearance.
8. *Replacement Aileron Installation only:* Measure overlap tangent to the leading edge curvature. Use a 6 inch straight edge.



OVERLAP GAP INSPECTION



LEADING EDGE GAP INSPECTION



NEUTRAL POSITION GAP INSPECTION

DETAIL A

SR20_MM57_2533A

Figure 57-504
Aileron Gap and Overlap - Serials 1886 & subs

C. Adjustment/Test - Aileron Balancing (See Figure 57-505)

(1) Adjustment/Test - Aileron Balancing

Note: To balance the aileron, the assembly must be painted, including the inboard and outboard hinges, actuation arm assembly, and all attaching hardware.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease Pencil	-	Any Source	Mark chord line.
Close Tolerance Balance Pins	-	Any Source	Support aileron.
Knife Edge Supports	-	Any Source	Support aileron.
Balance Arm Assembly	-	Any Source	Verify position of aileron chord line.
String	-	Any Source	Attach cup to aileron.
Tape	-	Any Source	Attach cup to aileron.
Paper Cup	-	Any Source	Determine required weight for balance.
Scale	-	Any Source	Determine required weight for balance.
Lead Washers	12682-001	Cirrus Design Duluth, MN 55811 218-727-2737	Add weight to aileron.

(b) Verify workbench is level in all directions.

(c) Ensure knife edge supports and balance arm assembly are parallel to workbench top.

(d) Remove aileron. (Refer to 57-50)

Note: The chord line is defined as the line extending from the trailing edge through the hinge line. It is perpendicular to the spar.

(e) Mark the chord line on the inboard rib shear web.

(f) Place aileron assembly on knife edge supports.

(g) Determine if a static imbalance exists.

1 The aileron is balanced if aileron chord line mark is parallel to balance arm.

2 A static overbalance exists if aileron is leading edge heavy.

3 A static underbalance exists if aileron is trailing edge heavy.

(h) Determine the amount of static imbalance.

Note: Ensure paper cup hangs centered and vertical with no contact with aileron.

1 Attach paper cup to one end of string.

2 For static underbalance condition, attach string to leading edge of aileron. For static overbalance condition, attach string to trailing edge of aileron.

3 Add attaching hardware to paper cup.

4 Add lead washers to cup until aileron chord line mark is parallel to balance arm.

(i) Calculate the aileron static balance.

In overbalance conditions, the static balance (M) is defined as

M = D × W.

In underbalance conditions, the static balance (M) is defined as

M = D × W × -1

where

D = distance perpendicular from hinge line to center of gravity (C.G.) of added mass,

W = weight required to balance the aileron.

Note: The value of M is positive for overbalance conditions and negative for underbalance conditions.

Static balance must be within +3.0 in-lb overbalance and 0.0 in-lb underbalance. Assuming a deviation of ±0.5 in-lb exists due to measurement error, calculated static balance must therefore fall within 0.5 - 2.5 in-lb overbalance and 0.0 in-lb underbalance.

1 Measure distance perpendicular from hinge line to C.G. of added mass in paper cup.

2 Weigh string, cup, and contents with a calibrated scale.

3 Using obtained measurements, solve formula to determine aileron static balance.

4 Verify static balance is within 0.5 - 2.5 in-lb overbalance and 0.0 in-lb underbalance.

Example:

Assume an aileron is underbalanced. If balance is achieved by adding 0.06 pounds, 3.75 inches forward of the hingeline, the aileron static balance is:

W = 0.06 pound

D = 3.75 inches

M = (0.06 × 3.75) × -1 = -0.23 ± 0.5 in-lb

In the example, -0.23 in-lb exceeds the tolerance for a static underbalance condition. To obtain aileron balance, 0.23 in-lb must be added forward of the hinge line. The balance must be rechecked to ensure static balance tolerance is not exceeded.

CAUTION: Do not exceed a maximum mass balance weight of 1.05 pounds (0.48 kg) at each mounting location. Do not exceed a maximum of four washers per bolt or nut. Always place steel washer next to nut.

(j) Add or remove weight as necessary to balance the aileron.

1 An underbalanced condition is corrected by adding lead washers under the bolts securing the outboard and inboard mass balances.

2 An overbalance condition is corrected by removing small amounts of material from the outboard and inboard lead mass balance in equal quantities. Typically this is done by drilling or other means.

(k) Tighten mass balance bolts to 20 - 25 in-lb (2.3 - 2.8 Nm).

(l) Install aileron. (Refer to 57-50)

In overbalance conditions, the static balance (M) = D x W.
In underbalance conditions, the static balance (M) = D x W x -1.

D = Distance perpendicular from hinge line
to center of gravity of added mass.

W = Weight required to balance the aileron.

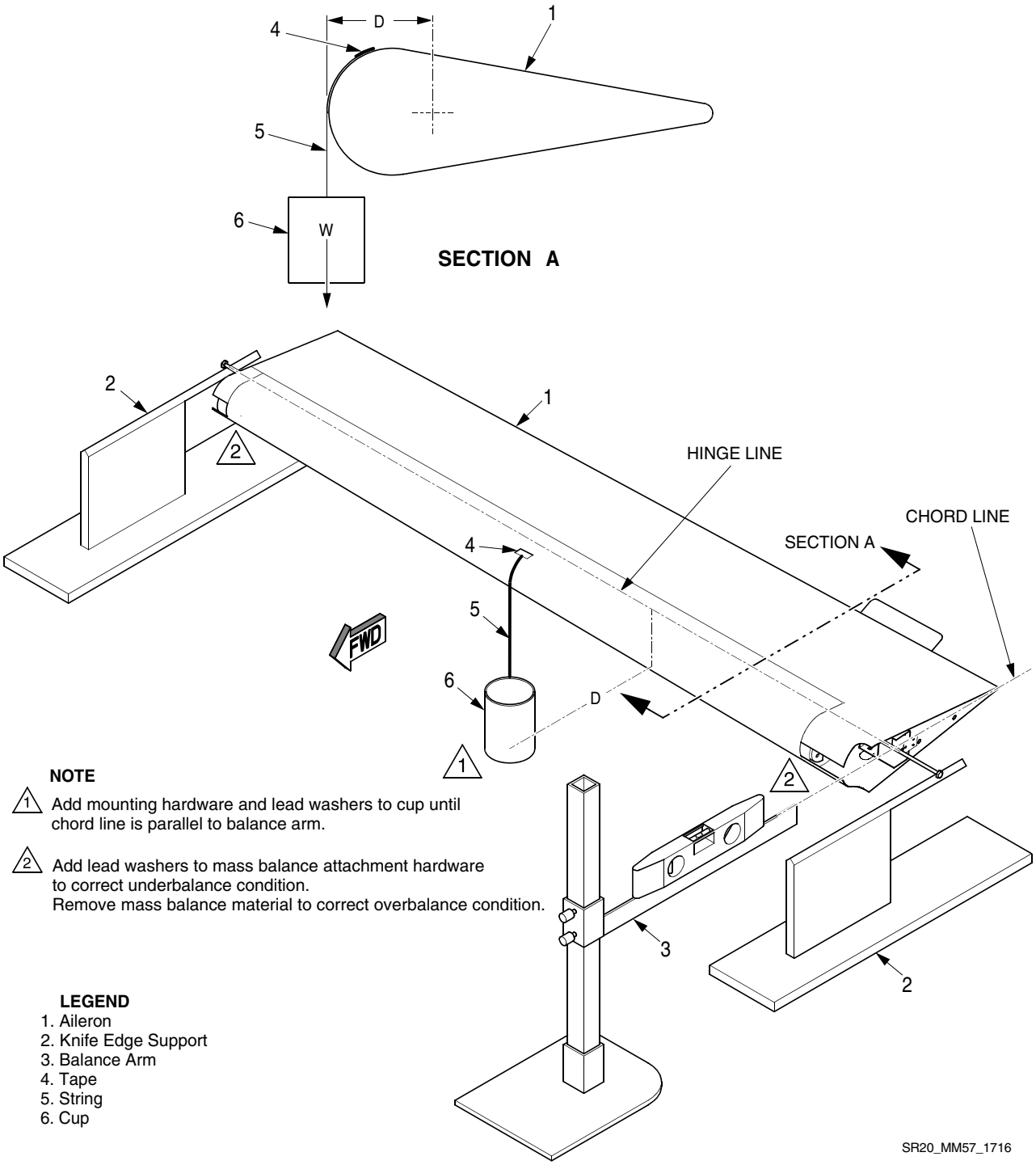


Figure 57-505
Aileron Balancing

D. Adjustment/Test - Aileron Trim Tab

(1) Adjustment/Test - Aileron Trim Tab

WARNING: Maintenance check flight must be performed by a qualified pilot.

(a) Ensure both fuel tanks contain equal amounts of fuel.
(b) After airplane is in flight in smooth air, set throttle to full power.
(c) Trim airplane to achieve 160 knots indicated air speed (KIAS).
(d) Input full aileron trim left while holding wings level and let go of control yoke.
(e) Observe and note amount of time required until a 30° bank has been achieved.
(f) Input full aileron trim right while holding wings level and let go of control yoke.
(g) Observe and note amount of time required until a 30° bank has been achieved.

Note: The amount of time required to achieve a 30° LH bank and a 30° RH bank should be approximately equal. If airplane rolls left too quickly, bend trailing edge of aileron trim tab down.

Support trim tab at the bend when adjusting to ensure trim tab does not bend at the rivets and pull away from wing. Do not bend trailing edge of aileron trim tab up more than 25° or down more than 10°.

(h) If required, bend aileron trim tab in small increments (approximately 2°) and repeat maintenance check flight.

E. Aileron Gap Seal - *Serials 1886 & subs* **(See Figure 57-506)**

(1) Removal - Aileron Gap Seal

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Smart Eraser® Pad	400E	Astro Pneumatic Tools Co. City Of Industry, CA 91714 626-965-4449	Remove residue.
General Purpose Adhesive Cleaner	08984	3M Company St. Paul, MN 55144 651-737-6501	Remove residue.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean installation area.
Cotton Cloth (clean and lint free)	-	Any Source	Clean installation area.

(b) Pull aileron gap seal from edge of wing.

(c) Remove tape residue from wing installation area using eraser pad.

(d) Remove any remaining residue from wing installation area using cleaner.

(e) Solvent clean installation area on wing. (Refer to 20-30)

(2) Installation - Aileron Gap Seal

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Masking Tape	-	Any Source	Limit primer application area.
Two-Sided Tape Primer	94	3M Company St. Paul, MN 55144 651-737-6501	Promote tape adhesion at installation area.
Paper Towels	-	Any Source	Apply primer.
Two-Sided Transfer Adhesive Tape 0.005 inch (0.127 mm) thick	F-9469PC	3M Company St. Paul, MN 55144 651-737-6501	Secure gap seal to wing.
Utility Knife	-	Any Source	Trim excess tape.
Squeegee	-	Any Source	Apply surface pressure.

(b) Place aileron in full down position.

(c) Apply masking tape 0.250 inch (0.635 cm) forward from aft edge of wing along length of aileron cutout.

(d) With paper towel, apply tape primer from aft edge of wing forward to masked off area along length of aileron cutout.

CAUTION: Do not stretch two-sided transfer adhesive tape during installation. Apply tape straight to avoid wrinkles.

(e) Apply two-sided tape to aft edge of wing along length of aileron cutout.

CAUTION: Do not cut into the wing when trimming excess tape.

(f) Use utility knife to trim excess tape from aft edge of wing.

CAUTION: Verify aileron gap seal is installed glossy side up.

(g) Center aileron gap seal in aileron cutout to within ±0.06 inch (1.5 mm).

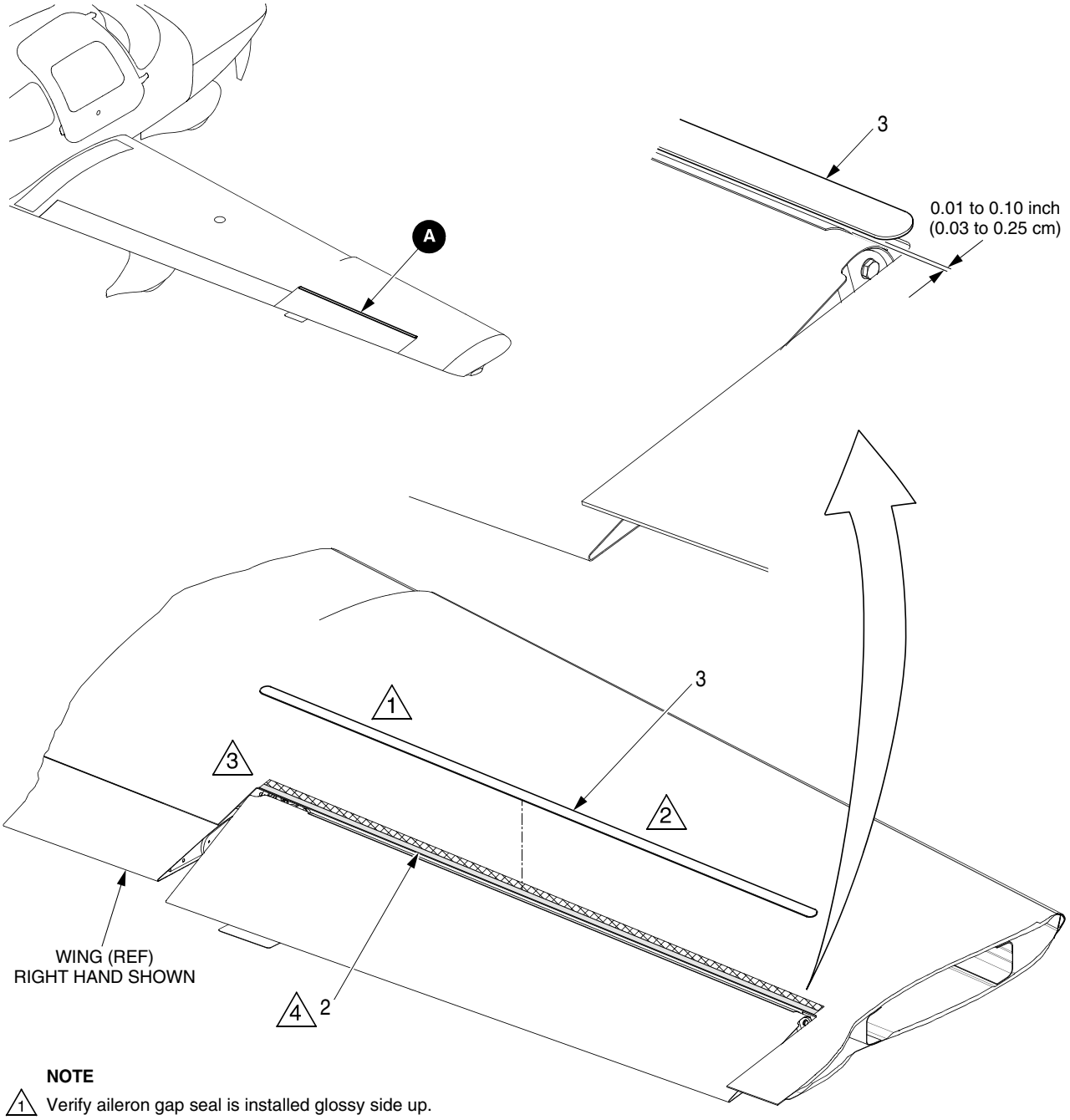
CAUTION: Gap seal shall not ride up on aileron.

(h) Ensure 0.01 to 0.10 inch (0.25 to 2.54 mm) gap between aft edge of gap seal and forward edge of aileron.

(i) Install aileron gap seal to taped installation area straight along aft edge of wing.

(j) Use squeegee to press aileron gap seal firmly to wing surface. Ensure all edges are firmly adhered.

(k) Remove masking tape from wing.



NOTE

1. Verify aileron gap seal is installed glossy side up.
2. Do not stretch two-sided transfer adhesive tape during installation. Apply tape straight to avoid wrinkles.
3. With paper towel, apply tape primer from aft edge of wing forward to masked off area centered in aileron cutout.
4. Do not cut into the wing when trimming excess tape.

LEGEND

1. Masking Tape
2. Two-Sided Tape
3. Aileron Gap Seal

DETAIL A

SR20_MM57_2636

Figure 57-506
Aileron Gap Seal Installation - Serials 1886 & subs

F. Flap Assembly - *Serials 1005 thru 1885* (See Figure 57-507)

(1) Removal - Flap Assembly

(a) Cut safety wire securing rod end mounting bolt to flap actuation fitting.

CAUTION: When disconnecting rod end, exercise caution to prevent flap from swinging downward and making contact with landing gear.

(b) Remove bolt and washer securing rod end to flap. Carefully lower flap.

(c) *Serials 1005 thru 1540 before SB 2X-57-06:* For inboard flap hinge, remove bolt, spacer, washer, and nut securing fairing to flap hinge.

(d) *Serials 1541 thru 1885, 1005 thru 1540 after SB 2X-57-06:* For inboard flap hinge, remove bolts, spacers, washers, and nuts securing stiffener to flap fairing. Remove stiffener from airplane.

(e) *Serials 1541 thru 1885, 1005 thru 1540 after SB 2X-57-06:* For mid and outboard flap hinges, remove bolts, spacers, washers, and nuts retaining fairing to flap hinge.

(f) For inboard, mid, and outboard flap hinges, remove bolt, washers, nut, and cotter pin securing flap and fairing to flap hinge. Remove flap and fairings from airplane.

(2) Installation - Flap Assembly

CAUTION: Flap mounting bolts must be installed with nuts facing inboard.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire	-	Any Source	Secure flap.
Loctite®	222	Any Source	Secure flap fairing.

(b) Position flap and fairings to hinges and secure with bolts, washers, nuts, and cotter pins.

(c) *Serials 1005 thru 1540 before SB 2X-57-06:* For inboard flap hinge, pivot fairing upward against flap hinge and secure with bolt, spacer, washer, and nut.

(d) *Serials 1541 thru 1885, 1005 thru 1540 after SB 2X-57-06:* Install stiffener to inboard fairing.

1 Position slotted end of stiffener to upper edge of inboard flap hinge.

2 Pivot fairing upward against flap hinge and over stiffener.

3 Install bolts, washers, and nuts securing stiffener to fairing.

(e) *Serials 1541 thru 1885, 1005 thru 1540 after SB 2X-57-06:* For mid and outboard flap hinges, pivot fairing upward against flap hinge and secure with bolts, spacers, washers, and nuts.

CAUTION: Flap must pivot freely on all three hinge bolts. If flap does not pivot freely, the problem must be corrected before securing actuation rod end.

(f) Verify flap moves smoothly and uninhibited through full range of motion.

(g) Position rod end to flap actuation fitting and secure with bolt and washer.

(h) Safety wire rod end mounting bolt to flap actuation fitting.

(i) Perform Adjustment/Test - Flap Force Limitation. (Refer to 57-50)

(j) Perform Operational Test - Flap System. (Refer to 57-50)

(3) Operational Test - Flap System

(a) Set BAT 1 switch to ON position.

(b) Set flaps switch to UP position.

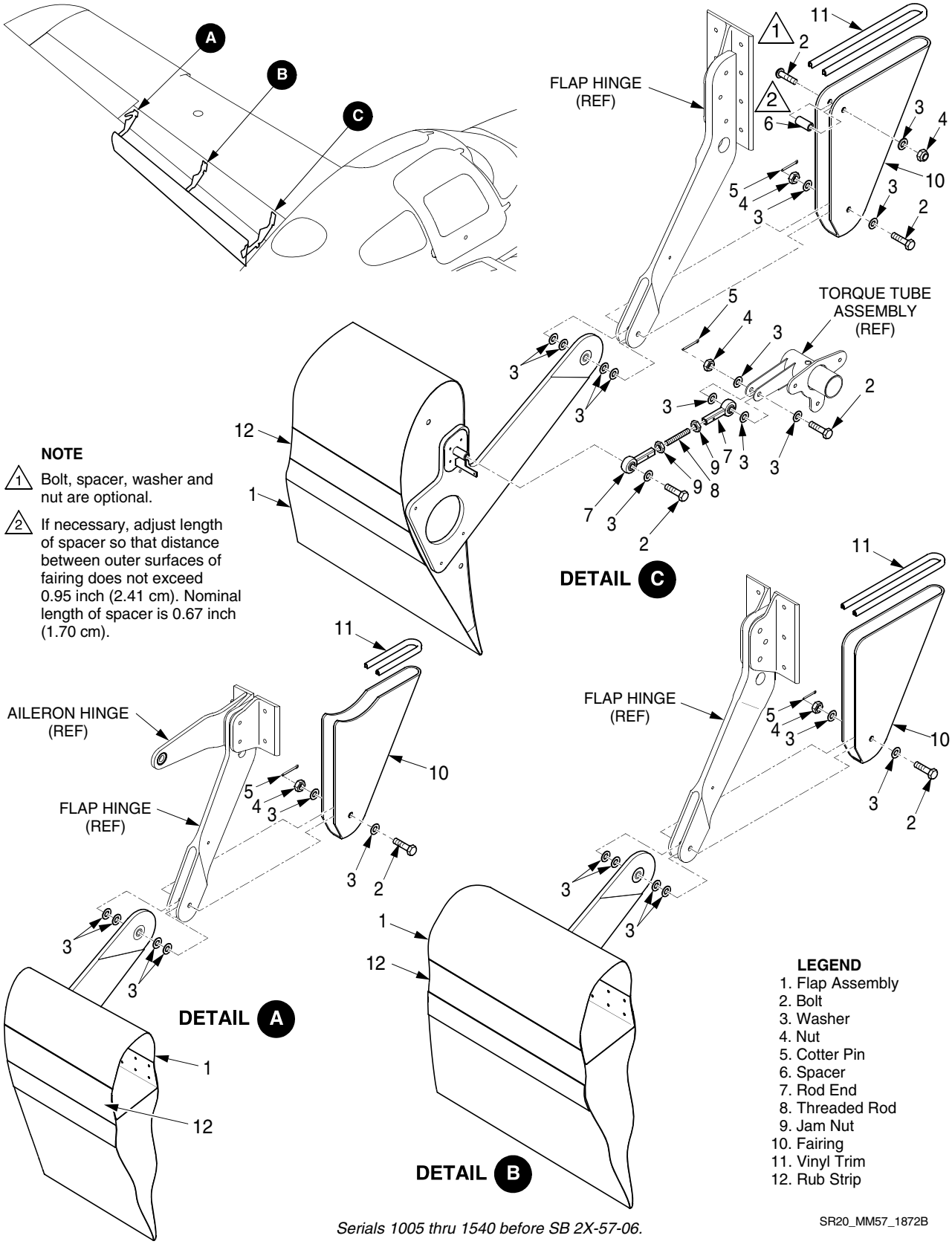
(c) Set flaps switch to 100% position.

(d) Verify flap moves smoothly and uninhibited through full range of motion.

(e) Verify flap position light illuminates correctly at UP, 50%, and 100% positions.

Note: Limited contact between flap and flap cove is permissible when the anti-chafe material is installed on flap.

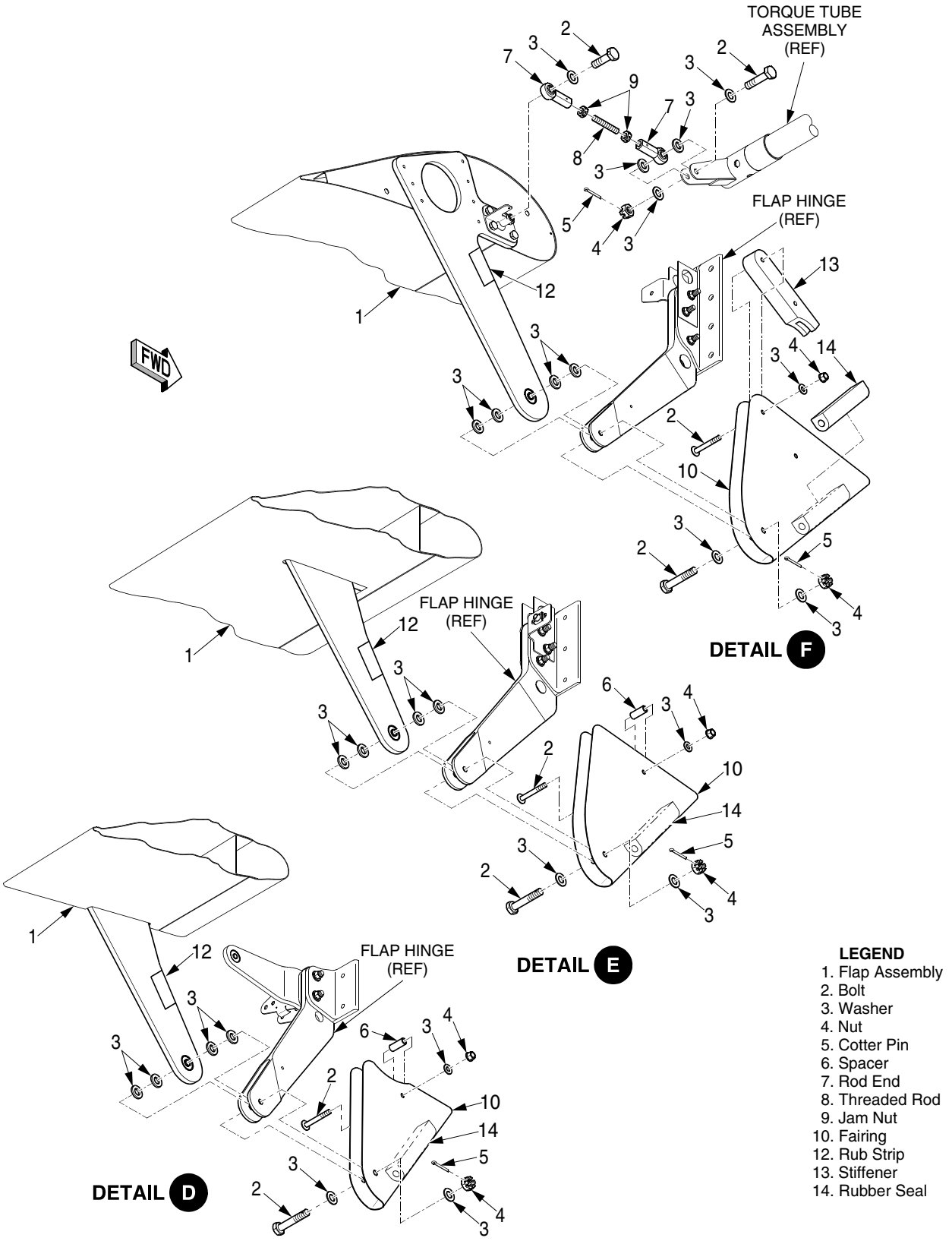
(f) Visually inspect for contact or rubbing between flap and flap cove. If flap surface contacts flap cove, install flap rub strip. (Refer to 57-50)



Serials 1005 thru 1540 before SB 2X-57-06.

Figure 57-507
Flap Installation - Serials 1005 thru 1540 before SB 2X-57-06 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1540 before SB 2X-57-06



Serials 1541 thru thru 1877, 1879 thru 1885, 1005 thru 1540 after SB 2X-57-06.

Figure 57-507
Flap Installation - Serials 1541 thru 1885, 1005 thru 1540 after SB 2X-57-06 (Sheet 2 of 2)

(4) Adjustment/Test - Flap Force Limitation - *Serials 1005 thru 1885* (See Figure 57-508)

The maximum acceptable force to remove the flap from the full-up position is 5 pounds or less. The flap force Adjustment/Test is performed at the time of installation when there is flap contact with the flap cove. Limited contact between the flap and flap cove is permissible when the anti-chafe material is installed on the flap.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Spring Scale	5A354	Chatillon Largo, Florida 33773 727-536-7831	Measure force required to deploy flaps.
Safety Wire	MS20995C32	Any Source	Retain part.

(b) Cut safety wire securing rod end mounting bolt to flap actuation fitting.

CAUTION: When disconnecting rod end, exercise caution to prevent flap from swinging downward and making contact with landing gear.

(c) Remove bolt and washer securing flap to push/pull rod end.

(d) Install bolt and attach spring scale to actuation fitting.

Note: This test requires two people. One must prevent flap from swinging downward while the other performs spring scale test.

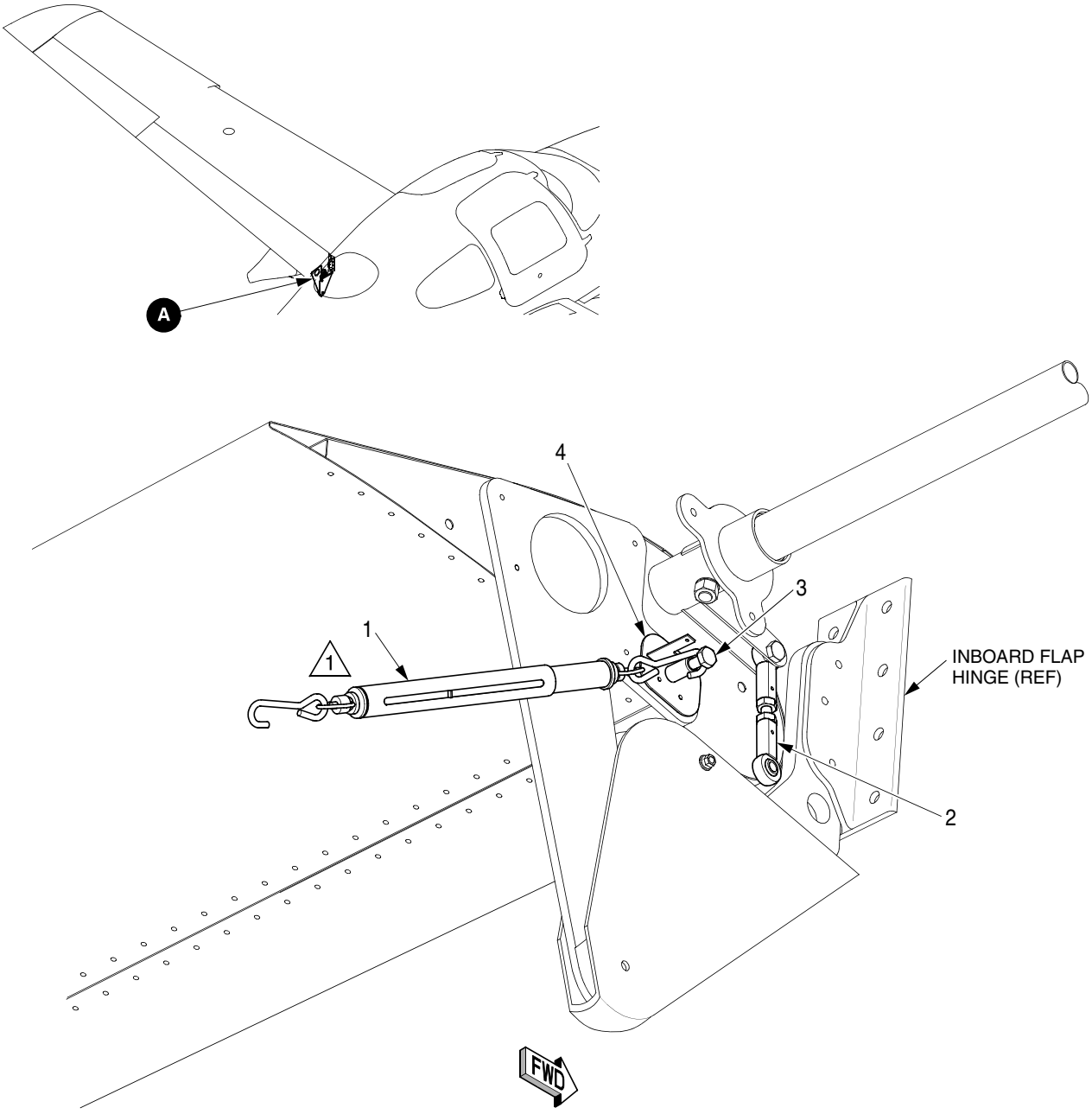
A force of 5 pounds or less is acceptable. If force is greater than 5 pounds, contact Cirrus Design for disposition.

Note: To replicate flap operating forces during Adjustment/Test, ensure spring scale is positioned in same orientation as installed flap push/pull rod.

(e) Position and pull spring scale in same orientation as installed flap push/pull rod and note force required to remove flap from full-up position.

(f) Position push/pull rod end to flap actuation fitting and secure with bolt and washer.

(g) Safety wire rod end mounting bolt to flap actuation fitting.



NOTE

1. To replicate flap operating forces, during Adjustment/Test, ensure spring scale is positioned in same orientation as installed push/pull rod.

DETAIL A

Serials 1005 thru 1877, 1879 thru 1885.

LEGEND
1. Spring Scale
2. Flap Push/Pull Rod
3. Bolt
4. Actuation Fitting

SR20_MM57_1523C

Figure 57-508
Flap Force Limitation Test - Serials 1005 thru 1885

G. Flap Assembly - *Serials 1886 & subs* **(See Figure 57-509)**

(1) Removal - Flap Assembly

(a) Cut safety wire securing rod end mounting bolt to flap actuation fitting.

CAUTION: When disconnecting rod end, exercise caution to prevent flap from swinging downward and making contact with landing gear.

(b) Remove bolt and washer securing rod end to flap. Carefully lower flap.

(c) At inboard, mid, and outboard flap hinges, remove bolts, washers, nuts, spacer (*Serials 2075 thru 2078 after SB 2X-57-11, & 2079*), and cotter pins securing flap to flap hinge. Remove flap from airplane.

(2) Installation - Flap Assembly

CAUTION: Flap mounting bolts must be installed with nuts facing inboard.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire	-	Any Source	Secure flap.
Loctite®	222	Any Source	Secure flap fairing.

(b) Position flap to hinges and secure with bolts, washers, nuts, spacer (*Serials 2075 thru 2078 after SB 2X-57-11, & 2079*), and cotter pins.

CAUTION: Flap must pivot freely on all three hinge bolts. If flap does not pivot freely, the problem must be corrected before securing actuation rod end.

(c) Verify flap moves smoothly and uninhibited through full range of motion.

(d) Position rod end to flap actuation fitting and secure with bolt and washer.

(e) Safety wire rod end mounting bolt to flap actuation fitting.

(f) Perform Operational Test - Flap System. (Refer to 57-50)

(3) Operational Test - Flap System

(a) Set BAT 1 switch to ON position.

(b) Set flaps switch to UP position.

(c) Set flaps switch to 100% position.

(d) Verify flap moves smoothly and uninhibited through full range of motion.

(e) Verify flap position light illuminates correctly at UP, 50%, and 100% positions.

(f) Visually inspect for contact or rubbing between flap and flap cove. If flap surface contacts flap cove, contact Cirrus Design for disposition.

(4) Removal - Flap Fairings

(a) Remove flap assembly. (Refer to 57-50)

(b) Remove bolt, washers, and nut securing fairing to flap hinge. Repeat for other fairings.

(5) Installation - Flap Fairings

(a) Position fairing to flap hinge and secure with bolt, washers, and nut. Repeat for other fairings.

(b) Install flap assembly. (Refer to 57-50)

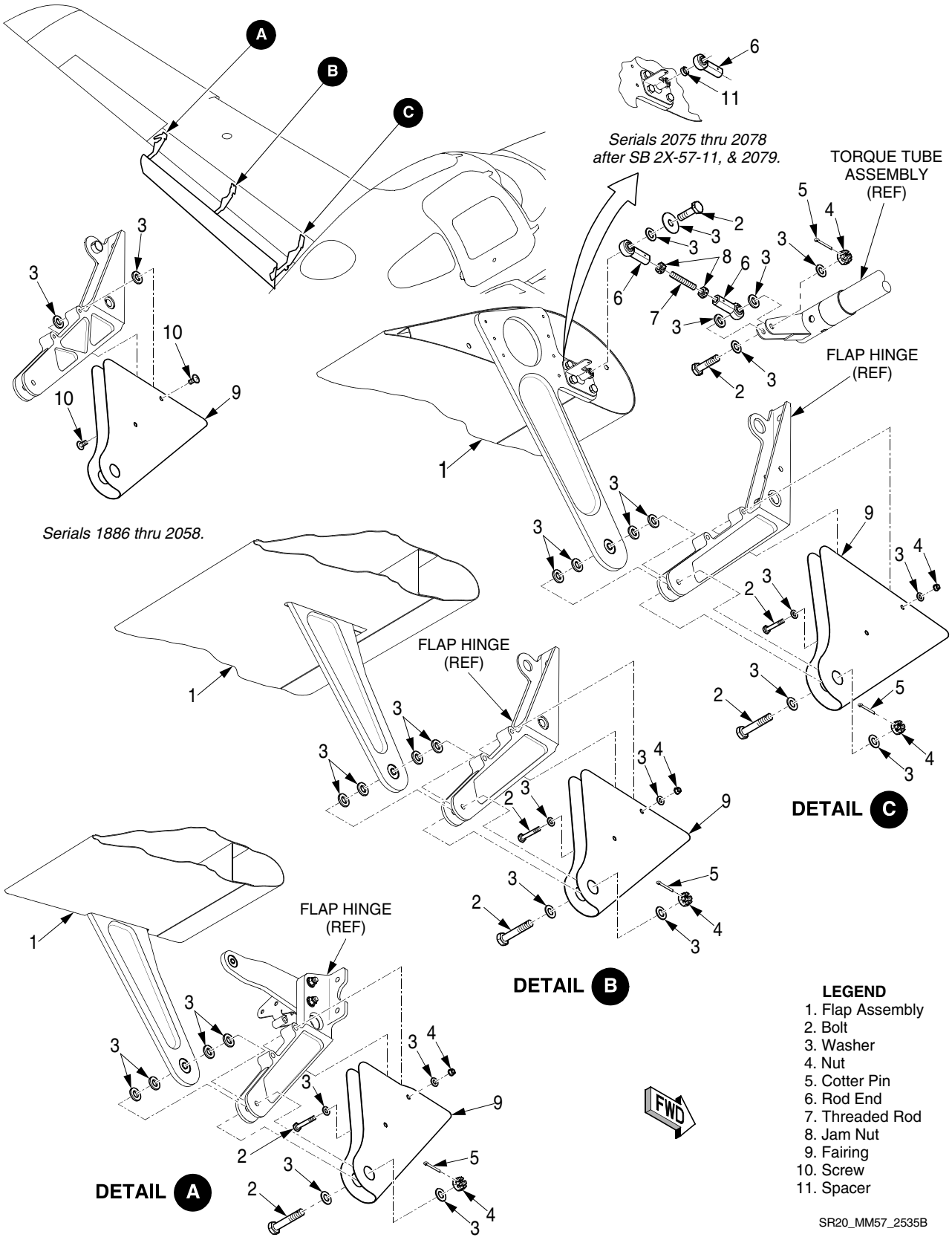


Figure 57-509
Flap Installation - Serials 1886 & subs

H. Flap Rub Strip (See Figure 57-5010)

(1) Removal - Flap Rub Strip

CAUTION: Do not allow the structure temperature to exceed 150° F (65.5° C) when applying heat with hot-air blower. Excessive heat may result in loss of structural integrity.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Denatured Alcohol	-	Any Source	Solvent.
Hot-Air Blower	-	Any Source	Flap rub strip removal.

(b) Apply heat with hot-air blower until adhesive loosens from flap surface.

(c) Peel flap rub strip away from surface, using additional heat if necessary.

(d) Solvent clean surface to remove residual adhesive. (Refer to 20-30)

(2) Installation - Flap Rub Strip

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Self Adhesive Flap Rub Strip	51168-002	Cirrus Design Duluth, MN 55811 218-727-2737	Flap protection.
Denatured Alcohol	-	Any Source	Solvent.
Water Wash	-	Any Source	Surface cleaning.
Masking Tape	-	Any Source	Flap rub strip alignment.
Squeegee	-	Any Source	Application of surface pressure.

(b) Water wash surface where flap rub strip is to be installed.

(c) Solvent clean surface where flap rub strip is to be installed. (Refer to 20-30)

(d) Raise flap to full up position.

Note: Only 0.25 to 0.50 inch (0.635 to 1.27 cm) of flap rub strip should be visible with flap in full-up position. Use masking tape to ensure proper alignment of flap rub strip.

(e) Apply masking tape along entire length of flap, leaving a margin of 0.25 to 0.50 inch (0.635 to 1.27 cm) between forward edge of tape and trailing edge of wing skin.

(f) Lower the flap.

(g) Remove protective backing from flap rub strip using care not to contaminate adhesive surface.

Note: Avoid stretching flap rub strip as poor adhesion will result.

(h) Using masking tape as a guide, place one edge of flap rub strip on surface and work across flap to eliminate wrinkles and air pockets.

(i) Press flap rub strip firmly to surface with squeegee. Ensure all edges are firmly adhered.

(j) Remove masking tape.

(k) Solvent clean as necessary to remove adhesive residue. (Refer to 20-30)

(l) Raise flap to full up position.

(m) Verify visible width of flap rub strip is 0.25 to 0.50 inch (0.635 to 1.27 cm) along length of flap rub strip.

(n) Perform Adjustment/Test - Flap Force Limitation. (Refer to 57-50)

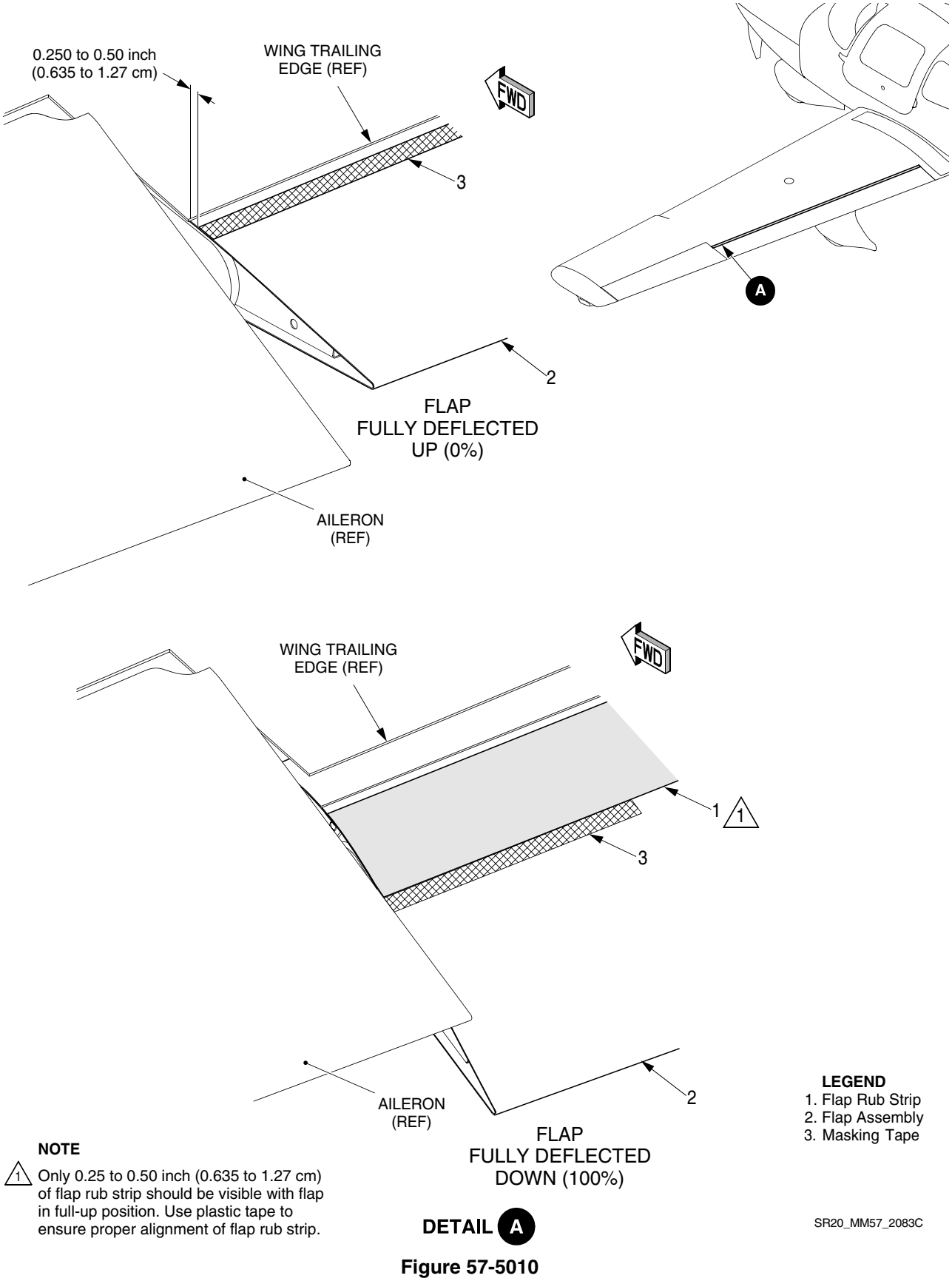


Figure 57-5010
Flap Rub Strip Installation

CHAPTER

61

PROPELLER

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CHAPTER 61 - PROPELLER

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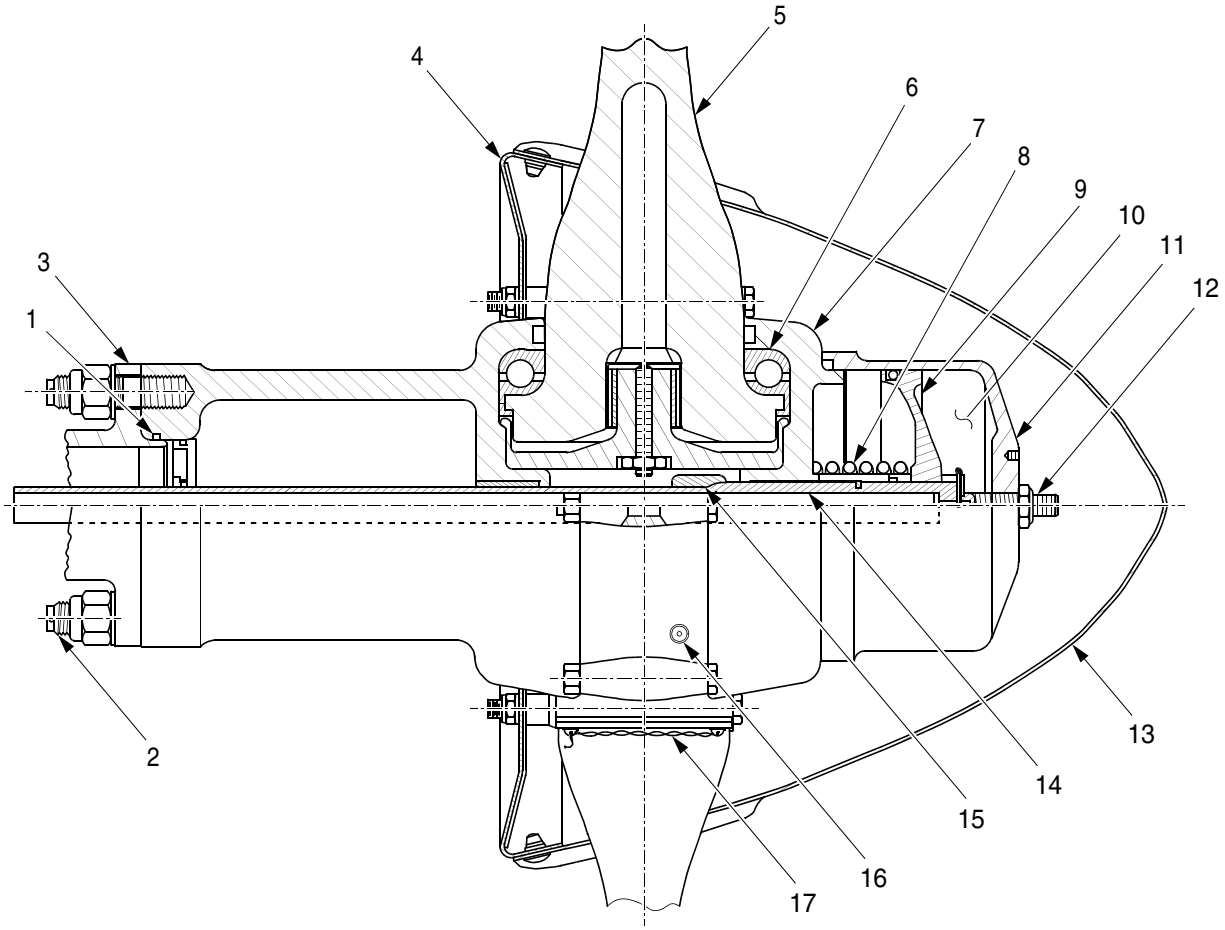
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PROPELLER

1. GENERAL

The airplane employs a 2 blade, optional 3 blade, Hartzell Compact, constant speed, non-feathering propeller. The aluminum blades are mounted in an aluminum hub which contains the pitch changing mechanism consisting of a piston/cylinder, piston rod, and blade actuating components. For propeller speed adjustment, a propeller control cable is terminated on a cam plate which is mounted to the throttle control lever. This connection mechanically adjusts the propeller speed by increasing oil pressure from an engine mounted governor to move the blades into high pitch or reduced RPM. A spring and centrifugal twisting moment of the blades moves them to low pitch in the absence of governor oil pressure. Under this arrangement, the propeller is set to 2700 RPM for full forward throttle takeoff and climb, 2500 RPM for mid to full throttle cruise, and approximately 1900 RPM at lower power.



LEGEND

1. Shaft O-Ring
2. Mounting Stud
3. Engine Flange
4. Spinner Bulkhead
5. Blade
6. Blade Retention Bearing
7. Hub
8. Pitch Return Spring
9. Piston
10. Oil
11. Cylinder
12. Low Pitch Stop
13. Spinner Dome
14. Pitch Change Rod
15. Fork
16. Grease Fitting
17. Balance Wire

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Figure 61-001
Propeller Schematic

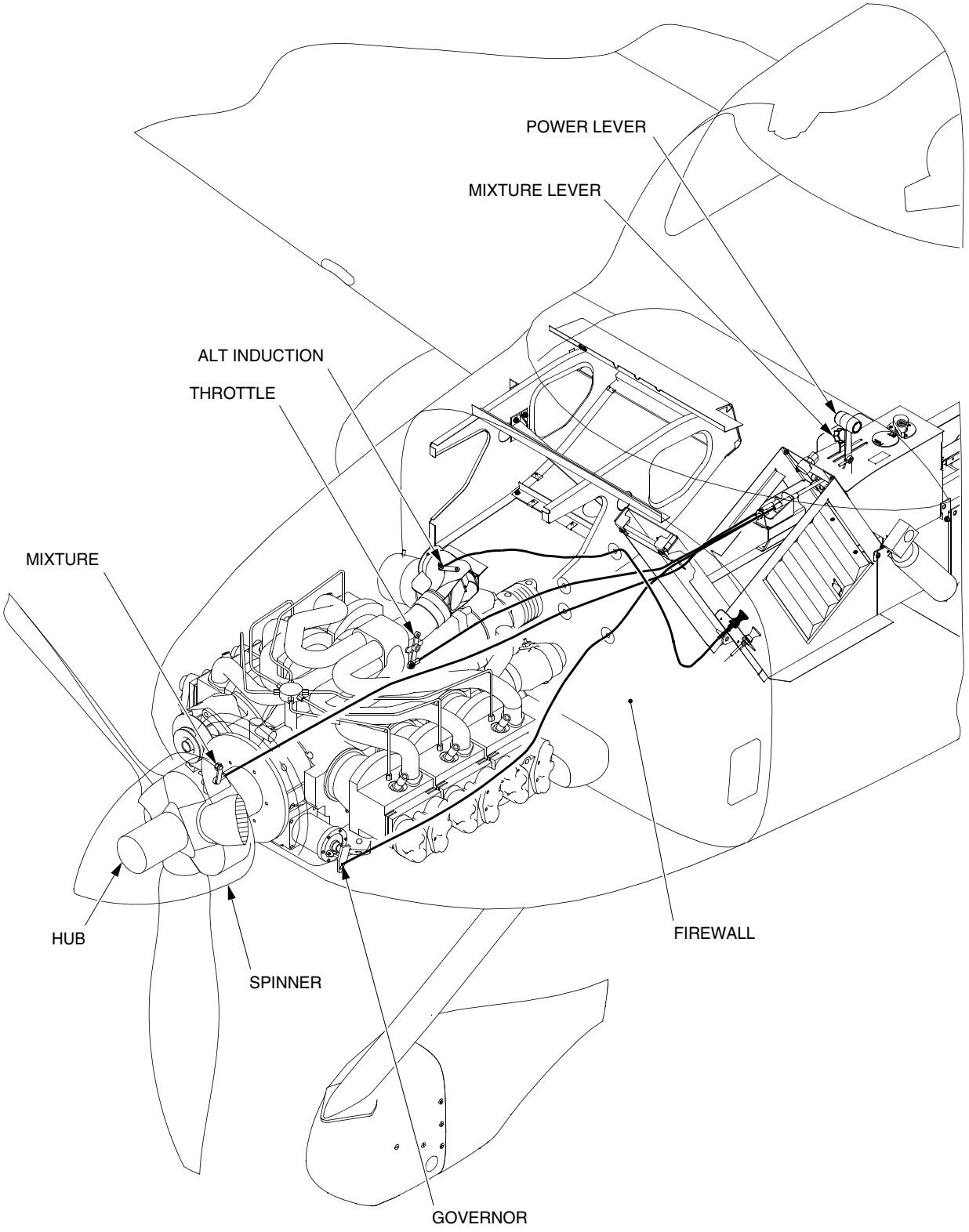


Figure 61-002
Propeller Control

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Surging propeller.	Governor out of adjustment.	Inspect and adjust governor.
	Air in propeller governor oil body.	Cycle propeller through pitch range several times.
Engine speed varies with attitude or airspeed.	Governor not properly controlling propeller blade angle.	Inspect and adjust governor.
	Friction in propeller.	Inspect propeller and make necessary adjustments.
Decrease in engine speed while increasing airspeed.	Governor is excessively increasing oil volume.	Inspect and adjust governor.
Decrease in engine speed while decreasing airspeed.	Governor is not reducing oil volume.	Inspect and adjust governor.
Increase in engine speed while decreasing airspeed.	Governor is excessively decreasing oil volume.	Inspect and adjust governor.
Increase in engine speed while increasing airspeed.	Governor is not increasing oil volume.	Inspect and adjust governor.
	Propeller piston seal leaking oil to opposite side of piston.	Remove propeller from aircraft, disassembly, clean, and replace propeller seals. (Refer to 61-10)
Propeller goes to uncommanded low pitch.	Loss of propeller oil pressure.	Inspect governor pressure relief valve, governor drive, engine oil supply, engine transfer bearing for leakage.
Oil leakage at engine flange/hub interface.	Damaged O-ring seal between engine and propeller.	Replace O-ring. (Refer to 61-10)
	Mounting nuts not tight.	Clean mating surface and tighten nuts properly. (Refer to 61-10)
Oil leakage at other locations.	Defective seals or incorrect assembly.	Repair or replace seals as required.
Tachometer does not indicate 2700 RPM with power lever in full forward position.	Governor out of adjustment.	Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment. (Refer to 61-20)
Tachometer does not indicate 2500 RPM with power lever in engine cruise position.	Governor control cable	Perform Functional Test - Engine Cruise RPM. (Refer to 61-20)

PROPELLER ASSEMBLY

1. DESCRIPTION

The propeller assembly consists of a hollow aluminum hub which supports the propeller blades and also houses the pitch changing mechanism. Movement of propeller blades is controlled by a hydraulic piston/cylinder combination mounted on the front of the hub. The linear motion of the hydraulic piston is transmitted to each blade through a pitch change rod and fork. A pitch change knob at the base of each blade intersects with the fork.

Blade pitch is controlled by the governor. The governor supplies oil to the propeller hub to move the blades toward high pitch position (decreased RPM). Conversely, the propeller blades move toward low pitch position (increase RPM) as the governor drains oil away from the propeller hub. A mechanical spring is installed within the propeller to assist movement of the blades to a lower pitch position as RPM decays since blade centrifugal twisting moment is only present when the propeller is rotating. The mechanical spring will ensure that blade angle will reach the low pitch stop when the propeller is static. If oil pressure is lost at any time, the propeller will move to low pitch.

The propeller assembly employes high-strength, aluminum blades. It is essential that the propeller assembly be maintained in accordance with Hartzell Propeller recommended service procedures. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

2. MAINTENANCE PRACTICES

A. Propeller (See Figure 61-101)

The following maintenance practices apply to both the standard two blade propeller and optional three blade propeller as the maintenance practices do not differ. The propeller hub mounting flange has six, half inch diameter studs configured in a four inch circle. Two half inch diameter dowel pins are also provided to transfer torque and index the propeller with respect to the engine crankshaft.

WARNING: Ensure master and magneto switches are off, and ignition key is removed.

(1) Removal - Propeller

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Hoist	-	Any Source	Hoist propeller.
Sling	-	Any Source	Secure propeller to hoist.
Drain Pan	-	Any Source	Receive waste lubricant.

(b) Remove key from ignition.
(c) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
(d) Move fuel selector to OFF position.
(e) Place mixture control in idle cut-off.
(f) Remove engine cowling. (Refer to 71-10)

CAUTION: To ensure spinner dome is reinstalled in same clocked position, draw a reference line across spinner dome and spinner bulkhead.

(g) Remove screws and washers securing spinner dome to spinner bulkhead.
(h) Remove spinner dome from airplane.
(i) Remove alternator belt. (Refer to 24-30)
(j) Position hoist and lifting sling forward of airplane and attach sling to propeller.
(k) Place a drain pan beneath propeller to catch any spilled lubricant.
(l) Loosen and remove nuts and washers securing propeller to engine flange.

CAUTION: Note orientation of propeller blades to engine to ensure propeller is reinstalled in correct clock position.

Remove propeller from engine flange with care to prevent damaging the propeller mounting studs.

(m) Remove propeller from airplane.

CAUTION: To ensure spinner bulkhead is reinstalled in same clocked position, draw a reference line across spinner bulkhead and propeller hub.

(n) Remove bolts, spacers, washers, and nuts securing spinner bulkhead to propeller hub.
(o) Remove O-ring from groove inside hub at flange mounting and discard.
(p) Remove drain pan and discard spilled lubricant.

(2) Installation - Propeller

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Hoist	-	Any Source	Hoist propeller.
Sling	-	Any Source	Secure propeller to hoist.
Degreaser	-	Any Source	Degrease components.
O-Ring	C-3317-228	Hartzell Propellers Inc. Piqua, Ohio 937-778-4200	Sealing component.

(b) Apply a light coat of engine oil to new O-ring and bore surfaces of propeller. Insert O-ring into groove inside hub at flange mounting.

CAUTION: Verify spinner bulkhead is in same clocked position as originally installed.

(c) Position spinner bulkhead to propeller hub and secure with bolts, spacers, washers, and nuts. Torque nuts to 22 ft-lb (30 Nm). Do not add nut run on drag to torque values.

(d) Clean the engine shaft, propeller flange, and engine flange.

(e) Assemble alternator backing plates, and sheave around engine flange and loosely tighten nuts, washers, and bolts.

(f) Place alternator belt around sheave. (Refer to 24-30)

CAUTION: Verify propeller is in same clocked position as originally installed.

Care must be taken to avoid damaging hub or O-ring when installing propeller. Do not attempt to forcefully draw propeller onto engine flange with nuts.

(g) Using hoist and sling, align dowel pins in propeller flange with corresponding holes in engine mounting flange.

(h) Install washers and nuts securing propeller assembly to engine flange.

CAUTION: Tighten nuts evenly to avoid hub damage.

(i) Through a system of gentle rocking, hoisting, and maneuvering, systematically tighten backing plates, sheave, and propeller to engine flange.

(j) Torque nuts securing propeller to engine flange 70 - 80 ft-lb (94.9 - 108.5 Nm). Do not add nut run on drag to torque values.

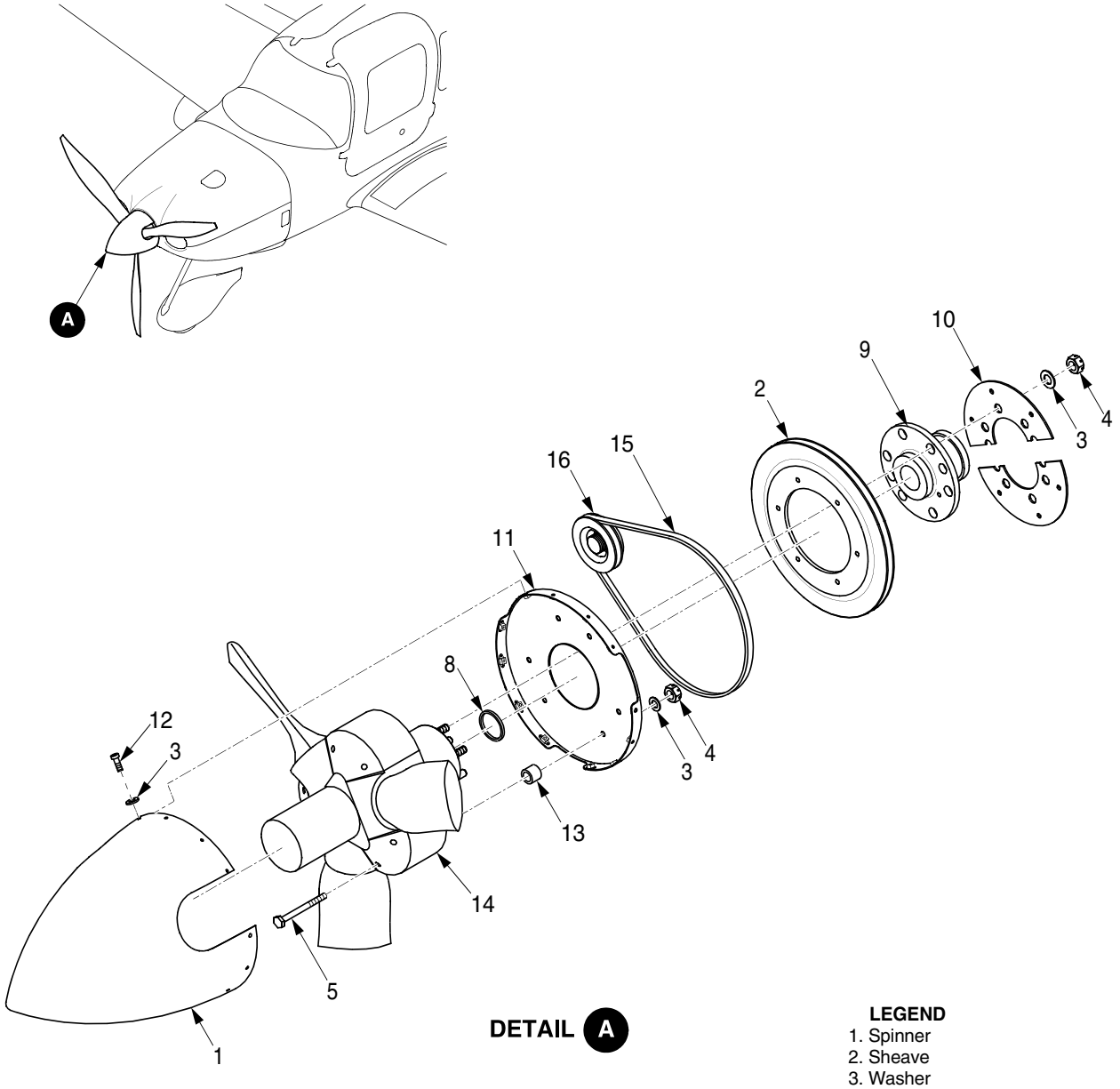
(k) Install bolts securing backing plates and sheave to engine flange.

(l) Adjust alternator belt tension. (Refer to 24-30)

CAUTION: Verify spinner dome is in same clocked position as originally installed.

(m) Position spinner dome to front of propeller hub and secure to spinner bulkhead with screws and washers.

(n) Install engine cowling. (Refer to 71-10)



LEGEND

1. Spinner
2. Sheave
3. Washer
4. Nut
5. Bolt
6. Propeller Stud
7. Dowel Pin
8. O-ring
9. Engine Prop Flange
10. Backing Plate
11. Spinner Backing Plate
12. Screw
13. Spacer
14. Propeller
15. Alternator Belt
16. Alternator Pulley (Ref)

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Figure 61-101
Propeller Installation

B. Adjustment/Test - Dynamic Balance

Dynamic balancing reduces vibration produced by the propeller and powerplant. Small balance weights are added to the propeller/crankshaft assembly to correct for errors in mass distribution so vibration is reduced. Refer to the manufacturer's Instructions for Continued Airworthiness for pertinent information regarding dynamic balancing.

C. Inspection/Check - Blade Track

Blade track is the way one rotating blade tip follows the other in almost the same plane. Excessive difference in blade track may be an indication of bent blades or improper propeller installation. Refer to the manufacturer's Instructions for Continued Airworthiness for pertinent information regarding blade track.

D. Inspection/Check - Loose Blades

Although blades should be tight in the propeller, slight movement is acceptable if blade returns to original position when released. Blades with excessive movement, or that do not return to original position when released may indicate internal wear or damage. Refer to the manufacturer's Instructions for Continued Airworthiness for pertinent information regarding loose blades.

E. Cleaning/Painting

Propeller blades are painted with a durable specialized coating that is resistant to abrasion. If this coating becomes eroded, it is necessary to re-paint the blades to provide proper corrosion and erosion protection. Refer to the manufacturer's Instructions for Continued Airworthiness for pertinent information regarding painting.

F. Repairs

Nicks, gouges, and scratches on blade surfaces or on leading or trailing edges must be removed prior to flight. Refer to the manufacturer's Instructions for Continued Airworthiness for pertinent information regarding repairs.

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PROPELLER CONTROL

1. GENERAL

The propeller governor is an engine RPM sensing device and high pressure oil pump. Pressurized engine oil is directed to the propeller hydraulic cylinder or released from the hydraulic cylinder in response to engine RPM change. Change in oil volume in the hydraulic cylinder changes the blade angle and returns the propeller system RPM to the value set by the cockpit throttle/propeller control. The governor is mounted on the lower left forward portion of the engine crankcase.

2. MAINTENANCE PRACTICES

A. Propeller Governor (See Figure 61-201)

(1) Removal - Propeller Governor

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing control cable rod end to governor control arm.

(c) Place a drain pan beneath governor to catch oil spillage.

(d) Remove nuts and washers securing governor to studs on governor mounting pad.

(e) Remove and discard gasket.

(2) Installation - Propeller Governor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Engine oil.	-	Any Source	Lubrication.

(b) Lubricate governor shaft spines with engine oil.

(c) Install new gasket over studs on governor mounting pad.

(d) Position governor over studs on governor mounting pad and secure with washers and nuts. Torque nuts to 155 - 175 in-lb (17.5 - 19.7 Nm).

(e) Install bolt, washers, nut, and cotter pin securing control cable rod end to governor control arm.

(f) Install engine cowling. (Refer to 71-10)

(3) Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment

(a) Remove engine cowling. (Refer to 71-10)

(b) Perform Adjustment/Test - Throttle Control Cable. (Refer to 76-10)

(c) Perform Adjustment/Test - Mixture Control Cable. (Refer to 76-10)

(d) Adjust governor control cable jam nuts so power control lever in the full forward position causes governor control arm to make contact with governor low pitch control arm stop.

(e) Ensure power control lever has positive clearance to console slot in both full forward and full aft positions.

CAUTION: Engine starting and shut-down may only be performed by authorized personnel.

(f) Start and warm up engine. (Refer to Pilot's Operating Handbook, Section 4)

Note: Due to lower loads on the engine during flight, engine RPM should be set to approximately 2650 during ground static adjustments to ensure engine output of 2700 RPM during flight conditions.

(g) With power lever full forward, verify tachometer reads 2650 RPM.

(h) If engine tachometer does not read 2650 RPM, shut down engine, and adjust the low pitch/high RPM screw on the governor.

1 Remove safety wire from adjustment screw.

Note: One revolution of the adjustment screw will increase or decrease engine speed approximately 25 - 30 RPM.

2 Loosen adjustment screw locknut and turn screw in clockwise direction to decrease engine speed or in counterclockwise direction to increase engine speed.

3 Tighten adjustment screw locknut.

CAUTION: Engine starting and shut-down may only be performed by authorized personnel.

4 Start and warm up engine. (Refer to Pilot's Operating Handbook, Section 4)

5 With power lever full forward, verify tachometer reads 2650 RPM.

6 If engine tachometer does not read 2650 RPM, shut down engine, and repeat adjustment.

7 When correctly adjusted, shut down engine, and safety wire adjustment screw locknut.

(i) Tighten governor control cable jam nuts. Verify minimum rod-end thread engagement of 0.312 inch (0.79 cm).

(j) Install engine cowling. (Refer to 71-10)

(4) Functional Test - Engine Cruise RPM

WARNING: Test flight may only be performed by authorized personnel.

(a) Conduct test flight.

1 With power lever full forward, verify tachometer reads 2700 RPM.

2 With power lever at cruise setting, verify tachometer reads 2500 - 2525 RPM.

(b) If unable to obtain 2700 RPM at full power, perform Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment. (Refer to 61-20)

(c) If unable to obtain 2500 - 2525 RPM at cruise setting, perform the following steps:

1 Remove engine cowling. (Refer to 71-10)

Note: One thread on governor control cable push rod measures 0.0313 inch (0.7950 mm) and equals approximately 20 RPM.

2 At control quadrant, adjust governor control cable rod end so governor control arm moves off of low pitch stop the distance required to obtain increase in cruise RPM. For example, to gain 20 RPM, shorten rod end one revolution until a 0.0313 inch (0.7950 mm) gap exists between governor control arm and low pitch stop.

3 At governor, adjust governor control cable rod end until governor control arm contacts low pitch stop. Verify minimum rod end thread engagement of 0.312 in (0.79 cm).

4 At throttle body, adjust throttle control cable rod end until throttle body control arm contacts full forward stop. Verify minimum rod end thread engagement of 0.312 in (0.79 cm).

5 In full forward and full aft positions, ensure power lever has positive clearance with slot in engine control panel.

6 Install engine cowling. (Refer to 71-10)

7 Conduct test flight.

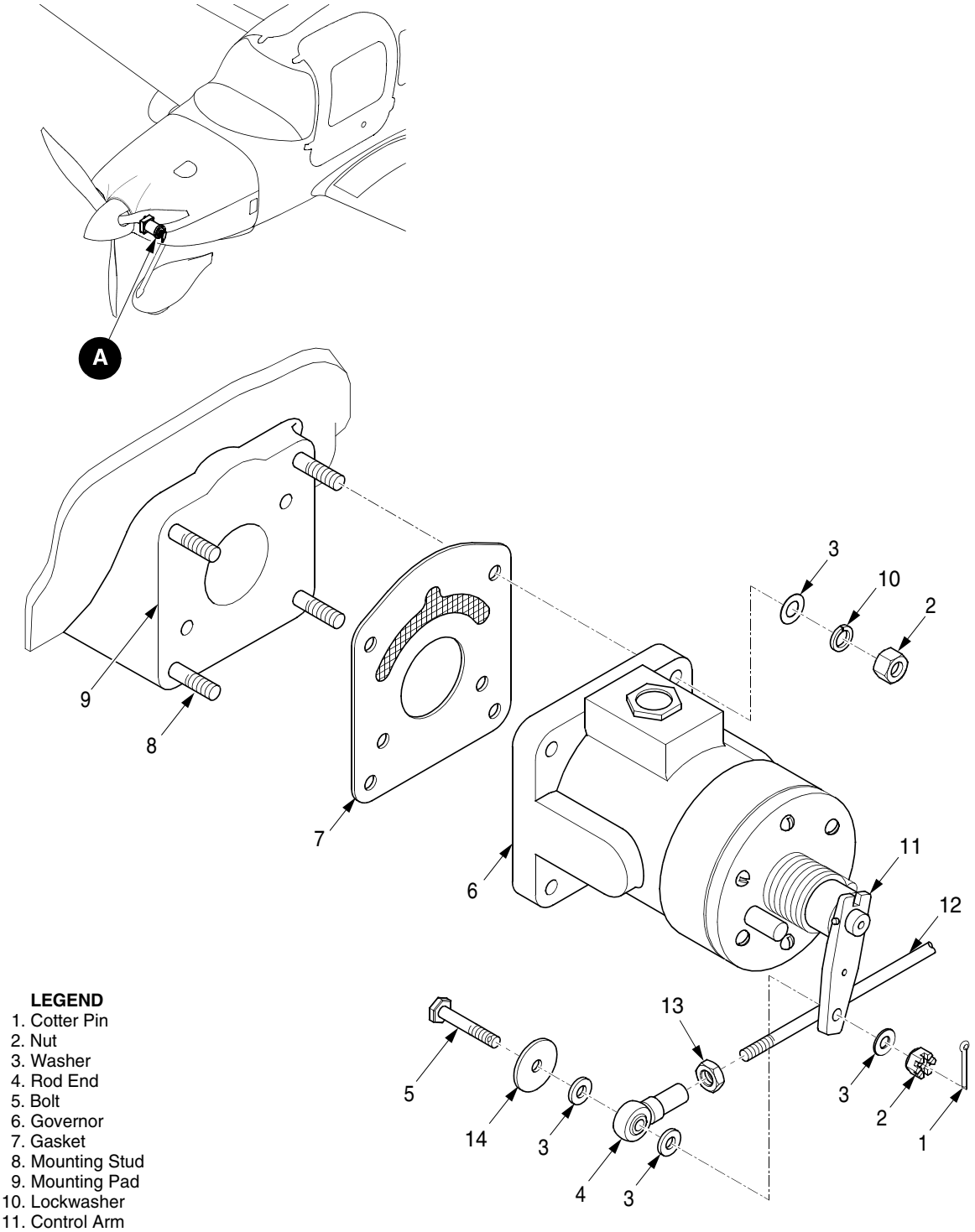


Figure 61-201
Governor Installation

EFFECTIVITY:
All

CHAPTER 71

POWER PLANT

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71-LOEP	2	04 SEP 2018
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71-TOC	3	04 SEP 2018
71-TOC	4	04 SEP 2018
71-00	1	01 JAN 2012
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71-00	14	15 JUN 2010
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71-10	15	15 DEC 2014
71-10	16	15 DEC 2014
71-10	17	19 SEP 2010
71-10	18	19 SEP 2010
71-20	1	19 SEP 2010
71-20	2	15 DEC 2014
71-20	3	19 SEP 2017
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71-20	5	04 SEP 2018
71-20	6	19 SEP 2010
71-20	7	19 SEP 2010
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71-40	8	15 JUN 2010
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71-60	1	15 JUN 2010
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71-60	5	15 DEC 2014
71-60	6	15 DEC 2014
71-70	1	15 JUN 2010
71-70	2	15 JUN 2010
71-70	3	15 JUN 2010
71-70	4	19 SEP 2010
71-70	5	19 SEP 2010
71-70	6	19 SEP 2010

EFFECTIVITY:
All

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POWER PLANT

1. GENERAL

This chapter describes maintenance practices for the airplane systems which provide the means to induce and convert fuel-air mixture into power such as the engine, baffling, cowling, mount, attach fittings, electrical harnesses, air intake, and engine drains.

2. DESCRIPTION

A. Engine

The airplane is powered by a Teledyne Continental IO-360-ES engine. The engine is a six cylinder, horizontally opposed, fuel injected, air-cooled, wet sump, power plant incorporating a down01 May 2012 induction system, tuned exhaust, and provisions for front and rear mounted accessories. (See Figure 71-001) (See Figure 71-002) (See Figure 71-003)

B. Baffling

Sheet metal baffles are installed on the engine to direct the air flow around the cylinders and other engine compartment components. To help direct and contain air flow in the engine compartment, the baffles utilize fiber reinforced silicon seals in contact with the cowling around the circumference of the engine.

3. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Engine will not start.	Improper use of starting procedure.	Review starting procedure. See POH.
	Fuel tank empty.	Inspect and fill tank. (Refer to 12-10)
	Mixture control in SHUTOFF position.	Advance mixture control to RICH position.
	Fuel selector valve in OFF position.	Place selector valve in ON position to tank known to contain fuel.
	Fuel vaporization.	Turn boost pump ON.
	Engine flooded.	Turn off boost pump and ignition switch. Advance throttle to full OPEN, retard fuel control to full LEAN, and crank engine to clear cylinders of excess fuel. Repeat starting procedure.
	Water in fuel system.	Sample fuel. See POH. If water present, drain and flush fuel system. (Refer to 12-10)
	Fuel contamination.	Drain and flush fuel system. (Refer to 12-10)
	Defective magneto switch or grounded magneto leads.	Check continuity. Repair or replace switch or leads.
	Spark plugs fouled.	Remove, clean, and re-gap. Refer to the engine manufacturer's approved service instructions.
	Excessive starter slippage.	Replace starter adapter. Refer to the manufacturer’s approved Instructions For Continued Airworthiness.
	Defective ignition system.	Inspect and replace necessary components. (Refer to 74-00)
	Induction system leak.	Inspect hose for cracks. Tighten or replace loose or damaged hose connections.
	Fuel system malfunction.	Isolate cause and correct.
Engine will not run at idle RPM.	Fuel injection system improperly adjusted.	See “Engine Fuel System Troubleshooting.” (Refer to 73-00)
	Air leak in intake manifold.	Torque loose connection or replace malfunctioning part.

TROUBLE	PROBABLE CAUSE	REMEDY
Rough idling.	Fuel injection system improperly adjusted.	Adjust fuel system. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Mixture levers set for improper mixture.	Review mixture control. See POH.
	Fouled Spark Plugs.	Remove, clean and adjust gaps. (Refer to 74-20)
	Hydraulic tappets fouled.	Replace fouled tappets. Inspect and clean oil filter at more frequent intervals.
	Burned or warped exhaust valves worn seat, scored valve guides.	Inspect, repair or replace cylinder. Replace any burned, warped or worn exhaust valves.
	Manifold valve vent obstruction.	Repair or replace manifold valve.
Engine runs too lean at cruising power.	Fuel flow reading too low.	Check fuel strainer for clogging. Clean screen.
	Fuel injection malfunction.	Inspect and replace necessary components. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Cracked induction tube.	Inspect, repair, or replace induction tube.
	Improper manual leaning procedure.	Review leaning procedure. See POH.
	Fuel injection system maladjusted.	Adjust fuel system. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Engine runs too rich at cruising power.	Restrictions in air intake passages.	Check passages and remove restrictions.
	Improper manual leaning of Fuel/Air mixture.	Review leaning procedure. See POH.
	Cracked induction tube.	Inspect, repair, or replace induction tube.
Engine runs too lean or too rich at throttle setting other than cruise.	Fuel injection system maladjusted.	See "Engine Fuel System Troubleshooting". (Refer to 73-00)
Continuous fouling of spark plugs.	Piston rings excessively worn or broken.	Replace rings. Replace cylinder if damaged.
	Piston rings are not seated.	Hone cylinder walls and replace rings.
	Running the engine too rich.	Review engine operation. See POH.

