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# Maintenance Manual

# MODEL 182/T182 SERIES 1997 AND ON



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CESSNA AIRCRAFT COMPANY  
WICHITA, KANSAS, USA

182SMM14

**3 FEBRUARY 1997**

REVISION 14

1 JULY 2007

CESSNA AIRCRAFT COMPANY  
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MAINTENANCE MANUAL

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**SERVICE BULLETIN LIST**

**1. Service Bulletins**

<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB97-11-02	Pilot's Operating Handbook Revision	Jul 1/97	Dec 1/98
SB97-11-03 R1	Autopilot Limitation Placard Installation and Control Cable Tension Inspection	Sep 21/98	Dec 1/98
SB97-11-05	Altimeter Certification Logbook Entry Verification	Dec 15/97	Dec 1/98
SB97-22-01	Bendix/King Autopilot Flight Computer Modification	Oct 6/97	Dec 1/98
SB97-24-02	Electrical Wire Bundle Routing Inspection and Modification	Dec 22/97	Dec 1/98
SB97-26-01	Fire Extinguisher Mounting Bracket Inspection	Dec 22/97	Dec 1/98
SB97-28-02	Fuel Tank Vent Line Inspection	Nov 14/97	Dec 1/98
SB97-33-01 R1	Light Dimming Module Resistor Installation Inspection	Dec 14/98	Dec 1/98
SB97-34-01	KLN 89B GPS Navigation System Approach Restrictions	Jul 2/97	Dec 1/98
SB97-34-02 R1	Alternate Static Source Valve Inspection	Dec 8/97	Dec 1/98
SB97-71-01 R1	Alternate Air Door Hinge Assembly Replacement	Jul 27/97	Dec 1/98
SB97-78-01	Engine Exhaust Muffler Inspection	Aug 11/97	Dec 1/98
SB97-78-02 R1	Engine Exhaust Muffler Inspection	Dec 23/97	Dec 1/98
SB98-11-03	Pilot's Operating Handbook and Checklist Revisions	May 1/98	Dec 1/98
SB98-11-04	Muffler Inspection Placard Installation	Aug 21/98	Dec 1/98
SB98-11-07	Brazilian Pilot's Operating Handbook Revision	Oct 12/98	Dec 1/98
SB98-20-01 R1	Firewall Sealant Replacement	Dec 31/98	Dec 1/98
SB98-22-01	KAP-140 Dual Axis Autopilot Modification	May 15/98	Dec 1/98
SB98-22-02 R2	KAP-140 Dual Axis Autopilot Limitation	Feb 1/99	Dec 1/98
SB98-24-01	Alternator Replacement	Mar 30/98	Dec 1/98
SB98-25-01	Pilot and Copilot Seat Back Pivot Fitting Inspection	May 29/98	Dec 1/98
SB98-25-02	Pilot and Copilot Seat Roller Inspection	Sep 14/98	Dec 1/98
SB98-27-04	Control Column Internal Slide Attach Screw Inspection	May 29/98	Dec 1/98

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<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB98-27-06	Flight Control Cables and Travel Inspection	Jun 15/98	Dec 1/98
SB98-28-01	Engine Fuel Pressure Transducer Inspection and Replacement	Mar 2/98	Dec 1/98
SB98-34-01 R1	KLN 89B GPS Navigation System IFR Non-Precision Approach Limitation	Aug 3/98	Dec 1/98
SB98-71-02	Engine Air Filter Replacement	Jul 27/98	Dec 1/98
SB98-78-02 R1	Engine Exhaust Muffler Pressure Test and Ball Joint Inspection	Dec 14/98	Dec 1/98
SB98-37-01 R1	Airborne Vacuum Pump Inspection	Mar 8/99	Dec 1/99
SB98-55-03	Horizontal Stabilizer Forward Inboard Rib To Spar Gap Inspection	Nov 30/98	Dec 1/99
SB98-78-03	Engine Exhaust Muffler Replacement	Feb 14/98	Dec 1/99
SB99-11-02	German Pilot's Operating Handbook and Checklist Revisions	Sep 27/99	Dec 1/99
SB99-21-01	Fresh Air Vent Replacement	Mar 15/99	Dec 1/99
SB99-24-01	Electrical Power System Modification	Mar 15/99	Dec 1/99
SB99-24-02	Circuit Panel Assembly Cover Installation	Dec 27/99	Nov 1/00
SB99-25-01 R1	Emergency Locator Transmitter (ELT) Operational Test	Dec 27/99	Jun 1/00
SB99-28-01	Wing Fuel Tank Vent Check Valve Inspection	Apr 26/99	Dec 1/99
SB99-32-01	Brake Torque Plate Inspection	May 10/99	Dec 1/99
SB99-34-01 R1	KLN 89B GPS Navigation System Modification	Apr 24/00	Dec 1/99
SB99-37-01	Vacuum Hose Modification	Dec 27/99	Nov 1/00
SB99-53-01	Firewall Doubler Inspection and Engine Cowl Shock Mount Installation	Mar 8/99	Dec 1/99
SB99-53-02	Tailcone Skin Installation Inspection	Apr 26/99	Dec 1/99
SB99-71-01 R2	Engine Piston Pin Plug Wear Inspection	Jul 12/99	Dec 1/99
SB99-71-05	Engine Valve Seat Inspection	Oct 25/99	Jun 1/00
SB00-22-01	KAP-140 Autopilot Servo Inspection/Modification	Feb 14/00	Nov 1/00
SB00-24-01	Main Power Junction Box Circuit Breaker Retrofit Kit Installation	Mar 13/00	Nov 1/00
SB00-24-02	Electrical Panel Wiring Modifications	Jun 5/00	Nov 1/00
SB00-27-01 R1	Lower Forward Elevator Control Cable Pulley Brackets Inspection	Aug 28/00	Nov 1/00
SB00-34-01	Pitot Tube Heater Assembly Insulation Installation	Apr 10/00	Nov 1/00

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<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB00-37-01	Vacuum System Air Filter Element Inspection/Replacement	Aug 14/00	Nov 1/00
SB00-53-01 R1	Center Cabin Rivet Inspection/Installation	Apr 10/00	Jun 18/01
SB00-73-01 R2	Engine Fuel Injection Lines and Support Clamps Inspection	Dec 24/01	Jan 2/06
SB00-79-01 R1	Engine Low Oil Pressure Switch Replacement	Feb 21/00	Nov 1/00
SB00-11-05	Pilot's Operating Handbook and Pilot's Checklist Revision	Dec 26/00	Jun 18/01
SB00-27-02 R1	Aileron Control Cable Quadrant Inspection Inspection/Modification	Nov 6/00	Jun 18/01
SB01-73-01 R2	Engine Driven Fuel Pump Inspection	Oct 10/05	No Effect
SB01-74-01	Ignition Switch Center Ground Terminal Inspection	Jun 25/01	Jun 18/01
SB01-71-03	Engine Turbocharger Mounting Bolt Replacement	Aug 20/01	No Effect
SB01-25-01	Glareshield Shroud Installation	Dec 24/01	No Effect
SB01-28-04	Fuel Quantity Level Sender/Transmitter Inspection	Oct 1/01	No Effect
SB01-34-01	Com Antenna Replacement	Sep 3/01	No Effect
SB02-11-01	Pilot's Operating Handbook Revisions	Jan 21/02	No Effect
SB02-11-02	Pilot's Operating Handbook Revisions	Jan 21/02	No Effect
SB02-22-01	Honeywell Kap 140 Autopilot System Modification	Nov 25/02	No Effect
SB02-25-01	Pilot and Copilot Shoulder Harness Guide Removal	Apr 29/02	No Effect
SB02-28-01 R1	Fuel Line Inspection	Dec 16/02	No Effect
SB02-34-01	Goodrich WX-500 Weather Mapping Sensor Modification	Nov 25/02	No Effect
SB02-37-01	Vacuum System Reducer Fitting Replacement	Jan 21/02	No Effect
SB02-37-02	Dry Vacuum Pump and Coupling Replacement Requirements	Feb 18/02	No Effect
SB02-37-03	Vacuum System Reducer Fitting Replacement	Feb 18/02	No Effect
SB02-37-04	Airborne Air and Fuel Products Check Valve Manifold Inspection	Oct 28/02	No Effect
SB02-52-01	Cabin Door Handle Replacement	Jan 21/02	No Effect
SB02-53-01	Fuselage Ballast Weight Installation	Sep 9/02	No Effect

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<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB02-55-01	Elevator Rivet Installation	Oct 14/02	No Effect
SB02-71-03 R2	Engine Crankshaft Gear Retaining Bolt Replacement	May 10/04	No Effect
SB02-71-04	Engine Induction System Fuel Overboard Drain Relocation	Nov 25/02	No Effect
SB02-71-05 R1	Engine Oil Pump Plug Inspection	Feb 03/03	No Effect
SB03-23-01	Honeywell KMA 26 Audio Panel Modification	Jul 28/03	No Effect
SB03-24-01	Alternator Replacement	Jul 28/03	No Effect
SB03-24-02	MC01-3A Main Electrical Power Junction Box Modification	Oct 13/03	No Effect
SB03-27-01	Flap Actuator Motor Inspection	Sep 29/03	No Effect
SB03-27-02	Flap Control Bracket Attach Bolts Replacement	Dec 22/03	No Effect
SB03-28-01	Fuel Cap Lanyard Removal	Oct 27/03	Jan 2/06
SB03-32-01	Nose Landing Gear Wheel Fairing Modification	Sep 29/03	No Effect
SB03-34-01	Honeywell KS 270C, KS 271C and KS 272C Servo Friction Inspection	Oct 27/03	No Effect
SB03-34-02 R1	Altimeter Inspection	Feb 16/04	No Effect
SB03-37-01	Vacuum Manifold Inspection/Replacement	Nov 10/03	No Effect
SB03-53-01	Aft Cabin Stringer Inspection	May 26/03	No Effect
SB03-53-03 R1	Nose Landing Gear Fairing Attachment Inspection	Mar 15/04	No Effect
SB03-71-02	Fuel Injection Servo Inspection	May 26/03	No Effect
SB03-73-01	Throttle Arm Retention Inspection	Nov 4/03	No Effect
SB04-11-03	NAV III Pilot's Checklist	Aug 30/04	No Effect
SB04-22-01	Autopilot Circuit Breaker Extension Cap Installation	Sep 13/04	No Effect
SB04-23-01	Garmin GIA 63 Inspection/Modification	Sep 13/04	No Effect
SB04-24-01	Alternator Control Unit Inspection/Replacement	Mar 1/04	No Effect
SB04-25-01 R4	Crew Seat Recline Modification	Dec 26/06	No Effect
SB04-25-02 R1	Crew Seat Back Cylinder Lock Inspection and Crank Arm Modification	Oct 17/05	No Effect
SB04-25-04	Crew Seat Back Cylinder Lock Control Inspection/Adjustment	Oct 11/04	No Effect
SB04-27-01 R2	Elevator Rivet Inspection	Sep 13/04	No Effect
SB04-28-02	Fuel Strainer Installation Inspection	May 10/04	No Effect

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<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB04-34-01	Marker Beacon Placard Installation	Nov 22/04	No Effect
SB04-34-02	Vertical Navigation Placard Installation	Dec 27/04	No Effect
SB04-52-01	Security Lock Installation	Jun 28/04	No Effect
SB04-53-02 R1	Firewall Doubler Flange Modification and Shock Mount Inspection	Apr 11/05	No Effect
SB04-53-03	Forward Door Post Bulkhead Washer Inspection	Oct 11/04	No Effect
SB04-71-01	Engine Cowl Flap Rivet Inspection	Apr 26/04	No Effect
SB04-71-02	Engine Starter Inspection/Replacement	Nov 8/04	No Effect
SB04-73-01	Engine Fuel Injection Lines and Support Clamps Inspection	Aug 30/04	Jan 2/06
SB05-11-02	Pilot's Operating Handbook Revisions	Mar 28/05	No Effect
SB05-22-01	Trim Servo Cable Chain Inspection	Dec 5/05	No Effect
SB05-22-02	Honeywell KAP-140 Autopilot Software Modification	Dec 5/05	No Effect
SB05-24-01	MC01-3A Main Electrical Power Junction Box Circuit Breakers Inspection	Jan 31/05	No Effect
SB05-25-01	Inflatable Seat Belt Restraint Installation Inspection	Mar 7/05	No Effect
SB05-25-02	Inflatable Seat Restraints Installation	Apr 25/05	No Effect
SB05-28-01	Fuel Strainer Gasket Inspection	Jan 17/05	No Effect
SB05-33-01	High Intensity Discharge (HID) Landing and Taxi Light Installation	May 9/05	Jan 2/06
SB05-34-01	Garmin G1000 System Software Upgrade	Jan 31/05	No Effect
SB05-34-02	Garmin GMA 1347 Audio Panel Modifications	Feb 14/05	No Effect
SB05-34-03	Garmin GMA 63 Integrated Avionics Unit Modification	Feb 14/05	No Effect
SB05-34-04	Garmin GMA 63 Integrated Avionics Unit Modification	Apr 25/05	No Effect
SB05-34-05	Garmin G1000 System Software Upgrade	Jul 29/05	No Effect
SB05-34-06	Garmin G1000 GDL-69A Weather and Digital Audio Entertainment Interface Installation	Jul 29/05	No Effect
SB05-34-07	Garmin G1000 Obstacle And Terrain Avoidance System Database Update	Sep 26/05	No Effect
SB05-34-08	Garmin G1000 System Software Upgrade	Sep 26/05	No Effect
SB05-34-09	Garmin G1000 GDL-69A Weather And Digital Audio Entertainment Interface Installation	Sep 26/05	No Effect
SB05-34-10	Aft Avionics And Electrical Wire Bundle Inspection	Nov 21/05	No Effect



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<b>Service Bulletin Number</b>	<b>Title</b>	<b>Service Bulletin Date</b>	<b>Manual Incorporation</b>
SB05-34-11	Garmin GIA 63 Integrated Avionics Unit Outside Cover Replacement	Nov 21/05	No Effect
SB05-34-12	Garmin G1000 Display Unit (GDU) 1040 Cover Glass Delamination	Dec 5/05	No Effect
SB05-37-01	Vacuum Pump Inspection/Replacement	Nov 7/05	No Effect
SB05-53-02	Tunnel Bulkhead Rivet Inspection	Sep 12/05	No Effect
SB05-57-01	Wing Trailing Edge Rib Inspection	Oct 10/05	No Effect
SB05-71-01	Engine Crankshaft Replacement	Jul 18/05	No Effect
SB05-73-01	Engine Driven Fuel Pump Inspection	Mar 7/05	No Effect
SB06-11-01	Pilot's Operating Handbook Revisions	Mar 27/06	No Effect
SB06-11-02	Pilot's Checklist Revisions	Nov 6/06	No Effect
SB06-22-01	Honeywell KS270C Pitch Servo and KS271C Roll Servo Tach Generator Modification	Apr 24/06	No Effect
SB06-24-01	Electrical Ground Strap Inspection	May 8/06	No Effect
SB06-24-02 R1	60 Ampere Alternator Rotor Replacement	Dec 18/06	No Effect
SB06-24-03	60 Ampere Alternator Brush Replacement	Dec 18/06	No Effect
SB06-24-04	Circuit Breaker Inspection	Dec 26/06	No Effect
SB06-24-05	Circuit Breaker Panel Assembly Inspection	Dec 26/06	No Effect
SB06-27-01	Flap Aft Roller Bearing Installation Modification	Apr 10/06	No Effect
SB06-32-01	Brake Master Cylinder Covers Inspection	Sep 25/06	No Effect
SB06-34-01	Honeywell KT 73 MODE S Transponder Installation	Feb 27/06	No Effect
SB06-34-02 R1	Garmin G1000 System Software Upgrade	Mar 27/06	No Effect
SB06-34-03	Enablement of Garmin G1000 Terrain Awareness Warning System CLASS-B (TAWS-B)	May 22/06	No Effect
SB06-34-04	Automatic Direction Finder (ADF) and Distance Measuring Equipment (DME) Installation	Oct 23/06	No Effect
SB06-52-01	Cabin Door Modification	Mar 27/06	No Effect
SB06-53-01	Fuselage Stringer Rivet Inspection	Oct 23/06	No Effect
SB06-71-01 R1	Engine Crankshaft Retirement	May 8/06	No Effect
SB06-71-02	Engine Compartment Fuel Hoses Security Inspection	Jun 19/06	No Effect

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**INTRODUCTION**

**1. General**

**WARNING:** All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., recommended by Cessna are solely based on the use of new, remanufactured, or overhauled Cessna approved parts. If parts are designed, manufactured, remanufactured, overhauled, and/or approved by entities other than Cessna, then the data in Cessna's maintenance/service manuals and parts catalogs are no longer applicable and the purchaser is warned not to rely on such data for non-Cessna parts. All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., for such non-Cessna parts must be obtained from the manufacturer and/or seller of such non-Cessna parts.

- A. The information in this publication is based on data available at the time of publication and is updated, supplemented, and automatically amended by all information issued in Service Newsletters, Service Bulletins, Supplier Service Notices, Publication Changes, Revisions, Reissues and Temporary Revisions. All such amendments become part of and are specifically incorporated within this publication. Users are urged to keep abreast of the latest amendments to this publication through information available at Cessna Authorized Service Stations or through the Cessna Propeller Aircraft Product Support subscription services. Cessna Service Stations have also been supplied with a group of supplier publications which provide disassembly, overhaul, and parts breakdowns for some of the various supplier equipment items. Suppliers publications are updated, supplemented, and specifically amended by supplier issued revisions and service information which may be reissued by Cessna thereby automatically amending this publication and are communicated to the field through Cessna's Authorized Service Stations and/or through Cessna's subscription services.
- B. Inspection, maintenance and parts requirements for STC installations are not included in this manual. When an STC installation is incorporated on the airplane, those portions of the airplane affected by the installation must be inspected in accordance with the inspection program published by the owner of the STC. Since STC installations may change systems interface, operating characteristics and component loads or stresses on adjacent structures. Cessna provided inspection criteria may not be valid for airplanes with STC installations.
- C. REVISIONS, REISSUES and TEMPORARY REVISIONS can be purchased from your Cessna Service Station or directly from Cessna Propeller Aircraft Product Support, Department 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706.
- D. Information in this Maintenance Manual is applicable to all U.S. and Foreign Certified Model 182 airplanes beginning at serial 18280001 and T182 airplanes beginning at serial T18208001. Information unique to a particular country is identified in the chapter affected.
- E. All supplemental service information concerning this manual is supplied to all appropriate Cessna Service Stations so they have the latest authoritative recommendations for servicing these Cessna airplanes. It is recommended that Cessna owners utilize the knowledge and experience of the Cessna Service Station.

**2. Cross Reference Listing of Popular Name Verses Model Numbers and Serials**

- A. All airplanes regardless of the manufacturer, are certified under model number designations. Popular names are often used for marketing purposes. To provide a consistent method of referring to these airplanes, the model number will be used in this publication unless the popular name is necessary to differentiate between versions of the same basic model. The following table provides a listing of popular names, model numbers and serial numbers.

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NAME	MODEL	SERIALS BEGINNING	SERIALS ENDING
Skylane	182S	18280001	18280944
Skylane	182T	18280945	
Skylane TC	T182T	T18208001	

### 3. Coverage and Format

- A. The Cessna Model 182/T182 1996 And On Maintenance Manual has been prepared to help maintenance personnel in servicing and maintaining the Model 182/T182 airplanes (beginning at Serial 18280001 and T18208001). This manual provides the necessary information required to enable the mechanic to service, inspect, troubleshoot, remove and replace components or repair systems.

**NOTE:** This manual is not intended to cover Model 182 airplanes produced prior to 1996. For manuals related to these airplanes, please refer to applicable listings in the Cessna Propeller Aircraft Customer Care Supplies & Publications Catalog.

- B. This manual has been prepared in accordance with the Air Transport Association (ATA) Specification Number 100 for Manufacturer's Technical Data.
- C. Information beyond the scope of this manual may be found in the applicable Model 182 Wiring Diagram Manual, Model 182 Illustrated Parts Catalog and the Single Engine Models 172, 182, T182, 206 and T206 1996 And On Structural Repair Manual.
- D. Technical Publications are also available for the various components and systems which are not covered in this manual. These manuals must be utilized as required for maintenance of those components and systems, and may be purchased from the manufacturer.

### 4. Temporary Revisions

- A. Additional information which becomes available may be provided by temporary revision. This service is used to provide, without delay, new information which will assist in maintaining safe flight/ground operations. Temporary revisions are numbered consecutively within the ATA chapter assignment. Page numbering utilizes the three-element number which matches the maintenance manual. Temporary revisions are normally incorporated into the maintenance manual at the next regularly scheduled revision.

### 5. Serialization

- A. All Model 182 airplanes are issued a serial number. This number is assigned as construction begins and remains with the airplane throughout its service life. This serial number appears on the airplane ID plate, located below the horizontal stabilizer, and on a trim plate located on the pilot side doorpost. This serial number is used to identify changes within the text or within an illustration. The absence of a serial number in text or illustration indicates the material is applicable to all airplanes.

### 6. Material Presentation

- A. This Maintenance Manual is available on paper, microfiche or Compact Disc (CD-ROM). The CD-ROM contains the Maintenance Manual, Illustrated Parts Catalog Manual, Wiring Diagram Manual and Structural Repair Manual on a single disc.

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**7. Service Bulletins**

- A. Service Bulletins may require special inspections and authorize modifications to the airplane and/or system. As service bulletins are issued, they will be incorporated in the next scheduled revision and noted in the Service Bulletin List, located previous to the Introduction. The list of service bulletins utilizes four columns to summarize information.
- (1) Service Bulletin Number - This Service Bulletin number column identifies the bulletin by number. Service Bulletins are numbered consecutively within ATA chapter assignment.
  - (2) Service Bulletin Date - The service bulletin date column indicates the initial date the bulletin became active.
  - (3) Title - The title column identifies the service bulletin by nomenclature. It is the same title displayed on page one of the service bulletin.
  - (4) Manual Incorporation - The manual incorporation column indicates if the service bulletin has been incorporated in the maintenance manual by date, if the service bulletin had no effect on the maintenance manual (No Effect), or if the service bulletin has not been worked (dashed lines).

**8. Using the Maintenance Manual**

- A. Division of Subject Matter.
- (1) The Maintenance Manual is divided into four major sections. The major sections are in turn separated into chapters, with each chapter having its own effectivity page and table of contents. The manual divisions are as follows:
    - (a) Major Section 1 - Airplane General

Chapter	Title
5	Time Limits/Maintenance Checks
6	Dimensions and Areas
7	Lifting and Shoring
8	Leveling and Weighing
9	Towing and Taxiing
10	Parking, Mooring, Storage and Return to Service
11	Placards and Markings
12	Servicing

- (b) Major Section 2 - Airframe Systems

Chapter	Title
20	Standard Practices - Airframe
21	Air Conditioning
22	Auto Flight
23	Communications
24	Electrical Power
25	Equipment/Furnishings
26	Fire Protection
27	Flight Controls
28	Fuel

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<b>Chapter</b>	<b>Title</b>
30	Ice and Rain Protection
31	Indicating/Recording Systems
32	Landing Gear
33	Lights
34	Navigation
35	Oxygen
37	Vacuum

(c) Major Section 3 - Structures

<b>Chapter</b>	<b>Title</b>
51	Standard Practices and Structures - General
52	Doors
55	Stabilizers
56	Windows
57	Wings

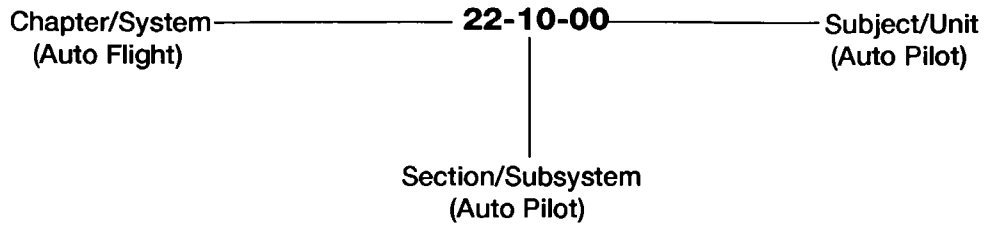
(d) Major Section 4 - Power Plant

<b>Chapter</b>	<b>Title</b>
61	Propeller
71	Power Plant
73	Engine Fuel and Control
74	Ignition
76	Engine Controls
77	Engine Indicating
78	Exhaust
79	Oil
80	Starting
81	Turbines

B. Page Numbering System.

- (1) The page numbering system used in the Maintenance Manual consists of three-element numbers separated by dashes. Refer to the example below for an illustration of typical numbering layout as used in the ATA format.

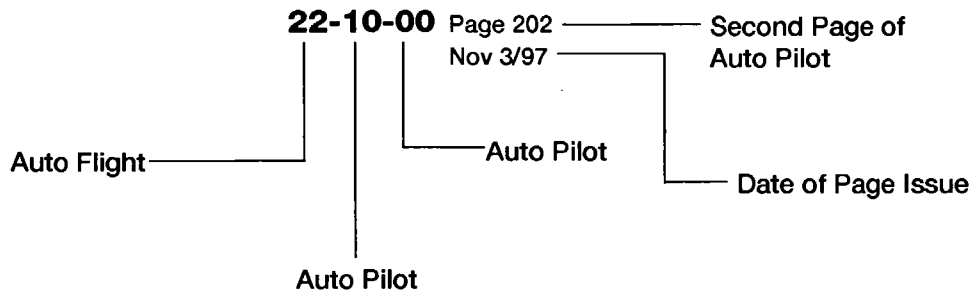
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- (2) When the chapter/system element number is followed with zeros in the section/subsystem and subject/unit element number (21-00-00), the information is applicable to the entire system.
- (3) When the section/subsystem element number is followed with zeros in the subject/unit element number (21-51-00), the information is applicable to the subsystem within the system.
- (4) The subject/unit element number is used to identify information applicable to units within the subsystems. The subject/unit element number progresses sequentially from the number -01 in accordance with the number of subsystem units requiring maintenance information.
- (5) All system/subsystem/unit (chapter/section/subject) maintenance data is separated into specific types of information: description and operation, troubleshooting, maintenance practices. Blocks of sequential page numbers are used to identify the type of information:
  - Page 1 through 99 - Description and Operation
  - Page 101 through 199 - Troubleshooting
  - Page 201 through 299 - Maintenance Practices
  - Page 301 through 399 - Servicing
  - Page 401 through 499 - Removal/Installation
  - Page 501 through 599 - Adjustment/Test
  - Page 601 through 699 - Inspection/Check
  - Page 701 through 799 - Cleaning/Painting
  - Page 801 through 899 - Approved Repairs

**NOTE:** In most cases, the individual topics have been combined into a 200-series document (Maintenance Practices). When specific topics require lengthy explanation, they will utilize the page blocks mentioned above.

- (6) A typical page number:



- (7) Illustrations are also tied into the page block numbering system. For example, all illustrations within a Maintenance Practices section will begin with the number 2 (i.e. Figure 201, Figure 202, etc.). Conversely, all illustrations within an Approved Repair section will begin with the number 8 (i.e. Figure 801, Figure 802, etc.).

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**9. Effectivity Pages**

- A. A list of effectivity pages are provided at the beginning of each maintenance manual chapter. All pages in the specific chapter are listed in numerical sequence on the Effectivity Page(s) with the date of issue for each page.