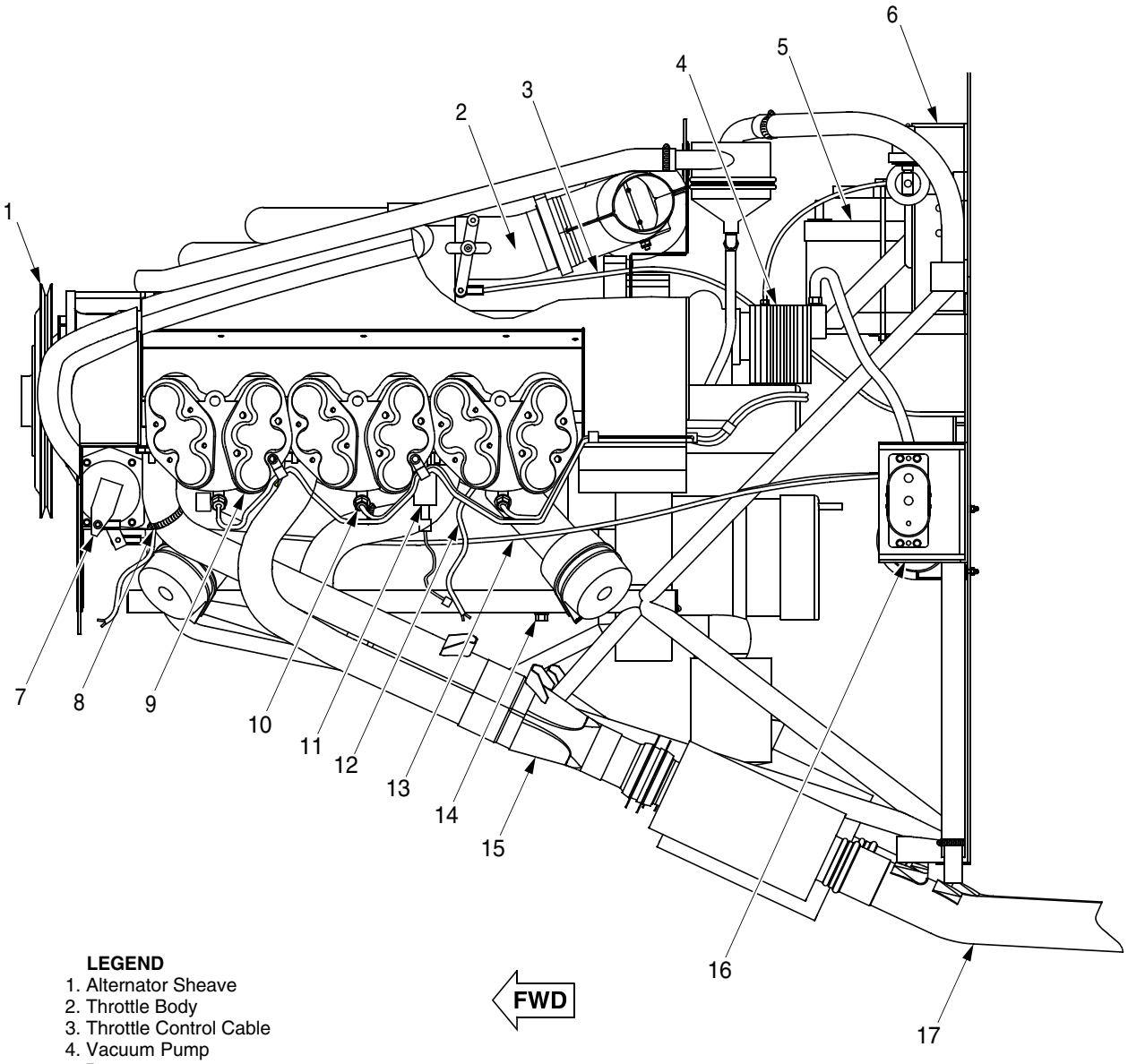
TROUBLE	PROBABLE CAUSE	REMEDY
Engine runs rough at high RPM.	Loose mounting bolts or damaged mount pads.	Torque mounting bolts. Replace mount pads. (Refer to 71-20)
	Plugged fuel nozzle jet.	Inspect and clean as necessary. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Propeller out of balance.	Perform Adjustment/Test - Dynamic Balance. (Refer to 61-10)
	Ignition system malfunction.	See Ignition "Troubleshooting". (Refer to 74-00)
Continuous missing at high RPM.	Broken valve spring.	Replace as necessary. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Plugged fuel nozzle jet.	Inspect and clean as necessary. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Burned or warped valve.	Repair or replace cylinder. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Hydraulic tappet dirty or worn.	Remove and replace. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Ignition system malfunction.	Inspect and replace necessary components. (Refer to 74-00)
Sluggish operation and low power.	Restriction in air intake passages.	Inspect and clear obstruction.
	Ignition system malfunction.	Inspect and replace necessary components. (Refer to 74-00)
	Fuel injection system maladjusted.	Inspect and replace necessary components. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Valve seats worn and leaking. Piston rings worn or stuck in grooves.	Borescope cylinders and check compression. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Throttle not full open.	Check and adjust linkage. (Refer to 76-10)

TROUBLE	PROBABLE CAUSE	REMEDY
High cylinder head temperature.	Low octane fuel.	Drain tanks and replace with correct fuel grade. (Refer to 12-10)
	Cylinder baffle seals leaking or mis-positioned.	Inspect and repair cylinder baffles. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Debris between cylinder fins.	Thoroughly inspect and clean cylinder fins.
	Excessive carbon deposits in cylinder head and on pistons.	Inspect ignition and fuel injections system. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Magnetos out of time.	Re-time ignition system internally and externally. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Magneto distributor block contamination.	Replace magneto. (Refer to 74-10)
	Exhaust system gas leakage.	Inspect and repair. (Refer to 78-20)
	Exhaust valve leaking.	Inspect and repair cylinder. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Lean fuel/air mixture.	Review leaning procedure. See POH.
Oil leaks.	At front of engine, damaged crankshaft oil seal.	Replace crankshaft oil seal.
	Around plugs, fittings, and gaskets due to looseness or damage.	Torque or replace.
Low compression.	Piston rings excessively worn.	Inspect, repair or replace cylinder. Replace piston rings. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Valve faces and seats worn.	Inspect, repair or replace cylinder. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Excessively worn cylinder walls.	Replace cylinder and piston rings. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

TROUBLE	PROBABLE CAUSE	REMEDY
Poor idle cut-off.	Worn or improperly rigged mixture control.	Inspect cable. Replace worn linkage (if necessary). Rig properly. (Refer to 76-10)
	Engine driven fuel pump improperly adjusted.	Adjust fuel pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Fuel manifold valve not seated tightly.	Replace manifold valve. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Climbing to altitude, fuel flow fluctuates.	Fuel vaporization.	Operate fuel boost pump. See POH.
Low fuel pressure.	Incorrect fuel pump adjustment.	Check and adjust fuel pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Malfunctioning fuel pump relief valve.	Replace fuel pump.
	Obstruction in fuel line.	Clear obstruction or replace fuel line.
High fuel pressure.	Malfunctioning relief valve operation in fuel pump.	Replace fuel pump.
	Restricted recirculation passage in fuel pump.	Replace fuel pump.
	Incorrect fuel pump adjustment.	Check and adjust fuel pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

TROUBLE	PROBABLE CAUSE	REMEDY
Fluctuating fuel pressure.	Vapor in fuel system, excessive fuel temperature.	Normally, operating the auxiliary pump will clear system. Operate boost pump. See POH.
Engine has poor acceleration.	Idle mixture too lean.	Check RPM rise and idle cutoff. Adjust idle mixture. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Worn control linkage.	Replace worn elements of linkage. (Refer to 76-10)
	Restricted air cleaner.	Service air filter. (Refer to 71-60)
	Malfunctioning ignition system.	Check ignition cables and connections. Replace malfunctioning spark plugs. (Refer to 74-00)
Engine runs rough at above idle RPM.	Improper Fuel/Air mixture.	Check fuel manifold connections for leaks. Torque loose connections. Check fuel control/metering unit and linkage for setting and adjustment. Refer to the engine manufacturer's approved service instructions. Check fuel filters and screens for debris. Check for proper fuel pump pressure.
	Restricted fuel nozzle jet.	Clean. Replace nozzle if obstruction cannot be cleared by solvent action.
	Ignition system and spark plugs malfunctioning.	Clean, regap and test spark plugs. Inspect, test and repair ignition system. Replace components as required. (Refer to 74-00)
Engine lacks power, reduction in maximum manifold pressure.	Incorrectly adjusted throttle control linkage.	Check movement of linkage by moving control from idle to full throttle. Replace worn components. (Refer to 76-10)
	Dirty air filter.	Service air filter in accordance with the manufacturer's approved Instructions For Continued Airworthiness. (Refer to 71-60)
	Fuel manifold valve sticking or obstructed.	Replace manifold valve. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

TROUBLE	PROBABLE CAUSE	REMEDY
Low oil pressure indication on engine gage.	Low oil supply. Oil viscosity too low.	Replenish. Drain and refill with correct viscosity. Adjust oil pressure in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Malfunctioning oil pump.	Repair or replace oil pump.
	Weak or broken oil pressure relief valve spring.	Replace spring.
High oil temperature indication.	Prolonged ground operation.	Limit ground operation to a minimum.
	Malfunctioning gage or bulb unit.	Inspect wiring, bulb unit, and gage.
	Climb angle too high.	Reduce climb angle.
	Obstruction on oil cooler.	Inspect for obstruction and remove.
	Insufficient baffle sealing in area of oil cooler.	Inspect, repair, or replace engine baffling.
	Low oil supply.	Replenish.
Engine starts but dies or will not idle.	Idle fuel adjustment screw incorrectly adjusted.	Adjust screw. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Spark plugs fouled.	Remove, clean, and re-gap. (Refer to 74-20)
	Water in fuel system.	Sample fuel. See POH. If water present drain and flush fuel system. (Refer to 12-10)
	Defective ignition system.	Inspect and replace necessary components. (Refer to 74-00)
	Fuel system defective or contaminated.	Inspect, drain and flush fuel system. (Refer to 12-10)
	Fuel vaporization.	Operate boost pump. See POH.
	Air leak in intake manifold.	Tighten loose connection or replace malfunctioning part.



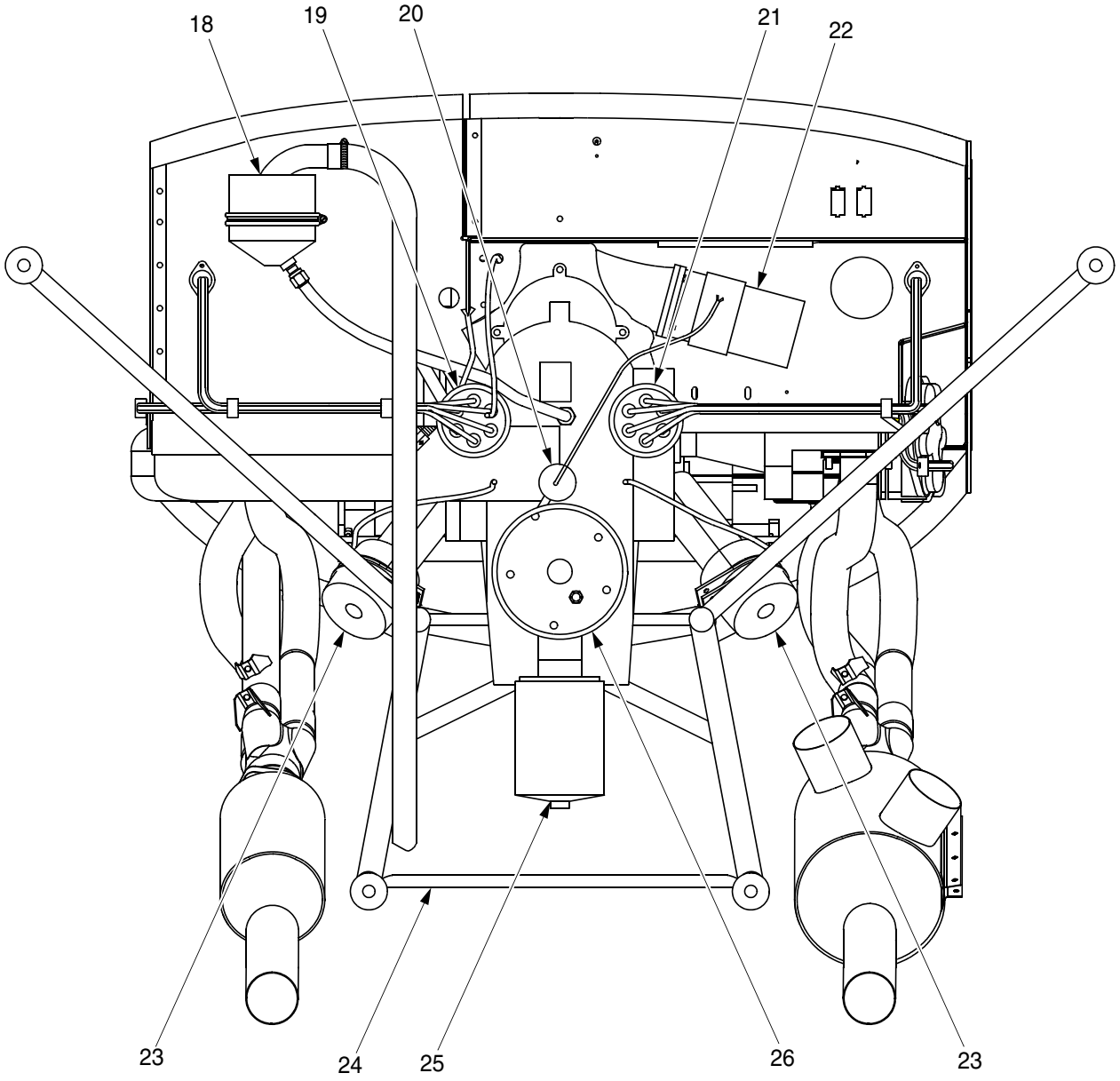
LEGEND

1. Alternator Sheave
2. Throttle Body
3. Throttle Control Cable
4. Vacuum Pump
5. Battery
6. Master Control Unit
7. Governor
8. Exhaust Gas Temperature Probe
9. Valve Cover
10. Lower Spark Plug
11. Oil Pressure Sensor
12. Cylinder Head Temperature Sensor
13. Governor Control Cable
14. Crankcase Oil Drain
15. Exhaust Collector
16. External Power Receptacle
17. Tailpipe

Serials 1005 thru 1267.

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Figure 71-001
Engine Components - Serials 1005 thru 1267 (Sheet 1 of 4)



AFT VIEW

LEGEND

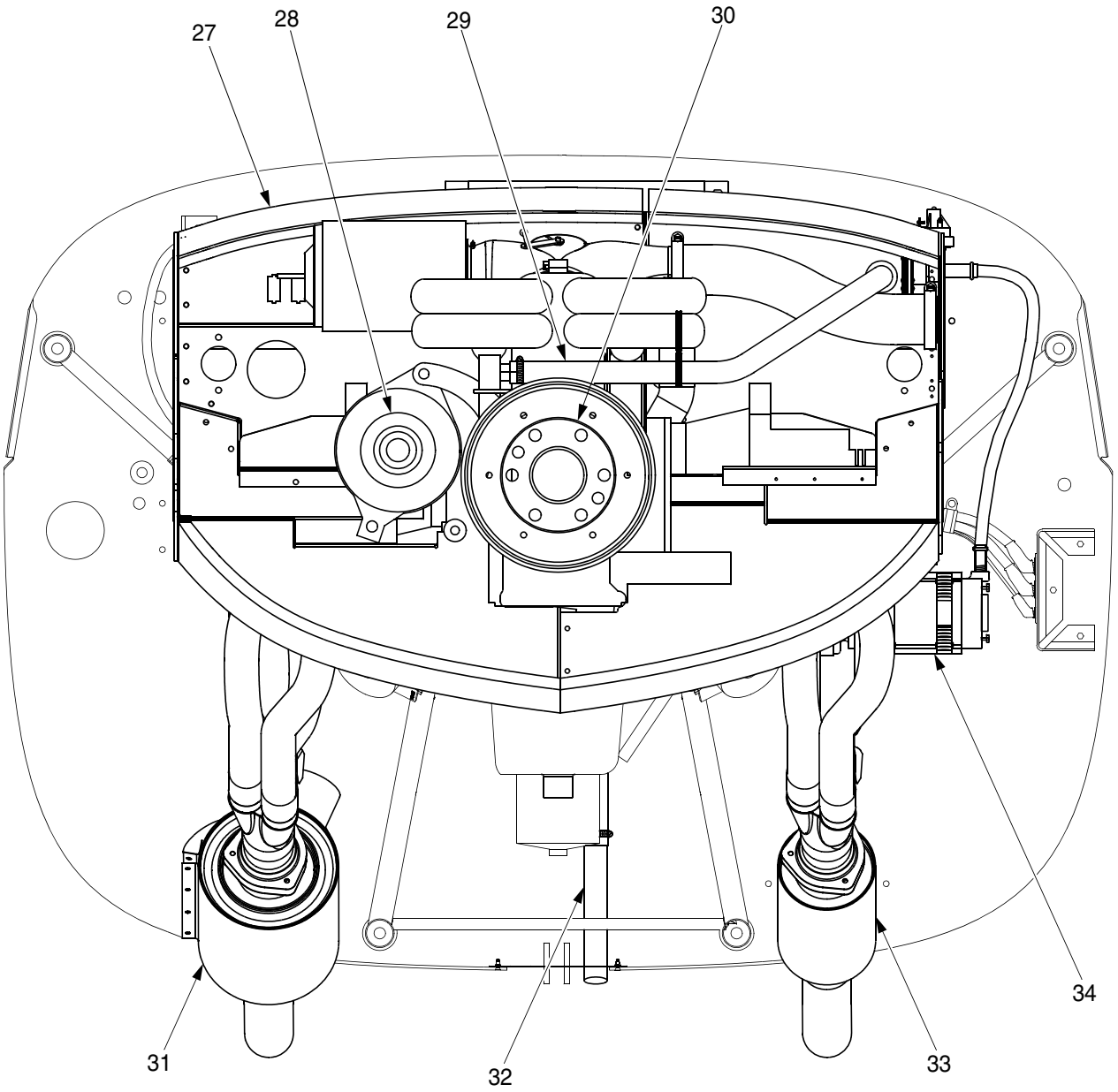
18. Oil Separator
19. Left Magneto
20. Tachometer Sensor Assembly
21. Right Magneto
22. Starter
23. Engine Mount Isolator
24. Engine Mount Weldment
25. Oil Filter
26. Auxiliary Alternator (if installed)

Serials 1005 thru 1267.

SR20_MM71_1097

Figure 71-001
Engine Components - Serials 1005 thru 1267 (Sheet 2 of 4)

EFFECTIVITY:
Serials 1005 thru 1267



FRONT VIEW

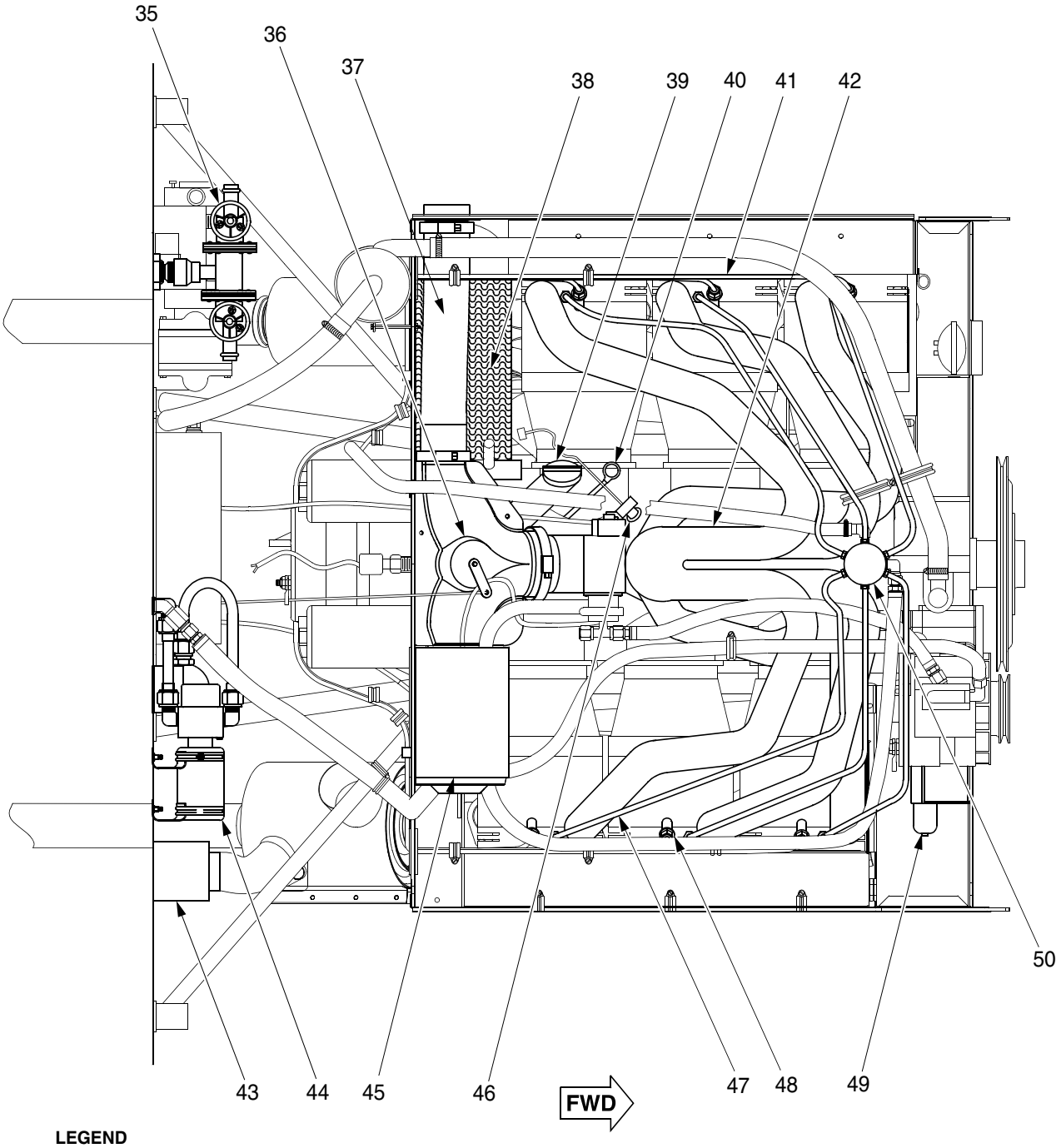
LEGEND

27. Engine Baffle
28. Alternator
29. Oil Separator Line
30. Propeller Mount
31. Heater Muffler
32. Oil Separator Vent Line
33. Muffler
34. Backup Vacuum Pump

Serials 1005 thru 1267.

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Figure 71-001
Engine Components - Serials 1005 thru 1267 (Sheet 3 of 4)



LEGEND

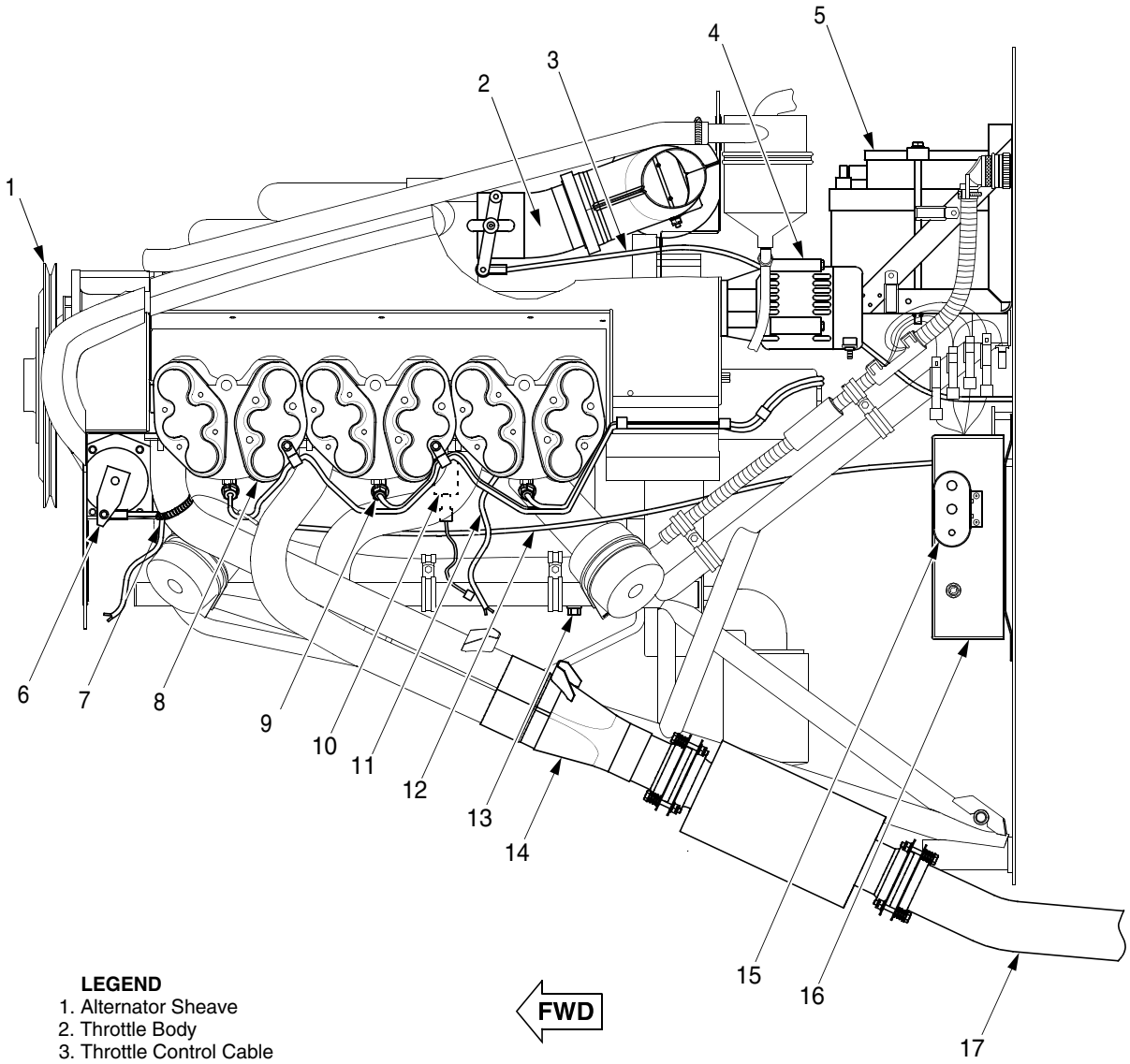
35. Vacuum Manifold
36. Induction Duct Assembly
37. Alternate Air Duct
38. Oil Cooler
39. Oil Filler Port
40. Dipstick
41. Wiring Harness
42. Intake Manifold
43. Plenum Chamber
44. Fuel Boost Pump
45. Induction Air Filter
46. Manifold Air Pressure Sensor
47. Fuel Line
48. Upper Spark Plug
49. Fuel Pump
50. Fuel Manifold Valve

Serials 1005 thru 1267.

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Figure 71-001
Engine Components - Serials 1005 thru 1267 (Sheet 4 of 4)

EFFECTIVITY:
Serials 1005 thru 1267



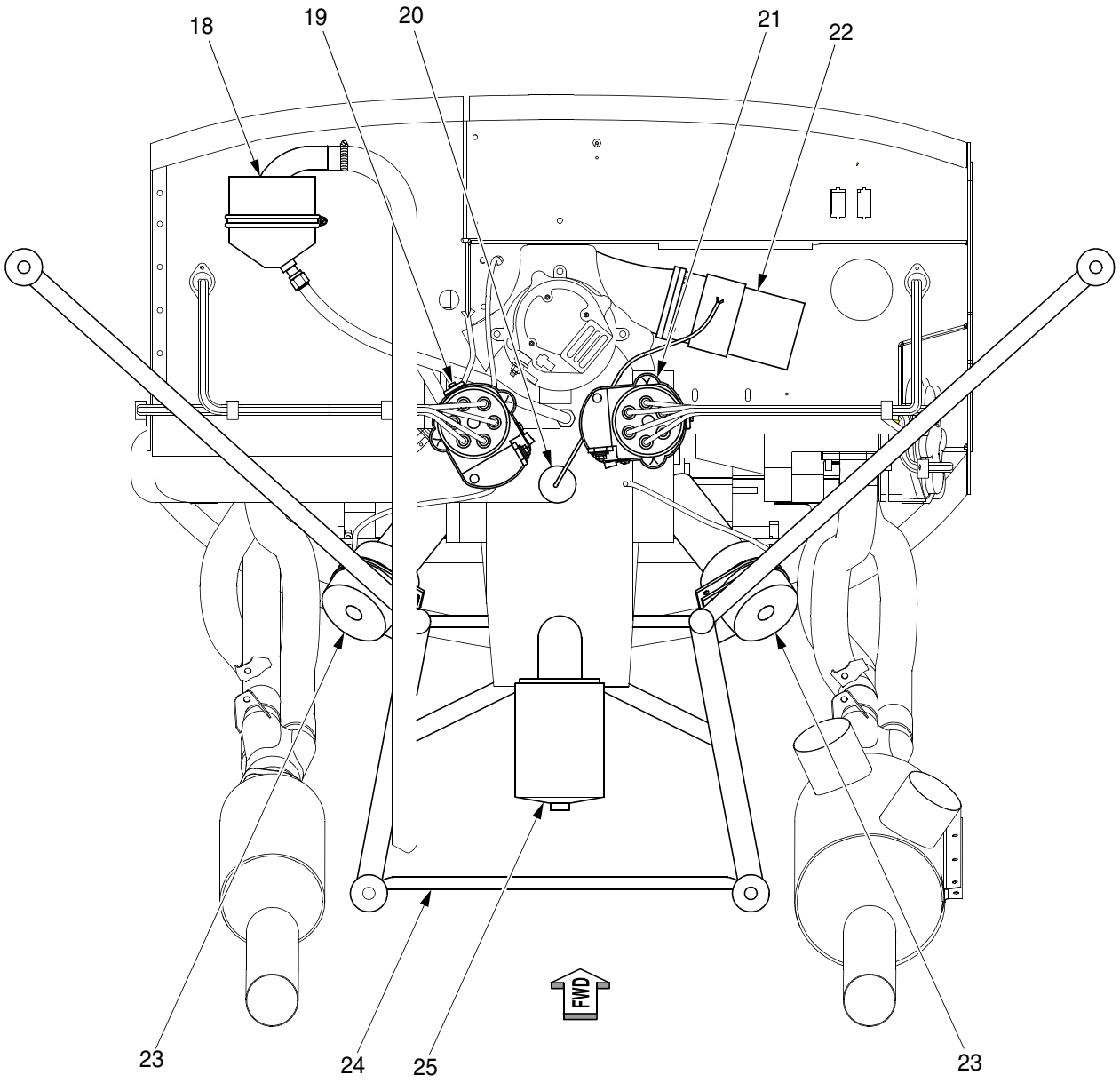
LEGEND

1. Alternator Sheave
2. Throttle Body
3. Throttle Control Cable
4. Alternator
5. Battery
6. Governor
7. Exhaust Gas Temperature Probe
8. Valve Cover
9. Lower Spark Plug
10. Oil Pressure Sensor
11. Cylinder Head Temperature Sensor
12. Governor Control Cable
13. Crankcase Oil Drain
14. Exhaust Collector
15. External Power Receptacle
16. Master Control Unit
17. Tailpipe

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics

SR20_MM71_1582A

Figure 71-002
Engine Components - Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 4)



AFT VIEW

LEGEND

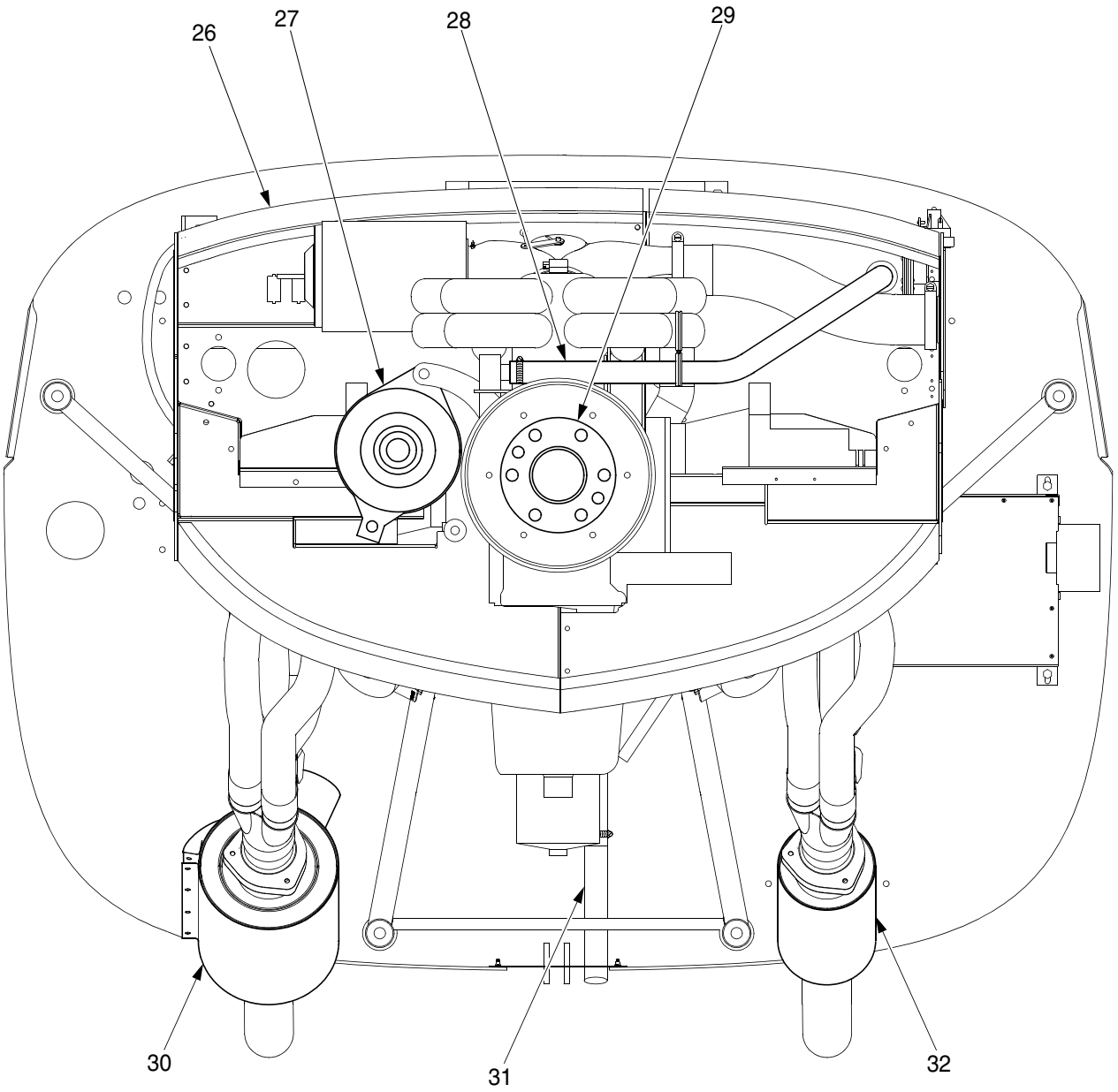
18. Oil Separator
19. Left Magneto
20. Tachometer Sensor Assembly
21. Right Magneto
22. Starter
23. Engine Mount Isolator
24. Engine Mount Weldment
25. Oil Filter

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics

SR20_MM71_1583A

Figure 71-002
Engine Components - Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 4)

EFFECTIVITY:
Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics



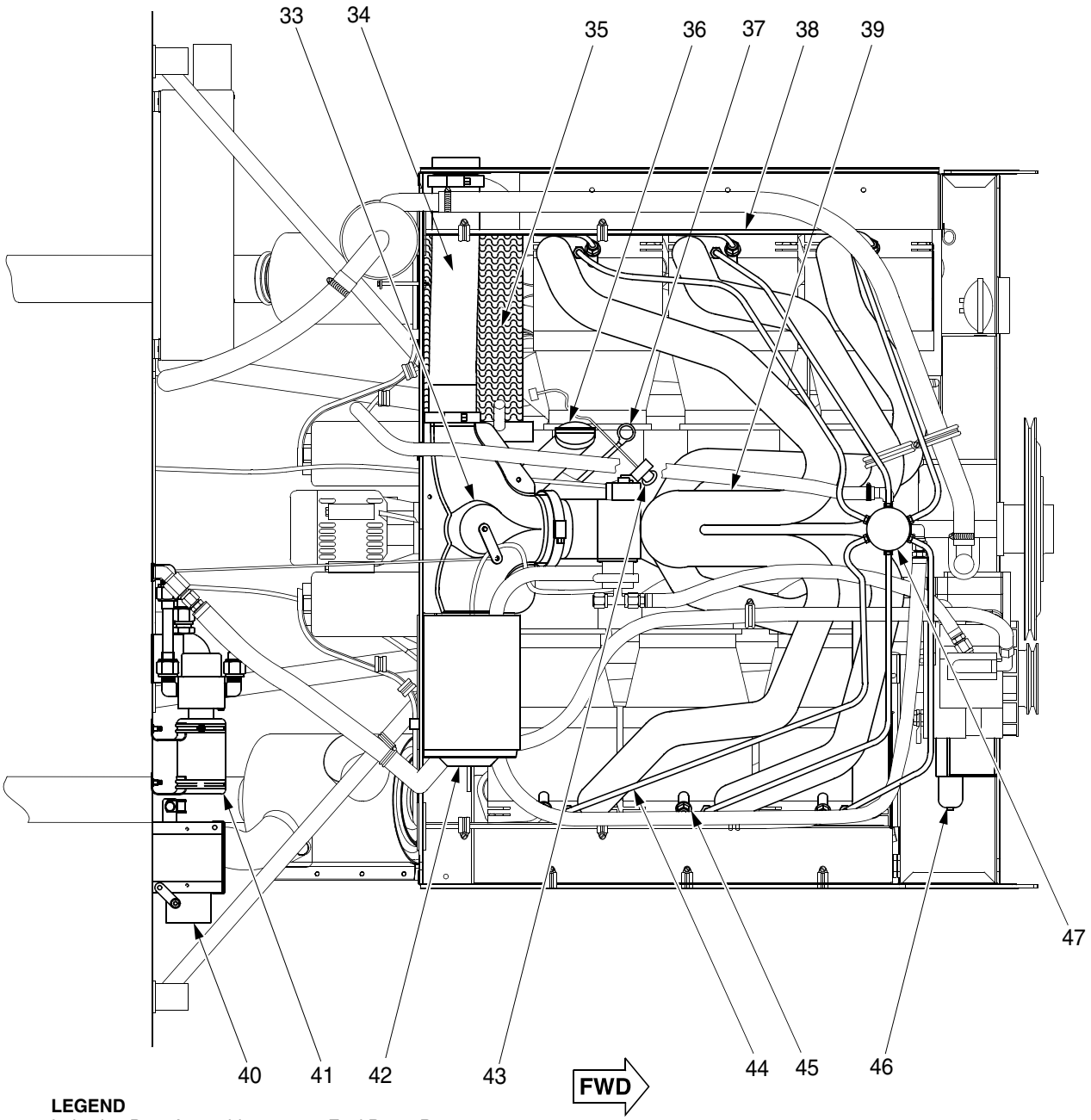
FRONT VIEW

LEGEND
26. Engine Baffle
27. Alternator
28. Oil Separator Line
29. Propeller Mount
30. Heater Muffler
31. Oil Separator Vent Line
32. Muffler

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics

SR20_MM71_1584A

Figure 71-002
Engine Components - Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 3 of 4)



LEGEND

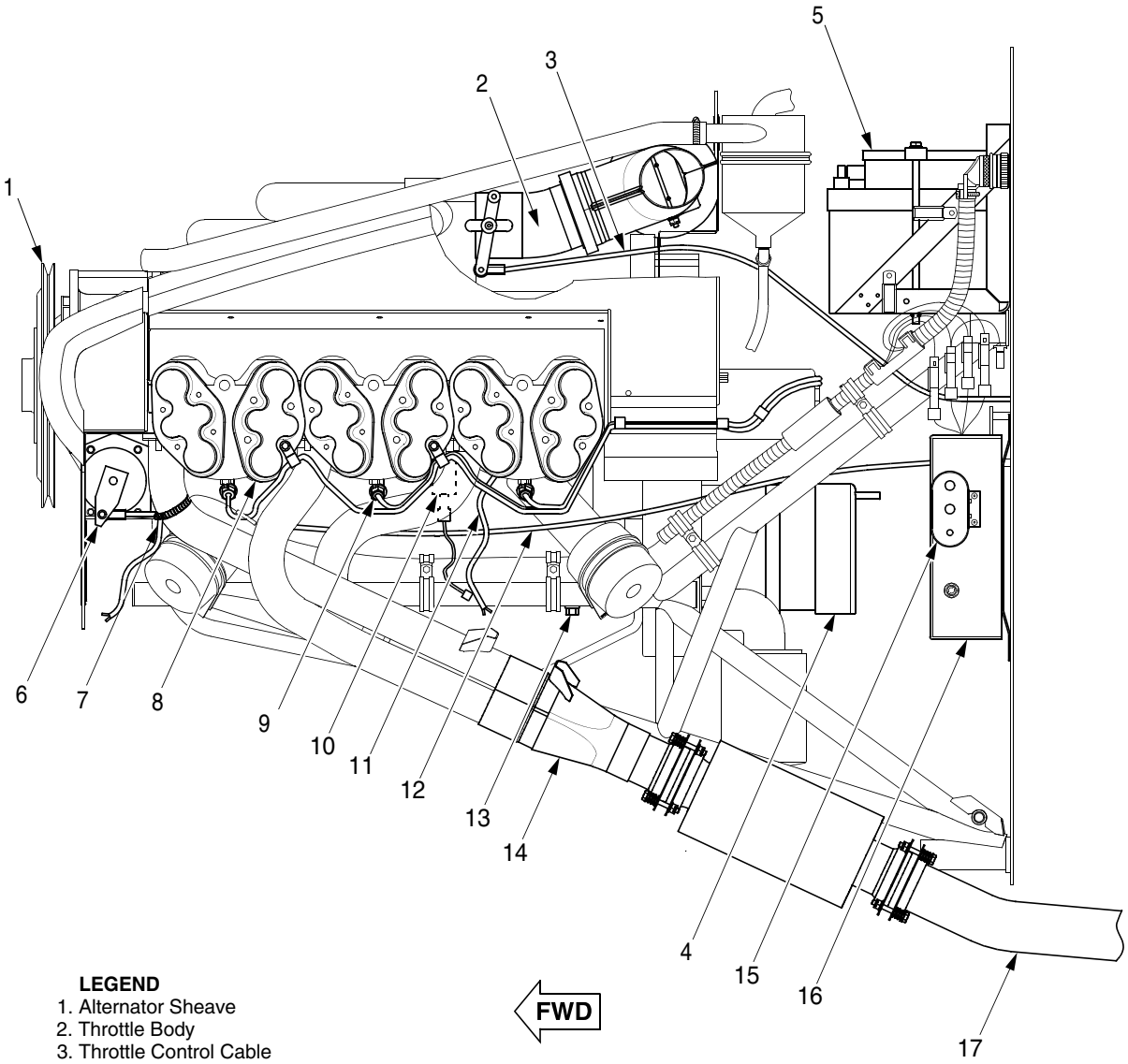
33. Induction Duct Assembly
34. Alternate Air Duct
35. Oil Cooler
36. Oil Filler Port
37. Dipstick
38. Wiring Harness
39. Intake Manifold
40. Plenum Chamber
41. Fuel Boost Pump
42. Induction Air Filter
43. Manifold Air Pressure Sensor
44. Fuel Line
45. Upper Spark Plug
46. Fuel Pump
47. Fuel Manifold Valve

Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics

SR20_MM71_1585A

Figure 71-002
Engine Components - Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 4 of 4)

EFFECTIVITY:
Serials 1268 thru 2015, 2016 & subs w/o Perspective Avionics



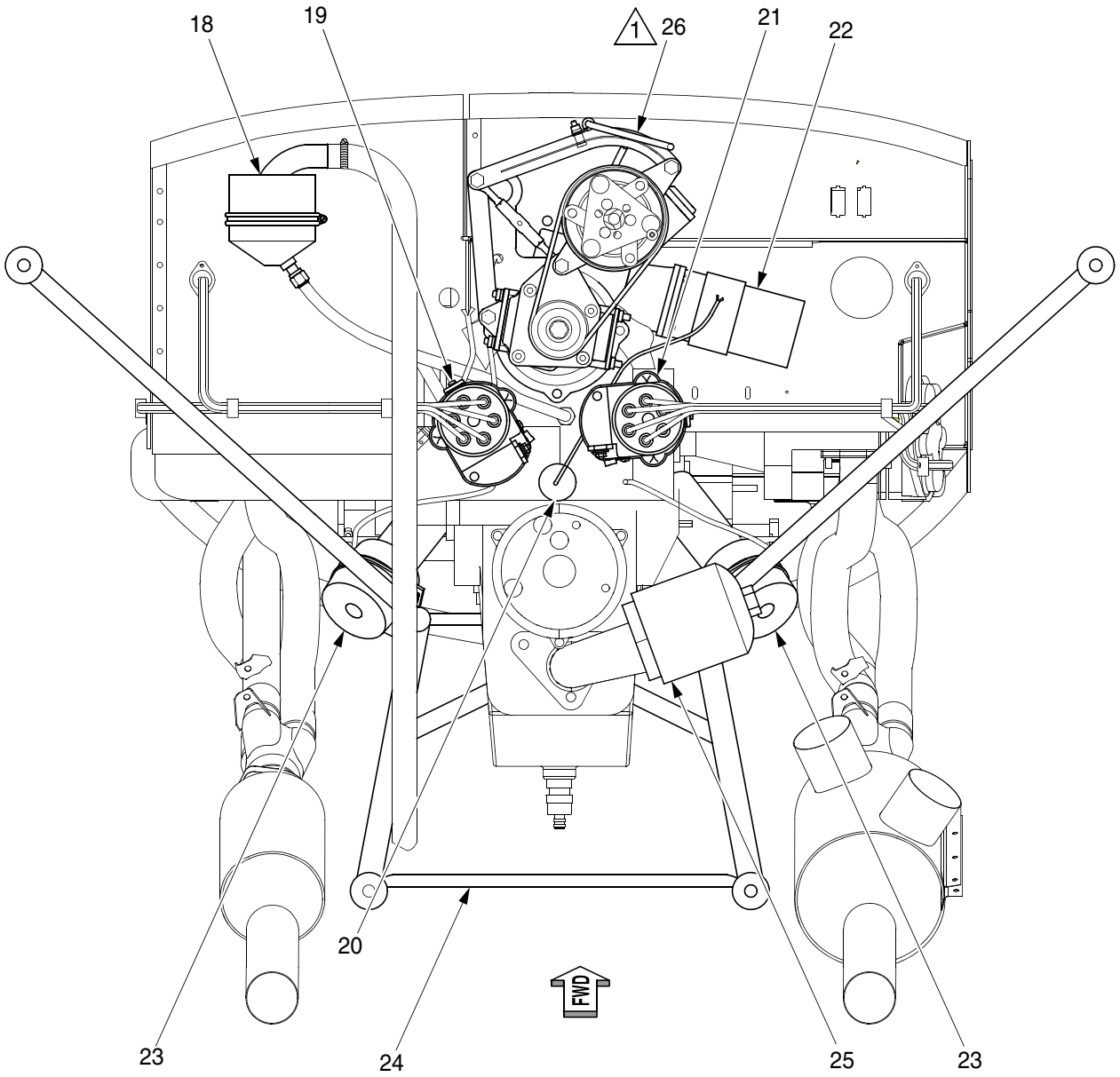
LEGEND

1. Alternator Sheave
2. Throttle Body
3. Throttle Control Cable
4. Alternator
5. Battery
6. Governor
7. Exhaust Gas Temperature Probe
8. Valve Cover
9. Lower Spark Plug
10. Oil Pressure Sensor
11. Cylinder Head Temperature Sensor
12. Governor Control Cable
13. Crankcase Oil Drain
14. Exhaust Collector
15. External Power Receptacle
16. Master Control Unit
17. Tailpipe

Serials 2016 & subs w/ Perspective Avionics

SR20_MM71_3035

Figure 71-003
Engine Components - Serials 2016 & subs w/ Perspective Avionics (Sheet 1 of 4)



AFT VIEW

LEGEND

18. Oil Separator
19. Left Magneto
20. Tachometer Sensor Assembly
21. Right Magneto
22. Starter
23. Engine Mount Isolator
24. Engine Mount Weldment
25. Oil Filter
26. Compressor

NOTE

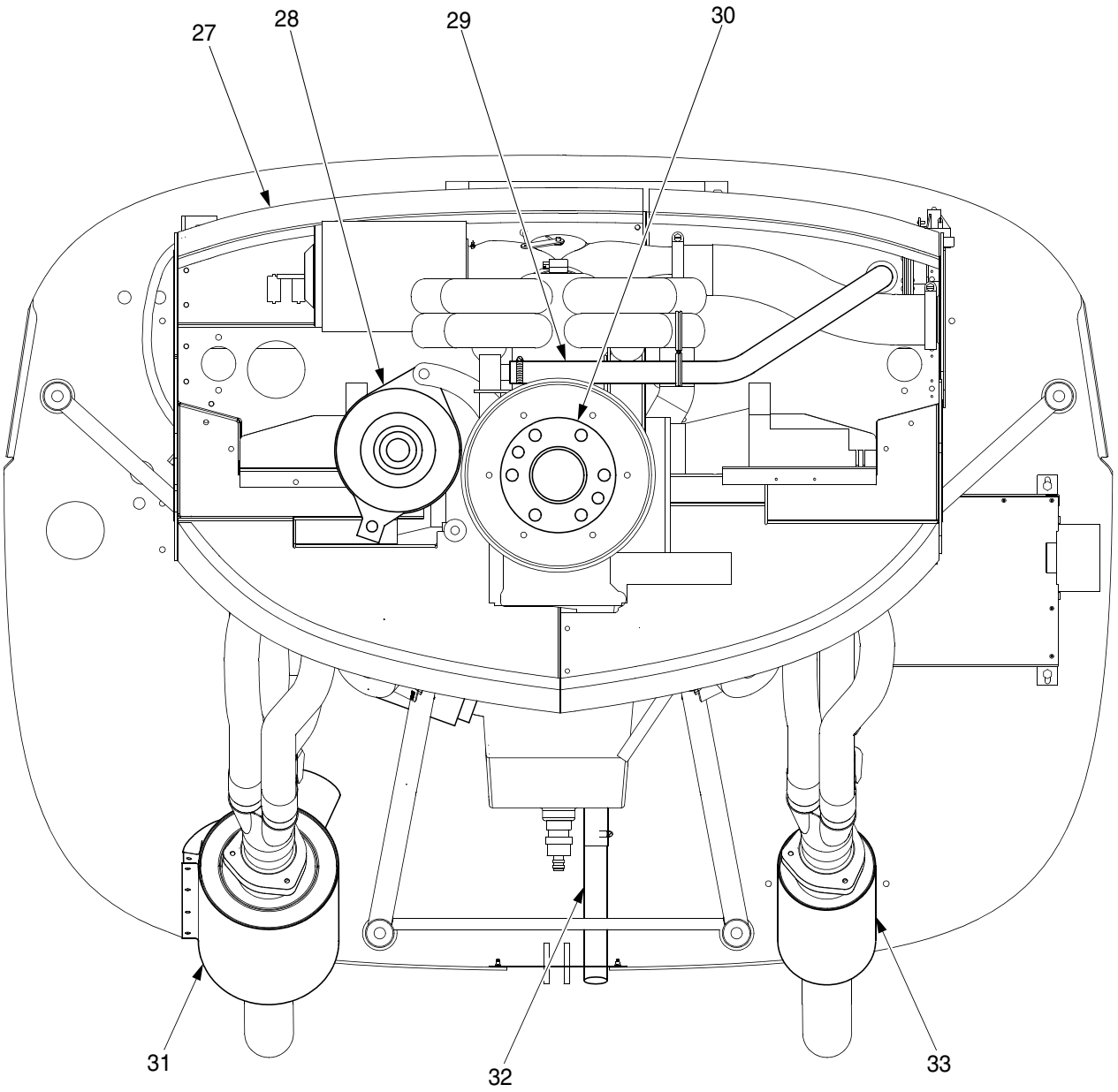
1 *Serials w/ Air Conditioning.*

Serials 2016 & subs w/ Perspective Avionics

SR20_MM71_3036A

Figure 71-003
Engine Components - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 4)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics



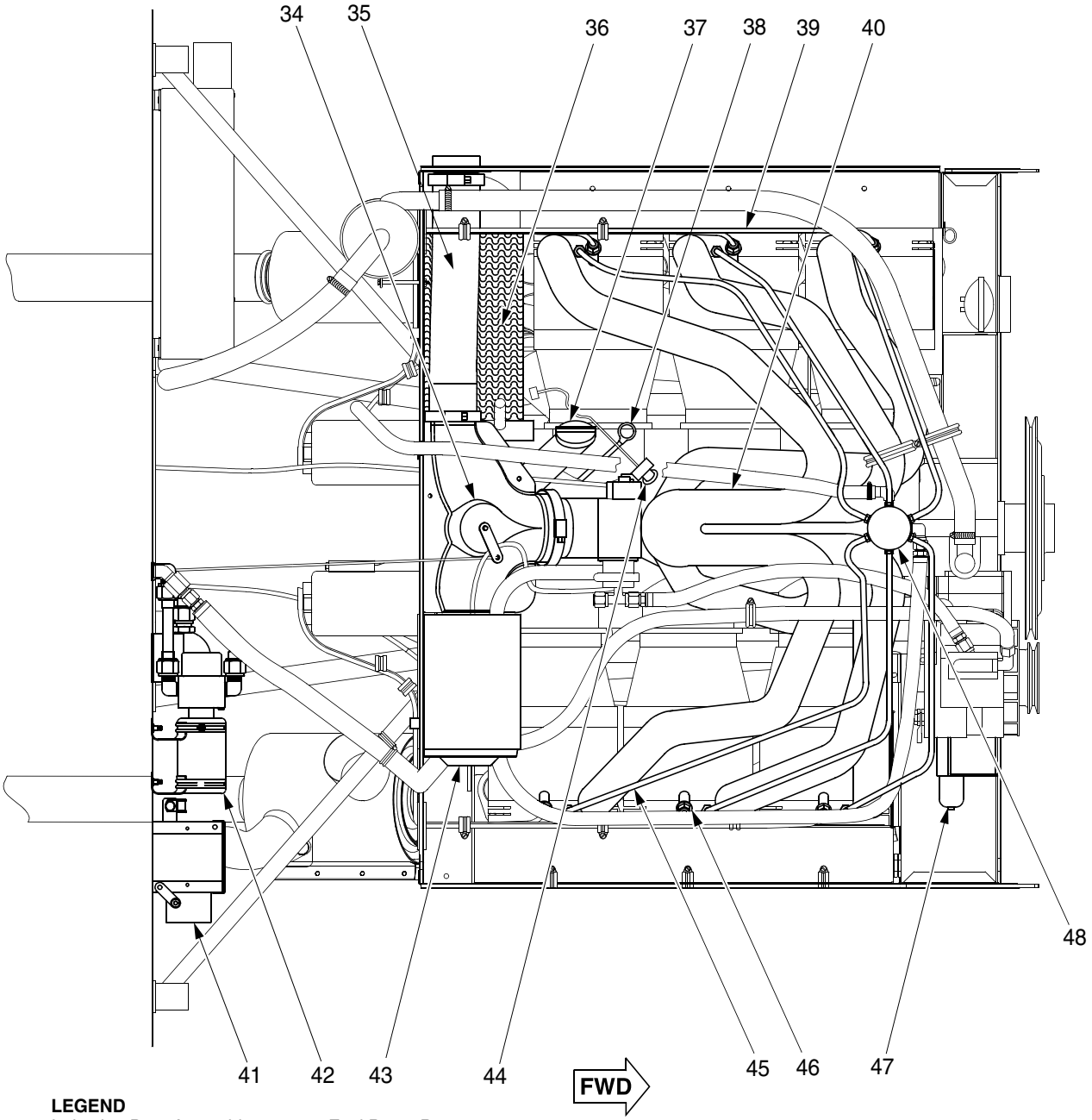
FRONT VIEW

LEGEND
27. Engine Baffle
28. Alternator
29. Oil Separator Line
30. Propeller Mount
31. Heater Muffler
32. Oil Separator Vent Line
33. Muffler

Serials 2016 & subs w/ Perspective Avionics

SR20_MM71_3037A

Figure 71-003
Engine Components - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 4)



LEGEND

34. Induction Duct Assembly
35. Alternate Air Duct
36. Oil Cooler
37. Oil Filler Port
38. Dipstick
39. Wiring Harness
40. Intake Manifold
41. Plenum Chamber
42. Fuel Boost Pump
43. Induction Air Filter
44. Manifold Air Pressure Sensor
45. Fuel Line
46. Upper Spark Plug
47. Fuel Pump
48. Fuel Manifold Valve

Serials 2016 & subs w/ Perspective Avionics

SR20_MM71_3038A

Figure 71-003
Engine Components - Serials 2016 & subs w/ Perspective Avionics (Sheet 4 of 4)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

4. MAINTENANCE PRACTICES

A. Engine

(1) Removal - Engine

CAUTION: Place a tail stand of suitable capacity under tail of airplane before removing engine.

Note: Label each component when disconnected to facilitate reinstallation. Protect openings exposed as a result of removing or disconnecting components against entry of foreign material by installing covers or sealing with tape.

(a) Place all electrical switches in the cockpit in the OFF position.
(b) *Serials 2065 & subs w/ Air Conditioning:* Pull COMPRESSOR/CONTROL PANEL circuit breaker.
(c) Set fuel selector valve to the OFF position.
(d) Remove engine cowling. (Refer to 71-10)
(e) Remove battery. (Refer to 24-30)
(f) Drain gascolator and fuel lines. (Refer to 12-10)
(g) Drain engine oil sump. (Refer to 12-10)
(h) Remove spinner and propeller. (Refer to 61-10)
(i) Disconnect magneto primary lead wires at magnetos. (Refer to 74-10)
(j) Disconnect electrical cable at starter. (Refer to 80-10)
(k) Disconnect exhaust gas temperature probe. (Refer to 77-20)
(l) Remove exhaust system. (Refer to 78-10)

CAUTION: When removing throttle and governor control cables, note EXACT size, position, and number of attaching washer or spacers for reference on reinstallation. Use care to avoid bending cable controls too sharply.

(m) Disconnect throttle and mixture control cables at engine. Remove clamps securing cables to engine and pull cables aft, clear of engine. (Refer to 76-10)
(n) Disconnect governor control cable at governor. (Refer to 61-20)
(o) Disconnect alternate air control cable at induction duct assembly. (Refer to 71-60)
(p) *Serials 2065 & subs w/ Air Conditioning:* Disconnect compressor. (Refer to 21-50)
1 Discharge air conditioning system. (Refer to 12-10)
2 Disconnect resistor wire from wire harness.
3 Disconnect compressor hoses from firewall.
4 Cap fittings and hoses.
(q) Disconnect all environmental air flexible hoses and ducts and remove from airplane. (Refer to 21-00)
(r) Disconnect tachometer sensor lead at connector. (Refer to 77-10)
(s) Disconnect manifold air pressure sensor lead at connector. (Refer to 77-10)
(t) Disconnect oil pressure sensor lead at connector. (Refer to 79-30)
(u) Disconnect electrical wires at alternator(s). (Refer to 24-30)
(v) Disconnect all clamps and ties attaching wires or cables to engine and pull wires and cables aft, clear of engine.
(w) *Serials 1005 thru 1267:* Disconnect vacuum lines at vacuum pumps. (Refer to 37-10)

WARNING: **Residual oil and fuel draining from engine hoses and lines constitutes a fire hazard. Caution must be used to prevent the inadvertent pooling of such materials when lines or hoses are disconnected.**

(x) Disconnect oil breather vent line at the oil separator.

(y) Disconnect fuel pump supply line at pump and cap line.

(z) Disconnect fuel return line at aft baffle and cap line.

(aa) Disconnect fuel system vent line at tee located beneath engine.

CAUTION: Prior to removing engine attach bolts, ensure all hoses, wires, lines, cables, cable ties, and clamps are disconnected or removed from positions which would interfere with engine removal.

(ab) Attach hoist at forward and aft lifting rings.

(ac) Loosen bolts securing engine to engine mounts.

(ad) Lift engine with hoist just enough to relieve weight from engine mounts.

CAUTION: Note location and position of engine mount isolators prior to engine removal for reference on reinstallation.

(ae) Remove grounding straps, nuts, washers, and bolts securing engine to engine mount.

(af) Slowly hoist engine away from airplane, guiding the detached parts out as the engine is removed.

(ag) Preserve engine in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

(2) Installation - Engine

Note: Remove all protective caps and identification tags as each component is installed.

Prior to installing engine, install all components that were removed from engine after engine was removed from airplane.

(a) De-preserve engine in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

(b) Insert all upper isolators onto engine mount points and slowly lower engine onto engine mount weldment so isolators are loosely held in place.

(c) Assemble engine mount isolators. (Refer to 71-20)

(d) Install engine mount bolts, washers, and nuts. Torque nuts to 450 - 500 in-lb (51 - 56 Nm). (Refer to 71-20)

(e) Remove hoist and tail stand.

(f) *Serials 1005 thru 1267:* Connect vacuum lines to vacuum pumps. (Refer to 37-10)

(g) Connect oil breather vent line at the oil separator.

(h) Connect fuel pump supply line at pump.

(i) Connect fuel return line at aft baffle.

(j) Connect fuel vent line at tee located beneath engine.

(k) Connect alternator leads and wiring at alternator(s). (Refer to 24-30)

(l) Connect oil pressure sensor lead. (Refer to 79-30)

(m) Connect manifold pressure sensor lead. (Refer to 77-10)

(n) Connect tachometer sensor lead. (Refer to 77-10)

(o) Attach and connect all environmental air flexible hoses and ducts. (Refer to 21-00)

(p) *Serials 2065 & subs w/ Air Conditioning:* Connect compressor. (Refer to 21-50)

1 Connect resistor wire to wire harness.

2 Remove caps from fittings and hoses.

3 Connect 5/8 inch (19 mm) compressor hose to firewall. Torque hose and fittings to 250 to 350 in-lb (28.2 - 39.5 Nm).

4 Connect 1/2 inch (16 mm) compressor hose to firewall. Torque hose and fittings to 180 to 240 in-lb (20.3 - 27.1 Nm).

(q) Connect alternate air control cable at induction duct assembly. (Refer to 71-60)

(r) Connect governor control cable. (Refer to 61-20)

(s) Connect throttle and mixture control cables. Adjust power control cables. (Refer to 76-10)

(t) Install exhaust system. (Refer to 78-10)

(u) Connect exhaust gas temperature probe. (Refer to 77-20)

(v) Connect starter electrical cable. (Refer to 80-10)

(w) Connect magneto primary lead wires. (Refer to 74-10)

(x) Install propeller and spinner. (Refer to 61-10)

(y) Ensure any other lines, hoses, electrical leads, clamps, and ties disconnected during removal of engine are installed.

(z) Fill engine with proper grade and amount of engine oil. (Refer to 12-10)

(aa) Install battery. (Refer to 24-30)

(ab) Set fuel selector valve to the ON position, open throttle and mixture to full, turn on electric full pump, and check fuel lines for leaks.

(ac) Perform Airplane Operational and Functional Check. (Refer to 05-30)

(ad) Install engine cowling. (Refer to 71-10)

(ae) *Serials 2065 & subs w/ Air Conditioning:* Perform Inspection/Check - System Plumbing Refrigerant Leak Test. (Refer to 21-50)

(af) *Serials 2065 & subs w/ Air Conditioning:* Charge air conditioning system. (Refer to 12-10)

(ag) *Serials 2065 & subs w/ Air Conditioning:* Reset COMPRESSOR/CONTROL PANEL circuit breaker.

(ah) *Serials 2065 & subs w/ Air Conditioning:* Perform Operational Test - Air Conditioning System. (Refer to 21-50)

B. Engine Baffling (See Figure 71-004)

CAUTION: Proper baffling installation and care is critical to engine cooling. If baffles or seals are broken or misshaped, the amount of air flowing past a particular cylinder or component will increase. The increased airflow in one area causes a reduction of airflow past other components and leads to higher temperatures in some parts of the engine. Ensure baffles are installed correctly and seals fit and direct airflow in the proper direction.

Various lines, hoses, wires, and controls are routed through some baffles. Ensure that these components are reinstalled correctly after baffle installation.

(1) Removal - Engine Baffling

(a) Remove engine cowling. (Refer to 71-10)

(b) *Serials 1005 thru 1147:* Remove screws and washers connecting wires to landing light assembly. (Refer to 33-40)

(c) Disconnect any lines, hoses, wires, and controls routed through baffling.

(d) Remove tension springs.

(e) Remove bolts, screws, washers, and nuts securing baffling to engine.

(f) Remove baffling from airplane.

(2) Installation - Engine Baffling

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.

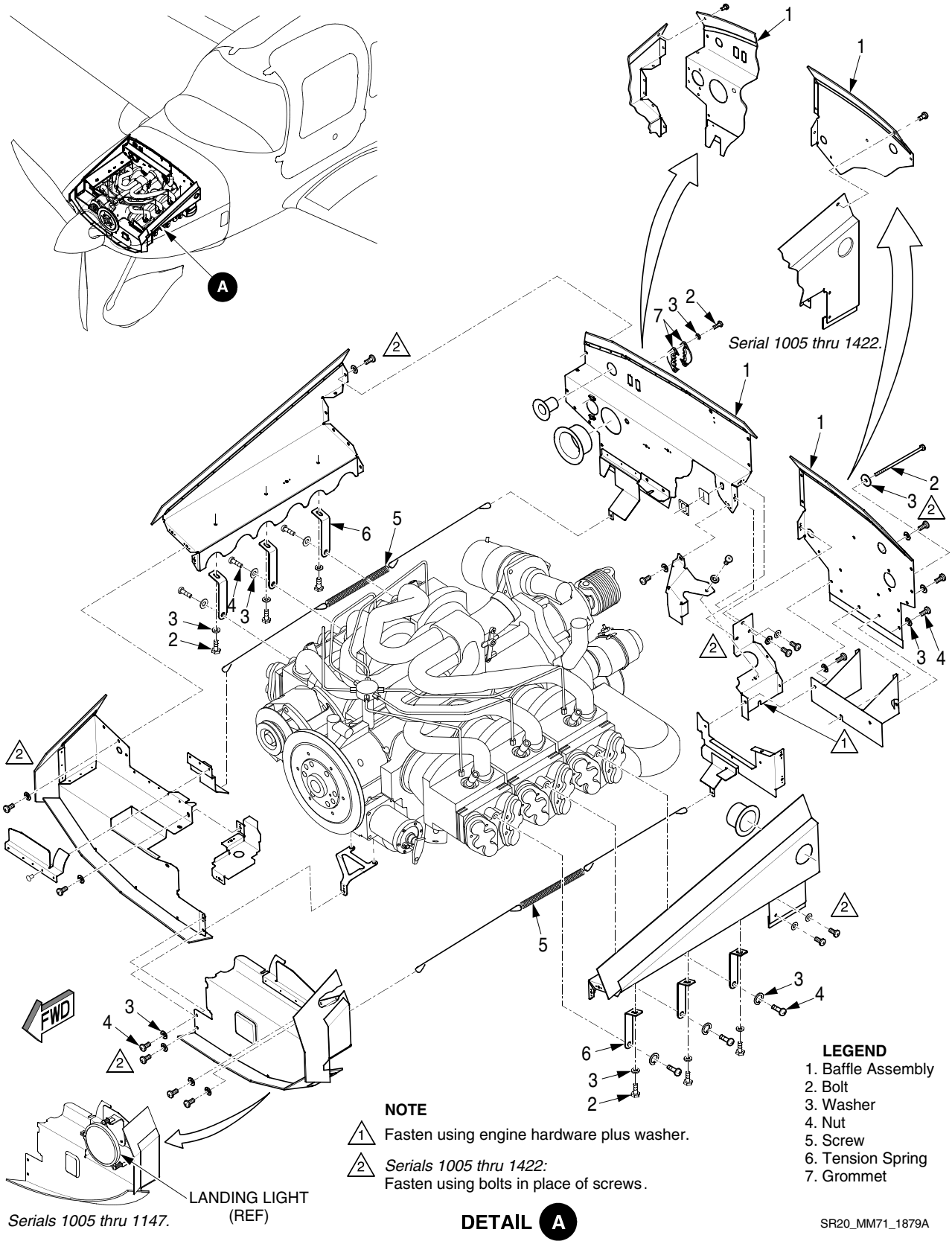
(b) Position baffling to engine and secure with bolts, screws, washers, and nuts.

(c) Install tension springs.

(d) Connect any lines, hoses, wires, and controls routed through baffling.

(e) *Serials 1005 thru 1147:* Install screws and washers connecting wires to landing light assembly. (Refer to 33-40)

(f) Install engine cowling. (Refer to 71-10)



LEGEND
1. Baffle Assembly
2. Bolt
3. Washer
4. Nut
5. Screw
6. Tension Spring
7. Grommet

NOTE

1 Fasten using engine hardware plus washer.

2 *Serials 1005 thru 1422:* Fasten using bolts in place of screws.

Figure 71-004
Engine Baffling Installation

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COWLING

1. DESCRIPTION

Serials 1005 thru 1147: The engine cowling, fabricated from fiberglass and epoxy, consists of one upper and one lower half. In addition, two aluminum closeout plates are secured to the lower cowl to fully surround the nose gear strut. The cowling is secured to the fuselage with quarter-turn fasteners and screws. The oil inspection door is located on the upper cowl and external power receptacle door is located on the lower cowl.

Serials 1148 thru 1422: The engine cowling, fabricated from fiberglass and epoxy, consists of one upper and one lower half. In addition, one aluminum closeout plate and one urethane closeout seal are secured to the lower cowl to fully surround the nose gear strut. The cowling is secured to the fuselage with quarter-turn fasteners and screws. The oil inspection door is located on the upper cowl and the external power receptacle door is located on the lower cowl. The landing light assembly is integral to the lower cowl. For maintenance practices pertinent to the landing light, refer to Chapter 33, Lights. (Refer to 33-40)

Serials 1423 thru 2064: The engine cowling, fabricated from fiberglass and epoxy, consists of one upper and two lower halves. A two-piece urethane closeout seal is secured to the lower cowl halves to fully surround the nose gear strut. The cowling is secured to the fuselage with quarter-turn fasteners and screws. The oil inspection door is located on the upper cowl and the external power receptacle door is located on the lower cowl. The landing light assembly is integral to the LH lower cowl. For maintenance practices pertinent to the landing light, refer to Chapter 33, Lights. (Refer to 33-40)

Serials 2065 & subs: The engine cowling, fabricated from fiberglass and epoxy, consists of one upper and two lower halves. The cowling is secured to the fuselage with quarter-turn fasteners and screws. The oil inspection door is located on the upper cowl and the external power receptacle door is located on the lower cowl. A fresh air inlet in the lower RH cowl provides fresh air for the environmental system. The landing light assembly is integral to the LH lower cowl. For maintenance practices pertinent to the landing light, refer to Chapter 33, Lights. (Refer to 33-40)

2. MAINTENANCE PRACTICES

A. Engine Cowling - *Serials 1005 thru 1147* (See Figure 71-101)

CAUTION: Two people are required when removing or installing engine cowling to avoid damaging the cowling due to bending or flexing. Apply masking tape around perimeter of spinner to avoid scratching spinner.

(1) Removal - Engine Cowling

(a) Remove screws securing forward and aft closeout plates to bottom of lower cowl. Remove closeout plates from airplane.

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(b) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(c) Remove screws securing upper cowl to lower cowl.

(d) Release quarter-turn fasteners securing upper cowl to lower cowl and fuselage. Remove upper cowl from airplane.

(e) Remove quarter-turn fasteners securing lower cowl to fuselage. Remove lower cowl from airplane.

(2) Installation - Engine Cowling

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(a) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(b) Position lower cowl around engine compartment and secure to fuselage with quarter-turn fasteners.

Note: To facilitate cowling installation, place thumb on cowl directly above quarter-turn fastener, lightly apply thumb pressure to reduce space between fastener and receptacle, turn and seat fastener.

(c) Place upper cowl into position and secure to lower cowl and fuselage with quarter-turn fasteners.

(d) Install screws securing upper cowl to lower cowl.

(e) Position forward and aft closeout plates around nose gear strut and secure with screws.

(f) Perform Inspection/Check - Engine Cowl Fit-Up. (Refer to 71-10)

(g) Open engine oil access door and inspect engine baffle seal. Seal must be bent inward ensuring a seal along the radius of the upper cowling.

(h) Close engine oil access door.

(i) Remove protective tape from spinner.

B. Engine Cowling - *Serials 1148 thru 1422* (See Figure 71-101)

CAUTION: Two people are required when removing or installing engine cowling to avoid damaging the cowling due to bending or flexing. Apply masking tape around perimeter of spinner to avoid scratching spinner.

(1) Removal - Engine Cowling

(a) Remove screws securing aft closeout plate to bottom of lower cowl. Remove closeout plate from airplane.

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(b) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(c) Remove screws securing upper cowl to lower cowl.

(d) Release quarter-turn fasteners securing upper cowl to lower cowl and fuselage. Remove upper cowl from airplane.

(e) Disconnect landing light connector on lower cowl.

(f) Release quarter-turn fasteners securing lower cowl to fuselage. Remove lower cowl from airplane.

(2) Installation - Engine Cowling

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(a) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(b) Position lower cowl around engine compartment and install quarter-turn fasteners.

(c) Connect landing light connector on lower cowl.

Note: To facilitate cowling installation, place thumb on cowl directly above quarter-turn fastener, lightly apply thumb pressure to reduce space between fastener and receptacle, turn and seat fastener.

(d) Place upper cowl into position and secure to lower cowl and fuselage with quarter-turn fasteners.

(e) Install screws securing upper cowl to lower cowl.

(f) Position aft closeout plate around nose gear strut and secure with screws.

(g) Perform Inspection/Check - Engine Cowl Fit-Up. (Refer to 71-10)

(h) Open engine oil access door and inspect engine baffle seal. Seal must be bent inward ensuring a seal along the radius of the upper cowl.

(i) Close engine oil access door.

(j) Remove protective tape from spinner.

C. Engine Cowling - *Serials 1423 thru 2064* (See Figure 71-101)

CAUTION: Two people are required when removing or installing engine cowling to avoid damaging the cowling due to bending or flexing. Apply masking tape around perimeter of spinner to avoid scratching spinner.

(1) Removal - Engine Cowling

(a) Remove screws securing upper cowl to lower cowls.

(b) Release quarter-turn fasteners securing upper cowl to lower cowls and fuselage. Remove upper cowl from airplane.

(c) Disconnect landing light connector on LH lower cowl.

(d) *Serials 1886 thru 2064:* Disconnect fresh air inlet duct from RH lower cowl.

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(e) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(f) Remove screws securing RH lower cowl to LH lower cowl.

(g) Release quarter-turn fasteners securing RH lower cowl to fuselage. Remove RH lower cowl from airplane.

(h) Remove screws securing LH lower cowl to drain manifold.

(i) Release quarter-turn fasteners securing LH lower cowl to fuselage. Remove LH lower cowl from airplane.

(2) Installation - Engine Cowling

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(a) Rotate two bladed propeller to horizontal position or three bladed propeller so one blade is vertical.

(b) Position LH lower cowl around engine compartment and secure to fuselage with quarter-turn fasteners.

(c) Install screws securing LH lower cowl to drain manifold.

(d) Position RH lower cowl around engine compartment and secure to fuselage with quarter-turn fasteners.

(e) Install screws securing RH lower cowl to LH lower cowl.

(f) *Serials 1886 thru 2064:* Connect fresh air inlet duct to RH lower cowl.

(g) Connect landing light connector on LH lower cowl.

(h) *Serials 1005 thru 1885:* Ensure a minimum clearance of 0.3 inch (0.76 cm) between lower cowls and heat exchanger, muffler, and tailpipes. Bend the outboard exhaust brackets as required to obtain cowl and belly clearance tolerances.

Note: To facilitate cowling installation, place thumb on cowl directly above quarter-turn fastener, lightly apply thumb pressure to reduce space between fastener and receptacle, turn and seat fastener.

(i) Place upper cowl into position and secure to lower cowls and fuselage with quarter-turn fasteners.

(j) Install screws securing upper cowl to lower cowls.

(k) Perform Inspection/Check - Engine Cowl Fit-Up. (Refer to 71-10)

(l) Open engine oil access door and inspect engine baffle seal. Seal must be bent inward ensuring a seal along the radius of the upper cowl.

(m) Close engine oil access door.

(n) Remove protective tape from spinner.

D. Engine Cowling - *Serials 2065 & subs* (See Figure 71-101)

CAUTION: Two people are required when removing or installing engine cowling to avoid damaging the cowling due to bending or flexing. Apply masking tape around perimeter of spinner to avoid scratching spinner.

(1) Removal - Engine Cowling

(a) Remove screws securing upper cowl to lower cowls.

(b) Release quarter-turn fasteners securing upper cowl to lower cowls and to fuselage. Remove upper cowl from airplane.

(c) Disconnect landing light connector on LH lower cowl.

(d) Disconnect environmental fresh air inlet duct from RH lower cowl.

(e) Remove screws securing fuel drain manifold to LH lower cowl.

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(f) Rotate propeller so one blade is vertical.

(g) Remove screws securing RH lower cowl to LH lower cowl.

(h) Release quarter-turn fasteners securing RH lower cowl to fuselage. Remove RH lower cowl from airplane.

(i) Release quarter-turn fasteners securing LH lower cowl to fuselage. Remove LH lower cowl from airplane.

(2) Installation - Engine Cowling

WARNING: Ensure engine magnetos are grounded (OFF) prior to rotating propeller.

(a) Rotate propeller so one blade is vertical.

(b) Position LH lower cowl around engine compartment and secure to fuselage with quarter-turn fasteners.

(c) Position RH lower cowl around engine compartment and secure to fuselage with quarter-turn fasteners.

(d) Install screws securing RH lower cowl to LH lower cowl.

(e) Install screws securing fuel drain manifold to LH lower cowl.

(f) Connect environmental fresh air inlet duct to RH lower cowl.

(g) Connect landing light connector on LH lower cowl.

Note: To facilitate cowling installation, place thumb on cowl directly above quarter-turn fastener, lightly apply thumb pressure to reduce space between fastener and receptacle, turn and seat fastener.

(h) Place upper cowl into position and secure to lower cowls and fuselage with quarter-turn fasteners.

(i) Install screws securing upper cowl to lower cowls.

(j) Perform Inspection/Check - Engine Cowl Fit-Up. (Refer to 71-10)

(k) Open engine oil access door and inspect engine baffle seal. Seal must be bent inward ensuring a seal along the radius of the upper cowl.

(l) Close engine oil access door.

(m) Remove protective tape from spinner.

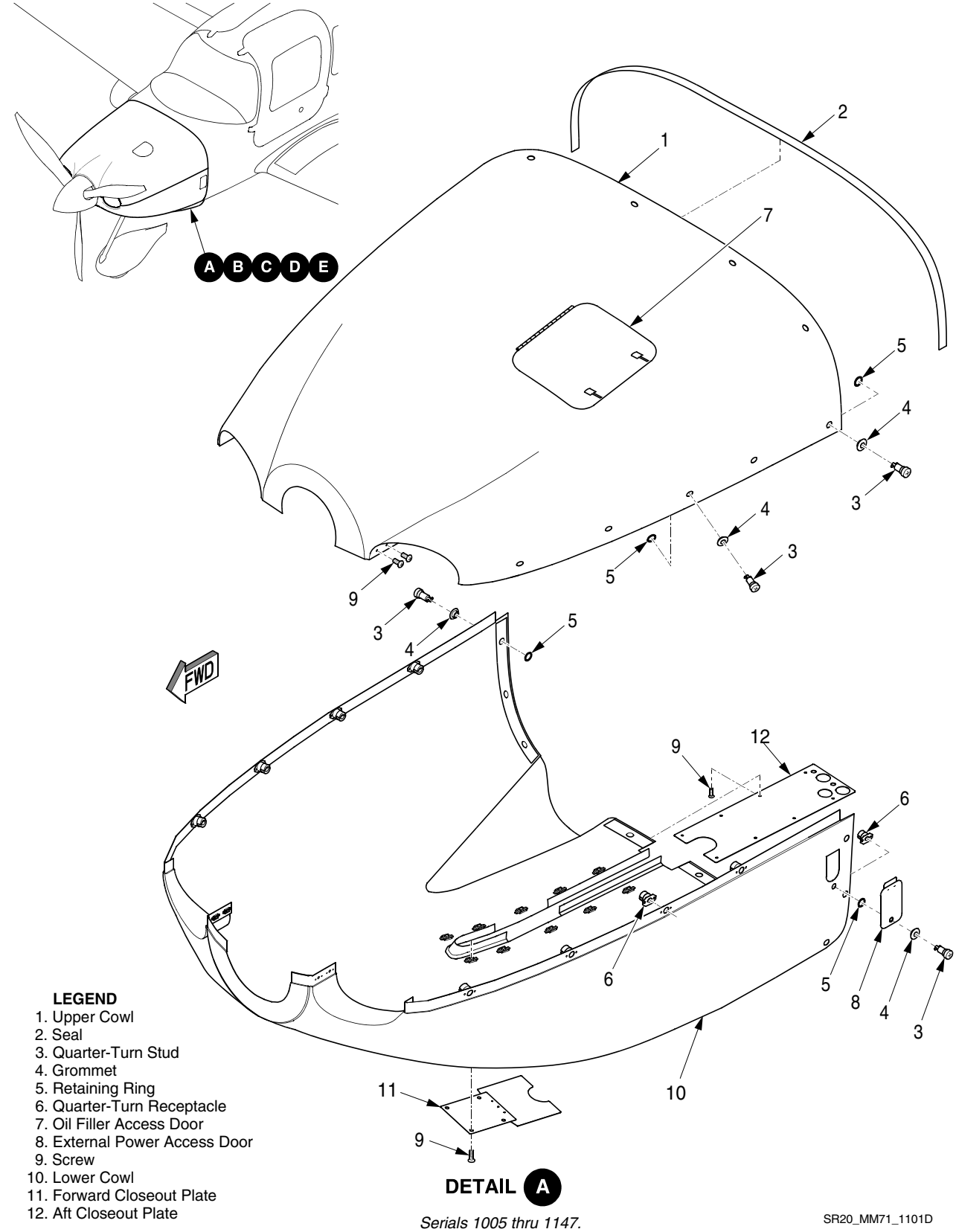
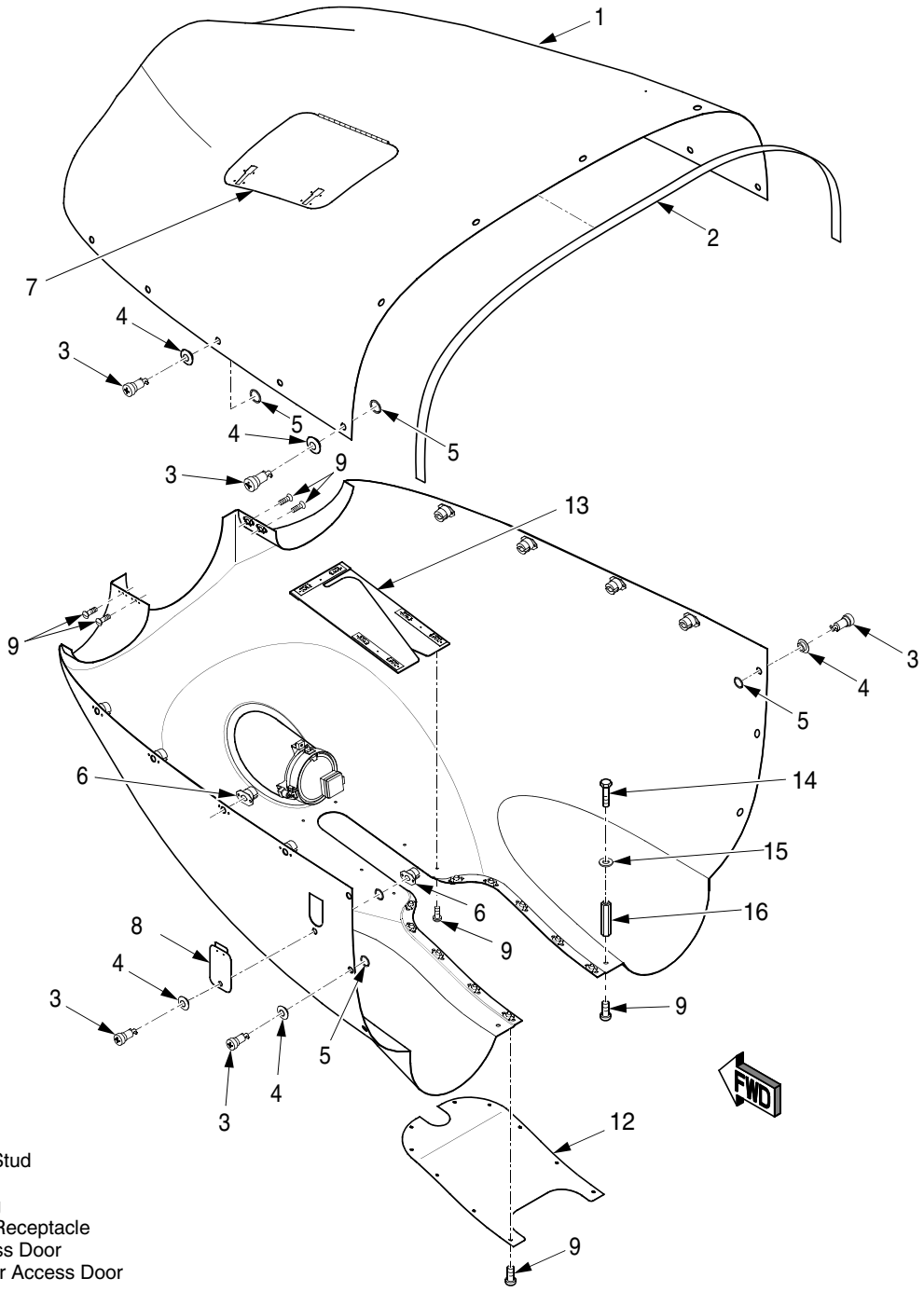


Figure 71-101
Engine Cowling Installation - Serials 1005 thru 1147 (Sheet 1 of 5)



LEGEND

1. Upper Cowl
2. Seal
3. Quarter-Turn Stud
4. Grommet
5. Retaining Ring
6. Quarter-Turn Receptacle
7. Oil Filler Access Door
8. External Power Access Door
9. Screw
10. Lower Cowl
12. Aft Closeout Plate
13. Closeout Seal
14. Bolt
15. Washer
16. Standoff

Figure 71-101
Engine Cowling Installation - Serials 1148 thru 1422 (Sheet 2 of 5)

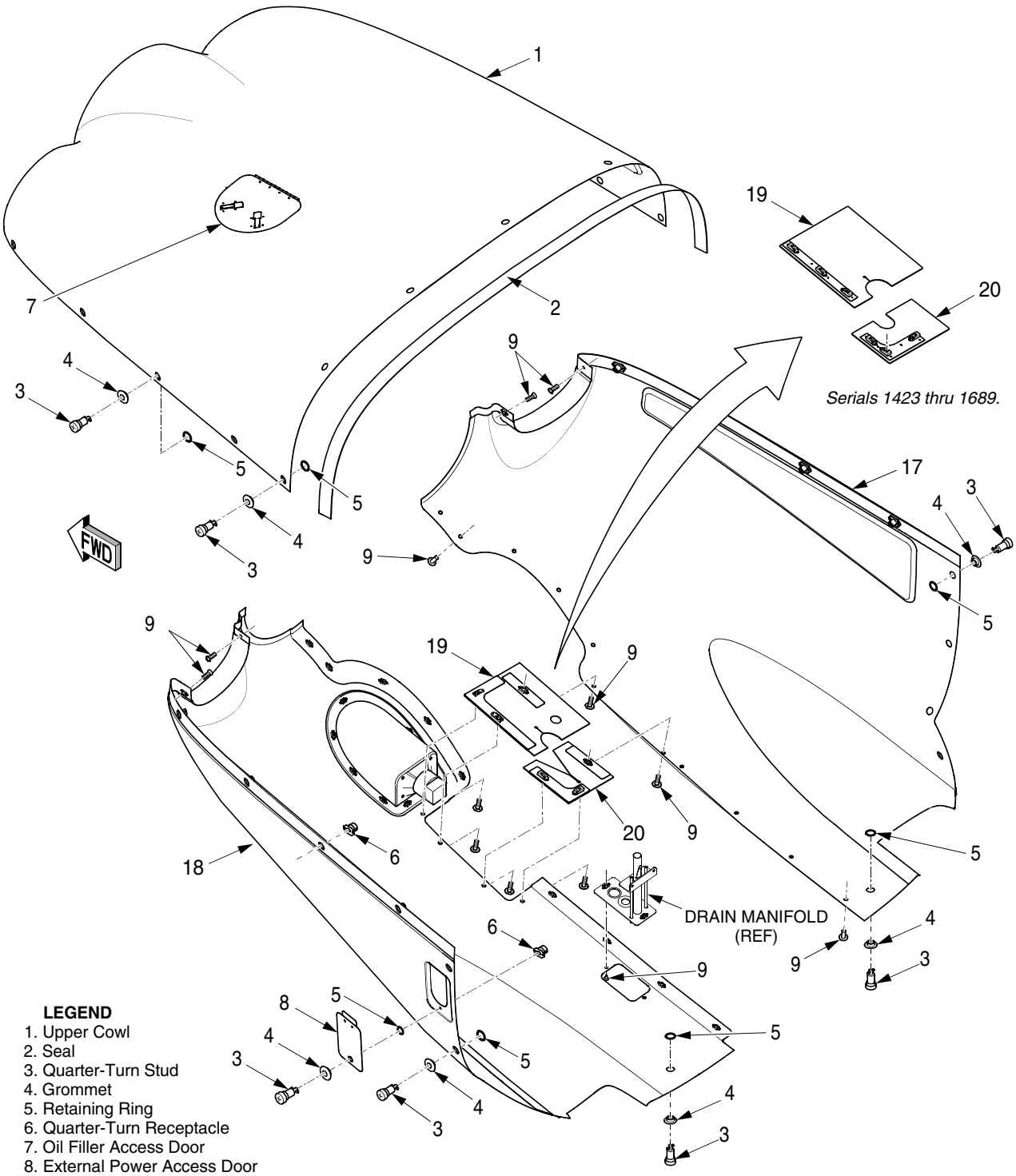
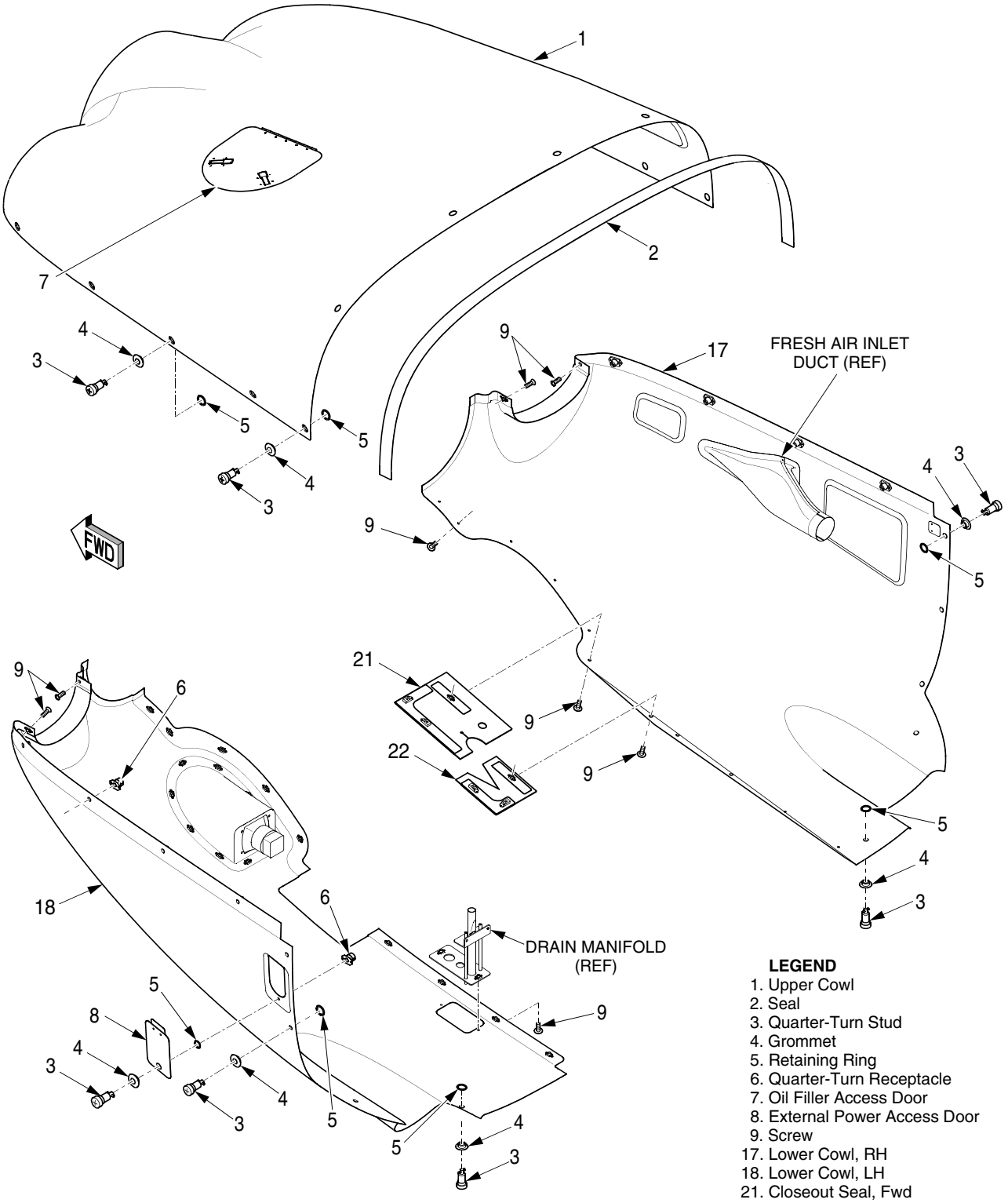


Figure 71-101
Engine Cowling Installation - Serials 1423 thru 1885 (Sheet 3 of 5)

EFFECTIVITY:
Serials 1423 thru 1885



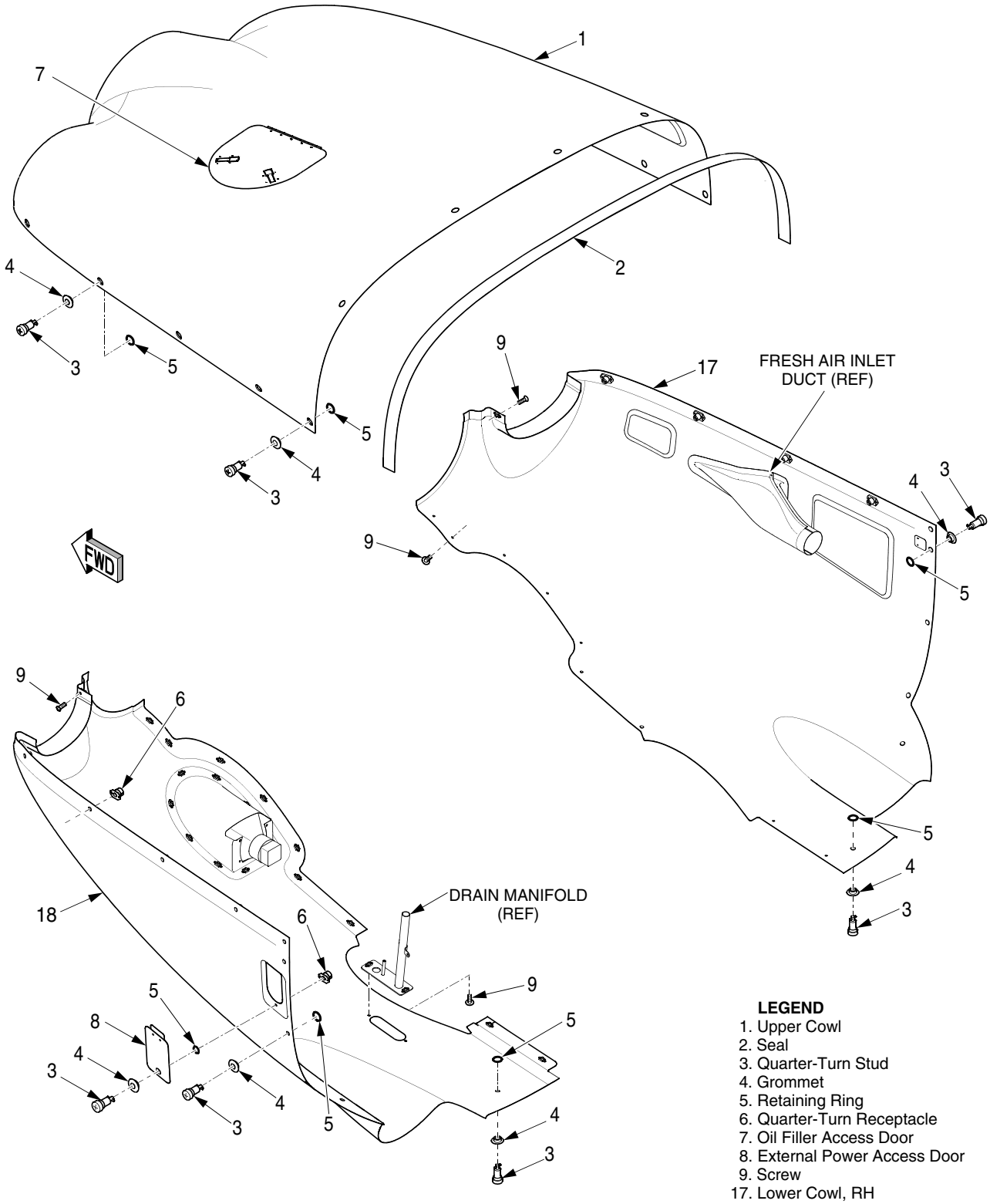
DETAIL D

Serials 1878, 1886 thru 2064,
2065 & subs w/o Perspective Avionics.

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Figure 71-101
Engine Cowling Installation - Serials 1886 thru 2064, 2065 & subs w/o Perspective (Sheet 4 of 5)

EFFECTIVITY:
Serials 1886 thru 2064, 2065 & subs w/o Perspective



LEGEND

1. Upper Cowl
2. Seal
3. Quarter-Turn Stud
4. Grommet
5. Retaining Ring
6. Quarter-Turn Receptacle
7. Oil Filler Access Door
8. External Power Access Door
9. Screw
17. Lower Cowl, RH
18. Lower Cowl, LH

DETAIL E

Serials 2065 & subs w/ Perspective Avionics.

SR20_MM71_3368

Figure 71-101
Engine Cowling Installation - Serials 2065 & subs (Sheet 5 of 5)

EFFECTIVITY:
Serials 2065 & subs

E. Inspection/Check - Engine Cowl Fit-Up (See Figure 71-102)

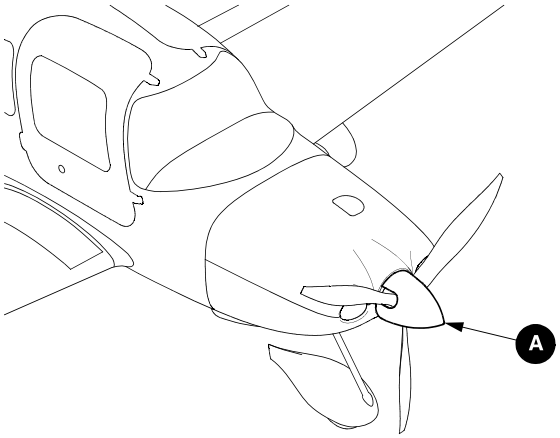
(1) Inspection/Check - Engine Cowl Fit-Up

(a) Ensure gap between propeller spinner and cowling measures between 0.25 inch (0.64 cm) and 0.50 inch (1.27 cm).

(b) *Serials 1005 thru 1422:* Measure height difference between aft, top of spinner and forward, top of cowl.

1 If cowl is level with, or no greater than 0.25 inch (0.64 cm) lower than spinner, the cowl is properly aligned.

2 If cowl is higher than 0.25 inch (0.64 cm) above top of spinner, perform Adjustment/Test - Engine Mount Weldment. (Refer to 71-20)



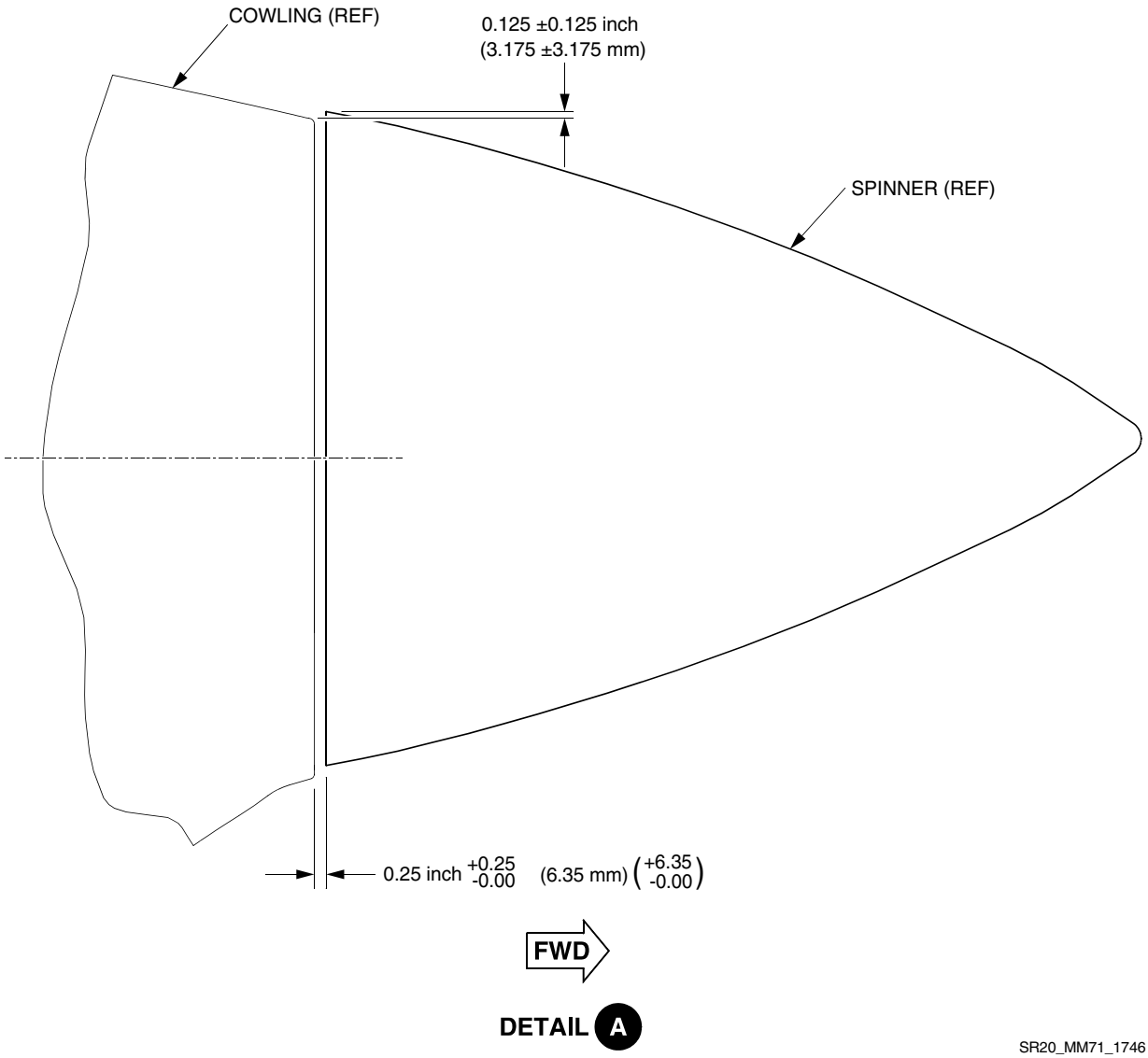


Figure 71-102
Cowling Alignment Measurements

F. Repairs

(1) Repair - Cowl Flange Contact (See Figure 71-103)

Contact of spinner to cowling may result in damage to cowl flanges due to cowling misalignment. The affected area lies at the forward cowl flanges and occurs when screws securing the upper and lower cowls together at forward inlets are not installed prior to starting the airplane.

Any other damage extending beyond the cowl flanges is not field repairable and Cirrus Design must be contacted for disposition. (Refer to AMM-Intro-)

(a) Remove engine cowling. (Refer to 71-10)

(b) Determine type and extent of damage. If necessary, contact Cirrus Design for disposition. (Refer to AMM-Intro-)

(c) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Precure Patch Material 7.50 x 14.50 inches (19.05 x 36.83 cm)	52005-004	Cirrus Design Duluth, MN 55811 218-727-2737	Repair composite structures.
Compass With Extension Bar	14.2 inches (36.07 cm) minimum diameter	Any Source	Measure and mark semi-ring repair patch.
Isopropyl Alcohol	99% or higher purity	Any Source	General cleaning.
Orbital Sander	39825A12	Any Source	Prepare repair surface.
Masking Tape	2.0 inches (5.0 cm)	Any Source	Limit repair area.
Permanent Marker	(Refer to 51-30)	(Refer to 51-30)	Identify repair area.
Release Film	(Refer to 51-30)	(Refer to 51-30)	Protect lay-up surface.
Peel Ply	(Refer to 51-30)	(Refer to 51-30)	Makes smooth and contaminate free repair surface.
Glass Repair Fabric	(Refer to 51-30)	(Refer to 51-30)	Repair composite structures.
Plastic Sheet	-	Any Source	Make template of repair ply.
Structural Paste Adhesive Repair System: MGS L418-Based *or* ES6292-Based	(Refer to 51-30)	(Refer to 51-30)	Bond plies over puncture.
Structural Resin Repair System: MGS L418-Based *or* MGS L285-Based	(Refer to 51-30)	(Refer to 51-30)	Ply lay-up.
Sandpaper	120-grit or finer	Any Source	Paint and primer removal.

Description	P/N or Spec.	Supplier	Purpose
Sandpaper	60 to 80-grit	Any Source	Abrade bonding surfaces.
Rigid Closed Cell Foam	(Refer to 51-30)	(Refer to 51-30)	Stiffen laminate.
Aerosil	(Refer to 51-30)	(Refer to 51-30)	Resin filler.
Sil-Cell	(Refer to 51-30)	(Refer to 51-30)	Resin filler.

CAUTION: Never use a grinder for removal of outer surface coats. A grinder will gouge the surface creating more damage. Chemical strippers should not be used as they may become trapped, damage the laminate, or leave a residue.

Note: Multi-action orbital type sanders or simple hand-sanding are the preferred methods of paint removal. Fine-grit paper (120-grit or finer) should be selected to minimize the potential for accidental damage.

(d) Remove paint finish from repair area. (Refer to 51-20)

(e) If affected by repair area, remove Expanded Metal Mesh (EMM) lightning protection and/or aluminum tape. (Refer to 51-20)

Note: Sand cowl flange to tangent at least 0.5 inch (12.7 mm) beyond damaged area. Retain as much flange width as possible.

(f) If necessary, use sandpaper to remove any delaminated, loose, or damaged plies on the cowl skin. (Refer to 51-20)

(g) Solvent clean with isopropyl alcohol. (Refer to 20-30)

(h) Prepare cowl repair patch. (See Figure 71-103)

1 On precure patch material, use compass to measure and mark 7.10 inches (18.03 cm) radius for outer edge of semi-ring. From initial compass needle position, measure and mark 6.10 inches (15.49 cm) radius for inner edge of semi-ring.

2 Cut semi-ring shape from precure patch material to create repair patch.

3 *Serials 1423 & subs:* For repairs to either lower cowl sections, position repair patch to cowl flange and cut away excess.

CAUTION: To ensure proper adhesion, prepared surface on cowl must be larger than repair patch.

4 Bevel outer edge of repair patch to fill radius at cowl flange tangent.

(i) Bond repair patch into position.

1 Solvent clean with isopropyl alcohol. (Refer to 20-30)

2 Mix MGS L418-based or ES6292-based structural adhesive. (Refer to 51-30)

3 Using a clean spatula or wooden applicator, apply adhesive to repair area on inside of cowl flange to obtain bond thickness of 0.005 to 0.060 inch (0.13 to 1.50 mm).

CAUTION: Movement during cure may cause bond voids. Do not move or pull repair patch away from cowl flange after squish-out is achieved or voids will form.

Note: If insufficient amount of cowl flange remains to fixture the repair patch, secure repair patch into position using tape.

4 Align inner edge of repair patch with original cowl flange edge. Secure with fixturing as required to prevent movement during cure.

5 Cure repair patch bond. (Refer to 51-20)

6 Taper original cowl flange at damaged edges to create smooth transition for repair plies.

Note: Ensure plies extend at least 0.5 inch (12.7 mm) beyond disbond.

Ensure each ply overlaps the previous ply by at least 0.5 inch (12.7 mm).

(j) Cut five glass-fiber repair plies at ±45°. (Refer to 51-20)

(k) Mix MGS L418-based or MGS L285-based structural resin. (Refer to 51-30)

Note: It is acceptable to butt plies to cowling flange edge.

(l) Layup three glass fabric repair plies to inner side of cowl flange. (Refer to 51-20)

(m) Layup two glass fabric repair plies to outer side of cowl flange. (Refer to 51-20)

(n) Cure repair plies. (Refer to 51-20)

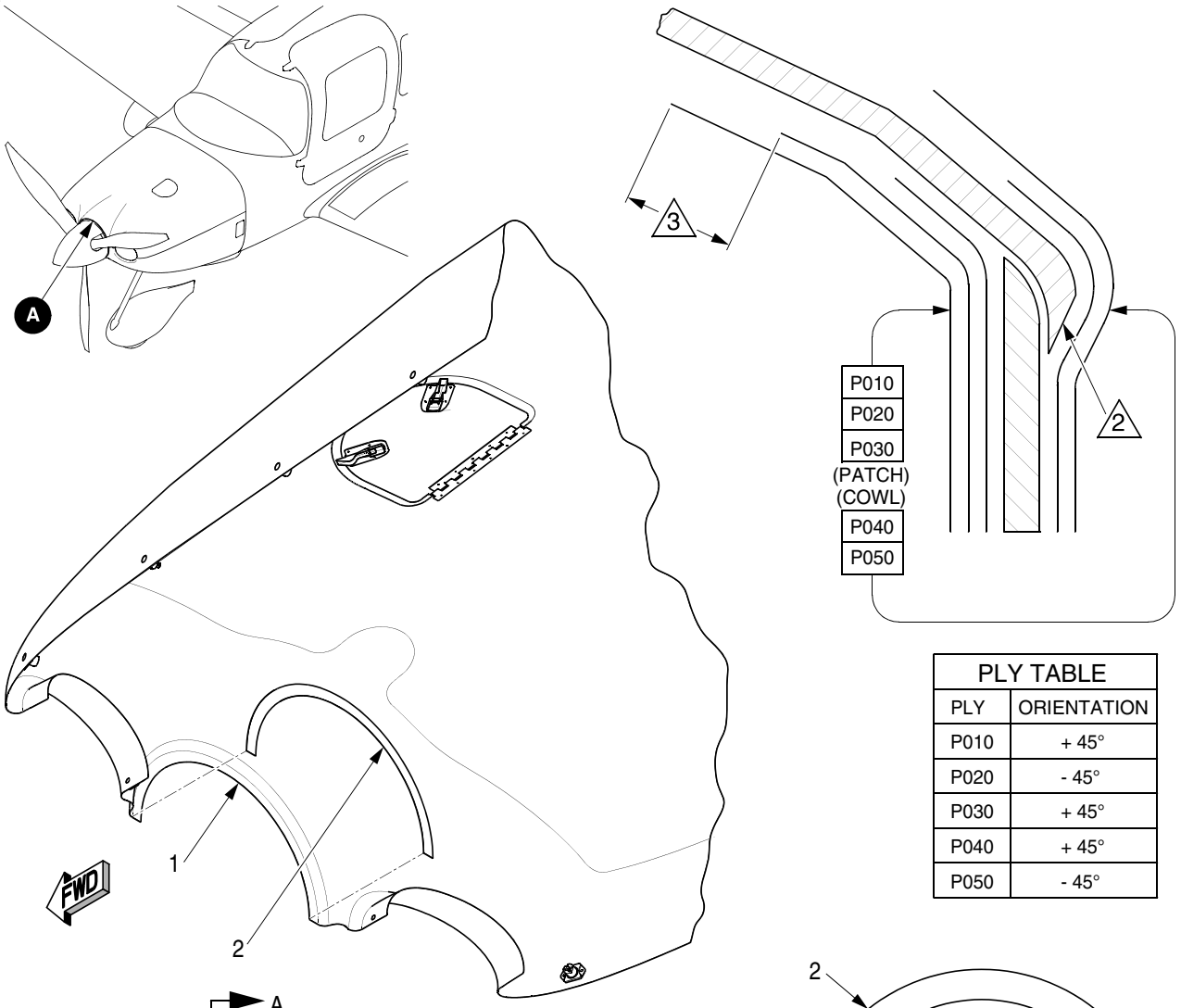
(o) Sand repair plies to edge of repair ring.

(p) If affected by repair area, install Expanded Metal Mesh (EMM) lightning protection and/or aluminum tape. (Refer to 51-20)

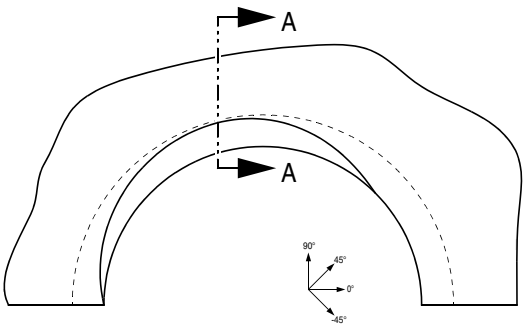
(q) Prepare the surface for primer and paint. (Refer to 51-20)

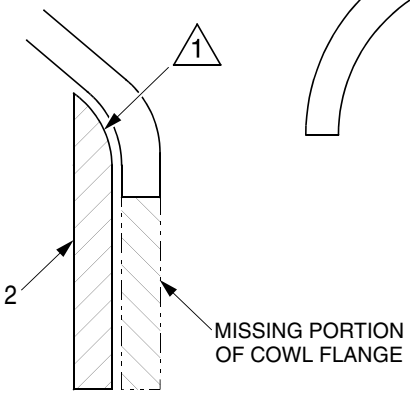
(r) Paint repair area. (Refer to 51-20)

(s) Install engine cowling. (Refer to 71-10)

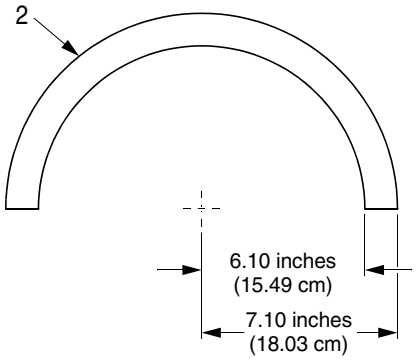


PLY TABLE	
PLY	ORIENTATION
P010	+ 45°
P020	- 45°
P030	+ 45°
P040	+ 45°
P050	- 45°





SECTION A-A



NOTE

1. Bevel outer edge of repair patch to fill radius at cowling flange tangent.
2. Taper original cowl flange at damaged edges to create smooth transition for repair plies.
3. Ensure each ply overlaps the previous ply by at least 0.5 inch (12.7 mm).

LEGEND

1. Upper Cowl
2. Repair Patch

DETAIL A

SR20_MM71_2078

Figure 71-103
Cowl Flange Repair

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MOUNTS

1. DESCRIPTION

This section describes the framework which supports and attaches the engine to the airplane. Included are the engine mount weldment and elastomeric vibration isolators.

Serials 1005 thru 2064: The engine is attached to a welded tubular steel engine mount. The engine mount weldment is fastened to the fuselage firewall at four points by steel bolts. Conventional elastomeric isolators are employed for vibration damping. At the engine mount points, oversized steel disks are attached on the opposite side of the engine so that in the event of a fire, the disks will keep the engine fastened to the engine mount weldment.

Serials 2065 & subs: The engine is bed-mounted on a tubular steel weldment which incorporates four semi-focal mount fittings. The mount fittings use conventional elastomeric isolators for vibration damping. The engine mount is bolted in four locations to the composite fuselage firewall. The firewall attach points are structurally reinforced with gusset-type attachments that transfer thrust and bending loads into the fuselage shell.

2. MAINTENANCE PRACTICES

A. Engine Mount Weldment (See Figure 71-201)

(1) Removal - Engine Mount Weldment

(a) Position airplane on a hard, flat, level surface.

(b) Set parking brake.

(c) Place wheel chocks into position.

(d) Remove key from ignition.

(e) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(f) Remove engine. (Refer to 71-00)

(g) *Serials 1005 thru 1422:* Remove cockpit floor covering. (Refer to 25-10)

(h) *Serials 1005 thru 1422:* Remove access panels CF1L and CF1R to gain access to engine mount weldment lower attach points. (Refer to 06-00)

(i) Remove glareshield. (Refer to 25-10)

(j) Remove nose gear assembly. (Refer to 32-20)

(k) *Serials 1005 thru 1422:* Remove lower engine mount nuts, washers, and through-bolts.

(l) *Serials 1423 thru 2064:* Remove nuts, radius fillers, washers, and bolts securing lower engine mount to attach plate and bridge.

(m) Ensure engine mount weldment is supported and remove upper engine mount nuts, washers, and through-bolts.

(n) Remove engine mount weldment from airplane.

(2) Installation - Engine Mount Weldment

(a) Ensure engine mount weldment is supported and aligned with mounting points on firewall.

(b) Install upper engine mount through-bolts, washers, and nuts. Dry torque to 38 - 40 ft-lb (52 - 54 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

(c) *Serials 1005 thru 1422:* Install lower engine mount through-bolts, washers, and nuts. Dry torque to 38 - 40 ft-lb (52 - 54 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

(d) *Serials 1423 thru 2064:* Install bolts, washers, radius fillers, and nuts securing lower engine mount to attach plate and bridge. Dry torque to 38 - 40 ft-lb (52 - 54 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

(e) Install nose gear assembly. (Refer to 32-20)

(f) Install glareshield. (Refer to 25-10)

(g) *Serials 1005 thru 1422:* Install access panels CF1L and CF1R. (Refer to 06-00)

(h) *Serials 1005 thru 1422:* Install cockpit floor covering. (Refer to 25-10)

(i) Install engine. (Refer to 71-00)

(3) Adjustment/Test - Engine Mount Weldment - *Serials 1005 thru 1422*

Note: Perform this procedure only if cowl is higher than spinner or 0.25 inch (0.64 cm) lower than spinner.

Note: It is permissible to install a shim between the firewall and each of the two lower or upper engine mounts. If engine mount must be shimmed, a maximum of one 0.109 inch (2.8 mm) shim is allowed under each engine mount firewall attach fitting. It is not permissible to install a shim under only one of the two upper or lower engine mounts. Shims on lower mount attach points must be installed with trimmed edge facing down.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Shims (two)	14197-102	Cirrus Design	Adjust engine mount weldment.

CAUTION: Place a weighted tail stand of suitable capacity under tail of airplane before removing engine. Adjust tail stand to slightly raise nose landing gear from the floor.

(b) Remove cockpit floor covering to forward access panels. (Refer to 25-10)

(c) Remove access panels CF1L and CF1R to gain access to engine mount weldment lower attach points. (Refer to 06-00)

(d) Remove glareshield. (Refer to 25-10)

(e) Attach hoist to forward and aft engine lift rings.

(f) If top of spinner is lower than top of cowling, the engine mount weldment requires shimming on the lower engine mounts.

1 Remove lower engine mount nuts, washers, and through-bolts.

2 Slide one shim between the firewall and each lower engine mount.

3 Ensure trimmed edge on shim faces down (towards the ground).

(g) If height from top of spinner to top of cowling is greater than 0.25 inch (6.35 mm), the engine mount weldment requires shimming on the upper engine mounts.

1 Remove upper engine mount nuts, washers, and through-bolts.

2 Slide one shim between the firewall and each upper engine mount.

(h) Ensure engine mount weldment is supported and aligned with mounting points on firewall.

(i) *Serials 1005 thru 2064:* Install engine mount through-bolts, washers, and nuts. Dry torque upper and lower bolts to 38 - 40 ft-lb (52 - 54 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

(j) *Serials 2065 & subs:* Install engine mount through-bolts, washers, and nuts. Dry torque upper bolts to 38 - 40 ft-lb (52 - 54 Nm), dry torque lower bolts to 100 - 140 in-lb (11.4 - 15.8 Nm) adding torque value to overcome nut friction. (Refer to 20-60)

(k) Remove hoist.

(l) Install access panels CF1L and CF1R. (Refer to 06-00)

(m) Install cockpit floor covering. (Refer to 25-10)

(n) Install glareshield. (Refer to 25-10)

B. Engine Mount Isolators (See Figure 71-201)

(1) Removal - Engine Mount Isolators

(a) Set parking brake.

(b) Remove key from ignition.

(c) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

CAUTION: Place a weighted tail stand of suitable capacity under tail of airplane before removing engine.

Note: Tag each component when disconnected to facilitate reinstallation. Protect openings exposed as a result of removing or disconnecting components against entry of foreign material by installing covers or sealing with tape.

(d) Remove engine cowling. (Refer to 71-10)

(e) Disconnect battery. (Refer to 24-30)

CAUTION: Prior to lifting engine, ensure all hoses, wires, lines, cables, cable ties, and clamps that would interfere with engine removal are disconnected or removed.

(f) Remove exhaust system. (Refer to 78-20)

(g) Attach hoist to forward and aft engine lift rings.

(h) Loosen bolts securing engine to engine mounts.

(i) Lift engine with hoist just enough to relieve weight from engine mounts.

(j) Remove screws and washers securing grounding straps to aft RH and forward LH isolators.

(k) Remove bolts and washers securing engine to engine mount weldment.

(l) Mark and note location of each isolator for reference upon reinstallation.

(m) Slightly raise or lower hoist just enough to force separation between engine mounting points and engine mount isolators. Remove isolators from airplane.

(2) Installation - Engine Mount Isolators

Note: If isolators are being reused, ensure isolators are reinstalled in same location as originally installed.

To ensure proper engine placement, position all engine isolators to engine mount weldment and loosely assemble attaching parts before torquing bolts.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite	242	Any Source	Retain grounding strap screw.

(b) Slightly raise engine away from engine mount weldment and insert all upper isolators onto engine mount points.

(c) Lower engine onto engine mount weldment so isolators are loosely held in place.

(d) Install aft isolators.

1 Loosely install spacer, lower isolator, washer, and bolt securing aft engine to engine mount weldment.

2 Position grounding strap to aft RH isolator and secure with Loctite, screw, and washer.

(e) Install forward isolators.

1 Loosely install spacer, lower isolator, washer, and bolt securing forward engine to engine mount weldment.

2 Position grounding strap to LH forward isolator and secure with Loctite, screw, and washer.

(f) Torque engine attach bolts to 450 - 500 in-lb (51 - 57 Nm). (Refer to 20-60)

(g) Remove hoist and tail stand.

(h) Install exhaust system. (Refer to 78-20)

(i) Connect or install all previously removed hoses, wires, lines, cables, cable ties, and clamps, ensuring proper clearance from exhaust pipes, etc.

(j) Connect battery. (Refer to 24-30)

(k) Install engine cowling. (Refer to 71-10)

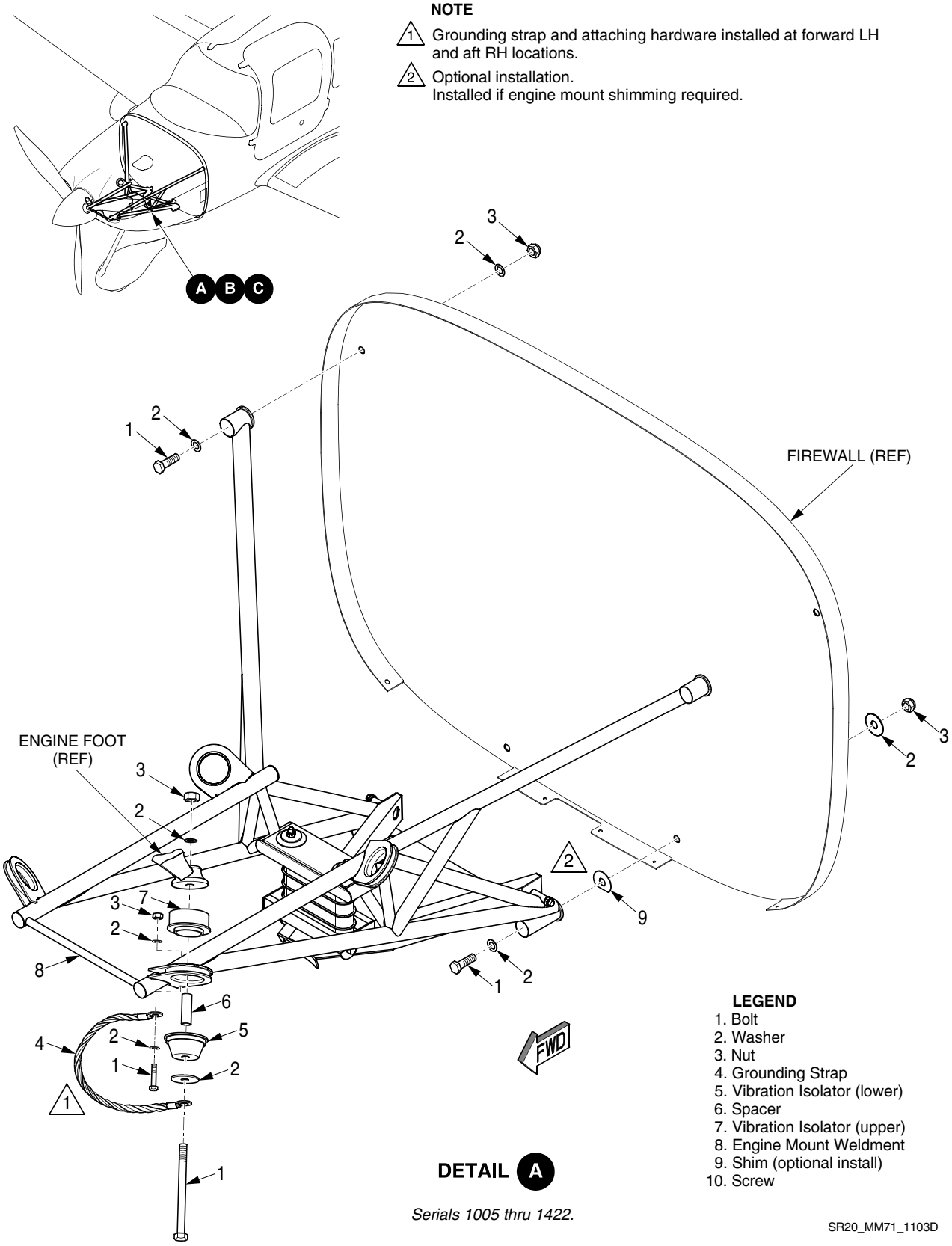


Figure 71-201
Engine Mount and Isolator Installation - Serials 1005 thru 1422 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1422

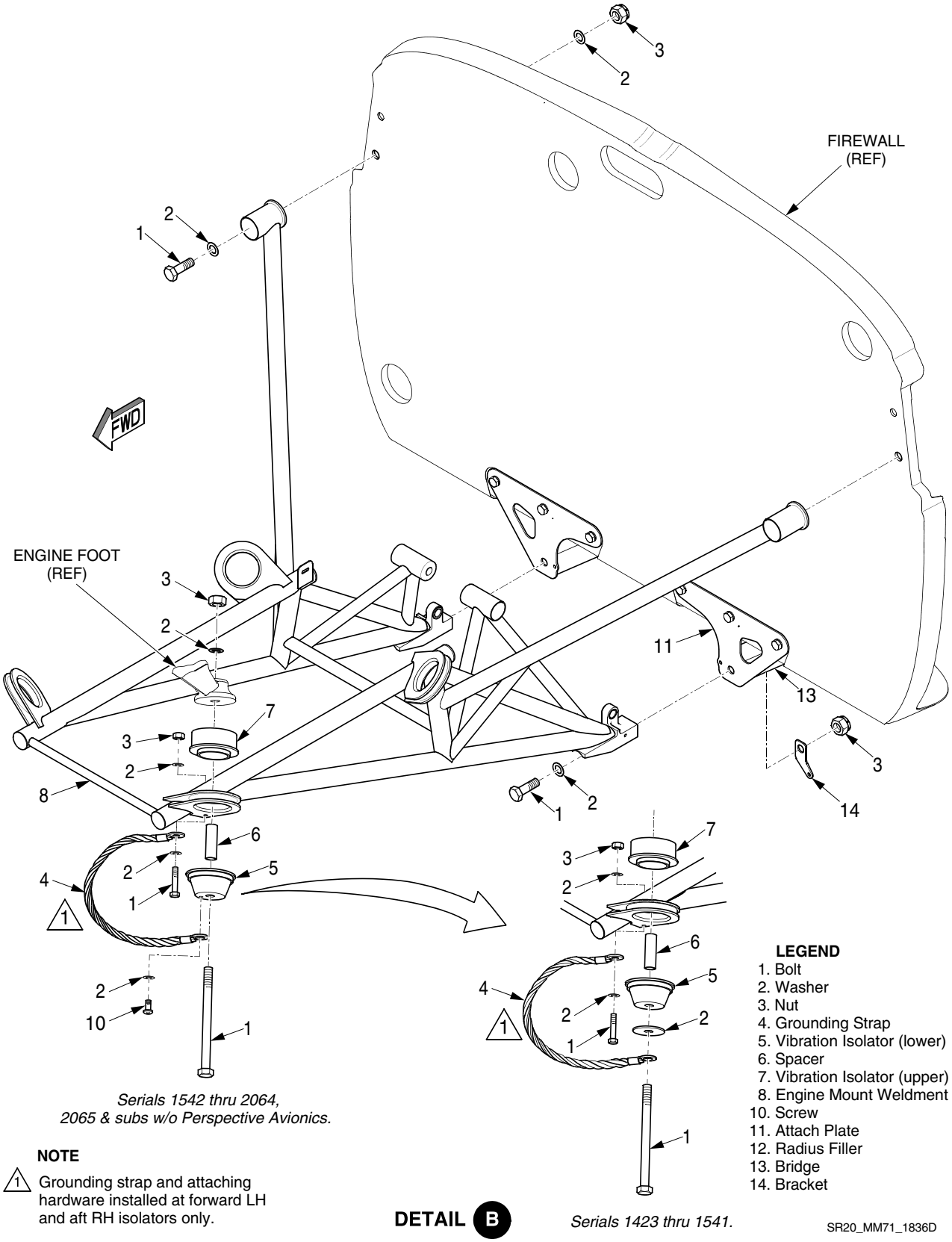


Figure 71-201
Engine Mount and Isolator Installation - Serials 1423 - 2064, 2065 & subs w/o Perspective (Sheet 2 of 3)

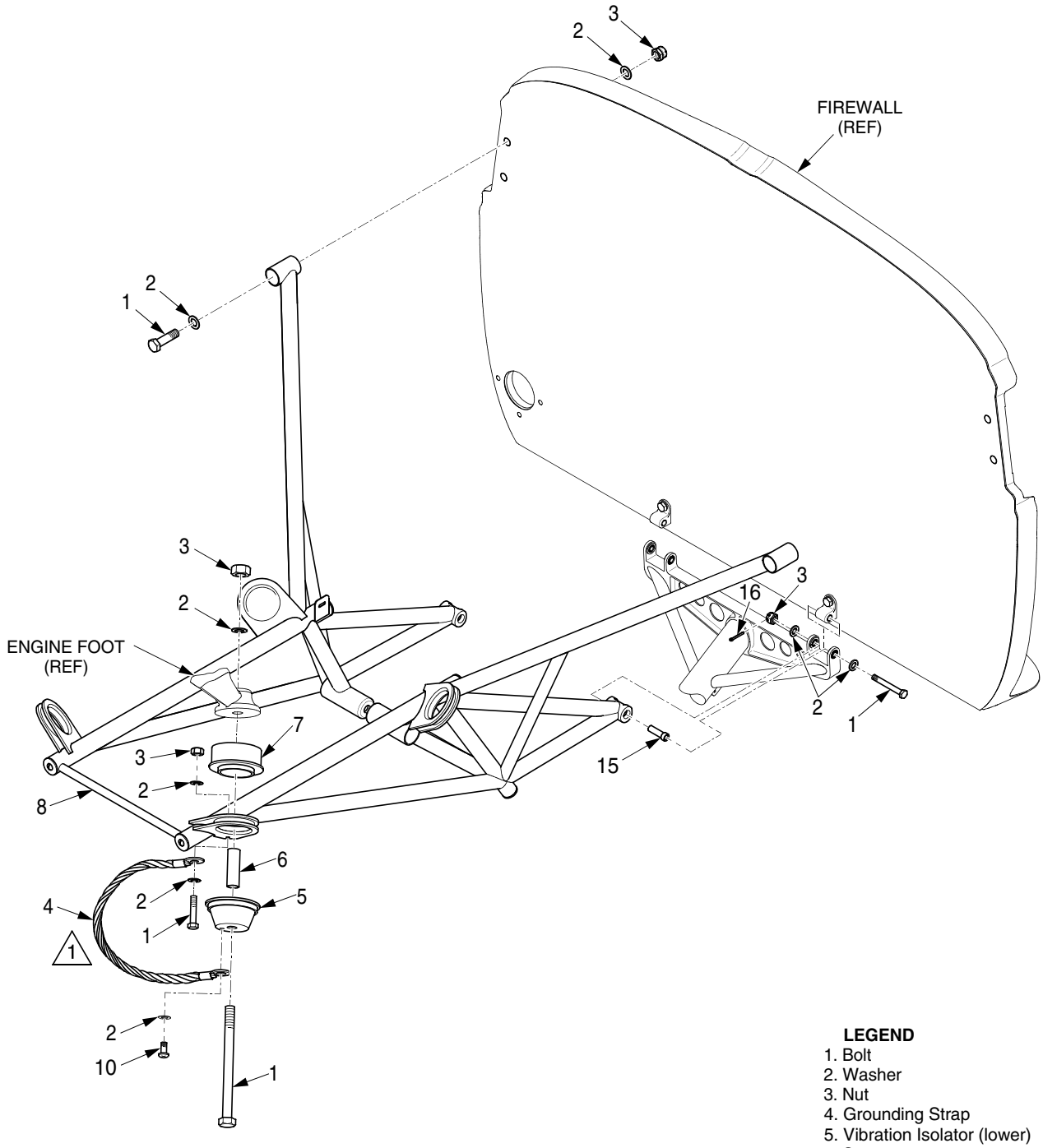


Figure 71-201
Engine Mount and Isolator Installation - Serials 2065 & subs (Sheet 3 of 3)

EFFECTIVITY:
Serials 2065 & subs

ATTACH FITTINGS

1. DESCRIPTION

This section describes those fittings and brackets which are used for support of components in and about the powerplant. These items include the throttle control cable bracket, governor control cable bracket, mixture control cable bracket, and fuel and hose line stand-off clamps.

2. MAINTENANCE PRACTICES

A. Throttle Control Cable Bracket (See Figure 71-401)

(1) Removal - Throttle Control Cable Bracket

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing cable to throttle control arm.

(c) Remove cable rod end.

(d) Remove nut securing bracket to engine.

(e) Pull cable and bracket slightly aft and remove nut, washer, bolt, and retaining clip securing cable to bracket. Remove bracket from airplane.

(2) Installation - Throttle Control Cable Bracket

(a) Position cable to bracket and loosely secure with retaining clip, bolt, washer, and nut.

(b) Install cable rod end.

(c) Position cable to throttle control arm and secure with bolt, washers, nut, and cotter pin.

(d) Adjust slack in cable and tighten retaining clip nut.

(e) Position bracket to engine and secure with nut.

(f) Perform Adjustment/Test - Throttle Control Cable. (Refer to 76-10)

(g) Install engine cowling. (Refer to 71-10)

B. Governor Control Cable Bracket (See Figure 71-401)

(1) Removal - Governor Control Cable Bracket

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing cable to governor control arm.

(c) Remove nut, washers, bolt, and retaining clip securing cable to bracket.

(d) Remove nuts securing bracket to engine. Remove bracket from airplane.

(2) Installation - Governor Control Cable Bracket

(a) Position bracket to engine and secure with nuts.

(b) Position cable to bracket and secure with retaining clip, bolt, washers, and nut.

(c) Position cable to governor control arm and secure with bolt, washers, nut, and cotter pin.

(d) Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment. (Refer to 61-20)

(e) Install engine cowling. (Refer to 71-10)

C. Mixture Control Cable Bracket (See Figure 71-401)

(1) Removal - Mixture Control Cable Bracket
  (a) Remove engine cowling. (Refer to 71-10)
  (b) Remove cotter pin, nut, washers, and bolt securing cable to mixture control arm.
  (c) Remove nut, washers, bolt, and retaining clip securing cable to bracket.
  (d) Remove nuts securing bracket to engine. Remove bracket from airplane.

(2) Installation - Mixture Control Cable Bracket
  (a) Position bracket to engine and secure with nuts.
  (b) Position cable to bracket and secure with retaining clip, bolt, washers, and nut.
  (c) Position cable to mixture control arm and secure with bolt, washers, nut, and cotter pin.
  (d) Perform Adjustment/Test - Mixture Control Cable. (Refer to 76-10)
  (e) Install engine cowling. (Refer to 71-10)

D. Fuel and Hose Line Stand-Off Clamps (See Figure 71-401)

(1) Removal - Fuel and Hose Line Stand-Off Clamps

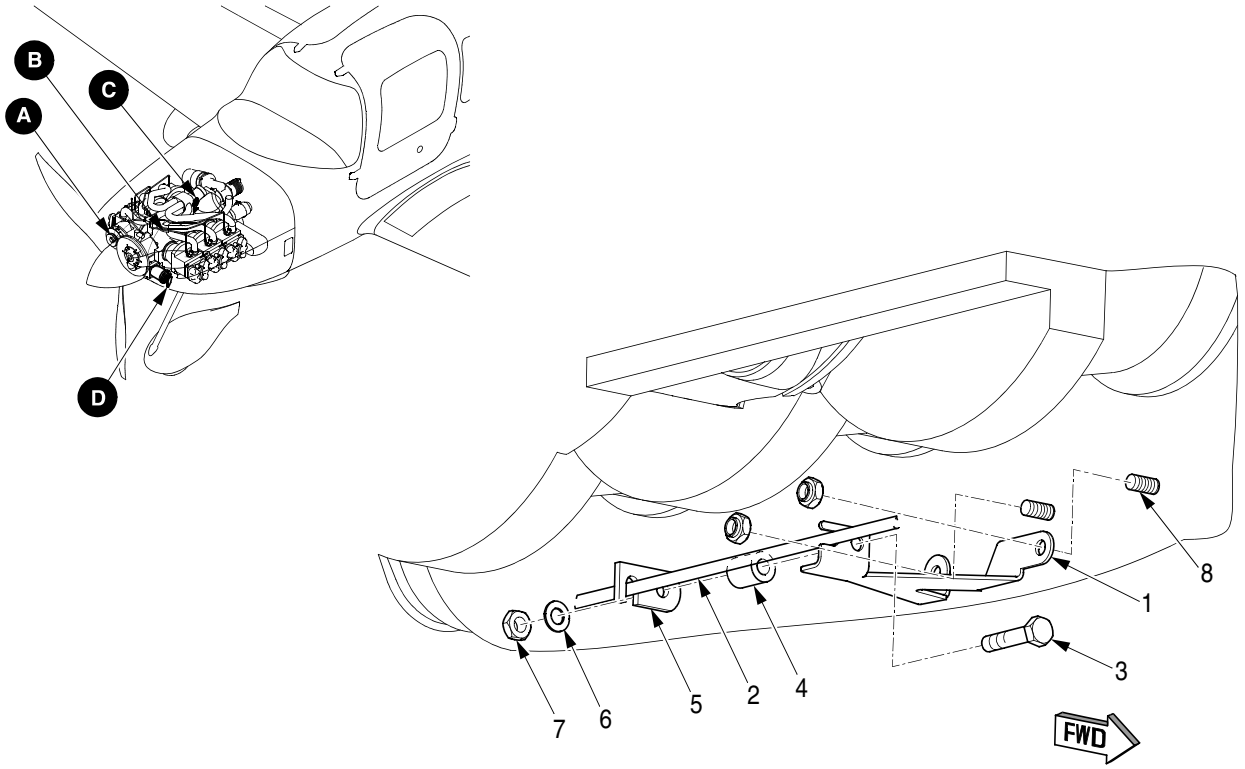
(a) Remove nut, washer, and bolt securing component clamp to stand-off clamp.

(b) Pry stand-off clamp open and remove from airplane.

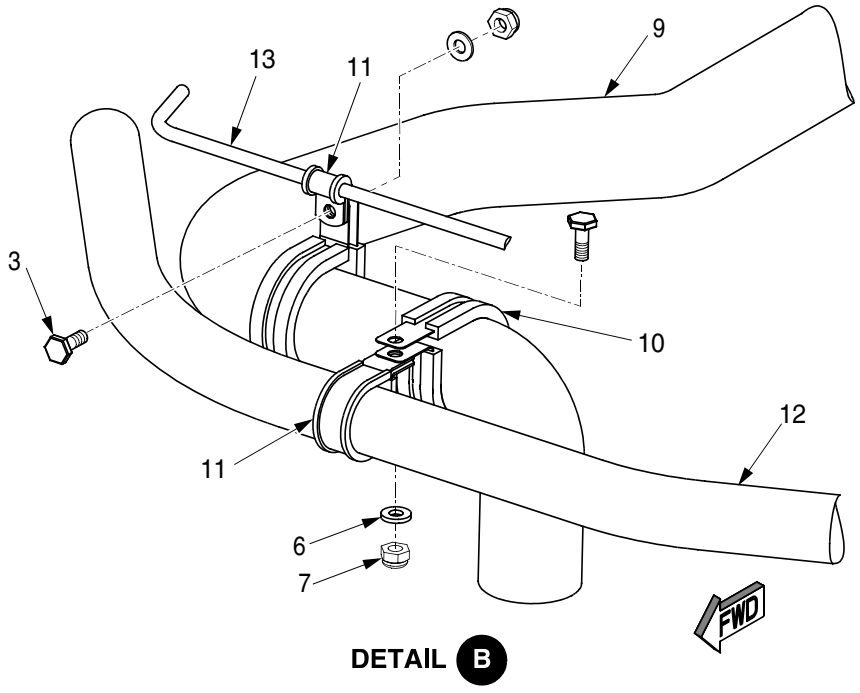
(2) Installation - Fuel Line and Hose Stand-Offs

(a) Position stand-off clamp around induction pipe.

(b) Align component clamp with stand-off clamp and install bolt, washer, and nut.



DETAIL A



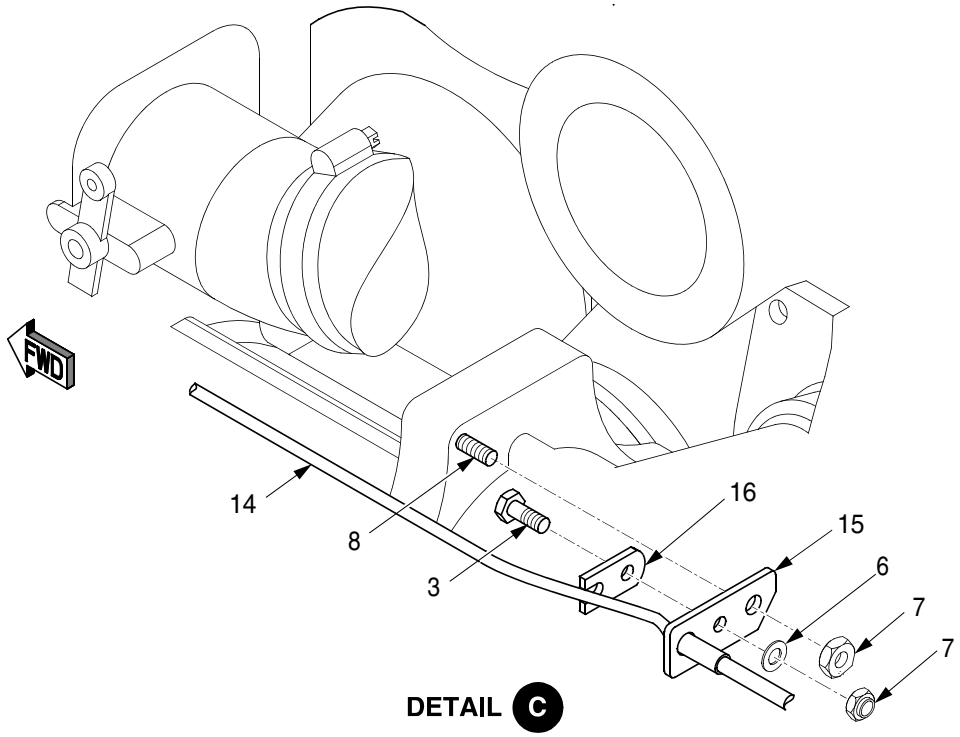
DETAIL B

LEGEND

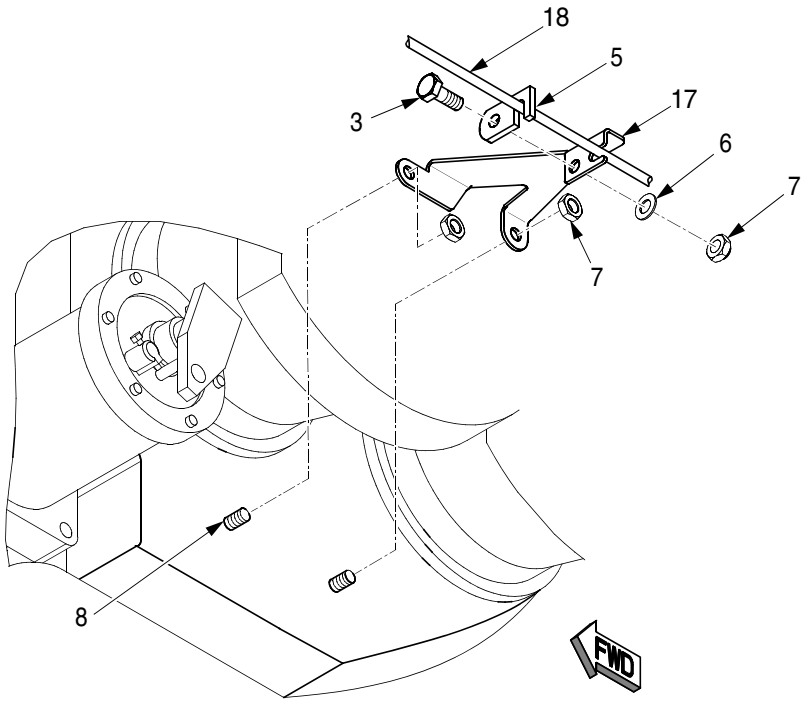
1. Mixture Control Cable Bracket
2. Mixture Control Cable
3. Bolt
4. Spacer, Mixture Control
5. Clip, Anchorage
6. Washer
7. Nut
8. Engine Pad Stud
9. Induction Pipe
10. Stand-off Clamp
11. Component Clamp
12. Hose
13. Fuel Line

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Figure 71-401
Attach Fitting Installations (Sheet 1 of 2)



DETAIL C



DETAIL D

LEGEND

3. Bolt
5. Clip, Anchorage
6. Washer
7. Nut
8. Engine Pad Stud
14. Throttle Control Cable
15. Throttle Cable Support
16. Clip
17. Governor Control Cable Bracket
18. Governor Control Cable

SR20_MM71_1106

Figure 71-401
Attach Fitting Installations (Sheet 2 of 2)

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ELECTRICAL HARNESS

1. DESCRIPTION

This chapter describes the electrical cables, plugs, connectors, etc. which serve power plant and airplane systems, but are banded together to facilitate removal and installation of the engine.

Serials 1005 thru 1267: The airplane employs two engine wiring harnesses. The wiring harnesses connect the following components: vacuum manifold, standby vacuum pump, fuel pump, landing light, fuel pressure switch, fuel flow sensor, oil temperature sensor, exhaust gas temperature sensor, manifold air pressure sensor, oil pressure sensor, tachometer sensor, magnetos, alternator, secondary alternator (if installed), and ground bus bar.

Serials 1268 & subs: The airplane employs two engine wiring harnesses. The wiring harnesses connect the following components: fuel pump, landing light, fuel pressure switch, fuel flow sensor, oil temperature sensor, exhaust gas temperature sensor, manifold air pressure sensor, oil pressure sensor, tachometer sensor, magnetos, alternator, secondary alternator, air conditioning compressor (optional), and ground bus bar. For maintenance practices pertinent to firewall forward wiring refer to the SR20 Wiring Manual.

2. MAINTENANCE PRACTICES

A. Electrical Harness

(1) Removal - Electrical Harnesses

To remove engine wiring harnesses, disconnect all items listed in above, tag connectors, cut cable ties or loosen clamps, disconnect firewall connectors, and remove electrical harnesses from the airplane

(2) Installation - Electrical Harnesses

To install electrical harnesses, connect all connectors at the tagged locations of the items listed above, secure harnesses with cables ties or clamps, and connect firewall connectors.

Upon installation, perform Operational Check and check cockpit instrumentation for normal operation. (Refer to 05-30)

AIR INTAKES

1. DESCRIPTION

This section describes that portion of the power plant which directs mass air flow to the engine.

Induction air enters the engine through a filter mounted on the right, aft side of the engine baffling and then flows into the induction duct assembly mounted on the center aft end of the engine. The induction duct assembly employs a flapper valve which, in the case of filter blockage, or induction ice, allows alternate air to enter the induction duct body via a flexible duct open to the sheltered, “warm” side of the engine baffle. The alternate air valve is manually controlled from the cabin by pulling a control knob mounted on the left side of the center console. From the induction duct body, induction air flows to the throttle body after which the air is distributed to each cylinder via the intake manifold and separate intake tubes.

2. MAINTENANCE PRACTICES

A. Induction Air Filter (See Figure 71-601)

(1) Removal - Induction Air Filter

(a) Remove engine cowling. (Refer to 71-10)

(b) *Serials 1148 & subs:* Remove bolt and washer securing filter bracket to baffle.

(c) Remove cotter pin, nut, washer, and cover plate securing filter to induction duct assembly.

(d) Remove filter from airplane.

(2) Installation - Induction Air Filter

(a) Position filter to induction duct assembly and secure with cover plate, washer, nut, and cotter pin.

(b) *Serials 1148 & subs:* Install bolt and washer securing filter bracket to baffle.

(c) Install engine cowling. (Refer to 71-10)

B. Alternate Air Control Cable (See Figure 71-601)

(1) Removal - Alternate Air Control Cable

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing cable to flapper valve control arm.

(c) Remove nut, support clamp, and bolt securing cable to engine baffling.

(d) Remove any clamps securing alternate air cable to engine mount.

(e) Remove nut and washer securing alternate air control knob and cable to console mounting bracket.

Note: Prior to removal, note routing of cable through firewall and console ribs for aid on reinstallation and remove as much sealant as possible surrounding cable fitting on firewall.

(f) Gently pull cable aft, through firewall, ensuring that the cable does not inadvertently pull other components loose, and remove from airplane.

(2) Installation - Alternate Air Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Adhesive	RTV 736	Dow Corning	Sealant.
Fiber Frax	970J,TON-0146	UniFrax	Firewall insulation.

(b) Ensure cable fitting on firewall is clear and free of old sealant.

(c) Route cable through mounting bracket, firewall, and engine baffling, to flapper valve control arm.

(d) Install washer and nut securing alternate air control knob to console mounting bracket.

(e) Install bolt, washers, nut, and cotter pin securing cable to flapper valve control arm.

(f) Wrap FiberFrax paper around portion of control cable which will pass through firewall fitting so a tight fit is achieved at the cable/firewall interface.

(g) Remove alternate air hose connected to induction duct to gain visibility to flapper valve.

(h) Install support clamp, bolt, and nut securing control cable to engine baffling so that with the cable control knob pushed in, the flapper valve fully closes.

(i) Apply silicone adhesive to entire firewall fitting and fitting/cable interface.

(j) Install engine cowling. (Refer to 71-10)

C. Induction Duct Assembly (See Figure 71-601)

(1) Removal - Induction Duct Assembly

(a) Remove induction air filter. (Refer to 71-60)

(b) Remove cotter pin, nut, washers, and bolt securing induction air cable to hinge assembly.

(c) Remove clamp securing alternate air duct to induction duct assembly.

(d) Loosen clamps securing induction duct assembly to throttle body. Remove induction duct assembly from airplane.

(2) Disassembly - Induction Duct Assembly

(a) Remove nuts and screws securing flapper to hinge assembly and remove flapper.

(b) Remove bushings, washers, nut, and cotter pin securing hinge assembly to induction duct assembly.

(c) Remove filter rod and cotter pins securing air filter eyebolt to induction duct assembly.

(3) Assembly- Induction Duct Assembly

(a) Position air filter eyebolt to induction duct assembly and secure with filter rod and cotter pins.

(b) Lightly hand-tighten bushings, washers, and nut securing hinge assembly to induction duct assembly.

(c) Perform Inspection/Check - Flapper Assembly. (Refer to 71-60)

(4) Installation - Induction Duct Assembly

(a) Position induction duct assembly to throttle body. Tighten clamps securing induction duct assembly to throttle body.

(b) Install clamp securing alternate air duct to induction duct assembly.

(c) Position induction air cable to hinge assembly and secure with bolt, washers, nut and cotter pin.

(d) Install induction air filter. (Refer to 71-60)

(5) Inspection/Check - Flapper Assembly

(a) Verify that during rotation of flapper, gasket contacts all edges of induction duct assembly at both stop points.

Note: Gasket should have some deflection but not so much that it folds under and causes resistance when flapper is moved away from fully closed position.

(b) Verify that no excess deflection of flapper gasket occurs.

(c) If excess deflection occurs:

1 Perform Disassembly - Induction Duct Assembly. (Refer to 71-60)

Note: When trimming gasket, keep smooth surface on trimmed edges free of any loose fibers.

2 Trim gasket on flapper assembly with sharp scissors.

3 Perform Assembly - Induction Duct Assembly. (Refer to 71-60)

(d) Once proper fit is obtained, torque nut to 10 - 15 in-lb (1.1 - 1.7 Nm) and install cotter pin.

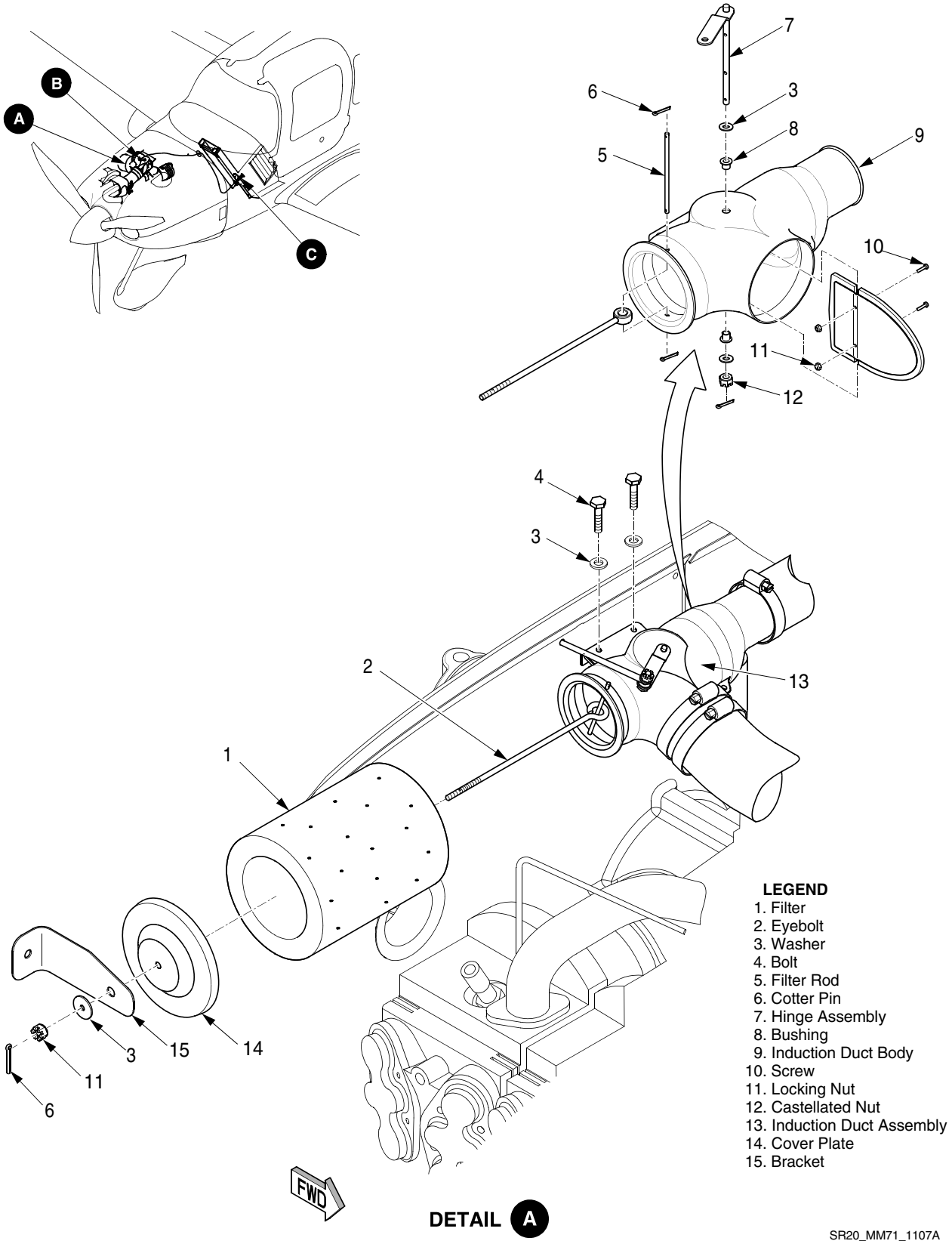


Figure 71-601
Induction Air System Installation (Sheet 1 of 2)

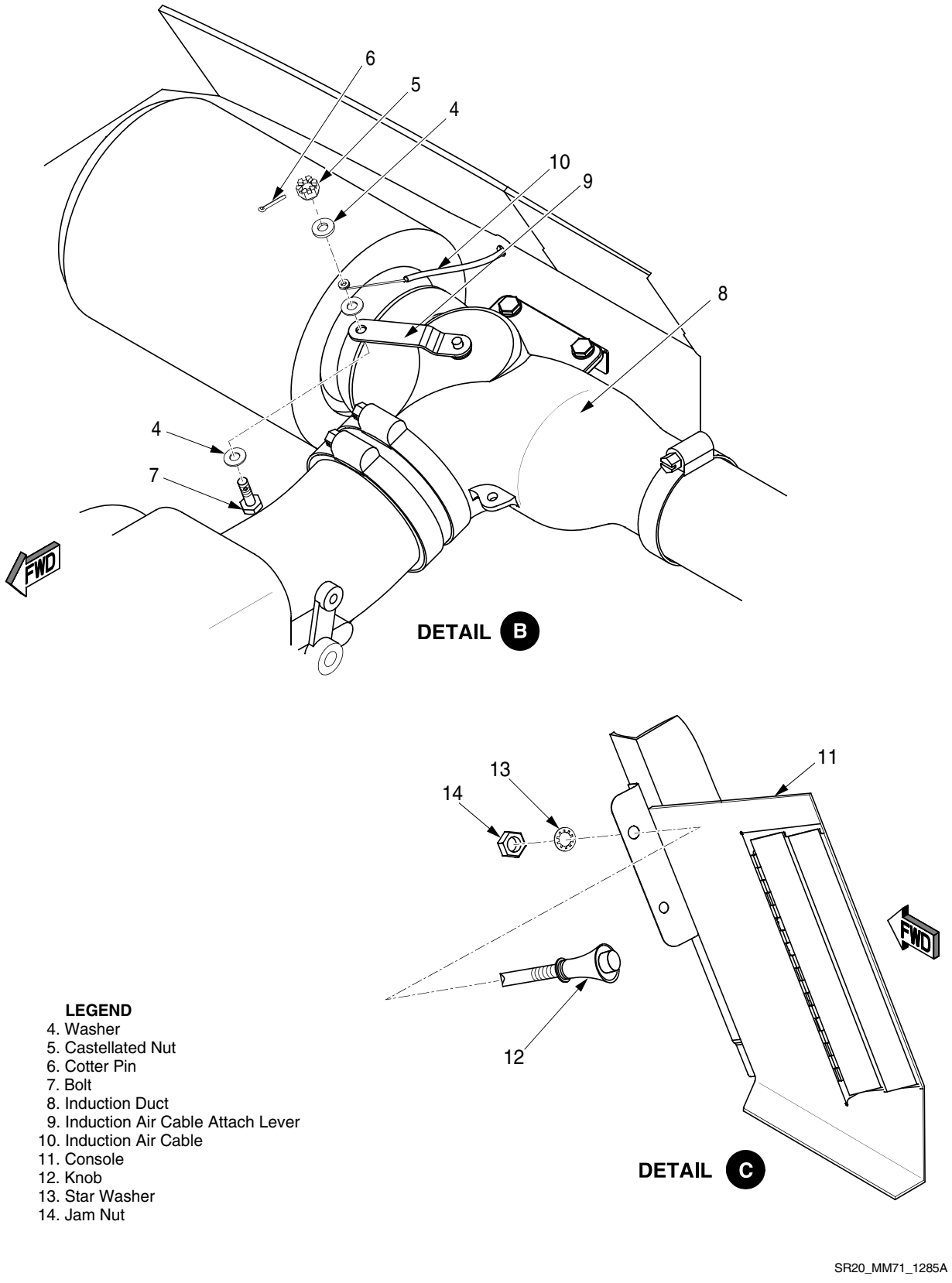


Figure 71-601
Induction Air System Installation (Sheet 2 of 2)

ENGINE DRAINS

1. DESCRIPTION

This section describes those components and manifold assemblies which are used to drain excess fluids from the power plant and its accessories. This includes the fuel, oil, and battery system engine drains.

2. MAINTENANCE PRACTICES

A. System Drain Hoses (See Figure 71-701)

(1) Removal - System Drain Hose

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Hose - Fuel System	1/4” MIL-H-2098	Any Source	Drain.
Hose - Oil System	1" MIL-H-6000	Any Source	Drain.
Hose - Battery System	TBP-3706	Teledyne Continental Motors Mobile, AL 36601 334-436-8468	Drain.

(b) Remove engine cowling. (Refer to 71-10)

(c) Determine length of new hose by measuring existing hose on airplane.

(d) Loosen hose clamps and remove hose.

(2) Installation - System Drain Hose

(a) Position new hose on system component.

(b) Install hose clamp to secure to system.

(c) Install engine cowling. (Refer to 71-10)

B. Engine Drain Manifold - *Serials 1005 thru 1422* **(See Figure 71-701)**

(1) Removal - Engine Drain Manifold

(a) Remove engine cowling. (Refer to 71-10)

(b) Loosen hose clamps and remove hoses from engine drain manifold.

(c) Remove screws securing manifold to firewall.

CAUTION: Ensure underlying structure is not damaged when cutting through sealant.

(d) Carefully cut through firewall sealant with utility knife and remove manifold.

(2) Installation - Engine Drain Manifold

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Firewall Sealant	DAPCO-2200	D Aircraft Products Anaheim, CA 92807 714-632-8444	Sealant.

(b) Ensure surface area is clean and free of debris.

(c) Position engine drain manifold to firewall and secure with screws.

(d) Apply firewall sealant over aft edge of manifold.

(e) Position engine drain hoses on manifold.

(f) Install hose clamps securing hoses to manifold.

(g) Install engine cowling. (Refer to 71-10)

C. Engine Drain Manifold - *Serials 1423 & subs* **(See Figure 71-701)**

(1) Removal - Engine Drain Manifold

(a) Remove engine cowling. (Refer to 71-10)

(b) Loosen hose clamps and remove hoses from engine drain manifold.

(c) Loosen nut securing gascolator drain tube to drain manifold.

(d) *Serials 1423 thru 2064:* Remove screws and washers securing manifold to firewall and remove manifold from airplane.

(e) *Serials 2065 & subs:* Remove bolt and washer securing drain manifold to engine mount and remove drain manifold from airplane.

(2) Installation - Engine Drain Manifold

(a) *Serials 1423 thru 2064:* Position engine drain manifold to firewall and secure with screws and washers.

(b) *Serials 2065 & subs:* Position drain manifold to engine mount and secure with bolt and washer.

(c) Position gascolator drain tube to drain manifold and secure with nut.

(d) Position engine drain hoses on manifold.

(e) Install hose clamps securing hoses to manifold.