**10. Revision Filing Instructions**

- A. Regular Revision.
  - (1) Pages to be removed or inserted in the maintenance manual are determined by the effectivity page. Pages are listed in sequence by the three-element number (chapter/section/subject) and then by page number. When two pages display the same three-element number and page number, the page with the most recent Date of Page Issue shall be inserted in the maintenance manual. The date column on the corresponding chapter effectivity page shall verify the active page.
- B. Temporary Revision.
  - (1) File temporary revisions in the applicable chapter in accordance with filing instructions appearing on the first page of the temporary revision.
  - (2) The rescission of a temporary revision is accomplished by incorporation into the maintenance manual or by a superseding temporary revision. A Record of Temporary Revisions is furnished in the Temporary Revision List located previous to the Introduction. A Manual Incorporation Date column on the Temporary Revision List page will indicate the date the temporary revision was incorporated, thus authorizing the rescission of the temporary revision.

**11. Identifying Revised Material**

- A. Additions or revisions to text in an existing section will be identified by a revision bar in the left margin of the page and adjacent to the change.
- B. When technical changes cause unchanged text to appear on a different page(s), a revision bar will be placed in the left margin opposite the chapter/section/subject, page number and date of all affected pages, providing no other revision bar appears on the page. These pages will display the current revision date in the Date of Page Issue location.
- C. Chapter 5 may contain revision bars to indicate revised text. However, inspection items are noted as revised, added or deleted by the date of changed item code. Also, a revision date is indicated below the page number.
- D. When extensive technical changes are made to text in an existing section that requires extensive revision, revision bars will appear the full length of text.
- E. Revised and new illustrations will be indicated by either a revision bar along the side of the page or a hand indicator directing attention to the area.

**12. Warnings, Cautions and Notes**

- A. Throughout the text in this manual, warnings, cautions and notes pertaining to the procedures being accomplished are utilized. These adjuncts to the text are used to highlight or emphasize important points. Warnings and Cautions precede the text they pertain to, and Notes follow the text they pertain to.
  - (1) **WARNINGS** - Calls attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons.
  - (2) **CAUTIONS** - Calls attention to methods and procedures which must be followed to avoid damage to airplane and equipment .
  - (3) **NOTES** - Contains information only.

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**13. Cessna Propeller Aircraft Customer Care Supplies and Publications Catalog**

- A. A Cessna Propeller Aircraft Customer Care Supplies and Publications Catalog is available from a Cessna Service Station or directly from Cessna Propeller Aircraft Product Support Dept. 751 Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706. The catalog lists all publications and Customer Care Supplies available from Cessna for prior year models as well as new products. To maintain this catalog in a current status, it is revised yearly and issued in paper and aerofiche form.

**14. Customer Comments on Manual**

- A. Cessna Aircraft Company has endeavored to furnish you with an accurate, useful, up-to-date manual. This manual can be improved with your help. Please use the return card, provided with your manual, to report any errors, discrepancies, and omissions in this manual as well as any general comments you wish to make.



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**LIST OF REVISIONS**

**1. Revisions**

- A. This Maintenance Manual includes the original issue and the revisions listed in Table 1. Make sure that the information in this manual is current and that the latest maintenance and inspection procedures are available. The revisions must be incorporated in the manual as they are issued.

Table 1. Basic Manual - Original Issue 3 February 1997

Revision Number	Date	Writer	Revision Number	Date	Writer
	1 December 1998		2	1 December 1999	
3	1 June 2000		4	1 November 2000	
5	18 June 2001		6	15 December 2001	jgb
7	1 April 2002	jgb	8	4 August 2003	jgb
9	1 March 2004	rdg	10	1 March 2005	tk
11	2 January 2006	bjo	12	3 July 2006	bjo
13	1 January 2007	jcn	14	1 July 2007	jcn

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**LIST OF MANUFACTURERS TECHNICAL PUBLICATIONS**

**1. List of Manufacturers Technical Publications**

A. Outlined below is a list of manufacturers publications.

Table 1. CHAPTER 22 - AUTOFLIGHT

Item	Cessna Part Number	Manufact- urer's Part Number	Publica- tion Part Number	Publication Title	Manufacturer
GFC -700 Autopilot			190- 00352-00	G1000 Line Maintenance Manual	Garmin USA 1200 East 151st Street Olathe, KS 66062
Autopilot Servo		GSA 8X/GSM 85	190- 00303-72	Installation Manual	Garmin International, Inc. 1200 E. 151st Street Olathe, Kansas 66062
Autopilot		KAP 140	006- 00991- 0002		Allied Signal 101 N. Industrial Parkway New Century, KS 66031

Table 2. CHAPTER 23 - COMMUNICATIONS

Item	Cessna Part Number	Manufact- urer's Part Number	Publica- tion Part Number	Publication Title	Manufacturer
NAV/ COMM		KX-155A	006- 10542- 0000	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
Audio Amplifier/ Intercom/ Marker Beacon Receiver		KMA 26	006- 10544- 0000	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031

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Table 3. CHAPTER 24 - ELECTRICAL POWER

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Standby Battery		AVT-200413		Cyclon Selection Guide (Third Edition) (NOTE 1)	AVT Inc. DBA Electritek - AVT 400 East Mineral Avenue Littleton, CO 80122-2604  Hawker 617 North Ridgeview Drive Warrensburg, MO 64093-9301

**NOTE 1:** The power cells inside the Standby Battery are manufactured by Hawker and the manufacturer publication that is shown above is from Hawker. AVT is the supplier of the Standby Battery pack as installed in the airplane. The data shown in the Hawker manual is informational only. Maintenance procedures for the Standby Battery given in Chapter 24, Standby Battery - Maintenance Practices must be followed.

**CHAPTER 25 - EQUIPMENT FURNISHING**

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Seat Belt Airbag Assembly		7035-1-011- 8105 (Co-Pilot Seat)	E508804	Supplemental Maintenance Manual	AmSafe Aviation 5456 E. McDowell Rd. Mesa, AZ 85215 www.amsafe.com
		7035-1-021- 8105 (Pilot Seat)			
		7035-2-011- 8105 (LH Rear Seat)			
		7035-2-021- 8105 (RH Rear Seat)			
Inflation Assembly		508792-401 (Co-Pilot Seat)	E508804	Supplemental Maintenance Manual	AmSafe Aviation 5456 E. McDowell Rd. Mesa, AZ 85215 www.amsafe.com
		508794-401 (Pilot Seat)			
Electronics Module Assembly		508358-409	E508804	Supplemental Maintenance Manual	AmSafe Aviation 5456 E. McDowell Rd. Mesa, AZ 85215 www.amsafe.com

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**CHAPTER 25 - EQUIPMENT FURNISHING**

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Three-Point Air Bag Belt		7035-2030118105 (Co-Pilot Seat)	E508804	Supplemental Maintenance Manual	AmSafe Aviation 5456 E. McDowell Rd. Mesa, AZ 85215 www.amsafe.com
		7035-2040218105 (Pilot Seat)			
		7035-2050218105 (LH Rear Seat)			
		7035-2060218105 (RH Rear Seat)			
V23 System Diagnostic Tool		508668-201	E508804	Supplemental Maintenance Manual	AmSafe Aviation 5456 E. McDowell Rd. Mesa, AZ 85215 www.amsafe.com

Table 4. CHAPTER 26 - FIRE PROTECTION

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Fire Extinguisher	C421001-0201	A352 GS		Hand Portable Halon 1211 Fire Extinguisher Maintenance Manual	Amerex Corp. P.O. Box 81 Trussville, AL 35173-0081

Table 5. CHAPTER 32 - LANDING GEAR

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Wheel	C163006-0301	40-75B		Cleveland Wheels & Brakes Component Maintenance Manual	Parker Hannifin Corporation Aircraft Wheel & Brake 1160 Center Road P.O. Box 158 Avon, OH 44011
Brakes	30-05219-1	30-52U		Cleveland Wheels & Brakes Component Maintenance Manual	Parker Hannifin Corporation Aircraft Wheel & Brake 1160 Center Road P.O. Box 158 Avon, OH 44011

**LIST OF MANUFACTURERS TECHNICAL PUBLICATIONS**

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Table 6. CHAPTER 34 - NAVIGATION

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Blind Encoder	3940408-1	SSD120-20	M881000D	Altitude Encoder/ Digitizer Owner/ Installation Manual	Trans-Cal Industries, Inc. 16141 Cohasset St. Van Nuys, CA 91406
Navigation Indicator	066-03056-0011	KI 209A	006-10543-0000	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
Automatic Direction Finder	066-01072-0014	KR 87	006-00184-0005	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
Mode C Transponder	066-01156-0101	KT 76C	006-10545-0000	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
NAV Indicators	066-03056-0002	KI 208/209	006-00140-0003	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
GPS	066-01148-1111	KLN 89/89B	006-10522-0001	Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031
Autopilot	3900008-1	KAP140 2-axis		Installation Manual	Allied Signal 101 N. Industrial Parkway New Century, KS 66031

Table 7. CHAPTER 71 - POWER PLANT

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Engine		IO540-AB1A5	60294-7	Direct Drive Engine Overhaul Manual	Textron Lycoming

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Table 8. CHAPTER 73 - ENGINE FUEL AND CONTROL

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Fuel Injection System		RSA-5	15-338D	RSA-5 & RSA-10 Fuel Injection Systems Operation & Service Manual	Precision Airmotive 14800 40th Ave. NE Marysville, WA 98271
Fuel Injection System		RSA-5	15-810B	Troubleshooting Techniques for the Precision Airmotive RSA Fuel Metering System	Precision Airmotive 14800 40th Ave. NE Marysville, WA 98271
Fuel Injection System		RSA-5	15-895G	Index of Manuals, Bulletins, and Service Information Letters for Precision Airmotive Fuel Controls	Precision Airmotive 14800 40th Ave. NE Marysville, WA 98271

Table 9. CHAPTER 74 - IGNITION

Item	Cessna Part Number	Manufacturer's Part Number	Publication Part Number	Publication Title	Manufacturer
Magneto		6351	L-1363C	4300/6300 Series Magneto Maintenance and Overhaul Manual	Slick Aircraft Products 530 Blackhawk Park Ave. Rockford, IL 61104

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8	Leveling and Weighing	Mar 1/2004	1	G2
9	Towing and Taxiing	Mar 1/2004	1	G9
10	Parking and Mooring	Jul 1/2007	1	G16
11	Placards and Markings	Mar 1/2005	1	H4
12	Servicing	Jul 3/2006	1	H10
20	Standard Practices - Airframe	Jan 1/2007	2	A2
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27	Flight Controls	Jul 1/2007	3	A2
28	Fuel	Jul 1/2007	3	D11
30	Ice and Rain Protection	Jan 1/2007	3	F2
31	Indicating/Recording Systems	Jan 2/2006	3	G2
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34	Navigation	Jul 1/2007	4	A2
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37	Vacuum	Jan 2/2006	4	E6
51	Standard Practices - Structures	Mar 1/2004	4	F2
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55	Stabilizers	Mar 1/2004	4	G7
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71	Powerplant	Jan 1/2007	4	I15
73	Engine Fuel and Control	Jan 1/2007	4	L2
74	Ignition	Jul 1/2007	5	A2
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78	Exhaust	Jan 1/2007	5	C2
79	Oil	Jan 2/2006	5	C15
80	Starting	Jul 1/2007	5	D5
81	Turbines	Mar 1/2004	5	D12

**NOTE 1:** \*Represents date of page one of each chapter's List of Effective Pages which is applicable to Manual revision date.

**CHAPTER**

**5**

**TIME LIMITS/  
MAINTENANCE  
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**TIME LIMITS/MAINTENANCE CHECKS**

**1. Scope**

- A. This chapter provides the time limits and maintenance checks for the Model 182 airplanes. It is divided into several sections, each with a specific purpose toward providing information necessary to establish inspection criteria.

**2. Inspection Requirements**

- A. As required by U.S. Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required annual inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation.
- B. Compliance with the regulations is accomplished using one of three methods:
  - (1) **Traditional (Annual/100 Hour) inspection program** which utilizes 14 CFR 43, Appendix D (scope and detail) to inspect the airplane. In addition, Cessna recommends certain components or items be inspected at 50 hour intervals. These inspection items are listed in Inspection Time Intervals, Section 5-10-01.
  - (2) **Progressive Care inspection program** which allows the work load to be divided into smaller operations that can be accomplished in a shorter time period. This method is detailed in Progressive Care Program, Section 5-12-00.
  - (3) **PhaseCard inspection program** which is geared toward high-utilization flight operations (approximately 600 flight hours per year). This system utilizes 50-hour intervals (Phase 1 and Phase 2) to inspect high-usage systems and components. At 12 months or 600 flight hours, whichever occurs first, the airplane undergoes a complete (Phase 3) inspection. PhaseCard Inspection programs can be ordered through Propeller Aircraft Product Support. P.O. Box 7706, Wichita, KS 67277, Phone (316) 517-5800, Fax (316) 942-9006.

**3. Inspection Program Selection**

- A. The selection of an inspection program (Annual, Progressive Care or PhaseCard) is primarily based on owner/operator preferences, whether an airplane is flown for hire, and numbers of hours flown during the year.

**4. Description**

- A. Listed below is a brief description and intended purpose of each section of this chapter. For detailed information related to each particular inspection program, refer to the specific section within this chapter.
- B. Section 5-00-00, Time Limits/Maintenance Checks - General. This section provides a general overview of inspection requirements.
- C. Section 5-10-01, Inspection Time Intervals. The primary purpose of this section is to provide a central location for inspection time intervals. This section may also be utilized in conjunction with 14 CFR Part 43 to provide greater detail on inspection criteria when performing Annual/100 Hour inspections.
- D. Section 5-11-00, Component Time Limits. This section provides a list of components which are life- or time-limited. Although these components are not listed in any of Cessna's inspection programs, they must be considered and included in whatever inspection program is used.
- E. Section 5-12-00, Progressive Care Program. This section outlines the progressive inspection program. The program is divided into four primary operations which cover all inspection requirements up through the 200-hour interval inspection items. The remaining operations cover inspections which are at intervals other than what the four primary operations cover. Refer to the Progressive Care Program section for a more detailed description of the Progressive Care Program.

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**5. General Inspection Terms and Guidelines**

**NOTE:** When inspections criteria are required, these criteria are spelled out in the text. If more detailed instructions are required for an inspection, these instructions will refer to the appropriate locations (supplier publications and/or the maintenance manual).

- A. Definitions of terms used through the inspection programs are as follows:
- (1) **ON CONDITION** is defined as the necessary inspections and/or checks to determine that a malfunction or failure of the component will not occur prior to the next scheduled inspection.
  - (2) **CONDITION** is defined as inspection for (but not limited to) cleanliness, cracks, deformation, corrosion, wear, and loose or missing fasteners.
  - (3) **SECURITY** is defined as an inspection for looseness of fasteners and fastener securing devices such as safety wire, cotter pins and self-locking nuts.
- B. During Inspections, use the following general guidelines:
- (1) **MOVABLE PARTS:** Inspect for lubrication, servicing, security of attachment, binding, excessive wear, safetizing, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing, and tension.
  - (2) **FLUID LINES AND HOSES:** Inspect for leaks, cracks, bulging, collapsed, twisted, dents, kinks, chafing, proper radius, security, discoloration, bleaching, deterioration, and proper routing; rubber hoses for hardness or flexibility and metal lines for corrosion.
  - (3) **METAL PARTS:** Inspect for security of attachment, cracks, metal distortion, and heat deterioration.
  - (4) **WIRING:** Inspect for security, chafing, burning, arcing, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals.

**CAUTION:** Torque values listed in this manual are not to be used for checking tightness of installed parts during service.

- (5) **STRUCTURAL FASTENERS:** Inspect for correct torque in accordance with applicable torque values. Refer to Chapter 20, Torque Data - Maintenance Practices, during installation or when visual inspection indicates the need for a torque check.
  - (6) **FILTERS, SCREENS, AND FLUIDS:** Inspect for cleanliness and the need for replacement at specified intervals.
  - (7) A system check (operation or function) that requires electrical power, must be performed using 28.5 Volts, +0.25 or -1.00 Volts, bus voltage. This will make sure that all components are operating at their operational voltage.
- C. Airplane file.
- (1) Miscellaneous data, information, and licenses are a part of the airplane file. Check that the following documents are up-to-date and in accordance with current Federal Aviation Regulations. Most of the items listed are required by the Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of airplanes operated outside the United States should check with their own aviation officials to determine their individual requirements.
    - (a) To be displayed in the airplane at all times:
      - 1 Standard Airworthiness Certificate (FAA Form 8100-2).
      - 2 Aircraft Registration Certificate (FAA Form 8050-3).
      - 3 Aircraft Radio Station License (Federal Communication Commission Form 556 if transmitter is installed).
    - (b) To be carried in the airplane at all times:
      - 1 Weight and Balance Data Sheets and associated papers (all copies of the Repair and Alteration Form, FAA Form 337, are applicable).
      - 2 Equipment List.
      - 3 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
    - (c) To be made available upon request:
      - 1 Airplane, Engine and Propeller Logbooks.

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**AIRWORTHINESS LIMITATIONS - FAA APPROVED DATA**

**1. Scope**

- A. The Airworthiness Limitations section is FAA approved and specifies maintenance required under Parts 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

**2. Airworthiness Limitations**

- A. There are no airworthiness limitations associated with this airplane.



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**INSPECTION TIME INTERVALS**

**1. General**

- A. The primary purpose of this section is to provide for inspection time intervals. The section 5-10-01 may be utilized in conjunction with 14 CFR Part 43 inspection scope and detail, but is not intended to be utilized as the primary checklist for inspection of the airplane.

**NOTE:** The inspection guidelines contained in this section are not intended to be all inclusive, for no such charts can replace the good judgment of certified airframe and powerplant mechanics in performance of their duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

**2. Procedure**

- A. A complete airplane inspection includes all inspection items as required by 14 CFR 43, Appendix D, Scope and Detail of annual/100 hour inspections. The chart provided in this section should be used to augment the inspection.
- B. The Component Time Limits section (5-11-00) should be checked in conjunction with this inspection to ensure proper overhaul and replacement requirements are accomplished at the specified times.
- C. The intervals shown are recommended intervals at which items are to be inspected based on normal usage under average environmental conditions. Airplanes operated in extremely humid areas (tropics), or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, and lubrication. Under these adverse conditions, perform periodic inspections in compliance with this chart at more frequent intervals until the operator can set his own inspection periods based on field experience.
- (1) The 14 CFR Part 91 operator's inspection intervals shall not deviate from the inspection time limits shown in this manual except as provided below: (Refer to 14 CFR 91.409)
- (a) The aircraft can only exceed its inspection point up to ten hours if the aircraft is enroute to a facility to have the inspection completed.
  - (b) In the event of late compliance of any operation scheduled, the next operation in sequence retains a due point from the time the late operation was originally scheduled (reschedule if late).
  - (c) In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next phase due point may remain where originally set.
  - (d) In the event of early compliance on any operation scheduled, that occurs more than 10 hours ahead of schedule, the next phase due point must be rescheduled to establish a new due point from the time of early accomplishment.

**3. Inspection Terms and Guidelines**

- A. For inspection terms and guidelines, refer to Chapter 5, Time Limits/Maintenance Checks - General.

**4. Chart Legend**

- A. Each page of the inspection listed in Inspection Time Limits, section 5-10-01 contains the following five columns:
- (1) **REVISION STATUS** - This column provides the date that a given item was added, deleted or revised. A blank entry in this column indicates no change since the original issue of this manual.
  - (2) **INSPECTION ITEM CODE NUMBER** - This column lists a six-digit number permanently assigned to a scheduled maintenance item. A given inspection item code number will never change and will not be reused in the event the scheduled maintenance item is deleted.
  - (3) **REQUIREMENTS** - This column provides a short description of the inspection and/or servicing procedures. Where a more detailed description of the procedure is required, a reference will be made to either another selection located within the maintenance manual or a specific reference to a supplier publication.

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- (4) **INTERVAL** - This column lists the frequency of inspection in alphabetic coded form. The legend for the alpha code is listed below.
- (5) **OPERATION** - The Progressive Care inspection program allows the work load to be divided into smaller operations that can be accomplished in a shorter time period. This program is detailed in section 5-12-00, which is the Progressive Care Program.
- (6) **ZONE** - This column locates the components within a specific zone. For a breakdown of how the airplane is zoned, refer to Chapter 6, Airplane Zoning - Description and Operation.

<b>INTERVAL</b>	<b>OPERATION</b>	<b>INTERVAL</b>
A.	1, 2, 3, 4	Every 50 hours.
B.	1, 2, 3, 4	Every 100 hours.
C.	1, 2, 3, 4	Every 200 hours.
D.	5	Every 400 hours or 1 year, whichever occurs first.
E.		<b>(Not used)</b>
F.	7	Every 600 hours or 1 year, whichever occurs first.
G.		<b>(Not used)</b>
H.	9	Every 500 hours.
I.	10	Every 1000 hours.
J.	11	Every 2 years.
K.		<b>(Not used)</b>
L.		<b>(Not used)</b>
M.	14	Every 2 years, or any time components are added or removed which have the potential to affect the magnetic accuracy and/or variation of the compass calibration, or any time the accuracy of the compass is in question.
N.	15	Every 2000 hours.
O.	16	Every 1000 hours or 1 year, whichever occurs first.
P.	17	Every 12 calendar months.
Q.	18	Every 6 years.
R.	19	Every 12 years.
S.	20	Every 1 year.
T.	21	Every 3 years.
U.		<b>(Not used)</b>
V.	22	Beginning five years from the date of the manufacture, you must make sure of the serviceability of the components every twelve months. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.
W.	23	Every 100 hours or every one year, whichever occurs first.
X.	24	Every 100 hours, every annual inspection, every overhaul, and any time fuel lines or clamps are serviced, removed or replaced.
Y.	25	First 600 hours and as defined by the manufacturer thereafter.
Z.	26	Every 1000 hours or 3 years, whichever occurs first.

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**INSPECTION TIME LIMITS**

**1. Inspection Items**

REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION ZONE	
Added Mar 1/05	110000	Interior Placards, Exterior Placards, Decals, Markings and Identification Plates - Inspect for security of installation and legibility. Refer to Chapter 11, Placards and Markings - Inspection/Check.	B	1, 2, 3, 4	ALL
Deleted Mar 1/04	112101				
Deleted Mar 1/04	113101				
	212001	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	D	5	211
Revised Mar 1/05	212002	Primary Flight Display (PFD) Fan, Multi-Function Display (MFD) Fan, Deck Skin Fan, and Remote Avionics Cooling Fan - Operational Check. Refer to Chapter 21, Avionics Cooling - Maintenance Practices.	W	23	220, 225
	214001	Cold and Hot Air Hoses - Check condition, routing, and security.	B	2, 4	120
Revised Dec 1/98	214002	Heater Components, Inlets, and Outlets - Inspect all lines, ducts, clamps, seals, and gaskets for condition, restriction, and security.	B	1, 3	211
Revised Jun 1/00	214003	Cabin Heat and Ventilation Controls - Check freedom of movement through full travel. Check friction locks for proper operation.	B	1	211
	221001	Autopilot Rigging - Refer to Autopilot - Maintenance Practices.	F	7	610
Added Dec 1/98	221002	Autopilot Servo Capstan Assemblies. Check slip-clutch torque settings. Refer to Autopilot - Maintenance Practices.	O	16	610
Added Dec 1/98	221003	Autopilot Servo Actuators. Inspect for evidence of corrosion and or buildup of dirt or other particulate matter which may interfere with servo operation. Refer to Autopilot - Maintenance Practices.	O	16	610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	231001	Communication Antennas and Cables - Inspect for security of attachment, connection, and condition.	C	3	210
	235001	Microphones, Headsets, and Jacks - Inspect for cleanliness, security, and evidence of damage.	C	1	211
Added 4/03	235002	Microphone Push-To-Talk Switch - Clean the pilot's and copilot's microphone switches. Refer to Chapter 23, Communication - Maintenance Practices.	B	1, 3	222, 223
	242001	Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension.	A	1, 2, 3, 4	120
Revised Jun 3/06	243001	Main Battery - Examine the general condition and security. Complete a check of the level of electrolyte. Refer to Chapter 12, Battery - Servicing.	B	2, 4	310
Revised Jun 3/06	243002	Main Battery Box and Cables - Clean and remove any corrosion. Examine the cables for routing, support, and security of the connections.	B	2, 4	310
	243003	General Airplane and System Wiring - Inspect for proper routing, chafing, broken or loose terminals, general condition, broken or inadequate clamps, and sharp bends in wiring.	C	1	210
	243004	External Power Receptacle and Power Cables - Inspect for condition and security.	C	2	120
Added Mar 1/05	243005	Standby Battery - Complete the Standby Battery Capacity Test. Refer to Chapter 24, Standby Battery - Maintenance Practices.	S	20	220
	246001	Switch and Circuit Breaker Panel, Terminal Blocks, and Junction Boxes - Inspect wiring and terminals for condition and security.	C	1	222
Revised Jun 1/00	246002	Power Junction Box - Check operation and condition. Check availability and condition of spare fuse (if applicable).	B	1, 3	222

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Jul 3/06	246003	Alternator Control Unit - Complete the Over-voltage Protection Circuit Test. Refer to Chapter 24, Alternator Control Unit.	J	11	222
Revised Mar 1/05	246101	Essential and Crossfeed Bus Diodes - Check for proper operation. Complete the Essential and Crossfeed Bus Diode Inspection. Refer to Chapter 24, Essential and Crossfeed Bus Diodes - Maintenance Practices.	S	20	224
Revised Jul 3/06	251001	Seats - Examine the seats to make sure they are serviceable and installed correctly. Make sure the seat stops and adjustment mechanism operate correctly. Examine the seat recline control and attaching hardware to make sure the hardware and lock are not damaged and are correctly installed. Lubricate the threads of the Seat Crank Handle Assembly with MIL-PRF-81322 general purpose grease.	B	1, 3	211
	251002	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Inspect seat rails for cracks.	B	2, 4	230
	251101	Restraint System, front and rear - Check belts for thinning, fraying, cutting, broken stitches, or ultra-violet deterioration. Check system hardware for security of installation.	B	1, 3	211
Added Mar 1/05	251102	AMSAFE Aviation Inflatable Restraint (AAIR) - Examine the restraint for dirt, frayed edges, unserviceable stitching, loose connections, and other wear.	S	20	211
	252201	Upholstery, Headliner, Trim, and Carpeting - Check condition and security.	D	5	211
Revised Jan 2/05	256001	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with 14 CFR Part 91.207.	B	1, 3	310
	262001	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.	B	1, 3	230

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Dec 1/98	262002	Cockpit Mounted Halon Type Fire Extinguisher - Weigh bottle. Bottle must be reserviced by qualified individual if more than 2 ounces is lost.	P	17	211
Added Dec 1/98	262003	Cockpit Mounted Halon Type Fire Extinguishers - Perform hydrostatic test. The hydrostatic test shall be at twelve-year intervals based on initial servicing or date of last hydrostatic test.	R	19	211
Added Dec 1/98	262004	Cockpit Mounted Halon Type Fire Extinguishers - Empty, inspect for damage, and recharge.	Q	18	211
Revised Dec 1/98	271001	Aileron Controls - Check freedom of movement and proper operation through full travel.	B	1, 3	120, 520, 620
	271002	Ailerons and Cables - Check operation and security of stops. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment or if stops are damaged. Check fairleads and rub strips for condition.	C	3	120, 520, 620
	271003	Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.	B	1, 3	520, 620
	271004	Ailerons and Hinges - Check condition, security, and operation	B	1, 3	520, 620
	271005	Control Wheel Lock - Check general condition and operation.	C	1	222
Revised Dec 1/98	271006	Control Linkage - Inspect pulleys, cables, bearings, and turnbuckles for condition and security.	C	1	222, 223
	272001	Rudder - Check internal surfaces for corrosion, condition of fasteners, and balance weight attachment.	C	3	340

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<b>REVISION STATUS</b>	<b>ITEM CODE NUMBER</b>	<b>TASK</b>	<b>INTERVAL</b>	<b>OPERATION</b>	<b>ZONE</b>
Revised Jun 1/00	272002	Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect balance weight for looseness and the supporting structure for damage.	B	1, 3	340
Revised Dec 1/98	272003	Rudder, Tips, Hinges, Stops, Clips and Cable Attachment - Check condition, security, and operation.	B	1, 3	340
	272004	Rudder Pedals and Linkage - Check for general condition, proper rigging, and operation. Check for security of attachment.	C	1	230
Added Dec 1/98	272005	Rudder Control - Check freedom of movement and proper operation through full travel. Check rudder stops for damage and security.	B	1, 3	340
Revised Dec 1/98	273001	Elevator Control - Check freedom of movement and proper operation through full travel.	B	1, 3	222, 223
Revised Jun 1/00	273002	Elevator Control System - Inspect pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition, security, and operation. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety.	B	1, 3	222, 223
Revised Dec 1/98	273003	Elevator, Hinges, Stops, and Cable Attachment - Check condition, security, and operation.	B	1, 3	320, 330
Added Dec 1/98	273004	Elevator Downspring - Check structure, bolts, linkage, bell crank, and push-pull tube for condition, operation, and security. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travels if cables require tension adjustment or if stops are damaged.	B	1, 3	310
	273101	Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.	B	1, 3	224, 240, 310

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Jun 1/00	273102	Elevator Trim Control and Indicator - Check freedom of movement and proper operation through full travel. Check pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition and security. Check electric trim controls for operation as applicable. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety	C	1	224, 240, 310
	273103	Elevator Trim Tab and Hinges - Check condition, security, and operation.	B	1, 3	224
Revised Jul 3/06	273104	Elevator Trim Tab Actuator - Examine the free play limits. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices, Trim Tab Free Play Inspection. If the free play is more than the permitted limits, lubricate the actuator and examine the free play limits again. If the free play is still more than the permitted limits, replace the actuator.	B	1, 3	320
Deleted Dec 1/98	273105				
	273106	Elevator Trim Tab Stop Blocks - Inspect for damage and security.	C	1	240
Added Jul 3/06	273107	Elevator Trim Tab Actuator - Remove, clean, examine, and lubricate the actuator. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices.	Z	26	320
Revised Dec 1/98	275001	Flaps - Check tracks, rollers, and control rods for security of attachment. Check rod end bearings for corrosion. Check operation.	B	1, 3	510, 610
	275002	Wing Flap Control - Check operation through full travel and observe Flap Position indicator for proper indication.	C	1	221
	275003	Flap Structure, Linkage, Bellcranks, Pulleys, and Pulley Brackets - Check for condition, operation and security.	C	3	510, 610
	275004	Flaps and Cables - Check cables for proper tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment.	C	3	510, 610



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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Dec 1/98	275005	Flap Motor, Actuator, and Limit Switches - Check wiring and terminals for condition and security. Check actuator for condition and security.	C	3	610
Revised Dec 1/98	275006	Flap Actuator Threads - Clean and lubricate. Refer to Chapter 12-21-03.	B	1, 3	610
	282001	Fuel System - Inspect plumbing and components for mounting and security.	B	1, 3	510, 610
Revised Dec 1/98	282002	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.	B	1, 3	510, 610
Revised Jun 1/00	282003	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.	B	1, 3	224
Revised Dec 1/98	282004	Integral Fuel Bays - Check for evidence of leakage and condition of fuel caps, adapters, and placards. Using quick drains, ensure no contamination exists. Check quick drains for proper shut off.	B	1, 3	510, 610
Deleted Aug 4/03	282005				
	282006	Fuel Selector - Using quick drain, ensure no contamination exists.	B	1, 3	224
	282007	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.	B	1, 3	510, 610
Revised Mar 1/05	282008	Fuel Quantity Indicators - Examine for damage and security of installation. Complete a fuel quantity calibration check. Refer to Chapter 28, Fuel Storage and Distribution - Maintenance Practices.	F	7	220

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Jan 2/06	282009	Integral Fuel Bays - Drain the fuel (Refer to Chapter 12, Fuel - Servicing) and purge tanks (Refer to the Single Engine Structural Repair Manual, 1996 and On). Complete an inspection of the tank interior and outlet screens and remove any foreign object debris. Complete an inspection of the tank interior surfaces for sealant deterioration and corrosion (especially in the sump areas).	I	10	510, 610
Revised Jun 1/00	282010	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security.	B	2, 4	120
	311001	Instruments - Check general condition and markings for legibility.	B	1, 3	220
Deleted Mar 1/05	311002				
	311003	Instrument Lines, Fittings, Ducting, and Instrument Panel Wiring - Check for proper routing, support, and security of attachment.	C	1	220
Revised Jun 1/00	321001	Main Landing Gear Wheel Fairings and Brake Fairings - Check for cracks, dents, and condition of paint.	B	2, 4	721, 722
Revised Mar 1/05	321002	Main Gear Spring Assemblies - Examine for cracks, dents, corrosion, condition of paint or other damage. Examine for chips, scratches, or other damage that lets corrosion get to the steel spring. Examine the axles for condition and security.	B	2, 4	721, 722
	321003	Main Landing Gear Attachment Structure - Check for damage, cracks, loose rivets, bolts and nuts and security of attachment.	B	2, 4	721, 722
	322001	Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.	B	2, 4	720
	322002	Nose Landing Gear Wheel Fairings - Check for cracks, dents, and condition of paint.	B	2, 4	720

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	322003	Nose Gear Fork - Inspect for cracks, general condition, and security of attachment.	C	4	720
	322004	Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.	B	2, 4	720
	324001	Brakes - Test toe brakes and parking brake for proper operation.	B	2, 4	230
Revised Dec 1/98	324002	Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake. Refer to Chapter 12-13-00 for servicing instructions.	B	2, 4	224, 230
	324003	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support.	D	5	721, 722
	324004	Tires - Check tread wear and general condition. Check for proper inflation.	B	2, 4	720, 721, 722
	324005	Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.	B	2, 4	721, 722
Revised Dec 1/98	324006	Wheel Bearings - Clean, inspect and lube.	B	4	720, 721, 722
	325001	Nose Gear Steering Mechanism - Check for wear, security, and proper rigging.	C	4	720
	331001	Instrument and Cabin Lights - Check operation, condition of lens, and security of attachment.	B	1, 3	220, 211, 221
	334001	Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.	B	1, 3	340, 520, 620
	341101	Static System - Inspect for security of installation, cleanliness, and evidence of damage.	C	3	210
Revised Jul 3/06	341102	Pitot and Static System - Examine in accordance with 14 CFR Part 91.411.	J	11	220

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	341103	Pitot Tube and Stall Warning Vane - Check for condition and obstructions and verify operation of anti-ice heat.	A	1, 2, 3, 4	510
	342101	Magnetic Compass - Inspect for security of installation, cleanliness, and evidence of damage.	C	1	225
Revised Dec 1/98	342102	Magnetic Compass - Calibrate.	M	14	220
Revised Dec 1/98	345001	Instrument Panel Mounted Avionics Units (Including Audio Panel, VHF Nav/Com(s), ADF, GPS, Transponder, Compass System, Multi-function Display, and Primary Flight Display) and Remote Mounted Avionics Components. Inspect for deterioration, cracks, and security of instrument panel mounts. Inspect for security of electrical connections, condition, and security of wire routing.	C	1	225
	345002	Avionics Operating Controls - Inspect for security and proper operation of controls and switches and ensure that all digital segments will illuminate properly.	C	1	225
	345003	Navigation Indicators, Controls, and Components - Inspect for condition and security.	C	1	220, 225
	345004	Navigation Antennas and Cables - Inspect for security of attachment, connection, and condition.	C	1	310
Added Nov 1/00	351001	Oxygen System (if applicable) - Inspect masks, hoses, lines, and fittings for condition, routing, and support. Test operation and check for leaks.	C	1	211
Added Nov 1/00	351002	Oxygen Cylinder (if applicable) - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.	T	21	211
	371001	Vacuum System - Inspect for condition and security.	B	2, 4	120
	371002	Vacuum Pumps - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.	B	2, 4	120

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	371003	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.	B	2, 4	120
Revised Dec 1/98	371004	Gyro Filter - Inspect for damage, deterioration and contamination. Clean or replace if required.	B	2, 4	120
Deleted Aug 4/03	371005				
Revised Jan 2/06	371006	Vacuum Manifold Check Valve - Complete a check for proper operation. (Only airplanes with dual vacuum pumps and Airborne manifolds. Refer to the Airborne Air & Fuel Products Service Letter Number 39A or latest revision, and in accordance with SB02-37-04.) Refer to Chapter 37, Vacuum System - Maintenance Practices for the removal and installation of the check valve.	V	22	120
Added Jan 2/06	371007	Do an inspection of the wear indicator ports on the vacuum pumps described in Tempest Service Letter 004.	Y	25	120
	521001	Doors - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	B	1, 3	210
	531001	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.	B	1, 3	210
	531002	Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.	C	2	120
	531003	Internal Fuselage Structure - Inspect bulkheads, doorposts, stringers, doublers, and skins for corrosion, cracks, buckles, and loose rivets, bolts and nuts.	C	1	211

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Dec 1/98	551001	Horizontal Stabilizer and Tailcone structure - Inspect bulkheads, spars, ribs, and skins, for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tips.	B	1, 3	320, 330
Revised Dec 1/98	551002	Horizontal Stabilizer and Tips - Inspect externally for skin damage and condition of paint.	B	1, 3	320, 330
Revised Dec 1/98	553001	Vertical Stabilizer Fin - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tip.	B	1, 3	340
Revised Dec 1/98	553002	Vertical Stabilizer Fin and Tailcone - Inspect externally for skin damage and condition of paint.	B	1, 3	340
	561001	Windows and Windshield - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	B	1, 3	210
	571001	Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.	B	1, 3	510, 520, 610, 620
	571002	Wing Struts and Strut Fairings - Check for dents, cracks, loose screws and rivets, and condition of paint.	B	1, 3	510, 610
	571003	Wing Access Plates - Check for damage and security of installation.	C	3	510, 520, 610, 620
	571004	Wing Spar and Wing Strut Fittings - Check for evidence of wear. Check attach bolts for indications of looseness and retorque as required.	C	3	510, 520, 610, 620
	571005	Wing Structure - Inspect spars, ribs, skins, and stringers for cracks, wrinkles, loose rivets, corrosion, or other damage.	C	3	510, 520, 610, 620
	611001	Spinner - Check general condition and attachment.	A	1, 2, 3, 4	110
Revised Jan 3/05	611002	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.	B	2, 4	110

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION ZONE	
	611003	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	A	1, 2, 3, 4	110
	611004	Propeller Hub - Check general condition.	C	2	110
	611005	Propeller Mounting - Check for security of installation.	A	1, 2, 3, 4	110
	611006	Propeller Mounting Bolts - Inspect mounting bolts and safety wire for signs of looseness. Retorque mounting bolts as required.	C	2	110
Added Nov 1/00	611007	Propeller Heat Slip Rings, Brushes, and Boots - Inspect for condition, and security. Perform operational check.	A	1, 2, 3, 4	110
Added Dec 1/98	612001	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	A	1, 2, 3, 4	110
Revised Aug 4/03	612002	Propeller Governor and Control - Check for security and operation of controls. Maximum linear freeplay is 0.050 inch.	C	2	110
Added Dec 15/01	612003	Propeller Control Cable - Non-repairable item and must be replaced at every interval or whenever maximum linear movement exceeds 0.050 inch. Refer to Chapter 61-20-00, Propeller Control Cable.	N	15	120,210
Added Nov 1/00	710001	Turbocharger (if applicable) - Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	A	1, 2, 3, 4	120
Revised Aug 4/03	710002	Turbocharger (if applicable) - Examine the turbocharger for burned areas, bulges, or cracks. Use a flashlight and mirror in the tailpipe to examine the turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	C	2	120

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Revised Dec 1/98	711001	Cowling and Cowl Flaps - Inspect for cracks, dents, other damage and security of cowl fasteners. Check cowl flaps for condition, security, and operation. Check cowl flap controls for freedom of movement through full travel.	A	1, 2, 3, 4	120
	712001	Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.	C	2	120
	716001	Alternate Induction Air System - Check for obstructions, operation, and security.	A	1, 2, 3, 4	120
	716002	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	A	1, 2, 3, 4	120
Revised Jun 1/00	716003	Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation.	B	2, 4	120
	716004	Induction Air Filter - Remove and clean. Inspect for damage and service.	A	2, 4	120
Added Jan 2/06	720000	Fuel line (Stainless steel tube assembly) and support clamp inspection and installation. Refer to Lycoming Service Bulletin Number 342E or later version.	X	24	120
	722001	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	A	1, 2, 3, 4	120
	722002	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorquing as necessary. Check crankcase breather lines for obstructions, security, and general condition.	B	2, 4	120
	722003	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	A	1, 2, 3, 4	120



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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	723001	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.	B	2, 4	120
	723002	Engine Metal Lines, Hoses, Clamps, and Fittings - Check for leaks, condition, and security. Check for proper routing and support.	C	2	120
	723003	Engine Baffles and Seals - Check condition and security of attachment.	A	1, 2, 3, 4	120
Revised Jan 2/06	723004	Cylinder Compression - Complete a differential compression test. If there is weak cylinder compression, refer to Chapter 71, Engine - Troubleshooting, for further procedures.	B	2, 4	120
	730001	Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.	B	2, 4	120
	730002	Fuel Injection System - Check system for security and condition. Clean fuel inlet screen, check and clean injection nozzles and screens (if evidence of contamination is found), and lubricate air throttle shaft.	B	2, 4	120
Added Jun 18/01	730003	Idle and Mixture - Run the airplane engine to determine satisfactory performance. If required, adjust the idle rpm and fuel mixture. Refer to Chapter 73, Fuel Injection Systems - Maintenance Practices.	B	2, 4	120
Revised Jan 2/06	741001	Magnetos - Examine the external condition and for correct installation and condition of the electrical leads. Complete a check of the engine timing (external timing). You must set the internal timing if the total of all external adjustments are more than 0.125 inch (3.17 mm) from the original factory position, or between each of the internal timing adjustments. Refer to Chapter 74, Ignition System - Maintenance Practices.	B	2, 4	120
Revised Jul 3/06	741002	Magnetos - Clean, examine, and adjust as necessary. Do the 500-hour inspection in accordance with the Slick 4300/6300 Series Magneto Maintenance and Overhaul Manual.	H	9	120

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	742001	Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.	B	2, 4	120
	742002	Spark Plugs - Remove, clean, analyze, test, gap, and rotate top plugs to bottom and bottom plugs to top.	B	2, 4	120
	743001	Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.	B	2, 4	120
Revised Jun 1/00	743002	Inspect and lubricate ACS brand ignition switch. Refer to Chapter 74, Ignition System - Maintenance Practices.	N	15	224
Revised Jan 2/06	761001	Engine Controls and Linkage - Examine the general condition and freedom of movement through the full range. Complete a check for the proper travel, security of attachment, and for evidence of wear. Complete a check of the friction lock and vernier adjustment for proper operation. Complete a check to make sure the throttle, fuel mixture, and propeller governor arms operate through their full arc of travel. The maximum linear freeplay is 0.050 inch.	B	1, 2, 3, 4	120, 225
Revised Dec 1/98	781001	Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust system - Maintenance Practices.	A	1, 2, 3, 4	120
Added Nov 1/00	781002	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust System - Maintenance Practices. Note: This inspection is specifically required for German (LBA) certification.	A	1, 2, 3, 4	120

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Jun 1/00	791001	Engine Oil - Drain oil sump and oil cooler. Check for metal particles or foreign material in filter, on sump drain plug, and on engine suction screen. Refer to Textron Lycoming Service Bulletin # 480C or latest revision. Replace filter, and refill with recommended grade aviation oil.	A	1, 2, 3, 4	120
	792001	Oil Cooler - Check for obstructions, leaks, and security of attachment.	A	1, 2, 3, 4	120
Revised Jun 1/00	801001	Starter and Electrical Connections - Check security and condition of starter, electrical connection, and cable.	B	2, 4	120
Added Apr 1/02	801002	Bendix Drive Starter Assembly - Clean and lubricate starter drive assembly.	A	1, 2, 3, 4	120

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**COMPONENT TIME LIMITS**

**1. General**

- A. Most components given in Chapter 5 must be examined as shown elsewhere in this chapter and repaired, overhauled, or replaced as necessary. Some components have a time or life limit and must be overhauled or replaced on or before the specified limit.
- B. The terms overhaul and replacement as used within this section are defined as follows:
  - (1) Overhaul - Overhaul the item as given in 14 CFR 43.2 or replace it.
  - (2) Replacement - Replace the item with a new item or a serviceable item that is within its service life and time limits or has been rebuilt as given in 14 CFR 43.2.
- C. This section (5-11-00) gives a list of items which must be overhauled or replaced at specific time limits. Cessna-Supplied Replacement Time Limits shows those items which Cessna has found necessary to overhaul or replace at specific time limits. Supplier-Supplied Replacement Time Limits shows component time limits which have been given by an outside supplier for their products. In addition to these time limits, the components shown in this section are also examined at regular time intervals given in the Inspection Time Intervals section. If necessary, based on service use and inspection results, these components can be overhauled or replaced before their time limit is reached.

**2. Cessna-Supplied Replacement Time Limits**

- A. Equipment/Furnishings (Chapter 25).
  - (1) 504516-401-XXXX Restraint System, Pilot's Left Hand or Right Hand Auto Adjust - Replace every 10 years.
  - (2) 504851-401-XXXX Restraint System, Pilot's Left Hand or Right Hand Manual Adjust - Replace every 10 years.
  - (3) 504516-403-XXXX Restraint System, Aft Bench Left Hand or Right Hand Auto Adjust - Replace every 10 years.
  - (4) 504851-403-XXXX Restraint System, Aft Bench Left Hand or Right Hand Manual Adjust - Replace every 10 years.
  - (5) 2000031-09-201 Restraint Assembly, Pilot's Seat - Replace every 10 years.
  - (6) 2000031-10-201 Restraint Assembly, Copilot's Seat - Replace every 10 years.
  - (7) 2000031-11-201 Restraint Assembly, Right Rear Seat - Replace every 10 years.
  - (8) 2000031-12-201 Restraint Assembly, Left Rear Seat - Replace every 10 years.
- B. Flight Controls (Chapter 27).
  - (1) 1260074-1 Trim Tab Actuator - Replace the trim tab actuators when the free play cannot be kept in limits by the adjustment or replacement of the rod ends, rod end bolts, screw assembly, and the lubrication of the trim tab actuator.
  - (2) 1260074-7 Trim Tab Actuator (with dual axis autopilot) - Replace the trim tab actuators when the free play cannot be kept in limits by the adjustment or replacement of the rod ends, rod end bolts, screw assembly, and the lubrication of the trim tab actuator.
- C. Vacuum (Chapter 37).
  - (1) C294502-0201 Gyro Filter - Replace at 600 hours.
- D. Propeller (Chapter 61).
  - (1) 565-580-038 Propeller Control Cable - Replace at engine TBO.
- E. Powerplant (Chapter 71).
  - (1) Engine Compartment Flexible Fluid-Carrying Teflon Hoses (Cessna-Installed), Except Drain Hoses - Replace every 10 years or at the engine overhaul, whichever occurs first.

**NOTE:** This life limit is intended not to let flexible, fluid-carrying Teflon hoses in a deteriorated or damaged condition stay in service. Replace the flexible, fluid-carrying Teflon hoses in the engine compartment (Cessna-installed only) every 10 years or at the engine overhaul, whichever occurs first. This does not include drain hoses. Serviceable hoses which are beyond these limits must be put on order immediately and replaced within 30 days after the new hose is received from Cessna.

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- (2) Engine Compartment Drain Hoses - Replace on condition.
- (3) Engine Flexible Hoses (Textron Lycoming Installed) - Refer to latest Textron Lycoming Engine Service Bulletins.
- (4) P198290, P106150 Air Filter - Replace every 500 hours or if the condition of the part shows the need for replacement.
- (5) CA3717 Air Filter - Replace every 100 hours or if the condition the part shows the need for replacement.
- (6) Mixture and Throttle Cables - Replace at every engine TBO.
- (7) 31B22207 Engine Starter - Replace at every engine TBO.
- (8) Engine Shock Mounts - Replace at every engine TBO or if the condition of the part shows the need for replacement.

**F. Chapter 79 (Oil).**

- (1) 83278 Oil Pressure Switch - Replace every 3000 hours.

**NOTE:** If the 83278 Oil Pressure Switch has more than 3000 hours and is in serviceable condition, you must submit an order for a new switch immediately and replace the switch within 60 days after you receive it from Cessna.

**3. Supplier-Supplied Replacement Time Limits**

**A. Chapter 25 (Equipment/Furnishings).**

- (1) 2020-0 Pointer ELT Battery - Refer to 14 CFR 91.207 for battery replacement time limits.
- (2) 508358-409 and 508358-421 AMSAFE Aviation Inflatable Restraint (AAIR) Forward and Aft Electronics Module Assemblies (EMA) - Remove and return the forward and aft EMA's to AMSAFE Aviation after seven years from the manufacture date. The expiration of the service life, that is the total sum of storage life and installation life, must not be more than seven years from the manufacture date. Only the manufacturer can renew the EMA's.
- (3) 508792-401 and 508794-401 Pilot's, Copilot's, Left Passenger's, and Right Passenger's AMSAFE Aviation Inflatable Restraint (AAIR) Inflator Assemblies - Remove and return the pilot's, copilot's, left passenger's, and right passenger's inflator assemblies to AMSAFE Aviation after seven years from the manufacture date. The expiration of the service life, that is the total sum of storage life and installation life, must not be more than seven years from the manufacture date. The expiration date is found on the gas cylinder. Only the manufacturer can renew the inflator assemblies.
- (4) 452-201-[X] Remote Mounted CO Detector - Replace 7 years.

**B. Chapter 28 (Fuel).**

- (1) Dukes Model 5100 Electric Fuel Pump - Replace at 10 Years if not overhauled.

**C. Chapter 37 (Vacuum).**

- (1) 1H5-25 Vacuum Manifold - Refer to Airborne Air & Fuel Product Reference Memo No. 39 or the latest revision for replacement time limits.
- (2) B3-5-1 or ARB3-5-1 Regulator Valve Filter - Replace at 100 hours.
- (3) Dry Vacuum Pump - Replace the engine-driven vacuum pump, if it does not have a wear indicator, every 500 hours of operation, or replace the pump at the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first. For vacuum pumps with a wear indicator, replace the pump at the manufacturer's recommended inspection and replacement interval for that vacuum pump.
- (4) Airborne 350 Vacuum Pump Coupling - Replace every 6 years.

**D. Chapter 61 (Propeller).**

- (1) Propeller - Refer to the latest revision of McCauley Service Bulletin 137 for the overhaul time limits.
- (2) C161031-0119 Propeller Governor - Any governor damaged by a propeller blade strike, propeller or engine lightning strike, engine detonation, oil contamination, or sudden engine stop must not be returned to service. All such parts must be repaired or overhauled. Refer to McCauley Service Bulletin 215C or latest revision.

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- E. Chapter 71 (Powerplant).
  - (1) IO-540-AB1A5 and TI0540-AK1A Engine - Refer to Textron/Lycoming Service Instruction S.I. 1009AJ or latest revision for time limits.
  - (2) CH48110 Engine Oil Filter - Refer to Textron/Lycoming Service Instructions S.I. 1492B, S.I. 1267C, and Service Bulletin SB.480C, or latest revisions.
- F. Chapter 74 (Ignition).
  - (1) 6351 Slick Magnetos - Refer to Slick Service Bulletin SB2-80C, or latest revision, for time limits.

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**PROGRESSIVE CARE PROGRAM**

**1. General**

**NOTE:** The inspection charts contained within the Progressive Care Program are not intended to be all-inclusive, for no such charts can replace the good judgment of a certified airframe and powerplant mechanic in performance of his or her duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator must select only qualified personnel to maintain the airplane.

A. The program is divided into four primary operations (operations 1 thru 4) which cover all 50-hour, 100-hour, and 200-hour inspection requirements. The other operations include all of the inspection requirements due at other intervals.

B. The inspection program is divided into the progressive inspection operations.

Operation 1 - Has all 50-hour inspection items, and the 100- or 200-hour inspection items contained in the fuselage area.

Operation 2 - Has all 50-hour inspection items, and the 100- or 200-hour inspection items contained in the engine compartment area.

Operation 3 - Has all 50-hour inspection items, and the 100- or 200-hour inspection items contained in the wing.

Operation 4 - Has all 50-hour inspection items, and the 100- or 200-hour inspection items contained in the landing gear.

Operation 5 - Has all 400-hour or 1-year inspection items, whichever occur first.

Operation 6 - Has all items that must have an inspection at the first 100 hours, and each 500 hours after (NOT CURRENTLY USED).

Operation 7 - Has all 600-hour or 1-year inspection items, whichever occur first.

Operation 8 - Has all 1000-hour or 3-year inspection items, whichever occur first (NOT CURRENTLY USED).

Operation 9 - Has all 500-hour inspection items.

Operation 10 - Has all 1000-hour inspection items.

Operation 11 - Has all 2-year inspection items.

Operation 12 - Has all items that must have an inspection at the first 5 years, and each 12 months after, until replacement at 10 years (NOT CURRENTLY USED).

Operation 13 - Has all 50-hour or 4-month inspection items, whichever occur first (NOT CURRENTLY USED).

Operation 14 - Has all 2-year inspection items, or inspections of components that are added or removed with the potential to change the magnetic accuracy and/or variation of the compass calibration, or any time the accuracy of the compass is in question.

Operation 15 - Has all 2000-hour inspection items.

Operation 16 - Has all 1000-hour or 1-year inspection items, whichever occur first.

Operation 17 - Has all 12-month inspection items.

Operation 18 - Has all 6-year inspection items.

Operation 19 - Has all 12-year inspection items.

Operation 20 - Has all 1-year inspection items.

Operation 21 - Has all 3-year inspection items.

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- Operation 22 - Has all 5-year inspection items from the date of manufacture. Serviceability of the components must be examined each 12 months. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.
- Operation 23 - Has all 100-hour or 1-year inspection items, whichever occur first.
- Operation 24 - Every 100 hours, every annual inspection, every overhaul, and any time fuel lines or clamps are serviced, removed or replaced.
- Operation 25 - First 600 hours and as defined by the manufacturer thereafter.
- Operation 26 - Every 1000 hours or 3 years, whichever occurs first.

## 2. Procedure

- A. A FULL AIRPLANE INSPECTION includes all 50-, 100-, and 200-hour inspection items plus those Inspection Items contained in other operations which are due at the specified time.
- B. The Component Time Limits Section (5-11-00) must be read at each inspection interval to make sure that the correct overhaul and replacement requirements are done at the specified times.
- C. The Inspection Operations have been developed based on normal usage under average environmental conditions. Airplanes operated in extremely humid areas (tropics), or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, and lubrication. Under these adverse conditions, do the periodic inspections in compliance with the Inspection Operations at more frequent intervals until the operator can set his own inspection periods based on field experience. The operator's inspection intervals must not deviate from the inspection time limits shown in this manual except as given below:
  - (1) Each inspection interval can be extended by 10 hours (if time-controlled), or by 30 days (if date-controlled) or can be performed early at any time prior to the regular interval as provided below:
    - (a) In the event of late compliance of any operation scheduled, the next operation in sequence keeps a due point from the time the late operation was originally scheduled.
    - (b) In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next phase due point can stay where originally set.
    - (c) In the event of early compliance of any operation scheduled, that occurs more than 10 hours ahead of schedule, the next operation due point must be rescheduled to establish a new due point from the time of early compliance.