(f) Install engine cowling. (Refer to 71-10)

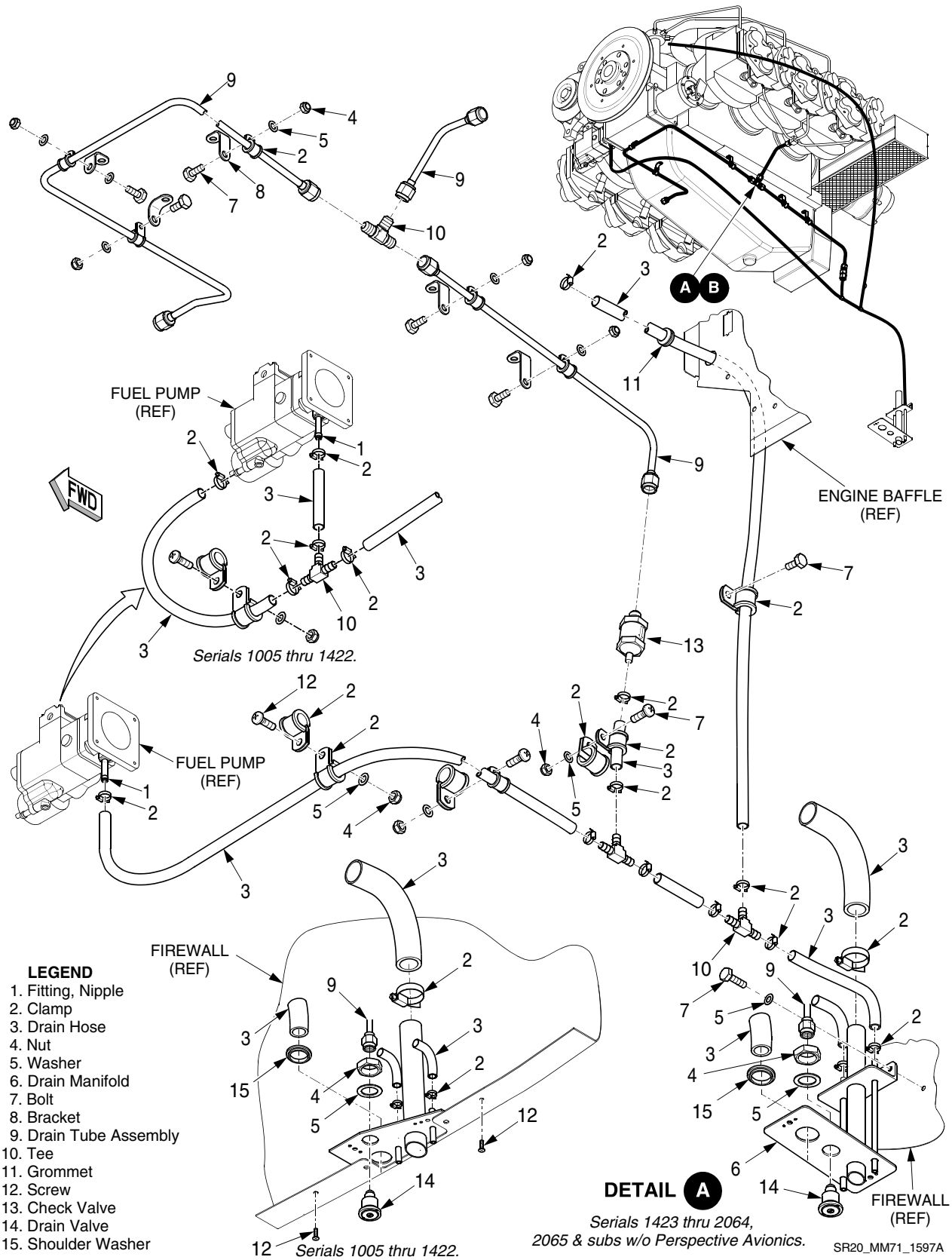
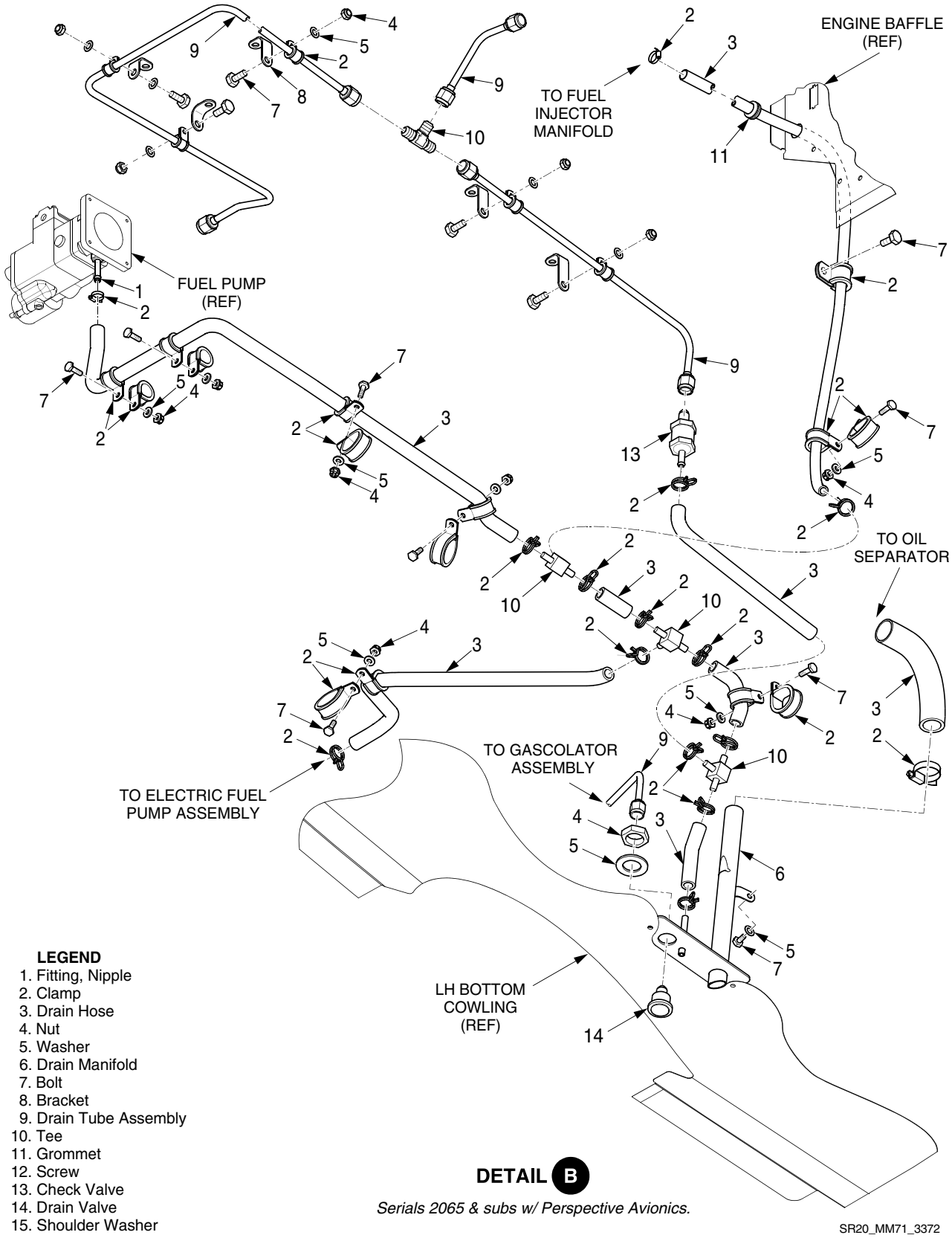


Figure 71-701
Engine Drains - Serials 1005 thru 2064 (1 of 2)



LEGEND

1. Fitting, Nipple
2. Clamp
3. Drain Hose
4. Nut
5. Washer
6. Drain Manifold
7. Bolt
8. Bracket
9. Drain Tube Assembly
10. Tee
11. Grommet
12. Screw
13. Check Valve
14. Drain Valve
15. Shoulder Washer

Figure 71-701
Engine Drains - Serials 2065 & subs (2 of 2)

EFFECTIVITY:
Serials 2065 & subs

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ENGINE

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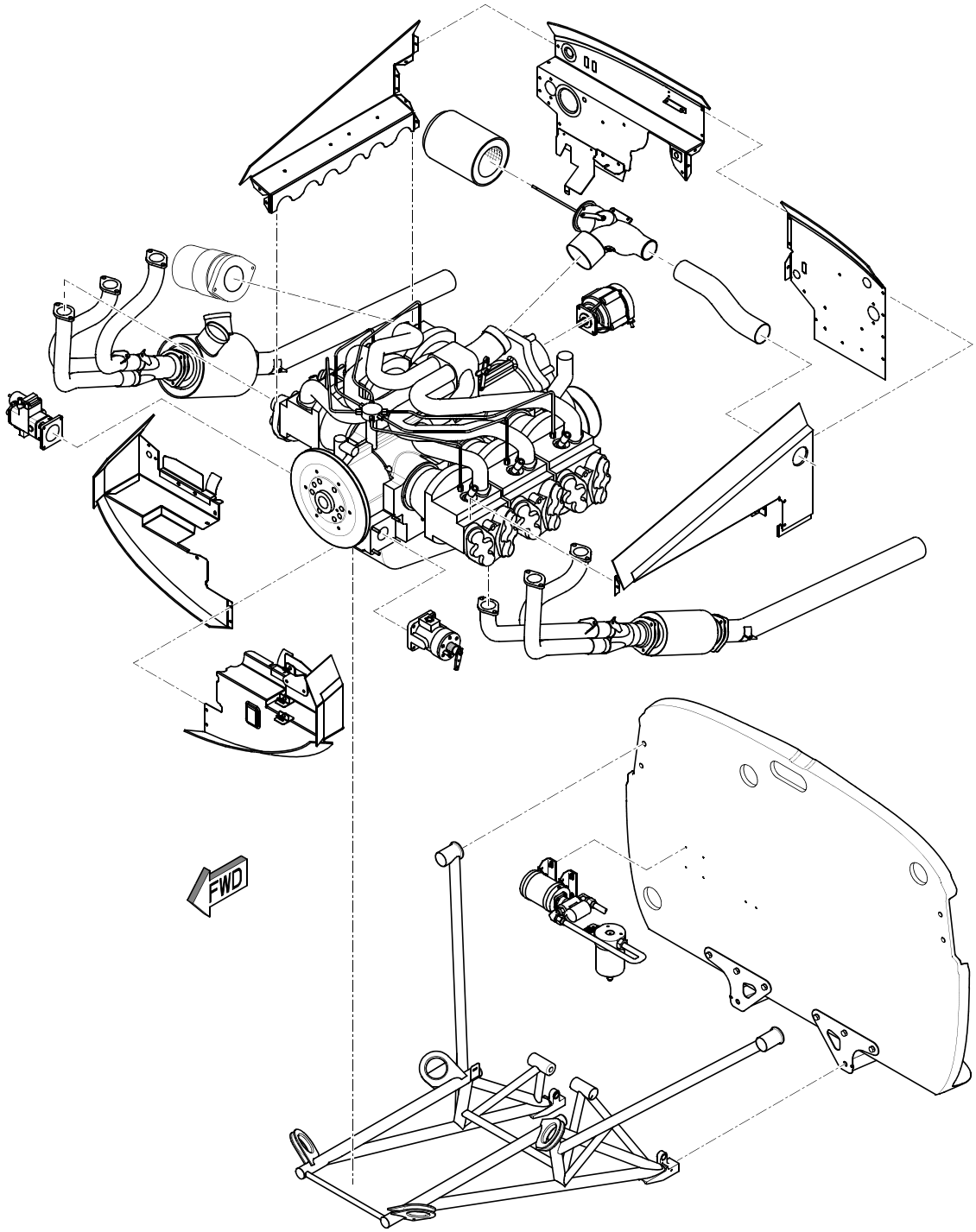
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ENGINE

1. GENERAL

For information pertaining to this chapter such as maintenance practices, limits, and procedures for tear-down, cleaning, inspection, assembly, testing, etc., refer to the manufacturer's approved Instructions For Continued Airworthiness.



SR20_MM72_1588A

Figure 72-001
Engine Installation

EFFECTIVITY:
All

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ENGINE FUEL SYSTEMS

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CHAPTER 73 - ENGINE FUEL SYSTEM

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ENGINE FUEL SYSTEM

1. GENERAL

This chapter describes those units and components which deliver metered fuel and air to the engine. Components covered include the manifold pressure gage/fuel flow gage. For additional information on fuel injection system components, refer to the manufacturer's approved Instructions For Continued Airworthiness.

The fuel injection system is of the multi-nozzle, continuous-flow type which controls fuel flow to match engine air flow. Any change in throttle position, engine speed, or a combination of these, causes fuel flow to change in the correct relation to engine air flow.

Fuel is drawn from the supply tanks by the engine-driven fuel pump, where the fuel is metered based on engine and environmental conditions. Excess fuel is returned to the tank. A boost pump is installed for use in starting and vapor suppression. When liquid fuel leaves the fuel-pump pressure chamber, it is directed to an integral mixture control valve. The mixture control valve shaft is linked to the cockpit mixture control.

From the mixture control valve, fuel is directed to the fuel metering valve mounted on the side of the throttle body. The shaft that positions the throttle body butterfly valve also positions the metering valve and is linked to the cockpit throttle control. From the fuel metering valve, fuel passes through the fuel flow meter, then to the fuel manifold valve.

The fuel manifold valve contains a diaphragm chamber and the necessary ports which connect to the fuel injector lines. When fuel pressure reaches approximately 3.5 psi, the manifold valve admits fuel to the six ports in the manifold. The spring-loaded diaphragm works with a ported plunger which distributes the precise amount of fuel, via the fuel injector lines, to the fuel injector nozzles.

For fuel system schematic, refer to Chapter 28, Fuel. (See Figure 28-003)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Engine will not start and no fuel flow indication.	No fuel to engine.	Check fuel tank level.
	Mixture control improperly rigged.	Check mixture control for proper rigging. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Engine not primed.	Auxiliary pump switch to BOOST position.
	Selector valve in OFF position.	Position selector valve to ON position.
Engine will not start with fuel flow indication.	Engine flooded.	Turn off boost pump and ignition switch. Advance throttle to full OPEN, retard mixture to full LEAN, and crank engine to clear cylinders of excess fuel. Repeat starting procedure.
	No fuel to engine.	Loosen one line at cylinder nozzle. If no fuel flow shows on gage, replace fuel metering valve.
Rough idle.	Nozzle restricted.	Remove nozzles and clean. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Improper idle mixture.	Adjust fuel-air mixture. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Poor acceleration.	Idle mixture incorrect.	Adjust fuel-air mixture. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Unmetered fuel pressure too high.	Lower unmetered fuel pressure. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Worn linkage.	Replace worn component of linkage.

Trouble	Probable Cause	Remedy
Engine runs rough.	Restricted nozzle.	Remove and clean all nozzles. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Improper mixture.	Improper pump pressure, replace pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Low fuel flow indication.	Restricted flow to metering valve.	Check mixture control for full travel.
	Inadequate flow from fuel pump.	Verify pump pressure, adjust engine-driven pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
High fuel flow indication.	Restricted flow beyond metering valve.	Check for restricted nozzles or fuel metering valve. Clean or replace as required. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Restricted recirculation passage in fuel pump.	Replace engine-driven fuel pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Fluctuating or erroneous fuel flow indication.	Vapor in system, excess fuel temperature.	If not cleared with boost pump, check for clogged ejector jet in vapor separator cover.
Poor idle cut off.	Fuel flow continues to engine.	Check mixture control is in full idle cut off. Check boost pump is OFF. If neither, replace manifold valve.
Fluctuating fuel flow indications.	Fuel vapor as a result of high ambient temperatures.	If not cleared with auxiliary pump, check for clogged vent in fuel pump vapor separator cover.
Unmetered fuel pressure too high.	Internal orifices plugged.	Clean internal orifices injector pump. Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Unmetered fuel pressure drop.	Relief valve stuck open.	Repair or replace fuel pump.
Very high idle and full throttle.	Relief valve stuck closed.	Repair or replace fuel pump.
Fuel pressure present. No fuel pressure.	Check valve stuck open.	Repair or replace fuel pump.

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ELECTRIC FUEL PUMP CONTROL

1. DESCRIPTION

An electric two-speed fuel pump provides boost (low speed) and prime (high speed) for the engine. A console mounted rocker switch located on the center console provides control for the electric fuel pump. The prime position is momentary. Boost is a non-momentary on position.

Serials 1005 thru 1227 before SB 20-73-02: A fuel pressure based system is used to control boost pump operation. Both positions of the pump normally operate on the low-speed setting. For engine priming, a pressure actuated switch located on the fuel injection distribution manifold allows the pump to run on high speed when fuel system pressure is below 3 PSI. This allows rapid priming of the fuel system for starting. Once the fuel system is primed, the electric pump is switched to the low-speed setting by the pressure switch. The boost position operates the electric pump at the low-speed setting only, regardless of fuel system pressure. The boost pump operates on 28 VDC supplied through the 5-amp FUEL PUMP circuit breaker on Main Bus 2.

Serials 1228 & subs, 1005 thru 1227 after SB 20-73-02: An oil pressure based system is used to control boost pump operation. The oil pressure/oil temperature gage provides a signal to either the starting circuit (*Serials 1005 thru 1581*) or the data acquisition unit (*Serials 1582 & subs*) to generate a ground for the oil annunciator and the fuel system. This system allows the fuel pump to run at the prime (high speed) when the engine oil pressure is less than 10 PSI. Whenever the engine oil pressure exceeds 10 PSI, pressing the prime switch will have no effect. The boost position operates the electric pump at the low-speed, regardless of oil pressure. The boost pump operates on 28 VDC supplied through the 5-amp FUEL PUMP circuit breaker on Main Bus 2.

2. MAINTENANCE PRACTICES

A. Fuel Pressure Switch - *Serials 1005 thru 1227 before SB 20-73-02* (See Figure 73-201)

(1) Removal - Fuel Pressure Switch

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery 1. (Refer to 24-30)

(d) Loosen fuel distribution manifold valve from engine.

(e) Disconnect connector from fuel pressure switch assembly.

(f) Remove screws and washers securing terminal rings to landing light assembly, if applicable.

(g) Remove fuel pressure switch assembly from fuel distribution manifold valve.

(2) Installation - Fuel Pressure Switch

(a) Install fuel pressure switch to fuel distribution manifold valve.

(b) Install screws and washers securing terminal rings to landing light assembly, if applicable.

(c) Connect connector from fuel pressure switch assembly.

(d) Tighten fuel distribution manifold valve to engine.

(e) Connect battery 1. (Refer to 24-30)

(f) Install engine cowling. (Refer to 71-10)

EFFECTIVITY:
Serials 1005 thru 1227 before SB 20-73-02

B. Starting Circuit Assembly - *Serials 1228 thru 1581, 1005 thru 1227 after SB 20-73-02* (See Figure 73-201)

(1) Removal - Starting Circuit Assembly

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Remove glareshield. (Refer to 25-10)

(c) Disconnect and disassemble firewall ground connector J100.

(d) Disconnect pin 18 and wire IESC1024-22 from connector J100.

(e) Disconnect starting circuit assembly from oil pressure/temperature gage and connector P650. Remove starting circuit assembly from airplane.

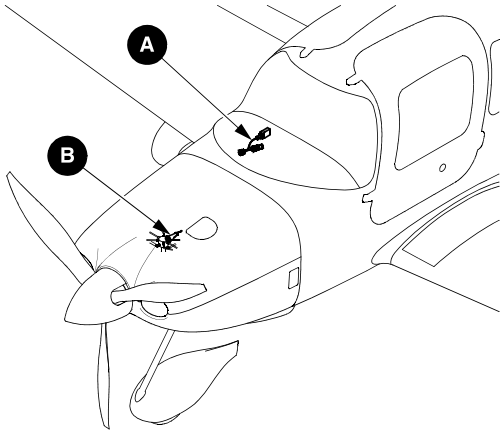
(2) Installation - Starting Circuit Assembly

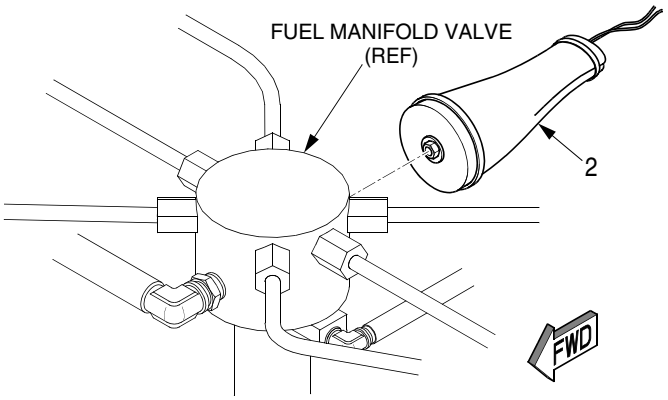
(a) Install pin 18 and wire IESC1024-22 to connector J100.

(b) Reassemble connector J100 and install to connector P100.

(c) Connect starting circuit assembly to oil pressure/temperature gage and connector P650.

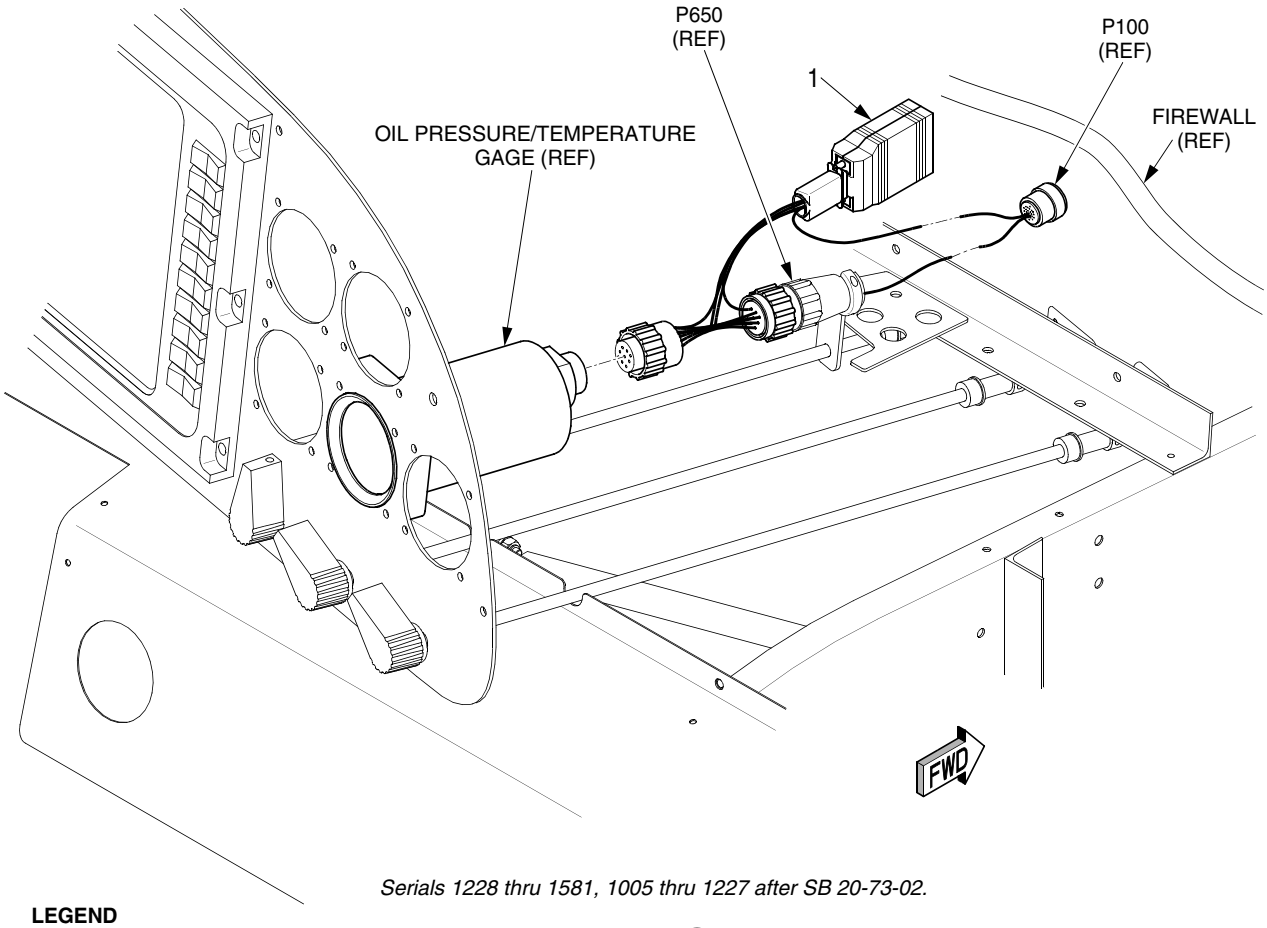
(d) Install glareshield. (Refer to 25-10)





Serials 1005 thru 1227 before SB 20-73-02.

DETAIL B



Serials 1228 thru 1581, 1005 thru 1227 after SB 20-73-02.

LEGEND
1. Starting Circuit Assembly
2. Fuel Pressure Switch

DETAIL A

SR20_MM73_1531B

Figure 73-201
Fuel Pressure Switch and Starting Circuit Assembly Installation - Serials 1005 thru 1581

INDICATING

1. DESCRIPTION

This section describes that portion of the engine fuel system which is used to indicate the flow rate. This includes the MAP/fuel flow gage and fuel flow sensor.

The fuel flow sensor is installed in the fuel line between the throttle body metering valve and the injector manifold, and is mounted to the engine baffling.

Serials 1005 thru 1581: The fuel flow sensor sends a fuel flow rate signal to the electrically operated fuel flow gage.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: The fuel flow sensor sends a fuel flow rate signal to the Data Acquisition Unit (DAU). The DAU decodes the sensor information and transmits the data to the PFD and MFD.

Serials 2016 & subs w/ Perspective Avionics: The fuel flow sensor sends a fuel flow rate signal to the GEA 71 engine airframe unit. The engine airframe unit decodes the sensor information and transmits the data to the PFD and MFD.

2. MAINTENANCE PRACTICES

A. Map/Fuel Flow Gage (Refer to 77-10)

B. Fuel Flow Sensor (See Figure 73-301)

(1) Removal - Fuel Flow Sensor

(a) Set BAT 1, BAT 2, and AVIONICS master switches to OFF positions.

(b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.

(c) *Serials 1582 & subs:* Pull ANNUN / ENGINE INST circuit breaker.

(d) Remove engine cowling. (Refer to 71-10)

(e) Disconnect sensor electrical connector at firewall.

(f) Disconnect fuel lines from fittings and cap.

(g) Remove screws and washers securing sensor to engine baffling. Remove sensor from airplane.

(2) Installation - Fuel Flow Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Grease	MIL-G-60320 Type I	Any Source	Lubricate threads on fittings.

(b) Position sensor to engine baffling and secure with screws and washers.

(c) Apply grease to threads on fittings.

(d) Connect fuel lines to fittings. Torque fittings to 150 - 180 in-lb (17 - 20 Nm).

(e) Connect sensor electrical connector at firewall.

(f) Install engine cowling. (Refer to 71-10)

(g) *Serials 1005 thru 1581:* Reset ENGINE INST circuit breaker.

(h) *Serials 1582 & subs:* Reset ANNUN / ENGINE INST circuit breaker.

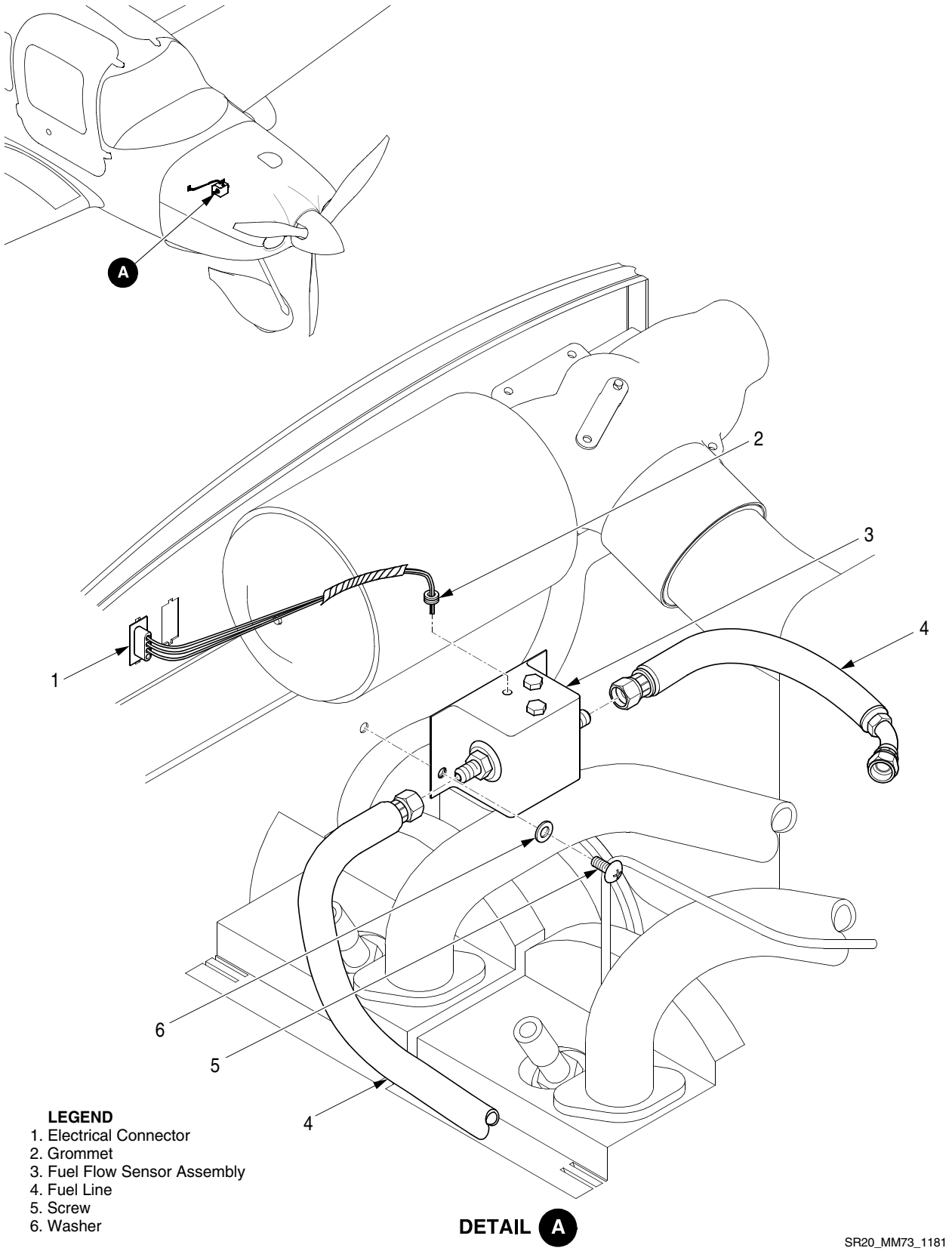


Figure 73-301
Fuel Flow Sensor Installation

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IGNITION

1. GENERAL

This chapter describes those units and components which furnish, distribute, and control an electrical current to ignite the fuel-air mixture in the engine cylinders. The ignition components include magnetos, ignition harness, spark plugs, and ignition switch.

The magnetos are completely self-contained ignition generating devices. Mounted center aft on the accessory case, each magneto utilizes a rotating magnet to induce a voltage into a magnetic coil. The magnetic coil steps up the voltage at the distributor which distributes the high-energy voltage through the ignition harness to the spark plugs.

Ignition system operation is controlled by the ignition switch mounted on either the left side of the bolster panel *(Serials 1005 thru 1336, 1337 thru 1422 w/o PFD)*, or on the left side of the instrument panel *(Serials 1337 thru 1422 w/ PFD, 1423 & subs)*.

With the switch OFF, the magnetos are grounded and will not produce spark. The right magneto fires the upper right and the lower left spark plugs. The left magneto fires the upper left and the lower right spark plugs. The magneto cases, spark plugs, cables, and connections are shielded to prevent radio interference.

Each magneto has an impulse coupling installed for engine starting. The impulse coupling delays magneto rotation, retarding spark until each piston reaches T.D.C. At T.D.C., the coupling spins ahead, generating enough voltage for ignition at starting RPM. Impulse coupling disengages after engine start.
(See Figure 74-001)

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Hard starting.	Incorrect external timing to engine.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect internal timing.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Point gap setting incorrect.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty impulse coupling.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Worn pawls or stop pin.	Inspect pawls and stop pin for wear. Correct as necessary.
	Impulse coupling fails to return to unwound position.	Inspect impulse couple nut for proper torque.
	Fouled spark plugs.	Clean spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect spark plug gap.	Regap spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty ignition switch.	Inspect ignition switch for possibility of intermittent grounding and proper operation. Repair or replace as necessary.
	Corrosion on harness lead contacts.	Inspect and clean in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

Trouble	Probable Cause	Remedy
Hard starting (cont.)	Magneto internal component failure.	Check specifications and inspect in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Points.	Inspect for excessive burning, pitting, corrosion, gap setting, and general condition.
	Cam.	Inspect cam for excessive wear or unevenness that could cause "point spread".
	Condenser.	Inspect for faulty P-lead connection, over-torqued condition on P-lead stud, damaged pigtail connector, and integrity of windings.
	Coil.	Inspect for cracks, damage to high tension strap or pigtail connector, and integrity of windings.
	Distributor Gear.	Inspect electrode finger for looseness, gear teeth, and shaft. Inspect carbon brush for damage.
	Distributor Block.	Inspect distributor towers for evidence of abrasion or excessive burning. Examine rotor gear bushings for wear.

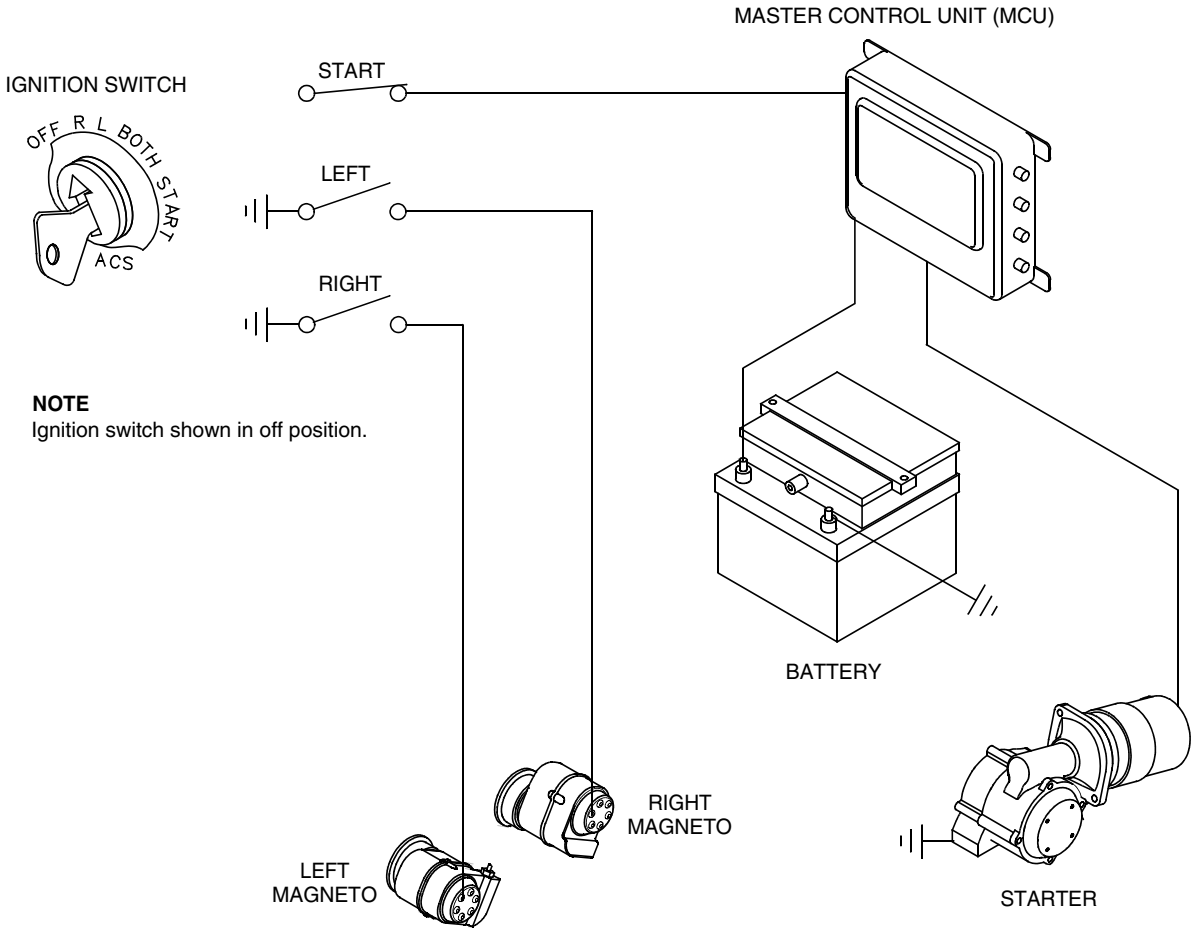
Trouble	Probable Cause	Remedy
Rough running.	Incorrect external timing to engine.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect internal timing.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Fouled spark plugs.	Clean spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect spark plug gap.	Regap spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty spark plug.	Test spark plug in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty ignition lead.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty ignition switch.	Inspect ignition switch for possibility of intermittent grounding and proper operation. Repair or replace as necessary.
	Weak condenser.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

Trouble	Probable Cause	Remedy
Rough running or vibration in specific RPM range.	Magneto internal component failure.	Check specifications and inspect in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Points.	Inspect for excessive burning, pitting, corrosion, gap setting, and general condition.
	Cam.	Inspect cam for excessive wear or unevenness that could cause "point spread".
	Condenser.	Inspect for faulty P-lead connection, over-torqued condition on P-lead stud, damaged pigtail connector, and integrity of windings.
	Coil.	Inspect for cracks, damage to high tension strap or pigtail connector, and integrity of windings.
	Distributor Gear.	Inspect electrode finger for looseness, gear teeth, and shaft. Inspect carbon brush for damage.
	Distributor Block.	Inspect distributor towers for evidence of abrasion or excessive burning. Examine rotor gear bushings for wear.
Bearing bar burned.	Carbon tracking due to excessive carbon brush wear.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Mounting flange broken.	Hold-down clamps overtorqued.	Replace mounting flange.
		Torque hold-down clamps to 190 - 220 in-lb (21 - 24 Nm).
	Hold-down clamps torqued unevenly.	Replace mounting flange.
		Reinstall, ensuring clamps are torqued with even pressure.
	Magneto gasket residue on accessory case mounting pad.	Replace mounting flange.
		Ensure mounting face is free of gasket residue.

Trouble	Probable Cause	Remedy
Excessive RPM drop during magneto check.	Incorrect external timing to engine.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect internal timing.	Correct as required in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Fouled spark plugs.	Clean spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Incorrect spark plug gap.	Regap spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty spark plug.	Test spark plug in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty tachometer.	Confirm tachometer accuracy at RPM where magneto drop noted. Correct as necessary.
	Faulty ignition lead.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
	Corrosion on harness lead contacts.	Inspect and clean in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
Magneto will not fire.	Faulty ignition switch.	Inspect ignition switch for possibility of intermittent grounding and proper operation. Repair or replace as necessary.
	Faulty condenser.	Inspect for faulty P-lead stud, damaged pigtail connector, and damaged grounding.
	Faulty coil.	Inspect for cracks, damage to high tension strap or pigtail connector, and integrity of windings.
	Point gap setting incorrect.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.

Trouble	Probable Cause	Remedy
Magneto “hot”.	Faulty ignition switch.	Inspect ignition switch for possibility of intermittent grounding and proper operation. Repair or replace as necessary.
	Broken P-lead wire.	Repair as necessary.
Power loss.	Incorrect external timing to engine.	Correct as required in accordance with the manufacturer’s approved Instructions For Continued Airworthiness.
	Faulty tachometer.	Confirm tachometer accuracy at RPM where magneto drop noted. Correct as necessary.
Points burned excessively.	Faulty condenser.	Inspect for faulty P-lead connection, over-torqued condition on P-lead stud, damaged pigtail connector, and integrity of windings.
	Incorrect spark plug gap.	Regap spark plugs in accordance with the manufacturer’s approved Instructions For Continued Airworthiness.
	Fouled spark plugs.	Clean spark plugs in accordance with the manufacturer’s approved Instructions For Continued Airworthiness.
	Faulty spark plug.	Test spark plug in accordance with the manufacturer’s approved Instructions For Continued Airworthiness.
High tension lead on coil worn or burned through.	Improper tension between high tension lead and carbon brush.	Refer to the manufacturer’s approved Instructions For Continued Airworthiness.

Trouble	Probable Cause	Remedy
Coil cracked or arcing in case.	Faulty coil.	Inspect for cracks, damage to high tension strap or pigtail connector, and integrity of windings.
	Incorrect spark plug gap.	Regap spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Fouled spark plugs.	Clean spark plugs in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
	Faulty spark plug.	Test spark plug in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
Electrode finger loose on distributor gear.	Timing pin wedged between electrode and distributor block during timing process.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.
Distributor block towers scored or excessively burned.	Electrode finger contacting towers.	Inspect and replace as necessary.
Distributor gear bushings excessively worn.	Improper lubrication of bushings.	Refer to the manufacturer's approved Instructions For Continued Airworthiness.



SWITCH POSITION AND ACTION

OFF	LEFT	RIGHT	BOTH	START
GROUND LEFT GROUND RIGHT	GROUND RIGHT	GROUND LEFT	NO ACTION	BATTERY TO STARTER

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Figure 74-001
Ignition System

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ELECTRICAL POWER SUPPLY

1. DESCRIPTION

This section describes the maintenance practices pertinent to the magnetos. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

2. MAINTENANCE PRACTICES

A. Magnetos (See Figure 74-101)

(1) Removal - Magnetos

(a) Remove engine cowling. (Refer to 71-10)

Note: To aid reinstallation, mark harness cap and adjacent point on distributor housing prior to removing harness cap.

(b) Remove screws securing harness caps to magnetos.

(c) Remove ignition switch P-lead wires from magneto condensers.

(d) Remove ground wires from magnetos.

(e) Remove nuts and washers securing magnetos to accessory case.

(f) Withdraw magnetos from airplane ensuring that the coupling bushings do not dislodge and fall into the accessory case.

(g) Protect exposed openings from foreign material contamination by installing covers or sealing with tape.

(2) Installation - Magnetos

(a) Refer to the manufacturer's approved Instructions For Continued Airworthiness for magneto inspection, maintenance, installation, and timing.

(b) Install engine cowling. (Refer to 71-10)

B. Magneto Blast Tubes (See Figure 74-101)

(1) Removal - Magneto Blast Tubes

(a) Remove RH magneto blast tube.

1 Remove hose clamp securing blast tube to aft baffle.

2 Remove bolt, washers, nut, and clamp securing blast tube to battery drain hose.

3 If installed, remove cable ties securing blast tube to battery bracket. Remove blast tube from airplane.

(b) *Serials 1817 & subs:* Remove LH magneto blast tube.

1 Remove hose clamp securing blast tube to aft baffle.

2 If installed, remove cable ties securing blast tube to fuel injector manifold drain hose. Remove blast tube from airplane.

(2) Installation - Magneto Blast Tubes

(a) Install RH magneto blast tube.

1 Position blast tube to aft baffling and secure with hose clamp.

2 Position blast tube and clamp to battery drain hose clamp and secure with bolt, washers, and nut.

3 If necessary for proper positioning, install cable ties securing blast tube to battery bracket.

4 Verify blast tube is perpendicular to magneto with a 0.5 ± 0.3 inch (1.27 ± 0.76 cm) space between magneto and blast tube outlet.

(b) *Serials 1817 & subs:* Install LH magneto blast tube.

1 Position blast tube to aft baffling and secure with hose clamp.

2 If necessary for proper positioning, install cable ties securing blast tube to fuel injector manifold drain hose.

3 Verify blast tube is perpendicular to magneto with a 0.5 ± 0.3 inch (1.27 ± 0.76 cm) space between magneto and blast tube outlet.

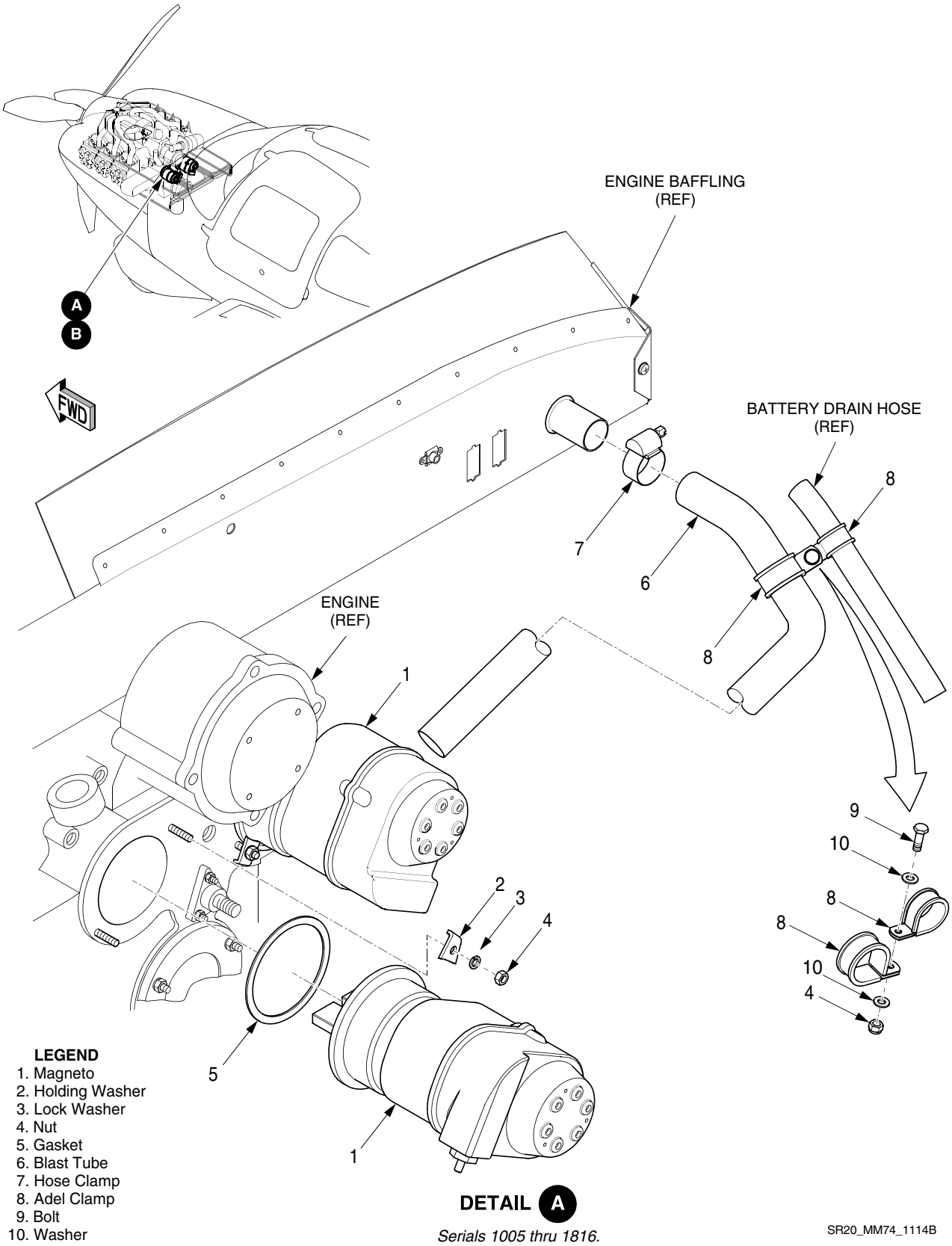


Figure 74-101
Magneto Installation - Serials 1005 thru 1816 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1816

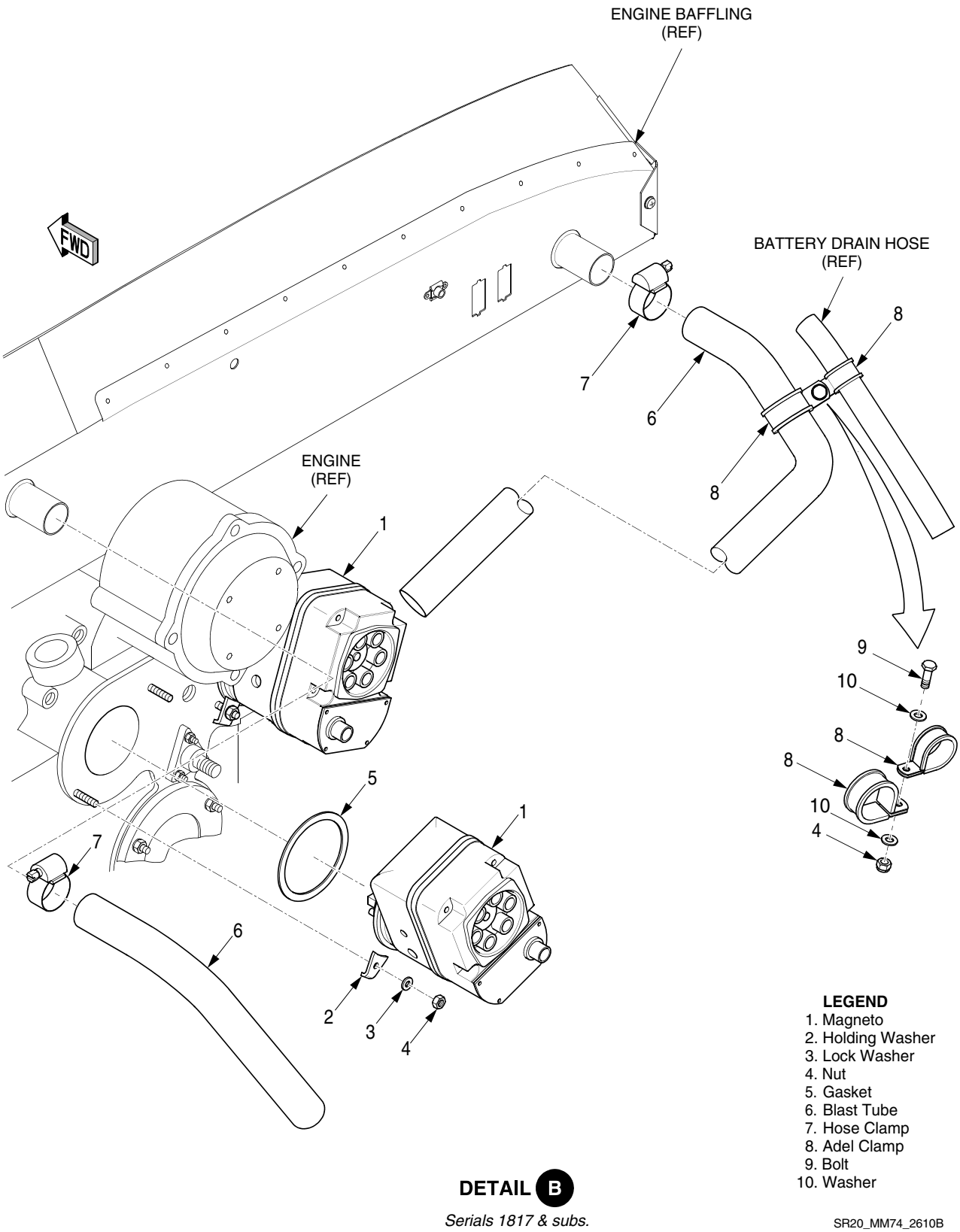


Figure 74-101
Magneto Installation - Serials 1817 & subs (Sheet 2 of 2)

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DISTRIBUTION

1. DESCRIPTION

This section describes the maintenance practices of that portion of the ignition system which conducts high-voltage electricity from the magnetos to the spark plugs. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

2. MAINTENANCE PRACTICES

A. Ignition Harness (See Figure 74-201)

(1) Removal - Ignition Harness

(a) Remove engine cowling. (Refer to 71-10)

CAUTION: To prevent damage to the spark plug insulator and connector, when withdrawing insulator from spark plug, pull the harness lead straight out and at same angle as the barrel.

(b) Remove ferrule assembly nuts securing ignition harness leads to spark plugs.

(c) Remove clamps and ties securing ignition harness to engine.

(d) Remove screws and nuts securing harness cap to magneto.

(e) Remove ignition harness from airplane.

(2) Installation - Ignition Harness

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Dow Corning 111	DC 111	Any Source	Lubricant and sealant.

Note: Prior to installing ignition harness, check mating surfaces for cleanliness.

(b) Attach ignition harness to the appropriate magneto.

(c) Install washers and screws securing harness cap to magneto. Torque screws 18 - 20 in-lb (2.0 - 2.2 Nm).

(d) Route ignition harness leads to the appropriate spark plug position as indicated by the alphanumeric markings on each spark plug nut.

(e) Secure clamps and ties securing ignition harness to engine.

CAUTION: When tightening spark plug nut, hold ferrule with a 7/16” wrench to prevent twisting the ignition lead.

(f) Coat insulator with Dow Corning 111 and insert into spark plug. Torque spark plug ferrule assembly nut 110 - 120 in-lb (12.4 - 13.5 Nm). Repeat for remaining insulators.

(g) Install engine cowling. (Refer to 71-10)

B. Spark Plugs (See Figure 74-202)

(1) Removal - Spark Plugs

(a) Remove engine cowling. (Refer to 71-10)

CAUTION: To prevent damage to the spark plug insulator and connector, when withdrawing insulator from spark plug, pull the harness lead straight out and at same angle as the barrel.

(b) Remove ferrule assembly nut on harness lead and remove insulator from spark plug.

(c) Remove spark plug from engine and place in identification tray.

(d) Cover spark plug hole to prevent foreign materials from passing into engine.

(e) Repeat previous steps for remaining spark plugs.

(2) Installation - Spark Plugs

CAUTION: Do not install any spark plug that has been dropped or exhibits damage.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spark Plug Lubricant and Anti-Seize Compound	2612	Champion Spark Plug Toledo, OH 43661	Lubricant and Anti-Seize.

(b) Clean spark plug as required.

(c) Set spark plug electrode gap to manufacturer's specified gap.

CAUTION: Do not apply anti-seize to the first thread of spark plug.

Do not allow antiseize compound to contaminate electrodes or insulator.

(d) Place new gasket on spark plug.

(e) Lubricate spark plug.

(f) Thread spark plug by hand into cylinder to within one or two threads of the gasket.

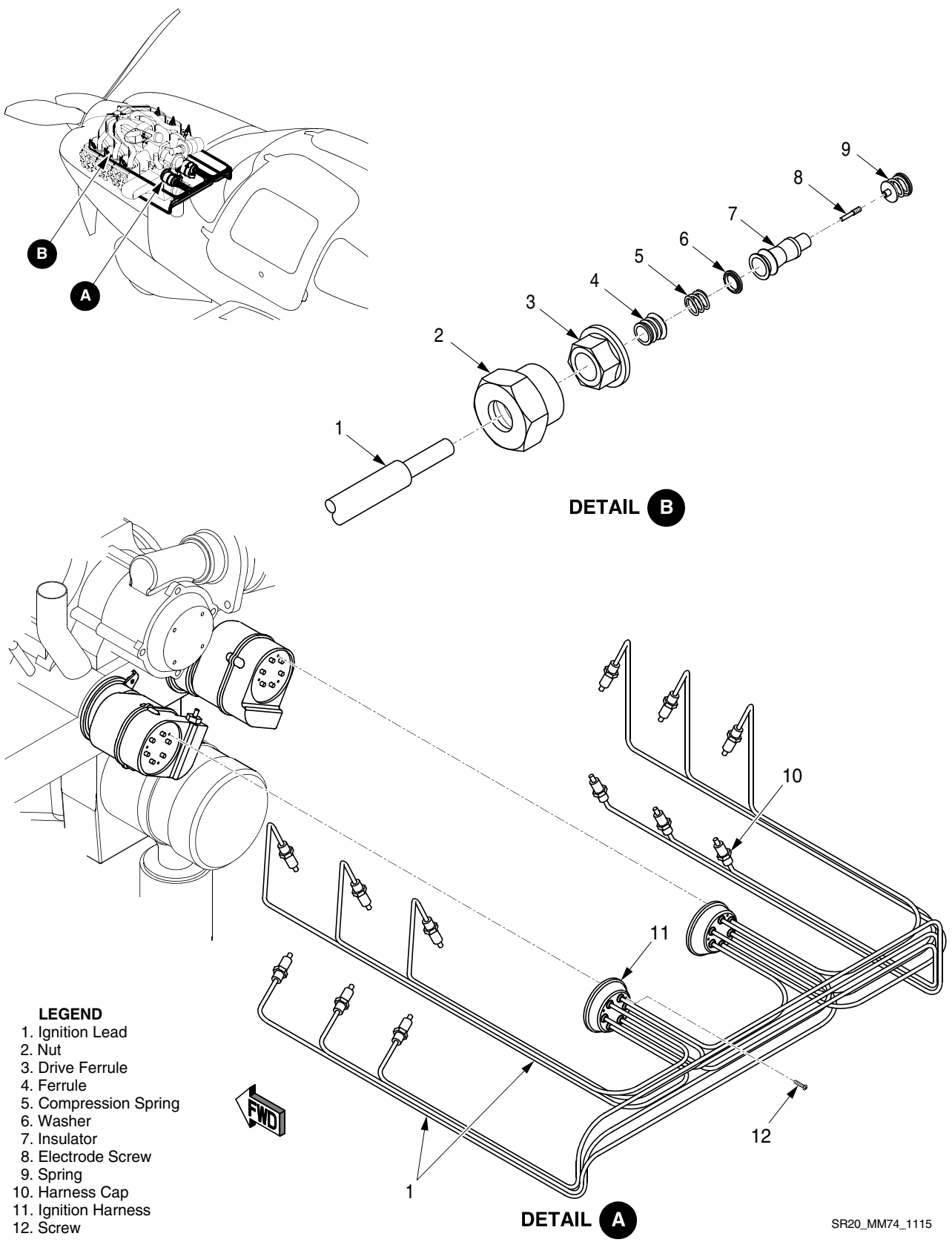
(g) Install spark plug.

(h) Torque plug 300 - 360 in-lb (33.8 - 40.6 Nm).

(i) Repeat previous steps for remaining spark plugs.

(j) Install ignition harness leads. (Refer to 74-20)

(k) Install engine cowling. (Refer to 71-10)

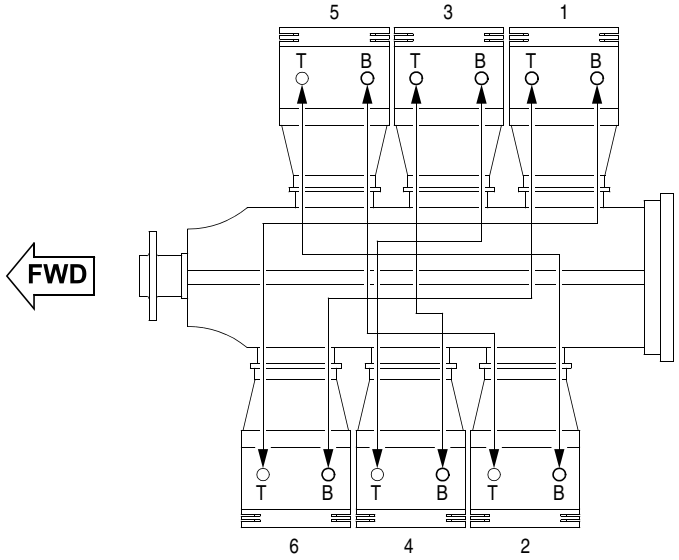


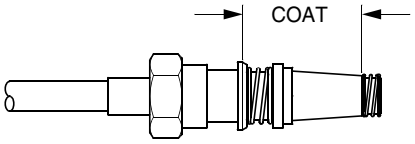
LEGEND

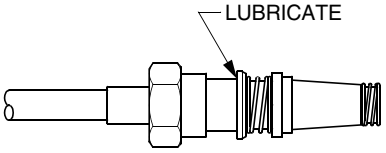
1. Ignition Lead
2. Nut
3. Drive Ferrule
4. Ferrule
5. Compression Spring
6. Washer
7. Insulator
8. Electrode Screw
9. Spring
10. Harness Cap
11. Ignition Harness
12. Screw

Figure 74-201
Ignition System Installation

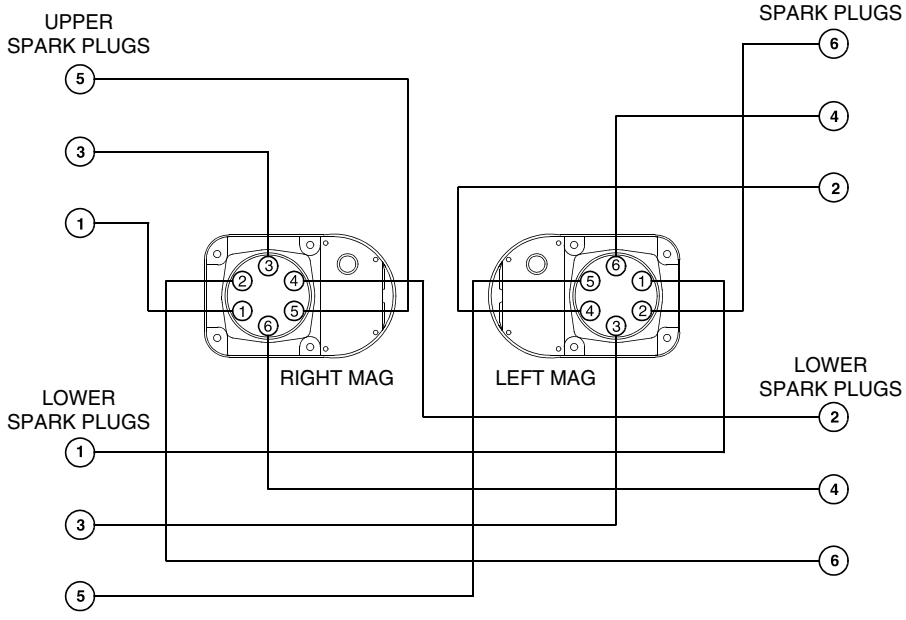
CYLINDER NUMBER FROM	CYLINDER NUMBER TO
1 TOP	6 BOTTOM
1 BOTTOM	6 TOP
2 TOP	5 BOTTOM
2 BOTTOM	5 TOP
3 TOP	4 BOTTOM
3 BOTTOM	4 TOP
4 TOP	3 BOTTOM
4 BOTTOM	3 TOP
5 TOP	2 BOTTOM
5 BOTTOM	2 TOP
6 TOP	1 BOTTOM
6 BOTTOM	1 TOP

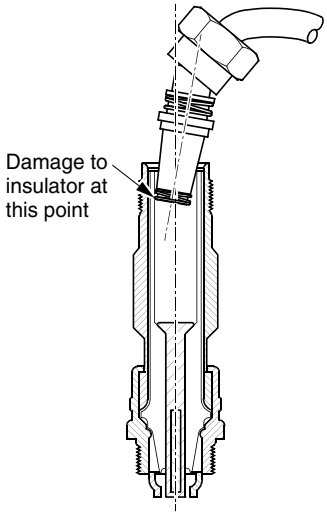






ENGINE FIRING ORDER	1	6	3	2	5	4
MAGNETO FIRING ORDER	1	2	3	4	5	6





CAUTION
When removing ignition lead from spark plug, pull terminal end straight out of plug, to prevent ceramic insulator damage.

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Figure 74-202
Spark Plug Installation

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SWITCHING

1. DESCRIPTION

This section describes that portion of the ignition system which provides a means of rendering the ignition electrical power supply inoperative. This includes the ignition switch.

2. MAINTENANCE PRACTICES

A. Ignition Switch (See Figure 74-302)

(1) Servicing - Ignition Switch (See Figure 74-301)

The following procedures must be accomplished every 2000 hours.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Isopropyl Alcohol	99% or higher purity	Any Source	Clean contacts and cups.
Cotton Tip Swab	-	Any Source	Clean contacts and cups.
Lubricant	Luberex 10-1206	GC Electronics Rockford, IL 61102 815-968-9661	Lubricate contacts and cups.
Paint, Red	-	Any Source	Mark as serviced.

(b) Remove ignition switch. (Refer to 74-30)

CAUTION: If length of wiring facilitates ignition switch disassembly, do not remove wire leads from terminals. If wiring is disconnected, note location of attaching leads for reference on reinstallation.

(c) Disassemble ignition switch.

1 Position ignition switch assembly with terminal-end facing upward.

2 Remove screws and washers securing terminal board assembly to ignition switch body.

Note: Ensure loose spring and cup parts within ignition switch assembly are retained during disassembly.

3 Carefully lift terminal board assembly from ignition switch body.

(d) Clean ignition switch.

1 Using isopropyl alcohol on cotton tip swab, clean cups and contacts on terminal board assembly.

(e) Inspect ignition switch.

1 Examine condition of cups and terminal board assembly for wear or corrosion.

2 If contacts or terminals on terminal board assembly are loose, corroded, or show signs of excessive wear, replace terminal board assembly.

3 If silver plating on cups is corroded, worn through to brass material, or burned/pitted from arcing, replace cups.

(f) Assemble ignition switch.

1 Apply thin coating of lubricant to switch contacts and contact cups.

2 Verify all contact areas are covered with lubricant.

3 Position ignition switch body with opening facing upward.

Note: Ensure loose spring and cup parts within ignition switch assembly are retained during assembly.

4 If required, reassemble ignition switch using new parts.

Note: Ensure cups and springs are positioned in ignition switch body so that no binding occurs.

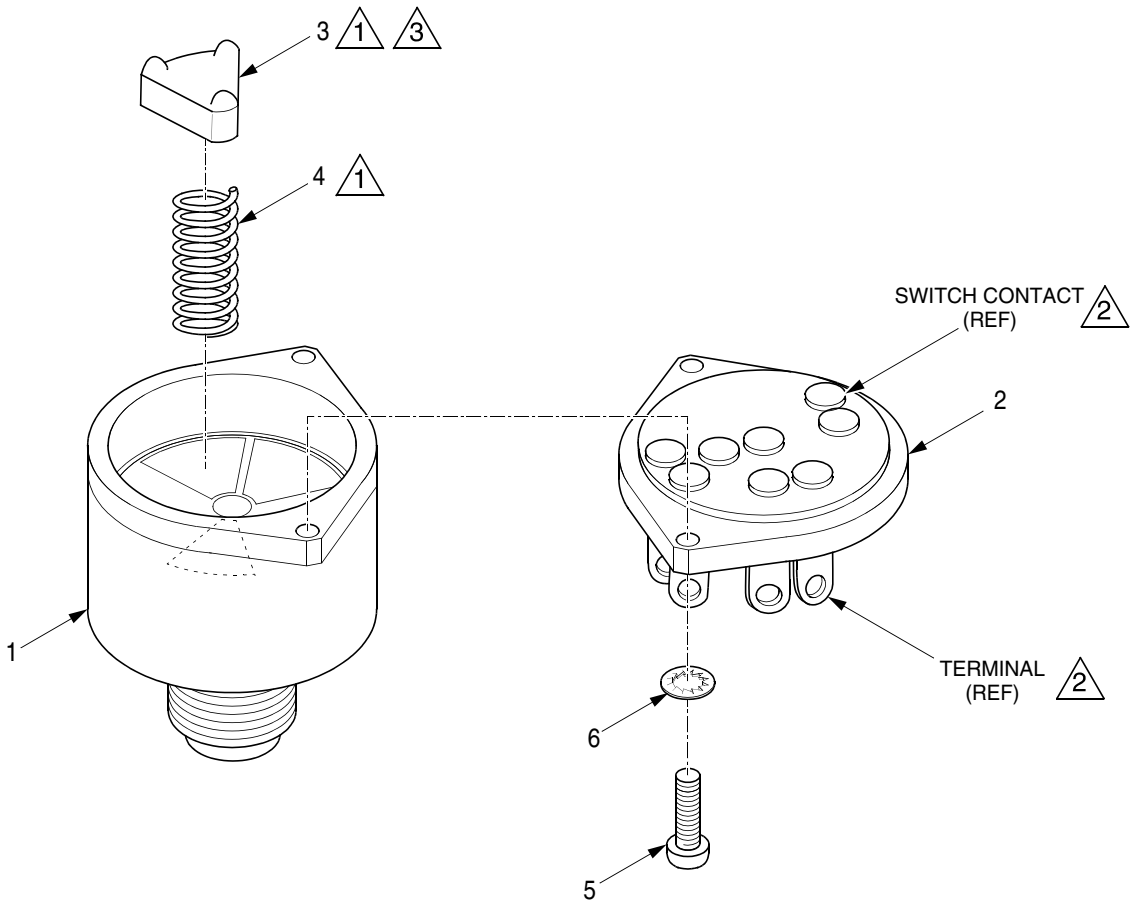
5 Position and secure terminal board assembly to ignition switch body with screws and washers.

6 Mark ignition switch assembly with dab of red paint on terminal board screws to indicate completion of servicing.

7 If removed, reconnect wire leads to ignition switch terminals.

(g) Install ignition switch. (Refer to 74-30)

(h) Perform Operational Test - Ignition Switch. (Refer to 74-30)



NOTE

1 Ensure loose spring and cup parts within ignition switch assembly are retained during disassembly.

2 If contacts or terminals on terminal board assembly are loose, corroded, or show signs of excessive wear, replace terminal board assembly.

3 If silver plating on cups is corroded, worn through to brass material, or burned/pitted from arcing, replace cups.

LEGEND

1. Ignition Switch Body
2. Terminal Board Assembly
3. Cup
4. Spring
5. Screw
6. Lockwasher

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Figure 74-301
Ignition Switch Servicing

(2) Removal - Ignition Switch

(a) Turn ignition switch to the OFF position.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery. (Refer to 24-30)

(d) *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD:* Remove LH kick plate. (Refer to 25-10)

(e) *Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o Perspective:* Remove PFD. (Refer to 31-60)

(f) *Serials 2016 & subs w/ Perspective:* Remove glareshield. (Refer to 25-10)

(g) *Serials 2016 & subs w/ Perspective:* Remove cable tie securing LH crew display duct to air vent and disconnect. (Refer to 21-20)

(h) Remove retaining nut securing ignition switch to bolster/instrument panel, remove placard plate, and remove switch from panel.

WARNING: **Prior to disconnecting ignition switch, ground P-leads at magnetos to prevent accidental firing of engine.**

CAUTION: When removing wire leads from ignition switch, note location of attaching leads for reference on reinstallation.

(i) Loosen screws from terminals on back of ignition switch and remove wire leads.

(3) Installation - Ignition Switch

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Threadlocker	425	Loctite	Lock switch threads.
Serials 2016 & subs w/ Perspective: Cable Ties, 4-inch	-	Any Source	Secure duct.

(b) Connect wire leads to ignition switch.

(c) Perform Functional Test - Ignition Switch. (Refer to 74-30)

(d) Apply threadlocker to threaded fasteners of ignition switch. (Refer to 20-40)

(e) Position ignition switch in bolster/instrument panel, position placard on ignition switch, and install retaining nut.

(f) *Serials 1005 thru 1336, 1337 thru 1422 w/o PFD:* Install LH kick plate. (Refer to 25-10)

(g) *Serials 1337 thru 1422 w/ PFD, 1423 & subs w/o Perspective:* Install PFD. (Refer to 31-60)

(h) *Serials 2016 & subs w/ Perspective:* Position LH crew display duct to air vent and secure with cable tie. (Refer to 21-20)

(i) *Serials 2016 & subs w/ Perspective:* Install glareshield. (Refer to 25-10)

(j) Connect battery. (Refer to 24-30)

(k) Install engine cowling. (Refer to 71-10)

(4) Functional Test - Ignition Switch

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Ohmmeter	-	Any Source	Test continuity.

(b) Remove engine cowling. (Refer to 71-10)

(c) Disconnect battery. (Refer to 24-30)

(d) Check right P-lead continuity:

1 Remove P-lead from right magneto.

2 Attach P-lead to ohmmeter and to airframe ground.

3 With switch in OFF or L position, verify ohmmeter indicates closed circuit.

4 With ignition switch in R or BOTH position, verify ohmmeter indicates open circuit.

5 Connect P-lead to right magneto.

(e) Check left P-lead continuity:

1 Remove P-lead from left magneto.

2 Attach P-lead to ohmmeter and to airframe ground.

3 With switch in OFF or R position, verify ohmmeter indicates closed circuit.

4 With ignition switch in L or BOTH position, verify ohmmeter indicates open circuit.

5 Connect P-lead to left magneto.

(f) Connect battery. (Refer to 24-30)

(g) Install engine cowling. (Refer to 71-10)

(5) Operational Test - Ignition Switch

(a) Start engine in accordance with Pilot's Operating Handbook.

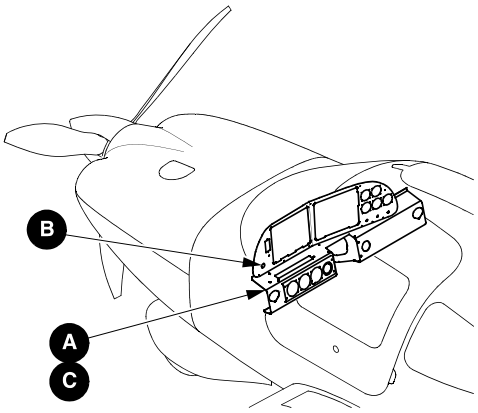
(b) Check magnetos for normal engine RPM drop.

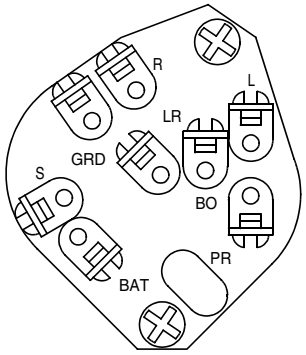
(c) Verify both magnetos are grounded when switch is in OFF position.

(d) Reduce engine RPM to idle, and turn switch to OFF position.

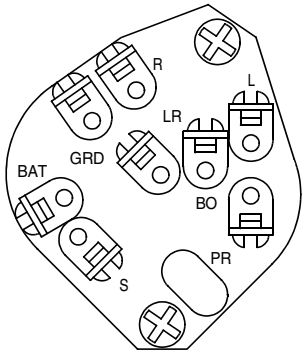
(e) Verify engine quits immediately, signifying that both magnetos have grounded through ignition switch.

(f) After engine stops, move mixture control to IDLE CUT-OFF position.



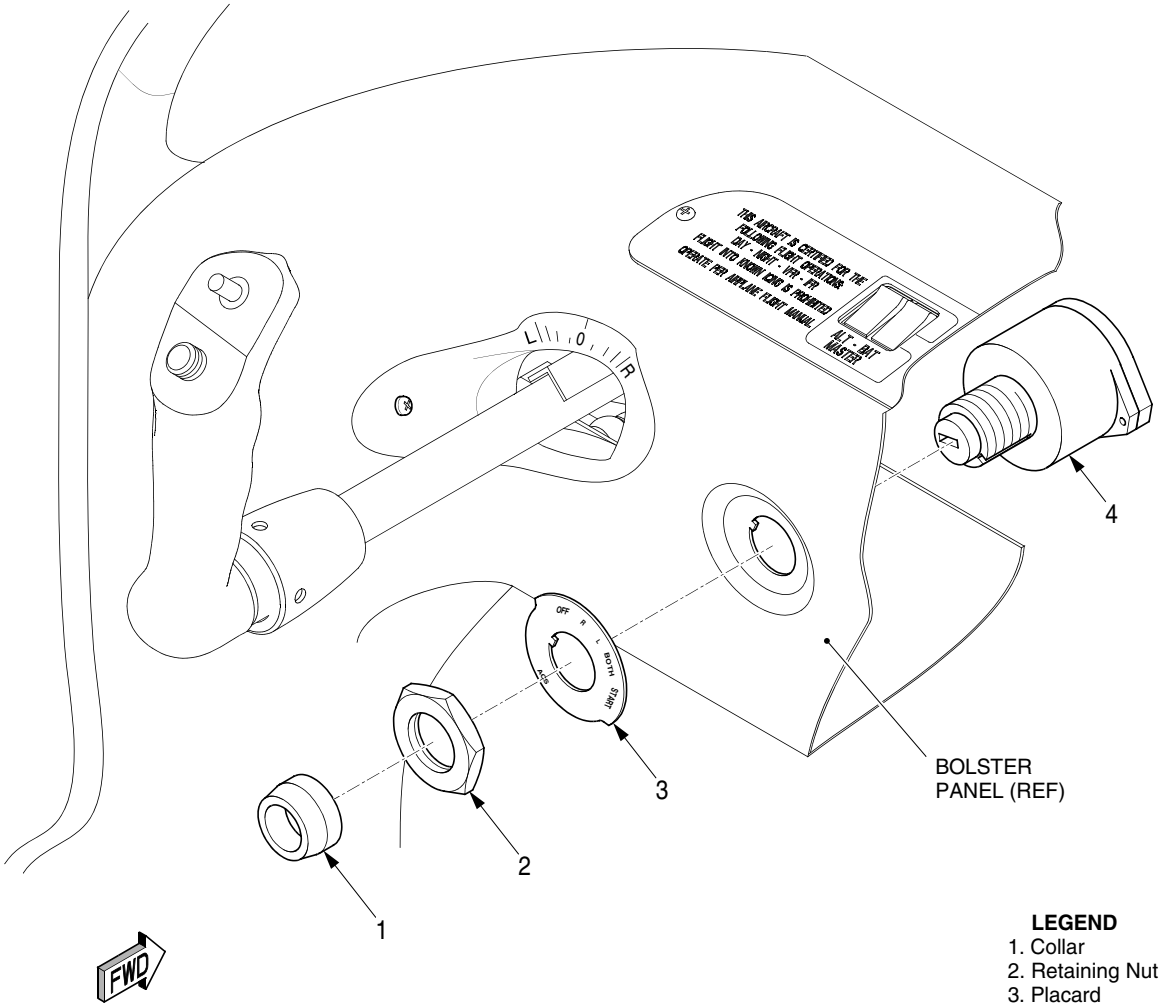


GREEN BASE



WHITE BASE

IGNITION SWITCH TERMINALS



LEGEND
1. Collar
2. Retaining Nut
3. Placard
4. Ignition Switch

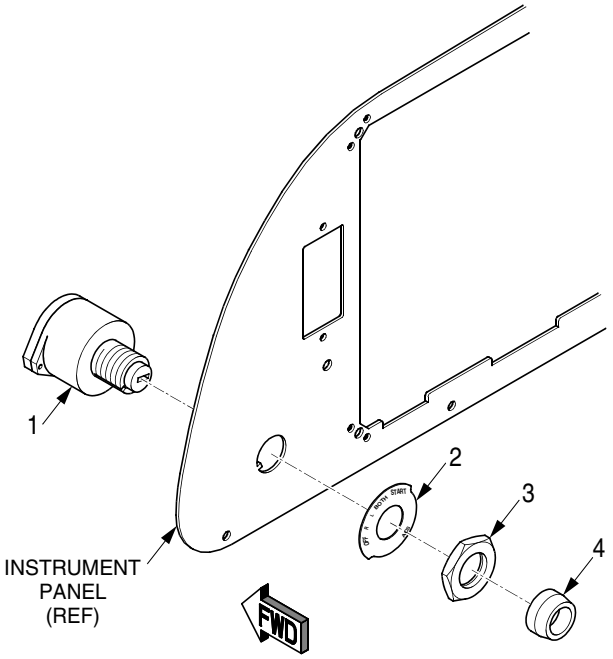
DETAIL A

Serials 1005 thru 1336.

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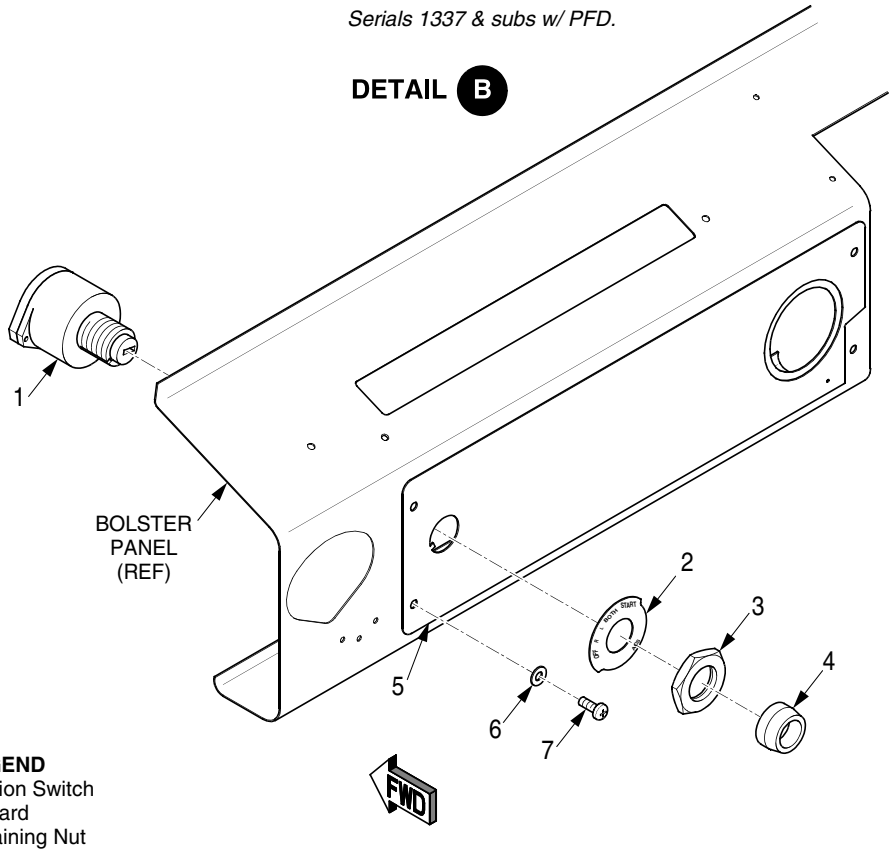
Figure 74-302
Ignition Switch Installation - Serials 1005 thru 1336 (Sheet 1 of 2)

I



Serials 1337 & subs w/ PFD.

DETAIL B



LEGEND
1. Ignition Switch
2. Placard
3. Retaining Nut
4. Collar
5. Switch Plate
6. Washer
7. Screw

Serials 1337 & subs w/o PFD.

DETAIL C

SR20_MM74_1700A

Figure 74-302
Ignition Switch Installation - Serials 1337 & subs (Sheet 2 of 2)

CHAPTER 76

ENGINE CONTROLS

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CHAPTER 76 - ENGINE CONTROLS

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ENGINE CONTROLS

1. GENERAL

This chapter describes the controls which govern operation of the engine. The engine controls for the airplane consist of the following: throttle, mixture, and propeller governor. The primary controls employ conventional push-pull type levers and are connected to a control quadrant mounted forward on the center console. The quadrant control assembly incorporates a friction lock which can be adjusted to retain the throttle and mixture control lever positions.

The throttle control lever is connected through a cable to the throttle body mounted forward of the induction duct assembly.

The propeller governor control cable is terminated on a cam follower plate which is integral to the throttle control lever. This connection allows the propeller speed to be mechanically adjusted to the throttle setting. Under this arrangement, the propeller is set to 2700 RPM for full forward throttle takeoff and climb, 2500 RPM for mid to full throttle cruise, and approximately 1900 RPM at lower power. For additional maintenance practices regarding the propeller governor refer to Chapter 61, Propeller. (Refer to 61-00)

The mixture control lever is connected through a cable to the fuel pump located on the forward RH corner of the engine.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Power lever binding.	Control quadrant friction lock knob too tight.	Loosen friction lock knob.
	Control cable defective or worn.	Perform Adjustment/Test - Control Quadrant. (Refer to 76-10)
	Quadrant assembly nuts too tight.	Loosen nuts, reinstall cotter pins.
	Bearing worn on cam follower.	Replace bearing.
Mixture lever binding.	Control quadrant friction lock knob too tight.	Loosen friction lock knob.
	Cable defective or worn.	Replace cable.
Engine RPM too high or low during flight.	Propeller governor cable rod ends not properly adjusted.	Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment. (Refer to 61-20)
	Tachometer malfunctioning.	Inspect and replace (if necessary). (Refer to 77-10)
	Propeller governor malfunctioning.	Inspect and replace (if necessary). (Refer to 61-20)
No tachometer indication when engine running.	Tachometer malfunctioning.	Inspect and replace (if necessary). (Refer to 77-10)
Erratic tachometer indication when engine running smoothly.	Tachometer malfunctioning.	Inspect and replace (if necessary). (Refer to 77-10)

POWER CONTROL

1. DESCRIPTION

This section describes those components which furnish a means of controlling engine power. Engine controls for the airplane include the following: control quadrant, throttle control cable, mixture control cable, and governor control cable.

2. MAINTENANCE PRACTICES

A. Control Quadrant (See Figure 76-101)

(1) Servicing - Control Quadrant

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Aeroshell ASG22 Synthetic Lubricant	51197-001	Any Source	Lubricant.

(b) Remove RH crew seat. (Refer to 25-10)

(c) Remove friction lock knob and washer from control quadrant.

(d) Remove right mid console trim. (Refer to 25-10)

(e) Remove right aft console trim. (Refer to 25-10)

(f) Using a clean, lint-free shop towel, remove contaminates from control quadrant, control cable ends, and attaching hardware.

(g) Apply a generous amount of lubricant to groove in engine control power lever.

(h) To distribute lubricant on bushing, move engine control power lever through full range of motion several times.

(i) Using a clean, lint-free shop towel, remove excessive lubricant from control quadrant.

(j) Install right aft console trim. (Refer to 25-10)

(k) Install right mid console trim. (Refer to 25-10)

(l) Install friction lock knob and washer to control quadrant.

(m) Install RH crew seat. (Refer to 25-10)

(2) Removal - Control Quadrant

(a) Remove RH crew seat. (Refer to 25-10)

(b) Remove friction lock knob and washer from control quadrant.

(c) Remove LH and RH mid console trim. (Refer to 25-10), (Refer to 25-10)

(d) Remove LH and RH aft console trim. (Refer to 25-10), (Refer to 25-10)

(e) Remove right and left aft console trim. (Refer to 25-10)

(f) Remove throttle control cable from control quadrant. (Refer to 76-10)

(g) Remove mixture control cable from control quadrant. (Refer to 76-10)

(h) Remove governor control cable from control quadrant. (Refer to 76-10)

(i) *Serials 2016 & subs w/ Perspective Avionics:* Remove cable ties and wire loom as required to access TO/GA switch wire harness. Disconnect connectors and de-pin TO/GA switch jack to remove harness from control quadrant.

(j) Remove nuts, washers, and bolts securing control quadrant to center console. Remove control quadrant from airplane.