## 3. Inspection Terms and Guidelines

- A. For inspection terms and guidelines, refer to Time Limits/Maintenance Checks - General.



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**INSPECTION OPERATION 1**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 1 gives a list of item(s), which has all 50-hour interval inspection items and those 100- or 200-hour interval inspection items contained in the fuselage area. Items from other areas are included to meet their required time interval.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
611001	Spinner - Check general condition and attachment.	110		
611003	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	110		
611005	Propeller Mounting - Check for security of installation.	110		
611007	Propeller Heat Slip Rings, Brushes, and Boots - Inspect for condition, and security. Perform operational check.	110		
612001	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	110		
242001	Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
710001	Turbocharger (if applicable) - Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	120		
711001	Cowling and Cowl Flaps - Inspect for cracks, dents, other damage and security of cowl fasteners. Check cowl flaps for condition, security, and operation. Check cowl flap controls for freedom of movement through full travel.	120		
716001	Alternate Induction Air System - Check for obstructions, operation, and security.	120		
716002	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	120		
722001	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	120		
722003	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	120		
723003	Engine Baffles and Seals - Check condition and security of attachment.	120		
781001	Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust system - Maintenance Practices.	120		
781002	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust System - Maintenance Practices. Note: This inspection is specifically required for German (LBA) certification.	120		
791001	Engine Oil - Drain oil sump and oil cooler. Check for metal particles or foreign material in filter, on sump drain plug, and on engine suction screen. Refer to Textron Lycoming Service Bulletin # 480C or latest revision. Replace filter, and refill with recommended grade aviation oil.	120		
792001	Oil Cooler - Check for obstructions, leaks, and security of attachment.	120		
801002	Bendix Drive Starter Assembly - Clean and lubricate starter drive assembly.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
761001	Engine Controls and Linkage - Examine the general condition and freedom of movement through the full range. Complete a check for the proper travel, security of attachment, and for evidence of wear. Complete a check of the friction lock and vernier adjustment for proper operation. Complete a check to make sure the throttle, fuel mixture, and propeller governor arms operate through their full arc of travel. The maximum linear freeplay is 0.050 inch.	120, 225		
271001	Aileron Controls - Check freedom of movement and proper operation through full travel.	120, 520, 620		
243003	General Airplane and System Wiring - Inspect for proper routing, chafing, broken or loose terminals, general condition, broken or inadequate clamps, and sharp bends in wiring.	210		
521001	Doors - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	210		
531001	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.	210		
561001	Windows and Windshield - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	210		
214002	Heater Components, Inlets, and Outlets - Inspect all lines, ducts, clamps, seals, and gaskets for condition, restriction, and security.	211		
214003	Cabin Heat and Ventilation Controls - Check freedom of movement through full travel. Check friction locks for proper operation.	211		
235001	Microphones, Headsets, and Jacks - Inspect for cleanliness, security, and evidence of damage.	211		
251001	Seats - Examine the seats to make sure they are serviceable and installed correctly. Make sure the seat stops and adjustment mechanism operate correctly. Examine the seat recline control and attaching hardware to make sure the hardware and lock are not damaged and are correctly installed. Lubricate the threads of the Seat Crank Handle Assembly with MIL-PRF-81322 general purpose grease.	211		
251101	Restraint System, front and rear - Check belts for thinning, fraying, cutting, broken stitches, or ultra-violet deterioration. Check system hardware for security of installation.	211		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
351001	Oxygen System (if applicable) - Inspect masks, hoses, lines, and fittings for condition, routing, and support. Test operation and check for leaks.	211		
531003	Internal Fuselage Structure - Inspect bulkheads, doorposts, stringers, doublers, and skins for corrosion, cracks, buckles, and loose rivets, bolts and nuts.	211		
311001	Instruments - Check general condition and markings for legibility.	220		
311003	Instrument Lines, Fittings, Ducting, and Instrument Panel Wiring - Check for proper routing, support, and security of attachment.	220		
331001	Instrument and Cabin Lights - Check operation, condition of lens, and security of attachment.	220, 211, 221		
345003	Navigation Indicators, Controls, and Components - Inspect for condition and security.	220, 225		
275002	Wing Flap Control - Check operation through full travel and observe Flap Position indicator for proper indication.	221		
246001	Switch and Circuit Breaker Panel, Terminal Blocks, and Junction Boxes - Inspect wiring and terminals for condition and security.	222		
246002	Power Junction Box - Check operation and condition. Check availability and condition of spare fuse (if applicable).	222		
271005	Control Wheel Lock - Check general condition and operation.	222		
235002	Microphone Push-To-Talk Switch - Clean the pilot's and copilot's microphone switches. Refer to Chapter 23, Communication - Maintenance Practices.	222, 223		
271006	Control Linkage - Inspect pulleys, cables, bearings, and turnbuckles for condition and security.	222, 223		
273001	Elevator Control - Check freedom of movement and proper operation through full travel.	222, 223		
273002	Elevator Control System - Inspect pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition, security, and operation. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety	222, 223		
273103	Elevator Trim Tab and Hinges - Check condition, security, and operation.	224		
282003	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.	224		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
282006	Fuel Selector - Using quick drain, ensure no contamination exists.	224		
273101	Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.	224, 240, 310		
273102	Elevator Trim Control and Indicator - Check freedom of movement and proper operation through full travel. Check pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition and security. Check electric trim controls for operation as applicable. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety	224, 240, 310		
342101	Magnetic Compass - Inspect for security of installation, cleanliness, and evidence of damage.	225		
345001	Instrument Panel Mounted Avionics Units (Including Audio Panel, VHF Nav/Com(s), ADF, GPS, Transponder, Compass System, Multi-function Display, and Primary Flight Display) and Remote Mounted Avionics Components. Inspect for deterioration, cracks, and security of instrument panel mounts. Inspect for security of electrical connections, condition, and security of wire routing.	225		
345002	Avionics Operating Controls - Inspect for security and proper operation of controls and switches and ensure that all digital segments will illuminate properly.	225		
262001	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.	230		
272004	Rudder Pedals and Linkage - Check for general condition, proper rigging, and operation. Check for security of attachment.	230		
273106	Elevator Trim Tab Stop Blocks - Inspect for damage and security.	240		
256001	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with 14 CFR Part 91.207.	310		
273004	Elevator Downspring - Check structure, bolts, linkage, bell crank, and push-pull tube for condition, operation, and security. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travels if cables require tension adjustment or if stops are damaged.	310		
345004	Navigation Antennas and Cables - Inspect for security of attachment, connection, and condition.	310		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
273104	Elevator Trim Tab Actuator - Examine the free play limits. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices, Trim Tab Free Play Inspection. If the free play is more than the permitted limits, lubricate the actuator and examine the free play limits again. If the free play is still more than the permitted limits, replace the actuator.	320		
273003	Elevator, Hinges, Stops, and Cable Attachment - Check condition, security, and operation.	320, 330		
551001	Horizontal Stabilizer and Tailcone structure - Inspect bulkheads, spars, ribs, and skins, for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tips.	320, 330		
551002	Horizontal Stabilizer and Tips - Inspect externally for skin damage and condition of paint.	320, 330		
272002	Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect balance weight for looseness and the supporting structure for damage.	340		
272003	Rudder, Tips, Hinges, Stops, Clips and Cable Attachment - Check condition, security, and operation.	340		
272005	Rudder Control - Check freedom of movement and proper operation through full travel. Check rudder stops for damage and security.	340		
553001	Vertical Stabilizer Fin - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tip.	340		
553002	Vertical Stabilizer Fin and Tailcone - Inspect externally for skin damage and condition of paint.	340		
334001	Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.	340, 520, 620		
341103	Pitot Tube and Stall Warning Vane - Check for condition and obstructions and verify operation of anti-ice heat.	510		
571001	Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.	510, 520, 610, 620		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
275001	Flaps - Check tracks, rollers, and control rods for security of attachment. Check rod end bearings for corrosion. Check operation.	510, 610		
282001	Fuel System - Inspect plumbing and components for mounting and security.	510, 610		
282002	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.	510, 610		
282004	Integral Fuel Bays - Check for evidence of leakage and condition of fuel caps, adapters, and placards. Using quick drains, ensure no contamination exists. Check quick drains for proper shut off.	510, 610		
282007	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.	510, 610		
571002	Wing Struts and Strut Fairings - Check for dents, cracks, loose screws and rivets, and condition of paint.	510, 610		
271003	Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.	520, 620		
271004	Ailerons and Hinges - Check condition, security, and operation	520, 620		
275006	Flap Actuator Threads - Clean and lubricate. Refer to Chapter 12-21-03.	610		
110000	Interior Placards, Exterior Placards, Decals, Markings and Identification Plates - Inspect for security of installation and legibility. Refer to Chapter 11, Placards and Markings - Inspection/Check.	ALL		

\*\*\* End of Operation 1 Inspection Items \*\*\*

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**INSPECTION OPERATION 2**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 2 gives a list of item(s), which has all 50-hour interval inspection items and those 100- or 200-hour interval inspection items contained in the engine compartment. Items from other areas are included to meet their required time interval.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
611001	Spinner - Check general condition and attachment.	110			
611002	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.	110			
611003	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	110			
611004	Propeller Hub - Check general condition.	110			
611005	Propeller Mounting - Check for security of installation.	110			
611006	Propeller Mounting Bolts - Inspect mounting bolts and safety wire for signs of looseness. Retorque mounting bolts as required.	110			
611007	Propeller Heat Slip Rings, Brushes, and Boots - Inspect for condition, and security. Perform operational check.	110			



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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
612001	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	110		
612002	Propeller Governor and Control - Check for security and operation of controls. Maximum linear freeplay is 0.050 inch.	110		
214001	Cold and Hot Air Hoses - Check condition, routing, and security.	120		
242001	Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension.	120		
243004	External Power Receptacle and Power Cables - Inspect for condition and security.	120		
282010	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security.	120		
371001	Vacuum System - Inspect for condition and security.	120		
371002	Vacuum Pumps - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.	120		
371003	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.	120		
371004	Gyro Filter - Inspect for damage, deterioration and contamination. Clean or replace if required.	120		
531002	Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.	120		
710001	Turbocharger (if applicable) - Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	120		
710002	Turbocharger (if applicable) - Examine the turbocharger for burned areas, bulges, or cracks. Use a flashlight and mirror in the tailpipe to examine the turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	120		
711001	Cowling and Cowl Flaps - Inspect for cracks, dents, other damage and security of cowl fasteners. Check cowl flaps for condition, security, and operation. Check cowl flap controls for freedom of movement through full travel.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
712001	Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.	120		
716001	Alternate Induction Air System - Check for obstructions, operation, and security.	120		
716002	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	120		
716003	Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation.	120		
716004	Induction Air Filter - Remove and clean. Inspect for damage and service.	120		
722001	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	120		
722002	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary. Check crankcase breather lines for obstructions, security, and general condition.	120		
722003	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	120		
723001	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.	120		
723002	Engine Metal Lines, Hoses, Clamps, and Fittings - Check for leaks, condition, and security. Check for proper routing and support.	120		
723003	Engine Baffles and Seals - Check condition and security of attachment.	120		
723004	Cylinder Compression - Complete a differential compression test. If there is weak cylinder compression, refer to Chapter 71, Engine - Troubleshooting, for further procedures.	120		
730001	Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.	120		
730002	Fuel Injection System - Check system for security and condition. Clean fuel inlet screen, check and clean injection nozzles and screens (if evidence of contamination is found), and lubricate air throttle shaft.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
730003	Idle and Mixture - Run the airplane engine to determine satisfactory performance. If required, adjust the idle rpm and fuel mixture. Refer to Chapter 73, Fuel Injection Systems - Maintenance Practices.	120		
741001	Magnetos - Examine the external condition and for correct installation and condition of the electrical leads. Complete a check of the engine timing (external timing). You must set the internal timing if the total of all external adjustments are more than 0.125 inch (3.17 mm) from the original factory position, or between each of the internal timing adjustments. Refer to Chapter 74, Ignition System - Maintenance Practices.	120		
742001	Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.	120		
742002	Spark Plugs - Remove, clean, analyze, test, gap, and rotate top plugs to bottom and bottom plugs to top.	120		
743001	Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.	120		
781001	Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust system - Maintenance Practices.	120		
781002	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust System - Maintenance Practices. Note: This inspection is specifically required for German (LBA) certification.	120		
791001	Engine Oil - Drain oil sump and oil cooler. Check for metal particles or foreign material in filter, on sump drain plug, and on engine suction screen. Refer to Textron Lycoming Service Bulletin # 480C or latest revision. Replace filter, and refill with recommended grade aviation oil.	120		
792001	Oil Cooler - Check for obstructions, leaks, and security of attachment.	120		
801001	Starter and Electrical Connections - Check security and condition of starter, electrical connection, and cable.	120		
801002	Bendix Drive Starter Assembly - Clean and lubricate starter drive assembly.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
761001	Engine Controls and Linkage - Examine the general condition and freedom of movement through the full range. Complete a check for the proper travel, security of attachment, and for evidence of wear. Complete a check of the friction lock and vernier adjustment for proper operation. Complete a check to make sure the throttle, fuel mixture, and propeller governor arms operate through their full arc of travel. The maximum linear freeplay is 0.050 inch.	120, 225		
324002	Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake. Refer to Chapter 12-13-00 for servicing instructions.	224, 230		
251002	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Inspect seat rails for cracks.	230		
324001	Brakes - Test toe brakes and parking brake for proper operation.	230		
243001	Main Battery - Examine the general condition and security. Complete a check of the level of electrolyte. Refer to Chapter 12, Battery - Servicing.	310		
243002	Main Battery Box and Cables - Clean and remove any corrosion. Examine the cables for routing, support, and security of the connections.	310		
341103	Pitot Tube and Stall Warning Vane - Check for condition and obstructions and verify operation of anti-ice heat.	510		
322001	Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.	720		
322002	Nose Landing Gear Wheel Fairings - Check for cracks, dents, and condition of paint.	720		
322004	Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.	720		
324004	Tires - Check tread wear and general condition. Check for proper inflation.	720, 721, 722		
321003	Main Landing Gear Attachment Structure - Check for damage, cracks, loose rivets, bolts and nuts and security of attachment.	721, 722		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
324005	Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.	721, 722		
321001	Main Landing Gear Wheel Fairings and Brake Fairings - Check for cracks, dents, and condition of paint.	721,722		
110000	Interior Placards, Exterior Placards, Decals, Markings and Identification Plates - Inspect for security of installation and legibility. Refer to Chapter 11, Placards and Markings - Inspection/Check.	ALL		
*** End of Operation 2 Inspection Items ***				

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**INSPECTION OPERATION 3**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 3 gives a list of item(s), which has all 50-hour interval inspection items and those 100- or 200-hour interval inspection items contained in the wing. Items from other areas are included to meet their required time interval.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
611001	Spinner - Check general condition and attachment.	110		
611003	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	110		
611005	Propeller Mounting - Check for security of installation.	110		
611007	Propeller Heat Slip Rings, Brushes, and Boots - Inspect for condition, and security. Perform operational check.	110		
612001	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	110		
242001	Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
710001	Turbocharger (if applicable) - Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	120		
711001	Cowling and Cowl Flaps - Inspect for cracks, dents, other damage and security of cowl fasteners. Check cowl flaps for condition, security, and operation. Check cowl flap controls for freedom of movement through full travel.	120		
716001	Alternate Induction Air System - Check for obstructions, operation, and security.	120		
716002	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	120		
722001	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	120		
722003	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	120		
723003	Engine Baffles and Seals - Check condition and security of attachment.	120		
781001	Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust system - Maintenance Practices.	120		
781002	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust System - Maintenance Practices. Note: This inspection is specifically required for German (LBA) certification.	120		
791001	Engine Oil - Drain oil sump and oil cooler. Check for metal particles or foreign material in filter, on sump drain plug, and on engine suction screen. Refer to Textron Lycoming Service Bulletin # 480C or latest revision. Replace filter, and refill with recommended grade aviation oil.	120		
792001	Oil Cooler - Check for obstructions, leaks, and security of attachment.	120		
801002	Bendix Drive Starter Assembly - Clean and lubricate starter drive assembly.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
761001	Engine Controls and Linkage - Examine the general condition and freedom of movement through the full range. Complete a check for the proper travel, security of attachment, and for evidence of wear. Complete a check of the friction lock and vernier adjustment for proper operation. Complete a check to make sure the throttle, fuel mixture, and propeller governor arms operate through their full arc of travel. The maximum linear freeplay is 0.050 inch.	120, 225		
271001	Aileron Controls - Check freedom of movement and proper operation through full travel.	120, 520, 620		
271002	Ailerons and Cables - Check operation and security of stops. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment or if stops are damaged. Check fairleads and rub strips for condition.	120, 520, 620		
231001	Communication Antennas and Cables - Inspect for security of attachment, connection, and condition.	210		
341101	Static System - Inspect for security of installation, cleanliness, and evidence of damage.	210		
521001	Doors - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	210		
531001	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.	210		
561001	Windows and Windshield - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	210		
214002	Heater Components, Inlets, and Outlets - Inspect all lines, ducts, clamps, seals, and gaskets for condition, restriction, and security.	211		
251001	Seats - Examine the seats to make sure they are serviceable and installed correctly. Make sure the seat stops and adjustment mechanism operate correctly. Examine the seat recline control and attaching hardware to make sure the hardware and lock are not damaged and are correctly installed. Lubricate the threads of the Seat Crank Handle Assembly with MIL-PRF-81322 general purpose grease.	211		
251101	Restraint System, front and rear - Check belts for thinning, fraying, cutting, broken stitches, or ultra-violet deterioration. Check system hardware for security of installation.	211		



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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
311001	Instruments - Check general condition and markings for legibility.	220		
331001	Instrument and Cabin Lights - Check operation, condition of lens, and security of attachment.	220, 211, 221		
246002	Power Junction Box - Check operation and condition. Check availability and condition of spare fuse (if applicable).	222		
235002	Microphone Push-To-Talk Switch - Clean the pilot's and copilot's microphone switches. Refer to Chapter 23, Communication - Maintenance Practices.	222, 223		
273001	Elevator Control - Check freedom of movement and proper operation through full travel.	222, 223		
273002	Elevator Control System - Inspect pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition, security, and operation. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety	222, 223		
273103	Elevator Trim Tab and Hinges - Check condition, security, and operation.	224		
282003	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.	224		
282006	Fuel Selector - Using quick drain, ensure no contamination exists.	224		
273101	Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.	224, 240, 310		
262001	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.	230		
256001	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with 14 CFR Part 91.207.	310		
273004	Elevator Downspring - Check structure, bolts, linkage, bell crank, and push-pull tube for condition, operation, and security. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travels if cables require tension adjustment or if stops are damaged.	310		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
273104	Elevator Trim Tab Actuator - Examine the free play limits. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices, Trim Tab Free Play Inspection. If the free play is more than the permitted limits, lubricate the actuator and examine the free play limits again. If the free play is still more than the permitted limits, replace the actuator.	320		
273003	Elevator, Hinges, Stops, and Cable Attachment - Check condition, security, and operation.	320, 330		
551001	Horizontal Stabilizer and Tailcone structure - Inspect bulkheads, spars, ribs, and skins, for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tips.	320, 330		
551002	Horizontal Stabilizer and Tips - Inspect externally for skin damage and condition of paint.	320, 330		
272001	Rudder - Check internal surfaces for corrosion, condition of fasteners, and balance weight attachment.	340		
272002	Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect balance weight for looseness and the supporting structure for damage.	340		
272003	Rudder, Tips, Hinges, Stops, Clips and Cable Attachment - Check condition, security, and operation.	340		
272005	Rudder Control - Check freedom of movement and proper operation through full travel. Check rudder stops for damage and security.	340		
553001	Vertical Stabilizer Fin - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tip.	340		
553002	Vertical Stabilizer Fin and Tailcone - Inspect externally for skin damage and condition of paint.	340		
334001	Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.	340, 520, 620		
341103	Pitot Tube and Stall Warning Vane - Check for condition and obstructions and verify operation of anti-ice heat.	510		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
571001	Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.	510, 520, 610, 620		
571003	Wing Access Plates - Check for damage and security of installation.	510, 520, 610, 620		
571004	Wing Spar and Wing Strut Fittings - Check for evidence of wear. Check attach bolts for indications of looseness and retorquing as required.	510, 520, 610, 620		
571005	Wing Structure - Inspect spars, ribs, skins, and stringers for cracks, wrinkles, loose rivets, corrosion, or other damage.	510, 520, 610, 620		
275001	Flaps - Check tracks, rollers, and control rods for security of attachment. Check rod end bearings for corrosion. Check operation.	510, 610		
275003	Flap Structure, Linkage, Bellcranks, Pulleys, and Pulley Brackets - Check for condition, operation and security.	510, 610		
275004	Flaps and Cables - Check cables for proper tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment.	510, 610		
282001	Fuel System - Inspect plumbing and components for mounting and security.	510, 610		
282002	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.	510, 610		
282004	Integral Fuel Bays - Check for evidence of leakage and condition of fuel caps, adapters, and placards. Using quick drains, ensure no contamination exists. Check quick drains for proper shut off.	510, 610		
282007	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.	510, 610		
571002	Wing Struts and Strut Fairings - Check for dents, cracks, loose screws and rivets, and condition of paint.	510, 610		
271003	Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.	520, 620		
271004	Ailerons and Hinges - Check condition, security, and operation	520, 620		
275005	Flap Motor, Actuator, and Limit Switches - Check wiring and terminals for condition and security. Check actuator for condition and security.	610		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
275006	Flap Actuator Threads - Clean and lubricate. Refer to Chapter 12-21-03.	610		
110000	Interior Placards, Exterior Placards, Decals, Markings and Identification Plates - Inspect for security of installation and legibility. Refer to Chapter 11, Placards and Markings - Inspection/Check.	ALL		
*** End of Operation 3 Inspection Items ***				

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**INSPECTION OPERATION 4**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 4 gives a list of item(s), which has all 50-hour interval inspection items and those 100- or 200-hour interval inspection items contained in the landing gear. Items from other areas are included to meet their required time interval.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
611001	Spinner - Check general condition and attachment.	110			
611002	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.	110			
611003	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	110			
611005	Propeller Mounting - Check for security of installation.	110			
611007	Propeller Heat Slip Rings, Brushes, and Boots - Inspect for condition, and security. Perform operational check.	110			
612001	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	110			
214001	Cold and Hot Air Hoses - Check condition, routing, and security.	120			

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
242001	Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension.	120		
282010	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security.	120		
371001	Vacuum System - Inspect for condition and security.	120		
371002	Vacuum Pumps - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.	120		
371003	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.	120		
371004	Gyro Filter - Inspect for damage, deterioration and contamination. Clean or replace if required.	120		
710001	Turbocharger (if applicable) - Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	120		
711001	Cowling and Cowl Flaps - Inspect for cracks, dents, other damage and security of cowl fasteners. Check cowl flaps for condition, security, and operation. Check cowl flap controls for freedom of movement through full travel.	120		
716001	Alternate Induction Air System - Check for obstructions, operation, and security.	120		
716002	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	120		
716003	Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation.	120		
716004	Induction Air Filter - Remove and clean. Inspect for damage and service.	120		
722001	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	120		
722002	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary. Check crankcase breather lines for obstructions, security, and general condition.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
722003	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	120		
723001	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.	120		
723003	Engine Baffles and Seals - Check condition and security of attachment.	120		
723004	Cylinder Compression - Complete a differential compression test. If there is weak cylinder compression, refer to Chapter 71, Engine - Troubleshooting, for further procedures.	120		
730001	Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.	120		
730002	Fuel Injection System - Check system for security and condition. Clean fuel inlet screen, check and clean injection nozzles and screens (if evidence of contamination is found), and lubricate air throttle shaft.	120		
730003	Idle and Mixture - Run the airplane engine to determine satisfactory performance. If required, adjust the idle rpm and fuel mixture. Refer to Chapter 73, Fuel Injection Systems - Maintenance Practices.	120		
741001	Magnetos - Examine the external condition and for correct installation and condition of the electrical leads. Complete a check of the engine timing (external timing). You must set the internal timing if the total of all external adjustments are more than 0.125 inch (3.17 mm) from the original factory position, or between each of the internal timing adjustments. Refer to Chapter 74, Ignition System - Maintenance Practices.	120		
742001	Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.	120		
742002	Spark Plugs - Remove, clean, analyze, test, gap, and rotate top plugs to bottom and bottom plugs to top.	120		
743001	Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.	120		
781001	Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust system - Maintenance Practices.	120		

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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
781002	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Special check in area of heat exchanger. Refer to Chapter 78, Exhaust System - Maintenance Practices. Note: This inspection is specifically required for German (LBA) certification.	120		
791001	Engine Oil - Drain oil sump and oil cooler. Check for metal particles or foreign material in filter, on sump drain plug, and on engine suction screen. Refer to Textron Lycoming Service Bulletin # 480C or latest revision. Replace filter, and refill with recommended grade aviation oil.	120		
792001	Oil Cooler - Check for obstructions, leaks, and security of attachment.	120		
801001	Starter and Electrical Connections - Check security and condition of starter, electrical connection, and cable.	120		
801002	Bendix Drive Starter Assembly - Clean and lubricate starter drive assembly.	120		
761001	Engine Controls and Linkage - Examine the general condition and freedom of movement through the full range. Complete a check for the proper travel, security of attachment, and for evidence of wear. Complete a check of the friction lock and vernier adjustment for proper operation. Complete a check to make sure the throttle, fuel mixture, and propeller governor arms operate through their full arc of travel. The maximum linear freeplay is 0.050 inch.	120, 225		
324002	Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake. Refer to Chapter 12-13-00 for servicing instructions.	224, 230		
251002	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Inspect seat rails for cracks.	230		
324001	Brakes - Test toe brakes and parking brake for proper operation.	230		
243001	Main Battery - Examine the general condition and security. Complete a check of the level of electrolyte. Refer to Chapter 12, Battery - Servicing.	310		
243002	Main Battery Box and Cables - Clean and remove any corrosion. Examine the cables for routing, support, and security of the connections.	310		
341103	Pitot Tube and Stall Warning Vane - Check for condition and obstructions and verify operation of anti-ice heat.	510		



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ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
322001	Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.	720		
322002	Nose Landing Gear Wheel Fairings - Check for cracks, dents, and condition of paint.	720		
322003	Nose Gear Fork - Inspect for cracks, general condition, and security of attachment.	720		
322004	Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.	720		
325001	Nose Gear Steering Mechanism - Check for wear, security, and proper rigging.	720		
324004	Tires - Check tread wear and general condition. Check for proper inflation.	720, 721, 722		
324006	Wheel Bearings - Clean, inspect and lube.	720, 721, 722		
321003	Main Landing Gear Attachment Structure - Check for damage, cracks, loose rivets, bolts and nuts and security of attachment.	721, 722		
324005	Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.	721, 722		
321001	Main Landing Gear Wheel Fairings and Brake Fairings - Check for cracks, dents, and condition of paint.	721, 722		
110000	Interior Placards, Exterior Placards, Decals, Markings and Identification Plates - Inspect for security of installation and legibility. Refer to Chapter 11, Placards and Markings - Inspection/Check.	ALL		

\*\*\* End of Operation 4 Inspection Items \*\*\*

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**INSPECTION OPERATION 5**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 5 gives a list of item(s), which are completed every 400 hours or 1 year, whichever occurs first.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
212001	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	211			
252201	Upholstery, Headliner, Trim, and Carpeting - Check condition and security.	211			
324003	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support.	721, 722			

\*\*\* End of Operation 5 Inspection Items \*\*\*

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**PROGRESSIVE CARE**

**1. Operation 6**

THERE ARE CURRENTLY NO PROGRESSIVE CARE OPERATIONS CONTAINED IN THIS SECTION.