(3) Disassembly - Power Control - *Serials 2016 & subs w/ Perspective Avionics*

(a) Remove screws securing LH and RH knob caps to center knob.

(b) Remove screws securing center knob to power lever.

(c) Remove TO/GA switch. (Refer to 22-20)

(4) Assembly - Power Control - *Serials 2016 & subs w/ Perspective Avionics*

(a) Install TO/GA switch. (Refer to 22-20)

(b) Install screws securing center knob to power lever.

(c) Install screws securing LH and RH knob caps to center knob.

(5) Installation - Control Quadrant

(a) Position control quadrant to center console and secure with bolts, washers, and nuts.

(b) *Serials 2016 & subs w/ Perspective Avionics:* At control quadrant, re-route TO/GA switch wire harness. Re-pin jack and connect connectors. Secure TO/GA switch wire harness to existing wire harness with wire loom and cable ties.

(c) Install throttle control cable to control quadrant. (Refer to 76-10)

(d) Install mixture control cable to control quadrant. (Refer to 76-10)

(e) Install governor control cable to control quadrant. (Refer to 76-10)

(f) Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop Adjustment. (Refer to 61-20)

(g) Perform Adjustment/Test - Throttle Control Cable. (Refer to 76-10)

(h) Perform Adjustment/Test - Mixture Control Cable. (Refer to 76-10)

(i) Perform Adjustment/Test - Control Quadrant. (Refer to 76-10)

(j) Install LH and RH aft console trim. (Refer to 25-10), (Refer to 25-10)

(k) Install LH and RH mid console trim. (Refer to 25-10), (Refer to 25-10)

(l) Install friction lock knob and washer to control quadrant.

(m) Install RH crew seat. (Refer to 25-10)

(6) Adjustment/Test - Control Quadrant

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Spring Scale	40 lb	Any Source	Pull test.

(b) Loosen friction lock knob so engine control power lever moves as freely.

(c) Clean and lubricate exposed surface of control cables.

(d) Set engine control power lever to full forward (MAX) position.

CAUTION: Maximum pull force required to move engine control power lever from full forward (MAX) to full aft (IDLE) position must not exceed 20 pounds.

(e) Connect spring scale to engine control power lever and note force required to pull engine control power lever to full aft (IDLE) position.

(f) If pull force is less than 20 pounds, no further testing is required. If pull force is greater than 20 pounds, perform the following steps:

1 Determine which cable is generating excess friction by performing pull test three more times, each time with a different cable disconnected from control quadrant.

2 Replace cable(s) causing excessive friction and repeat pull test until pull force required to move power lever from full forward (MAX) to full aft (IDLE) position does not exceed 20 pounds.

Note: Pull force with new cables should not exceed 12 pounds. Engine control power lever must move smooth, without any signs of binding.

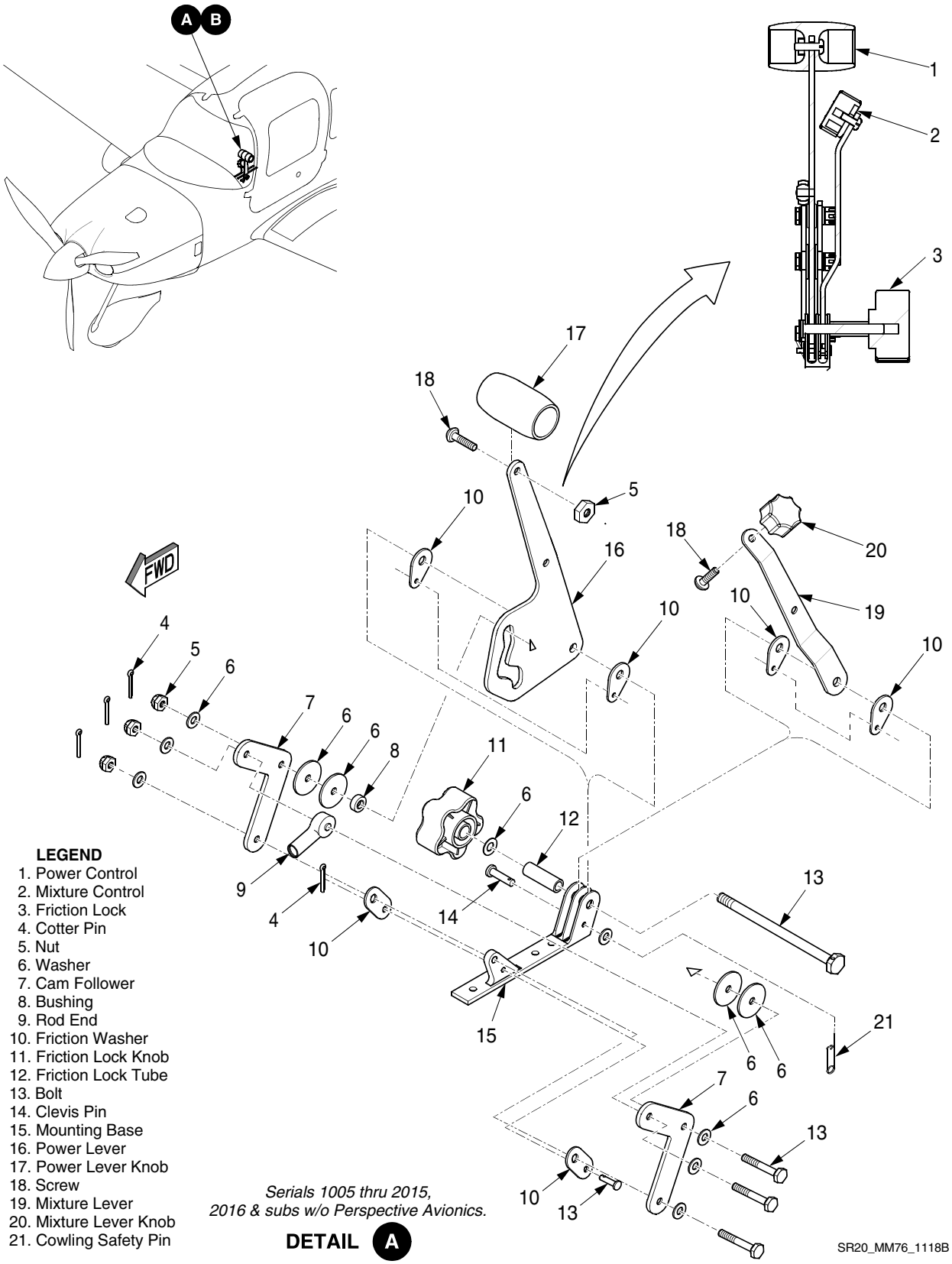
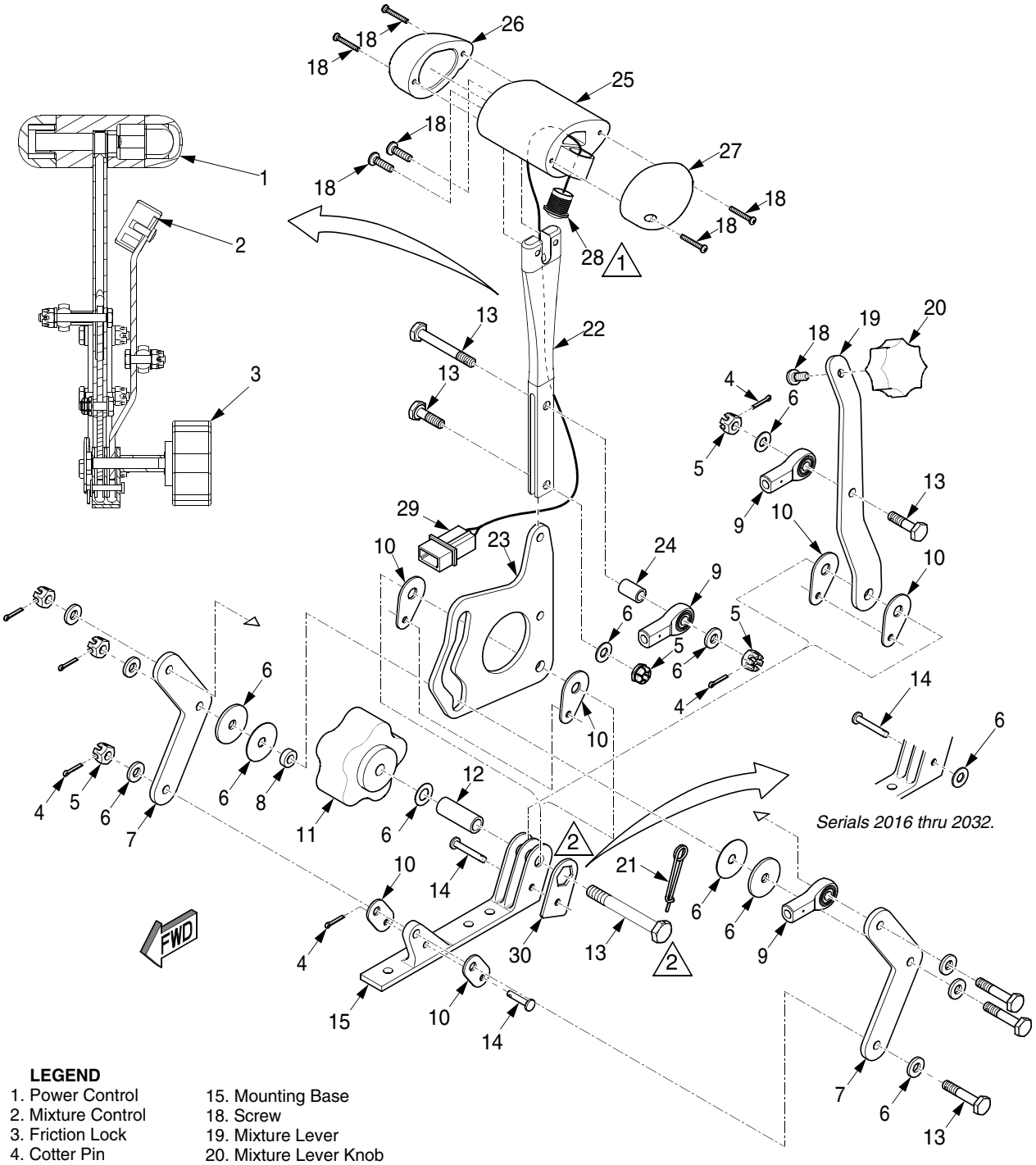


Figure 76-101

Control Quadrant Installation - Serials 0002 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 0002 thru 2015, 2016 & subs w/o Perspective Avionics



LEGEND

1. Power Control
2. Mixture Control
3. Friction Lock
4. Cotter Pin
5. Nut
6. Washer
7. Cam Follower
8. Bushing
9. Rod End
10. Friction Washer
11. Friction Lock Knob
12. Friction Lock Tube
13. Bolt
14. Clevis Pin
15. Mounting Base
18. Screw
19. Mixture Lever
20. Mixture Lever Knob
21. Cowling Safety Pin
22. Power Lever Upper
23. Power Lever Lower
24. Spacer
25. Knob, Center
26. Knob, Right
27. Knob, Left
28. Switch
29. Plug
30. Anti-Rotation Clip

NOTE

1. TO/GA switch only installed on aircraft with GFC 700 autopilot.
2. Ensure bolt head engages anti-rotation clip.

Figure 76-101
Control Quadrant Installation - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

B. Throttle Control Cable (See Figure 76-102)

Note: The throttle control cable is lubricated and sealed by the manufacturer and should not require further lubrication. If lubrication at control cable is desired, use only the approved lubricant listed in Chapter 12, Servicing. (Refer to 12-20)

(1) Removal - Throttle Control Cable

(a) Remove engine cowling. (Refer to 71-10)

(b) At throttle body, remove cotter pin, nut, washers, and bolt securing cable rod end to throttle control arm.

(c) Remove cable rod end.

(d) Remove nut securing cable support bracket to engine.

(e) Pull cable and bracket slightly aft and remove nut, washer, and bolt securing retaining clip to bracket.

(f) Remove any clamps or ties securing cable to engine mount.

(g) Remove friction lock knob and washer from control quadrant.

(h) Remove RH crew seat. (Refer to 25-10)

(i) Remove right and left aft console trim. (Refer to 25-10)

(j) At control quadrant, remove cotter pin, nut, washers, spacer, and bolt securing cable rod end to power lever.

(k) Remove rubber sleeves, nuts, and washers securing cable to console bracket.

Note: Prior to removal, note routing of cable and location of anti-chafing spiral wrap to facilitate installation. Remove as much sealant as possible from cable and cable fitting on firewall.

(l) Gently pull cable aft through firewall, ensuring that the control cable does not inadvertently pull other components loose. Remove cable from airplane.

(2) Installation - Throttle Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.
Fiber Frax Paper	970J, TON-0146	UniFrax	Firewall insulation.

(b) Ensure cable fitting on firewall is clear and free of old sealant.

CAUTION: When routing the cable, ensure the cable does not interfere with airplane control rigging, wires, or hoses.

(c) Route cable forward through the firewall to the engine compartment.

(d) Install rod ends to both ends of cable.

(e) At console, install washers, nuts, and rubber sleeves securing cable to support bracket.

(f) Position cable rod end to power lever and secure with bolt, spacer, washers, nut, and cotter pin.

(g) Route cable through engine mounting bracket and loosely install retaining clip, washer, and nut.

(h) Route cable through baffling hole. Install rod linkage and rubber bushing seal.

(i) At throttle body, secure cable rod end to throttle control arm with bolt, washers, nut, and cotter pin.

(j) Wrap fiber paper around portion of cable which passes through firewall fitting so a tight fit is achieved at the cable/firewall interface.

(k) Adjust slack in cable, tighten throttle bracket retaining clip nut, align throttle bracket with fuel injection manifold bracket, and install nut.

(l) Install clamps or ties securing cable to engine mount.

(m) Perform Adjustment/Test - Throttle Control Cable. (Refer to 76-10)

(n) Solvent clean firewall fitting and fitting/cable interface. (Refer to 20-30)

(o) Fillet seal firewall fitting and fitting/cable interface with silicone sealant. (Refer to 20-10)

(p) Install right and left aft console trim. (Refer to 25-10)

(q) Install friction lock knob and washer to control quadrant.

(r) Install RH crew seat. (Refer to 25-10)

(s) Install engine cowling. (Refer to 71-10)

(3) Adjustment/Test - Throttle Control Cable

(a) Adjust cable jamnuts so power control lever in full forward and aft positions, causes throttle body control arm to make contact with throttle body control arm stops on both sides of travel.

(b) Ensure power control lever is only limited by throttle body control arm stops and has positive clearance to console slot in both full forward and full aft positions.

(c) Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop. (Refer to 61-20)

(d) Upon adjustment completion, tighten jam nuts. Verify minimum rod end thread engagement of 0.312 inch (0.79 cm). Install cotter pins to rod end nuts.

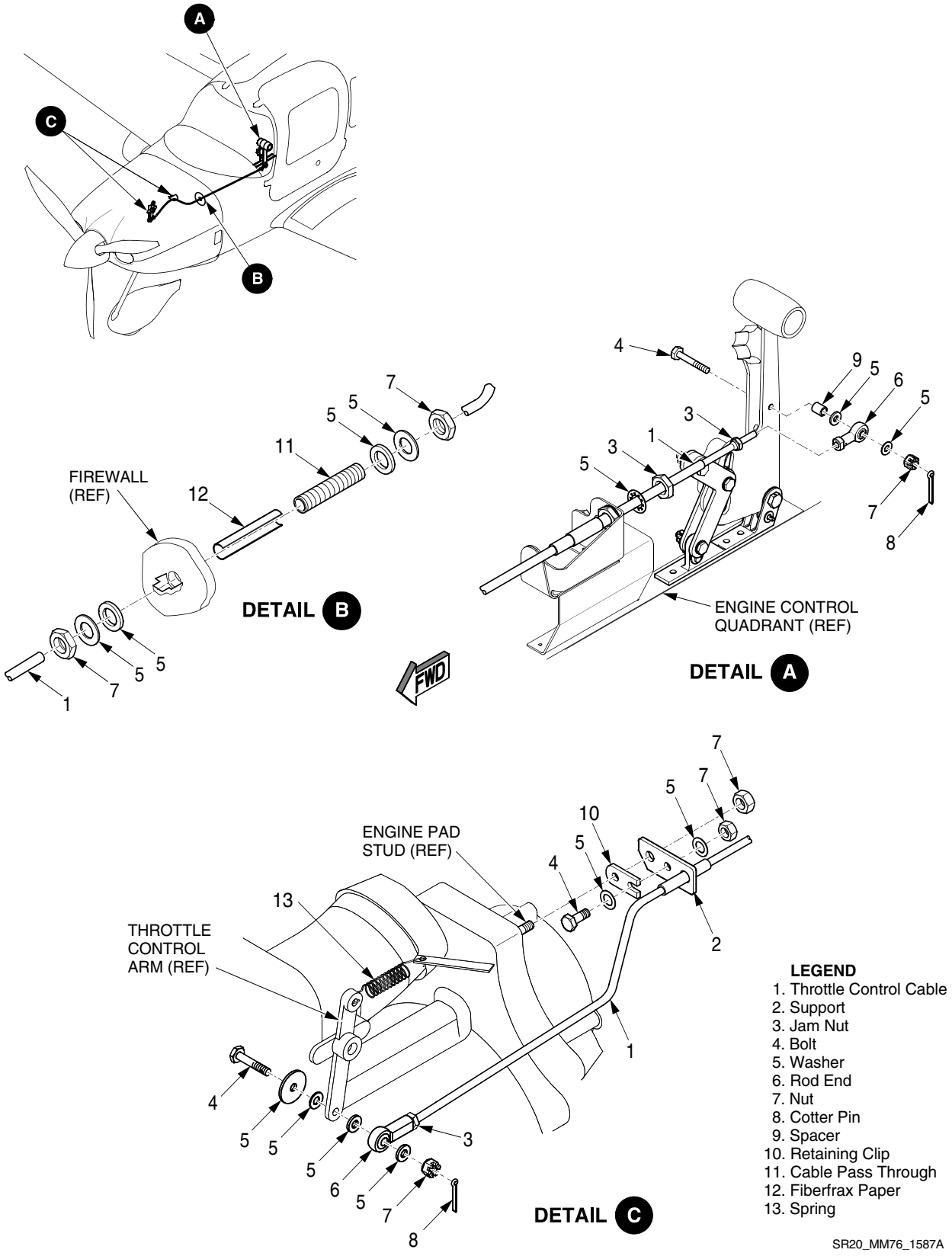


Figure 76-102
Throttle Control Cable Installation

C. Mixture Control Cable (See Figure 76-103)

Note: The mixture control cable is lubricated and sealed by the manufacturer and should not require further lubrication. If lubrication at control cable is desired, use only the approved lubricant listed in Chapter 12, Servicing. (Refer to 12-20)

(1) Removal - Mixture Control Cable

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing cable rod end to fuel pump control arm.

(c) Remove cable rod end.

(d) Remove retaining clip, nut, washers, spacer, and bolt securing cable to engine bracket.

(e) Remove clamps or cable ties securing cable to engine mount.

(f) Remove friction lock knob and washer from control quadrant.

(g) Remove RH crew seat. (Refer to 25-10)

(h) Remove right and left aft console trim. (Refer to 25-10)

(i) Remove nut, washer, and bolt securing clamp to center console rib and remove clamp from cable.

(j) Remove cotter pin, nut, spacer, and bolt securing cable rod end to mixture lever.

(k) Remove rubber sleeve, nut, and washer securing cable to console bracket.

Note: Prior to removal, note routing of cable and location of anti-chafing spiral wrap to facilitate installation. Remove as much sealant as possible from cable and cable fitting on firewall.

(l) Gently pull cable aft through firewall, ensuring that cable does not inadvertently pull other components loose. Remove cable from airplane.

(2) Installation - Mixture Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.
Fiber Frax Paper	970J, TON-0146	UniFrax	Firewall insulation.

(b) Ensure cable fitting on firewall is clear and free of old sealant.

CAUTION: When routing cable, ensure the cable does not interfere with airplane control rigging, wires, or hoses.

(c) Route cable forward through the firewall to the engine compartment.

(d) Install rod ends to both ends of cable.

(e) At console, install washers, nuts, and rubber sleeves securing cable to support bracket.

(f) Position cable rod end to mixture lever and secure with bolt, spacer, bearing, washer, nut, and cotter pin.

(g) Insert cable into engine bracket, align retaining clip over cable bracket, and install bolt, washers, spacer, and nut.

(h) Position cable rod end to fuel pump control arm and secure with bolt, washers, nut, and cotter pin.

(i) Wrap fiber paper around portion of cable which will pass through firewall fitting so a tight fit is achieved at the cable/firewall interface.

(j) At center console rib, attach clamp to cable and secure with bolt, washer, and nut.

(k) Install clamps or ties securing cable to engine mount.

(l) Perform Adjustment/Test - Mixture Control Cable. (Refer to 76-10)

(m) Solvent clean firewall fitting and fitting/cable interface. (Refer to 20-30)

(n) Fillet seal firewall fitting and fitting/cable interface with silicone sealant. (Refer to 20-10)

(o) Install right and left aft console trim. (Refer to 25-10)

(p) Install friction lock knob and washer to control quadrant.

(q) Install RH crew seat. (Refer to 25-10)

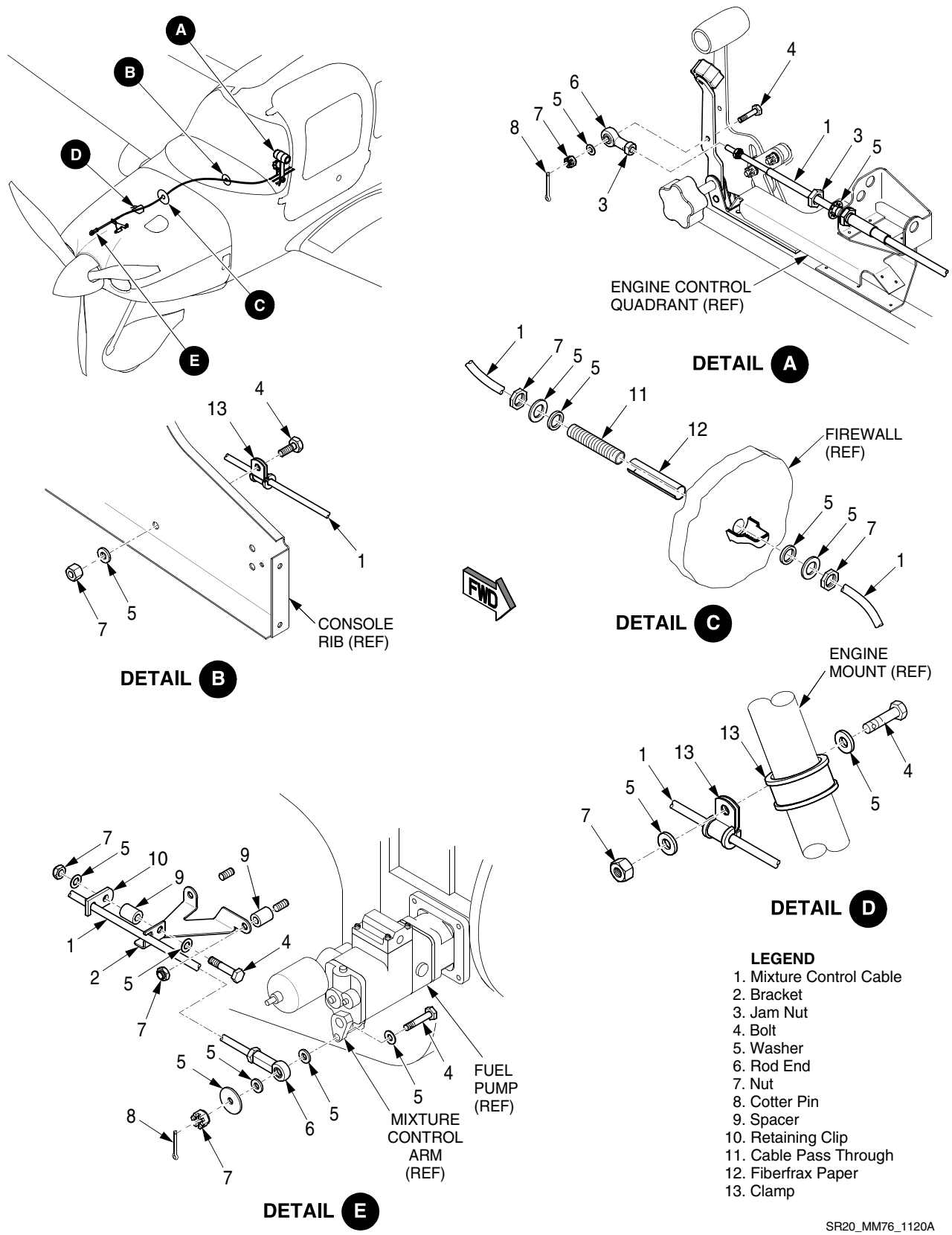
(r) Install engine cowling. (Refer to 71-10)

(3) Adjustment/Test - Mixture Control Cable

(a) Adjust cable jamnuts so mixture control lever in full forward and aft positions causes fuel pump control arm to make contact with fuel pump control arm stops on both sides of travel.

(b) Ensure mixture control lever is only limited by fuel pump control arm stop and has positive clearance to console slot in both full forward and full aft positions.

(c) Upon adjustment completion, tighten jam nuts. Verify minimum rod end thread engagement of 0.312 inch (0.79 cm). Install cotter pins to rod end bearing nuts.



LEGEND

1. Mixture Control Cable
2. Bracket
3. Jam Nut
4. Bolt
5. Washer
6. Rod End
7. Nut
8. Cotter Pin
9. Spacer
10. Retaining Clip
11. Cable Pass Through
12. Fiberfrax Paper
13. Clamp

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Figure 76-103
Mixture Control Cable Installation

D. Governor Control Cable (See Figure 76-104)

Note: The governor control cable is lubricated and sealed by the manufacturer and should not require further lubrication. If lubrication at control cable is desired, use only the approved lubricant listed in Chapter 12, Servicing. (Refer to 12-20)

(1) Removal - Governor Control Cable

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove cotter pin, nut, washers, and bolt securing cable rod end to governor control arm.

(c) Remove cable rod end.

(d) At cable support bracket mounted to engine, remove retaining clip nut, washers, and bolt and remove cable from support bracket.

(e) Remove any clamps or ties securing cable to engine mount.

(f) Remove friction lock knob and washer from control quadrant.

(g) Remove RH crew seat. (Refer to 25-10)

(h) Remove right and left aft console trim. (Refer to 25-10)

(i) At control quadrant, remove cotter pin, nut, washers, and bolt securing cable rod end to throttle cam follower.

(j) Remove rubber sleeve, nut, and washer securing cable to console bracket.

Note: Prior to removal, note routing of cable and location of anti-chafing spiral wrap to facilitate installation. Remove as much sealant as possible from cable and cable fitting on firewall.

(k) Gently pull cable aft through firewall, ensuring that cable does not inadvertently pull other components loose, and remove from airplane.

(2) Installation - Governor Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
High Temperature Silicone Sealant	RTV 736	Dow Corning	Sealant.
Fiber Frax Paper	970J, TON-0146	UniFrax	Firewall insulation.

(b) Ensure cable fitting on firewall is clear and free of old sealant.

CAUTION: When routing cable, ensure the cable does not interfere with airplane control rigging, wires, or hoses.

(c) Route cable forward through the firewall to the engine compartment.

(d) Install rod ends to both ends of cable.

(e) At console, install washers, nuts, and rubber sleeves securing cable to support bracket.

(f) At control quadrant, position cable rod end to throttle cam follower and install bolt, washers, nut, and cotter pin.

(g) Insert cable into support bracket, align retaining clip over bracket, and install bolt, washers, and nut.

(h) At governor, secure rod end bearing to governor control arm with bolt, washers, nut, and cotter pin.

(i) Wrap fiber paper around portion of cable which will pass through firewall fitting so a tight fit is achieved at the cable/firewall interface.
(j) Install clamps or ties securing cable to engine mount.
(k) Perform Adjustment/Test - Governor Rigging and Low-Pitch Stop. (Refer to 61-20)
(l) Solvent clean firewall fitting and fitting/cable interface. (Refer to 20-30)
(m) Fillet seal firewall fitting and fitting/cable interface with silicone sealant. (Refer to 20-10)
(n) Install right and left aft console trim. (Refer to 25-10)
(o) Install friction lock knob and washer to control quadrant.
(p) Install RH crew seat. (Refer to 25-10)
(q) Install engine cowling. (Refer to 71-10)

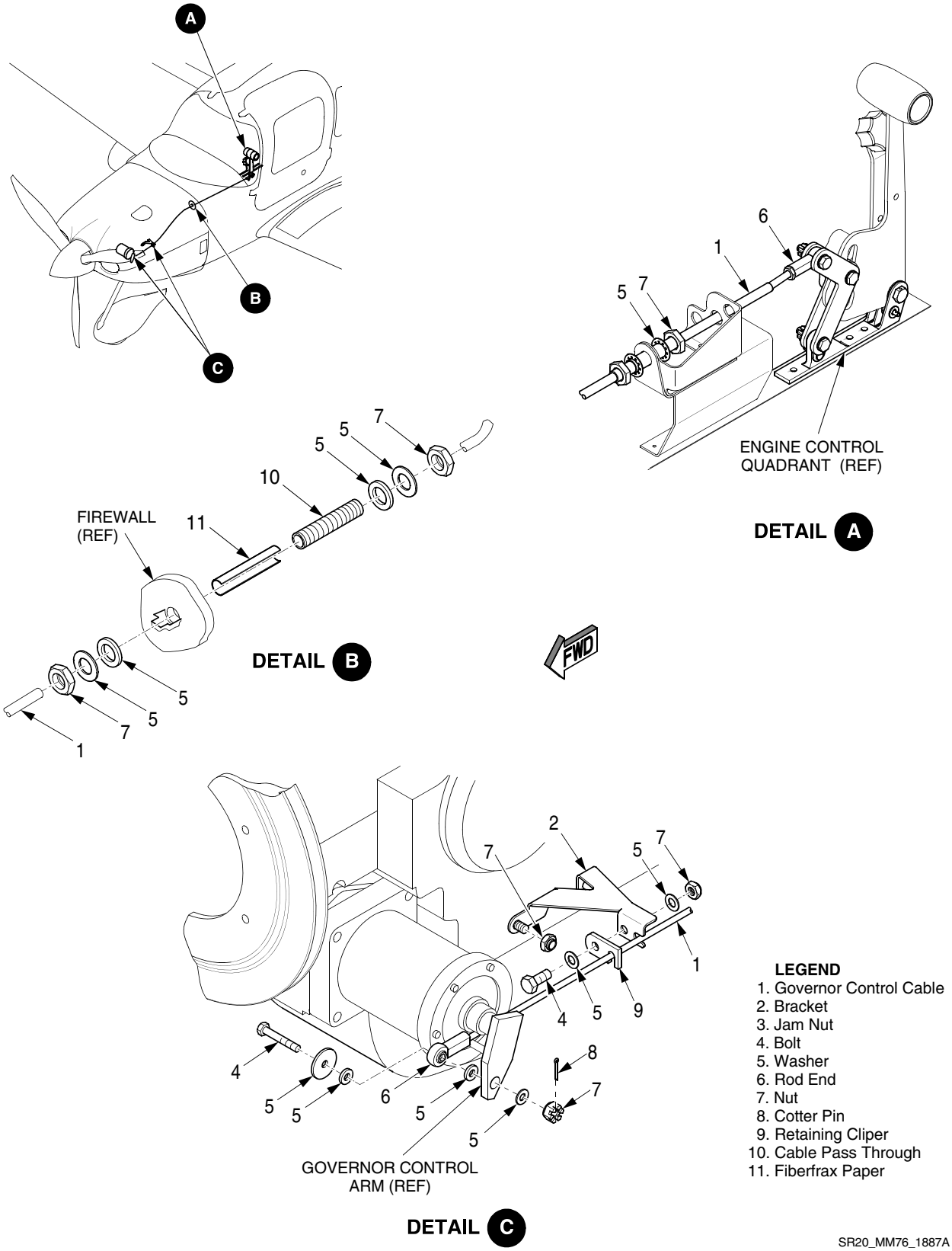


Figure 76-104
Governor Control Cable Installation

CHAPTER

77

ENGINE INDICATING

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77-40	3	15 JUN 2010
77-40	4	15 JUN 2010

CHAPTER 77 - ENGINE INDICATING

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77-40	7	19 SEP 2017
77-40	8	19 SEP 2017
77-40	9	19 SEP 2017
77-40	10	19 SEP 2017

EFFECTIVITY:
All

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ENGINE INDICATING

1. GENERAL

This chapter describes those components which indicate engine operation. The engine indicating components include the tachometer, MAP/fuel flow gage and sensor, EGT/CHT gage and sensors, sensor interface unit (SIU), and data acquisition unit (DAU).

Serials 1005 thru 1581 w/o EMax™ Engine Monitoring: Engine crankshaft speed is indicated by an electrically operated tachometer which receives a speed signal from a tachometer generator mounted on the aft end of the engine between the magnetos. Manifold pressure (MAP) is indicated by a MAP/fuel flow gage which receives a signal from a sensor mounted in the engine manifold. Exhaust gas temperature (EGT) is indicated by an EGT/CHT gage which receives a signal from a sensor mounted in cylinder #6 exhaust pipe. Cylinder head temperature (CHT) is indicated by an EGT/CHT gage which receives a signal from a sensor mounted in the #2 cylinder head.

Serials 1233 thru 1581 w/ EMax™ Engine Monitoring, 1005 thru 1232 after SB 20-77-01: Engine crankshaft speed is indicated by an electrically operated tachometer and by the MFD. Both indications receive a speed signal from the RH magneto. Manifold pressure (MAP) is indicated by a MAP/fuel flow gage and by the MFD. Both indications receive a signal from a sensor mounted in the engine manifold. Exhaust gas temperature (EGT) is indicated by the MFD which receives signals from six individual sensors (one per exhaust header). Cylinder head temperature (CHT) is indicated by the MFD which receives signals from six individual sensors (one per cylinder). The Sensor Interface Unit (SIU) decodes the sensor information and transmits the data to the MFD.

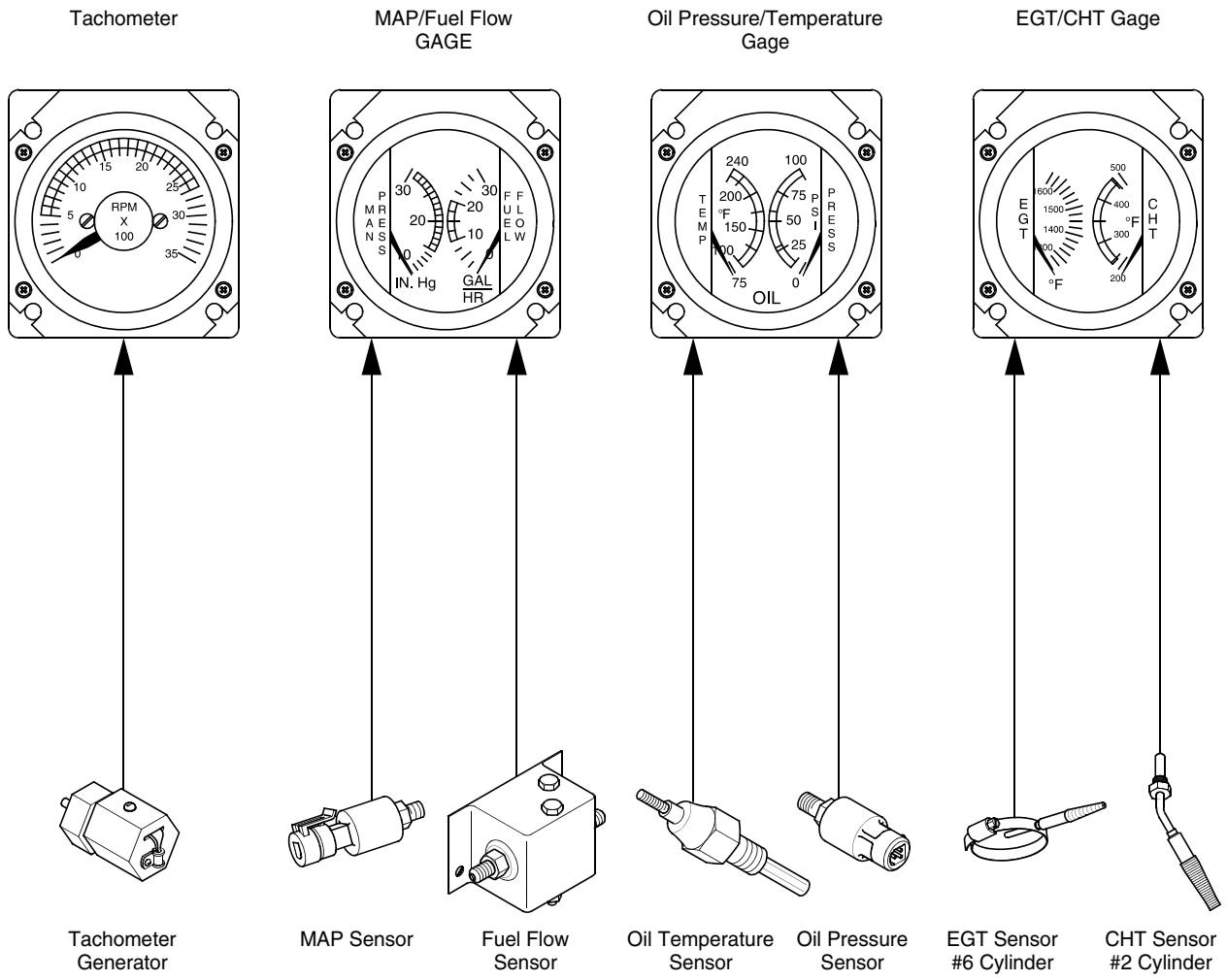
Serials 1582 thru 2015 w/o EMax™ Engine Monitoring, 2016 & subs w/o EMax™ Engine Monitoring and w/o Perspective Avionics: Engine crankshaft speed is indicated by the PFD and MFD which receive a speed signal from the RH magneto. Manifold pressure (MAP) is indicated by the PFD and MFD which receive a signal from a sensor mounted in the engine manifold. Exhaust gas temperature (EGT) is indicated by the MFD which receives a signal from a sensor mounted in cylinder #6 exhaust pipe. Cylinder head temperature (CHT) is indicated on the MFD which receives a signal from a sensor mounted in #2 cylinder head. The Data Acquisition Unit (DAU) decodes the sensor information and transmits the data to the PFD and MFD.

Serials 1582 thru 2015 w/ EMax™ Engine Monitoring, 2016 & subs w/ EMax™ Engine Monitoring and w/o Perspective Avionics: Engine crankshaft speed is indicated by the PFD and MFD which receive a speed signal from the RH magneto. Manifold pressure (MAP) is indicated by the PFD and MFD which receive a signal from a sensor mounted in the engine manifold. Exhaust gas temperature (EGT) is indicated by the MFD which receives signals from six individual sensors (one per cylinder exhaust pipe). Cylinder head temperature (CHT) is indicated by the MFD which receives signals from six individual sensors (one per cylinder). The Data Acquisition Unit (DAU) decodes the sensor information and transmits the data to the PFD and MFD.

Serials 2016 & subs w/ Perspective Avionics: Engine crankshaft speed is indicated by the PFD and MFD which receive a speed signal from the RH magneto. Manifold pressure (MAP) is indicated by the PFD and MFD which receive a signal from a sensor mounted in the engine manifold. Exhaust gas temperature (EGT) is indicated by the MFD which receives signals from six individual sensors (one per cylinder exhaust pipe). Cylinder head temperature (CHT) is indicated by the MFD which receives signals from six individual sensors (one per cylinder). The GEA 71 microprocessor decodes the sensor information and transmits the data to the PFD and MFD.

2. TROUBLESHOOTING

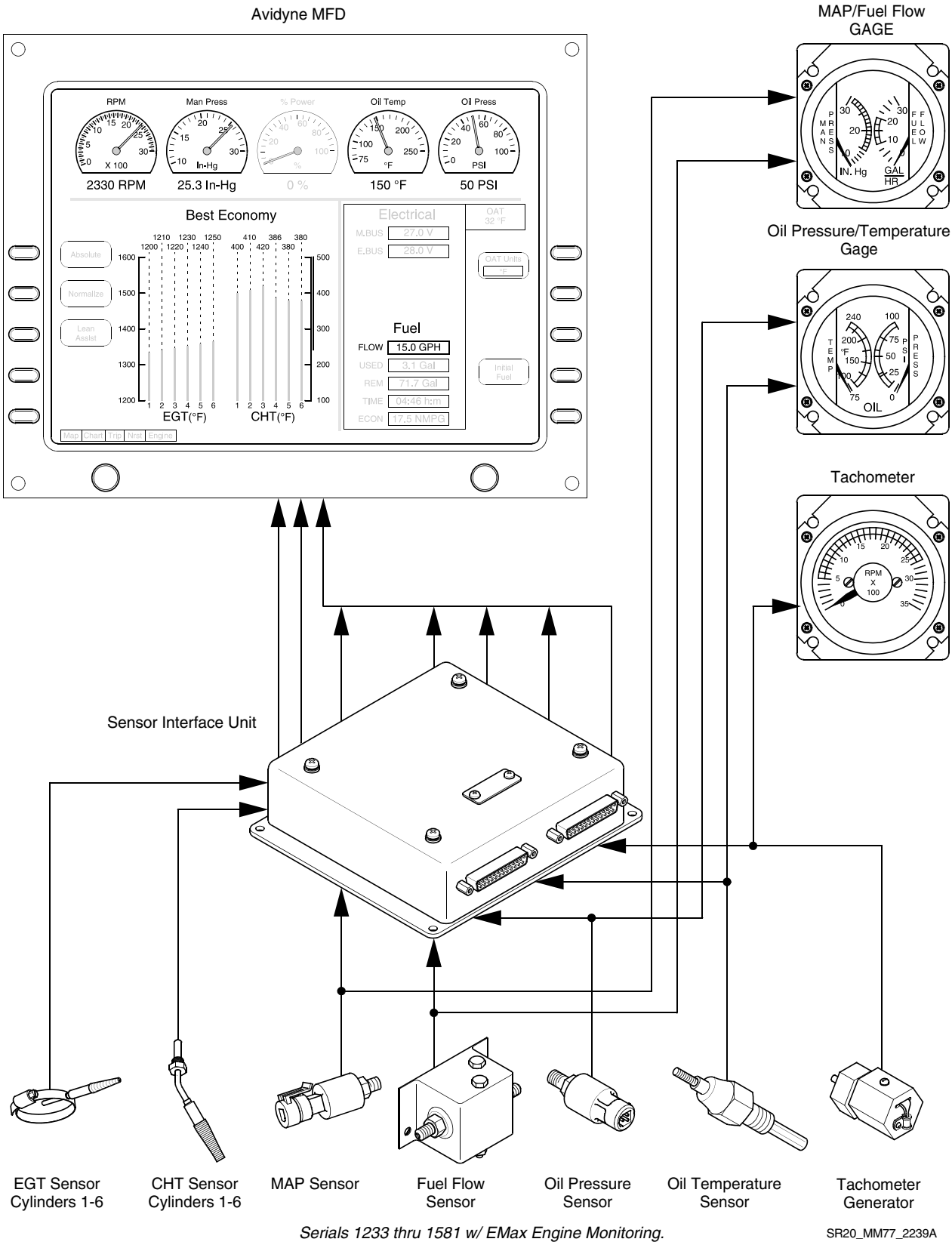
Trouble	Probable Cause	Remedy
No RPM indication.	Tachometer circuit breaker open.	Check circuit breaker.
	Tachometer generator failure.	Replace generator.
Engine Monitoring System indications disappear during flight into clouds or precipitation.	OAT Sensor not properly grounded.	Verify resistance from OAT sensor case to airplane ground is less than 2.0 ohms. If resistance is greater than 2.0 ohms, burnish OAT sensor backshell contact as required. Ensure backshell is secured tightly to sensor assembly.
No EGT/CHT indication.	Needle or display does not indicate temperature reading.	Check circuit breaker.
		Ensure sensor assembly and airplane harness are securely connected.
		Serials 1005 thru 1581 after SB 2X-77-02: Verify that airplane harness polarity matches sensor assembly. If not, remove terminals from connector on airplane harness, and re-install terminals to opposite pinouts.



Serials 1005 thru 1581 w/o EMax Engine Monitoring.

SR20_MM77_2237B

Figure 77-001
Engine Indicating Schematic - Serials 1005 thru 1581 w/o EMax Engine Monitoring (Sheet 1 of 4)

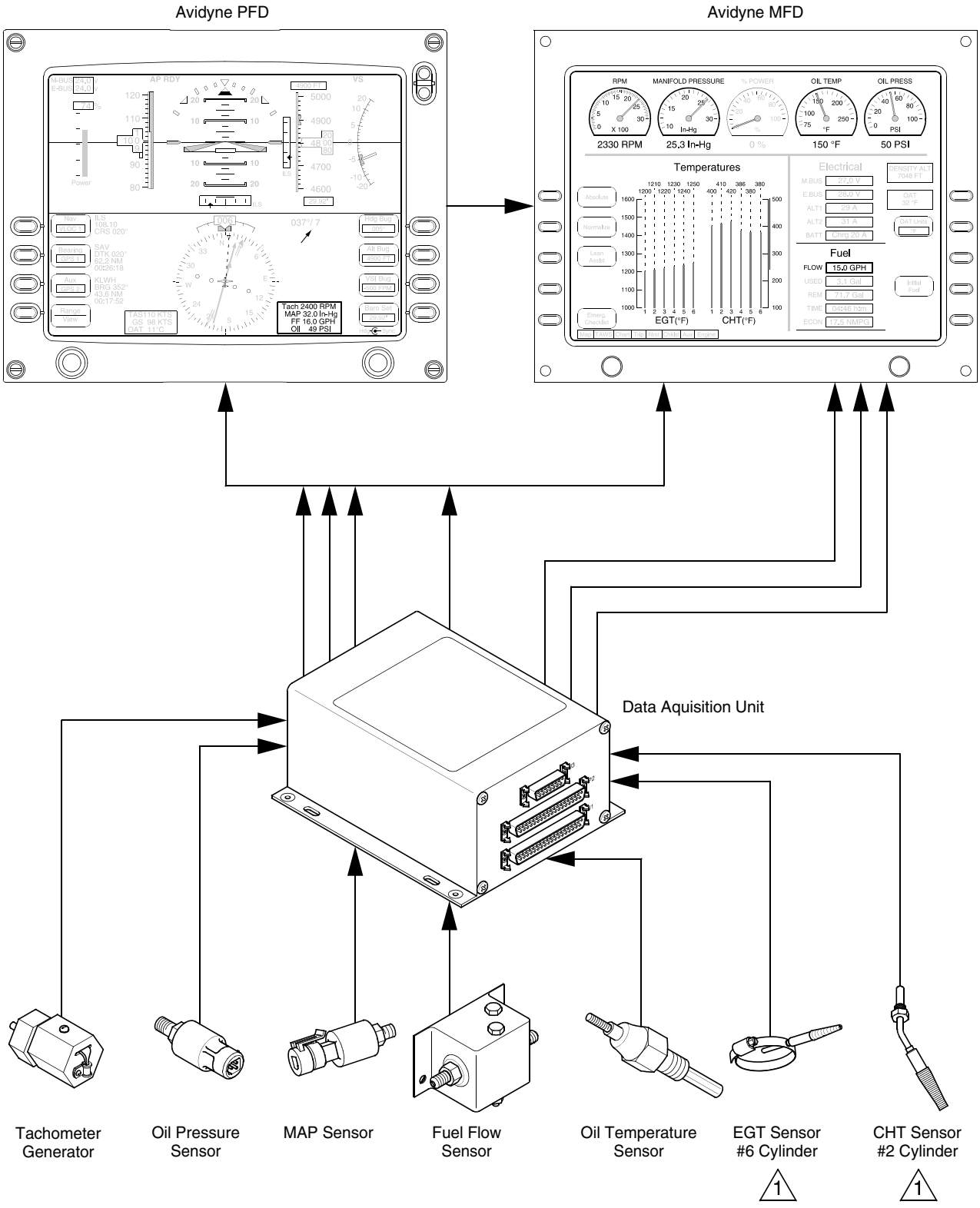


Serials 1233 thru 1581 w/ EMax Engine Monitoring.

SR20_MM77_2239A

Figure 77-001
Engine Indicating Schematic - Serials 1233 thru 1581 w/ EMax Engine Monitoring (Sheet 2 of 4)

EFFECTIVITY:
Serials 1233 thru 1581 w/ EMax Engine Monitoring



NOTE

1 EMax equipped airplanes have EGT and CHT sensors mounted to all six cylinders.

Figure 77-001
Engine Indicating Schematic - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 3 of 4)

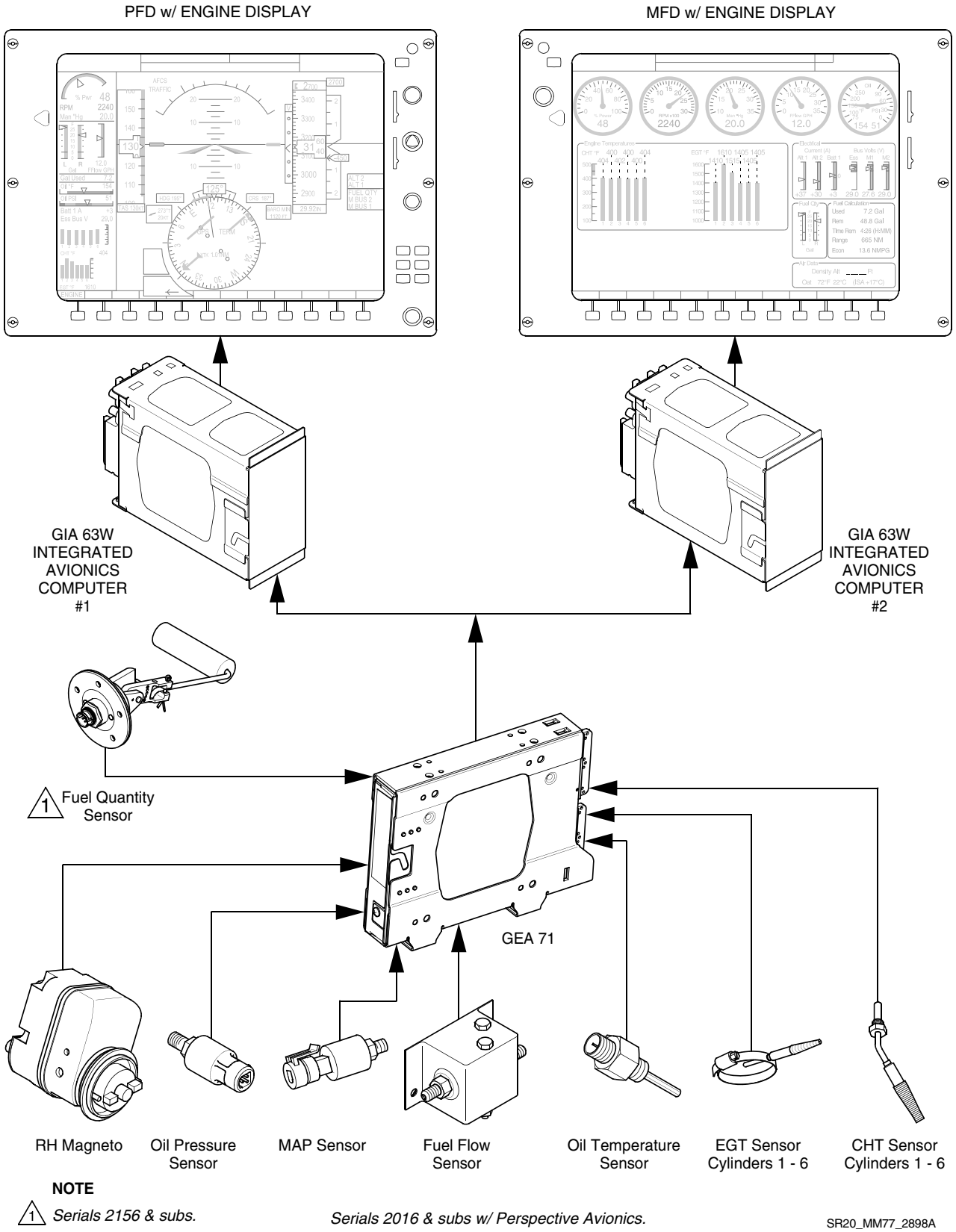


Figure 77-001
Engine Indicating Schematic - Serials 2016 & subs w/ Perspective Avionics (Sheet 4 of 4)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

POWER

1. DESCRIPTION

This section describes that portion of the engine indicating system which indicates power. Included are the tachometer, tachometer generator, MAP/fuel flow gage, and MAP sensor.

A. Tachometer

Serials 1005 thru 1581: A 2¼" tachometer is mounted on the right instrument panel adjacent to the other engine instruments. The tachometer pointer sweeps a scale marked from 0 to 3500 RPM in 100 RPM increments. The electrically operated tachometer receives a speed signal from a tachometer generator mounted on the aft end of the engine between the magnetos. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Engine RPM is shown in the upper left corner of the MFD as both a simulated tachometer and as text. The simulated tachometer receives a speed signal from a tachometer generator mounted on the aft end of the engine between the magnetos via the DAU and sweeps a scale marked from 0 to 3000 RPM in 50 RPM increments. Engine RPM is also continuously displayed in the engine data block located in the lower right corner of the PFD. In the event engine speed exceeds 2710 RPM for five seconds, the MFD will display "Check RPM" in a red advisory box in the lower right corner of the MFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Serials 2016 & subs w/ Perspective Avionics: Engine RPM is shown in the upper left corner of the MFD as both a simulated tachometer and as text. The simulated tachometer receives a speed signal from the speed sensor via the DAU and sweeps a scale marked from 0 to 3000 RPM in 100 RPM increments. Engine RPM is also continuously displayed in the engine data block located on the left side of the PFD. In the event engine speed exceeds 2710 RPM for ten seconds, the PFD will display "Check RPM" in a red advisory box in the lower right corner of the PFD. If the engine speed exceeds 2730 RPM for five seconds, the PFD will display "Check RPM" in a red advisory box in the lower right corner of the PFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

B. MAP/Fuel Flow Gage

Serials 1005 thru 1581: A 2¼" combination Fuel Flow and Manifold Pressure indicator is mounted on the right instrument panel immediately below the tachometer. The indicator is internally lighted. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1. The fuel flow pointer sweeps a scale marked from 0 to 30 Gal/Hr. The electrically operated fuel flow indicator receives a rate signal from a fuel flow transducer installed in the fuel line between the throttle body metering valve and the injector manifold. The manifold pressure pointer sweeps a scale marked from 0 to 30 inches HG in one-inch HG increments. The electrically operated manifold pressure indicator receives a signal from a pressure sensor mounted in the induction airstream on the left side of the induction air manifold near the throttle body.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Manifold pressure is shown in the upper left corner of the MFD as both a simulated pressure gage and as text. The simulated gage receives a signal from a pressure sensor mounted in the induction air manifold near the throttle body via the DAU and sweeps a scale marked from 10 to 30 inches HG in one-inch HG increments. Manifold pressure is also continuously displayed in the engine data block located in the lower right corner of the PFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Fuel flow is shown as text in the fuel data block located in the lower right corner of the MFD and is also continuously displayed in the engine data block located in the lower right corner of the PFD. For maintenance practices pertaining to fuel flow indication, see Chapter 28-40, Fuel Indicating. (Refer to 28-40)

Serials 2016 & subs w/ Perspective Avionics: Manifold pressure is shown in the upper center of the MFD as both a simulated pressure gage and as text. The simulated gage receives a signal from a pressure sensor mounted in the induction air manifold near the throttle body via the GEA 71 engine airframe unit. The gage sweeps a scale marked from 10 to 35 inches HG in one-inch HG increments. Manifold pressure is also continuously displayed in the engine data block located on the left side of the PFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Fuel flow is shown in the upper right corner of the MFD as both a simulated pressure gage and as text. For maintenance practices pertaining to fuel flow indication, see Chapter 28-40, Fuel Indicating. (Refer to 28-40)

2. MAINTENANCE PRACTICES

A. Tachometer - *Serials 1005 thru 1581* (See Figure 77-101)

(1) Removal - Tachometer

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENGINE INSTRUMENT circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect electrical connector from tachometer.

(e) Remove screws and washers securing tachometer to instrument panel. Remove tachometer from airplane.

(2) Installation - Tachometer

(a) Position tachometer to instrument panel and secure with screws and washers.

(b) Connect electrical connector to tachometer.

(c) Install MFD. (Refer to 31-60)

(d) Reset ENGINE INSTRUMENT circuit breaker.

(e) Perform Operational Test - Tachometer. (Refer to 77-10)

(3) Operational Test - Tachometer

(a) Set BAT 1 switch to ON position.

(b) Verify needle indicates zero.

(c) Set BAT 1 switch to OFF position.

B. Tachometer - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 77-101)**

Note: Engine RPM is displayed electronically on the MFD and PFD screens.

(1) Operational Test - Tachometer
- (a) Set BAT1 and AVIONICS switches to ON positions.
- (b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
- (c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
- (d) Rotate left knob to select Engine page.
- (e) Verify RPM display indicates zero.
- (f) Set BAT1 and AVIONICS switches to OFF positions.

C. Tachometer - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 77-101)

Note: Engine RPM is displayed electronically on the MFD and PFD screens.

(1) Operational Test - Tachometer
  (a) Set BAT1 and AVIONICS switches to ON positions.
  (b) On MFD, follow on-screen instructions to enter normal MFD operation.
  (c) Press [Engine] to select Engine page.
  (d) Verify RPM display indicates zero.
  (e) Set BAT1 and AVIONICS switches to OFF positions.

D. Tachometer Generator - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 77-101)

CAUTION: Protect openings exposed as a result of removing generator against entry of foreign material by installing covers or sealing with tape.

(1) Removal - Tachometer Generator
   (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
   (b) Pull ENGINE INSTRUMENT circuit breaker.
   (c) Remove engine cowling. (Refer to 71-10)
   (d) Disconnect electrical connector from tachometer generator.
   (e) Remove tachometer generator from engine accessory pad.

(2) Installation - Tachometer Generator
   (a) Position tachometer generator to engine accessory pad. Torque to 10 - 15 ft-lb (14 - 20 Nm).
   (b) Connect electrical connector to tachometer generator.
   (c) Install engine cowling. (Refer to 71-10)
   (d) Reset ENGINE INSTRUMENT circuit breaker.

EFFECTIVITY:
Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics

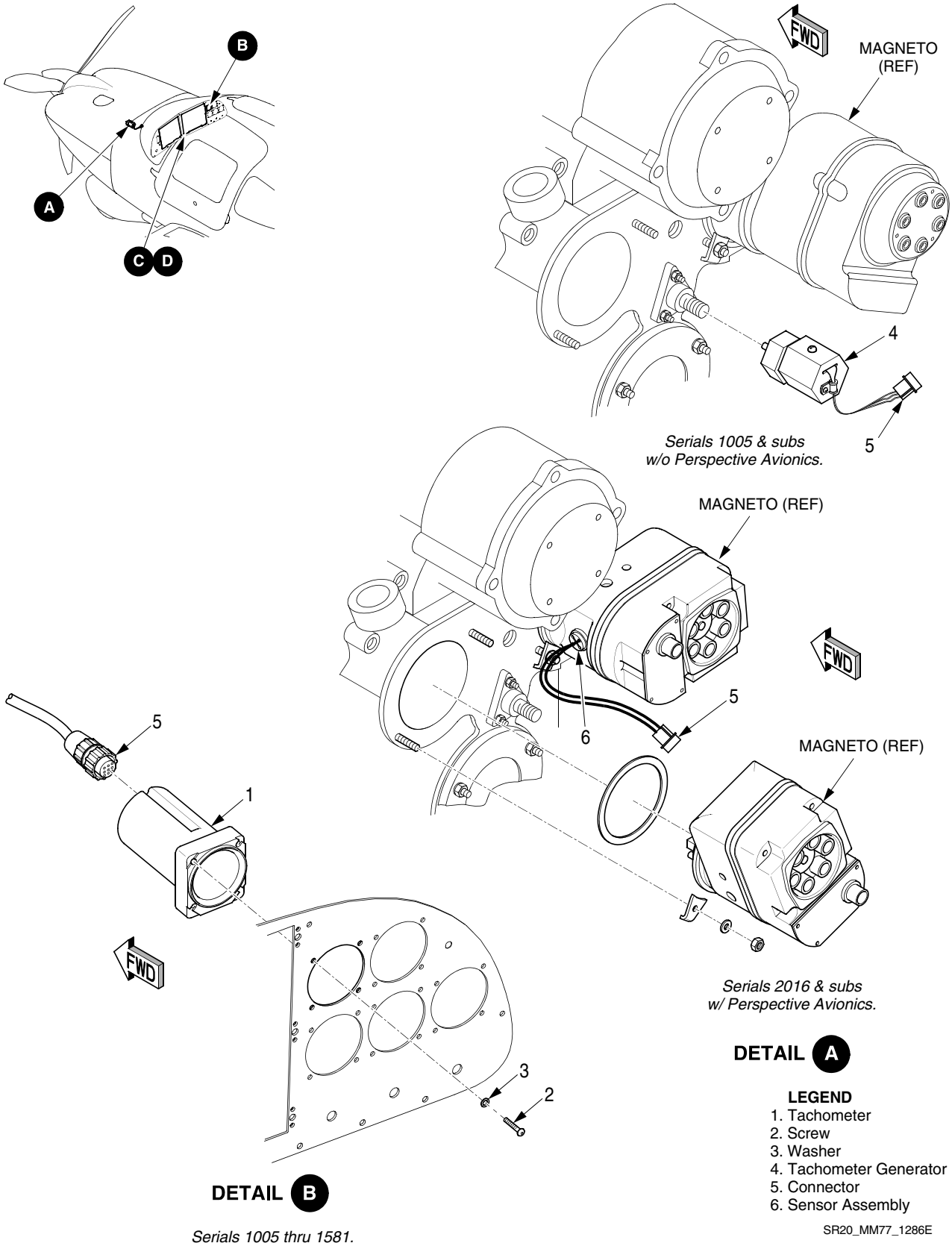
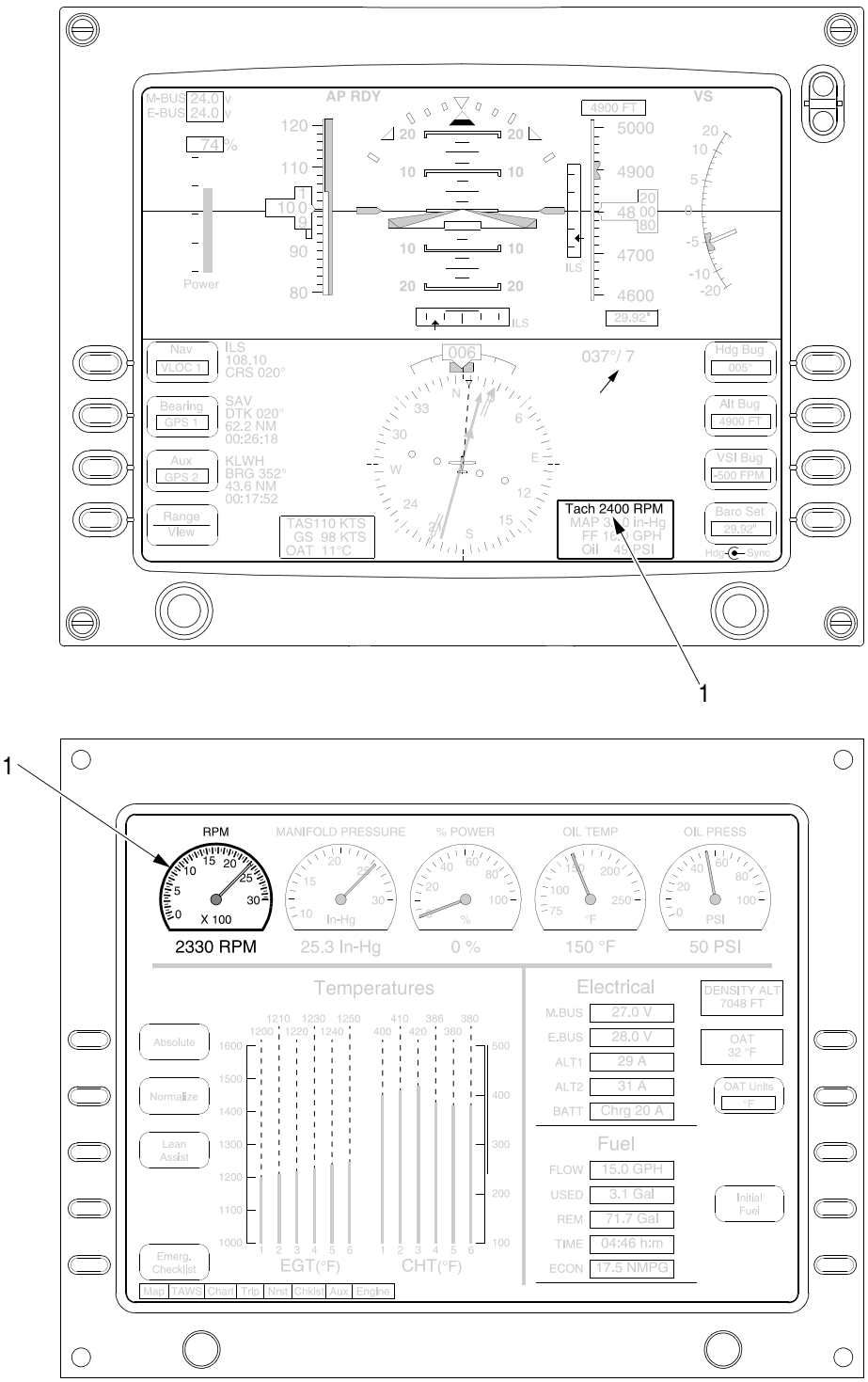


Figure 77-101
Engine Speed Indication (Sheet 1 of 3)



DETAIL C

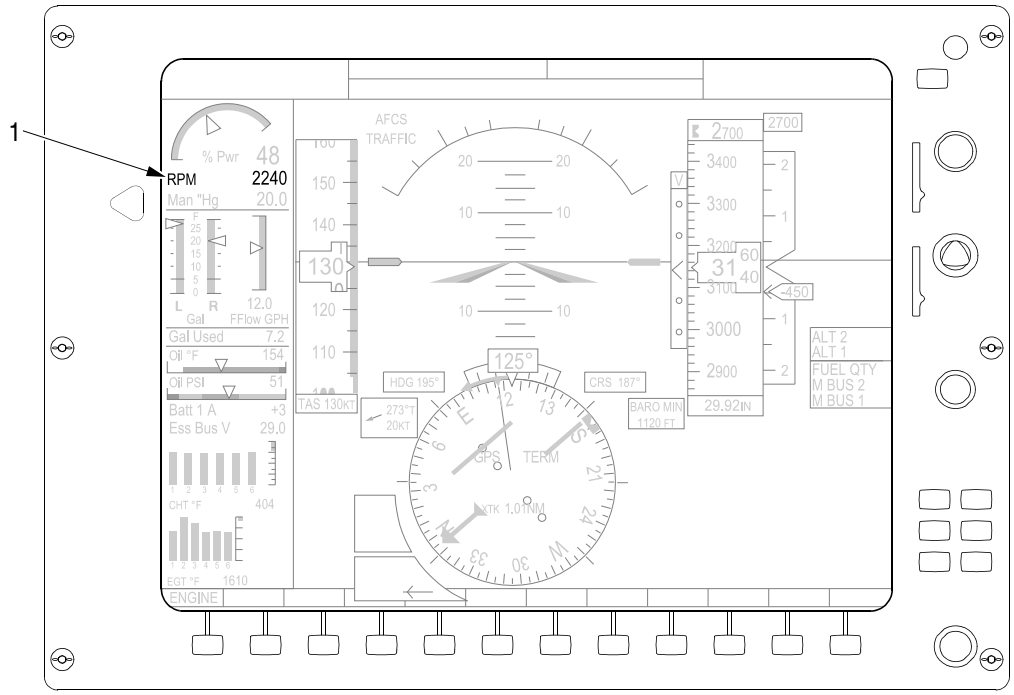
LEGEND
1. Tachometer

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics.

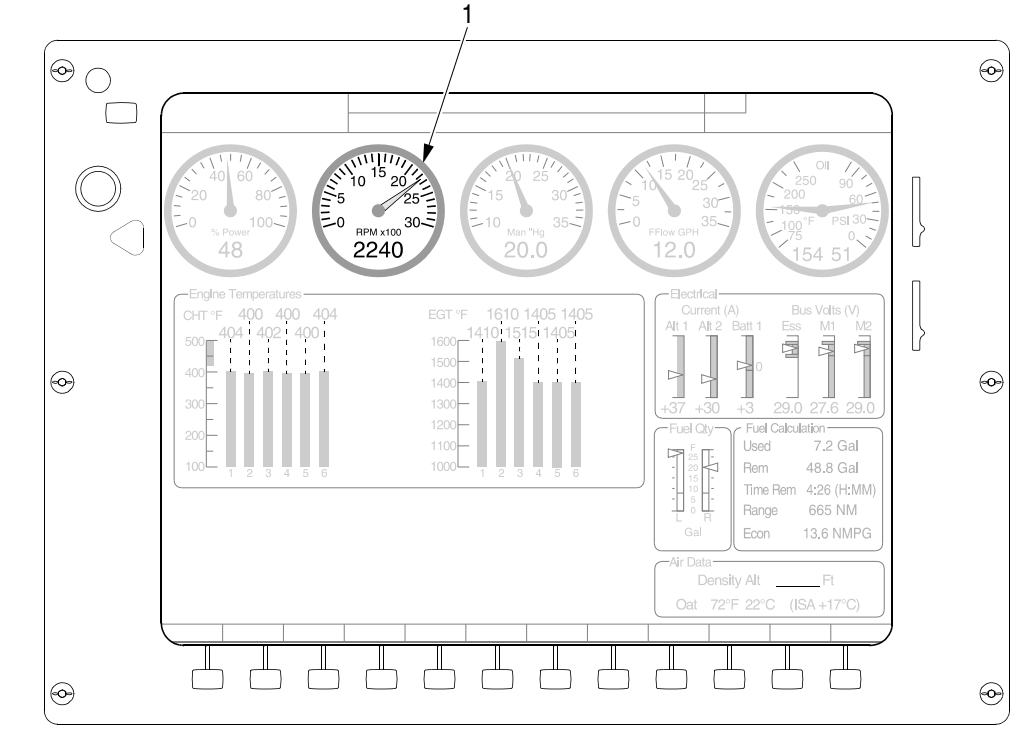
SR20_MM77_2229A

Figure 77-101
Engine Speed Indication - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 3)

EFFECTIVITY:
Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

DETAIL D

Serials 2016 & subs w/ Perspective Avionics.

LEGEND
1. Tachometer

SR20_MM77_2867A

Figure 77-101
Engine Speed Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

E. Map/Fuel Flow Gage - *Serials 1005 thru 1581* (See Figure 77-102)

(1) Removal - MAP/Fuel Flow Gage

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENGINE INSTRUMENT circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Disconnect electrical connector from gage.

(e) Remove screws and washers securing gage to instrument panel. Remove gage from airplane.

(2) Installation - MAP/Fuel Flow Gage

(a) Position gage to instrument panel and secure with screws and washers.

(b) Connect electrical connector to gage.

(c) Install MFD. (Refer to 31-60)

(d) Reset ENGINE INSTRUMENT circuit breaker.

(e) Perform Operational Test - MAP/Fuel Flow Gage. (Refer to 77-10)

(3) Operational Test - MAP/Fuel Flow Gage

(a) Set BAT 1 switch to ON position.

(b) Verify manifold pressure gage indicates the current barometric pressure ±0.5 inHg.

(c) Verify fuel flow gage indicates zero.

(d) Set BAT 1 switch to OFF position.

F. Map Gage - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* **(See Figure 77-102)**

Note: Manifold pressure is displayed electronically on the MFD and PFD screens.

(1) Operational Test - MAP Gage
  (a) Set BAT1 and AVIONICS switches to ON positions.
  (b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
  (c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
  (d) Rotate left knob to select Engine page.
  (e) Verify manifold pressure display indicates the current barometric pressure ±0.5 inHg.
  (f) Set BAT1 and AVIONICS switches to OFF positions.

G. Map Gage - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 77-102)

Note: Manifold pressure is displayed electronically on the MFD and PFD screens.

(1) Operational Test - MAP Gage
   (a) Set BAT1 and AVIONICS switches to ON positions.
   (b) On MFD, follow on-screen instructions to enter normal MFD operation.
   (c) Press [Engine] to select Engine page.
   (d) Verify manifold pressure display indicates the current barometric pressure ±0.5 inHg.
   (e) Set BAT1 and AVIONICS switches to OFF positions.

H. Manifold Pressure Sensor (See Figure 77-102)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - Manifold Pressure Sensor
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull ENGINE INSTRUMENT circuit breaker.
  (c) Remove engine cowling. (Refer to 71-10)
  (d) Disconnect electrical connector from sensor.
  (e) Remove sensor from engine manifold.

(2) Installation - Manifold Pressure Sensor
  (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	565	Any Source	MAP sensor installation.

  (b) Apply Loctite® to sensor threads.
  (c) Position sensor to engine manifold and install.
  (d) Connect electrical connector to sensor.
  (e) Install engine cowling. (Refer to 71-10)
  (f) Reset ENGINE INSTRUMENT circuit breaker.

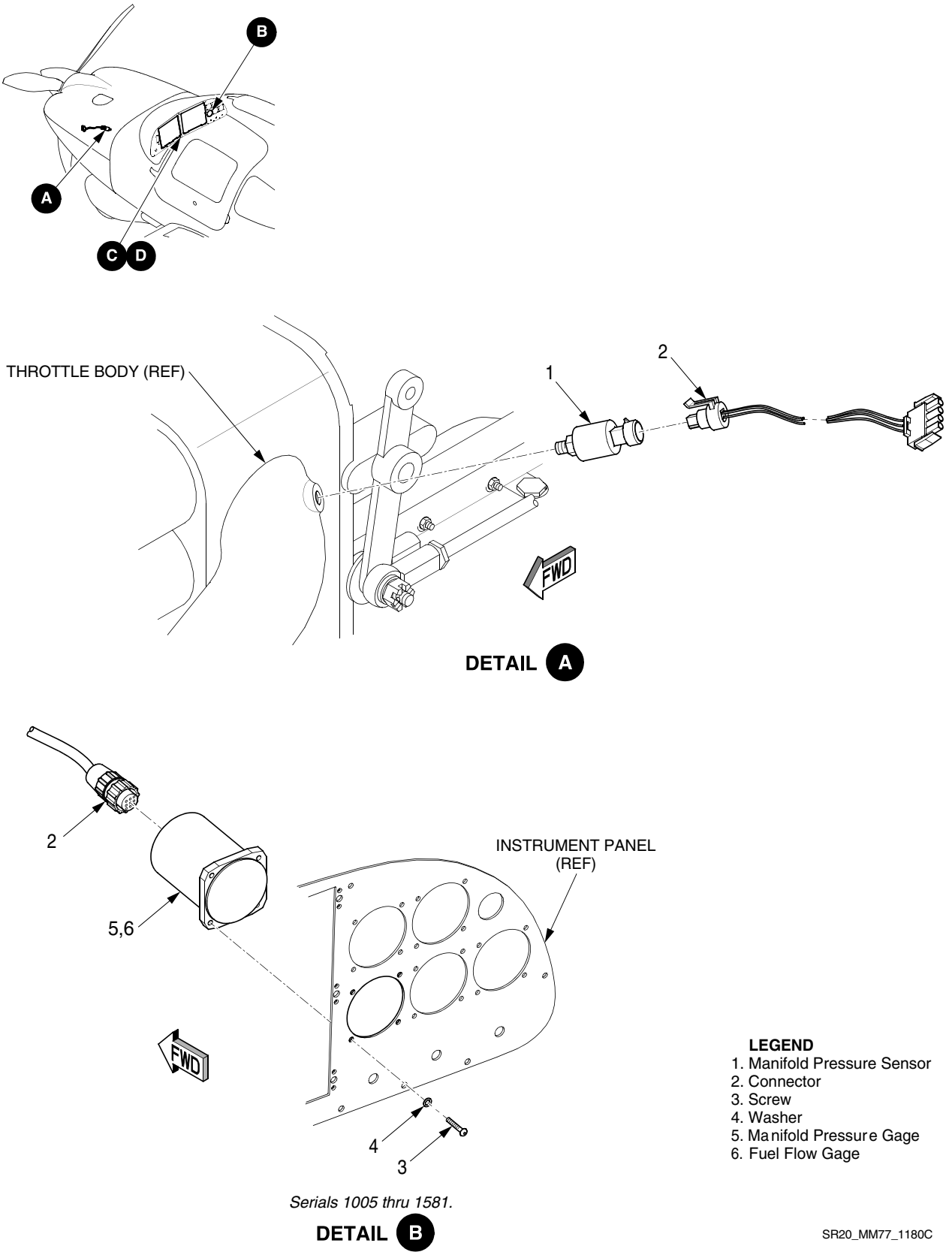
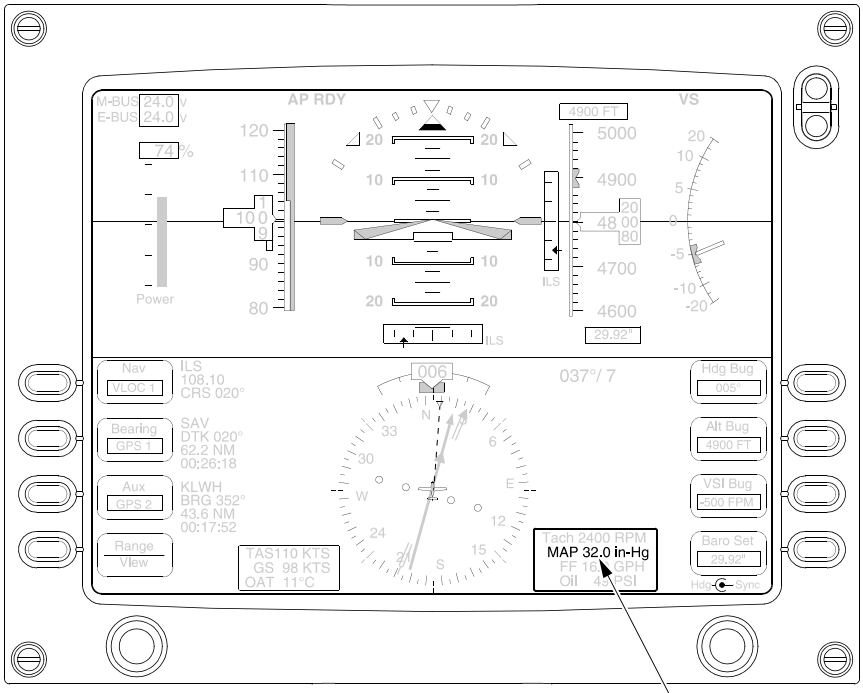
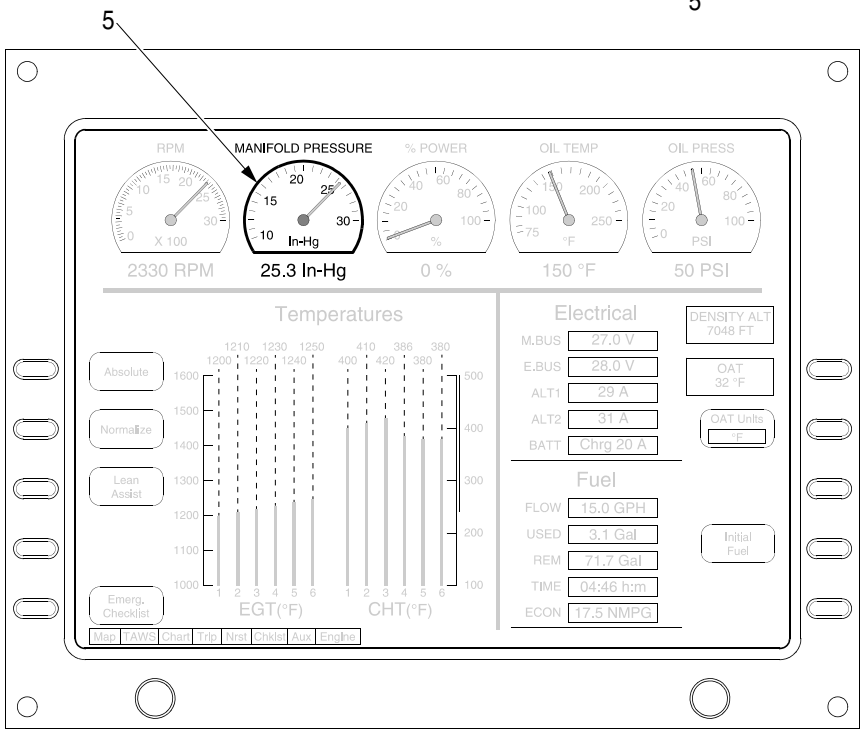


Figure 77-102
MAP/Fuel Flow Indication - Serials 1005 thru 1581 (Sheet 1 of 3)

EFFECTIVITY:
Serials 1005 thru 1581



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

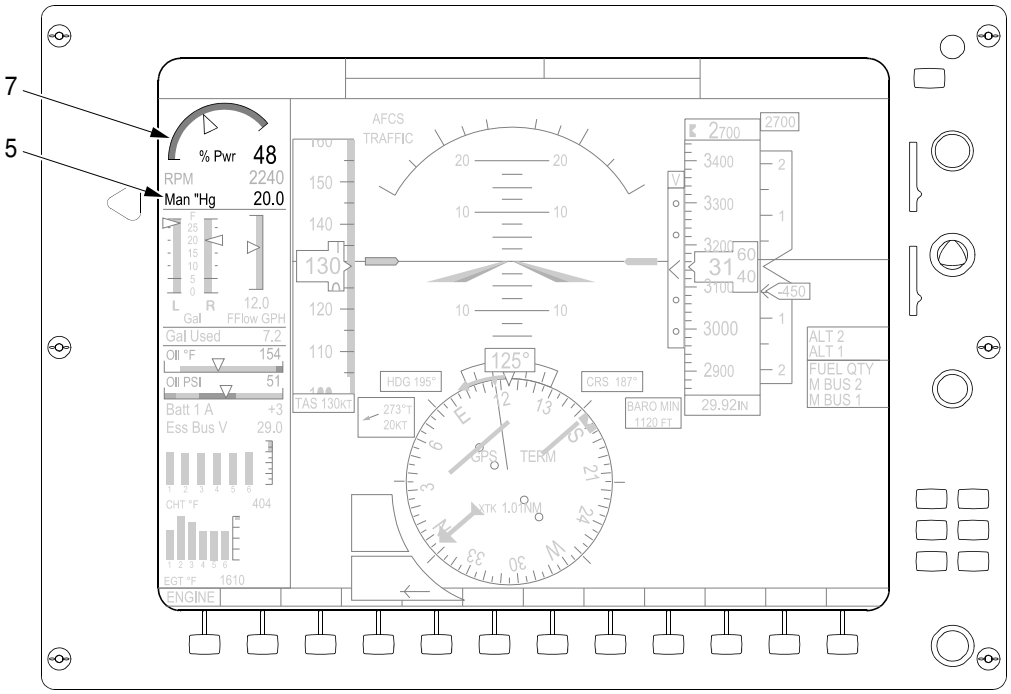
Serials 1582 thru 2015,
2016 & subs w/o Perspective Avionics.