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**INSPECTION OPERATION 7**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 7 gives a list of item(s), which are completed every 600 hours or 1 year, whichever occurs first.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
282008	Fuel Quantity Indicators - Examine for damage and security of installation. Complete a fuel quantity calibration check. Refer to Chapter 28, Fuel Storage and Distribution - Maintenance Practices.	220			
221001	Autopilot Rigging - Refer to Autopilot - Maintenance Practices.	610			

\*\*\* End of Operation 7 Inspection Items \*\*\*

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**PROGRESSIVE CARE**

**1. Operation 8**

THERE ARE CURRENTLY NO PROGRESSIVE CARE OPERATIONS CONTAINED IN THIS SECTION.

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**INSPECTION OPERATION 9**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 9 gives a list of item(s), which are completed every 500 hours.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
741002	Magnetos - Clean, examine, and adjust as necessary. Do the 500-hour inspection in accordance with the Slick 4300/6300 Series Magneto Maintenance and Overhaul Manual.	120			

\*\*\* End of Operation 9 Inspection Items \*\*\*

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**INSPECTION OPERATION 10**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 10 gives a list of item(s), which are completed every 1000 hours.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
282009	Integral Fuel Bays - Drain the fuel (Refer to Chapter 12, Fuel - Servicing) and purge tanks (Refer to the Single Engine Structural Repair Manual, 1996 and On). Complete an inspection of the tank interior and outlet screens and remove any foreign object debris. Complete an inspection of the tank interior surfaces for sealant deterioration and corrosion (especially in the sump areas).	510, 610			

\*\*\* End of Operation 10 Inspection Items \*\*\*

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**INSPECTION OPERATION 11**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 11 gives a list of item(s), which are completed every 2 years.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
341102	Pitot and Static System - Examine in accordance with 14 CFR Part 91.411.	220			
246003	Alternator Control Unit - Complete the Over-voltage Protection Circuit Test. Refer to Chapter 24, Alternator Control Unit.	222			

\*\*\* End of Operation 11 Inspection Items \*\*\*



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**PROGRESSIVE CARE**

**1. Operation 13**

THERE ARE CURRENTLY NO PROGRESSIVE CARE OPERATIONS CONTAINED IN THIS SECTION.

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**INSPECTION OPERATION 14**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 14 gives a list of item(s), which are completed every 2 years, or anytime components are added or removed from the airplane which have the potential to affect the magnetic accuracy and/or variation of the compass calibration, or anytime the accuracy of the compass is in question.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
342102	Magnetic Compass - Calibrate.	220			

\*\*\* End of Operation 14 Inspection Items \*\*\*

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**INSPECTION OPERATION 15**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 15 gives a list of item(s), which are completed every 2000 hours.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
612003	Propeller Control Cable - Non-repairable item and must be replaced at every interval or whenever maximum linear movement exceeds 0.050 inch. Refer to Chapter 61-20-00, Propeller Control Cable.	120,210			
743002	Inspect and lubricate ACS brand ignition switch. Refer to Chapter 74, Ignition System - Maintenance Practices.	224			

\*\*\* End of Operation 15 Inspection Items \*\*\*

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**INSPECTION OPERATION 16**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 16 gives a list of item(s), which are completed every 1000 hours or 1 year, whichever occurs first.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
221002	Autopilot Servo Capstan Assemblies. Check slip-clutch torque settings. Refer to Autopilot - Maintenance Practices.	610			
221003	Autopilot Servo Actuators. Inspect for evidence of corrosion and or buildup of dirt or other particulate matter which may interfere with servo operation. Refer to Autopilot - Maintenance Practices.	610			

\*\*\* End of Operation 16 Inspection Items \*\*\*

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**INSPECTION OPERATION 17**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 17 gives a list of item(s), which are completed every 12 calendar months.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
262002	Cockpit Mounted Halon Type Fire Extinguisher - Weigh bottle. Bottle must be reserviced by qualified individual if more than 2 ounces is lost.	211			

\*\*\* End of Operation 17 Inspection Items \*\*\*

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**INSPECTION OPERATION 18**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 18 gives a list of item(s), which are completed every 6 years.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
262004	Cockpit Mounted Halon Type Fire Extinguishers - Empty, inspect for damage, and recharge.	211			

\*\*\* End of Operation 18 Inspection Items \*\*\*

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**INSPECTION OPERATION 19**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 19 gives a list of item(s), which are completed every 12 years.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
262003	Cockpit Mounted Halon Type Fire Extinguishers - Perform hydrostatic test. The hydrostatic test shall be at twelve-year intervals based on initial servicing or date of last hydrostatic test.	211			

\*\*\* End of Operation 19 Inspection Items \*\*\*

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**INSPECTION OPERATION 20**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 20 gives a list of item(s), which are completed every 1 year.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
251102	AMSAFE Aviation Inflatable Restraint (AAIR) - Examine the restraint for dirt, frayed edges, unserviceable stitching, loose connections, and other wear.	211		
243005	Standby Battery - Complete the Standby Battery Capacity Test. Refer to Chapter 24, Standby Battery - Maintenance Practices.	220		
246101	Essential and Crossfeed Bus Diodes - Check for proper operation. Complete the Essential and Crossfeed Bus Diode Inspection. Refer to Chapter 24, Essential and Crossfeed Bus Diodes - Maintenance Practices.	224		

\*\*\* End of Operation 20 Inspection Items \*\*\*



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**INSPECTION OPERATION 21**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 21 gives a list of item(s), which are completed every 3 years.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
351002	Oxygen Cylinder (if applicable) - Inspect for 211 condition, check hydrostatic test date and perform hydrostatic test, if due.			

\*\*\* End of Operation 21 Inspection Items \*\*\*

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**INSPECTION OPERATION 22**

Date: \_\_\_\_\_  
Registration Number: \_\_\_\_\_  
Serial Number: \_\_\_\_\_  
Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 22 gives a list of item(s), which are completed beginning five years from the date of the manufacture, you must make sure of the serviceability of the components every twelve months. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
371006	Vacuum Manifold Check Valve - Complete a check for proper operation. (Only airplanes with dual vacuum pumps and Airborne manifolds. Refer to the Airborne Air & Fuel Products Service Letter Number 39A or latest revision, and in accordance with SB02-37-04.) Refer to Chapter 37, Vacuum System - Maintenance Practices for the removal and installation of the check valve.	120			

\*\*\* End of Operation 22 Inspection Items \*\*\*

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**INSPECTION OPERATION 23**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 23 gives a list of item(s), which are completed every 100 hours or every one year, whichever occurs first.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
212002	Primary Flight Display (PFD) Fan, Multi-Function Display (MFD) Fan, Deck Skin Fan, and Remote Avionics Cooling Fan - Operational Check. Refer to Chapter 21, Avionics Cooling - Maintenance Practices.	220, 225			

\*\*\* End of Operation 23 Inspection Items \*\*\*

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**INSPECTION OPERATION 24**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 24 gives a list of item(s), which are completed every 100 hours, every annual inspection, every overhaul, and any time fuel lines or clamps are serviced, removed, or replaced.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
720000	Fuel line (Stainless steel tube assembly) and support clamp inspection and installation. Refer to Lycoming Service Bulletin Number 342E or later version.	120			

\*\*\* End of Operation 24 Inspection Items \*\*\*

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**INSPECTION OPERATION 25**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 25 gives a list of item(s), which are completed the first 600 hours and as defined by the manufacturer thereafter
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
371007	Do an inspection of the wear indicator ports on the vacuum pumps described in Tempest Service Letter 004.	120			

\*\*\* End of Operation 25 Inspection Items \*\*\*

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**INSPECTION OPERATION 26**

Date: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Total Time: \_\_\_\_\_

**1. Description**

- A. Operation 26 gives a list of item(s), which are completed every 1000 hours or 3 years, whichever occurs first.
- B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 are shown. Frequently, the tasks define more specifically the scope and extent of each required inspection. These tasks are printed in the individual chapters of this manual.
- C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

**2. General Inspection Criteria**

- A. During each of the specified inspection tasks in this section, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.
- B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.
- C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
273107	Elevator Trim Tab Actuator - Remove, clean, examine, and lubricate the actuator. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices.	320			

\*\*\* End of Operation 26 Inspection Items \*\*\*

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**UNSCHEDULED MAINTENANCE CHECKS**

**1. General**

- A. During operation, the airplane can go through:
  - (1) Hard landings.
  - (2) Overspeed.
  - (3) Extreme turbulence or extreme maneuvers.
  - (4) Towing with a large fuel unbalance or high drag/side loads due to ground handling.
  - (5) Lightning strikes.
- B. When the flight crew gives a report of any of these conditions, complete a visual inspection of the airframe and specific inspections of components and areas involved.
- C. Do the inspections to find and examine the damage in local areas of visible damage, and in the structure and components adjacent to the area of damage.
- D. If foreign object damage (FOD) is found, complete a visual inspection of the airplane before the airplane is returned to service.

**2. Unscheduled Maintenance Checks Defined and Areas of Inspection**

- A. Hard/Overweight Landings.
  - (1) A hard landing is any landing made when the sink rate is more than the permitted sink rate limit. An overweight landing is any landing made when the gross weight is more than the maximum gross landing weight given in the approved Pilot's Operating Handbook.

**NOTE:** If the hard/overweight landing also has high drag/side loads, more checks are necessary.
  - (2) Hard or overweight landing check.
    - (a) Landing gear.
      - 1 Main gear struts - Examine for correct attachment and permanent set.
      - 2 Main gear attachments and supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.
      - 3 Nose gear trunnion supports and attaching structure - Examine for loose or unserviceable fasteners and signs of structural damage.
      - 4 Nose gear attachments and supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.
    - (b) Wings.
      - 1 Wing surface and lift strut - Examine the skin for buckles, loose or unserviceable fasteners, and fuel leaks. Examine the attach fittings for security.
      - 2 Trailing edge - Examine for any deformation that stops the normal flap operation.
- B. Overspeed.
  - (1) Overspeed occurs when one of the conditions that follow are met:
    - (a) The airplane was flown at a speed more than the speed limit of the flaps.
    - (b) The airplane was flown at a speed more than the maximum design speed.
  - (2) Overspeed (airspeed) check.
    - (a) Fuselage.
      - 1 Windshield and Windows - Examine for buckling, dents, loose or unserviceable fasteners, and signs of structural damage.
      - 2 All hinged doors - Examine the hinges, hinge attach points, latches and attachments, and skins for deformation and signs of structural damage.
    - (b) Cowling.
      - 1 Skins - Examine for buckling, cracks, loose or unserviceable fasteners, and signs of structural damage.

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- (c) Stabilizers.
    - 1 Stabilizers - Examine the skins, hinges and attachments, movable surfaces, mass balance weights, and the structure for cracks, dents, buckling, loose or unserviceable fasteners, and signs of structural damage.
  - (d) Wings.
    - 1 Flaps - Examine the skin for buckling, cracks, loose or unserviceable fasteners, attachments, and signs of structural damage.
    - 2 Fillets and fairings - Examine for buckling, dents, cracks, and loose or unserviceable fasteners.
- C. Extreme Turbulence or Extreme Maneuvers.
- (1) Extreme turbulence is caused by atmospheric conditions that produce dangerous quantities of stress on the airplane. Extreme maneuvers are any maneuvers that do not stay within the limits given in the Pilot's Operating Handbook.
  - (2) Extreme turbulence and/or maneuvers checks.
    - (a) Stabilizers.
      - 1 Horizontal stabilizer hinge fittings, actuator fittings, and stabilizer center section - Examine for loose or unserviceable fasteners and signs of structural damage.
      - 2 Vertical stabilizer - Examine the vertical stabilizer for signs of structural damage, skin buckles, loose or unserviceable fasteners, and damage to the hinges and actuator fittings.
      - 3 Elevator and rudder balance weight supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.
    - (b) Wing.
      - 1 Wing to body strut fittings and supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.
      - 2 Trailing Edge - Examine for any deformation that stops the normal operation of the flap and aileron.
- D. Lightning Strike.
- (1) If the airplane is flown through an electrically charged region of the atmosphere, it can be struck by an electrical discharge moving from cloud to cloud or from cloud to ground. During a lightning strike, the current goes into the airplane at one point and comes out of another, usually at opposite extremities. The wing tips, nose and tail sections are the areas where damage is most likely to occur. You can find burns and/or erosion of small surface areas of the skin and structure during inspection. In most cases, the damage is easily seen. In some cases, however, a lightning strike can cause damage that is not easily seen. The function of the lightning strike inspection is to find any damage to the airplane before it is returned to service.
  - (2) Lightning strike check. As the checks that follow are performed, complete the Lightning Strike/Static Discharge Incident Reporting Form and return it to Cessna Propeller Aircraft Product Support Dept. 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, KS. 67277-7706. If there are components listed on the form that are not applicable to your airplane, please write "Not Applicable" in the space provided.
    - (a) Communications.
      - 1 Antennas - Examine all antennas for burns or erosion. If you find damage, complete the functional test of the communication system.
    - (b) Navigation.
      - 1 Glideslope antenna - Examine for burning and pitting. If damage is found, complete a functional check of the glideslope system.
      - 2 Compass - The compass is serviceable if the corrected heading is within plus or minus 10 degrees of the heading shown by the remote compass system. Remove, repair, or replace the compass if the indication is not within the tolerance limits.
    - (c) Fuselage.
      - 1 Skin - Examine the surface of the fuselage skin for signs of damage.
      - 2 Tailcone - Examine the tailcone and static dischargers for damage.
    - (d) Stabilizers.
      - 1 Examine the surfaces of the stabilizers for signs of damage.
    - (e) Wings.
      - 1 Skins - Examine the skin for burns and erosion.



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- 2 Wing tips - Examine the wing tips for burns and pits.
    - 3 Flight surfaces and hinging mechanisms - Examine for burns and pits.
  - (f) Propeller.
    - 1 Propeller - Remove the propeller and have it examined at an authorized repair station.
  - (g) Powerplant.
    - 1 Engine - Refer to the engine manufacturer's overhaul manual for inspection procedures.
- E. Foreign Object Damage.
  - (1) Foreign object damage (FOD) is damage to the airplane caused by a bird strike or by any other foreign object while operating the airplane on the ground or in normal flight. Tools, bolts, nuts, washers, rivets, rags or pieces of safety-wire left in the aircraft during maintenance operations can also cause damage. The function of the foreign object damage inspection is to find any damage before the airplane is repaired or returned to service.
  - (2) Use caution to prevent unwanted objects from hitting the airplane during towing and at all times when the airplane is not in service.
  - (3) The aerodynamic cleanliness level (degree of surface smoothness), has an effect on the performance of the airplane. It is important to keep a high level of cleanliness.
  - (4) Normal operation or careless maintenance operations can cause contour distortion of the aerodynamic surface. Careless maintenance operations can also cause distortion to the doors and access panels. Be careful when you work with these items.
  - (5) Foreign object damage check.
    - (a) Landing gear.
      - 1 Fairings - Examine for dents, cracks, misalignment, and signs of structural damage.
    - (b) Fuselage.
      - 1 Skin - Examine the forward and belly areas for dents, punctures, cracks, and signs of structural damage.
    - (c) Cowlings.
      - 1 Skins - Examine for dents, punctures, loose or unserviceable fasteners, cracks, and signs of structural damage.
    - (d) Stabilizers.
      - 1 Leading edge skins - Examine for dents, cracks, scratches, and signs of structural damage.
    - (e) Windows.
      - 1 Windshield - Examine for pits, scratches, and cracks.
    - (f) Wings.
      - 1 Leading edge skins - Examine for dents, cracks, punctures, and signs of structural damage.
    - (g) Engine.
      - 1 Propeller - Examine the propeller for nicks, bends, cracks, and worn areas on the blades.
- F. High Drag/Side Loads Due To Ground Handling.
  - (1) A high drag/side load condition occurs when the airplane skids or overruns the prepared surface and goes onto an unprepared surface. It also includes landings that are short of the prepared surface, or landings which involve the damage of tires or skids on a runway to the extent that the safety of the airplane is in question. This includes takeoff and landings or unusual taxi conditions.
  - (2) High drag/side loads due to ground handling check.
    - (a) Landing gear.
      - 1 Main gear and fairings - Examine for loose or unserviceable fasteners, buckling, cracks, and signs of structural damage.
      - 2 Nose gear and fairing - Examine for loose or unserviceable fasteners, cracks, loose steering cable tension, buckling, and signs of structural damage.
    - (b) Wings.
      - 1 Wing to fuselage attach fittings and attaching structure - Examine for loose or unserviceable fasteners and signs of structural damage.

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B4224

**LIGHTNING STRIKE/STATIC DISCHARGE INCIDENT REPORTING FORM**  
**Part 1**

**1. Flight Crew must complete Part 1.**

**NOTE:** Entire report must be filled out following any lightning strike incident. If lightning strike is discovered after the fact, complete as much of report as possible. File form immediately following incident. Attach additional sheet(s) to provide complete description.

- A. Flight Information:  
Flight Number \_\_\_\_\_ Strike Date \_\_\_\_\_ Model \_\_\_\_\_ Unit/Serial Number \_\_\_\_\_  
Altitude \_\_\_\_\_ ft Airspeed \_\_\_\_\_ knots Geographical Location \_\_\_\_\_
- B. Airplane Orientation:  
Takeoff \_\_\_\_\_ Climb \_\_\_\_\_ Cruise \_\_\_\_\_ Descent \_\_\_\_\_  
Approach \_\_\_\_\_ Other \_\_\_\_\_
- C. At time of Strike, aircraft was:  
Above Clouds \_\_\_\_\_ Within Clouds \_\_\_\_\_ Below Ceiling \_\_\_\_\_
- D. Precipitation at Strike:  
Rain \_\_\_\_\_ Sleet \_\_\_\_\_ Hail \_\_\_\_\_ Snow \_\_\_\_\_ None \_\_\_\_\_
- E. Lightning in Vicinity:  
Before \_\_\_\_\_ After \_\_\_\_\_ None \_\_\_\_\_
- F. Static in Comm/Nav  
Before \_\_\_\_\_ After \_\_\_\_\_ None \_\_\_\_\_
- G. Was St. Elmo's fire (bluish electrical discharge or corona) visible before strike?  
Yes \_\_\_\_\_ No \_\_\_\_\_
- H. Interference (I) or Outage (O) report. Check all the following which apply, and list affected systems, such as dimming of cabin lights, total system outage, etc.
- |                    |         |         |
|--------------------|---------|---------|
| Engines            | I _____ | O _____ |
| Navigation         | I _____ | O _____ |
| Communication      | I _____ | O _____ |
| Flight Instruments | I _____ | O _____ |
| Flight Control     | I _____ | O _____ |
| AC Power System    | I _____ | O _____ |
| DC Power System    | I _____ | O _____ |
- I. Additional comments and descriptions:

Part 1 completed by: \_\_\_\_\_ Date \_\_\_\_\_ Phone \_\_\_\_\_

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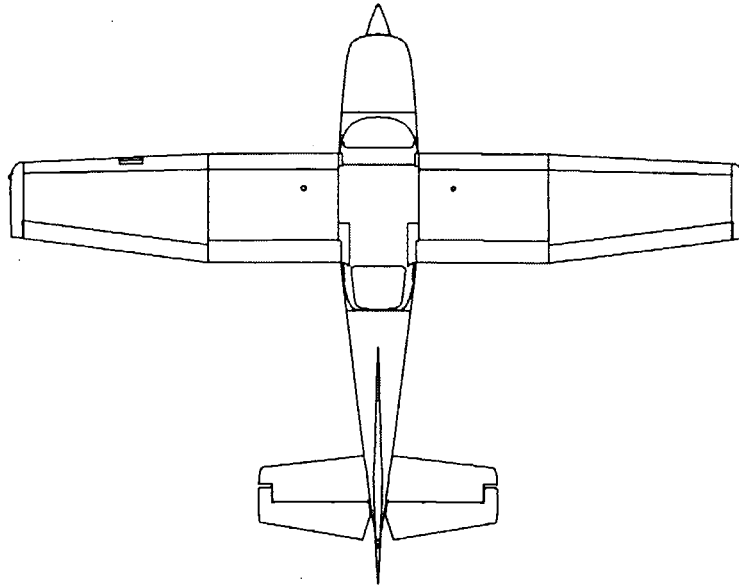
**LIGHTNING STRIKE/STATIC DISCHARGE INCIDENT REPORTING FORM**  
**Part 2**

**1. Ground Crew must complete Part 2.**

**NOTE:** Attach additional sheet(s) to provide complete description. Photos and sketches of damage are recommended and must be itemized and referenced in their description.

**NOTE:** If damage is severe, please report the lightning strike as soon as possible. Inspection by Cessna Engineering Representative(s) may be required.

- A. List any sweeping points, such as burn marks, divots, etc., and skin penetrations on airplane skin believed to be the result of the lightning strike. Itemize and reference location(s) of damage on drawing provided. Indicate top, bottom, left or right.



- B. Describe damage to structure and external components caused by previously mentioned damage points. In the case of skin penetration(s), indicate hole diameter(s). List all damage to radome and any other composite structure, such as fairings, control surfaces, etc. If lightning diverter strips are damaged, include lightning diverter strip location(s) on radome. For damage to composite structure, paint thickness must be included in description.
- C. List any damage to avionics and electrical components believed to be the result of the lightning strike, including damaged wiring, disengaged circuit breakers, etc. Include manufacturer, model number and serial number of damaged units where applicable.
- D. Estimate cost of repair.
- E. Mention severity of damage (light, moderate, heavy).
- F. Additional comments and descriptions:

Part 2 completed by: \_\_\_\_\_ Date \_\_\_\_\_ Phone \_\_\_\_\_

**CHAPTER**

**6**

**DIMENSIONS AND  
AREAS**

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**DIMENSIONS AND AREAS - GENERAL**

**1. Scope**

- A. This chapter includes statistical information and illustrations concerning the Model 182 airplane.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on airplane dimensions and specifications provides information on overall airplane dimensions, maximum weights, fuel and oil capacities, propeller type and pitch range information, tire data, and control surface travel/control cable tension settings.
  - (2) The section on stations provides illustrations to identify fuselage stations (FS) and wing stations (WS) used on the Model 182 airplane.
  - (3) This section provides illustrations of all airplane zones and is used in conjunction with the Model 182 Illustrated Parts Catalog to provide location information for required placards and markings.
  - (4) This section provides illustrations of all access/inspection plates located on or in the airplane.



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**AIRPLANE DIMENSIONS AND SPECIFICATIONS - DESCRIPTION AND OPERATION**

**1. General**

- A. This section identifies dimensions and specifications of the airplane. Dimensions are selected for pertinent information of measurements to assist operators, maintenance personal and/or ground handling personnel. Refer to the respective charts below.
- B. Airplane dimensions are illustrated in Figure 1.

**2. Dimensions and Specifications**

**AIRPLANE OVERALL**

**FUSELAGE DIMENSIONS**

Length (Overall)	29.0 Feet
Height (Maximum)	9 Feet 3 Inches
Wing Span (Overall)	36.0 Feet
Tail Span	11 Feet 8 Inches
Landing Gear Track Width	9.0 Feet
Cabin Width (Maximum Sidewall to Sidewall)	42.0 Inches
Cabin Height (Floorboard to Headliner)	48.5 Inches

**MAXIMUM WEIGHT**

Ramp	3110 Pounds
Takeoff	3100 Pounds
Landing	2950 Pounds

**FUEL CAPACITY**

Total	92.0 Gallons
Usable	88.0 Gallons

**ENGINE DATA**

<b>Type</b>	<b>Lycoming IO-540-AB1A5</b>
Oil Capacity	9.0 Quarts
RPM (Maximum)	2400 RPM
Horsepower	230 HP

<b>Type</b>	<b>Lycoming TIO-540-AK1A</b>
Oil Capacity	9.0 Quarts
RPM (Maximum)	2400 RPM
Horsepower	235 HP

**PROPELLER**

Type	McCauley B2D34C235/90 DKB-08, 2-Blade
Diameter (Maximum to Minimum)	82.0 to 80.5 Inches

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## PROPELLER

Pitch Range (High to Low)	31.8 to 17.0 Degrees
Type	McCaughey B3D36C431/80 VSA-01, 3-Blade
Diameter (Maximum to Minimum)	79.0 to 77.5 Inches
Pitch Range (High to Low)	31.7 to 14.9 Degrees
Pitch Range T182 (High to Low)	35.4 to 15.3

## TIRE, STRUT AND WHEEL ALIGNMENT DATA

Main Tire Size	6.00 X 6, 6-Ply Rating
Main Tire Pressure	42.0 PSI
Nose Tire Size	5.00 X 5, 6-Ply Rating
Nose Tire Pressure	49.0 PSI
Nose Gear Strut Pressure (Strut Extended)	55 to 60 PSI
Camber (Measured With Airplane Empty)	5 to 7 Degrees
Toe-In (Measured With Airplane Empty)	0.00 to 0.06 Inch

## CONTROL SURFACE TRAVELS/CABLE TENSION SETTINGS

### AILERONS

Aileron Up Travel	20 Degrees, +2 or -2 Degrees
Aileron Down Travel	15 Degrees, +2 or -2 Degrees
Aileron Carry Through Cable Tension	40 Pounds, +10 or -10 Pounds

### RUDDER

Rudder Travel (Measured Parallel to Water Line)	
Right	24 Degrees, +0 or -1 Degree
Left	24 Degrees, +0 or -1 Degree
Rudder Travel (Measured Perpendicular to Hinge Line)	
Right	27 Degrees 13 Minutes, +0 or -1 Degree
Left	27 Degrees 13 Minutes, +0 or -1 Degree
Rudder Cable Tension	30 Pounds, +10 or -10 Pounds

### ELEVATOR

Up Travel (Relative to Stabilizer)	28 Degrees, +1 or -1 Degree
Down Travel (Relative to Stabilizer)	21 Degrees, +1 or -1 Degree

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**TIRE, STRUT AND WHEEL ALIGNMENT DATA**

Cable Tension 30 Pounds, +10 or -10 Pounds

**ELEVATOR TRIM TAB**

Up Travel 24 Degrees, +2 or -2 Degrees

Down Travel 15 Degrees, +1 or -1 Degree

Cable Tension 15 Pounds, +0 or -5 Pounds

**FLAPS**

Flap Setting:

0 Degree (Up) 0 Degree, +0 or -0 Degree

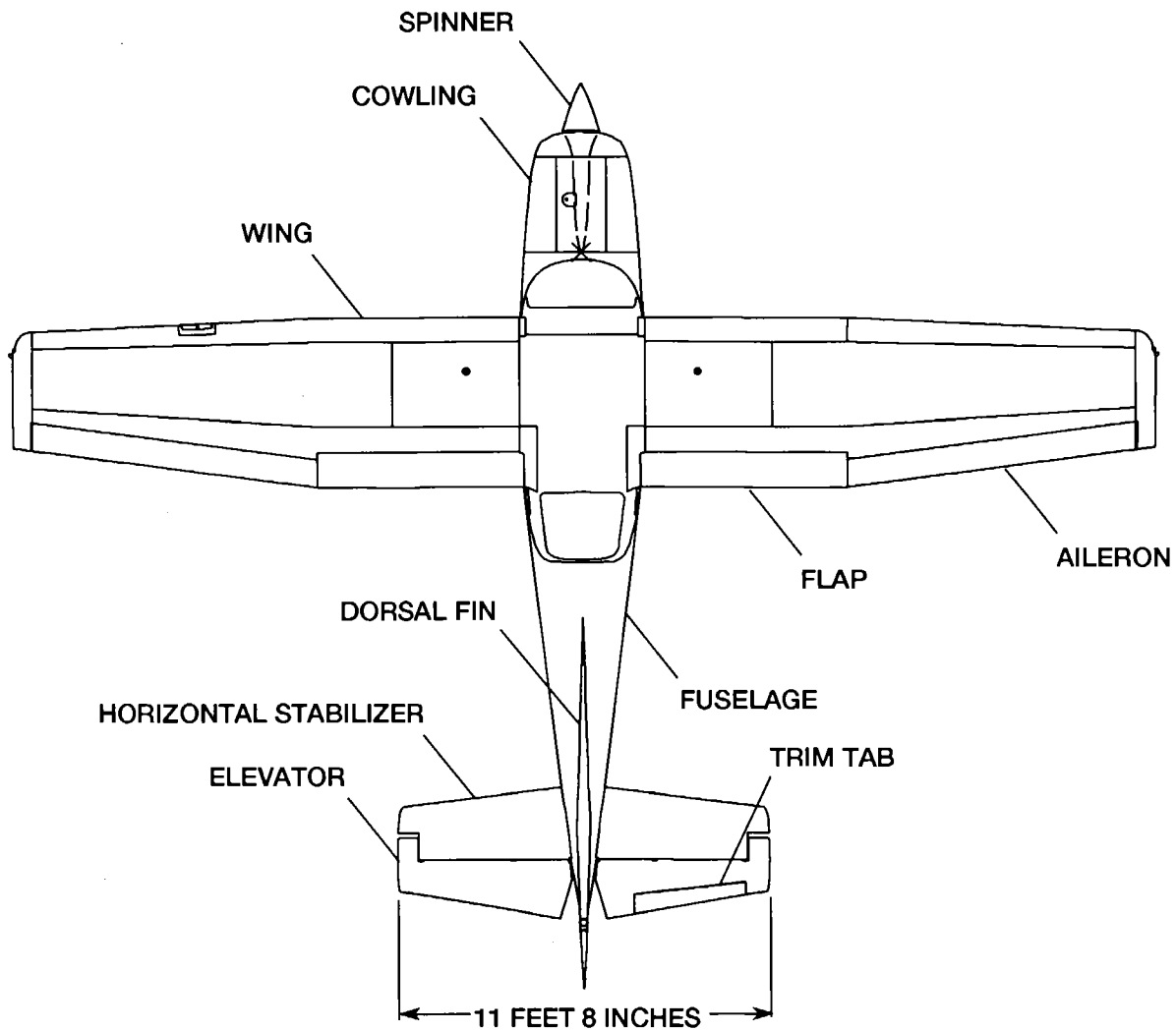
10 Degrees 10 Degrees, +2 or -2 Degrees

20 Degrees 20 Degrees, +2 or -2 Degrees

38 Degrees (Full) 38 Degrees, +0 or -1 Degree

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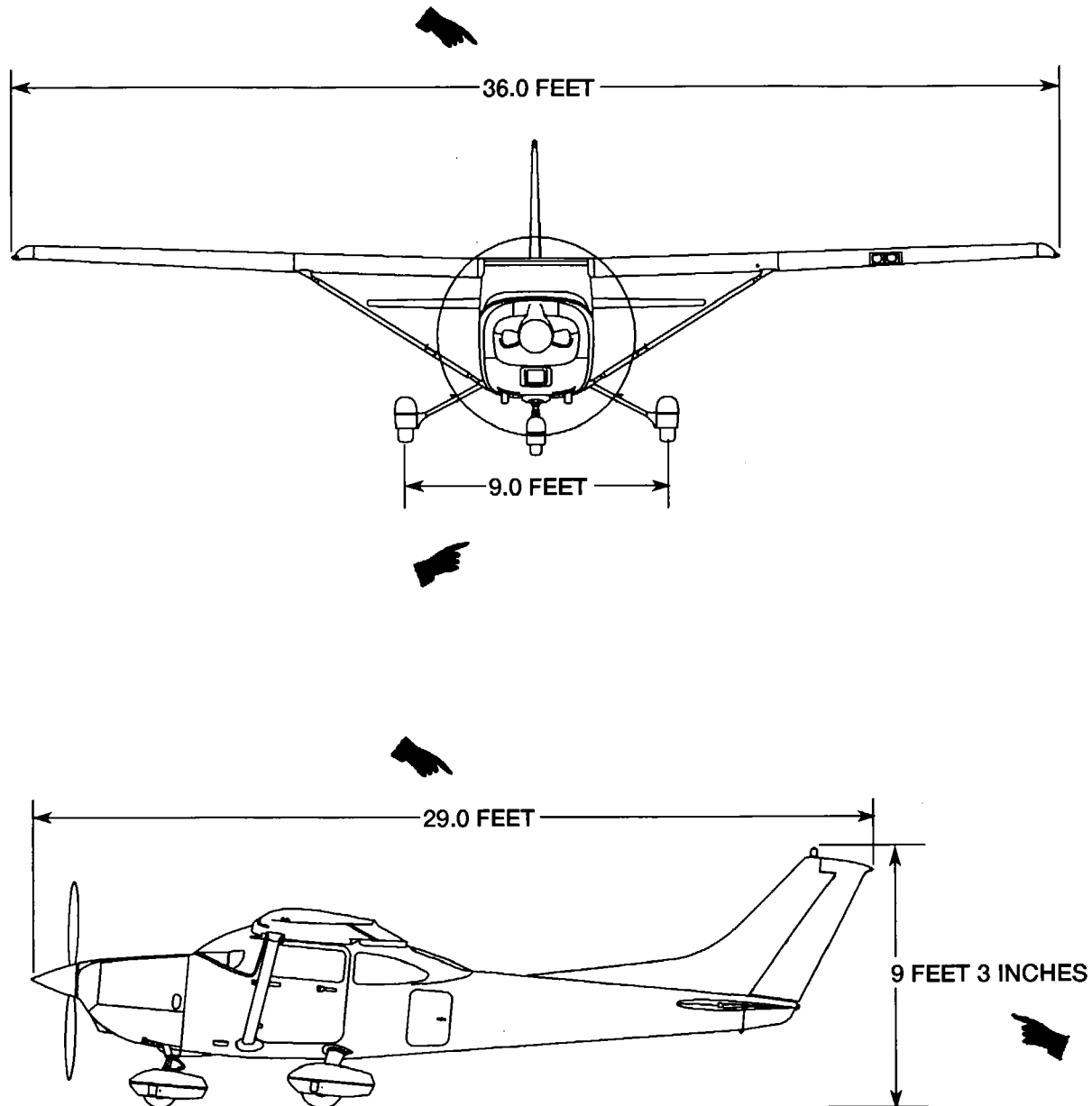


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Airplane Dimensions and Areas  
Figure 1 (Sheet 1)

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Airplane Dimensions and Areas  
Figure 1 (Sheet 2)

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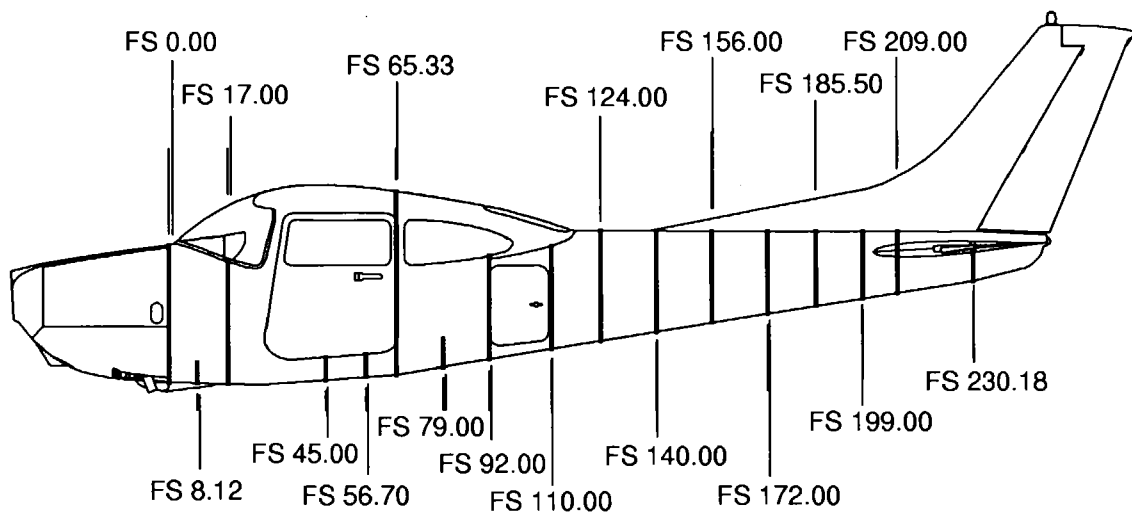
**AIRPLANE STATIONS - DESCRIPTION AND OPERATION**

**1. General**

- A. The airplane is laid out according to fuselage stations (FS) and wing stations (WS). These stations provide fixed reference points for all components located on or within the airplane. Fuselage Stations begin at the firewall (FS 0.00) and extend to the tailcone area (FS 230.18). Wing Stations begin at the root (WS 23.62) and extend to the tip (WS 208.00). Both Fuselage Stations and Wing Stations are measured in inches. For example, FS 185.50 is 185.50 inches aft of the firewall (FS 0.00).
- B. For an illustration of Fuselage Stations, refer to Figure 1. For an illustration of Wing Stations, refer to Figure 2.

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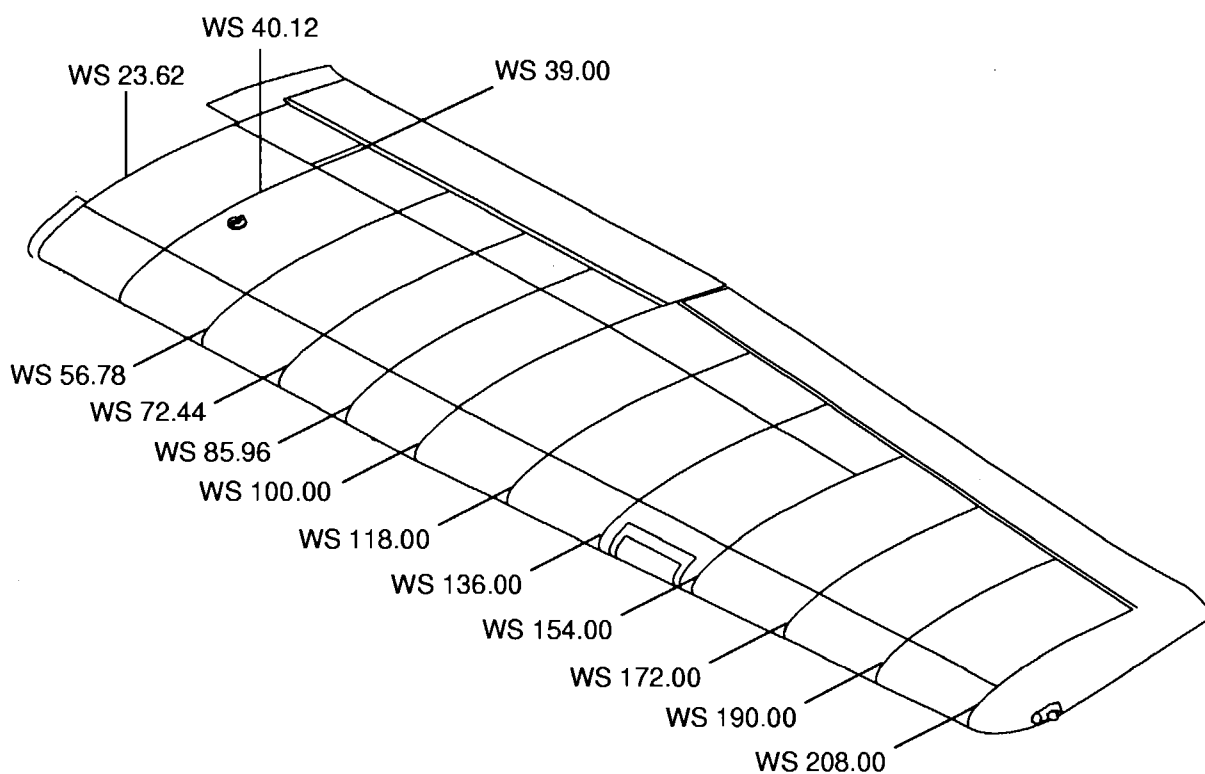


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Fuselage Stations  
Figure 1 (Sheet 1)

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Wing Stations  
Figure 2 (Sheet 1)



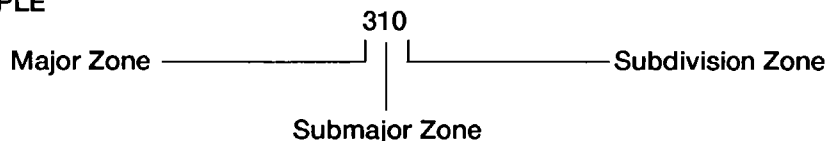
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**AIRPLANE ZONING - DESCRIPTION AND OPERATION**

**1. General**

- A. The Model 182/T182 is divided into numbered zones to provide a method for locating components and/or placards throughout the airplane. The zones are identified by a three-digit number as shown in the example below. The first digit in the sequence denotes the major zone (300 series for aft of cabin, 500 series for left wing, etc.). The second digit in the sequence further divides the zone into submajor zones (Zone 510 for inboard portion of the left wing and Zone 520 for outboard portion of the left wing, etc.). The third digit further divides the submajor zones into subdivisions (if no subdivision is needed, this digit is typically assigned as 0 (zero)).

**EXAMPLE**



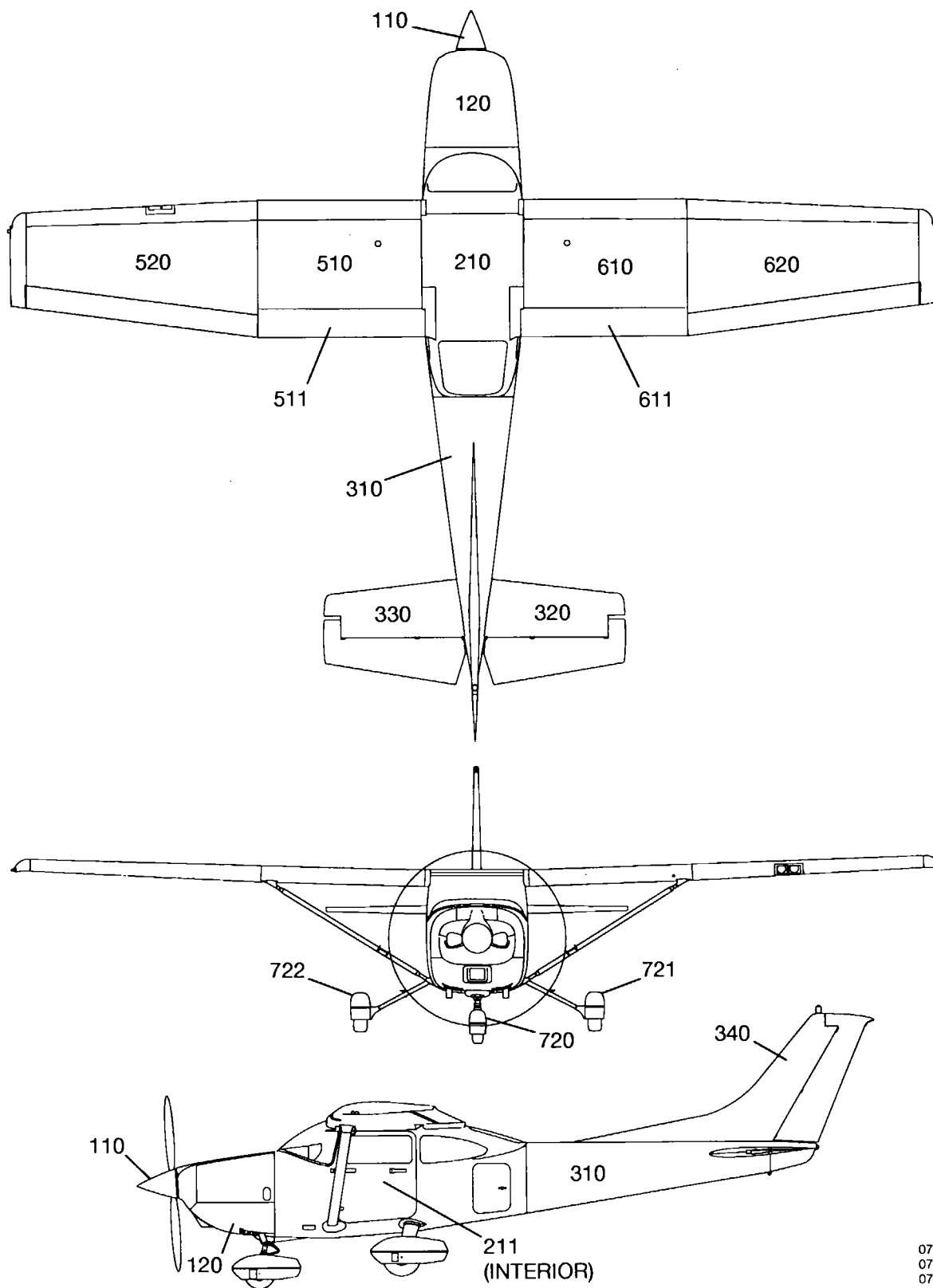
- B. Major Zones.
- (1) 100 - Forward side of firewall and forward.
  - (2) 200 - Aft side of firewall to end of cabin.
  - (3) 300 - Aft of cabin to end of airplane.
  - (4) 500 - Left wing.
  - (5) 600 - Right wing.
  - (6) 700 - Landing gear.

**2. Description**

- A. For a breakdown of airplane zones, refer to Figure 1.

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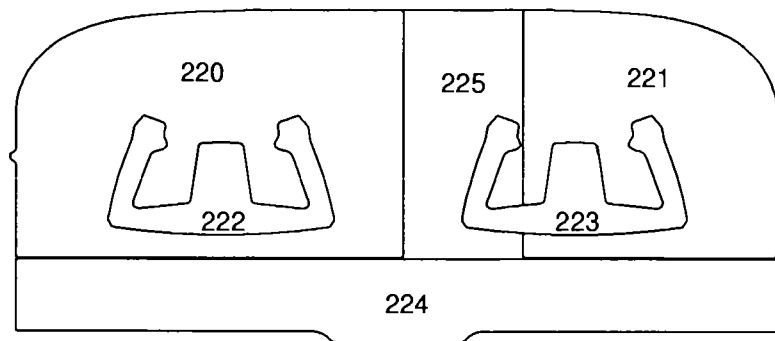


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 0710T1003  
 0710T1003

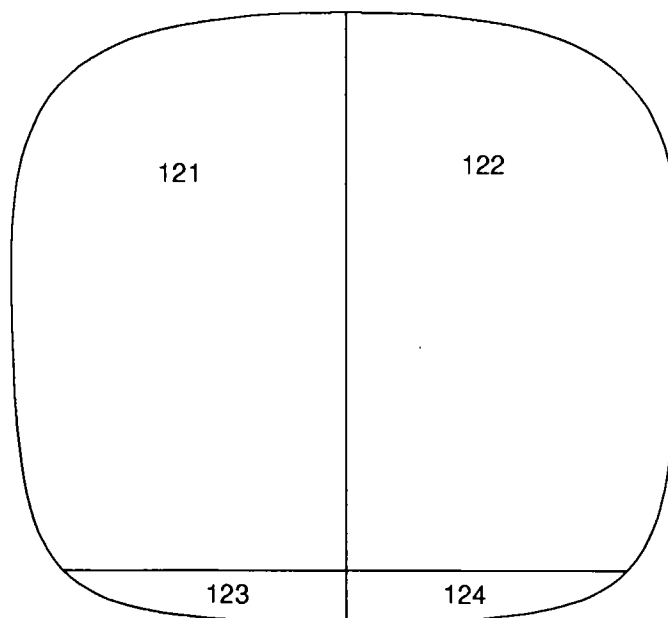
Airplane Zones  
 Figure 1 (Sheet 1)

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INSTRUMENT PANEL



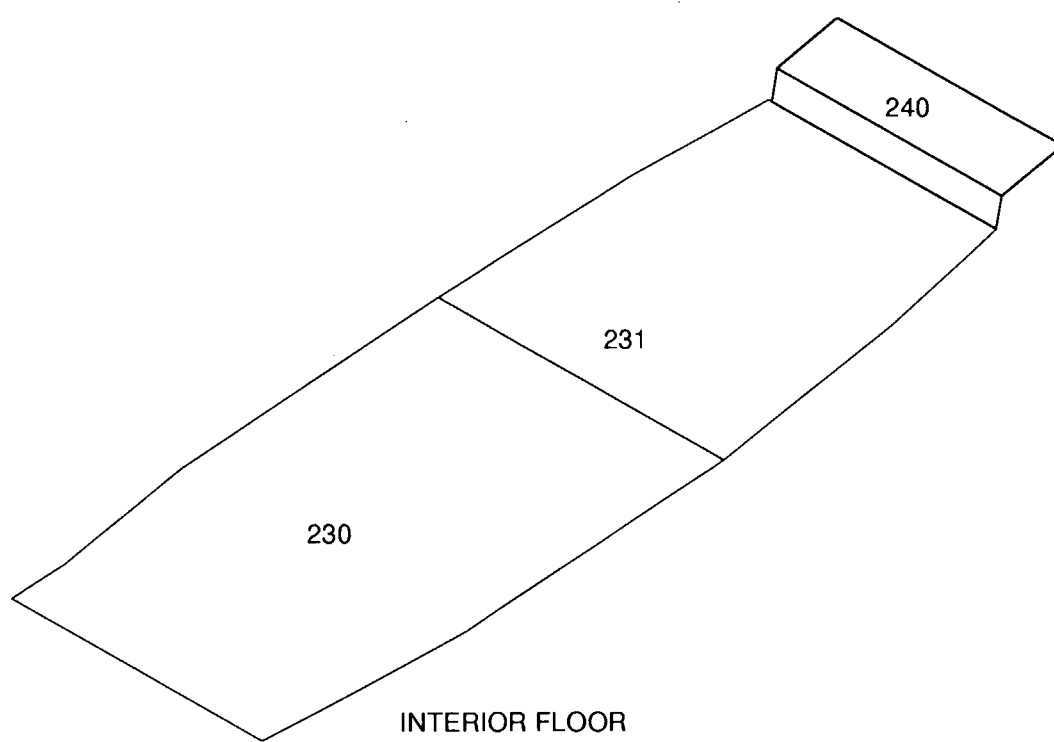
FIREWALL LOOKING FORWARD

0513T1003  
0701T1004

Airplane Zones  
Figure 1 (Sheet 2)

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Airplane Zones  
Figure 1 (Sheet 3)

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**ACCESS/INSPECTION PLATES - DESCRIPTION AND OPERATION**

**1. General**

- A. There are access and inspection panels on the interior and exterior of the airplane. These panels give access to components and airframe areas.

**NOTE:** Panels that have hinges attached to them (like the oil door for example) are not referred to as panels and are not included in this section.

- B. This section can be used in conjunction with inspection practices (Chapter 5) or standard maintenance practices to quickly find related components throughout the airplane.

**2. Access/Inspection Panel Numbering**

- A. All access/inspection panels have a series of numbers and letters which identify their zone location, sequence, and orientation.

- (1) Zone Location - Zone location is identified by the first three numbers of any panels. This three-number sequence is specified in Airplane Zoning - Description and Operation.
- (2) Sequence - The sequence is identified by alphabetical letters follow the three-number sequence. The first panel is identified as "A," the second panel is identified as "B",, and so on.
- (3) Orientation - The orientation for each panel is identified by one of four letters that come after the sequence letter. The orientation letters are "T" for top, "B" for bottom, "L" for left, and "R" for right.

- B. With access panel 510AB as an example, the breakdown is as follows:

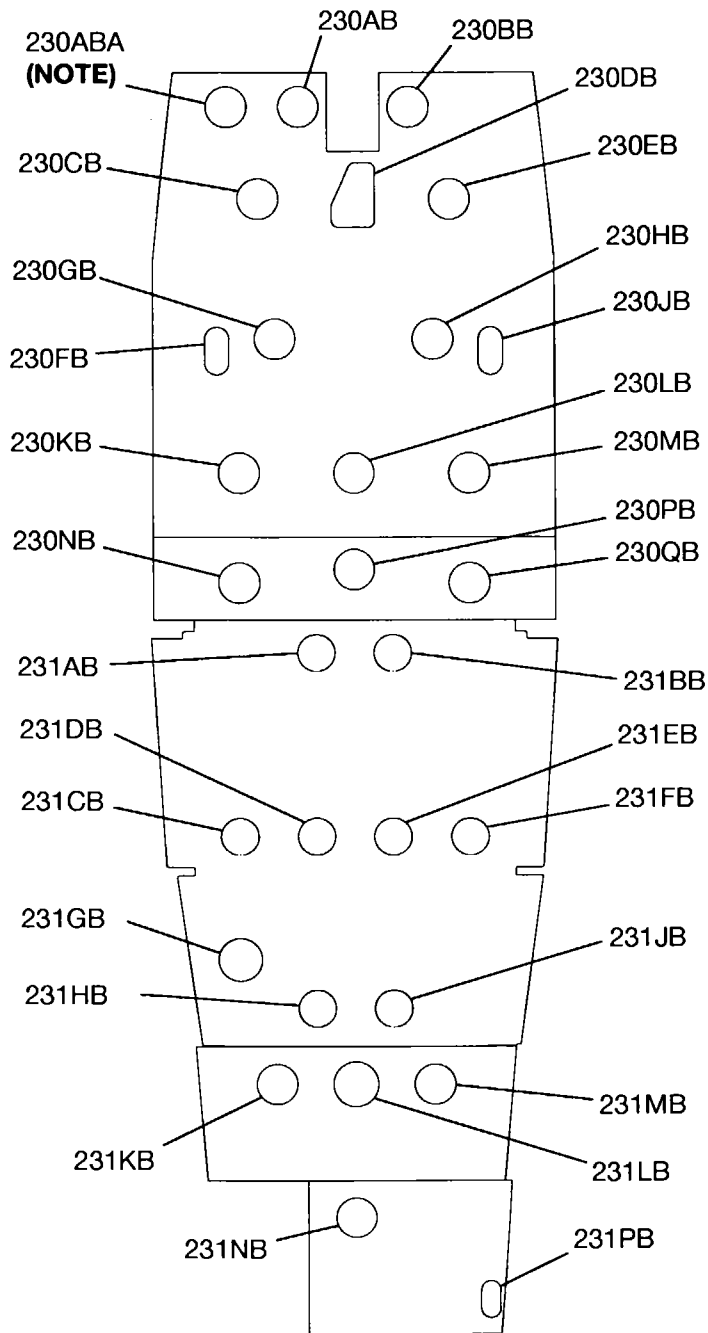
- (1) Zone Location = 510 (inboard portion of left wing)
- (2) Sequence = A (the first panel within the zone)
- (3) Orientation = B ( located on the bottom of the zone).

**3. Description**

- A. Access/Inspection Panels.