DETAIL C

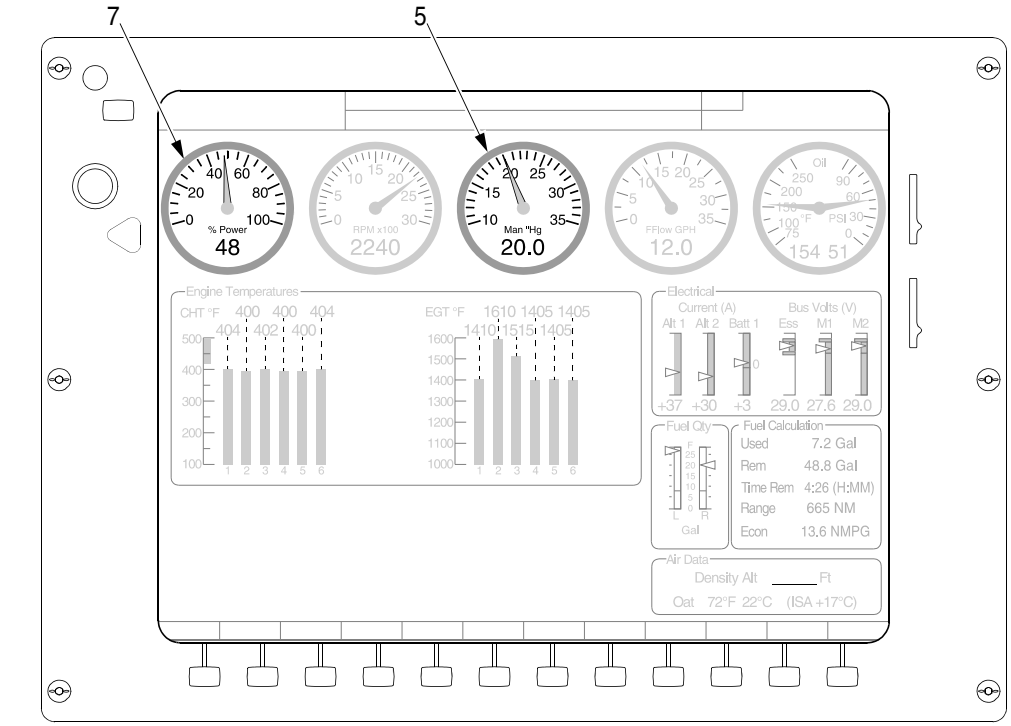
LEGEND
5. Manifold Pressure Gage

SR20_MM77_2233B

Figure 77-102
MAP Indication - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 2 of 3)



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

LEGEND
5. Manifold Pressure Gage
7. Percent Power Gage

DETAIL D

Serials 2016 & subs w/ Perspective Avionics.

SR20_MM77_2869C

Figure 77-102
MAP Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 3 of 3)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

TEMPERATURE

1. DESCRIPTION

This section describes that portion of the engine indicating system which indicates temperature. Included is the EGT/CHT gage and sensors.

A. EGT/CHT Gage And Sensors - *Serials w/o EMax™ Engine Monitoring and w/o Perspective Avionics*

Serials 1005 thru 1581: The EGT and CHT indicators receive temperature signals from sensors mounted in the exhaust stream of the #6 cylinder exhaust pipe and #2 cylinder head respectively.

Serials 1582 & subs: The EGT and CHT indicators receive temperature signals from sensors mounted in the exhaust stream of the #4 cylinder exhaust pipe and #6 cylinder head respectively.

Serials 1005 thru 1581: A 2¼" combination Exhaust Gas Temperature (EGT) and Cylinder Head Temperature (CHT) indicator is mounted in the right instrument panel. The electrically operated EGT pointer sweeps a scale marked from 1250° F to 1650° F in 25° F increments. The EGT scale has no limit markings. The electrically operated CHT pointer sweeps a scale marked from 200° F to 500° F. 28 VDC for instrument operation and lighting is supplied through the 5-amp ENGINE INST circuit breaker on either the Essential Bus (Serials 1005 thru 1267) or the Main Bus 1 (Serials 1268 & subs).

Serials 1582 & subs: EGT and CHT readings are displayed on the Multi-Function Display (MFD) as vertical bars that ascend and descend respective to increasing and decreasing temperatures. The EGT and CHT indicators receive temperature signals from sensors via the Data Acquisition Unit (DAU). The EGT bar and graph is marked from 1000° F to 1600° F in 100° F increments. The EGT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether EGT is rising or falling. The CHT bar and graph is marked from 100° F to 500° F in 100° F increments. The CHT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether CHT is rising or falling. In the event CHT exceeds 420° F, the MFD will display "Check CHT" in a yellow advisory box in the lower right corner of the MFD. If CHT exceeds 460° F, the MFD will display "Check CHT" in a red advisory box in the lower right corner of the MFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Note: *Serials 1337 thru 1581 w/ SRV:* Exhaust Gas Temperature (EGT) and Cylinder Head Temperature (CHT) indication is not available on these airplanes unless equipped with optional EMax engine monitoring.

B. EGT/CHT Gage And Sensors - Serials w/ EMax™ Engine Monitoring *and w/o Perspective Avionics*

The EGT and CHT indicators receive temperature signals from sensors mounted in all six exhaust pipes and cylinder heads respectively. MFD functionality is enhanced by displaying six channels of EGT and CHT data.

Serials 1232 thru 1581, Serials 1005 thru 1231 after SB 20-77-01: EGT and CHT readings are displayed on the Multi-Function Display (MFD) as vertical bars that ascend and descend respective to increasing and decreasing temperatures. The EGT and CHT indicators receive temperature signals from sensors via the Sensor Interface Unit (SIU). The EGT bar and graph is marked from 1000° F to 1600° F in 100° F increments. The EGT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether EGT is rising or falling. The CHT bar and graph is marked from 100° F to 500° F in 100° F increments. The CHT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether CHT is rising or falling. In the event CHT exceeds 420° F, the MFD will display "Check CHT" in a yellow advisory box in the lower right corner of the MFD. If CHT exceeds 460° F, the MFD will display "Check CHT" in a red advisory box in the lower right corner of the MFD. 28 VDC for instrument operation and lighting is supplied through the 5-amp ENGINE INST circuit breaker on the Main Bus 1.

Serials 1582 & subs: EGT and CHT readings are displayed on the Multi-Function Display (MFD) as vertical bars that ascend and descend respective to increasing and decreasing temperatures. The EGT and CHT indicators receive temperature signals from sensors via the Data Acquisition Unit (DAU). The EGT bar and graph is marked from 1000° F to 1600° F in 100° F increments. The EGT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether EGT is rising or falling. The CHT bar and graph is marked from 100° F to 500° F in 100° F increments. The CHT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether CHT is rising or falling. In the event CHT exceeds 420° F, the MFD will display “Check CHT” in a yellow advisory box in the lower right corner of the MFD. If CHT exceeds 460° F, the MFD will display “Check CHT” in a red advisory box in the lower right corner of the MFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

C. EGT/CHT Gage and Sensors - *Serials 2016 & subs w/ Perspective Avionics*

EGT and CHT readings are displayed on the MFD and PFD as vertical bars that ascend and descend respective to increasing and decreasing temperatures. The EGT and CHT indicators receive temperature signals from sensors via the Data Acquisition Unit (DAU). The EGT bar and graph is marked from 1000° F to 1600° F in 100° F increments. The EGT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether EGT is rising or falling. The CHT bar and graph is marked from 100° F to 500° F in 100° F increments. The CHT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether CHT is rising or falling. In the event CHT exceeds 420° F, the PFD will display “Check CHT” in a yellow advisory box in the lower right corner of the PFD. If CHT exceeds 460° F, the PFD will display “Check CHT” in a red advisory box in the lower right corner of the PFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

2. MAINTENANCE PRACTICES

A. EGT/CHT Gage - *Serials 1005 thru 1581 w/o EMax Engine Monitoring* (See Figure 77-201)

(1) Removal - EGT/CHT Gage

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENGINE INSTRUMENT circuit breaker.

(c) Remove glareshield. (Refer to 25-10)

(d) Disconnect electrical connector from gage.

(e) Remove screws and washers securing gage to instrument panel. Remove gage from airplane.

(2) Installation - EGT/CHT Gage

(a) Position gage to instrument panel and secure with screws and washers.

(b) Connect electrical connector to gage.

(c) Install glareshield. (Refer to 25-10)

(d) Reset ENGINE INSTRUMENT circuit breaker.

(e) Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)

(3) Operational Test - EGT/CHT Gage

(a) Set BAT 1 switch to ON position.

(b) Verify EGT needle indicates temperature reading.

(c) Verify CHT needle indicates temperature reading.

(d) Set BAT 1 switch to OFF position.

B. EGT/CHT Gage - *Serials 1005 thru 1581 w/ EMax Engine Monitoring, 1582 & subs* (See Figure 77-201)

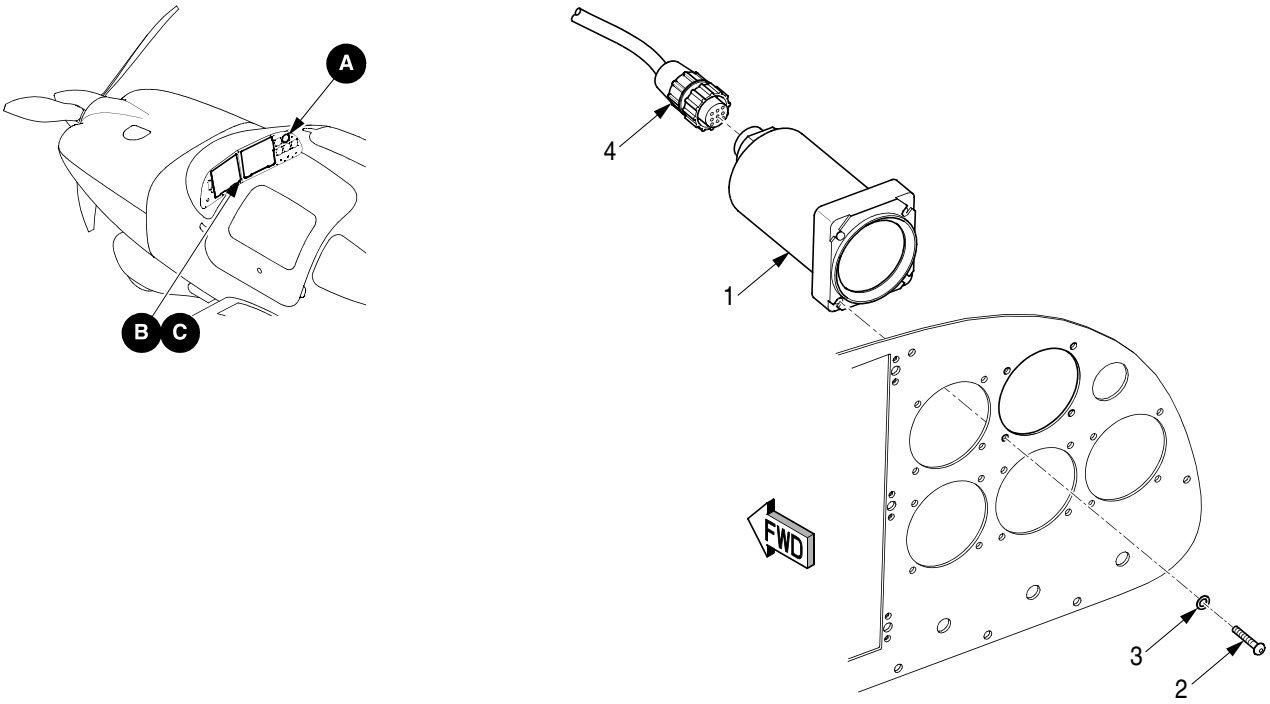
EGT and CHT readings are displayed on the MFD.

(1) Operational Test - EGT/CHT Gage - *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics*

(a) Set BAT1 and AVIONICS switches to ON positions.
(b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.
(c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.
(d) Rotate left knob to select Engine page.
(e) Verify EGT display indicates temperature reading.
(f) Verify CHT display indicates temperature reading.
(g) Set BAT1 and AVIONICS switches to OFF positions.

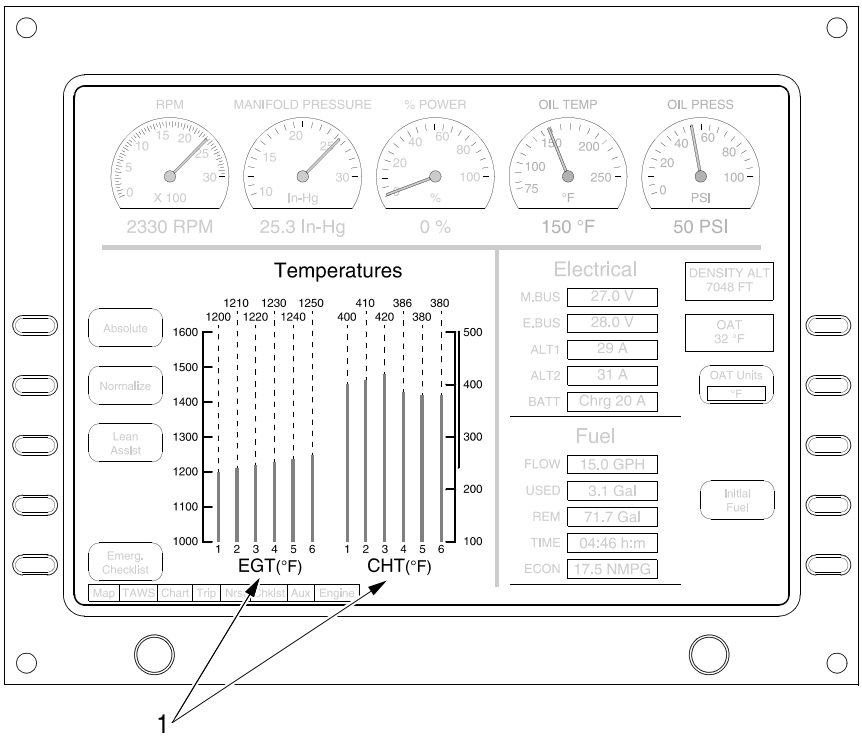
(2) Operational Test - EGT/CHT Gage - *Serials 2016 & subs w/ Perspective Avionics*

(a) Set BAT1 and AVIONICS switches to ON positions.
(b) On MFD, follow on-screen instructions to enter normal MFD operation.
(c) Press [Engine] to select Engine page.
(d) Verify EGT display indicates temperature reading.
(e) Verify CHT display indicates temperature reading.
(f) Set BAT1 and AVIONICS switches to OFF positions.



Serials 1005 thru 1581.

DETAIL A



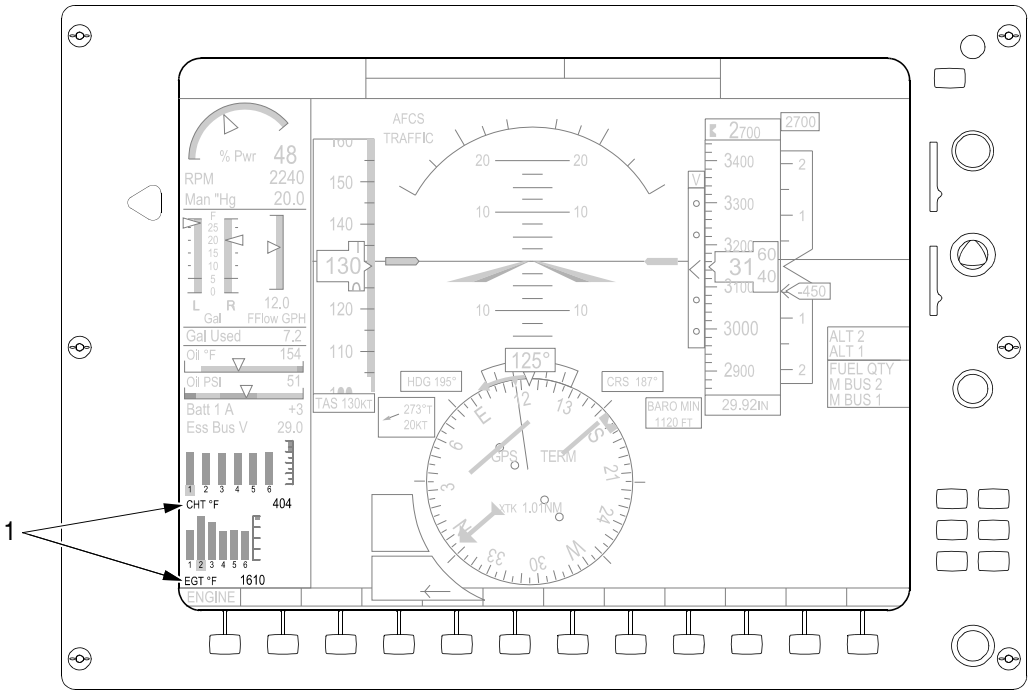
Serials 1005 thru 1581 w/ EMax Engine Monitoring, 1582 thru 2015, 2016 & subs w/o Perspective Avionics.

DETAIL B

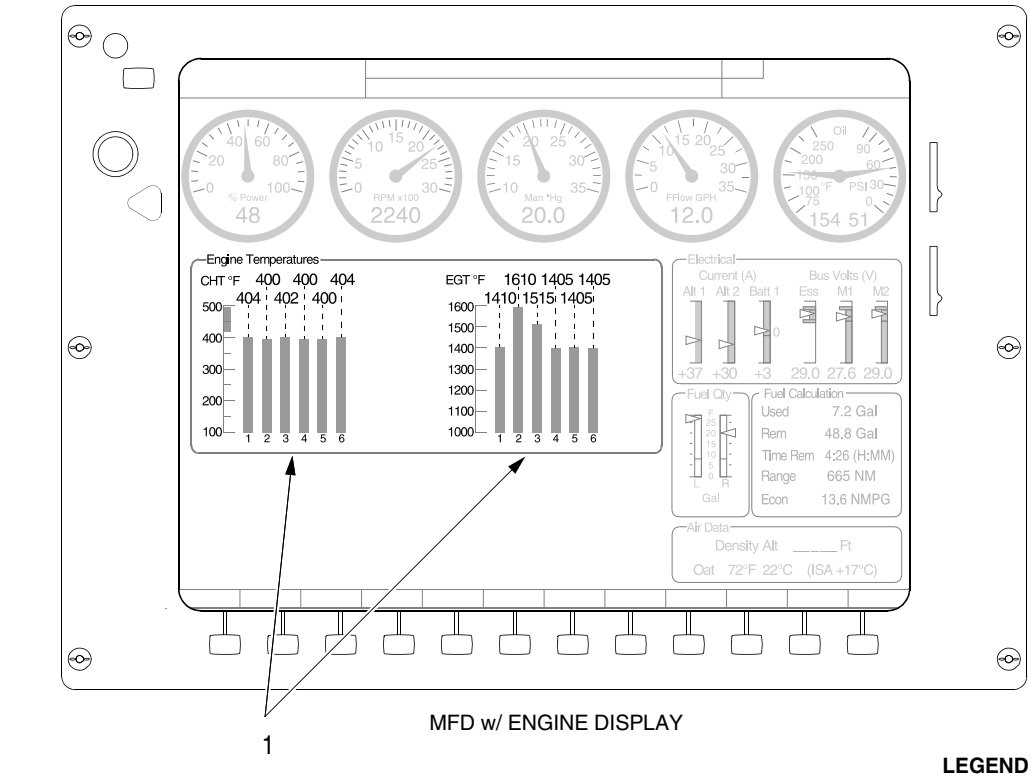
LEGEND
1. EGT/CHT Gage
2. Screw
3. Washer
4. Connector

SR20_MM77_2222A

Figure 77-201
EGT/CHT Indication - Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 1 of 2)



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

LEGEND
1. EGT / CHT Gage

Serials 2016 & subs w/ Perspective Avionics.

DETAIL C

SR20_MM77_2871A

Figure 77-201
EGT/CHT Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 2 of 2)

C. EGT Sensor - *Serials 1005 thru 1183* (See Figure 77-202)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - EGT Sensor
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) Pull ENGINE INSTRUMENT circuit breaker.
  (c) Remove engine cowling. (Refer to 71-10)
  (d) Remove insulation covering sensor wiring and disconnect.
  (e) Remove clamp securing sensor assembly to exhaust pipe.
  (f) Remove sensor seal, sensor thimble, sensor, and clamp from exhaust pipe.

(2) Installation - EGT Sensor
  (a) Position seal, thimble, and clamp over exhaust pipe hole.
  (b) Tighten clamp securing components to exhaust pipe. Torque screw to 45.0 in-lb (5.08 Nm).
  (c) Insert and firmly press sensor into thimble until sensor snaps into place.
  (d) Place insulation over sensor wire, connect sensor lead to harness, slide insulation over junction and secure with cable ties.
  (e) Reset ENGINE INSTRUMENT circuit breaker.
  (f) Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
  (g) Install engine cowling. (Refer to 71-10)

D. EGT Sensor - *Serials 1184 & subs* (See Figure 77-202)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - EGT Sensor
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ENGINE INSTRUMENT circuit breaker.
- (c) Remove engine cowling. (Refer to 71-10)
- (d) Remove cable ties securing wire loom around sensor wiring.
- (e) Disconnect sensor wiring from wire harness.
- (f) Remove screw securing clamp to exhaust pipe.
- (g) Remove sensor assembly from exhaust pipe.
- (h) Remove clamp and sensor assembly from airplane.

(2) Installation - EGT Sensor
- (a) Position sensor assembly and clamp to exhaust pipe.
- (b) Install screw securing clamp to exhaust pipe. Torque screw to 45.0 in-lb (5.08 Nm).
- (c) Connect sensor wiring to wire harness.
- (d) Position wire loom around sensor wiring and secure with cable ties.
- (e) Reset ENGINE INSTRUMENT circuit breaker.
- (f) *Serials 1184 thru 1581 w/o EMax Engine Monitoring:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (g) *Serials 1184 thru 2015, 2016 & subs w/o Perspective Avionics:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (h) *Serials 2016 & subs w/ Perspective Avionics:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (i) Install engine cowling. (Refer to 71-10)

E. CHT Sensor (See Figure 77-202)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - CHT Sensor
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ENGINE INSTRUMENT circuit breaker.
- (c) Remove engine cowling. (Refer to 71-10)
- (d) Remove cable ties securing wire loom around sensor wiring.
- (e) Disconnect sensor wiring from wire harness.
- (f) Remove nut securing sensor to cylinder head. Remove sensor from airplane.

(2) Installation - CHT Sensor

CAUTION: Ensure a minimum clearance of 0.2 inch (5.1 mm) between CHT sensor and cylinder fuel drain line. If necessary, manually adjust fuel drain line to obtain clearance. Verify no sharp kinks, bends, or local low points exist in the fuel drain line.

- (a) Position sensor to cylinder head and secure with nut.
- (b) Connect sensor wiring to wire harness.
- (c) Position wire loom around sensor wiring and secure with cable ties.
- (d) Reset ENGINE INSTRUMENT circuit breaker.
- (e) *Serials 1005 thru 1581 w/o EMax Engine Monitoring:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (f) *Serials 1005 thru 2015, 2016 & subs w/o Perspective Avionics:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (g) *Serials 2016 & subs w/ Perspective Avionics:* Perform Operational Test - EGT/CHT Gage. (Refer to 77-20)
- (h) Install engine cowling. (Refer to 71-10)

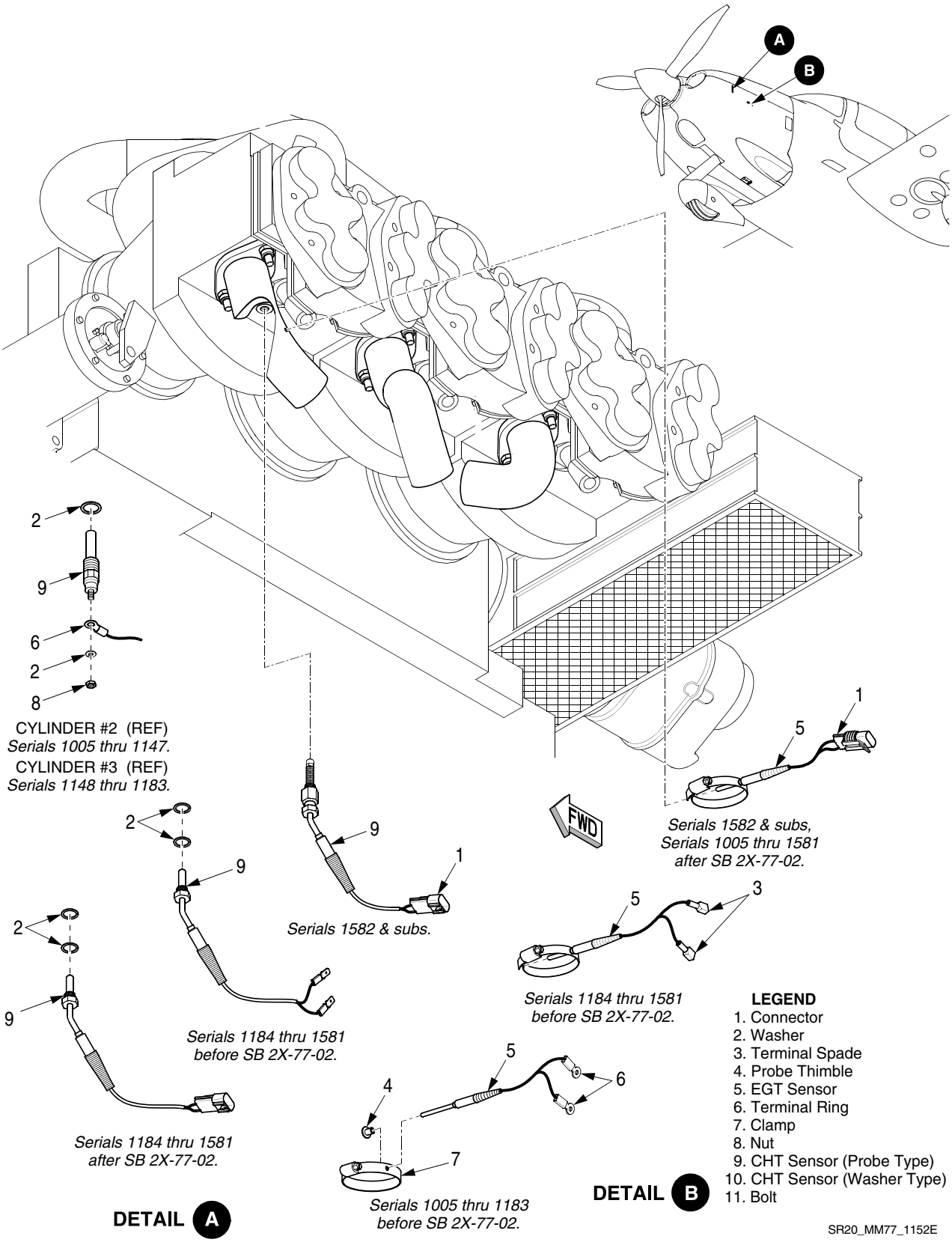


Figure 77-202
EGT/CHT Sensors Installation

ANALYZERS - ENGINE MONITORING

1. DESCRIPTION

This section describes that portion of the engine indicating system which is used to analyze engine performance, temperature, and condition.

Serials 1005 thru 1581 w/ EMax Engine Monitoring: Engine instrumentation is displayed on the Multi-Function Display (MFD). The Sensor Interface Unit (SIU), mounted above the RH kickplate, converts analog signals from the engine and fuel sensors to digital format, which is then transmitted to the MFD. The MFD displays fuel flow, nautical miles per gallon, fuel remaining, fuel-to-waypoint, fuel-to-destination, cylinder head temperatures (CHT), exhaust gas temperatures (EGT), engine crankshaft speed, manifold pressure, percent power, oil temperature, oil pressure, outside air temperature (OAT), and electrical bus voltages. EGT and CHT sensors are mounted to all six exhaust pipes and cylinder heads respectively. MFD functionality is enhanced by displaying six channels of EGT and CHT data. 28 VDC for system operation is suppled through the 5-amp ENGINE INST circuit breaker located on Main Bus 1.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Engine instrumentation is displayed on the Primary Flight Display (PFD) and Multi-Function Display (MFD). The Data Acquisition Unit (DAU), mounted above the RH kickplate, converts analog signals from the engine and fuel sensors to digital format, which is then transmitted to the MFD and PFD. The PFD displays percent power, engine crankshaft speed, manifold pressure, fuel flow, and oil pressure. The MFD displays fuel flow, nautical miles per gallon, fuel remaining, fuel-to-waypoint, fuel-to-destination, cylinder head temperatures (CHT), exhaust gas temperatures (EGT), engine crankshaft speed, manifold pressure, percent power, oil temperature, oil pressure, outside air temperature (OAT), and electrical bus voltages. The DAU replaces all of the signal conditioning, sensor excitation and warning light outputs that had been a function of the engine gages. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Serials 1582 thru 2015, 2016 & subs w/ EMax Engine Monitoring and w/o Perspective Avionics: EGT and CHT sensors are installed to each exhaust pipe and cylinder head respectively. MFD functionality is enhanced by displaying six channels of EGT and CHT data.

Serials 2016 & subs w/ Perspective Avionics: Engine instrumentation is displayed on the Primary Flight Display (PFD) and Multi-Function Display (MFD). The GEA 71 engine airframe unit, mounted behind the MFD, converts analog signals from the engine and fuel sensors to digital format, which is then transmitted to the MFD and PFD. The PFD displays percent power, engine crankshaft speed, manifold pressure, fuel flow, and oil pressure. The MFD displays fuel flow, nautical miles per gallon, fuel remaining, fuel-to-waypoint, fuel-to-destination, cylinder head temperatures (CHT), exhaust gas temperatures (EGT), engine crankshaft speed, manifold pressure, percent power, oil temperature, oil pressure, outside air temperature (OAT), and electrical bus voltages. The GEA 71 engine airframe unit replaces all of the signal conditioning, sensor excitation and warning light outputs that had been a function of the Data Acquisition Unit (DAU). 28 VDC for the digital instrument operation is supplied through the 3-amp ENGINE INSTR circuit breaker on Essential Bus 2.

The GEA 71 engine airframe unit is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-00)

For maintenance practices pertinent to the engine crankshaft speed and manifold pressure sensors, see the Power section of Engine Indicating. (Refer to 77-10)

For maintenance practices pertinent to the CHT and EGT sensors, see the Temperature section of Engine Indicating. (Refer to 77-20)

For maintenance practices pertinent to the oil temperature and oil pressure sensors, see the Indicating section of Oil. (Refer to 79-30)

For maintenance practices pertinent to the OAT sensor, see the Flight Environment Pitot-Static Systems section of Navigation and Pitot-Static Systems. (Refer to 34-10)

2. TROUBLESHOOTING

Serials 2016 & subs w/ Perspective Avionics:

Trouble	Probable Cause	Remedy
Engine airframe sensors not receiving valid data.	Software or configuration error.	Check PFD Alert Window for GIA1, GIA 2, or GEA configuration, software or failed data path error messages. Correct any errors before proceeding. On PFD in Configuration Mode, turn to GEA STATUS page and verify that GEA internal power supply, configuration, and calibration status boxes are green. 1. If internal power supply box is red, check for shorted engine airframe sensors that receive 5V, 10V or 12V power from GEA (tach sensor, MAP sensor, fuel flow sensor, oil pressure sensor, and pitot heat sensor). 2. The configuration and calibration boxes should be green. If calibration status boxes are red, replace GEA 71. Verify internal, external, and reference voltages listed in the Main Analog and I/O A Analog boxes are not dashed out (does not include Aircraft Power 1 and 2). If any voltages are dashed out, replace GEA 71.
	GEA 71 is offline.	On MFD AUX – SYSTEM STATUS page, verify GEA is online (green checkmark is present). If GEA is not online (Red-X is present), verify the unit is receiving power at GEA rack connector.
	Faulty GEA 71.	Replace GEA 71.
	Faulty wiring and connectors.	Check GIA and GEA interconnect wiring and unit connector pins for faults.

3. MAINTENANCE PRACTICES

A. Sensor Interface Unit (SIU) - *Serials 1005 thru 1581 w/ EMax Engine Monitoring* (See Figure 77-401)

(1) Removal - Sensor Interface Unit

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ENGINE INST circuit breaker.

(c) Remove RH kick plate. (Refer to 25-10)

(d) Disconnect electrical connectors from SIU.

(e) Remove screws, washers, and nuts securing SIU to kick plate. Remove SIU from airplane.

(2) Installation - Sensor Interface Unit

(a) Perform Adjustment/Test - Sensor Interface Unit. (Refer to 77-40)

(b) Position SIU to kick plate and secure with screws, washers, and nuts.

(c) Connect electrical connectors to SIU.

(d) Install RH kick plate. (Refer to 25-10)

(e) Reset ENGINE INST circuit breaker.

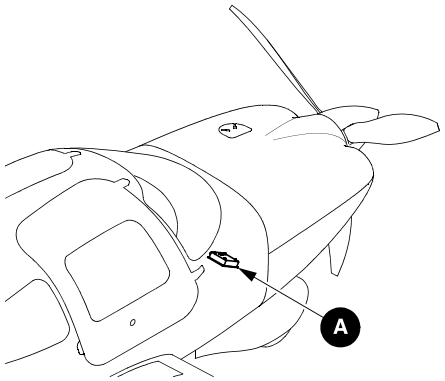
(3) Adjustment/Test - Sensor Interface Unit

CAUTION: DIP switches must be set to the proper configuration or the Sensor interface unit could send inaccurate data to the MFD. Exercise caution when setting DIP switches. Sensor interface units installed in accordance with Service Bulletin SB 20-77-01 use different DIP switch settings than sensor interface units installed during airplane production. The sensor interface unit is considered non-adjustable, once the unit has the switches set to the proper configuration, no further adjustment is required.

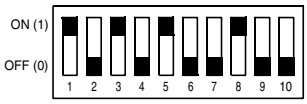
(a) Remove screws securing DIP switch cover to SIU.

(b) Reset DIP switches in accordance with Figure 77-301. (See Figure 77-401)

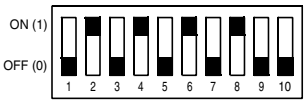
(c) Position DIP switch cover to SIU and secure with screws.



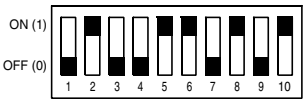
DIP SWITCH SETTINGS										
SR20 AIRPLANE SERIALS	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
1005 - 1147 after SB 20-77-01	1	0	1	0	1	0	0	1	0	0

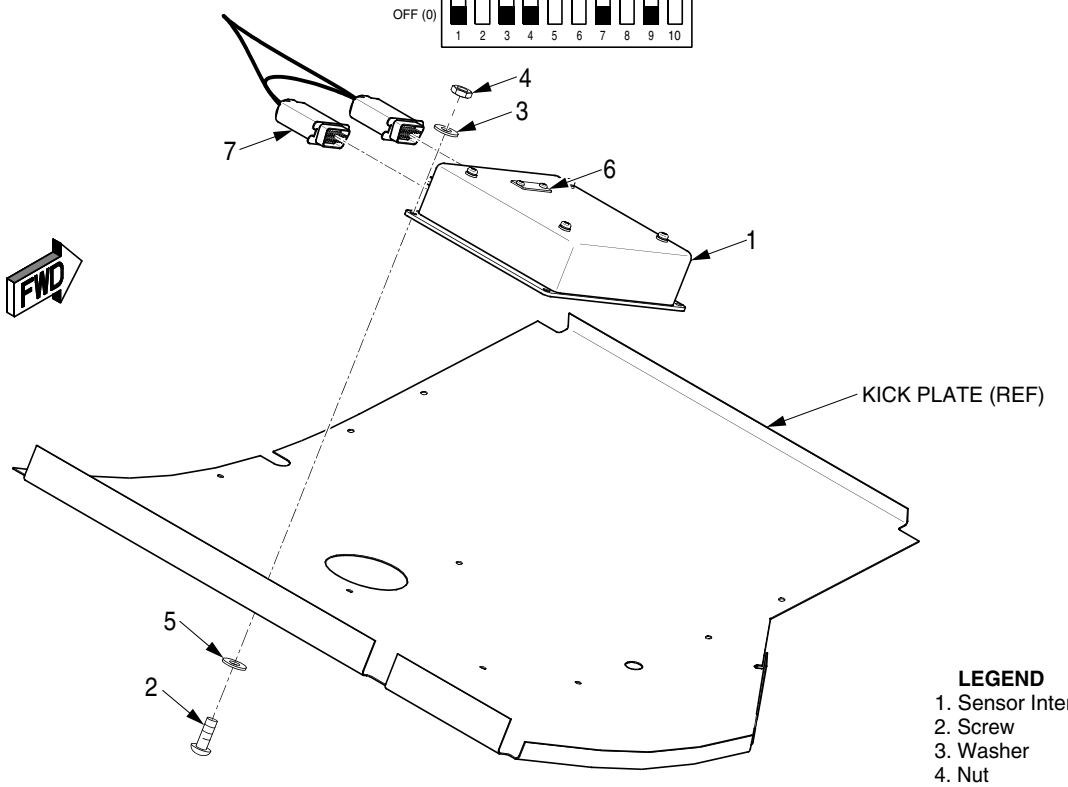


DIP SWITCH SETTINGS										
SR20 AIRPLANE SERIALS	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
1148 - 1231 after SB 20-77-01	0	1	0	1	0	1	0	1	0	0



DIP SWITCH SETTINGS										
SR20 AIRPLANE SERIALS	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
1232 and subsequent	0	1	0	0	1	1	0	1	0	1





Serials 1005 thru 1581 w/ EMax Engine Monitoring.

DETAIL A

LEGEND
1. Sensor Interface Unit
2. Screw
3. Washer
4. Nut
5. Nylon Washer
6. DIP Switch Cover
7. Connector

SR20_MM77_1593

Figure 77-401
Sensor Interface Unit Installation - *Serials 1005 thru 1581 w/ EMax Engine Monitoring*

EFFECTIVITY:
Serials 1005 thru 1581 w/ EMax Engine Monitoring

B. Data Acquisition Unit - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 77-402)

(1) Removal - Data Acquisition Unit (DAU)

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ANNUN / ENGINE INST circuit breaker.

(c) Remove RH kick plate. (Refer to 25-10)

(d) Disconnect electrical connectors from DAU.

(e) Remove screws, washers, and nuts securing DAU to kick plate. Remove DAU from airplane.

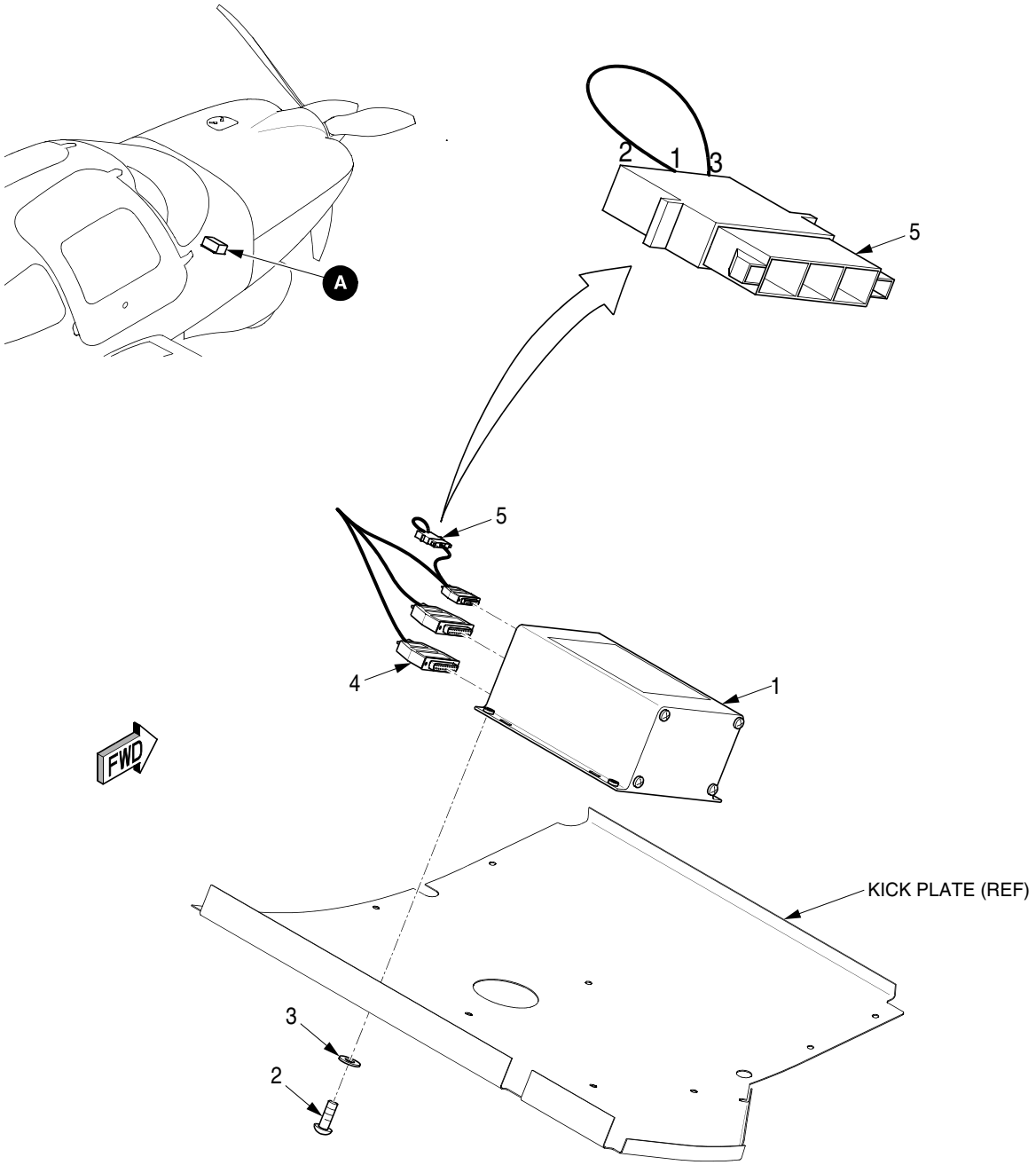
(2) Installation - Data Acquisition Unit (DAU)

(a) Position DAU to kick plate and secure with screws, washers, and nuts.

(b) Connect electrical connectors to DAU.

(c) Install RH kick plate. (Refer to 25-10)

(d) Reset ANNUN / ENGINE INST circuit breaker.



LEGEND
1. Data Acquisition Unit
2. Screw
3. Washer
4. Connector
5. Model Identification Jumper

DETAIL A

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics

SR20_MM77_2211A

Figure 77-402
Data Acquisition Unit Installation - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics

EFFECTIVITY:
Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics

C. GEA 71 Engine Airframe Unit - *Serials 2016 & subs w/ Perspective Avionics* **(See Figure 77-403)**

(1) Removal - GEA 71 Engine Airframe Unit

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull ANNUN / ENGINE INST circuit breaker.

(c) Remove MFD. (Refer to 31-60)

(d) Loosen screw securing handle-lock mechanism to engine airframe unit.

(e) Lift handle-lock mechanism to disengage engine airframe unit from connectors.

(f) Remove engine airframe unit from mounting rack.

(2) Installation - GEA 71 Engine Airframe Unit

(a) Position engine airframe unit to mounting rack, ensuring handle-lock mechanism engages slot on side of rack.

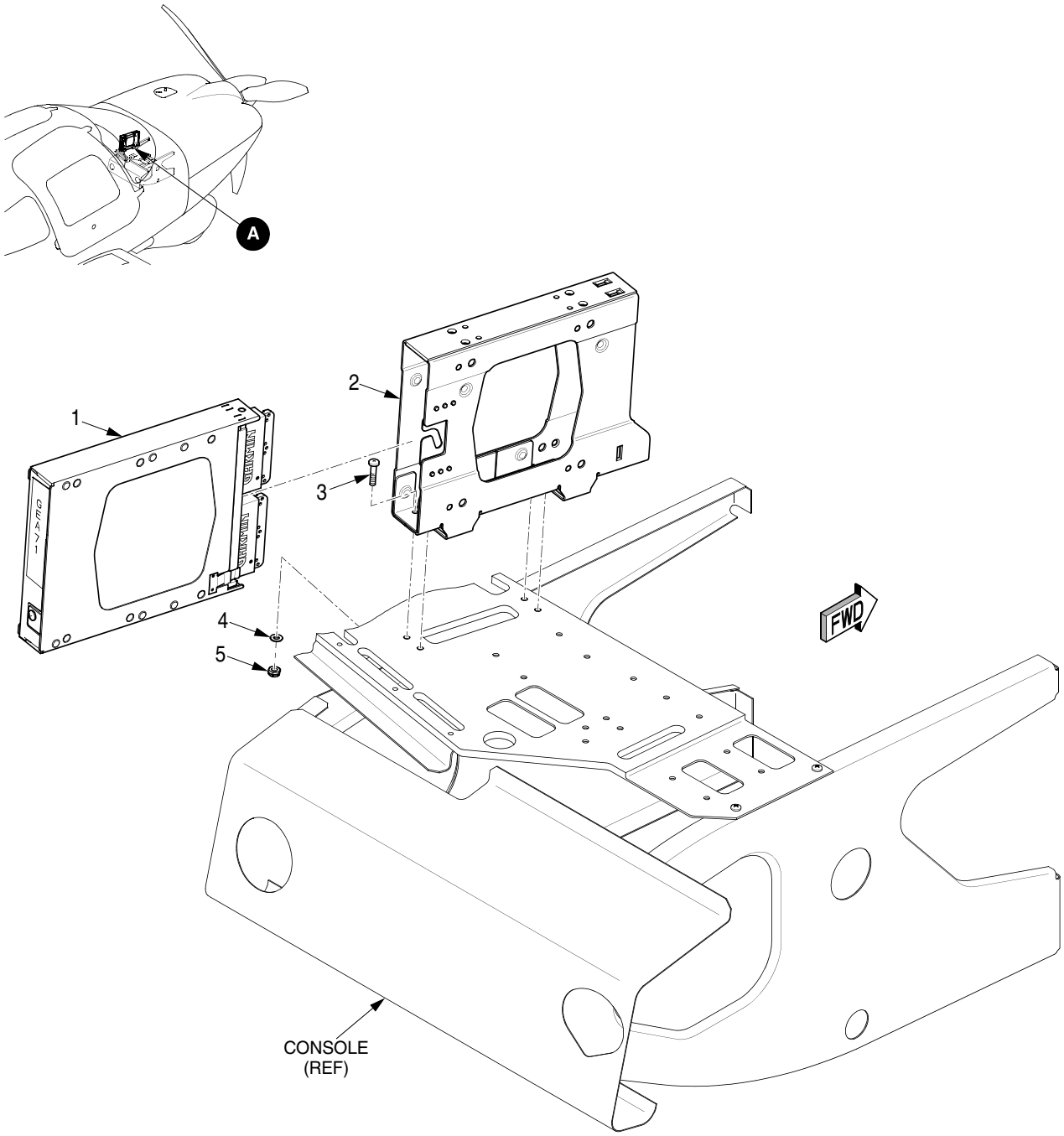
(b) Using handle-lock mechanism, gently push engine airframe unit into mounting rack to engage connectors.

(c) Tighten screw securing handle-lock mechanism to engine airframe unit.

(d) Install MFD. (Refer to 31-60)

(e) Reset ANNUN / ENGINE INST circuit breaker.

(f) If GEA 71 has been replaced with a new or different unit, or original unit has been repaired, perform Adjustment/Test - Component Software and Configuration Loading. (Refer to 42-00)



LEGEND
1. GEA 71 Engine Airframe Unit
2. Rack
3. Screw
4. Washer
5. Nut

DETAIL A

SR20_MM77_2704

Figure 77-403
GEA 71 Engine Airframe Unit Installation - Serials 2016 & subs w/ Perspective Avionics

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

D. Engine Monitoring Recording System - *Serials 1005 & subs w/ EMax Engine Monitoring*

The engine monitoring recording system records and stores engine data on the MFD.

(1) Functional Test - Engine Monitoring System - *Serials 1233 & subs w/ EMax Engine Monitoring*

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
USB Flash Drive	-	Any Source	Record data.
Computer with USB Port	-	Any Source	View data.

(b) Connect blank flash drive to USB port on MFD bezel.

(c) Set BAT 1, BAT 2, and AVIONICS switches to ON positions.

(d) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(e) On MFD, when READY TO WRITE ENGINE DATA TO REMOVABLE MEDIA is displayed, press [Proceed].

(f) On MFD, verify the following:

1 ENGINE DATA LOG TRANSFER IN PROGRESS is displayed.

2 Status Bar displays as data is written.

3 LOG TRANSFER SUCCEEDED is displayed.

4 CONTINUE... is displayed.

(g) Remove data storage device from USB port on MFD.

(h) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(i) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(j) Verify engine data was written to flash drive.

1 Connect flash drive to USB port on computer.

2 Navigate to flash drive and open EngineLog folder.

Note: The engine log files use the following naming convention:

Engine_070207_103017_out.log

where 070207 indicates the date (February 07, 2007) and 103017 indicates the time (10:30:17).

3 Open engine log file corresponding to date of functional test and verify engine data exists for the expected times.

4 If data exists, the engine monitoring recording system is functioning properly.

5 If no data exists, the engine monitoring recording system is malfunctioning. Contact Cirrus Design for disposition.

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CHAPTER 78

EXHAUST

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CHAPTER 78 - EXHAUST

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EXHAUST

1. GENERAL

This chapter describes those units and components which direct the engine exhaust gases overboard.

The exhaust system carries engine exhaust gasses directly from the engine exhaust ports to outside the cowling on the underside of the fuselage. The system is a tuned design, meaning each of the six headers are the same size and the overall length sized to provide optimum scavenging which results in maximum horsepower and engine durability. All exhaust gas components are fabricated from stainless steel and stainless hardware is used in all areas subject to high heat.

The engine exhaust system consists of exhaust headers, collector weldments, heat exchanger, muffler, tailpipes, and associated slip joints, ball joints, butt joints, and fasteners. Each engine cylinder is equipped with an exhaust pipe leading down and alongside of the engine, where the exhaust pipe joins with others at the collector weldment to form the exhaust header assembly. The RH header assembly is attached to a heat exchanger and tailpipe. The LH header assembly is attached to a muffler and tailpipe.

Serials 1005 thru 1422: Ball joints are employed to allow movement due to heat expansion and normal operating loads at the heat exchanger/collector, muffler/collector, heat exchanger/tailpipe, and muffler/tailpipe connections.

Serials 1423 & subs: Ball joints are employed to allow movement due to heat expansion and normal operating loads at the heat exchanger/collector and muffler/collector connections. Butt joints with clamps and sleeves are employed at the tailpipe/heat exchanger and tailpipe/muffler connections.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Excessive engine noise.	Defective heat exchanger or muffler.	Replace or repair heat exchanger or muffler. (Refer to 78-20)
	Crack in exhaust system.	Inspect for leaks or cracks. Repair or replace as required. (Refer to 78-20)
Exhaust gas in cabin.	Defective heat exchanger.	Weld or replace heat exchanger. (Refer to 78-20)
Traces of exhaust gas on cylinder.	Defective gasket on cylinder.	Replace gasket. (Refer to 78-10)
	Bent flange.	Replace leaking exhaust header. (Refer to 78-10)
	Crack on exhaust header.	Replace leaking exhaust header. (Refer to 78-10)

COLLECTOR

1. DESCRIPTION

This section describes the portion of the exhaust system which collects the exhaust gases from the cylinder and conducts them overboard. Included are the exhaust headers and collector weldments that combine to form the exhaust header assemblies.

Each of the six headers are connected to the engine by brass nuts on the engine exhaust studs. Gaskets seal the header to each cylinder.

The three headers on each side of the engine are connected to a collector weldment to form the exhaust header assembly. This collector weldment combines the 3 header pipes on each side of the engine into 1 pipe (per side). Exhaust gases are ported aft from the collector weldment to the heat exchanger on the RH side and the muffler on the LH side. Ball joints and slip joints are employed to allow movement due to heat expansion and normal operating loads.

2. MAINTENANCE PRACTICES

A. Exhaust Header Assembly (See Figure 78-101)

(1) Removal - Exhaust Header Assembly

Note: Individual exhaust headers can be removed from the assembly by removing the brass nuts attaching header to engine cylinder and twisting the header from the collector. The No. 1 header on the RH side and No. 6 header on the LH side are also secured to the collector through a slip joint and spring loaded bolt.

(a) Remove engine cowling. (Refer to 71-10)
(b) Remove tailpipe. (Refer to 78-20)
(c) Remove heat exchanger or muffler. (Refer to 78-20)
(d) Remove EGT probe from No. 6 exhaust header. (Refer to 77-20)
(e) Remove brass nuts attaching exhaust headers to engine cylinders.
(f) Remove exhaust header assembly from airplane.
(g) Remove old gaskets from cylinders.

(2) Installation - Exhaust Header Assembly

Note: Assemble any individual headers to header collector if removed. If No. 1 or No. 6 header was removed, install bolt, washers, spring, and nut securing header to collector. Tighten nut until snug, then turn two additional revolutions to compress spring. Install cotter pin.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Exhaust Header Gasket	630365	TCM	Seal.
Permatex 77124	-	Any Source	Antiseize lubricant.
Emery Cloth	-	Any Source	Polishing.

(b) Polish both sides of slip joint with emery cloth. Ensure surface is smooth and free of burrs.

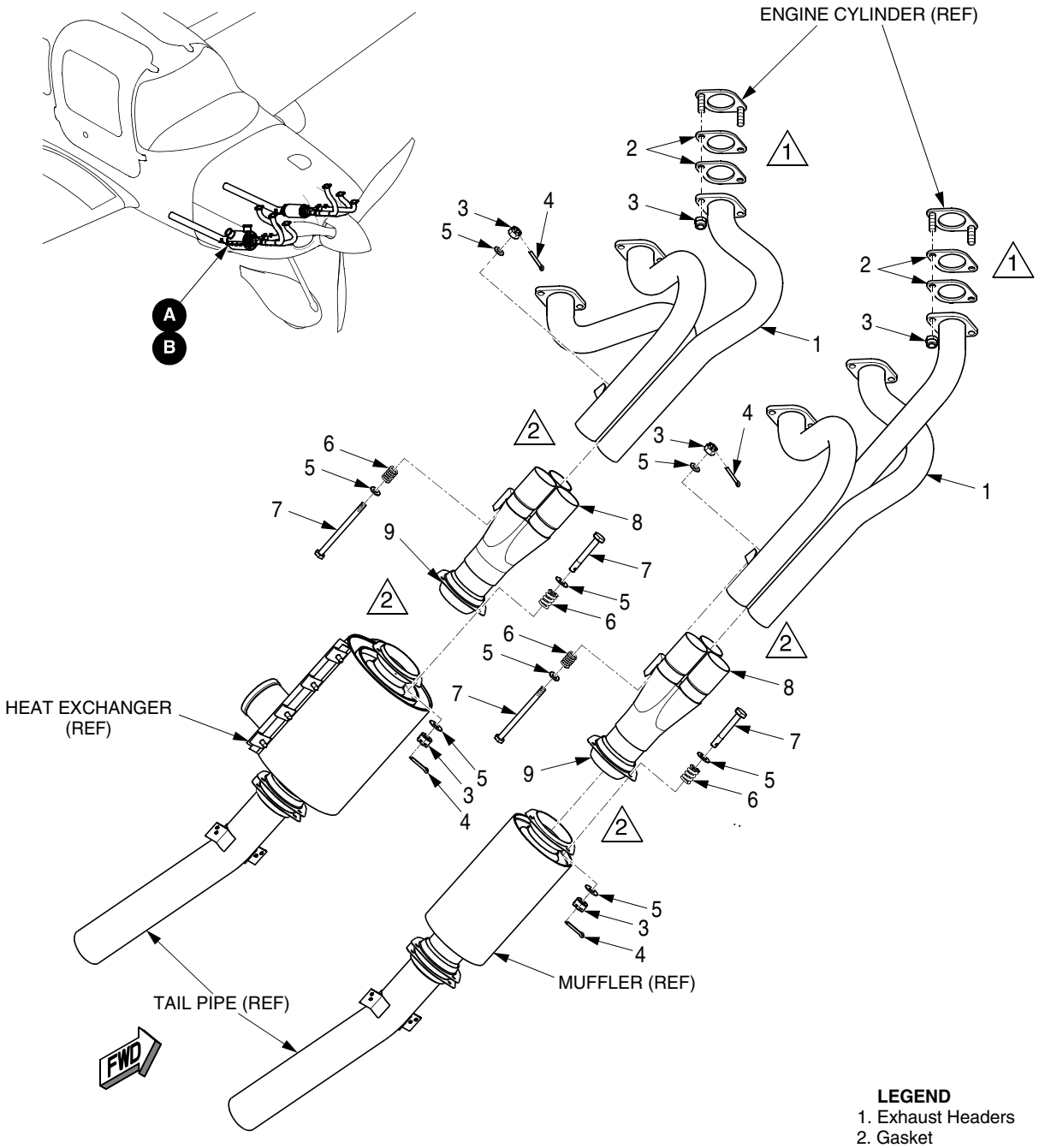
CAUTION: Do not use any antiseize compound containing graphite.

(c) Apply a thin coat of antiseize lubricant to polished ball and slip joint surfaces.
(d) Install exhaust gaskets with concave sides together on cylinder port studs.

CAUTION: Ensure that no pre-load exists on the headers when assembled to the collector and to the cylinders. Misalignment during installation may result in a cracked forward header assembly.

(e) Position exhaust header assembly on cylinder port studs.
(f) Install and torque nuts to 200 - 210 in-lb (22.5 - 23.7 Nm).
(g) Install EGT probe to No. 6 exhaust header. (Refer to 77-20)
(h) Install heat exchanger or muffler. (Refer to 78-20)
(i) Install tailpipe. (Refer to 78-20)
(j) Set BAT 1 switch to ON position.
(k) Start engine in accordance with Pilot's Operating Handbook procedures.

(l) Allow continuous engine run-time with engine at operating temperature.
(m) Shutdown engine in accordance with Pilot's Operating Handbook procedures.
(n) Allow engine to cool for 30 minutes.
(o) Set BAT 1 switch to OFF position.
(p) Re-torque nuts to 200 - 210 in-lb (22.5 - 23.7 Nm).
(q) Install engine cowling. (Refer to 71-10)



Serials 1005 thru 1422.

DETAIL A

LEGEND

1. Exhaust Headers
2. Gasket
3. Nut
4. Cotter Pin
5. Washer
6. Spring
7. Bolt
8. Collector
9. Ball Joint Flange

NOTE

1 Install gaskets with concave sides together.

2 Polish both sides of ball and slip joint with emery cloth to ensure surface is smooth and free of burrs. Apply a thin coat of antiseize lubricant to polished slip joint surfaces.

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Figure 78-101
Exhaust Header Assembly - Serials 1005 thru 1422 (Sheet 1 of 2)

EFFECTIVITY:
Serials 1005 thru 1422

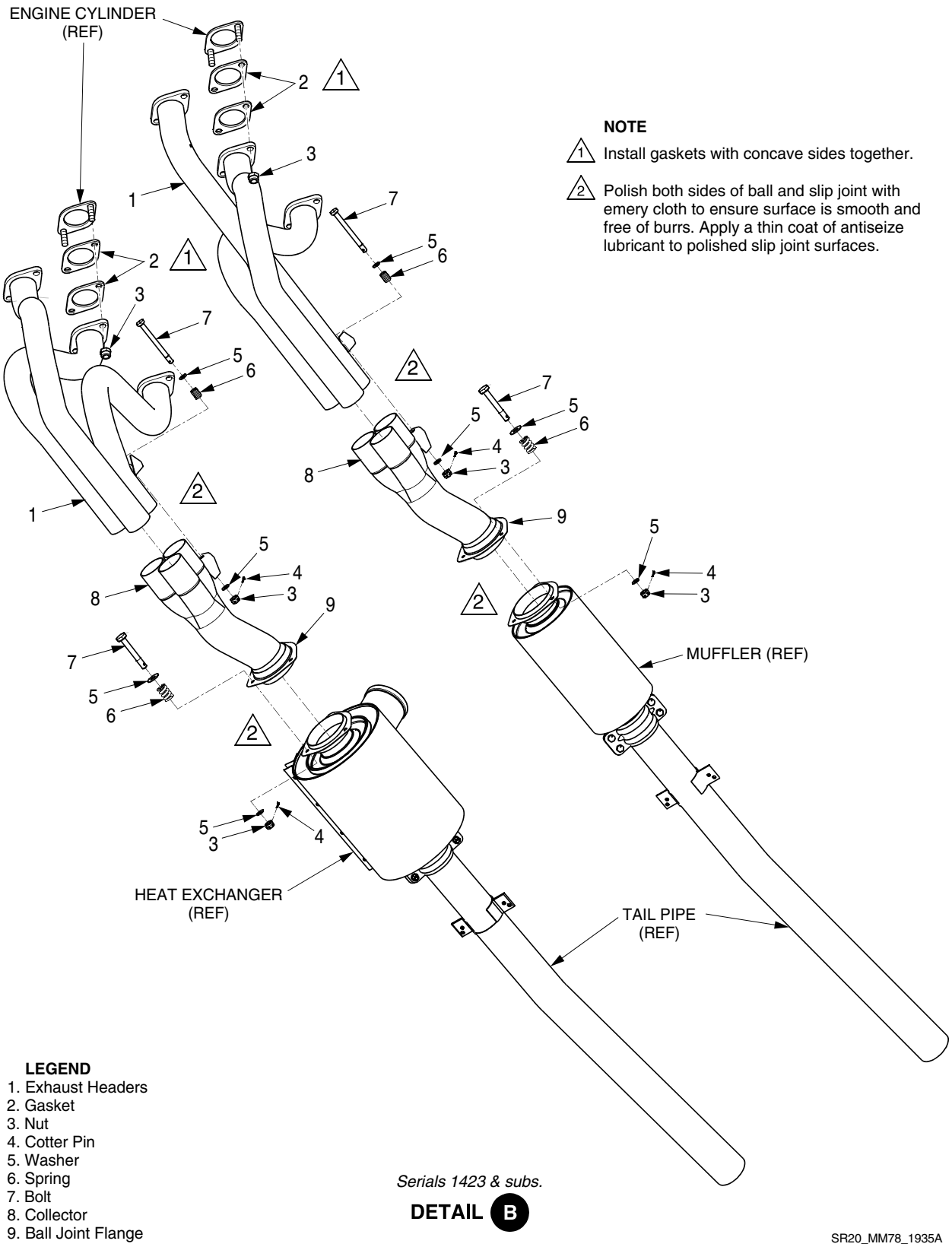


Figure 78-101
Exhaust Header Assembly - Serials 1423 & subs (Sheet 2 of 2)

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NOISE SUPPRESSOR

1. DESCRIPTION

Noise suppression is accomplished through use of a heat exchanger and muffler connected to the exhaust header assemblies.

The heat exchanger incorporates the use of heat sinks welded to the exterior of a muffler and a shroud with accommodations for ducts to provide cabin heating. Positive ventilation of the heat exchanger is provided at all times by air passing through the outer compartment and entering the cabin, or by venting overboard depending on the cabin heat valve position.

Serials 1005 thru 1422: Ball joints connect the heat exchanger and muffler to the header assemblies and exhaust tailpipes, allowing for relative motion between the engine and airframe.

Serials 1423 & subs: Ball joints support the heat exchanger and muffler, allowing for relative motion between the engine and airframe. Butt joints with clamps and sleeves connect the heat exchanger and muffler to the exhaust tailpipes.

2. MAINTENANCE PRACTICES

A. Heat Exchanger (See Figure 78-201)

(1) Removal - Heat Exchanger

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove tailpipe. (Refer to 78-20)

(c) Loosen clamps securing air intake and cabin heat hoses. Remove hoses from heat exchanger.

(d) Remove cotter pins, nuts, springs, washers, and bolts from forward ball joint securing heat exchanger to exhaust header assembly.

(e) Remove heat exchanger from airplane.

(2) Disassembly - Heat Exchanger

(a) Remove screws and nuts securing heat exchanger shroud to heat exchanger.

(3) Assembly - Heat Exchanger

CAUTION: Failure to properly align heat exchanger shroud to heat exchanger will result in poor cabin heating.

(a) Position heat exchanger shroud on heat exchanger so that shroud baffle is located between duct flanges and secure with screws and nuts.

(4) Installation - Heat Exchanger

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permatex K133	-	Any Source	Antiseize lubricant.
Emery Cloth	-	Any Source	Polishing.

(b) Polish both sides of ball joint with emery cloth to ensure surface is smooth and free of burrs.

(c) Apply a thin coat of antiseize lubricant to polished ball joint surfaces.

(d) Position heat exchanger to header assembly and install bolts, springs, washers, and nuts. Tighten nuts until snug, then turn two additional revolutions to compress springs.

(e) Install hose clamps for air intake and cabin heat hoses, and connect both hoses to heat exchanger.

(f) Perform Adjustment/Test - Forward Ball Joints. (Refer to 78-20)

(g) Install tailpipe. (Refer to 78-20)

(h) Install engine cowling. (Refer to 71-10)

(5) Inspection/Check - Heat Exchanger

The heat exchanger must be inspected for secure mounting, leakage, and general condition at each specified Scheduled Maintenance Check and whenever there is suspicion of exhaust gas leakage. Inspect the heat exchanger visually and by pressure check to determine possible leakage which could allow carbon monoxide to enter the heating system.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Rubber Plug	-	Any Source	Plug heat exchanger.
Industrial Vacuum Cleaner (Shop Vac)	-	Any Source	Pressurize heat exchanger.
Soap Suds Solution	-	Any Source	Leak detection.

Note: Up to 10 studs can be missing before replacing heat exchanger.

(b) Visually inspect heat exchanger for missing studs, dents, cracks, soot, missing parts, or evidence of exhaust gasses escaping through holes, cracks, or around welds and joints.

(c) Remove the heat exchanger shroud so that all surfaces of the heat exchanger are exposed.

CAUTION: To avoid foreign object debris/damage, ensure the vacuum cleaner is clean and free from any debris that might be blown into engine exhaust system.

(d) Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber expansion plug to effect a seal as required.

(e) Using a manometer or gage, apply 2.5 psi air pressure and check the complete exhaust manifold in the heat exchanger area manually by feel or by using a soap solution and watching for bubbles. The exhaust manifold in the heat exchanger area must be free of air leaks.

(f) If cracks, breaks, or any leakage along the heat exchanger are found during the pressure test prior to further flight replace the defective part.

B. Muffler (See Figure 78-201)

(1) Removal - Muffler

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove tailpipe. (Refer to 78-20)

(c) Remove cotter pins, nuts, springs, washers, and bolts from forward ball joint securing muffler to exhaust header assembly.

(d) Remove muffler from airplane.

(2) Installation - Exhaust Muffler

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permatex K133	-	Any Source	Antiseize lubricant.
Emery Cloth	-	Any Source	Polishing.

(b) Polish both sides of ball joint with emery cloth to ensure surface is smooth and free of burrs.

(c) Apply a thin coat of antiseize lubricant to polished ball joint surfaces.

(d) Position muffler to header assembly and secure with bolts, washers, springs, and nuts. Tighten nuts until snug then turn two additional revolutions to compress springs.

(e) Perform Adjustment/Test - Forward Ball Joints. (Refer to 78-20)

(f) Install tailpipe. (Refer to 78-20)

(g) Install engine cowling. (Refer to 71-10)

C. Tailpipe - *Serials 1005 thru 1422* (See Figure 78-201)

(1) Removal - Tailpipe

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove extension springs securing tailpipe to airframe.

(c) Remove nut, washers, and bolt securing grounding strap to tailpipe.

(d) Remove cotter pins, nuts, springs, washers, and bolts securing tailpipe to heat exchanger or muffler.

(e) Remove tailpipe from airplane.

(2) Installation - Tailpipe

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Permatex K133	-	Any Source	Antiseize lubricant.
Emery Cloth	-	Any Source	Polishing.

(b) Polish both sides of ball joint with emery cloth to ensure surface is smooth and free of burrs.

(c) Apply a thin coat of antiseize lubricant to polished ball joint surfaces.

(d) Position tailpipe on ball joint flange of muffler or heat exchanger and install bolts, washers, springs, and nuts.

(e) Evenly tighten tailpipe ball joint bolts as required to ensure overall length of each compression spring is compressed to at least 0.50 inch (1.27 cm). Continue to evenly tighten each ball joint bolt until the flange just starts to bow inward. Install cotter pins.

(f) Install bolt, washers, and nut securing grounding strap to tailpipe.

(g) Install extension springs securing tailpipe to airframe.

(h) Adjust tailpipe on muffler or heat exchanger port as required to ensure at aft end of tailpipe there is 2.0 inches (5.1 cm) of clearance between top of tailpipe and belly of airplane. (See Figure 78-202)

(i) Install engine cowling. (Refer to 71-10)

D. Tailpipe - *Serials 1423 & subs* (See Figure 78-201)

(1) Removal - Tailpipe

(a) Remove engine cowling. (Refer to 71-10)

(b) Remove extension springs securing tailpipe to airplane.

(c) Remove nut, washer, and bolt securing grounding strap to tailpipe.

(d) Remove nuts, washers, bolts, and clamps securing tailpipe to muffler or heat exchanger.

(e) Remove tailpipe from airplane.

(2) Installation - Tailpipe

(a) Position tailpipe on port of muffler or heat exchanger.

(b) Install clamps, bolts, washers, and nuts securing tailpipe to muffler or heat exchanger.

(c) Install bolt, washer, and nut securing grounding strap to tailpipe.

(d) Install extension springs securing tailpipe to airframe.

(e) Adjust tailpipe on muffler or heat exchanger port as required to ensure at aft end of tailpipe there is 2.0 - 3.5 inch (5.1 - 8.9 cm) of clearance between top of tailpipe and belly of airplane. (See Figure 78-202)

(f) Install engine cowling. (Refer to 71-10)

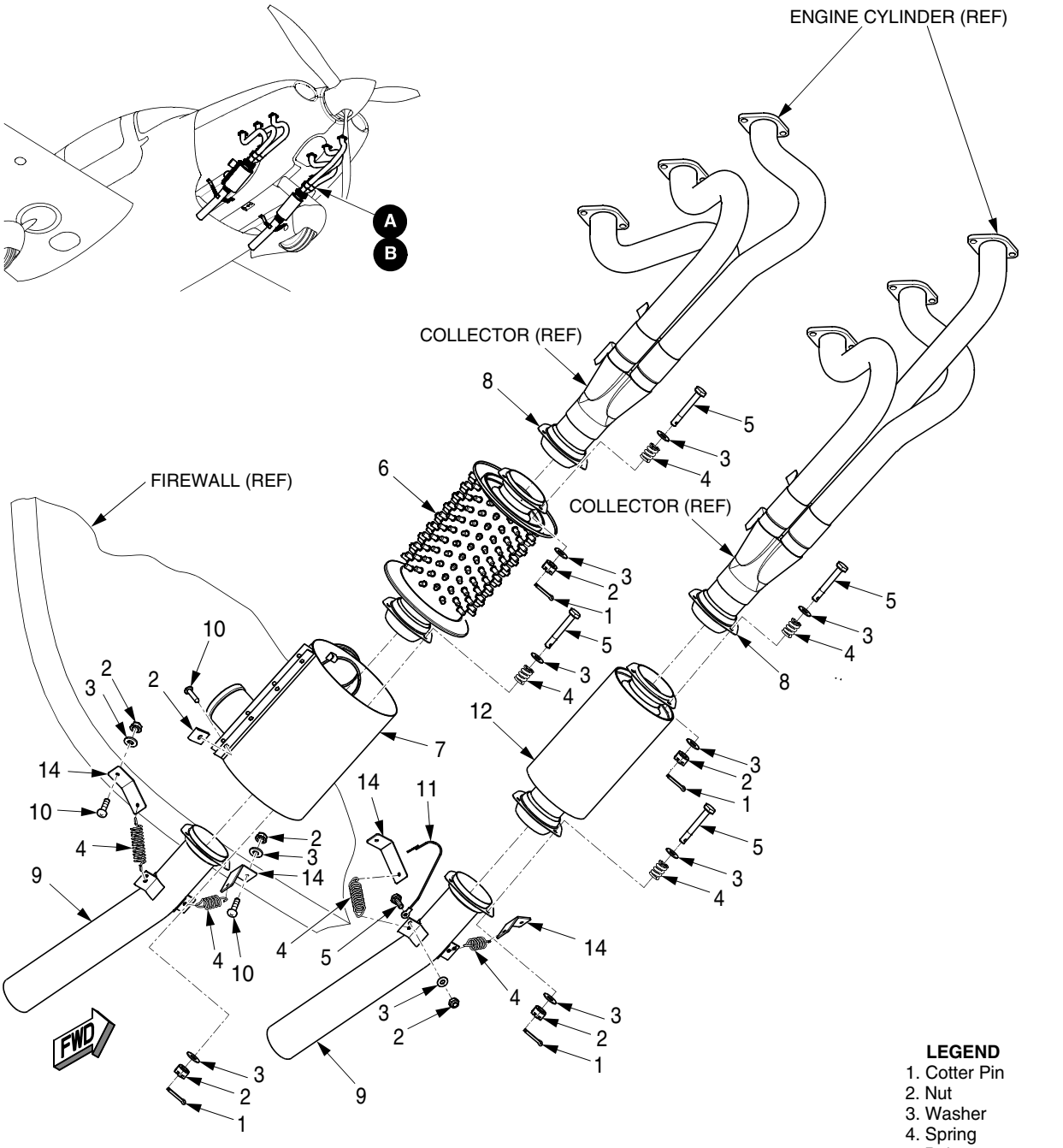


Figure 78-201
Exhaust System Installation - Serials 1005 thru 1422 (Sheet 1 of 2)

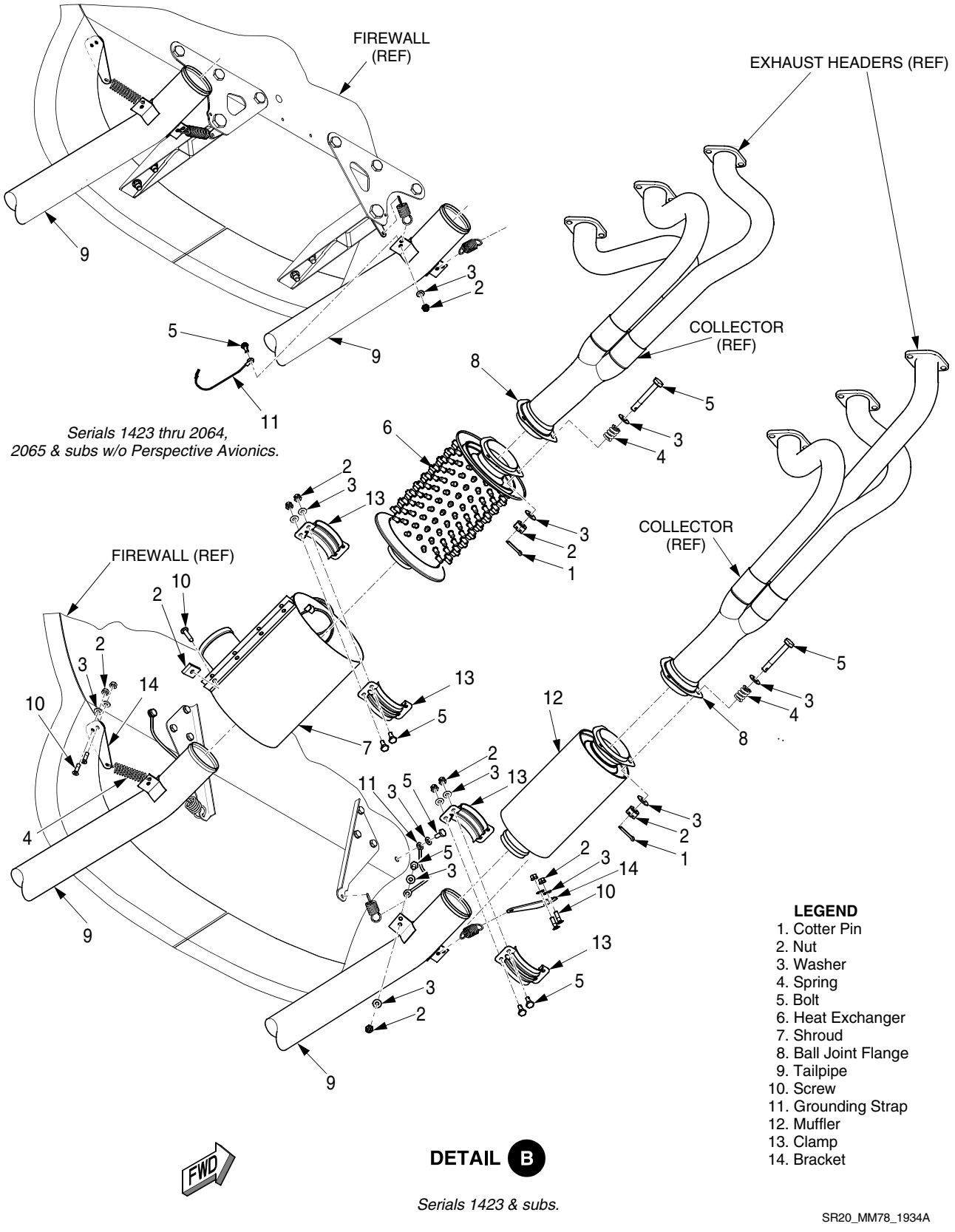
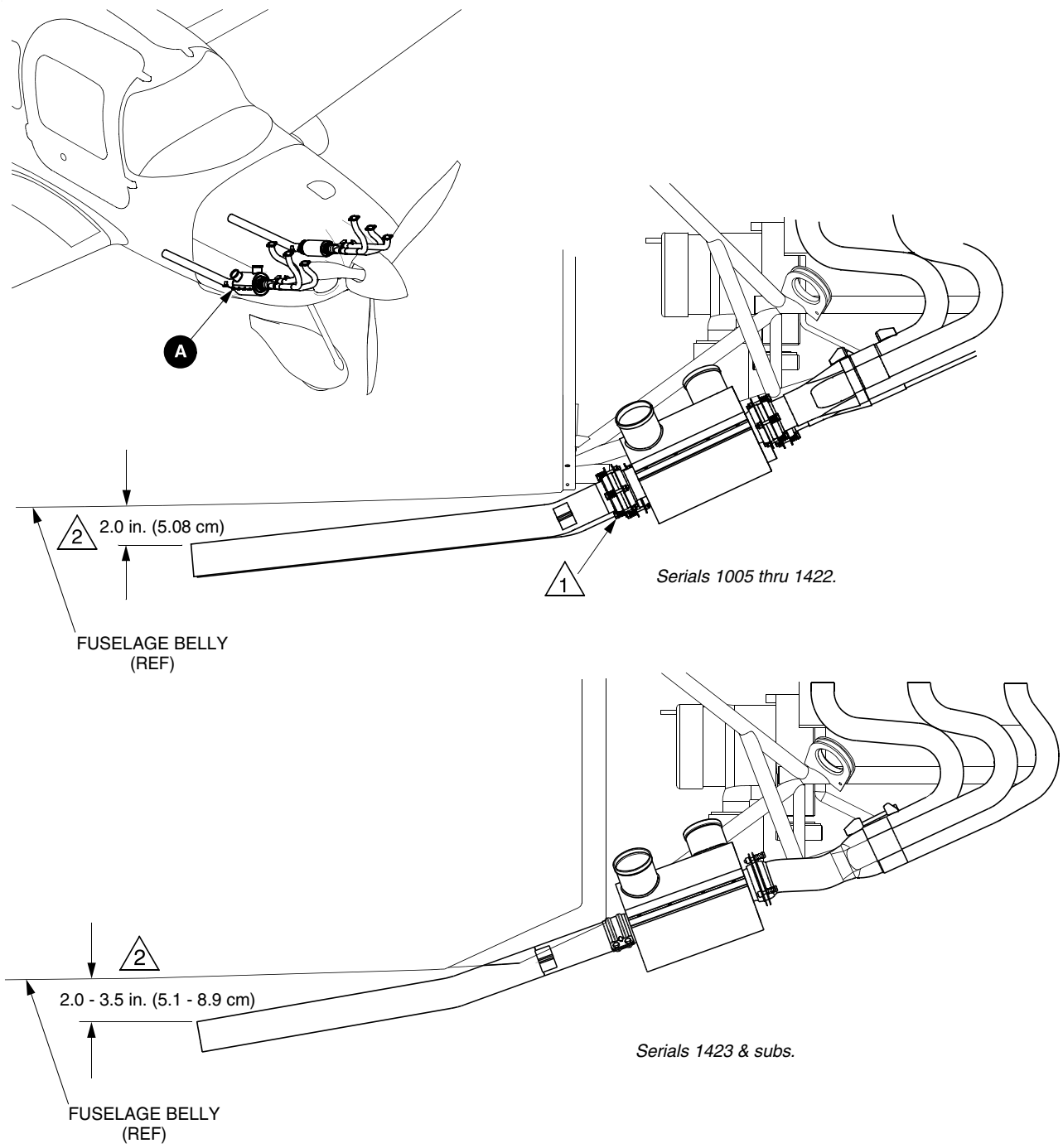


Figure 78-201
Exhaust System Installation - Serials 1423 & subs (Sheet 2 of 2)

EFFECTIVITY:
Serials 1423 & subs



DETAIL A

NOTE

1. Compress aft ball joint springs to 0.50 in.
2. At aft end of tailpipe, measure from top of tailpipe to nearest point on fuselage belly.

SR20_MM78_1231C

Figure 78-202
Tailpipe Adjustment

E. Adjustment/Test - Forward Ball Joints (See Figure 78-203)

The forward ball joints on the exhaust system must be inspected after installation and at each specified Scheduled Maintenance Check so that the load required to move forward ball joint is 5 - 15 lb (2.3 - 6.8 kg).

(1) Adjustment/Test - Forward Ball Joints

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Calibrated Spring Scale	5A354	Chatillon Kew Gardens, NY 11415	Load determination.

(b) Remove engine cowling (Refer to 71-10)

(c) Remove tailpipe. (Refer to 78-20)

(d) *Serials 1005 thru 1422:* Attach spring scale to bolt hole in aft ball joint flange.

(e) *Serials 1423 & subs:* Attach spring scale to aft port of heat exchanger or muffler.

Note: The ball joint is torqued correctly if forward ball joint starts to move between a range of 5 - 15 lb (2.3 kg to 6.8 kg) of pull during both tests. Different length bolts or washers may be necessary to obtain correct ball joint tension.

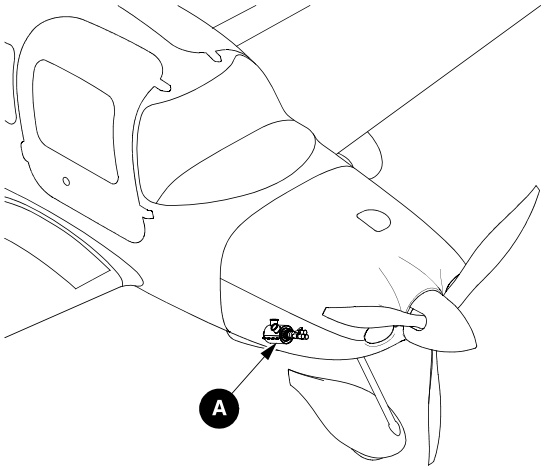
(f) Pull directly down on spring scale and note pull required to move forward ball joint.

(g) Pull outboard on spring scale (at right angle from first test) and note pull required to move forward ball joint.

(h) Add different length stainless steel bolts or washers as required to adjust ball joint tension so that 5 - 15 lb (2.3 kg to 6.8 kg) of pull is required to move forward ball joint. Install cotter pins.

(i) Install tailpipe. (Refer to 78-20)

(j) Install engine cowling. (Refer to 71-10)



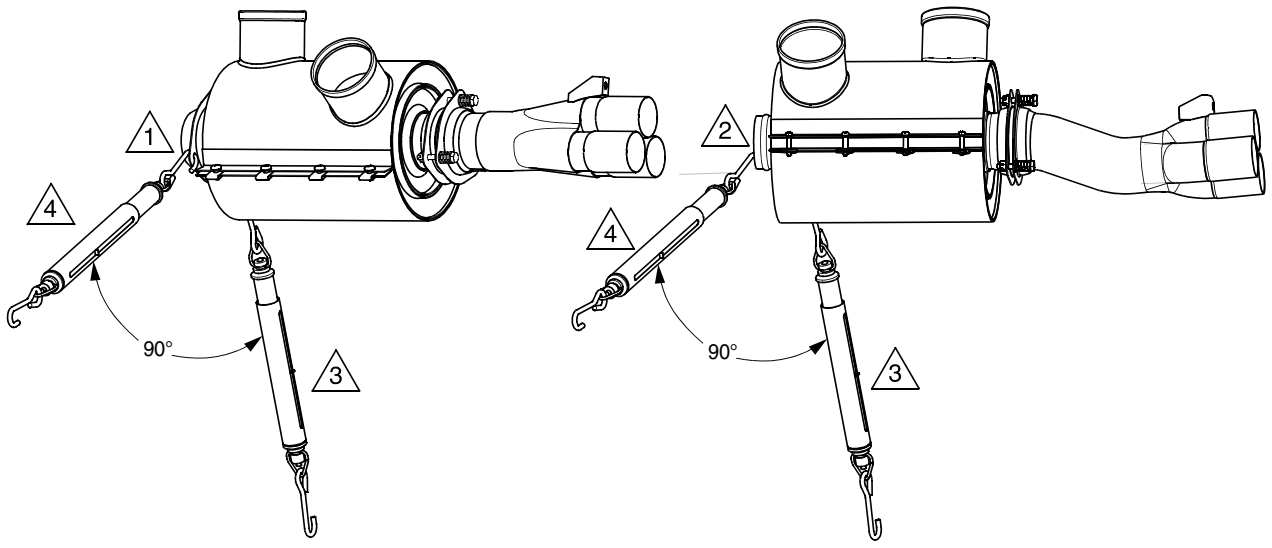
NOTE

1. *Serials 1005 thru 1422:*
   Attach spring scale to bolt hole in aft ball joint flange.

2. *Serials 1423 & subs:*
   Attach spring scale to aft port of heat exchanger or muffler.

3. Pull directly down on spring scale. The ball joint is torqued correctly if forward ball joint starts to move between a range of 5-15 lb of pull. Different length bolts or washers may be necessary to obtain correct ball joint tension.

4. Pull outboard at right angle to first test. The ball joint is torqued correctly if forward ball joint starts to move between a range of 5-15 lb of pull. Different length bolts or washers may be necessary to obtain correct ball joint tension.



Serials 1005 thru 1422.

Serials 1423 & subs.

DETAIL A

SR20_MM78_1886

Figure 78-203
Adjustment/Test - Forward Ball Joints

F. Inspection/Check - Exhaust System

The entire exhaust system including the heat exchanger, shroud, muffler, internal baffling, spark arrestors, headers, collectors, tailpipes, springs, and exhaust connections must be inspected at each specified Scheduled Maintenance Check.

(1) Inspection/Check - Exhaust System

(a) Remove engine cowling. (Refer to 71-10)

(b) Inspect all exhaust system external surfaces including welds, clamps, supports, brackets, springs, joints, and gaskets, for dents, cracks, missing parts, corrosion, or evidence of exhaust gasses escaping through holes, cracks or around joints.

(c) Disassemble heat exchanger. (Refer to 78-20)

(d) Inspect heat exchanger for cracks, dents, and evidence of exhaust gasses escaping through holes, cracks, or around joints.

CAUTION: In addition to performing Inspection/Check - Heat Exchanger at each specified Scheduled Maintenance Check, it must also be performed whenever there is suspicion of exhaust gas leakage.

(e) If there is suspicion of exhaust gas leakage, perform Inspection/Check - Heat Exchanger. (Refer to 78-20)

(f) Inspect baffle in heat exchanger for cracks. Moderate warpage of the baffle is acceptable.

(g) Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure may be performed.

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Rubber Plug	-	Any Source	Plug heat exchanger.
Industrial Vacuum Cleaner (Shop Vac)	-	Any Source	Pressurize heat exchanger.
Soap Suds Solution	-	Any Source	Leak detection.

2 Remove exhaust header assemblies. (Refer to 78-10)

3 Use rubber expansion plugs to seal openings.

4 Using a manometer or gage, apply 2.5 psi air pressure while each header assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.

5 If necessary, replace exhaust components found defective before the next flight.

6 Install exhaust header assemblies. (Refer to 78-10)

7 After installation of exhaust system components perform Inspection/Check - Heat Exchanger to ascertain that system is acceptable. (Refer to 78-20)

(h) Assemble heat exchanger. (Refer to 78-20)

(i) Install engine cowling. (Refer to 71-10)

CHAPTER 79

OIL

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OIL

1. GENERAL

This chapter covers those units and components external to the engine concerned with storing and delivering lubricating oil to and from the engine. These items include the oil filter, oil cooler, oil separator, oil filler cap/dipstick, oil pressure/temperature gage, oil pressure sensor, and oil temperature sensor. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

The oil supply is contained in a wet sump attached to the bottom of the crankcase. A conventional dipstick integral to the oil filler cap is provided for determining oil quantity.

When the crankshaft is turning, oil is drawn through a screen and pick up tube which extends from the sump to a port in the crankcase. Oil then passes to the inlet of the gear-type, engine-driven oil pump and is forced under pressure through the pump outlet. A pressure relief valve prevents excessive oil pressure by allowing excess oil to be returned to the sump. After exiting the pump, the pressurized oil enters a full-flow filter and is passed on to the oil cooler. If the filter element becomes blocked, a bypass relief valve will open to permit unfiltered oil to flow to the engine. As the oil enters the oil cooler, an oil temperature control unit directs the flow in one of two directions; when the oil is cold, the oil temperature control unit opens and bypasses most the oil around the cooler, as the oil warms, the oil temperature control unit closes off the cooler bypass and forces the oil through the cooler core. In operation, the oil temperature control unit modulates to maintain oil temperature in the normal range of approximately 170° F.

After leaving the cooler, the oil enters the crankcase where various channels and passageways direct it to the bearing surfaces and other areas requiring lubrication and cooling such as the valve lifters, inner domes and lower cylinder walls. Oil within the engine gravity drains back into the sump.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
High oil temperature indication.	Thermostat damaged or held open by solid matter.	Remove, clean valve and seat. If still inoperative, replace.
	Oil viscosity too high.	Drain and refill with correct seasonal oil grade. (Refer to 12-10)
	Prolonged ground operation.	Limit ground operation to a minimum.
	Malfunctioning gage or bulb unit.	Check wiring. Check bulb unit. Check gage. Replace malfunctioning parts.
	High power, low airspeed.	Adjust power - flight altitude.
	Low oil supply.	Replenish oil supply.
	Cooler air passages clogged.	Clean cooler thoroughly.
	Cooler core plugged.	Remove cooler and flush thoroughly.
	Baffle damaged.	Inspect baffling for damage or worn seals. Replace as required.
	Fuel system set too lean.	Adjust mixture setting in accordance with the manufacturer's approved Instructions For Continued Airworthiness.
Low oil pressure indication.	Low oil supply.	Replenish oil supply. (Refer to 12-10)
	Oil viscosity too low.	Drain and refill with correct seasonal oil grade. (Refer to 12-10)
	Foam in oil due to presence of alkaline solids in system.	Drain and refill with fresh oil. (It may be necessary to flush cooler core if presence of alkaline solids is due to previous cleaning with alkaline materials.) (Refer to 12-10)
	Pump producing low pressure.	Replace pump.
	Malfunctioning pressure gage.	Check gage. Replace if required.
	Weak or broken oil pressure relief valve spring.	Replace spring. Adjust pressure to 30-60 psi with oil at normal operating temperature.

DISTRIBUTION

1. DESCRIPTION

This section describes that portion of the oil system which is used to conduct oil from and to the engine. These items include the oil filter and oil cooler. Refer to Chapter 12, Servicing for approved engine oil specifications and servicing procedures. (Refer to 12-10)

2. MAINTENANCE PRACTICES

A. Oil Filter

(1) Removal - Oil Filter

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Strap Wrench	GA340	Snap-On Tools Kenosha, WI	Oil filter removal.

(b) Remove engine cowling. (Refer to 71-10)

(c) Remove safety wire securing oil filter to engine.

(d) Using strap wrench, remove oil filter from engine.

(e) Remove oil filter from airplane.

(2) Installation - Oil Filter

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Strap Wrench	GA340	Snap-On Tools Kenosha, WI	Oil filter removal.
Safety Wire	-	Any Source	Safetying.

(b) Fill filter with approved oil and coat seal with oil. (Refer to 12-10)

(c) Using strap wrench, install oil filter. Torque filter to 18 - 20 ft-lb (24.4 - 27.1 Nm).

(d) Install safety wire securing oil filter to engine.

(e) Install engine cowling. (Refer to 71-10)

B. Oil Cooler (See Figure 79-201)

(1) Removal - Oil Cooler

(a) Remove engine cowling. (Refer to 71-10)

(b) Drain engine oil. (Refer to 12-10)

(c) Remove engine baffling surrounding oil cooler. (Refer to 71-00)

(d) Loosen dampening shoe situated against forward side of oil cooler.

(e) Remove safety wire securing oil temperature control valve to engine cooler.

(f) Remove bolts, lock washers, and plain washers securing oil cooler to engine.

(g) Remove gasket.

(2) Installation - Oil Cooler

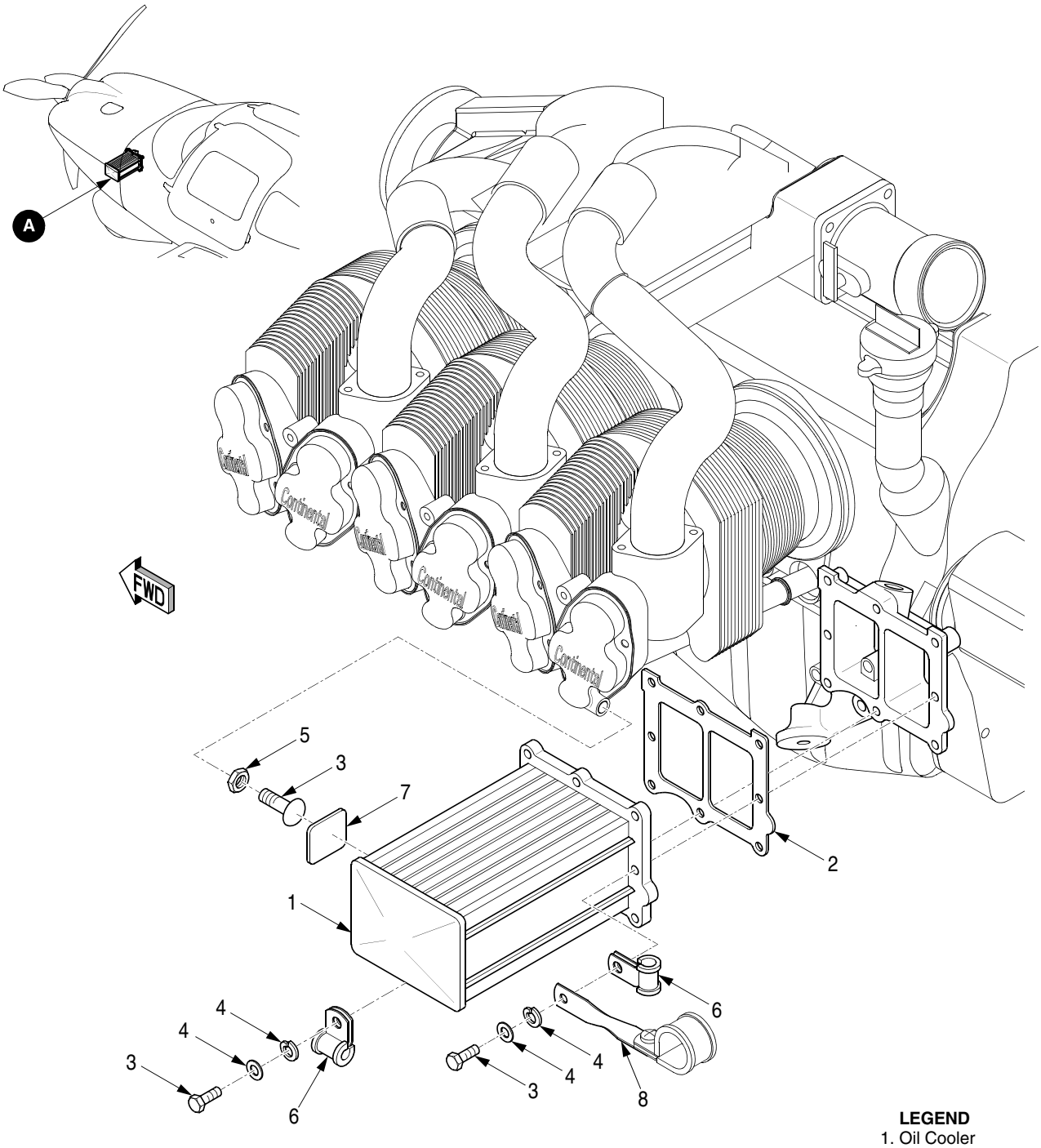
(a) Position new gasket and oil cooler on engine and install plain washer, lock washers and bolts. Torque bolts to 8.3 - 9.2 ft-lb (11.2 - 12.4 Nm).

(b) Adjust dampening shoe against oil cooler by backing bolt into shoe until shoe just contacts cooler. Preload shoe by adjusting bolt 2/3 turn further toward cooler and lock into place with jam nut.

(c) Install engine baffling. (Refer to 71-00)

(d) Replenish oil system. (Refer to 12-10)

(e) Install engine cowling. (Refer to 71-10)



LEGEND
1. Oil Cooler
2. Gasket
3. Bolt
4. Washer
5. Nut
6. Clamp
7. Dampening Shoe
8. Bracket

NOTE

1. Torque bolts to 8.3 - 9.2 ft-lb (11.2 - 12.4 Nm).

2. Adjust dampening shoe against oil cooler by backing bolt into shoe until shoe just contacts cooler. Preload shoe by adjusting bolt 2/3 turn further toward cooler and lock into place with jam nut.

DETAIL A

SR20_MM79_3521

Figure 79-201
Oil Cooler Installation

C. Oil Separator (See Figure 79-202)

(1) Removal - Oil Separator

(a) Remove engine cowling. (Refer to 71-10)

(b) Loosen clamp securing oil separator vent line. Remove vent line from oil separator outlet.

(c) Loosen clamp securing oil separator supply line. Remove supply line from oil separator inlet.

(d) Disconnect nipple fitting securing oil separator return line to oil separator outlet.

(e) Loosen clamp securing oil separator to engine baffling. Remove oil separator from airplane.

(2) Installation - Oil Separator

(a) Position oil separator to engine baffling and secure with clamp.

(b) Position return line to oil separator outlet and connect nipple fitting.

(c) Position supply line to oil separator inlet and secure with clamp.

(d) Position vent line to oil separator outlet and secure with clamp.

(e) Install engine cowling. (Refer to 71-10)

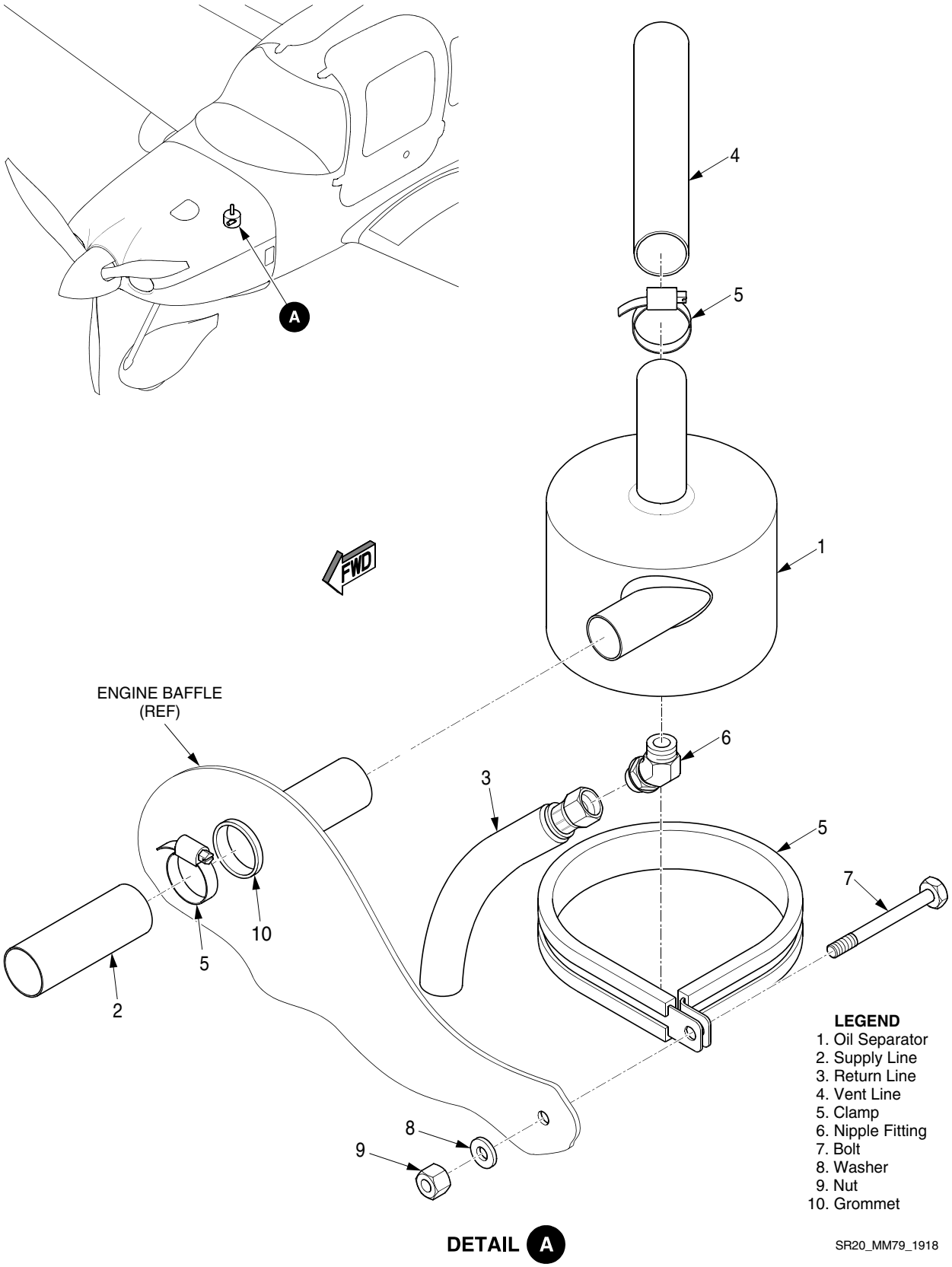


Figure 79-202
Oil Separator Installation

INDICATING

1. DESCRIPTION

This section describes that portion of the oil system which is used to indicate the quantity, temperature, and pressure of the oil. Components included are the oil filler cap/dipstick, oil pressure/temperature gage, oil pressure sensor, and oil temperature sensor.

An oil filler cap/dipstick is located at the rear of the engine on the top left side and is accessed through the oil filler door on the upper cowling. The engine oil tank capacity is 8 quarts (7.57 L). Refer to Chapter 12, Servicing for approved engine oil specifications and servicing procedures. (Refer to 12-10)

Serials 1005 thru 1581: A 2¼" combination Oil Pressure and Oil Temperature Gage is mounted on the right instrument panel immediately below the EGT/CHT gage. The instrument is internally lighted. The oil pressure pointer sweeps a scale marked from 0 psi to 100 psi. The oil pressure gage receives a signal from a pressure sensor on the left side of the engine. Normally, oil pressure may drop to 10 psi at idle but will be in the 30 - 60 psi range at higher RPM. The oil temperature pointer sweeps a scale marked from 75° F to 250° F in 25° F increments. The oil temperature gage receives a signal from a temperature sensor mounted on the engine near the left magneto. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on the Essential Bus.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Oil pressure is displayed in the upper right corner of the MFD as both a simulated pressure gage and as text. The simulated pressure gage receives a signal from a pressure sensor on the left side of the engine via the Data Acquisition Unit (DAU). The simulated pressure gage sweeps a scale marked from 0 psi to 100 psi in 5 psi increments. Oil pressure is also continuously displayed in the engine parameters field located in the lower right corner of the PFD. In the event oil pressure falls below 30 psi or exceeds 75 psi, the MFD will display "Check Oil Pressure" in a yellow advisory box in the lower right corner of the MFD. If oil pressure falls below 10 psi or exceeds 99 psi, the MFD will display "Check Oil Press" in a red advisory box.

Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics: Oil temperature is displayed in the upper right corner of the MFD as both a simulated temperature gage and as text. The simulated temperature gage receives a signal from a temperature sensor mounted on the engine near the left magneto via the Data Acquisition Unit (DAU). The simulated temperature gage pointer sweeps a scale marked from 75° F to 250° F in 10° F increments. In the event oil temperature reaches 235° F, the MFD will display "Monitor Oil Temperature" in a cyan advisory box in the lower right corner of the MFD. If oil temperature exceeds 240° F, the MFD will display "Check Oil Temperature" in a red advisory box in the lower right corner of the MFD. 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

Serials 2016 & subs w/ Perspective Avionics: Oil pressure is displayed in the upper right corner of the MFD as both simulated pressure gage and text. The simulated pressure gage receives a signal from a pressure sensor mounted at the aft end of the engine below the oil cooler via the Data Acquisition Unit (DAU). The simulated pressure gage sweeps a scale marked from 0 psi to 100 psi in 5 psi increments. Oil pressure is also continuously displayed in the engine parameters field located on the left side of the PFD. In the event oil pressure falls below 30 psi or exceeds 75 psi, the PFD will display "Check Oil Pressure" in a yellow advisory box in the lower right corner of the PFD. If oil pressure falls below 10 psi or exceeds 99 psi, the PFD will display "Check Oil Press" in a red advisory box.

Serials 2016 & subs w/ Perspective Avionics: Oil temperature is displayed in the upper right corner of the MFD as both simulated temperature gage and text. The simulated temperature gage receives a signal from a temperature sensor mounted at the lower left side of the engine below the oil cooler via the Data Acquisition Unit (DAU). The simulated temperature gage pointer sweeps a scale marked from 75° F to 250° F in 25° F increments. Oil temperature is also continuously displayed in the engine parameters field located on the left side of the PFD. In the event oil temperature reaches 235° F, the PFD will display "Monitor Oil Temperature" in a cyan advisory box in the lower right corner of the PFD. If oil temperature exceeds 240° F, the PFD will display "Check Oil Temperature" in a red advisory box in the lower right corner of the PFD.

Serials 1602, 1644, 1663 & subs: 28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

2. MAINTENANCE PRACTICES

A. Oil Filler Cap/Dipstick

For maintenance practices pertinent to the oil filler cap/dipstick, see Scheduled Servicing. (Refer to 12-10)

B. Oil Pressure/Temperature Gage - *Serials 1005 thru 1581* (See Figure 79-301)

(1) Removal - Oil Pressure/Temperature Gage
- (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
- (b) Pull ENGINE INST circuit breaker.
- (c) Remove MFD. (Refer to 31-60)
- (d) Disconnect electrical connector from gage.
- (e) Remove screws and washers securing gage to instrument panel. Remove gage from airplane.

(2) Installation - Oil Pressure/Temperature Gage
- (a) Position gage to instrument panel and secure with screws and washers.
- (b) Connect electrical connector to gage.
- (c) Install MFD. (Refer to 31-60)
- (d) Reset ENGINE INST circuit breaker.
- (e) Perform Operational Test - Oil Pressure/Temperature Gage. (Refer to 79-30)
- (f) Perform Oil Pressure Check as described in airplane Operational Check. (Refer to 05-30)

(3) Operational Test - Oil Pressure/Temperature Gage
- (a) Set BAT 1 switch to ON position.
- (b) Verify oil temperature needle indicates bottom of scale.
- (c) Verify oil pressure needle indicates zero.
- (d) Set BAT 1 switch to OFF position.

C. Oil Pressure/Temperature Gage - *Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics* (See Figure 79-301)

Oil pressure is displayed on the MFD and PFD screens. Oil temperature is displayed on the MFD screen.

(1) Operational Test - Oil Pressure/Temperature Gage

(a) Set BAT1 and AVIONICS switches to ON positions.

(b) On MFD, when PRESS ANY BEZEL KEY TO CONTINUE is displayed, press any key.

(c) If Engine Monitoring is selected, press [Fuel Done] to enter Map page.

(d) Rotate left knob to select Engine page.

(e) Verify oil temperature needle indicates bottom of scale.

(f) Verify oil pressure needle indicates zero.

(g) Set BAT1 and AVIONICS switches to OFF positions.

D. Oil Pressure/Temperature Gage - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 79-301)

Oil pressure is displayed on the MFD and PFD screens. Oil temperature is displayed on the MFD screen.

(1) Operational Test - Oil Pressure/Temperature Gage

(a) Set BAT1 and AVIONICS switches to ON positions.

(b) On MFD, follow on-screen instructions to enter normal MFD operation.

(c) Press [Engine] to select Engine page.

(d) Verify oil temperature needle indicates bottom of scale.

(e) Verify oil pressure needle indicates zero.

(f) Set BAT1 and AVIONICS switches to OFF positions.

E. Oil Pressure Sensor (See Figure 79-301)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - Oil Pressure Sensor
  (a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.
  (b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.
  (c) *Serials 1582 & subs:* Pull ANNUN / ENGINE INST circuit breaker.
  (d) Remove engine cowling. (Refer to 71-10)
  (e) Disconnect electrical connector from sensor.
  (f) Remove sensor and washer from engine. Discard washer.

(2) Installation - Oil Pressure Sensor
  (a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	565	Any Source	Oil sensor installation.

  (b) Apply Loctite® to sensor threads.
  (c) Position new sensor to engine and torque to 17.5 ft-lb (23.7 Nm).
  (d) Connect electrical connector to sensor.
  (e) Install engine cowling. (Refer to 71-10)
  (f) *Serials 1005 thru 1581:* Reset ENGINE INST circuit breaker.
  (g) *Serials 1582 & subs:* Reset ANNUN / ENGINE INST circuit breaker.
  (h) Perform Inspection/Check - Oil System Leak. (Refer to 12-10)

F. Oil Temperature Sensor (See Figure 79-301)

CAUTION: Protect openings exposed as a result of removing sensor against entry of foreign material by installing covers or sealing with tape.

(1) Removal - Oil Temperature Sensor

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.

(c) *Serials 1582 & subs:* Pull ANNUN / ENGINE INST circuit breaker.

(d) Remove engine cowling. (Refer to 71-10)

(e) Remove engine baffling surrounding oil cooler. (Refer to 71-00)

(f) Disconnect electrical lead from sensor.

(g) Remove safety wire securing sensor to engine.

(h) Remove sensor and washer from engine. Discard washer.

(2) Installation - Oil Temperature Sensor

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Safety Wire	-	Any Source	Safetying.

(b) Position new washer and sensor to engine.

(c) *Serials 1005 thru 2015 before SB2X-79-03, 2016 thru 2199 and 2214 thru 2216 before SB2X-79-02:* Install oil temperature sensor.

1 Torque sensor to 17.5 ft-lb (23.7 Nm).

2 Connect electrical lead to sensor.

(d) *Serials 1005 thru 2015 after SB2X-79-03, 2016 thru 2199 and 2214 thru 2216 after SB2X-79-02, 2200 thru 2213, 2217 & subs:* Install oil temperature sensor.

1 Position sensor so that markings on probe shaft face aft.

2 Torque lower (large) fitting to 17.5 ft-lb (23.7 Nm).

Note: Ensure markings on sensor probe shaft point aft.

3 Position sensor so that bottom of crimped section of probe is even with top surface of small fitting.

4 Torque upper (small) fitting to 7.5 - 8.2 ft-lb (10.2 - 11.1 Nm).

5 Connect oil temperature sensor to connector (P202) and secure to harness with wire ties.

(e) Safety wire sensor to engine. (Refer to 20-50)

(f) Install engine baffling surrounding oil cooler. (Refer to 71-00)

(g) Install engine cowling. (Refer to 71-10)

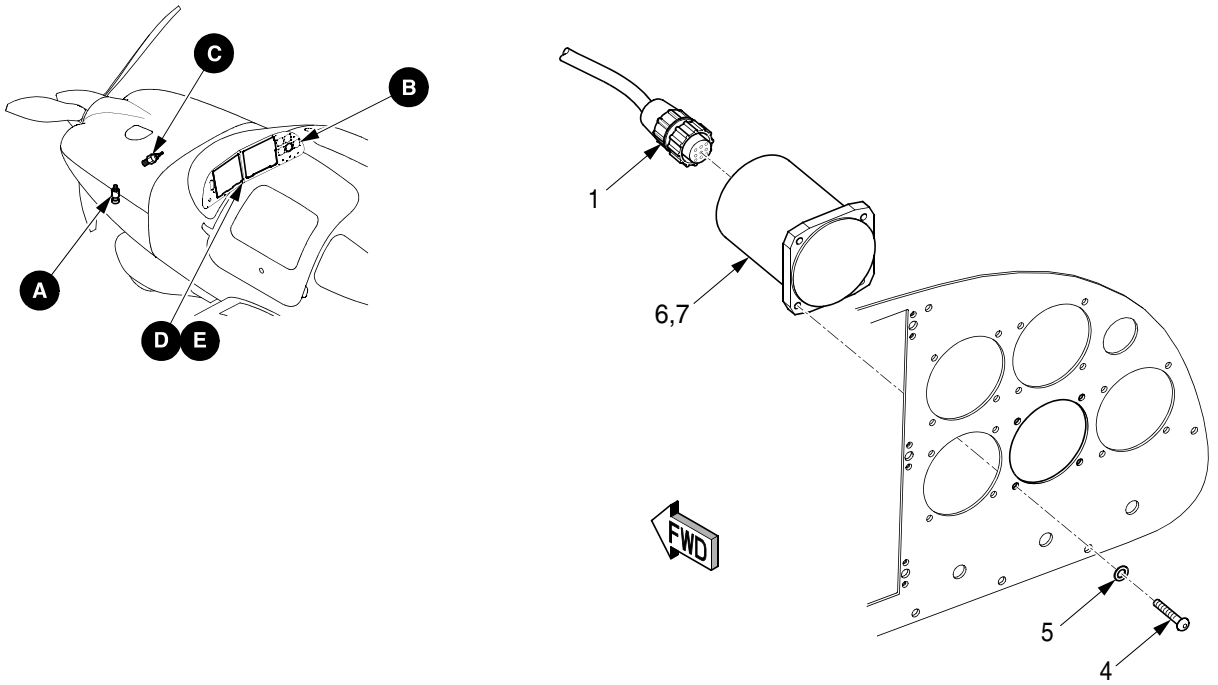
(h) *Serials 1005 thru 1581:* Pull ENGINE INST circuit breaker.

(i) *Serials 1582 & subs:* Pull ANNUN / ENGINE INST circuit breaker.

(j) Perform Inspection/Check - Oil System Leak. (Refer to 12-10)

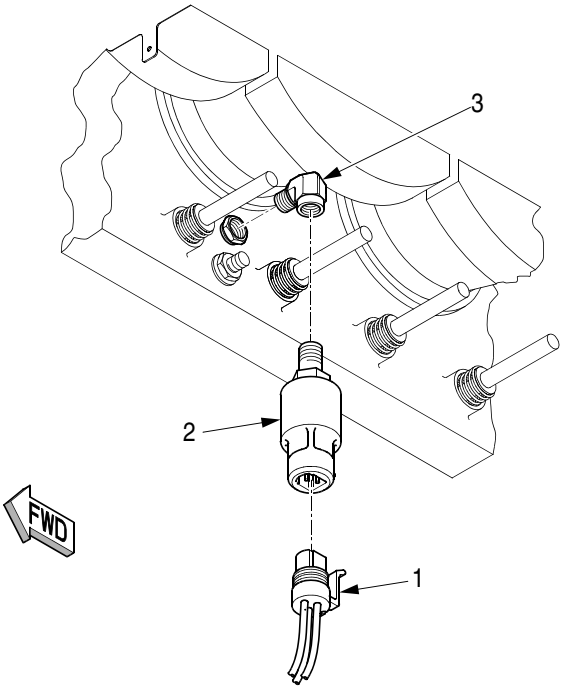
G. Oil Pressure/Temperature Warning Light

A oil pressure/temperature warning light is integrated into the annunciator assembly, mounted top center above the flight instruments. The oil light will illuminate if the oil temperature exceeds 240 ° F (116 ° C) or if the oil pressure is less than 10 psi (68.9 kPa). For maintenance practices pertinent to the annunciator assembly, see Indicating and Recording. (Refer to 31-50)



Serials 1005 thru 1581.

DETAIL B

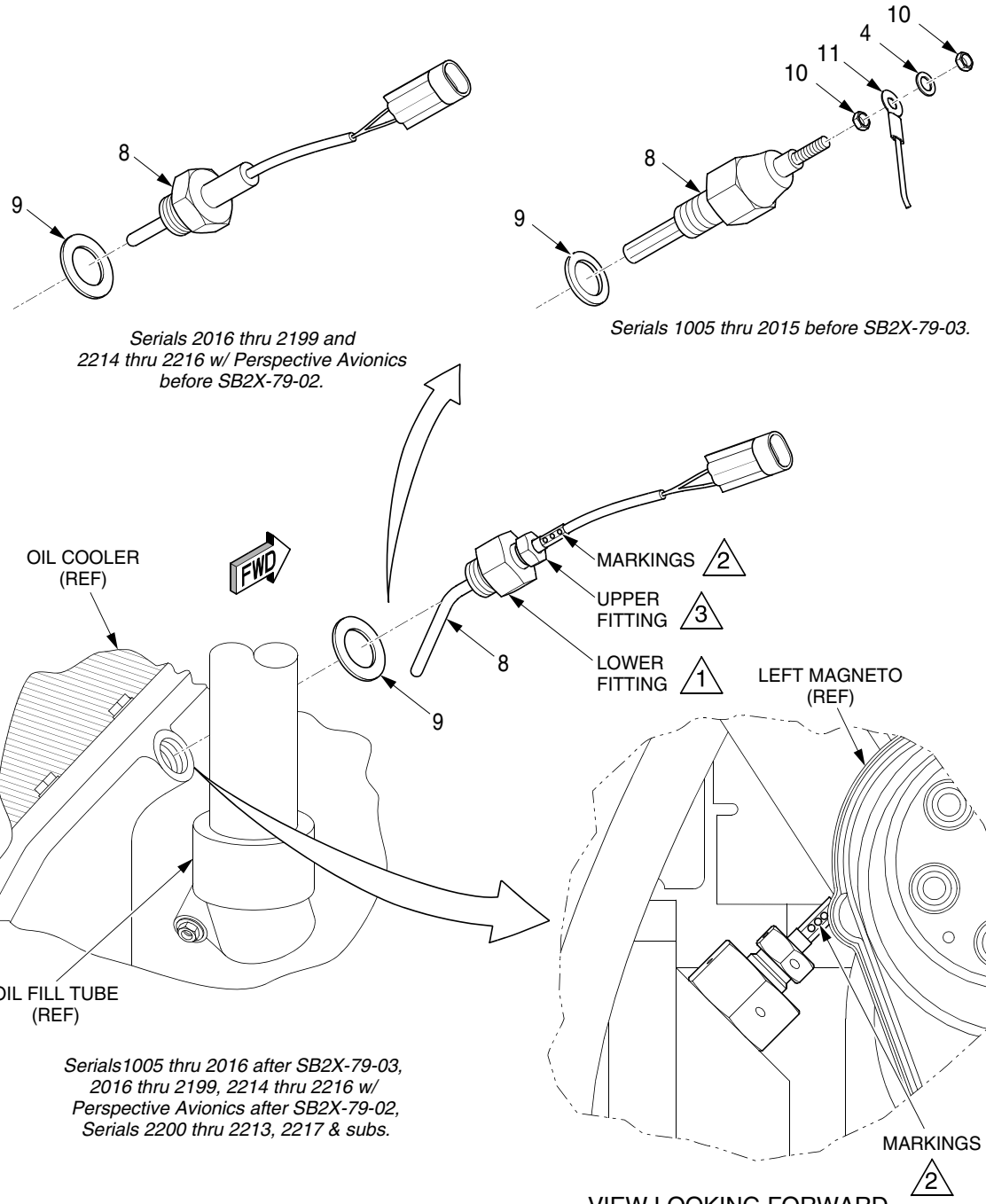


DETAIL A

LEGEND
1. Electrical Connector
2. Oil Pressure Sensor
3. Elbow Fitting
4. Screw
5. Washer
6. Oil Pressure Gage
7. Oil Temperature Gage

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Figure 79-301
Oil Pressure/Temperature Indication (Sheet 1 of 4)



NOTE

1. Torque lower (large) fitting to 17.5 ft-lb (23.7 Nm).
2. Ensure markings on sensor probe shaft point aft.
3. Torque upper (small) fitting to 7.5 - 8.2 ft-lb (10.2 - 11.1 Nm).

DETAIL C

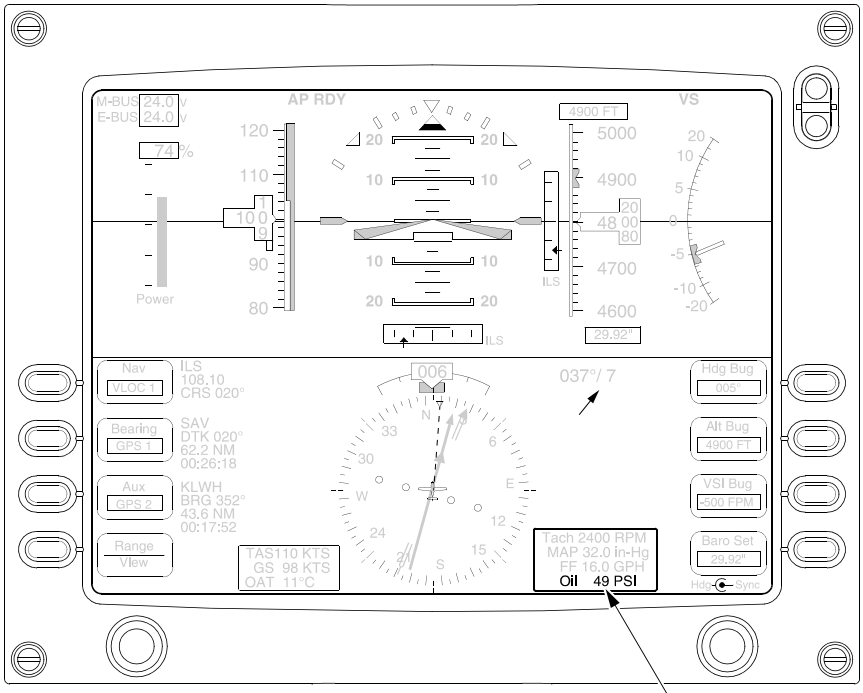
LEGEND

4. Washer
8. Oil Temperature Sensor
9. Gasket
10. Nut
11. Terminal Ring

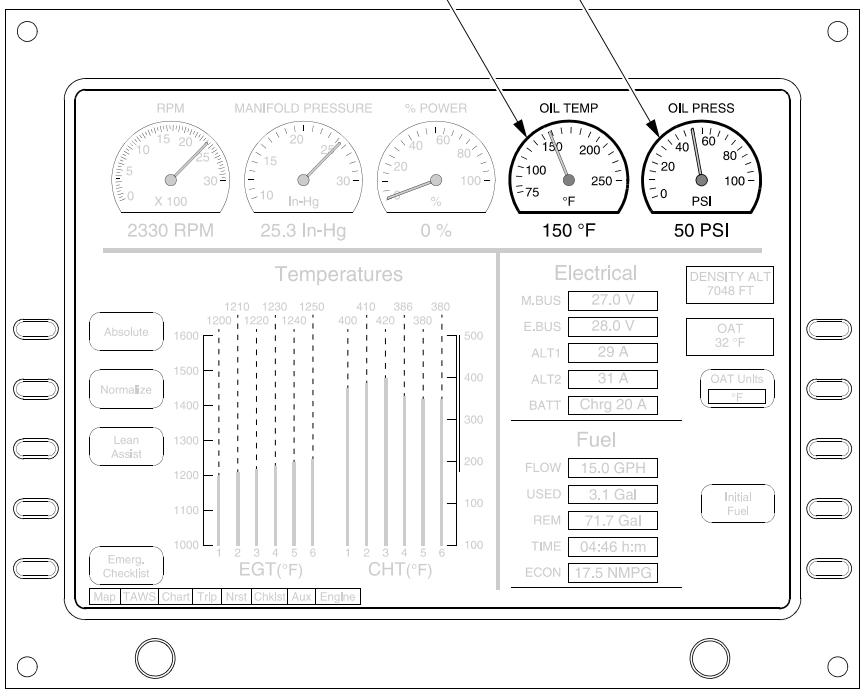
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Figure 79-301
Oil Pressure/Temperature Indication (Sheet 2 of 4)

EFFECTIVITY:
All



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

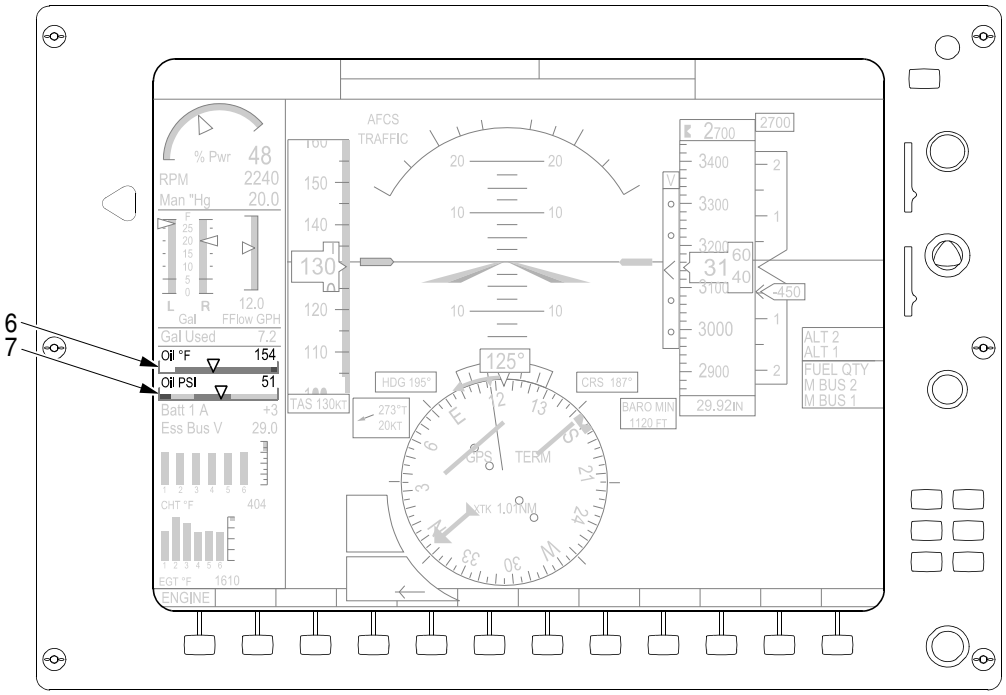
Serials 1582 thru 2015,
2016 & subs w/o Perspective Avionics.

DETAIL D

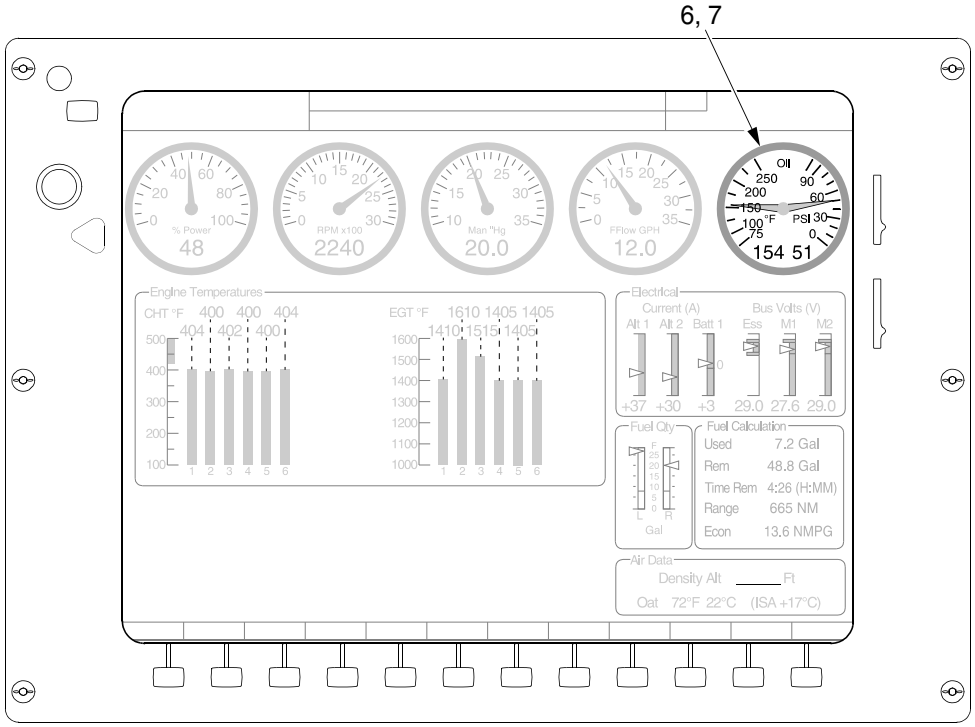
LEGEND
6. Oil Pressure Gage
7. Oil Temperature Gage

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Figure 79-301
Oil Pressure/Temperature Indication - Serials 1582 thru 2015, 2016 & subs w/o Perspective Avionics (Sheet 3 of 4)



PFD w/ ENGINE DISPLAY



MFD w/ ENGINE DISPLAY

Serials 2016 & subs w/ Perspective Avionics.

DETAIL E

LEGEND
6. Oil Pressure Gage
7. Oil Temperature Gage

SR20_MM79_2865B

Figure 79-301
Oil Pressure/Temperature Indication - Serials 2016 & subs w/ Perspective Avionics (Sheet 4 of 4)

EFFECTIVITY:
Serials 2016 & subs w/ Perspective Avionics

CHAPTER 80

STARTING

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CHAPTER 80 - STARTING
LIST OF EFFECTIVE PAGES

Chapter-Section	Page	Date
80-LOEP	1	15 JUN 2010
80-LOEP	2	15 JUN 2010
80-TOC	1	15 JUN 2010
80-TOC	2	15 JUN 2010
80-00	1	15 JUN 2010
80-00	2	15 JUN 2010
80-10	1	15 JUN 2010
80-10	2	15 JUN 2010
80-10	3	15 JUN 2010
80-10	4	15 JUN 2010

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CHAPTER 80 - STARTING

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Maintenance Practices		2
Starter		2
Removal - Starter		2
Installation - Starter		2

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STARTING

1. GENERAL

This chapter describes the components used for starting the airplane engine. This includes the starter. For additional information on starter system components, refer to the manufacturer's approved Instructions For Continued Airworthiness.

The starter is mounted on the side of the engine accessory case. When the starter solenoid is activated by the ignition key, its contacts close and electrical current energizes the electric motor that drives the starter worm gear. The worm gear is permanently meshed with a worm wheel in the accessory case. A clutch spring is attached to the worm wheel and, as the worm wheel turns, the spring tightens around a knurled drum on the engine's starter shaft. When the spring gets tight enough, the starter shaft begins to rotate at approximately the same speed as the worm wheel and starter motor. Attached to the starter shaft is a starter shaft gear that is permanently meshed with the crankshaft gear in the engine accessory case. Once the starter shaft is spun by the starter motor, the starter shaft gear turns the crankshaft. Upon engine start, the crankshaft will spin faster than the starter gear shaft causing the clutch spring to release the knurled drum on the starter shaft. This allows the engine to accelerate to idle speed without causing damage to the starter.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Starter will not operate.	Defective master switch or circuit.	Check continuity of master switch or circuit. Install new switch or wires.
	Defective starter switch, contactor, or switch circuit.	Check continuity of switch, contactor and circuit. Install new switch or wires.
	Defective starter motor power cable.	Inspect cable. Install new cable.
Starter motor runs, but does not turn crankshaft.	Damaged worm gear.	Remove starter and inspect worm gear. Replace defective parts.
Starter motor drags.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Inspect cable. Install new cable.
	Defective starter motor.	Check starter motor brushes, brush spring tension or thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Inspect commutator. Clean and turn commutator.
Starter excessively noisy.	Worn starter worm gear.	Inspect starter worm gear. Replace defective parts.

CRANKING

1. DESCRIPTION

This section describes that portion of the system used to perform the cranking portion of the starting operation.

2. MAINTENANCE PRACTICES

A. Starter (See Figure 80-101)

(1) Removal - Starter

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull STARTER RELAY circuit breaker.

(c) Remove engine cowling. (Refer to 71-10)

(d) Disconnect positive battery cable at battery.

(e) Disconnect electrical cable at starter motor.

(f) Remove starter in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

(2) Installation - Starter

(a) Install starter in accordance with the manufacturer's approved Instructions For Continued Airworthiness.

WARNING: Prior to connecting power to starter, ensure ignition switch is in OFF position, wheels are chocked, throttle is set to IDLE, and mixture is set to CUTOFF.

(b) Connect electrical cable to starter motor.

(c) Connect positive cable at battery.

(d) Install engine cowling. (Refer to 71-10)

(e) Reset STARTER RELAY circuit breaker.

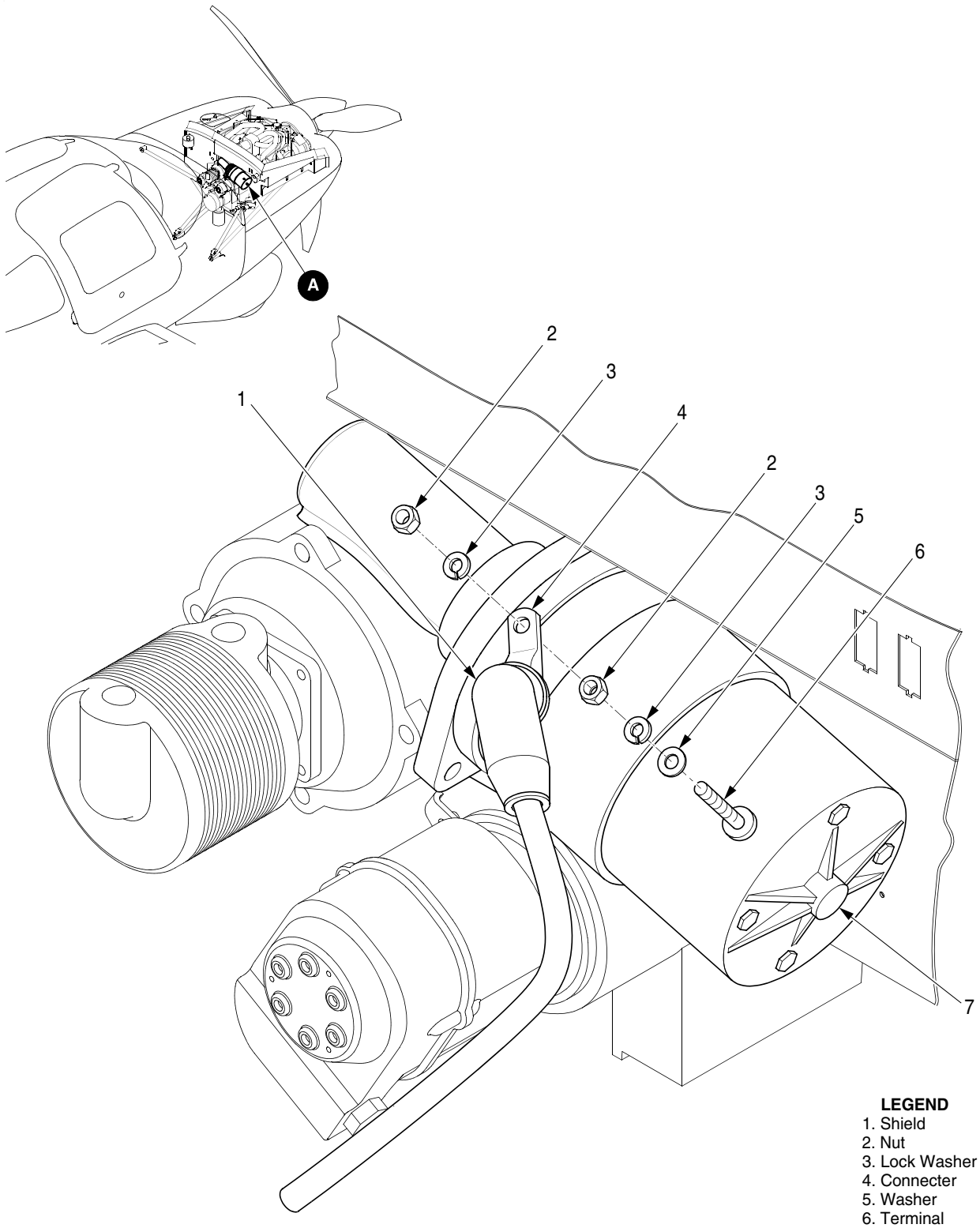


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CHAPTER 91

CHARTS

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CHARTS

1. GENERAL

This chapter includes reference tables containing conversion factors, equivalent measurements, approximate weights, and manufacturer and supplier addresses.

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REFERENCE TABLES

1. GENERAL

This chapter includes information on conversion factors and measurements.

2. CONVERSION FACTORS

Note: To determine the opposite conversion from that given, divide by the conversion number instead of multiplying.

A. Length

Multiply	by	To Obtain:
Inches	2.54	Centimeters
Feet	0.305	Meters
Miles	1.609	Kilometers
Kilometers	0.621	Miles
Square inches	6.452	Square centimeters
Square yards	0.836	Square meters
Square meters	1.196	Square yards

B. Volume

Multiply	by	To Obtain:
Fluid ounces	29.57	Cubic centimeters
Quarts	0.946	Liters
Diameter circle	3.1416	Circumference of circle
Diameter circle	0.8862	Side of equal square
Diameter circle squared	0.7854	Area of circle
Diameter sphere squared	3.1416	Area of sphere
Diameter sphere cubed	0.5236	Volume of sphere
U.S. Gallons	0.8327	Imperial gallons (British)
U.S. Gallons	0.1337	Cubic feet

C. Displacement

Multiply	by	To Obtain:
Cubic inches	16.38716	Cubic centimeters
Cubic yards	0.76456	Cubic meters

Multiply	by	To Obtain:
Grains	64.79892	Milligrams
Ounces, dry	28.35	Grams
Pounds	453.59	Grams
Pounds	0.45359	Kilograms

D. Pressure

Multiply	by	To Obtain:
U.S. Gallons	8.32675	Pounds of water at 20°C
Cubic feet	62.427	Pounds of water at 4°C
Feet of water at 4°C	0.4335	Pounds per square inch
Inch of mercury at 0°C	0.4912	Pounds per square inch

E. Speed

Multiply	by	To Obtain:
Knots	1.1516	Miles per hour
M.p.h.	1.61	Km/h
Km/h	0.62137	M.p.h.

F. Torque

Multiply	by	To Obtain:
N-m	0.102	Kg-m
N-m	0.7376	Ft.-lb
N-m	8.851	In-lb
Kg-m	9.807	N-m
Kg-m	7.233	Ft.-lb
Kg-m	86.8	In-lb
Ft.-lb	12.0	In-lb
Ft.-lb	0.1383	M/Kgs.
Ft.-lb	0.13826	Kg-m
Ft.-lb	13.8	Cm. - Kgs.
In-lb	0.113	N-m

G. Temperature

Temperature Conversion
°C × 9/5 + 32 = °F
°F - 32 x 5/9 = °C

3. EQUIVALENT MEASUREMENTS

A. Linear

Measurement	Equivalent to:	
1 Millimeter	-	0.03937 Inch
10 Millimeters	1 Centimeter	0.3937 Inch
10 Centimeters	1 Decimeter	3.937 Inches
10 Decimeters	1 Meter	39.37 Inches
10 Meters	1 Decameter	32.8 Feet
10 Decameters	1 Hectometer	328.0 Feet
10 Hectometers	1 Kilometer	0.621 Mile
1 Inch	25.4 Millimeters	2.54 Centimeters
12 Inches	1 Foot	0.3048 Meter
3 Feet	1 Yard	0.9144 Meter
5 ½ Yards	1 Rod	5.029 Meters
40 Rods	1 Furlong	201.168 Meters
8 Furlongs	1 Statute mile	1609.344 Meters
3 Statute miles	1 Land league	4.828 Kilometers
6 Feet	1 Fathom	1.828 Meters
1.1508 Statute mile	1 Nautical mile (knot)	1.852 Kilometers

B. Liquid Capacity

Measurement	Equivalent to:	
1 Minim	0.004 Cubic inch	0.062 Milliliter
60 Minims	1 Fluid dram	3.697 Milliliters
8 Fluid drams	1 Fluid ounce	0.030 Liter
4 Fluid ounces	1 Gill	0.118 Liter
8 Fluid ounces	1 Cup	0.236 Liter

Measurement	Equivalent to:	
2 Cups	1 Pint	0.473 Liter
2 Pints	1 Quart	0.946 Liter
4 Quarts	1 Gallon	3.785 Liters
1 Teaspoon	1 1/3 Fluid drams	4.929 Milliliters
1 Tablespoon	3 Teaspoons	14.787 Milliliters

C. Dry Capacity

Measurement	Equivalent to:	
1 Pint	33.60 Cubic Inches	0.551 Liter
2 Pints	1 Quart	1.101 Liters
8 Quarts	1 Peck	8.810 Liters

D. Capacity

Measurement	Equivalent to:	
1 Milliliter	-	0.027 Fluid drams
10 Milliliters	1 Centiliter	0.338 Fluid ounce
10 Centiliters	1 Deciliter	3.38 Fluid ounces
10 Deciliters	1 Liter	1.057 Liquid quarts
10 Deciliters	1 Liter	0.908 Dry quart
10 Liters	1 Decaliter	2.64 Gallons
10 Decaliters	1 Hectoliter	264.18 Gallons

4. APPROXIMATE WEIGHTS

A. Liquids

Type	Pound per Gallon:
Alcohol	6.576
Gasoline	6.042
Kerosene	6.668
Lubricating Oil	7.584
Water	8.335

B. Materials

Type	Pound per Gallon:
Aluminum (cast)	165
Bronze (phosphor)	554
Brass (cast-rolled)	534
Copper (cast-rolled)	556
Glass (plate)	184

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VENDOR SUPPLIED PARTS

CODE	VENDOR
V1LF36	3M MINNESOTA MINING AND MFG 3M CENTER SAINT PAUL, MN 55144-1000
X1234A	ACK TECHNOLOGIES 440 WEST JULIAN STREET SAN JOSE, CA 95110
V65873	ACS PRODUCTS 1585 COPPER DRIVE PO BOX 152 LAKE HAVASU CITY, AZ 86403-2406
V0E3U1	AERO ACCESSORIES INC 1240 SPRINGWOOD AVENUE GIBSONVILLE, NC 27249
V79731	AERO ELECTRIC CONNECTOR CO 755 WASHINGTON STREET SUITE 8 SOUTH EASTON, MA 02375
V5N730	AERO INSTRUMENTS INC 6935 STERNS HOUSTON, TX 77021-4620
V59579	AEROSPACE LIGHTING CORP 75 BEACON DRIVE HOLBROOK, NY 11741
VK5788	AEROSPACE SYSTEMS & COMPONENTS 5201 EAST 36TH STREET NORTH WICHITA, KS 67220 - 0320
V5M916	AIRCRAFT SPRUCE AND SPECIALTY CO 225 AIRPORT CIRCLE PO BOX 4000 CORONA, CA 91718-9961
V0FWE1	AM SAFE INC 1043 NORTH 47TH AVENUE PHOENIX, AZ 85043
V49367	AMPHENOL CORP AMPHENOL AEROSPACE 40-60 DELAWARE AVENUE SIDNEY, NY 13838-1395
X1234D	ANDAIR LTD UNIT 15 THE TANNERIES HAVANT, HAMPSHIRE, ENGLAND PO9 1JB
V80495	ANDERSON AIRMOTIVE PRODUCTS INC 994 JEFFERSON STREET FALL RIVER, MA 02721
V7X980	APPLIED THERMAL SYSTEMS INC 5924 SHALLOWFORD ROAD CHATTANOOGA, TN 37401
V63006	ARCOLECTRIC CORP 31-315 PLANTATION DRIVE THOUSAND OAKS, CA 92276-6602

VENDOR SUPPLIED PARTS

CODE	VENDOR
V1L906	ARDEN FASTENERS INC 200 SOUTH OWASSO BOULEVARD EAST PO BOX 64018 SAINT PAUL, MN 55164
V54380	ARNAV SYSTEMS INC 16923 MERIDIAN EAST PUYALLUP, WA 98373-0730
V60253	ARTEX AIRCRAFT SUPPLIES INC 14405 KEIL ROAD NORTHEAST AURORA, OR 97002 - 9467
V92489	ATTWOOD CORP 1016 MONROE AVENUE LOWELL, MI 49331-1167
V0FNZ2	AUSTIN - ROMTECH INC 8001 CENTRAL AVENUE NORTHEAST MPLS, MN 55432-2110
V0B3P0	AVIALL SERVICES INC 1355 MENDOTA HEIGHTS ROAD SUITE 220 MENDOTA HEIGHTS, MN 55120-1199
V1SVC7	AVIDYNE CORPORATION 55 OLD BEDFORD ROAD LINCOLN, MA 01773-1125
V1WDV8	B AND C SPECIALTY PRODUCTS INC 213 EAST 4TH NEWTON, KS 67114
V3BB51	BALLISTIC RECOVERY SYSTEMS INC 300 AIRPORT RD SOUTH SAINT PAUL, MN 55075
V0PNE8	BARCO AND ASSOCIATES 2838 COLLEGE BOULEVARD OCEANSIDE, CA 92056
V13636	BARRY CONTROLS 4510 VANOWEN STREET BURBANK, CA 91505
V6H391	BGF INDUSTRIES INC 3802 ROBERT PORCHER WAY GREENSBORO, NC 27410
V65963	BISHOP-WISECARVER CORP 2104 MARTIN WAY PITTSBURG, CA 94565-5027
V1Q449	BLUE SEA SYSTEMS 425 SEQUOIA DR BELLINGHAM, WA 98226
V0RUF7	BOSCH AEROSPACE INC 7501 SOUTH MEMORIAL PARKWAY SUITE 207 HUNTSVILLE, AL 35802-2226

VENDOR SUPPLIED PARTS

CODE	VENDOR
V56833	BRACKETT AIRCRAFT CO INC 7045 FLIGHTLINE DRIVE KINGMAN, AZ 86401-6761
V9X737	BUYERS PRODUCTS CO 7700 TYLER BOULEVARD MENTOR, OH 44060-4802
V09353	C AND K COMPONENTS INC 57 STANLEY AVENUE WATERTOWN, MA 02172
V99017	CAPLUGS 2150 ELMWOOD AVENUE BUFFALO, NY 14207-7198
V65664	CATAMOUNT MFG INC 158 GOVERNOR DRIVE PO BOX 720 ORANGE, MA 01364-0720
V56988	CENTURY SPRING CORP 222 EAST 16TH STREET LOS ANGELES, CA 90015-3636
V01963	CHERRY ELECTRICAL PRODUCTS 11200 88TH AVENUE PLEASANT PRAIRIE, WI 53158
V50516	CLAROSTAT SENSORS AND CONTROLS 12055 ROJAS DRIVE SUITE K EL PASO, TX 79936
V0NM25	CLEAN SEAL INC 20900 IRELAND ROAD SOUTH BEND, IN 46614-4382
V66530	CLICK BOND 2151 LOCKHEED WAY CARSON CITY, NV 89706-0713
V62661	COLDER PRODUCTS CO 1001 WESTGATE DR ST PAUL, MN 55114
V51351	COMANT INDUSTRIES INC 577 BURNING TREE ROAD FULLERTON, CA 92833-1445
V54071	COMMERCIAL AIRCRAFT PRODUCTS INC 2311 SOUTH EDWARDS WICHITA, KS 67213-0196
V63131	DAVTRON INC 427 HILLCREST WAY REDWOOD CITY, CA 94062-4012
V53669	DELPHI CONNECTION SYSTEMS 17150 VON KARMAN AVENUE IRVINE, CA 92614-0901

VENDOR SUPPLIED PARTS

CODE	VENDOR
V71983	DOW CHEMICAL CO 2030 DOW CENTER MIDLAND, MI 48674
V2N182	DURACELL INC BERKSHIRE CORPORATE PARK BETHEL, CT 06801
V61706	EAO SWITCH CORPORATION 98 WASHINGTON STREET MILFORD, CT 06460 - 3133
V4N674	EATON AEROQUIP INC 2500 WEST ARGYLE STREET JACKSON, MI 49202-1845
V55588	EATON CORP COMMERCIAL CONTROLS DIV 1100 EAST PRESTON STREET PO BOX 57 SELMA, NC 27576-0057
V0Z3C6	EDMO DISTRIBUTORS INC 12830 EAST MIRABEAU PARKWAY SPOKANE, WA 99216-1464
V23480	ELECTRONIC HARDWARE CORP 320 BROADHOLLOW ROAD FARMINGDALE, NY 11735-4879
V82121	ELECTROSWITCH CORP 180 KING AVENUE WEYMOUTH, MA 02188-2913
V0B9E8	ENVIRO SYSTEMS INC 4000 HWY 99 NORTH SEMINOLE, OK 74868 - 9442
X1234B	EURAMTEC CO 29650 GRAND RIVER AVENUE FARMINGTON HILLS, MI 48336-5622
V26124	GARLOCK BEARINGS INC 700 MIDATLANTIC PARKWAY THOROFARE, NJ 08086
V0TRC3	GARMIN INTERNATIONAL INC 1200 EAST 151ST STREET OLATHE, KS 66062
V1YH87	GE SUPPLY LOGISTICS LLC 9500 NORTH ROYAL LANE SUITE 130 IRVING, TX 75063 - 2426
V7L196	GENERAL ELECTRIC CO 7450 METRO BOULEVARD MINNEAPOLIS, MN 55435-3909
V26124	GGB NORTH AMERICA 700 MIDATLANTIC PARKWAY THOROFARE, NJ 08086

VENDOR SUPPLIED PARTS

CODE	VENDOR
V89305	GOODRICH AEROSPACE 100 PANTON ROAD VERGENNES, VT 05491
V81073	GRAYHILL INC 561 WEST HILLGROVE AVENUE LA GRANGE, IL 60525-5591
V03007	H. A. GUDEN INC 99 RAYNOR AVENUE RONKONKOMA, NY 11779 - 6649
V1LGE7	H3R INC 483 MAGNOLIA AVENUE LARKSPUR, CA 94939 - 2034
V83014	HARTWELL CORP 900 SOUTH RICHFIELD ROAD PLACENTIA, CA 92670-6788
V24692	HARTZELL PROPELLER 1 PROPELLER PLACE PIQUA, OH 45356-2655
V28520	HEYCO PRODUCTS INC 1800 INDUSTRIAL WAY NORTH TOMS RIVER, NJ 08755-4809
V74400	HOBBS CORP YALE BOULEVARD AND ASH STREET PO BOX 19424 SPRINGFIELD, IL 62794-9424
V91929	HONEYWELL INC - MICRO SWITCH DIV 11 WEST SPRING STREET FREEPORT, IL 61032-4316
V22373	HONEYWELL INC 23500 WEST 105TH STREET OLATHE, KS 66061-8425
V98284	HUMPHREY INC 9212 BALBOA AVENUE SAN DIEGO, CA 92123-1514
V0JFH8	IGUS BEARINGS INC 50 NORTH BROADWAY RUMFORD, RI 02916-2600
V77020	IMPERIAL INDUSTRIES INC 5850 SHELDON ROAD BELLEVILLE, MI 48111-1142
V0KTC0	IMPERIAL PLASTICS INC 5700 SHELDON RD CANTON, MI 48188
V68678	INSTRUMENT SPECIALTIES INC 39565 MOUND ROAD TROY, MI 48310-2744
V59993	INTERNATIONAL RECTIFIER 233 KANSAS STREET EL SEGUNDO, CA 90245-4315

VENDOR SUPPLIED PARTS

CODE	VENDOR
V52547	JACO MFG CO 468 GEIGER ST BEREA,OH 44017
V0LZE3	K.L. TANNEHILL INC 1210 WEST 96TH STREET BLOOMINGTON, MN 55431-2606
V22863	KAVLICO CORP 14501 PRINCETON AVENUE MOORPARK, CA 93021-9738
V051E8	KEITH PRODUCTS LP 4554 CLAIRE CHENNAULT DALLAS, TX 75248 - 3221
V0MJG0	KELLY AEROSPACE AIRPORT COMPLEX PO BOX 273 FORT DEPOSIT, AL 36032-0273
V84830	LEE SPRING CO 1462 62ND STREET BROOKLYN, NY 11219-5413
V2P953	LEMO USA INC 635 PARK COURT ROHNERT PARK, CA 94928-7940
V76005	LORD CORPORATION 1635 WEST 12TH STREET ERIE, PA 16514-0039
V76275	MCCAULEY PROPELLER SYSTEMS 5800 EAST PAWNEE WICHITA, KS 67218
V39428	MCMASTER-CARR SUPPLY CO 600 COUNTY LINE ROAD ELMHURST, IL 60126-2034
V27264	MOLEX INC 2222 WELLINGTON COURT LISLE, IL 60532-1613
V0ZQ52	MOUSER ELECTRONICS INC 1000 NORTH MAIN STREET MANSFIELD, TX 76063-1514
V02929	NEWARK ELECTRONICS 4801 NORTH RAVENSWOOD AVENUE CHICAGO, IL 60640-4457
V12624	NORTON PERFORMANCE PLASTICS 1 SEALANTS PARK GRANVILLE, NY 12832-1652
V92867	ORSCHELN PRODUCTS LLC 1177 NORTH MORLEY STREET MOBERLY, MO 65270-2716
V21649	OTTO ENGINEERING INC 2 EAST MAIN STREET CARPENTERSVILLE, IL 60110-0262

VENDOR SUPPLIED PARTS

CODE	VENDOR
V04RC7	PACIFIC PRECISION PRODUCTS 5 ARMSTRONG LANE HOQUIAM, WA 98550-9426
V06383	PANDUIT CORP 17301 RIDGELAND AVENUE TINLEY PARK, IL 60477-0981
V26433	PARKER HANNIFIN CORP 711 TAYLOR STREET ELYRIA, OH 44035-6229
V4P807	PETERS-DELAET INC 340 HARBOR WAY SOUTH SAN FRANCISCO, CA 94080-6900
V0CUJ4	PIVOT POINT INC 225 NORTH HIGHLAND STREET PO BOX 488 HUSTISFORD, WI 53034
V28198	POSITRONIC INDUSTRIES INC 423 NORTH CAMPBELL STREET SPRINGFIELD, MO 65806-6100
V63590	PREMIER INDUSTRIAL CORP SPC TECHNOLOGY DIV 4801 NORTH RAVENSWOOD AVENUE CHICAGO, IL 60640-4496
V1CY13	QUESTRON AEROSPACE FAS-TRONICS DIV 2153 EAGLE PARKWAY FORT WORTH, TX 76177-2311
V31926	RECCO PRODUCTS INC 702 S MAIN ST PO BOX 443 WAYLAND, MI 49348-0443
V95933	REVCOR INC 251 EDWARDS AVENUE CARPENTERSVILLE, IL 60110-1941
V09393	ROCHESTER GAUGES 11616 HARRY HINES BOULEVARD DALLAS, TX 75229 - 0242
V86797	ROGAN CORP 3455 WOODHEAD DRIVE NORTHBROOK, IL 60062-1894
V07382	ROTOR CLIP COMPANY INC 187 DAVIDSON AVENUE SOMERSET, NJ 08873
V1FX07	SEELYE-EILER INDUSTRIAL PLASTICS 9700 NEWTON AVENUE SOUTH BLOOMINGTON, MN 55431
V99321	SHAW AERO DEVICES INC 3580 SHAW BLVD NAPLES, FL 34117 - 8408

VENDOR SUPPLIED PARTS

CODE	VENDOR
V3U613	SKF COMPONENT SYSTEMS INC 1530 VALLEY CENTER PARKWAY BETHLEHEM, PA 18017
V94222	SOUTHCO 210 NORTH BRINTON LAKE ROAD PO BOX 0116 CONCORDVILLE, PA 19331-0116
V12522	STACOSWITCH INC 1139 BAKER STREET COSTA MESA, CA 92626-4191
V0VTX0	S-TEC CORP 1 S-TEC WAY MINERAL WELLS, TX 76067
V82389	SWITCHCRAFT INC 5555 NORTH ELSTON AVENUE CHICAGO, IL 60630-1314
V0PYA5	TELEDYNE CONTINENTAL MOTORS 2039 SOUTH BROAD STREET MOBILE, AL 36615-1286
V84375	TELEDYNE CONTINENTAL MOTORS BATTERY PRODUCTS 840 WEST BROCKTON AVENUE REDLANDS, CA 92374-2902
V28856	TELEX COMMUNICATIONS INC 12000 PORTLAND AVENUE BURNSVILLE, MN 55337-1522
V80254	TEXTRON LYCOMING INC 652 OLIVER STREET WILLIAMSPORT, PA 17701-4410
V49CZ4	TIP INDUSTRIES INC 415 KEIM BOULEVARD SUITE 2 BURLINGTON, NJ 08016
X1234C	TRIM-GARD COMPANY LTD 472 NEWBOLD STREET LONDON, ONTARIO, CANADA N6E 1K6
V57137	TRIM-LOK INC 6855 HERMOSA CIRCLE BUENA PARK, CA 90622-6180
V0BKV9	TYCO ELECTRONICS 1816 OLD HOMESTEAD LANE LANCASTER, PA 17601
V61225	UMA INC 260 MAIN STREET DAYTON, VA 22821-0100
V61158	UNIFRAX CORP 2351 WHIRLPOOL STREET NIAGARA FALLS, NY 14305-5241

VENDOR SUPPLIED PARTS

CODE	VENDOR
V83311	UNISON INDUSTRIES INC 5345 STATE HIGHWAY 12 NORWICH, NY 13815-3206
V27901	UNITED STATES PLASTIC CORP 1390 NEUBRECHT ROAD LIMA, OH 45801-3120
V28063	WALL COLMONOY CORP 4700 SOUTHEAST 59TH STREET OKLAHOMA CITY, OK 73135-4419
V79221	WATLOW ELECTRIC MANUFACTURING 12001 LACKLAND RD ST. LOUIS, MO 63146
V58961	WAYTEK INC 7660 QUATTRO DRIVE PO BOX 690 CHANHASSEN, MN 55317
V0LAX5	WES-GARDE COMPONENTS GROUP INC 11750 WESTLINE INDUSTRIAL DRIVE SAINT LOUIS, MO 63146
V10402	WHELEN ENGINEERING COMPANY 51 WINTHROP ROAD CHESTER, CT 06412-0684
V0PW06	WICKS AIRCRAFT SUPPLY 410 PINE STREET HIGHLAND, IL 62249-1243
V06229	WIELAND INC 49 INTERNATIONAL ROAD PO BOX 338 BURGAW, NC 28425
V81861	WIRE PRO INC BURTON ELECTRICAL ENGINEERING DIV 1510 WEST 135TH STREET GARDENA, CA 90249-2230
V0FVD7	WIREMASTERS INC 6997 INDUSTRIAL PARK ROAD MOUNT PLEASANT, TN 38474-3902
V66503	WOODWARD GOVERNOR CO 5001 NORTH 2ND STREET LOVES PARK, IL 61111-5800

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CHAPTER 93

SURVEILLANCE

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SURVEILLANCE

1. GENERAL

Those units and components which furnish a means of sensing the surrounding environment, and then process, display, and record the resulting information.

INFRARED SENSORS

1. DESCRIPTION

That portion of the system that uses heat sensing devices such as infra-red scanners, infra-red image and detection to acquire information. This includes the Enhanced Vision System.

The Enhanced Vision System (EVS) is an electro-optical system that uses a Long-Wave Infrared (IR) camera to enhance situational awareness. Infrared red is particularly effective at night, smoke, haze, and smog in addition to a broad spectrum of rain, snow, and radiation-type fog. EVS is an aid to visual acquisitions of:

- Ground vehicles and other ground-based equipment/obstacles,
- Aircraft on taxi-ways and runways,
- Other traffic during takeoff, approach, and landing,
- Runway and taxi lights,
- Runway and terrain features during climb, descent, and low altitude maneuvering.

The EVS sensor, located on the underside of the LH wing, contains a long-wave infrared camera that produces a infrared image and a low-light CMOS camera that produces a visible image. The two images are then combined to produce a single monochrome image that is transmitted directly to the MFD. Upon power-up the sensor requires approximately 90 seconds to produce a usable image.

28 VDC for Enhanced Vision System operation is supplied through the 5-amp EVS CAMERA circuit breaker on Main Bus 3. Refer to the manufacturer's approved Instructions For Continued Airworthiness.

2. TROUBLESHOOTING

Trouble - PFD	Probable Cause	Remedy
Video image not displayed.	Software not configured.	Perform Adjustment/Test - Optional Systems Activation, selecting the EVS option. (Refer to 42-20)
	No power to EVS unit.	Following initial power-up, listen for series of clicks as camera shutters open and close. If camera doesn't power on, verify security of connectors and wire harness.
	Display not receiving image information.	Verify security of connectors and wire harness.
Halo Images.	As sensor windows are heated, infrared detector not able to compensate for signal from window, as compared to outside view, so a white (hot) area may appear around image perimeter.	Turn system on during preflight or run-up to stabilize window and body heaters prior to flight and allow thermal stabilization.
Image degraded, or possibly even displayed as solid black or solid white.	Improper display settings.	Following initial power-up, adjust brightness and contrast settings to obtain the best image.
Display is visible but has an X and some bars through the image.	Anti-Tamper device not connected properly.	Verify anti-tamper device is connected to the proper pin.
	Faulty wiring.	Check wiring connecting anti-tamper device.

3. MAINTENANCE PRACTICES

A. Enhanced Vision System (EVS) Camera - *Serials 2016 & subs w/ Perspective Avionics* (See Figure 93-501)

(1) Removal - EVS Camera

(a) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(b) Pull EVS CAMERA circuit breaker.

(c) Remove wing access panel LW5. (Refer to 06-00)

(d) Disconnect wire harness connector from camera.

(e) Remove bolts and washers securing camera, gasket, and spacer to wing.

(f) Remove camera, gasket, and spacer from airplane.

(g) Remove remaining sealant from wing.

(2) Installation - EVS Camera

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222 or 222MS	Any Source	Secure EVS camera.
Caulk Sealant	(Refer to 51-30)	(Refer to 51-30)	Weather sealant.

(b) Connect wire harness connector to camera.

(c) Apply Loctite to bolt threads. (Refer to 20-40)

(d) Position spacer, gasket, and camera to wing and secure with bolts and washers.

(e) Use sealant to fillet seal spacer base. (Refer to 20-10)

(f) Install wing access panel LW5. (Refer to 06-00)

(g) Reset EVS CAMERA circuit breaker.

(h) Perform Operational Test - EVS Camera. (Refer to 93-50)

(3) Operational Test - EVS Camera

(a) Pull STARTER RELAY and FUEL PUMP RELAY circuit breakers.

(b) Set BAT 1 switch to ON position.

(c) Allow PFD and MFD to initialize for approximately one minute.

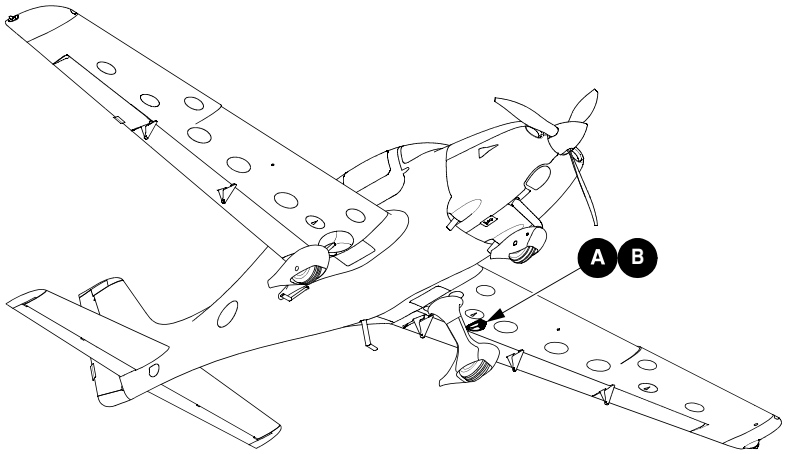
(d) On MFD, select Aux-Video page.