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CABIN FLOORBOARD PANELS

**NOTE:** THE ACCESS PANEL IS APPLICABLE  
 ON AIRPLANES 18281225 AND ON  
 AND AIRPLANES T18208203 AND ON.

0710T1009

Cabin Floorboard Panels  
 Figure 1 (Sheet 1)

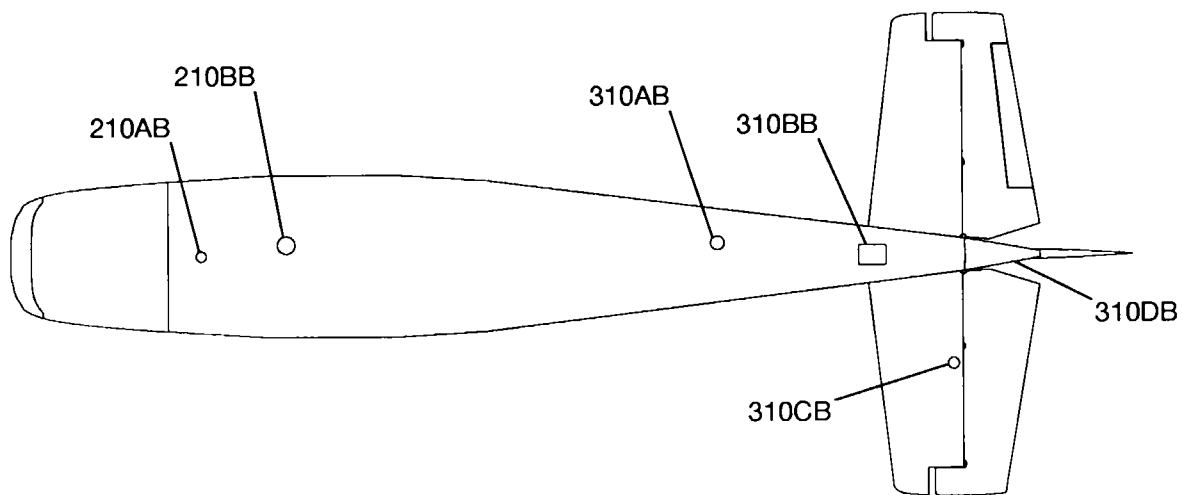
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Table 1. Cabin Floorboard Panels

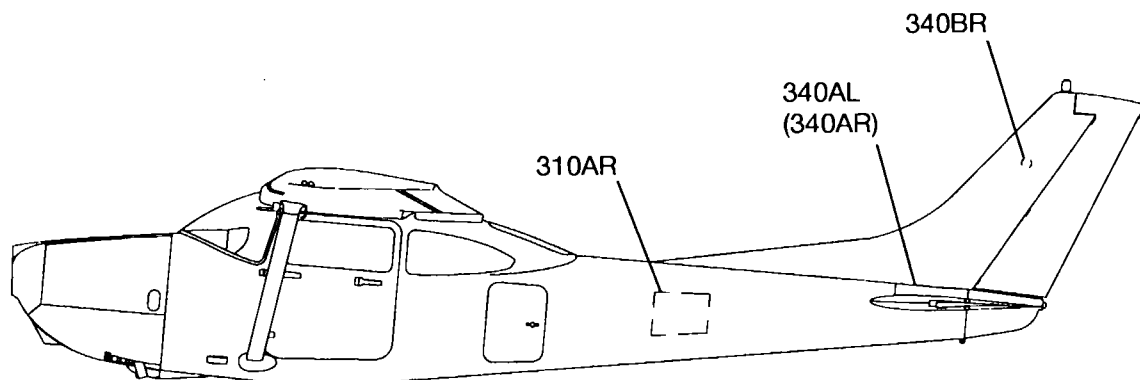
Panel	Equipment Located In Area (Refer to Figure 1)
230ABA	Nose Gear Steering Bellcrank
230AB	Nose Gear Steering Bellcrank
230BB	Nose Gear Steering Bellcrank
230CB	Brake Lines
230DB	Rudder Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Trim Pulleys
230EB	Structure
230FB	Fuel Lines
230GB	Brake Lines
230HB	Structure
230JB	Structure
230KB	Fuel Lines, Brake Lines
230LB	Rudder Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Trim Pulleys
230MB	Structure
230NB	Landing Gear And Brake Lines
230PB	Rudder Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Trim Pulleys
230QB	Landing Gear And Brake Lines
231AB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231BB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231CB	Structure
231DB	Rudder Cables, Elevator Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Pulleys, Elevator Trim Pulleys
231EB	Rudder Cables, Elevator Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Pulleys, Elevator Trim Pulleys, Transponder Antenna
231FB	Structure
231GB	Structure
231HB	Rudder Cables, Elevator Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Pulleys, Elevator Trim Pulleys
231JB	Rudder Cables, Elevator Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Pulleys, Elevator Trim Pulleys
231KB	Battery Cable
231LB	Rudder Cables, Elevator Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Pulleys, Elevator Trim Pulleys
231MB	Structure
231NB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231PB	Structure

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BOTTOM VIEW



LEFT VIEW

FUSELAGE PANELS

Fuselage Panels  
Figure 2 (Sheet 1)

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0710T1010



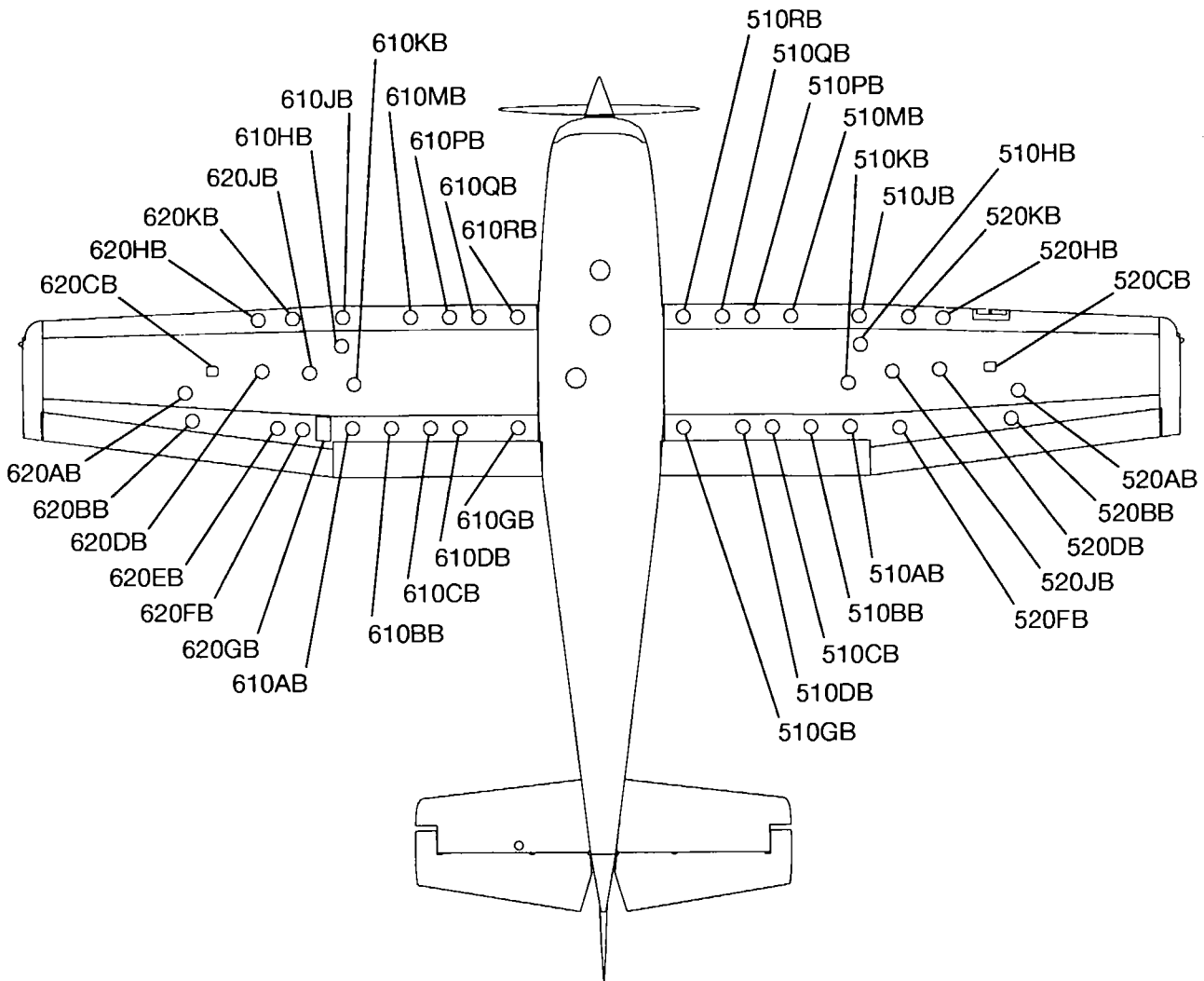
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Table 2. Fuselage Panels

Panel	Equipment Located In Area (Refer to Figure 2)
210AB	Fuel Selector
210BB	Antenna
310AB	Antenna
310BB	Elevator Bellcrank, Rudder Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Trim Pulleys
310CB	Elevator Trim Actuator
310DB	Elevator Horn, Rudder Cables
310AR	Emergency Locator Transmitter, Rudder Cables, Elevator Cables, Elevator Trim Cables
340AL (340AR)	Rudder Cables, Elevator Trim Cables, Rudder Pulleys, Elevator Trim Pulleys
340BR	Antenna T-Phasing Combiner

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BOTTOM VIEW

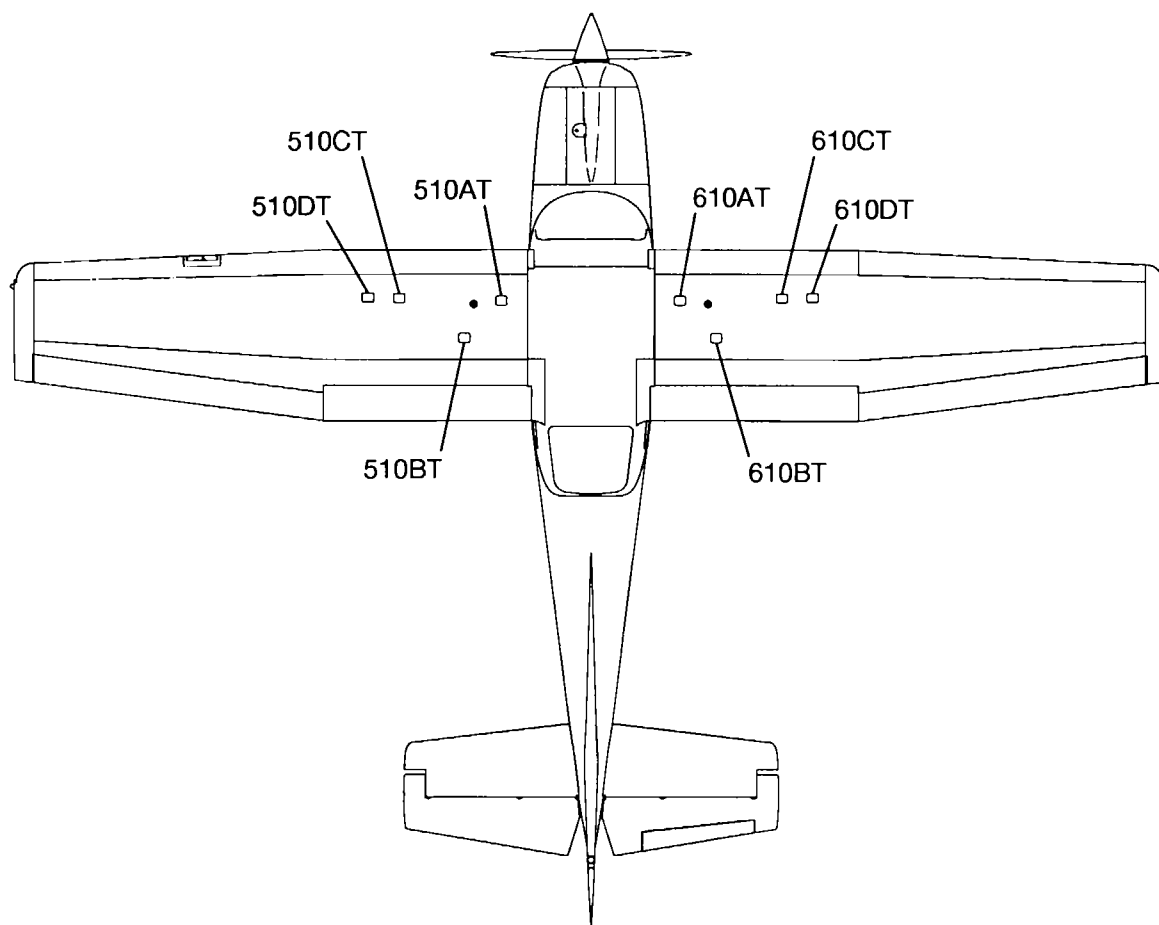
WING ACCESS PANELS

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Wing Access Panels  
 Figure 3 (Sheet 1)

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TOP VIEW

WING ACCESS PANELS

Wing Access Panels  
Figure 3 (Sheet 2)

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Table 3. Wing Access Panels

Panel	Equipment Located In Area (Refer to Figure 3)
620AB	Aileron Bellcrank
620BB	Aileron Bellcrank
620CB	Aileron Cables
620DB	Wing Structure
620EB	Aileron Cable
620FB	Aileron Cable
620GB	Roll Servo
620HB	Aileron Cable, Aileron Cable Pulley
620JB	Wing Structure
620KB	Aileron Cable
610AB	Aileron Cable
610BB	Flap Actuator
610CB	Courtesy Light
610DB	Wing Structure
610ET	Fuel Bay Access
610FT	Fuel Bay Access
610GB	Wing Structure
610HB	Wing Strut
610JB	Wing Strut
610KB	Fuel Vent Line
610LT	Fuel Bay Access
610MB	Aileron Cable, Electrical Wiring
610NT	Fuel Bay Access
610PB	Aileron Cable, Electrical Wiring
610QB	Aileron Cable, Electrical Wiring
610RB	Fresh Air Inlet
520AB	Aileron Bellcrank
520BB	Aileron Bellcrank
520CB	Aileron Cables
520DB	Wing Structure, Magnetometer
520FB	Wing Structure
520HB	Aileron Cable, Aileron Cable Pulley
520JB	Wing Structure

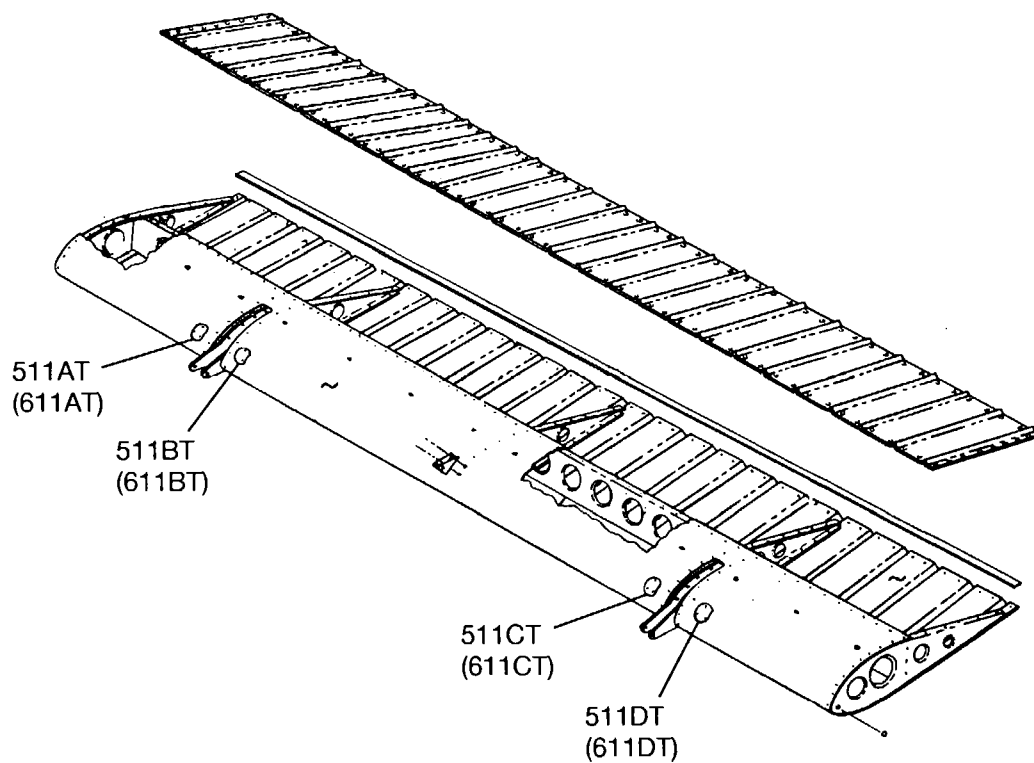
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Table 3. Wing Access Panels (continued)

Panel	Equipment Located In Area (Refer to Figure 3)
520KB	Aileron Cable
510AB	Aileron Cable
510BB	Flap Actuator
510CB	Courtesy Light
510DB	Wing Structure
510ET	Fuel Bay Access
510FT	Fuel Bay Access
510GB	Wing Structure
510HB	Wing Strut
510JB	Wing Strut, Pitot Tube
510KB	Fuel Vent Line
510LT	Fuel Bay Access
510MB	Aileron Cable
510NT	Fuel Bay Access
510PB	Pitot Line, Aileron Cable
510QB	Pitot Line, Aileron Cable
510RB	Fresh Air Inlet

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FLAP PANELS

0725T1001

Flap Panels  
Figure 4 (Sheet 1)

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Table 4. Flap Panels

Panel	Equipment Located In Area (Refer to Figure 4)
511AT	Flap Access
511BT	Flap Access
511CT	Flap Access
511DT	Flap Access
611AT	Flap Access
611BT	Flap Access
611CT	Flap Access
611DT	Flap Access

**CHAPTER**

**7**

**LIFTING AND  
SHORING**



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Lifting Procedure.....	7-11-00 Page 201

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**LIFTING AND SHORING - GENERAL**

**1. Scope**

- A. This chapter describes both standard and emergency procedures used to lift the airplane off the ground.

**2. Tools, Equipment and Material**

**NOTE:** Equivalent substitutes may be used for the following listed items:

NAME	NUMBER	MANUFACTURER	USE
Jack		Obtain locally	To jack wing.
Leg Extension		Obtain locally	To extend legs on jack.
Slide Tube Extension		Obtain locally	To extend jack height.
Universal Tail Stand		Obtain locally	To secure tail.
Padded Block		Fabricate locally	To provide cushion between wing jack and wing spar.

**3. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on jacking provides normal procedures and techniques used to jack the airplane off the ground.
  - (2) The section on emergency lifting provides procedures, techniques and fabrication information needed to lift the airplane by overhead means.

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**JACKING - MAINTENANCE PRACTICES**

**1. General**

- A. Normal jacking procedures involve lifting one main wheel at a time. This procedure is best accomplished using a floor jack in conjunction with the built-in jack pad (located directly below the step on each strut).

**CAUTION:** Jacking both wheels simultaneously at built-in jack pads is not recommended. When using built-in jack pad, flexibility of the main gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. If this occurs, the jack must be lowered for a second operation.

- B. When the airplane needs to be raised off the ground at all points, the following procedure should be used.

**2. Tools, Equipment and Materials**

- A. For a list of required tools, equipment and materials, refer to Lifting and Shoring - General.

**3. Jacking Procedure**

- A. Raise Airplane (Refer to Figure 201).

- (1) Place wing jacks and padded blocks under front spar, just outboard of wing strut. Ensure that padded block (1 inch X 4 inch X 4 inch with 0.25 inch rubber pad) is resting securely between spar and jack.
- (2) Raise wing jacks evenly until desired height is reached.

**CAUTION:** When placed on jacks centered under the wing front spar, the airplane is slightly tail heavy. Tail stands must be used and weigh enough to keep the tail down under all conditions. Additionally, the tail stand must be strong enough to support any weight which might be transferred to the tailcone area during maintenance, creating a greater tail heavy condition.

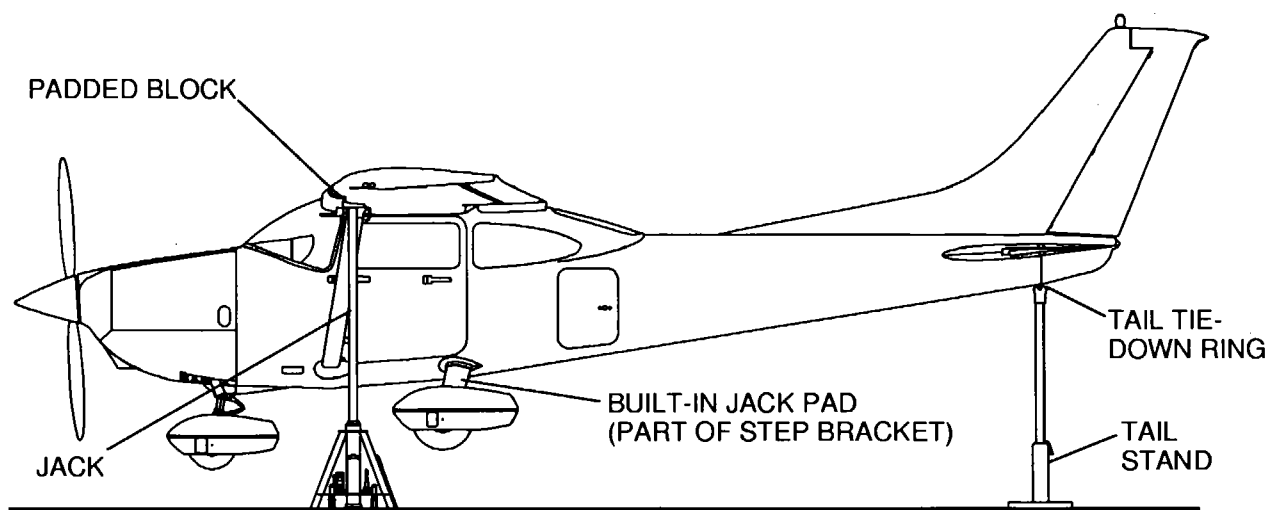
- (3) Carefully attach tail stand to tail tiedown ring.

- B. Lower Airplane (Refer to Figure 201).

- (1) Detach tail stand from tail tiedown ring.
- (2) Slowly lower wing jacks simultaneously until main tires are resting on ground.
- (3) Remove wing jacks and pads from wing area.

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Airplane Jacking  
Figure 201 (Sheet 1)

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**EMERGENCY LIFTING/HOISTING - MAINTENANCE PRACTICES**

**1. Lifting Procedure**

- A. The airplane may be lifted by means of suitable slings. The front sling should be hooked to each upper engine mount at the firewall, and the aft sling should be positioned around the fuselage at the first bulkhead forward of the leading edge of the stabilizer.

**CHAPTER**

**8**

**LEVELING AND  
WEIGHING**



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**LEVELING AND WEIGHING - GENERAL**

**1. Scope**

- A. This chapter provides information necessary to properly level the airplane.
- B. For information on airplane weighing procedures, refer to Section 6 of the Pilot's Operating Handbook And FAA Approved Airplane Flight Manual.

**2. Tools, Equipment and Material**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Spirit Level		Commercially available	Bubble level used to level airplane.

**3. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
  - (1) The section on leveling provides maintenance practices and instructions for longitudinal and lateral leveling of the airplane.

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**LEVELING - MAINTENANCE PRACTICES**

**1. General**

- A. This section provides reference points for leveling the airplane laterally and longitudinally.
- B. For an illustration of leveling points, refer to Figure 201.

**2. Tools, Equipment and Materials**

- A. For a list of required tools, equipment and materials, refer to Leveling And Weighing - General.

**3. Leveling Points**

- A. Lateral Leveling.
  - (1) The airplane may be leveled laterally by selecting two corresponding points on the upper door sills (left and right) and placing the level across these points.

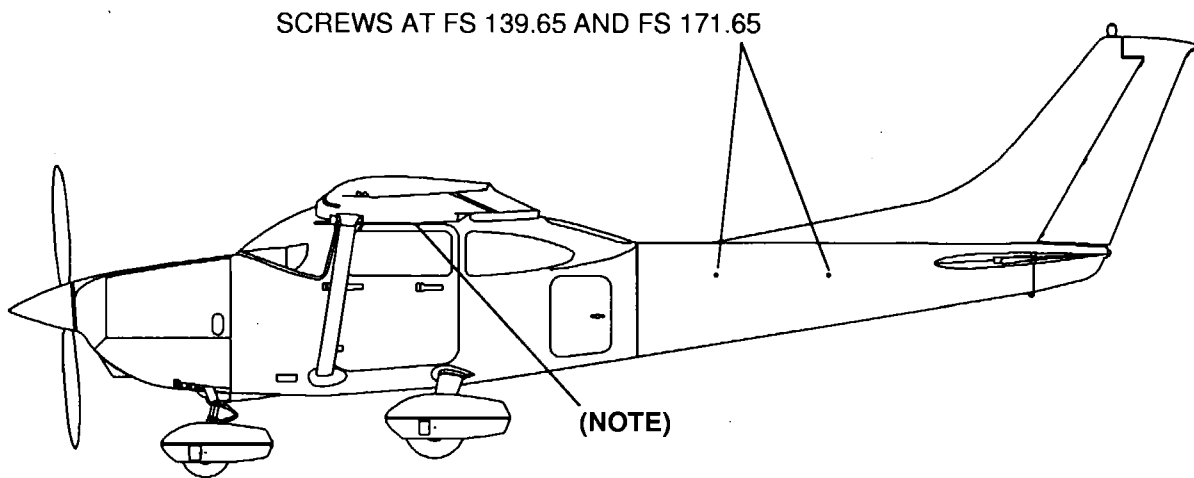
**NOTE:** Out of level tolerance for wing tips is 3 inches total.

- B. Longitudinal Leveling.
  - (1) Locate two NAS221-7 screws on left side of fuselage at FS 139.65 and FS 171.65.
  - (2) Remove screws and replace with studs of suitable length (approximately 2 inches long).
  - (3) Place level on protruding studs.

**NOTE:** The screws located at FS 139.65 and FS 171.65 are on Water Line (WL 13.25).

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**NOTE:** CORRESPONDING POINTS ON BOTH UPPER DOOR SILLS MAY BE USED TO LEVEL THE AIRPLANE Laterally.

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Airplane Leveling  
Figure 201 (Sheet 1)

**CHAPTER**

**9**

**TOWING AND TAXIING**

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**TOWING AND TAXIING - GENERAL**

**1. Scope**

- A. This chapter describes towing procedures for movement of the airplane on the ground.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the section incorporated in this chapter is as follows;
- (1) The section on towing describes those procedures and cautions applicable for the Model 182 airplanes.