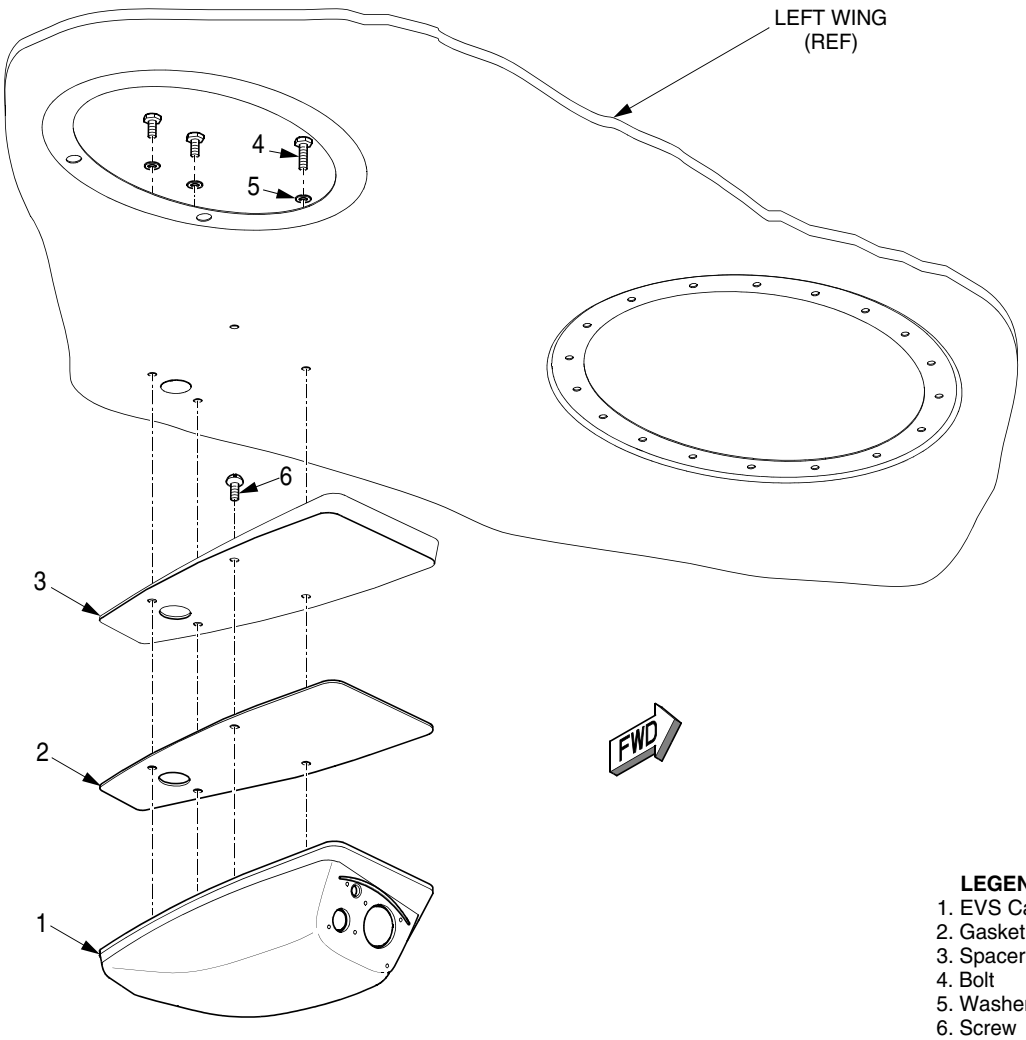
(e) Verify EVS video is displayed on top section of MFD.

(f) Verify no part of aircraft, excluding propeller, is visible in displayed video field-of-view.

(g) Set BAT 1 switch to OFF position.

(h) Reset STARTER RELAY and FUEL PUMP RELAY circuit breakers.





LEGEND
1. EVS Camera
2. Gasket
3. Spacer
4. Bolt
5. Washer
6. Screw

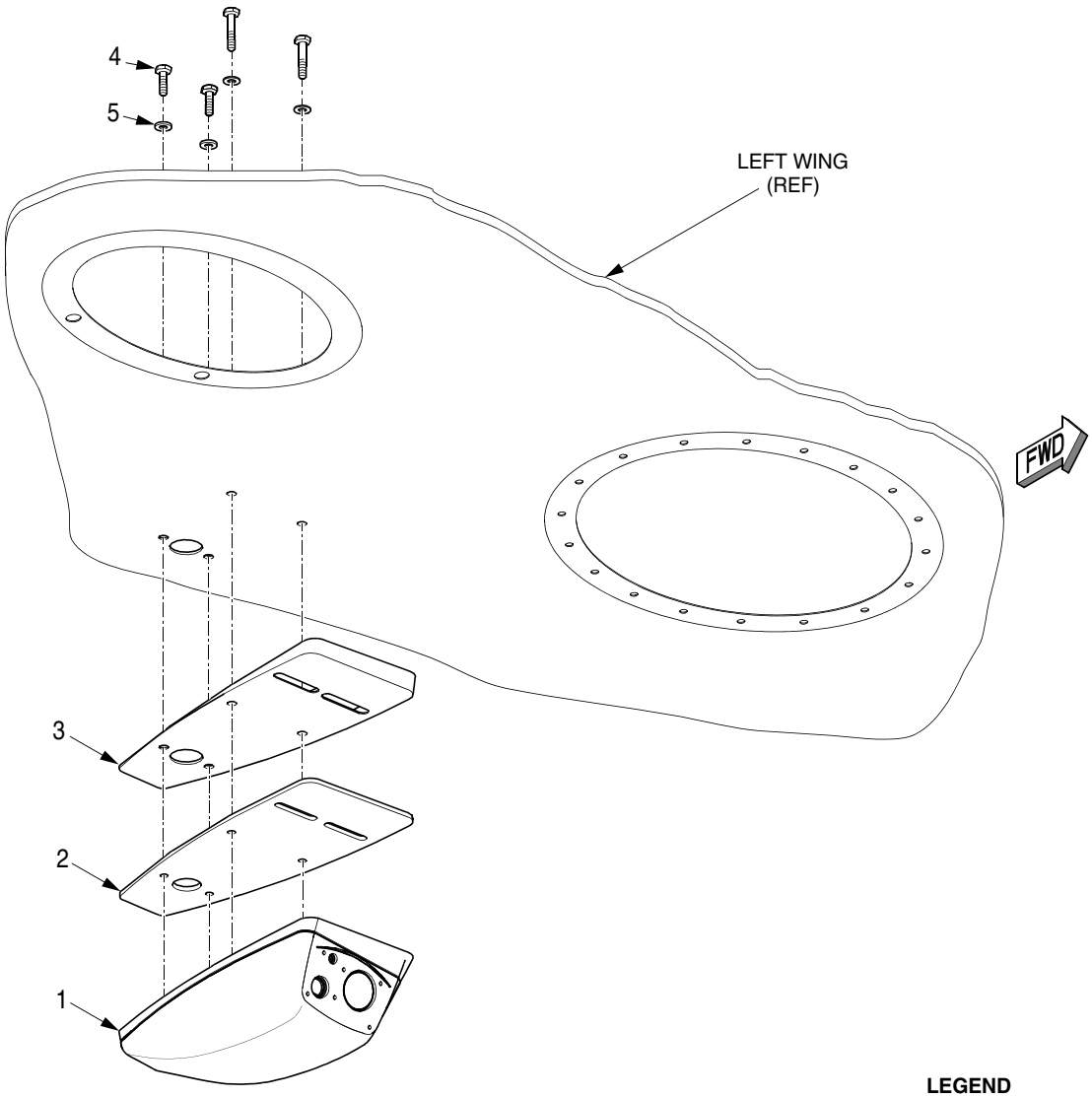
DETAIL A

Serials 2016 thru 2283.

SR20_MM93_2861

Figure 93-501
EVS Camera Installation - Serials 2016 thru 2283 w/ Perspective Avionics (Sheet 1 of 2)

EFFECTIVITY:
Serials 2016 thru 2283 w/ Perspective Avionics



LEGEND
1. EVS Camera
2. Gasket
3. Spacer
4. Bolt
5. Washer

DETAIL B

SR20_MM93_4683

Figure 93-501
EVS Camera Installation - Serials 2284 & subs (Sheet 2 of 2)

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CHAPTER 95

SPECIAL EQUIPMENT

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CHAPTER 95 - SPECIAL PURPOSE EQUIPMENT
LIST OF EFFECTIVE PAGES

Chapter-Section	Page	Date
95-LOEP	1	19 SEP 2017
95-LOEP	2	19 SEP 2017
95-TOC	1	19 SEP 2017
95-TOC	2	19 SEP 2017
95-00	1	31 MAY 2011
95-00	2	01 JAN 2016
95-00	3	31 MAY 2011
95-00	4	01 JAN 2016
95-00	5	01 JAN 2016
95-00	6	01 JAN 2016
95-00	7	01 JAN 2016
95-00	8	01 JAN 2016
95-00	9	15 DEC 2014
95-00	10	01 JAN 2016
95-00	11	01 JAN 2016
95-00	12	01 JAN 2016
95-00	13	01 JAN 2016
95-00	14	01 JAN 2016
95-00	15	01 JAN 2016
95-00	16	01 JAN 2016
95-00	17	19 SEP 2017
95-00	18	01 JAN 2016

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CHAPTER 95 - SPECIAL PURPOSE EQUIPMENT

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Cirrus Airplane Parachute System (CAPS)		2
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SPECIAL PURPOSE EQUIPMENT

1. GENERAL

This section describes special purpose equipment on the airplane. This equipment includes the Cirrus Airplane Parachute System (CAPS) and the aft tiedown ballast bracket.

A. Cirrus Airplane Parachute System (CAPS)

The airplane is equipped with a Cirrus Airplane Parachute System (CAPS) designed to bring the aircraft and its occupants to the ground in the event of a life-threatening emergency.

CAPS consists of a parachute, a solid-propellant rocket to deploy the parachute, a rocket activation system, and a harness faired into the fuselage structure.

A composite enclosure containing the parachute and solid-propellant rocket is mounted to the airplane structure immediately aft of the baggage compartment bulkhead. The enclosure is covered and protected from the elements by a thin composite cover.

The parachute is enclosed within a deployment bag that stages the deployment and inflation sequence. The deployment bag creates an orderly deployment process by allowing the canopy to inflate only after the rocket motor has pulled the parachute lines taut.

The parachute itself is a 2400-square-foot round canopy equipped with a slider, an annular-shaped fabric panel with a diameter significantly less than the open diameter of the canopy. The canopy suspension lines are routed through grommets so that the slider is free to move along the suspension lines. Since the slider is positioned at the top of the suspension lines near the canopy, at the beginning of the deployment sequence, the slider limits the initial diameter of the parachute and the rate at which the parachute inflates. The canopy inflates as the slider moves down the suspension lines.

A three-point attachment harness connects the airplane to the parachute. The harness consists of two forward straps faired into the fuselage skin and attached to the firewall, and one rear strap attached to FS 222 bulkhead located directly forward of the parachute compartment. The harness system is designed to control the pitch dynamics of the airplane during the deployment cycle by limiting the aft attachment strap's length until the cycle is complete. This is accomplished by utilizing a variable length strap section. The shorter section, which initially supports the load, employes a mechanical release that is activated by two pyrotechnic cutters which fire when the short section is pulled taut during extraction. The harness strap then lengthens and load is transferred to the longer section.

B. Aft Tie Down Ballast Bracket

The aft tie down ballast bracket is designed to offset the aircraft center of gravity. The ballast consists of two components that attach to the aft spar of the vertical stabilizer. The forward component weighs 8.4 lb (3.8 kg). The aft component weighs 6.4 lb (2.9 kg) and is integral to the aft tie down bracket.

The aft tie down ballast bracket installation replaces the non-ballast equipped aft tie down bracket. (Refer to 53-20)

2. DESCRIPTION (See Figure 95-001)

A. Cirrus Airplane Parachute System (CAPS)

Two separate and deliberate pilot actions are required to deploy the parachute. The first action requires the pilot to remove the access cover from the activation handle enclosure. The second action requires the pilot to pull the activation handle out, and down several inches.

Upon pulling the activation handle, the activation cable compresses the igniter's steel spring, cocks the plunger and the following sequence is initiated:

Serials 1005 thru 1267 before SB2X-95-20,
Serials 1268 thru 1422 before SB2X-95-17
Serials 1423 thru 2227,
Serials 1423 & subs w/o Perspective before SB2X-95-18: When one half-inch of plunger travel is reached, captured ball-bearings are released allowing the plunger to strike the firing pins. The firing pins strike two primers which ignite the primary booster.

Serials 1005 thru 1267 after SB2X-95-20,
Serials 1268 thru 1422 after SB2X-95-17,
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: When one half-inch of plunger travel is reached, captured ball-bearings are released allowing the plunger to close the electrical contacts. The closed electrical circuit ignites the primary booster.

The primary booster ignites a secondary booster initiating ignition of the larger rocket motor. Once ignited, the rocket propellant's hot gases are exhausted through the nozzle and the rocket impacts and disbonds the parachute compartment cover pulling the deployment bag from the enclosure. The deployment bag then stages the suspension line deployment and inflation of the parachute.

As the parachute inflates, the forward harness assembly grows taut, pulls free of the fuselage skin, and stops at the forward attach fitting which supports the forward portion of the airplane.

The aft harness is pulled taut, the line cutters are activated, and approximately eight seconds later "fire" and sever the nylon cord. The three-link release mechanism then opens allowing the aft harness to fully extend. The airplane then assumes its touchdown attitude; approximately ten degrees nose down, to optimize occupant protection.

B. Aft Tie Down Ballast Bracket

The aft tie down ballast bracket provides operators more flexibility in loading the aircraft within the prescribed weight and center of gravity limits.

Note: If alternating between aft tie down installations, use recorded aircraft weight to calculate and record new weight and center of gravity values on the Weight & Balance Record of the POH.

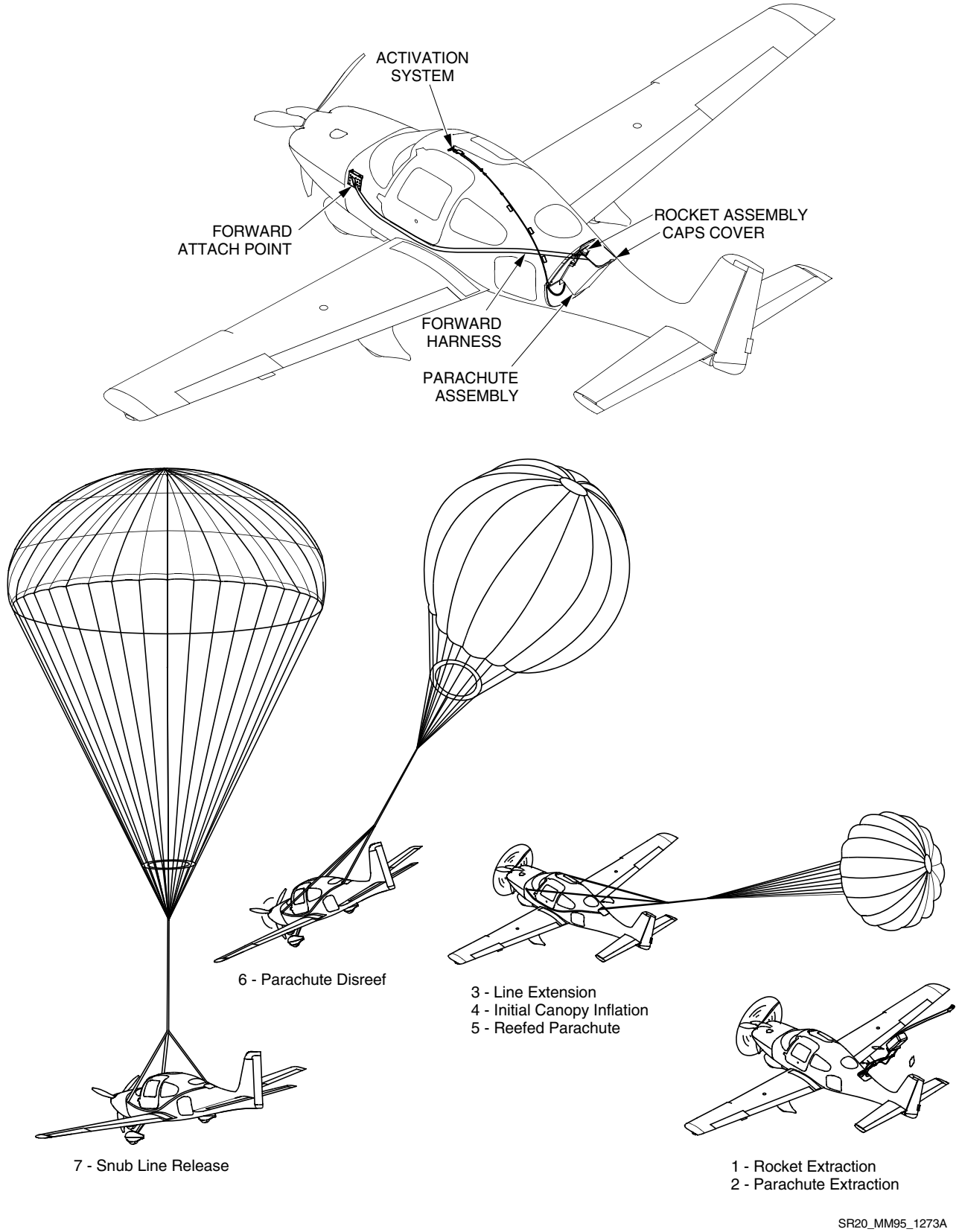


Figure 95-001
CAPS Deployment

3. MAINTENANCE PRACTICES

A. Cirrus Airplane Parachute System (CAPS)

WARNING: **Never activate CAPS on the ground. The rocket exits the fuselage with a velocity of 150 mph in the first tenth of a second and reaches full extension in less than one second. People near the airplane may be injured and extensive damage to the airframe will occur. Ground activation will cause the airplane to be out of service until CAPS is replaced and the airframe repaired and inspected.**

Rocket ignition will occur at temperature above 500° F (260° C). In the event of ground fire, use necessary precautions to avoid CAPS deployment.

FAA Type Certification for the SR20 is contingent on a functional Cirrus Airframe Parachute System (CAPS). The airplane may not be flown when CAPS is rendered inoperative.

CAUTION: CAPS must be serviced and maintained by Cirrus Design trained and authorized parachute system technicians only. Airframe and Powerplant license alone is not sufficient credentials for performing maintenance on CAPS. Refer to Cirrus Airframe Parachute System Maintenance Manual w/ Illustrated Parts List (P/N 12128-001) for additional CAPS Maintenance Practices.

Note: Licensed Airframe and Powerplant mechanics may visually inspect the parachute installation only as specified in the following inspection.

(1) Inspection/Check - Cirrus Airplane Parachute System (See Figure 95-002)

(a) Remove CAPS handle access cover and verify CAPS handle safety pin is installed.

(b) *Serials 1005 thru 1267 after SB2X-95-20:* Disconnect battery 1 from both positive and negative terminals. (Refer to 24-30)

(c) Remove bulkhead 222 trim and carpet. (Refer to 25-10)

(d) Remove access panel CB6 and CB7 from bulkhead 222. (Refer to 06-00)

(e) *Serials 1423 and subsequent*: Remove access panel RE3. (Refer to 06-00)

(f) Verify no moisture or mildew evident in Parachute Enclosure or CAPS Assembly.

(g) At top of Rocket Assembly, verify top surface of Rocket is level with or slightly higher than Pick-Up Collar Support.

(h) *Serials 1005 thru 1267 before SB2X-95-20,*
Serials 1268 thru 1422 before SB2X-95-17,
Serials 1423 thru 2227,
Serials 1423 & subs w/o Perspective before SB2X-95-18: Verify Rocket Lanyard is positioned around aft diameter of Pick-Up Collar Support.

(i) *Serials 1005 thru 1267 after SB2X-95-20,*
Serials 1268 thru 1422 after SB2X-95-17,
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: Verify Rocket Lanyard is positioned around forward diameter of Pick-Up Collar Support.

WARNING: **Rocket Lanyard must be positioned around diameter of Pick-Up Collar Support, NOT over top of Rocket. Failure to position Rocket Lanyard around diameter of Pick-Up Collar Support will absolutely FAIL deployment**

(j) Verify Rocket Lanyard is routed above Rear Harness Assembly.

WARNING: **Rocket Lanyard must be routed above Rear Harness Assembly, NOT underneath. Failure to route Rocket Lanyard properly will absolutely FAIL deployment.**

(k) Verify Shear Screws securing Pick-Up Collar Support to Pick-Up Collar are fully engaged.

(l) *Serials 1005 thru 1267 before SB2X-95-20,*
Serials 1268 thru 1422 before SB2X-95-17,
Serials 1423 thru 2227,
Serials 1423 & subs w/o Perspective before SB2X-95-18: Verify 0.40 inch (10.16 mm) clearance exists between Pick-Up Collar and BH 222.

(m) *Serials 1005 thru 1267 after SB2X-95-20,*
Serials 1268 thru 1422 after SB2X-95-17,
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: Verify minimum gap of 0.13 inch (3.30 mm) exists between outer diameter of pick-up collar ring and aft side of BH 222.

(n) *Serials 1005 thru 1267 before SB2X-95-20, 1268 thru 1422 before SB2X-95-17:* Verify Grommet installed to Rocket Shield and Activation Cable.

(o) Verify LH and RH Fuselage Harness exiting Parachute Enclosure is not twisted.

(p) Verify Protective Sheath around Aft Harness is captive by Aft Harness Bracket.

(q) Verify Lanyard is coiled behind Aft Harness and stowed neatly into Stowage Pocket on the parachute assembly.

(r) Just below Stowage Pocket, verify Aft Harness secured to Parachute Assembly either by velcro pack or stitching.

(s) Verify correct alignment of Three-Link Release Assembly.

(t) Verify Aft Harness lays flat against Parachute Assembly.

(u) Behind Rocket Shield, verify Abrasion Sheath installed to LH Fuselage Harness.

(v) Inspect for chafing or cutting on CAPS Assembly Retaining Straps along bottom and back of Parachute Enclosure.

(w) Verify correct Harness Routing through Three-Point Shackles.

(x) *Serials 1005 thru 1267 after SB2X-95-20,*
Serials 1268 thru 1422 after SB2X-95-17,
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: Complete Electric Ignition Checkout Procedure.

1 *Serials 1005 thru 1267 after SB2X-95-20:* Connect battery 1 at both positive and negative terminals. (Refer to 24-30)

2 *Serials 1268 thru 1422 after SB2X-95-17,*
Serials 1423 & subs w/o Perspective after SB2X-95-18,
2228 & subs: Open CB880 and CB881 circuit breakers at BAT 2.

3 *Serials 1005 thru 1267 after SB2X-95-20:* Disconnect J2702 from P2702.

4 Temporarily install 10 kohm resistor across positive and negative voltmeter terminals.

5 *Serials 1005 thru 1267 after SB2X-95-20,*
Serials 1268 thru 1422 after SB2X-95-17,
Serials 1423 & subs w/o Perspective after SB2X-95-18: Access P2700 through access panel CF5.

6 *Serials 2228 & subs:* Access P2700 through avionics bay.

7 *Serials 1005 thru 1267 after SB2X-95-20:* Verify the following voltage readings at P2700. Reference readings to P2700, socket 8 (center socket).

CHECK	DESCRIPTION	VOLTMETER READING
P2700, socket 2	CAPS BAT	0-0.4 V MAX.
P2700, socket 3	BAT 1 + CAPS BAT DIODE OR'D BUS	+24 V

8 *Serials 1268 thru 1422 after SB2X-95-17,*
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: Verify the following voltage readings at P2700. Reference readings to P2700, socket 8 (center socket).

CHECK	DESCRIPTION	VOLTMETER READING
P2700, socket 2	BAT 2 Bus	0-0.4 V MAX.
P2700, socket 3	BAT 1 + BAT 2 DIODE OR'D BUS	+24 V

9 Remove 10 kohm resistor from voltmeter and use diode check feature to verify the following readings.

(-) METER LEAD	(+) METER LEAD	METER READING
P2700, socket 3	P2700, socket 1	0.5+/-0.3 V
P2700, socket 3	P2700, socket 2	0.5+/-0.3 V
P2700, socket 1	P2700, socket 3	OPEN
P2700, socket 2	P2700, socket 3	OPEN

10 *Serials 1005 thru 1267 after SB2X-95-20:* Connect J2702 to P2702.

11 *Serials 1268 thru 1422 after SB2X-95-17,*
Serials 1423 & subs w/o Perspective after SB2X-95-18
2228 & subs: Close CB880 and CB881 circuit breakers.

12 *Serials 1005 thru 1267 after SB2X-95-20:* Perform the following voltage checks at diagnostics connector P2700. Reference all readings to P2700, socket 8 (-) lead.

CHECK	DESCRIPTION	VOLTMETER READING
P2700, socket 1	BAT 1 CLOCK POWER	+24 V
P2700, socket 2	CAPS BATT	+10 V
P2700, socket 3	IGNITER SWITCH DIAGNOSTIC	+24 V
P2700, socket 4	NOT USED	0 V

CHECK	DESCRIPTION	VOLTMETER READING
P2700, socket 5	NOT USED	0 V
P2700, socket 6	TEST POINT RESISTOR	0 V
P2700, socket 7	NOT USED	0 V
SHIELD GND	AIRCRAFT CHASSIS	0 V

13 *Serials 1268 thru 1422 after SB2X-95-17,*
Serials 1423 & subs w/o Perspective after SB2X-95-18,
Serials 2228 & subs: Perform the following voltage checks at diagnostics connector P2700. Reference all readings to P2700, socket 8 (-) lead

CHECK	DESCRIPTION	VOLTMETER READING
P2700, socket 1	BAT 1 CLOCK POWER	+24 V
P2700, socket 2	BAT 2	+24 V
P2700, socket 3	IGNITER SWITCH DIAGNOSTIC	+24 V
P2700, socket 4	NOT USED	0 V
P2700, socket 5	NOT USED	0 V
P2700, socket 6	TEST POINT RESISTOR	0 V
P2700, socket 7	NOT USED	0 V
SHIELD GND	AIRCRAFT CHASSIS	0 V

14 Use an ohmmeter to verify the following resistances.

FROM	TO	RESISTANCE
P2700, socket 8	P2700, socket 6	100+/-10 kohms
P2700, socket 8	CABLE SHIELD	<1 ohm

15 Stow and secure cabling for P2700 to prevent entangling aircraft control cables or shorting nearby wiring.

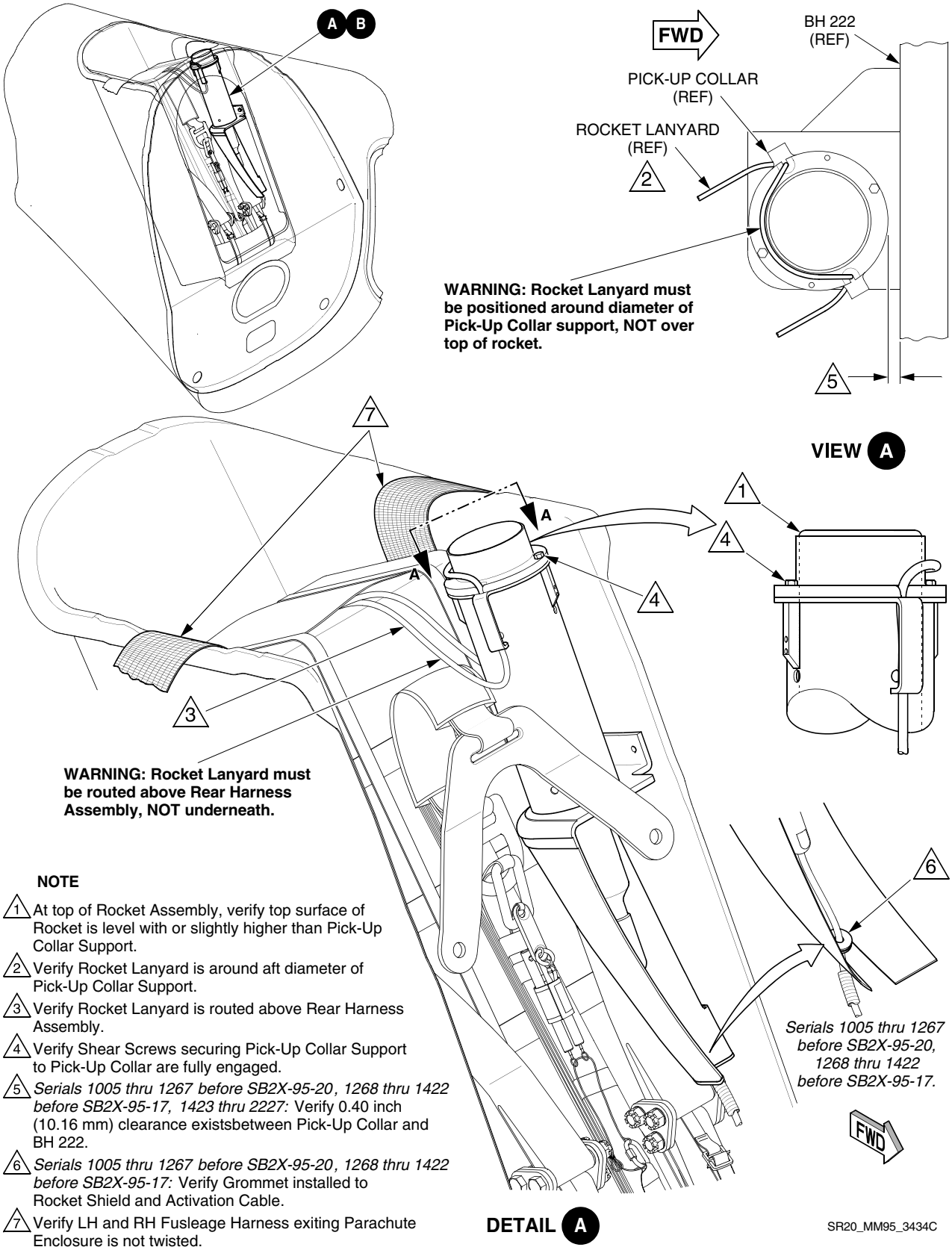
(y) *Serials 1005 thru 1267 after SB2X-95-20:* Disconnect battery 1 at both positive and negative terminals. (Refer to 24-30)

(z) *Serials 1423 and subsequent*: Install access panel RE3. (Refer to 06-00)

(aa) Install access panel CB6 and CB7 to bulkhead 222. (Refer to 06-00)

(ab) *Serials 1005 thru 1267 after SB2X-95-20:* Connect battery 1 at both positive and negative terminals. (Refer to 24-30)

(ac) Install bulkhead 222 trim and carpet. (Refer to 25-10)

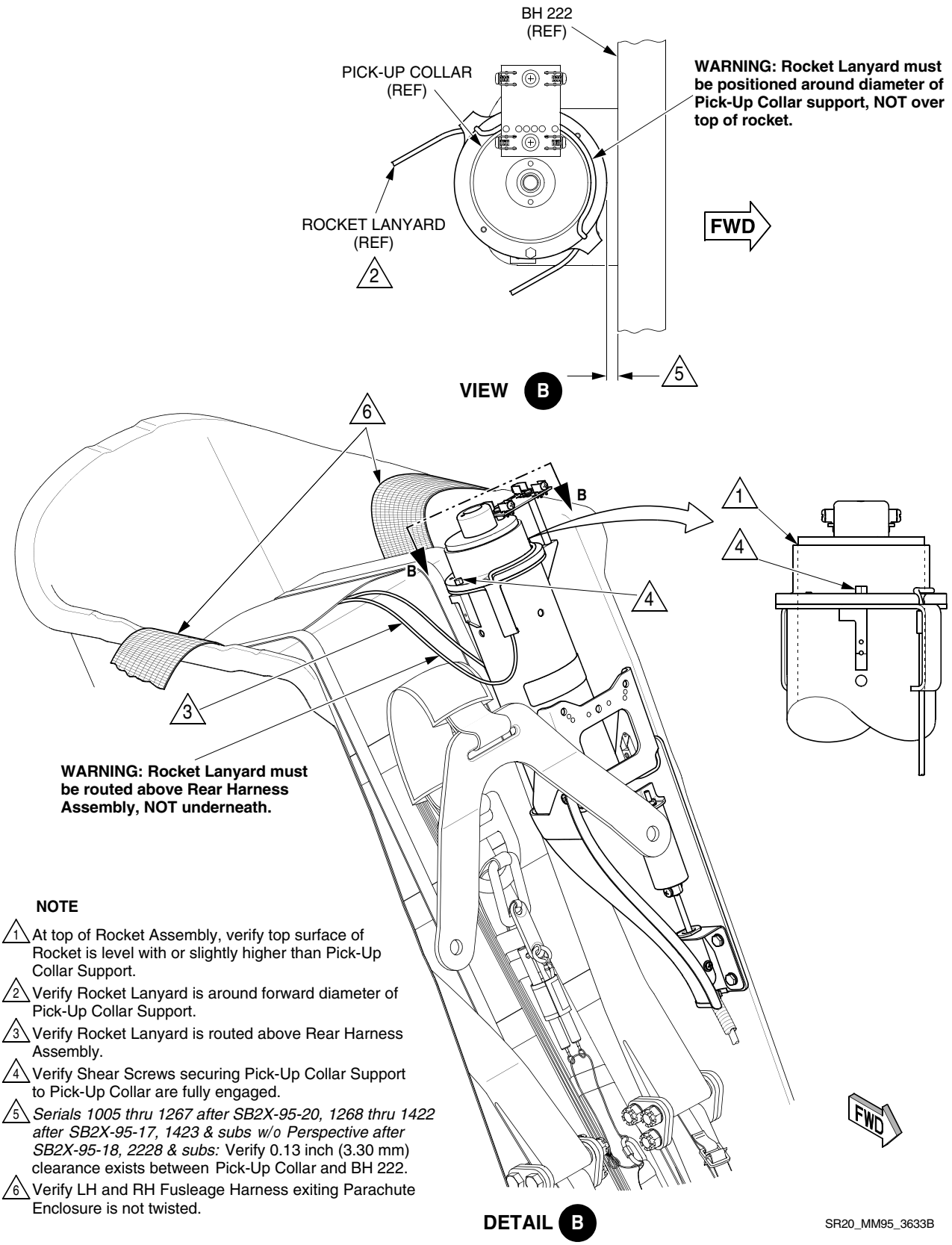


NOTE

1. At top of Rocket Assembly, verify top surface of Rocket is level with or slightly higher than Pick-Up Collar Support.
2. Verify Rocket Lanyard is around aft diameter of Pick-Up Collar Support.
3. Verify Rocket Lanyard is routed above Rear Harness Assembly.
4. Verify Shear Screws securing Pick-Up Collar Support to Pick-Up Collar are fully engaged.
5. *Serials 1005 thru 1267 before SB2X-95-20, 1268 thru 1422 before SB2X-95-17, 1423 thru 2227:* Verify 0.40 inch (10.16 mm) clearance existsbetween Pick-Up Collar and BH 222.
6. *Serials 1005 thru 1267 before SB2X-95-20, 1268 thru 1422 before SB2X-95-17:* Verify Grommet installed to Rocket Shield and Activation Cable.
7. Verify LH and RH Fusleage Harness exiting Parachute Enclosure is not twisted.

Figure 95-002

Inspection/Check - CAPS - 1005 & subs w/o Perspective before CAPS Rocket Motor Assy. Replacement Bulletins, 2016 thru 2227 (1 of 5)

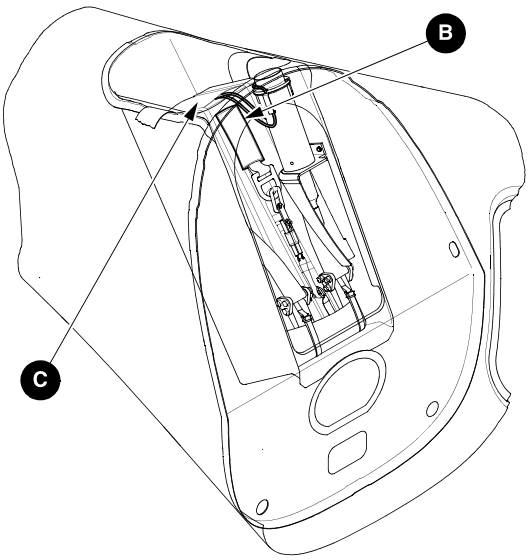


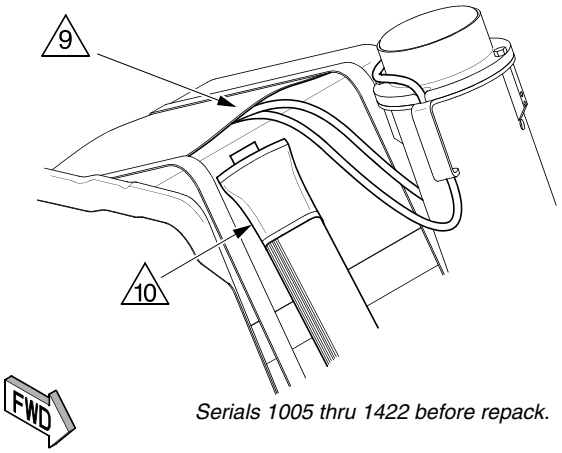
NOTE

1. At top of Rocket Assembly, verify top surface of Rocket is level with or slightly higher than Pick-Up Collar Support.
2. Verify Rocket Lanyard is around forward diameter of Pick-Up Collar Support.
3. Verify Rocket Lanyard is routed above Rear Harness Assembly.
4. Verify Shear Screws securing Pick-Up Collar Support to Pick-Up Collar are fully engaged.
5. *Serials 1005 thru 1267 after SB2X-95-20, 1268 thru 1422 after SB2X-95-17, 1423 & subs w/o Perspective after SB2X-95-18, 2228 & subs:* Verify 0.13 inch (3.30 mm) clearance exists between Pick-Up Collar and BH 222.
6. Verify LH and RH Fusleage Harness exiting Parachute Enclosure is not twisted.

Figure 95-002

Inspection/Check - CAPS - 1005 & subs w/o Perspective after CAPS Rocket Motor Assy. Replacment Bulletins, 2228 & subs (2 of 5)





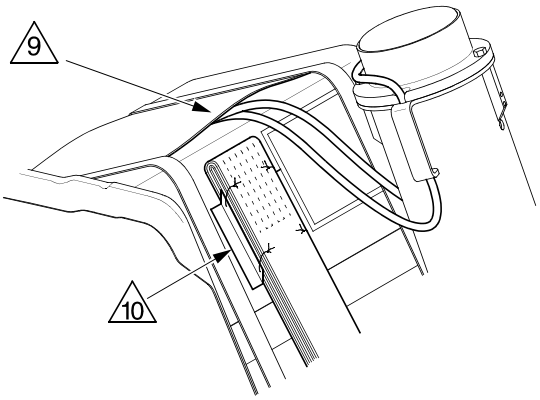
Serials 1005 thru 1422 before repack.

NOTE

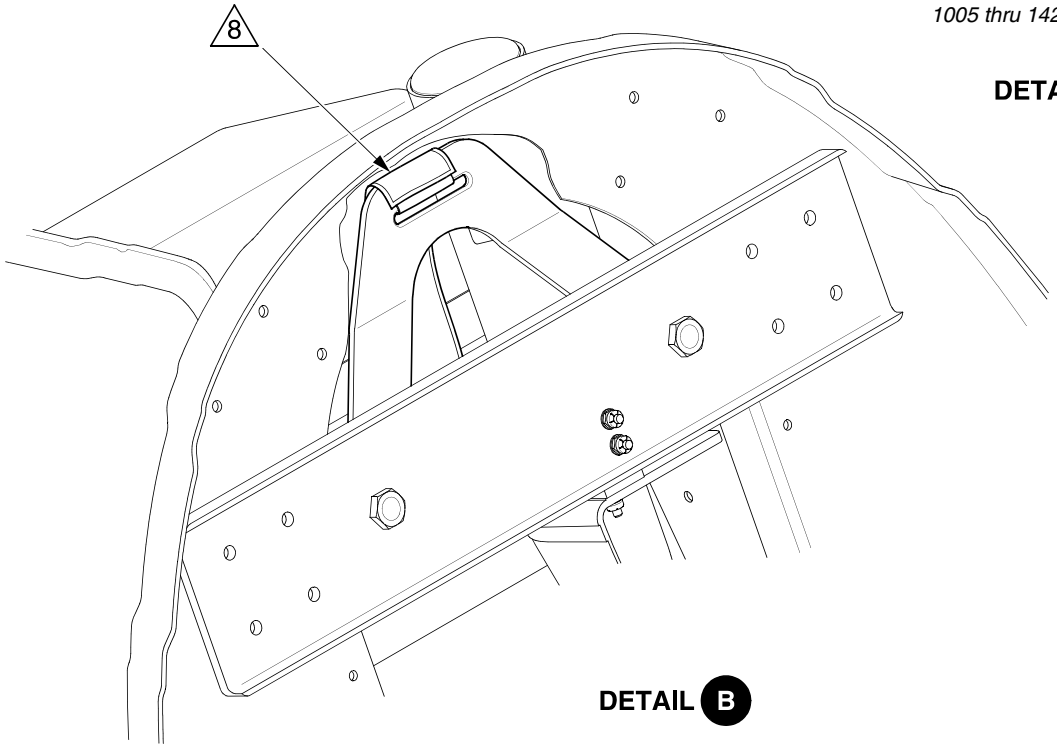
8 Verify Protective Sheath around Aft Harness is captive by Aft Harness Bracket.

9 Verify Lanyard is coiled behind aft harness and stowed neatly into stowage pocket on the parachute assembly.

10 Just below Stowage Pocket, verify Aft Harness secured to Parachute Assembly either by velcro pack or stitching.



Serials 1423 & subs,
1005 thru 1422 after repack.

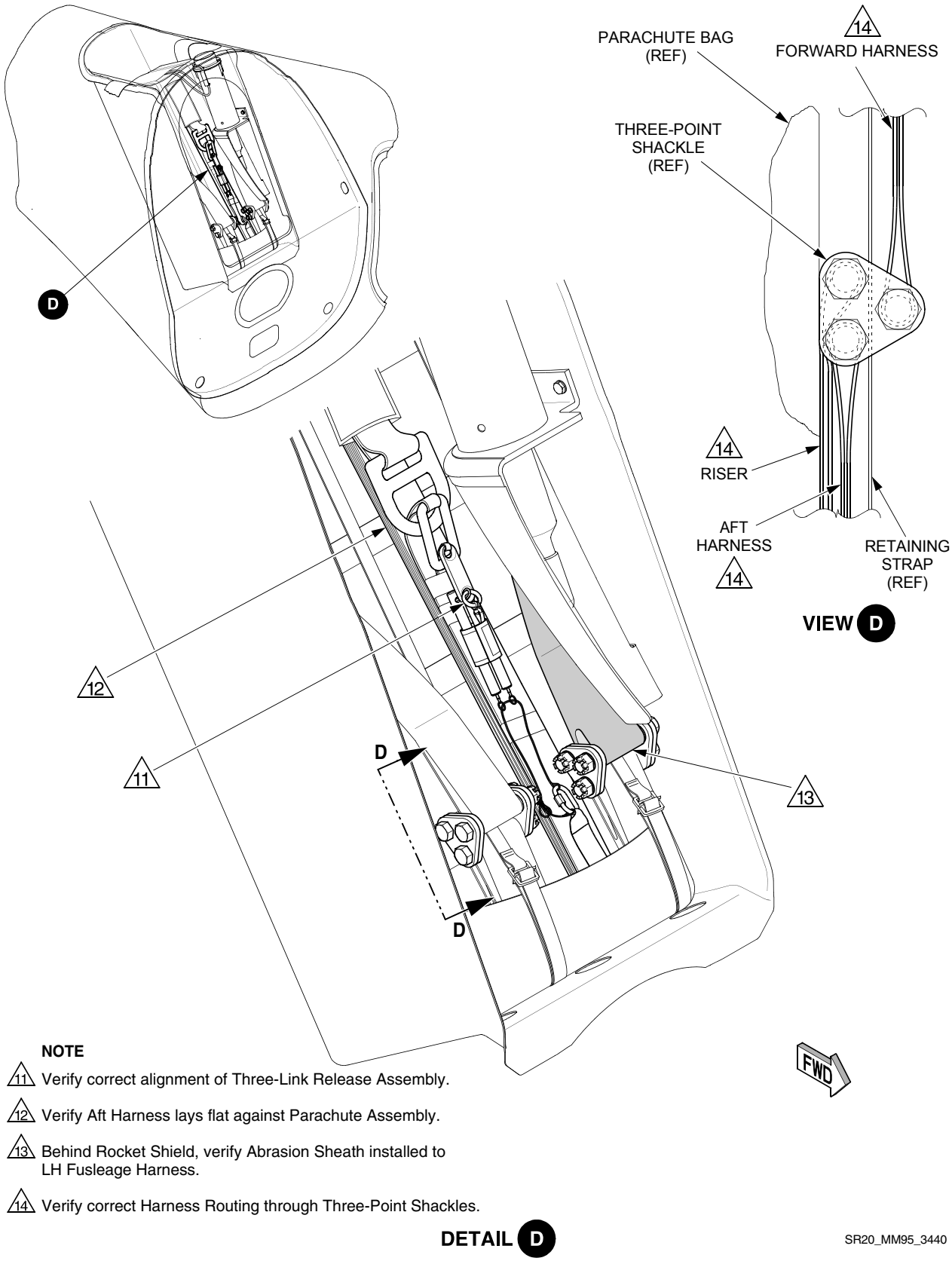


DETAIL C

DETAIL B

SR20_MM95_3436

Figure 95-002
Inspection/Check - Cirrus Airplane Parachute System (Sheet 3 of 5)



NOTE

11 Verify correct alignment of Three-Link Release Assembly.

12 Verify Aft Harness lays flat against Parachute Assembly.

13 Behind Rocket Shield, verify Abrasion Sheath installed to LH Fusleage Harness.

14 Verify correct Harness Routing through Three-Point Shackles.

DETAIL D

SR20_MM95_3440

Figure 95-002
Inspection/Check - Cirrus Airplane Parachute System (Sheet 4 of 5)

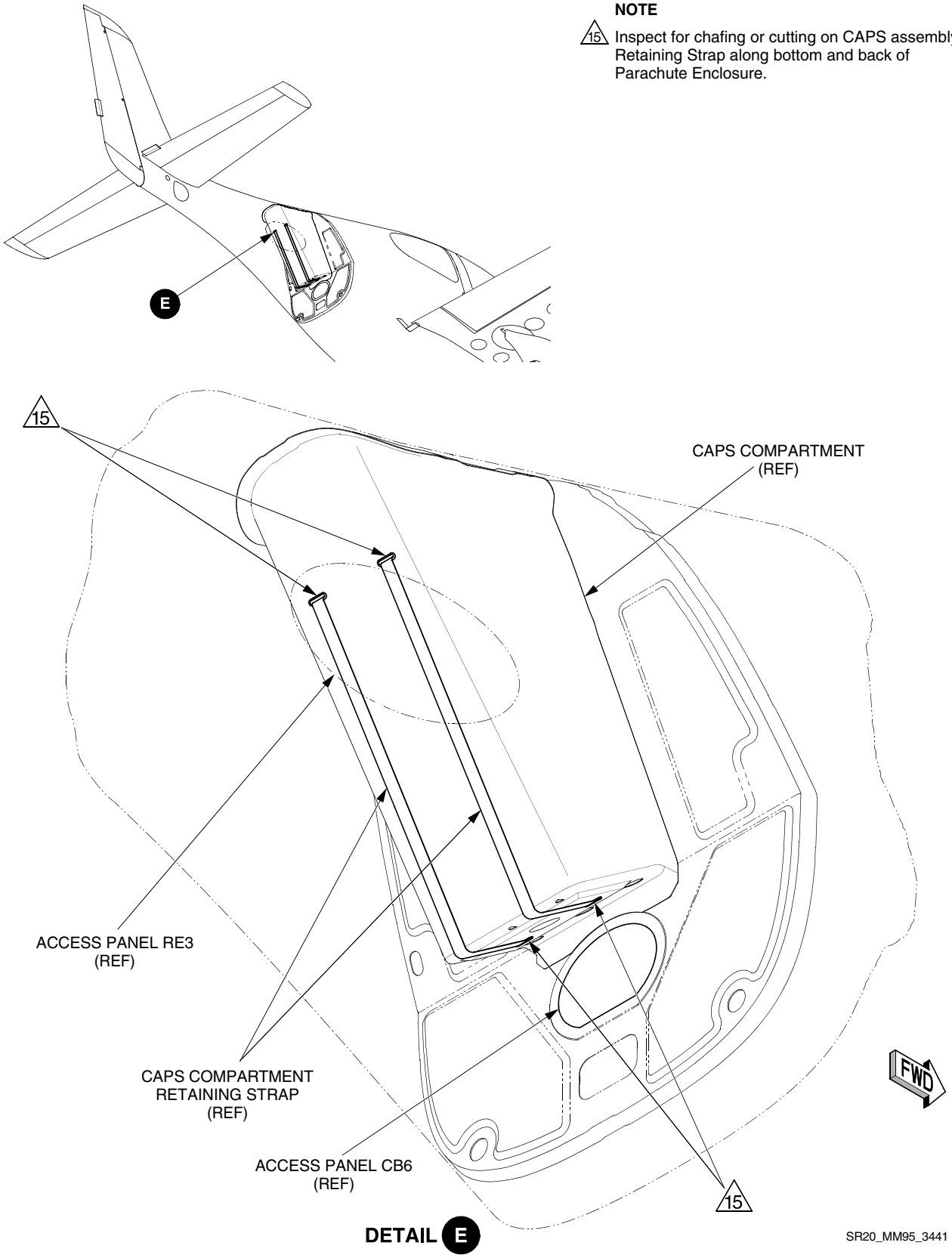


Figure 95-002
Inspection/Check - Cirrus Airplane Parachute System (Sheet 5 of 5)

EFFECTIVITY:
All

B. Aft Tie Down Ballast Bracket (See Figure 95-003)

(1) Removal - Aft Tie Down Ballast Bracket

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drop Cloth	-	Any Source	Protect empennage.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Pull ESSENTIAL and NON-ESSENTIAL AVIONICS circuit breakers.

(d) Remove RE1, RE2 and LE1 access panels. (Refer to 06-00)

(e) Remove rudder. (Refer to 55-40)

(f) Remove RH elevator. (Refer to 55-20)

(g) Remove pitch trim cartridge. (Refer to 27-30)

(h) Remove lower rudder attach fitting. (Refer to 55-50)

(i) Position drop cloth in empennage forward of aft vertical spar.

Note: Use drop cloth to protect empennage if ballast is accidently dropped during removal.

(j) Remove bolt securing aft tie down to aft tie down bracket. (Refer to 53-20)

Note: Aft tie down remains installed with sealant following bolt removal.

(k) Remove bolts, washers, and nuts securing aft tie down bracket and ballast to aft vertical spar.

(l) Remove ballast from airplane.

(m) Remove drop cloth from empennage.

(2) Installation - Aft Tie Down Ballast Bracket

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Drop Cloth	-	Any Source	Protect empennage.

(b) Position drop cloth in empennage forward of aft vertical spar.

Note: Use drop cloth to protect empennage if ballast is accidently dropped during installation.

(c) Forward of aft vertical spar, position ballast to aft tie down bracket installation area.

(d) Install bolts, washers, and nuts securing ballast to aft tie down bracket and aft vertical spar.

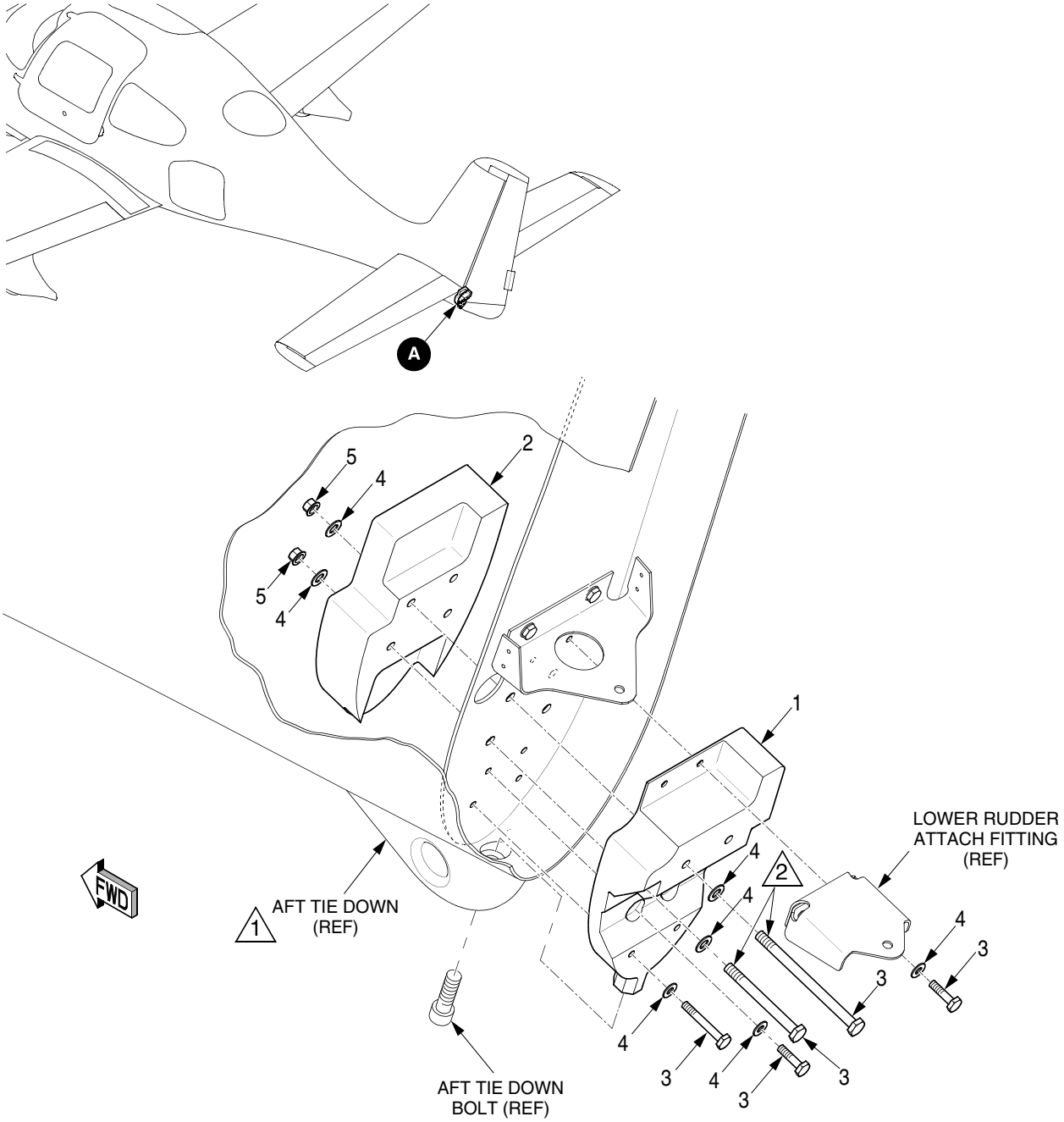
Note: Ensure bolt securing ballast engages with nut and washer with no more than five bolt threads within the ballast.

(e) Remove drop cloth from empennage.

(f) Install bolt securing aft tie down to aft tie down bracket. (Refer to 53-20)

(g) Install lower rudder attach fitting. (Refer to 55-50)

(h) Install pitch trim cartridge. (Refer to 27-30)
(i) Install RH elevator. (Refer to 55-20)
(j) Install rudder. (Refer to 55-40)
(k) Install RE1, RE2 and LE1 access panels. (Refer to 06-00)



DETAIL A

NOTE

1. Aft tie down remains installed with sealant following bolt removal.
2. Ensure bolt securing ballast engages with nut and washer with no more than five bolt threads within the ballast.

LEGEND

1. Aft Tie Down Bracket
2. Ballast
3. Bolt
4. Washer
5. Nut

SR20_MM95_2755

Figure 95-003
Aft Tie Down Ballast Bracket Installation

C. CAPS Battery - *Serials 1005 thru 1267 after SB2X-95-20* (See Figure 95-004)

(1) Removal - CAPS Battery

(a) Remove CAPS handle access cover and verify CAPS handle safety pin is installed.

(b) Set BAT 1, BAT 2, and AVIONICS switches to OFF positions.

(c) Disconnect battery 1 at both positive and negative terminals. (Refer to 24-30)

(d) Remove bulkhead 222 trim and carpet. (Refer to 25-10)

(e) Remove access panel CB6 from bulkhead 222. (Refer to 06-00)

(f) Disconnect CAPS battery.

(g) Remove screws, nuts, and washers securing battery cover assembly and shield plate to access panel.

(h) Remove battery from battery cover assembly.

(i) If replacing with new unit, dispose of lithium battery according to local regulations.

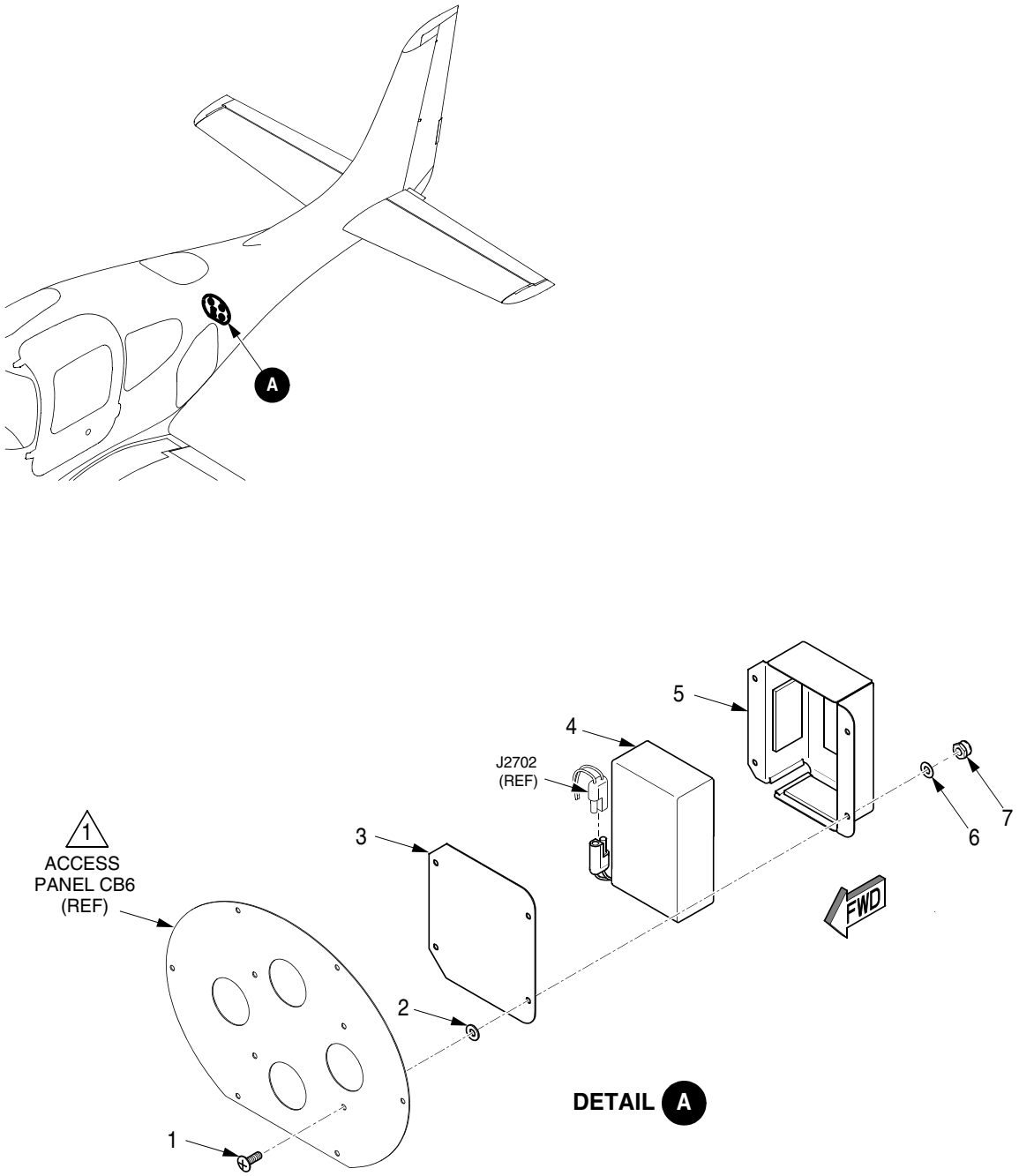
(2) Installation - CAPS Battery

(a) Secure battery in battery cover assembly.

(b) Secure battery cover assembly and shield plate to access panel CB6 with screws, nuts, and washers.

(c) Perform Inspection/Check - Cirrus Airplane Parachute System. (Refer to 95-00)

EFFECTIVITY:
Serials 1005 thru 1267 after SB2X-95-20



LEGEND

1. Screw
2. Washer, 0.032" Thk
3. Shield Plate
4. CAPS Battery
5. Battery Cover Assembly
6. Washer, 0.016" Thk
7. Nut

NOTE

1 Disconnect Battery 1 at both terminals before removing access panel.

SR20_MM95_3701

Figure 95-004
CAPS Battery Installation - Serials 1005 thru 1267 after SB2X-95-20

EFFECTIVITY:
Serials 1005 thru 1267 after SB2X-95-20

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CHAPTER 115

FLIGHT SIMULATOR SYSTEMS

CHAPTER 115 - FLIGHT SIMULATOR SYSTEMS
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115-00	2	15 JUN 2010
115-00	3	15 JUN 2010
115-00	4	15 JUN 2010
115-00	5	15 DEC 2014
115-00	6	15 JUN 2010
115-00	7	15 JUN 2010
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CHAPTER 115 - FLIGHT SIMULATOR SYSTEMS

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FLIGHT SIMULATOR SYSTEMS

1. GENERAL

This section describes systems required for simulator operation. This equipment includes the Cirrus Landing Gear Simulator (CLGS).

2. DESCRIPTION

The intent of the CLGS system is to replicate the appearance, style, and general function of a typical retractable landing gear system. The CLGS can be manipulated in flight to simulate a variety of possible system failures including incomplete gear extension/retraction, indicator system failures, and the use of emergency gear extension.

A. Cirrus Landing Gear Simulator (CLGS)

The airplane is equipped with a Cirrus Landing Gear Simulator (CLGS) designed to be used in flight to facilitate training on the operation of retractable landing gear systems.

The CLGS system consists of the Pilot Interface Panel, Instructor Fault Select Panel, Warning Horn Push Button, Logic Unit, Warning Horn, Circuit Breaker, and the necessary Wiring and Connectors.

(1) Pilot Interface Panel

The Pilot Interface Panel, located at the bottom of the center console opposite to the Flap Control Switch, provides the pilot with the ability to simulate operation of a retractable landing gear system. The panel is backlit for night operations and contains a GEAR UP/DOWN Locking Toggle Switch, three dimmable Light Emitting Diodes (LED), an Emergency Extension push-button and a Lamp Test push-button.

To simulate prevention of accidental gear retraction, the GEAR UP/DOWN Toggle Switch must be slightly pulled to release a lock prior to pivoting the lever up or down to simulate gear operation. To facilitate system identification the Toggle Switch knob is in the shape of a wheel.

Three LEDs, labeled NOSE, LH, and RH, indicate gear position and security. Red indicates gear is in-transit. Green indicates gear is down and locked. No lights indicate gear is up and locked.

The Emergency Extension push-button simulates a secondary method of extending the landing gear. Pressing and holding the EMER EXT push-button will turn all of the LED's Red until the EMER EXT push-button has been held for a cumulative total of 5 seconds, at which time the LED's illuminate Green.

The Lamp Test push-button provides for LED continuity testing. When the LAMP TEST push-button is pressed and held, the LED's will illuminate Red for 2±1 seconds and then illuminate Green until the push-button is released.

(2) Instructor Fault Selection Panel

The Instructor Fault Selection Panel, located out of the pilot’s view on the RH mid-console trim panel, provides the instructor with the ability to change CLGS system behavior via a rotary switch to simulate a variety of landing gear malfunctions.

(3) Warning Horn Push Button

The Warning Horn Push Button, labeled LDG GR SIM ALERT, is located aft of power lever and provides instructor the ability to simulate warning horn when landing gear is not extended and:

- power lever is reduced below threshold position, i.e. simulation of power-to-idle gear warning, or
- flaps are extended to landing position, i.e. simulation of landing configuration gear warning.

(4) Warning Horn

The Warning Horn, located on the LH kick plate above the pilot’s feet, is a piezo-ceramic audio indicator which, when activated, supplies a 110 dB pulsed warning tone.

(5) Logic Control Unit

The Logic Control Unit, located in the center console adjacent to the fuel gage, provides the logic and timing functions for the Pilot Interface Panel and Instructor Fault Select Panel to create the behavior of the CLGS system.

28 VDC for CLGS System operation is supplied through 2-amp circuit breaker on MAIN BUS 3.

3. MAINTENANCE PRACTICES

A. Pilot Interface Panel (See Figure 115-001)

(1) Removal - Pilot Interface Panel

(a) Pull FLAPS circuit breaker.

(b) Remove screws securing pilot interface panel to engine control panel.

(c) Disconnect wire harnesses.

(d) Remove pilot interface panel from airplane.

(2) Installation - Pilot Interface Panel

(a) Connect wire harnesses to pilot interface panel.

(b) Position pilot interface panel to engine control panel and secure with screws.

(c) Reset FLAPS circuit breaker.

(d) Perform Operational Test - Flap Switch Panel. (Refer to 27-50)

(e) Perform Operational Test - CLGS System. (Refer to 115-00)

(3) Operational Test - CLGS System

(a) Set BAT 1 switch to ON position.

(b) Pull MFD #1, MFD #2, COM 2, and GPS NAV GIA 2 circuit breakers.

(c) Test no failure for all gear.

1 On instructor fault selection panel, set fault selection knob to NO FAIL.

2 On pilot interface panel, set gear position toggle switch to UP.

3 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then turn off.

4 Set gear position toggle switch to DOWN.

5 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then illuminate green.

(d) Test LH gear failure in up position.

1 On instructor fault selection panel, set fault selection knob to L in UP band.

2 On pilot interface panel, set gear position toggle switch to UP.

3 Verify RH and NOSE LEDs illuminate red for approximately 5 seconds, then RH and NOSE LEDs turn off. LH LED will illuminate green throughout sequence.

4 Set gear position toggle switch to DOWN.

5 Verify RH and NOSE LEDs illuminate red for approximately 5 seconds, then illuminate green. LH LED will illuminate green throughout sequence.

(e) Test nose gear failure in up position.

1 On instructor fault selection panel, set fault selection knob to N in UP band.

2 On pilot interface panel, set gear position toggle switch to UP.

3 Verify LH and RH LEDs illuminate red for approximately 5 seconds, then turn off. NOSE LED will illuminate green throughout sequence.

4 Set gear position toggle switch to DOWN.

5 Verify LH and RH LEDs illuminate red for approximately 5 seconds, then illuminate green. NOSE LED will illuminate green throughout sequence.

(f) Test RH gear failure in up position.

1 On instructor fault selection panel, set fault selection knob to R in UP band.

2 On pilot interface panel, set gear position toggle switch to UP.

3 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then LH and NOSE LEDs turn off. RH LED will illuminate red throughout sequence.

4 Set gear position toggle switch to DOWN.

5 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then illuminate green.

(g) Test failure for all gear.

1 On instructor fault selection panel, set fault selection knob to ALL FAIL.

2 On pilot interface panel, set gear position toggle switch to UP for minimum of 6 seconds.

3 Verify LH, RH, and NOSE LEDs remain unchanged throughout sequence.

4 Set gear position toggle switch to DOWN for minimum of 6 seconds.

5 Verify LH, RH, and NOSE LEDs remain unchanged throughout sequence.

(h) Test RH gear failure in down position.

1 On pilot interface panel, set gear position toggle switch to UP.

2 On instructor fault selection panel, set fault selection knob to R in DOWN band.

3 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then turn off.

4 Set gear position toggle switch to DOWN.

5 Verify LH, RH, and NOSE LEDs illuminate red for approximately 5 seconds, then LH and NOSE LEDs turn green. RH LED will illuminate red throughout sequence.

(i) Test nose gear failure in down position.

1 On pilot interface panel, set gear position toggle switch to UP.

2 On instructor fault selection panel, set fault selection knob to N in DOWN band.

3 Verify LH and RH LEDs illuminate red for approximately 5 seconds, then turn off. NOSE LED will remain off throughout sequence.

4 Set gear position toggle switch to DOWN.

5 Verify LH and RH LEDs illuminate red for approximately 5 seconds, then illuminate green. NOSE LED will remain off throughout sequence.

(j) Test LH gear failure in down position.

1 On pilot interface panel, set gear position toggle switch to UP.

2 On instructor fault selection panel, set fault selection knob to L in DOWN band.

3 Verify RH and NOSE LEDs illuminate red for approximately 5 seconds, then turn off. LH LED will remain off throughout sequence.

4 Set gear position toggle switch to DOWN.

5 Verify RH and NOSE LEDs illuminate red for approximately 5 seconds, then illuminate green. LH LED will remain off throughout sequence.

(k) Test emergency extension push button.

1 On pilot interface panel, set gear position toggle switch to DOWN.

2 Press and hold emergency extension push button.

3 Verify LH, RH, and NOSE LED's illuminate red.

4 After continuing to hold emergency extension push button for approximately 5 seconds, verify LH, RH, and NOSE LED's illuminate and remain green.

5 Release the emergency extension push button.

(l) Test lamp test push button.

1 Press and hold lamp test push button.

2 Verify LH, RH, and NOSE LED's illuminate red for approximately 3 seconds, then turn green regardless of gear switch position.

3 Release lamp test push button.

(m) Test warning horn.

1 Press warning horn selection push button.

2 Verify warning horn is audible.

3 Set BAT 1 switch to OFF position.

B. Instructor Fault Selection Panel

(1) Removal - Instructor Fault Selection Panel

(a) Loosen set screws securing knob to switch shaft. Remove knob.

(b) Remove RH crew seat. (Refer to 25-10)

(c) Remove RH mid-console trim panel. (Refer to 25-10)

(d) Remove screws, washers, and nuts securing instructor fault selection panel to center console.

(e) Remove nut and washer securing switch to instructor fault selection panel plate.

(f) Remove instructor fault selection panel plate from switch.

(2) Installation - Instructor Fault Selection Panel

(a) If installing new instructor fault selection plate:

1 Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Instructor Fault Selection Panel Graphic Overlay	Refer to IPC	Refer to IPC	Install overlay.
Isopropyl Alcohol	99% or higher purity	Any Source	Clean.
Cotton Cloth (clean and lint free)	-	Any Source	Clean.
Epoxy Adhesive	(Refer to 51-30)	(Refer to 51-30)	Secure anchor.

2 Clean surfaces of instructor fault selection panel plate with isopropyl alcohol. (Refer to 20-30)

3 At inboard instructor fault selection panel plate, use epoxy to bond anchor 0.25 inch (0.64 cm) from forward edge and 1.67 inches (4.24 cm) from upper edge.

4 Install instructor fault selection panel graphic overlay to outboard surface of instructor fault selection panel plate.

(b) Install lock washer (included with switch) onto switch.

(c) Position switch through keyed mounting hole on instructor fault selection panel plate.

(d) Install washer and nut (both included with switch) securing switch to instructor fault selection panel plate. Torque to 12 - 15 in-lb (1.35 - 1.69 Nm).

(e) At RH center console, position instructor fault selection panel to installation area.

(f) Install screws, washers, and nuts securing instructor fault selection panel to center console.

CAUTION: To prevent chafing damage to knob during crew seat installation, do not install knob at this time.

(g) Install RH mid-console trim panel. (Refer to 25-10)

(h) Install RH crew seat. (Refer to 25-10)

(i) Position knob (included with switch) so that indicator line on knob is opposite from flat side of switch shaft.

(j) Verify knob set screw opposite of knob indicator line is positioned over flat side of switch shaft, and tighten.

(k) Locate second knob set screw on side of knob, and tighten.

(l) Perform Operational Test - CLGS System. (Refer to 115-00)

C. Warning Horn Push Button

(1) Removal - Warning Horn Push Button

(a) Remove RH aft console lower panel trim. (Refer to 25-10)

(b) Remove nut, washer, and shim securing warning horn push button to center console.

(c) Disconnect wire harness and remove warning horn push button from airplane.

(2) Installation - Warning Horn Push Button

(a) Position shim below installation hole on center console to adjust level difference.

(b) Route push button wire harness through center console, shim, lock washer (included with push button), and nut (included with push button).

(c) Install nut securing push button, shim, and washer to center console. Torque to 10 - 12 in-lb (1.13 - 1.35 Nm).

(d) Connect warning horn push button wire harness.

(e) Perform Operational Test - CLGS System. (Refer to 115-00)

(f) Install RH aft console lower panel trim. (Refer to 25-10)

D. Warning Horn

(1) Removal - Warning Horn

(a) Remove LH kick plate. (Refer to 25-10)

(b) Disconnect wire harness from warning horn.

(c) Remove screws, washers, and nuts securing warning horn to LH kick plate.

(d) Remove cable tie securing warning horn wire harness to nylon clamp.

(e) Remove warning horn from airplane.

(2) Installation - Warning Horn

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Cloth Tape	-	Any Source	Secure wire harness.

(b) Rotate shutter on warning horn so that sound holes are fully open.

(c) Position warning horn to LH kick plate with attached wire harness positioned to the aft left side of LH kick plate.

(d) Install screws, washers, and nuts securing warning horn to LH kick plate.

(e) At nylon clamp, wrap wires in cloth tape to provide secure fit in nylon clamp.

(f) Position wire harness to nylon clamp.

(g) Secure nylon clamp closed with cable tie.

(h) Position body of wire diode at center of aluminum clamp. Route other wire outside of clamp.

(i) Install screw, washers, and nut securing aluminum clamp to LH kick plate.

(j) Connect wire harness to warning horn.

(k) Perform Operational Test - CLGS System. (Refer to 115-00)

(l) Install LH kick plate. (Refer to 25-10)

E. Logic Control Unit

(1) Removal - Logic Control Unit

(a) Remove LH aft console lower panel trim. (Refer to 25-10)

(b) Disconnect wire harness from logic control unit.

(c) Remove screws securing logic control unit to center console.

(d) Remove logic control unit from airplane.

(2) Installation - Logic Control Unit

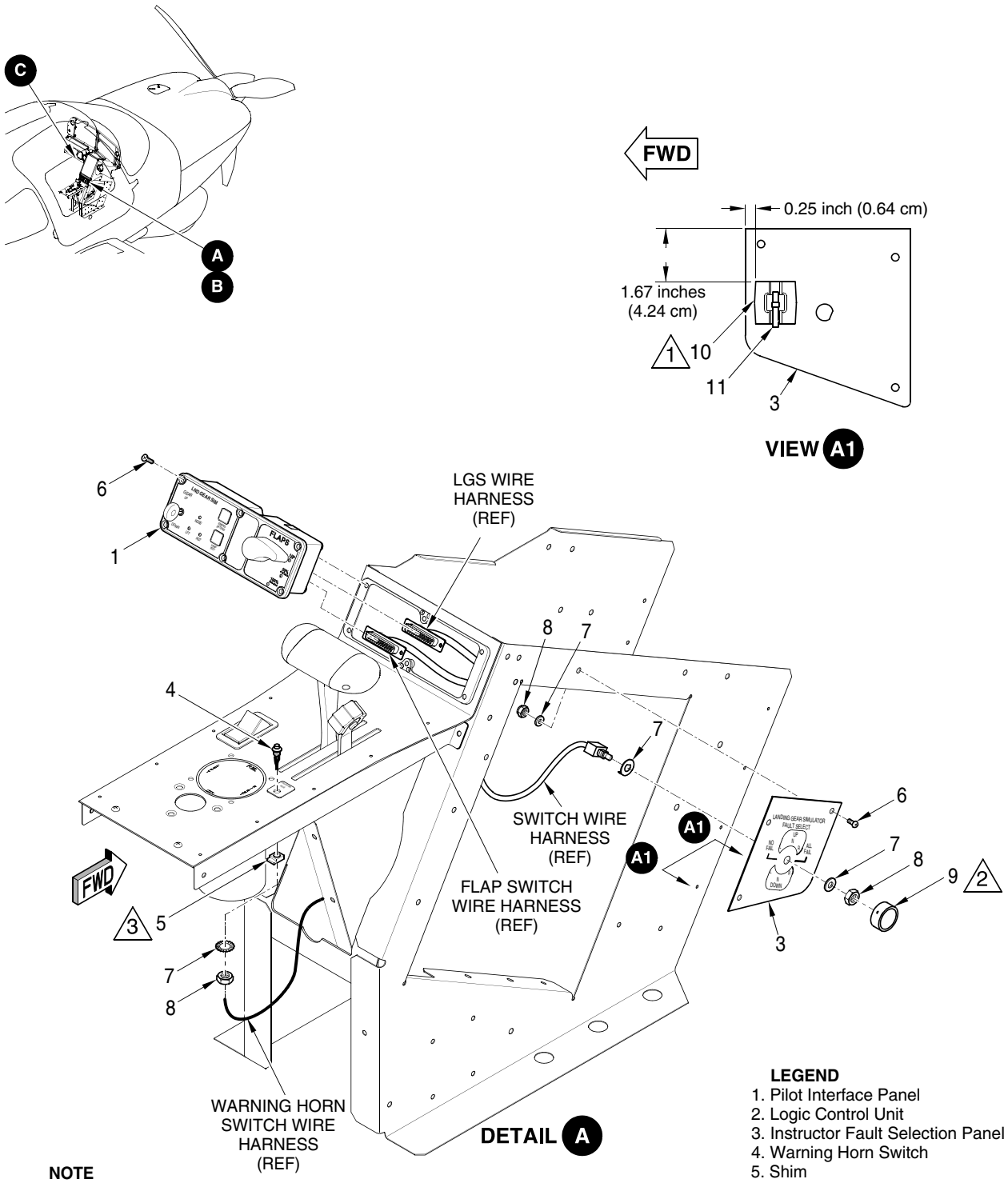
(a) At LH center console, position logic control unit to installation area.

(b) Install screws securing logic control unit to center console.

(c) Connect wire harness to logic control unit.

(d) Perform Operational Test - CLGS System. (Refer to 115-00)

(e) Install LH aft console lower panel trim. (Refer to 25-10)



NOTE

1. At inboard instructor fault selection panel plate, use epoxy to bond anchor 0.25 inch (0.64 cm) from forward edge and 1.67 inches (4.24 cm) from upper edge.
2. Position knob so that indicator line on knob is opposite from flat side of switch shaft. Verify set screw is positioned over flat side of switch shaft.
3. Position shim below installation hole on center console to adjust level difference.

LEGEND

1. Pilot Interface Panel
2. Logic Control Unit
3. Instructor Fault Selection Panel
4. Warning Horn Switch
5. Shim
6. Screw
7. Washer
8. Nut
9. Knob
10. Cable Tie Anchor
11. Cable Tie

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Figure 115-001
Cirrus Landing Gear Simulator (CLGS) Installation (Sheet 1 of 2)

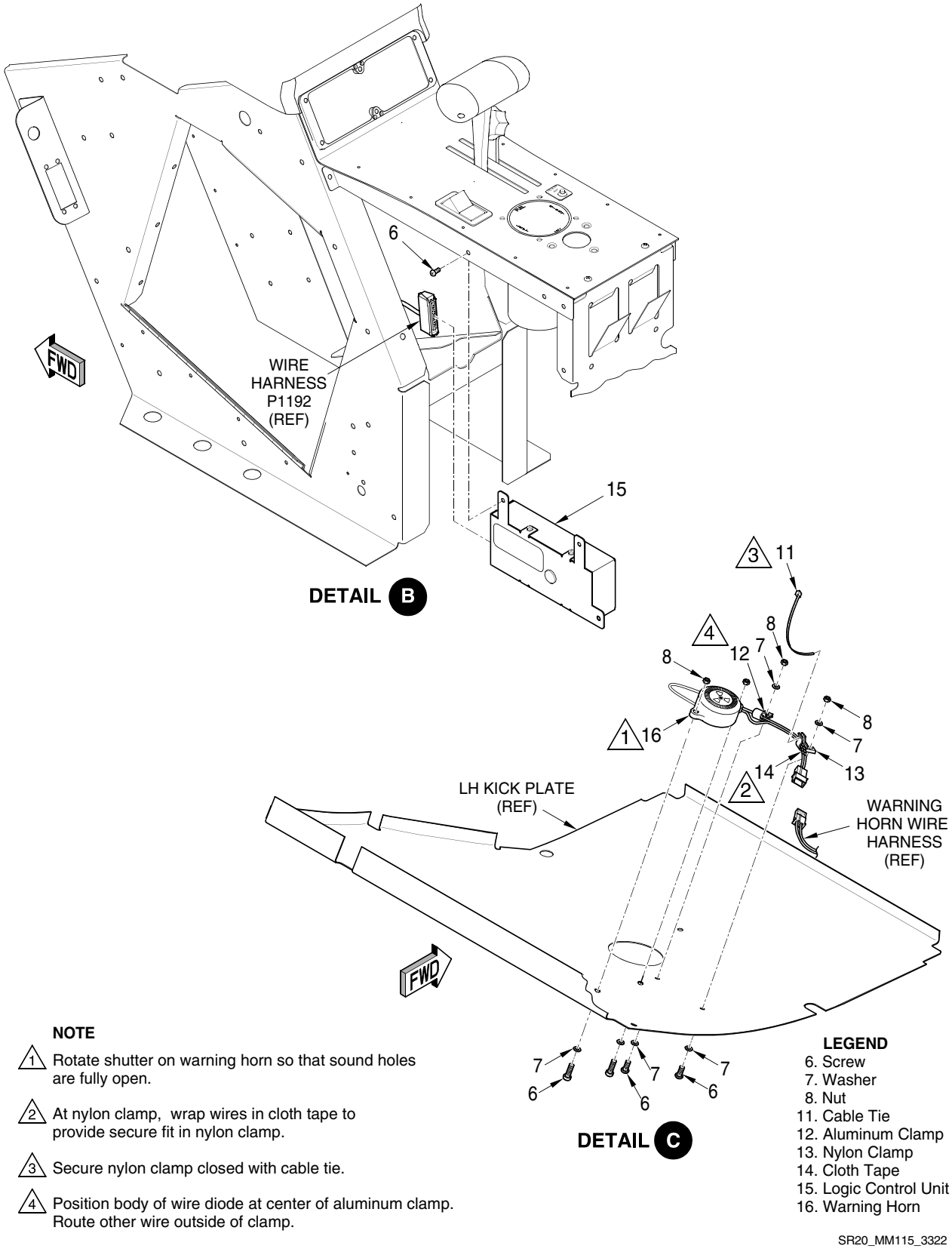


Figure 115-001
Cirrus Landing Gear Simulator (CLGS) Installation (Sheet 2 of 2)