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**TOWING - MAINTENANCE PRACTICES**

**1. General**

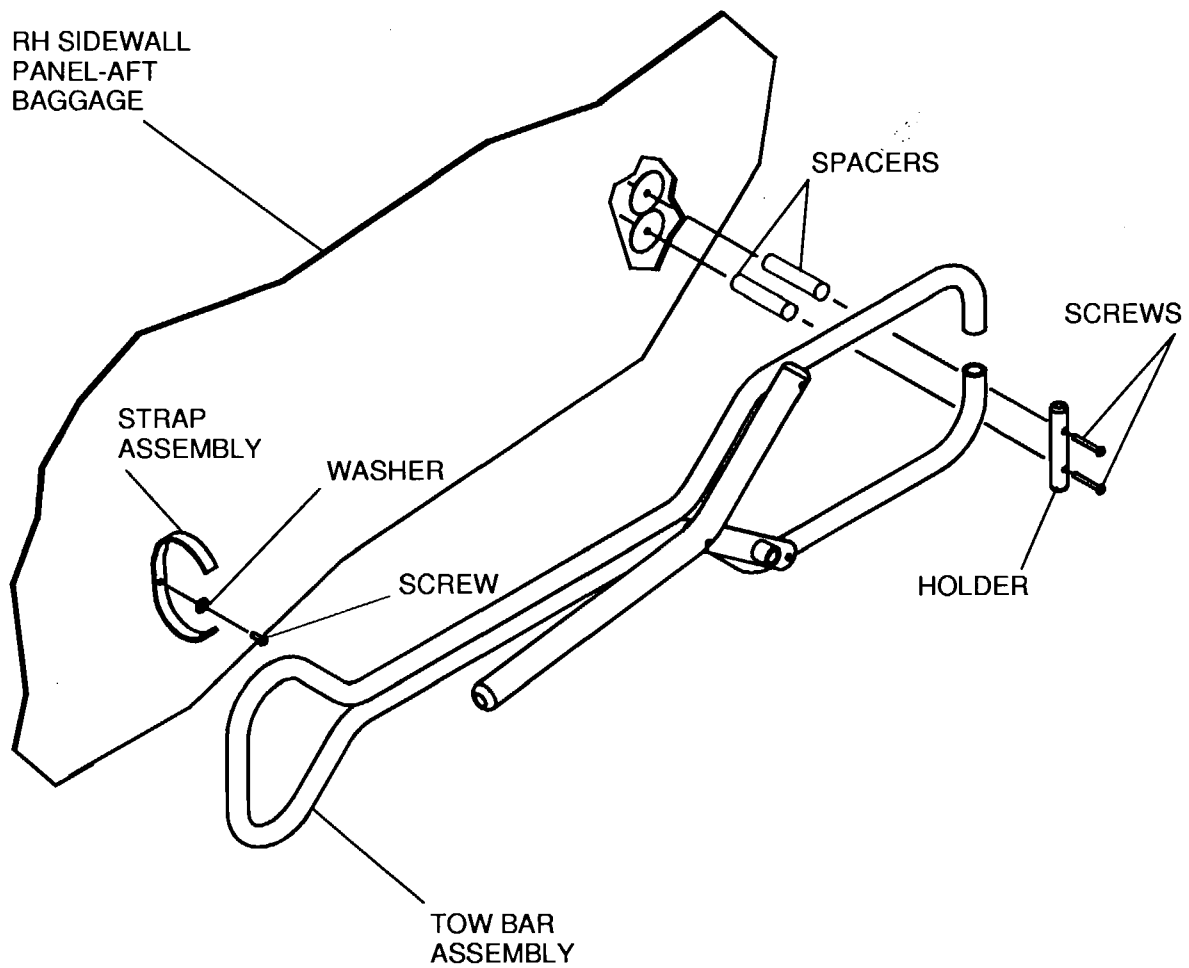
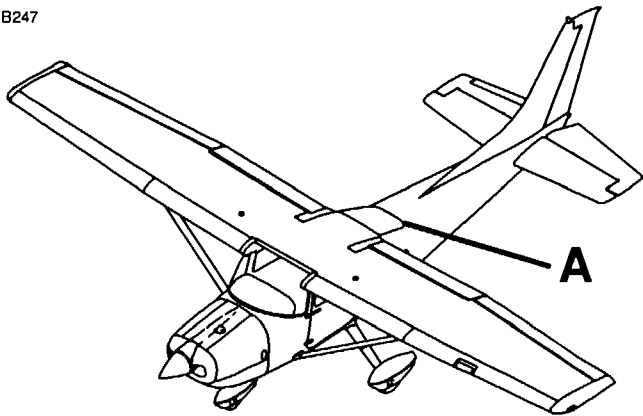
**A. Towing.**

**CAUTION:** When towing the airplane, never turn the nose wheel more than 29 degrees either side of center or the gear will be damaged. Do not push on control surfaces or outboard empennage surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin.

- (1) Moving the airplane by hand is accomplished by using the wing struts and nose landing gear strut as push points. A tow bar attached to the nose gear should be used for steering and maneuvering the airplane on the ground.
- (2) When no tow bar is available, press down at the horizontal stabilizer front spar adjacent to the fuselage to raise the nose wheel off the ground. With the nose wheel clear of the ground, the aircraft can be turned by pivoting it about the main wheels.

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Tow Bar Installation  
Figure 201 (Sheet 1)

**CHAPTER**

**10**

**PARKING AND  
MOORING**

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**PARKING, MOORING, STORAGE AND RETURN TO SERVICE - GENERAL**

**1. Scope**

A. This chapter provides maintenance instructions for parking, mooring, storage and return to service.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Wheel Chocks		Available Commercially	To chock landing wheels.
Engine Air Inlet Cover		Cessna Aircraft Cessna Parts Distribution Department 701, CPD 25800 East Pawnee Road Wichita, KS 67218-5590	To prevent entry of moisture and/or foreign particles through cowlings.
Pitot Tube Cover		Cessna Aircraft	To prevent entry of moisture and/or foreign particles in pitot tubes.
Static Ground Cable		Available Commercially	To static ground airplane.
Rope (0.375 inch diameter minimum) or equivalent		Available Commercially	To tie down wing and tail.
Dehydrator Plugs	MS27215-1 or -2	Available Commercially	To prevent moisture in cylinders during indefinite storage.
Corrosion Preventive Oil	One part MIL-L-6529, Type 1, with one part Royal "D"	Royal Lubricants Co. Inc. 72 Eagle Rock Ave. East Hanover, NJ 07936	Preserve engine during long term storage.
Preservative Oil	MIL-C-6529	Available Commercially	Preserve engine during long term storage.

**3. Definition**

A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:

- (1) The section on parking describes methods, procedures and precautions used when parking the airplane.
- (2) The section on mooring describes procedures and equipment used to moor the airplane.
- (3) The section on storage provides information on recommended storage procedures. Recommendations vary with the length of time the airplane is to be stored.
- (4) The section on return to service describes procedures used when returning the airplane to service from flyable, temporary or indefinite storage.

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**PARKING - MAINTENANCE PRACTICES**

**1. General**

- A. These maintenance practices cover procedures used to park the airplane.
- B. The airplane should be moored if high winds are anticipated or anytime the airplane remains outside for extended periods of time. Refer to Mooring - Maintenance Practices for mooring procedures. Refer to Storage - Maintenance Practices for detailed instructions regarding short term or long term storage.

**2. Parking Instructions**

- A. Hard Surface and Sod.
  - (1) Position airplane on level surface headed into wind.
  - (2) Set parking brake or chock main gear wheels.

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

- (3) Install control column lock.

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**STORAGE - MAINTENANCE PRACTICES**

**1. General**

- A. This section provides maintenance instructions and inspection criteria for airplanes in flyable, temporary and indefinite storage. Refer to the Lycoming Service Letter L180B (or latest revision).
- (1) Flyable storage is defined as a maximum of 30 days of nonoperational status and/or the first 25 hours of intermittent engine operation.
  - (2) Temporary storage is defined as a maximum of 90 days of nonoperational status.
  - (3) Indefinite storage is defined as more than 90 days of nonoperational status.

**2. Flyable Storage**

- A. Flyable storage is a maximum of 30 days storage with no engine operation and/or the first 25 hours of intermittent engine operation.
- B. Engine temperature and length of operation time are very important in the control of corrosion. The desired flight time for air cooled engines is at least one continuous hour at oil temperatures of 165 degrees F (74 degrees C) to 200 degrees F (93 degrees C) at intervals not to exceed 30 days. The one hour does not include taxi, take-off, and landing time.
- C. The aircraft temperature gages must operate correctly.
- D. The cooling air baffles must be in good condition and fitted properly.
- E. The oil cooler system must be of the proper size for the engine and airframe. Oil coolers that are not the correct size can cause an engine to operate at too high or low a temperature. Low temperatures are as dangerous as high temperatures because of build-up of water and acids.
- F. Pulling the propeller through by hand is not recommended when the airplane has not operated for approximately a week. Pulling the propeller through by hand before you start the engine or to minimize corrosion can cause damage. When the propeller is pulled through by hand, the rings can remove oil from the cylinder walls. The cam load made by the valve train removes oil from the cam and followers. After two or three times of pulling the propeller through by hand without engine starts, the cylinders, cam, and followers are left without the correct quantity of oil film. Engine starts without the correct lubrication can cause the engine parts to score, which can cause damage to the engine.
- G. The pitot tube, static air vents, air vents, openings in the engine cowl, and other openings must have protective covers installed to prevent entry of foreign object debris.

**3. Temporary Storage**

**NOTE:** The airplane is constructed of corrosion resistant, epoxy primed aluminum, which will last indefinitely under normal conditions, if kept clean. The alloys are subject to oxidation. The first indication of corrosion on unpainted surfaces is in the form of white deposits or spots. Corrosion on painted surfaces shows up as the paint being discolored or blistered. Storage in a dry hangar is necessary for good preservation and must be procured if possible.

**A. Temporary Storage of the Airplane**

- (1) The tiedown rings must be used as electrical ground points for all ground wires during the refuel procedures.
- (2) Fill the fuel tanks with the correct grade of gasoline.

**WARNING: During all fueling procedures, fire fighting equipment must be available. In case of an accidental disconnect of a ground wire. Two ground wires must be used from different points on the airplane which are attached to separate ground stakes. Make sure to ground the fuel nozzle the airplane.**

- (3) Clean and wax the airplane thoroughly.
- (4) Clean all oil or grease from the tires.

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- (5) Apply a tire preservative to the tires.
- (6) Cover the tires to protect against grease and oil.
- (7) Block up the fuselage to relieve the pressure on the tires or rotate the wheels every 30 days.

**NOTE:** This aids to change supporting points and prevent flat spotting on the tires.

- (8) Lubricate all airframe items and cover all openings which allow moisture and/or dust to enter.
- (9) Turn battery and store in a cool, dry place. Service the battery periodically and charge as required.
- (10) Disconnect the spark plug leads.
- (11) Remove the upper and lower spark plugs from each cylinder.
- (12) Use a portable pressure sprayer to spray a preservative oil in the upper spark plug hole of each cylinder (the piston must be in a down position). Rotate the crankshaft as each pair of cylinders is sprayed.
- (13) Rotate the crankshaft so that no piston is at a top position.
- (14) If the airplane is to be stored outside, set the two bladed propeller in a horizontal position to provide maximum clearance for passing airplanes.
- (15) Spray each cylinder without moving the crankshaft to cover all interior surfaces of the cylinder above the piston.
- (16) Install the spark plugs and attach the spark plug leads.
- (17) Spray two ounces of the preservative oil into the engine interior through the oil filler tube.
- (18) Seal all engine openings exposed to the atmosphere using suitable plugs. Attach a red streamer at each point that a plug is installed.

**CAUTION:** The pitot tube, static source vents, air vent openings in the engine cowling and other similar openings must have protective covers installed to prevent entry of foreign material.

- (19) If the airplane is to be stored outside, tie it down using the procedures outlined in Chapter 10, Mooring - Maintenance Practices.
- (20) Attach a warning placard to the propeller to identify that the propeller must not be moved while the engine is in storage.

#### 4. Indefinite Storage

- A. Put the airplane in indefinite storage.

**NOTE:** Periodic inspections must be performed to make sure of the integrity of preservation methods. Refer to Chapter 10, Inspection During Indefinite Storage.

- (1) Operate the engine for the oil temperature to reach the normal operating temperature.

**NOTE:** Normal operating temperature is within the green arc of the oil temperature gage. The engine oil must be drained while the engine is still warm.

- (2) Shut off the engine and remove the lower cowling to drain the engine oil. Refer to Chapter 71, Cowling - Maintenance Practices.
- (3) Lift the nose of the airplane slightly to aid in the removal of sludge in the engine oil sump.

**WARNING:** Avoid skin contact with engine oil. Any engine oil that inadvertently gets on the skin should be immediately removed.

- (4) Remove and discard the wire from the drain plug.
- (5) Remove the drain plug and let the oil drain into an applicable container.
- (6) Install plug in sump when all oil is drained.

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**CAUTION:** The corrosion preventive mixture is harmful to paint and shall be wiped from painted surfaces immediately.

- (7) Fill oil sump to normal capacity with thoroughly mixed corrosion preventative oil. Refer to Chapter 10, Parking, Mooring, Storage and Return to Service - General.
- (8) Remove the top spark plugs.
- (9) Slowly turn the propeller with the crankcase full of oil, through two revolutions.
- (10) Allow the engine to stand for ten minutes, then turn the propeller back and forth through 90 degrees for twelve cycles.
- (11) Drain the preservative oil.
- (12) Use MIL-C-6529 oil Type 1, to spray the exhaust port and valve of each cylinder. The piston must be approximately 1/4 turn before top center of the exhaust stroke.
- (13) Use an airless spray gun to spray two ounces of MIL-C-6529 oil, Type 1, into each cylinder through the spark plug hole.
- (14) For all spraying, the spray nozzle temperature must be maintained between 200°F (93.33°C) and 220°F (104.44°C).
- (15) Install dehydrator plugs in the upper spark plug holes. Make sure the dehydrator plugs are blue in color when installed.
- (16) Cover spark plug lead terminals with shipping plugs or other suitable covers.
- (17) Set the throttle in the full open position.
- (18) Place a bag of desiccant in the induction air intake and seal the opening with moisture resistant paper and tape.
- (19) Place a bag of desiccant in the exhaust tailpipe and seal openings with moisture resistant tape.
- (20) Seal the cold air inlet to the heater muff with moisture resistant tape.
- (21) Seal the engine breather tube by inserting a plug in the breather hose and clamping it in place.
- (22) Seal all other engine openings exposed to the atmosphere. Use applicable plugs or non-hygroscopic tape.
- (23) Attach a red streamer to each location where plugs or tapes are installed. Attach the red streamers outside the sealed area with tape or to the inside of the sealed area with safety wire to prevent wicking of moisture into the sealed area.

**CAUTION:** The corrosion preventive mixture is harmful to paint and must be wiped from painted surfaces immediately.

- (24) Drain corrosion preventative mixture from engine sump.
- (25) Install and safety the drain plug with wire. Refer to Chapter 20, Safelying - Maintenance Practices.
- (26) Install the lower cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
- (27) Attach a warning placard on the throttle control knob to identify that the engine contains no lubricating oil.
- (28) Placard the propeller to the effect that it must not be moved while the engine is in storage.

**NOTE:** As an alternate method of indefinite storage, the airplane may be serviced according to the temporary storage procedures. Run up at the maximum intervals of 90 days, and then service again according to the procedures in temporary storage.

**5. Inspection During Flyable Storage**

- A. There are no inspection requirements for airplanes in flyable storage.

**6. Inspection During Temporary Storage**

- A. Airplanes in temporary storage must use the following procedure to complete an inspection.
- (1) Inspect the airframe for corrosion every 30 days.
  - (2) Remove the dust collections as frequently as possible.
  - (3) Clean and wax airplane as necessary.

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- (4) Every 30 days do a minimum of one cylinder inspection for interior corrosion.

**NOTE:** Do not move the crankshaft during an inspection of the interior of cylinder.

**7. Inspection During Indefinite Storage**

- A. Airplanes in indefinite storage must use the following procedure to complete an inspection.
- (1) Inspect cylinder Protex plugs every seven days. Change Protex plugs if their color indicates an unsafe condition.
  - (2) If Protex plugs have changed color in one half of the cylinders, all desiccant material in the engine must be replaced with new material.
  - (3) Inspect the interior of one cylinder for corrosion through the spark plug hole and remove at least one rocker box cover and inspect the valve mechanism.

**CAUTION:** The corrosion preventive mixture is harmful to paint and shall be wiped from painted surfaces immediately.

- (4) Spray cylinder interiors with corrosion preventative mixture every six months and replace the desiccant and Protex plugs.

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**MOORING - MAINTENANCE PRACTICES**

**1. General**

A. This section provides instructions for mooring the airplane.

**2. Mooring Procedures**

- A. When mooring the airplane in the open, head into the wind if possible. Tie down the airplane as follows:
- (1) Tie ropes, cables, or chains to the wing tie-down fittings located at the upper end of each wing strut. Secure the opposite ends of ropes, cables, or chains to ground anchors.
  - (2) Secure a tie-down rope (no chains or cables) to upper strut of the nose gear, and secure opposite end of rope to a ground anchor.
  - (3) Secure the middle of a rope to the tail tie-down ring. Pull each end of rope away at a 45° angle and secure to ground anchors at each side of tail.
  - (4) Secure control lock on pilot control column. If control lock is not available, tie pilot control wheel back with front seat belt.
  - (5) These aircraft are equipped with a spring-loaded steering bungee which affords protection against normal wind gusts. However, if extremely high wind gusts are anticipated, additional external locks may be installed.



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**RETURN TO SERVICE - MAINTENANCE PRACTICES**

**1. General**

- A. Airplanes which have been in storage must be returned to service prior to first flight. Procedures for returning an airplane to service depend on length of time the airplane was stored. Refer to the following procedures for return to service after flyable storage, temporary storage and indefinite storage.

**2. Flyable Storage Return to Service**

- A. Accomplish the following:
- (1) Perform a thorough preflight inspection.

**NOTE:** At the end of the first 25 hours of engine operation, drain engine oil, change oil filter and service engine correct grade and quantity of engine oil.

**3. Temporary Storage Return to Service**

- A. Accomplish the following:
- (1) Remove airplane from blocks and check tires for proper inflation. Check for proper nose gear strut inflation.
  - (2) Check battery and install.
  - (3) Ensure oil sump has proper grade and quantity of engine oil.
  - (4) Service induction air filter and remove warning placard from propeller.
  - (5) Remove materials used to cover openings.
  - (6) Remove, clean and gap spark plugs.
  - (7) While spark plugs are removed, rotate propeller several revolutions to clear excess rust preventative oil from cylinders.
  - (8) Install spark plugs. Torque plugs to 330 inch-pounds and connect spark plug leads.
  - (9) Check fuel strainer. Remove and clean filter screen if necessary. Check fuel tanks and fuel lines for moisture and sediment. Drain enough fuel to eliminate any moisture and sediment.
  - (10) Perform a thorough preflight inspection, then start and warm up engine.

**4. Indefinite Storage Return to Service**

- A. Accomplish the following:
- (1) Remove aircraft from blocks. Check tires for correct inflation.
  - (2) Check and install battery.
  - (3) Remove all materials used to seal and cover openings.
  - (4) Remove warning placards posted at throttle and propeller.
  - (5) Remove drain plug and allow preservative oil to drain from engine sump.

**NOTE:** Preservative oil which remains in sump will mix with engine oil. Flushing of the oil system is not required.

- (6) Remove old oil filter. Install new oil filter.
- (7) Reinstall drain plug and service engine with correct quantity and grade of engine oil.
- (8) Service and install induction air filter.
- (9) Remove dehydrator plugs and spark plugs/plugs installed in spark plug holes. Rotate propeller several revolutions by hand to clear corrosion preventative mixture from cylinders.
- (10) Clean, gap and install spark plugs.
- (11) Rotate propeller by hand through compression stroke of each cylinders to check for possible liquid lock. Torque plugs to 330 inch-pounds.
- (12) Check fuel strainer. Remove and clean filter screen if necessary. Check fuel tanks and fuel lines for moisture and sediment. Drain enough fuel to eliminate any moisture and sediment.
- (13) Perform a thorough preflight inspection, then start and warm up engine.
- (14) Thoroughly clean and test fly airplane.

**CHAPTER**

**11**

**PLACARDS  
AND  
MARKINGS**

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**PLACARDS AND MARKINGS - GENERAL**

**1. General**

- A. Placards and markings on the exterior surfaces of the airplane are found in the Model 182 Illustrated Parts Catalog, Chapter 11.

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**PLACARDS AND MARKINGS - INSPECTION/CHECK**

**1. Scope**

A. This section gives information about the inspection of interior and exterior placards.

**2. Interior and Exterior Placard and Decal Inspection**

**NOTE:** This inspection is intended to be an overall inspection of all placards, decals, and markings on the airplane.

A. Inspect the Placards, Decals and Markings.

- (1) Examine the interior of the airplane, including the aft baggage areas, for the installation of all necessary placards, decals and markings.
  - (a) For necessary placards, decals, and markings, refer to the Model 182, Illustrated Parts Catalog.
- (2) Examine the exterior of the airplane for the installation of all necessary placards, decals, and markings.
  - (a) For necessary placards, decals, and markings, refer to the Model 182, Illustrated Parts Catalog.
- (3) Examine the airplane identification plate.
  - (a) The ID plate is found on the left side of the stinger, Zone 310. Refer to the Model 182, Illustrated Parts Catalog and Chapter 6, Airplane Zoning - Description and Operation.

**CHAPTER**

# **12**

**SERVICING**



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**SERVICING - GENERAL**

**1. Scope**

- A. This chapter provides instructions for the replenishment of fluids, scheduled and unscheduled servicing applicable to the entire airplane. Personnel shall observe safety precautions pertaining to the individual servicing application.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief description of each section follows.
- (1) The section on replenishing is subdivided into categories to group servicing information, such as, systems requiring hydraulic fluid or compressed gas. A brief description of the subdivision subjects follows.
    - (a) Replenishing charts for the liquids most commonly used to service the airplane are grouped together to aid maintenance personnel in servicing.
    - (b) The subdivision of fuel and oil provides maintenance personnel with general servicing procedures. Safety precautions and servicing procedures required by federal and local regulations may supersede the procedures described.
    - (c) The subject on hydraulic fluid servicing provides servicing procedures for the airplane hydraulic brake system, nose gear shimmy damper and nose gear strut.
    - (d) The remaining subject subdivisions provide service information on either a system, an assembly or a component.
  - (2) The section on scheduled servicing includes lubrication information, external cleaning and internal cleaning. The section is subdivided to provide individual system, assembly or component service information.

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**REPLENISHING - DESCRIPTION AND OPERATION**

**1. General**

A. This section provides maintenance personnel with servicing information for replenishing fuel and oil.

**2. Description**

A. For an illustration of service points located on the airplane, refer to Figure 1. This illustration may be used in conjunction with replenishing tables to aid maintenance technicians in servicing the airplane.

B. The following tables are provided to establish replenishment capacities of various systems:

- (1) Fuel Capacity (Table 1)
- (2) Approved Fuels (Table 2)
- (3) Engine Oil Capacity (Table 3)

**3. Fuel Capacity Table**

A. The following table lists airplane fuel capacity.

**WARNING: Only aviation grade fuels are approved for use.**

Table 1. Fuel Capacity

<b>TANK</b>	<b>U.S.</b>
Fuel Capacity	92.0 Gallons
Usable Fuel	88.0 Gallons

**4. Approved Fuel Table**

A. The following table lists approved fuels for use in the airplane.

Table 2. Approved Fuels

<b>TYPE OF FUEL</b>	<b>SPECIFICATION</b>	<b>COLOR</b>
100 LL	ASTM-D910	Blue
100	ASTM-D910	Green

For other fuels that can be used in Russia, refer to Lycoming Service Instruction No. 1070M (or subsequently approved Lycoming Service Instruction revision).

**5. Engine Oil Capacity Table**

A. The following table lists oil capacity for the airplane.

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**WARNING:** The U.S. Environmental Protection Agency advises mechanics and other workers who handle oil to minimize skin contact with used oil and promptly remove used oil from skin. In a laboratory study, mice developed skin cancer after skin was exposed to used engine oil twice a week without being washed off. Substances found to cause cancer in laboratory animals may also cause cancer in humans.

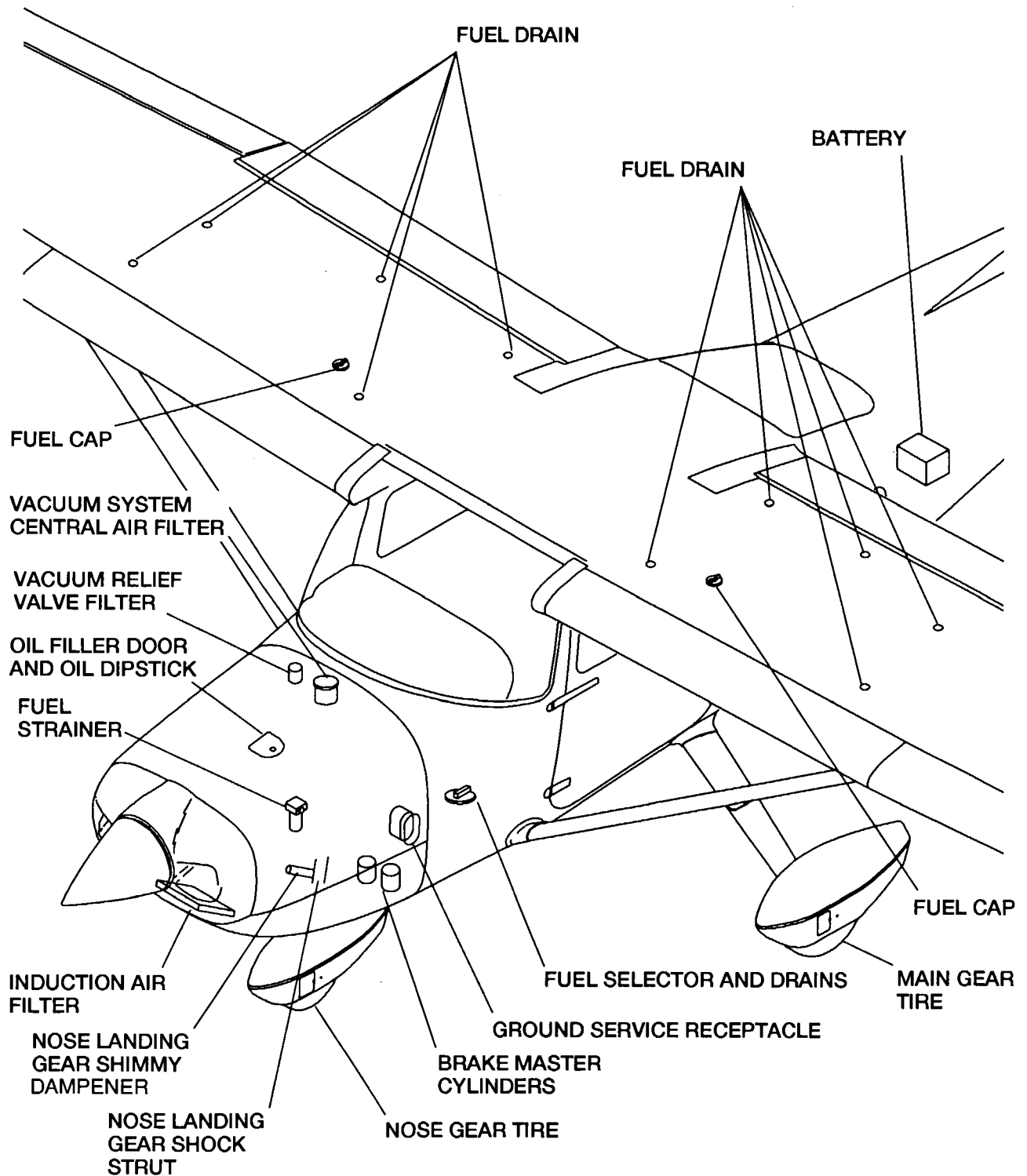
Table 3. Engine Oil Capacity

<b>SYSTEMS</b>	<b>U.S. Quarts</b>
Engine Oil (total with filter, oil cooler and cooler hoses)	13.0 quarts



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Airplane Service Points  
 Figure 1 (Sheet 1)

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**NOSE LANDING GEAR SHOCK STRUT - SERVICING**

**1. General**

- A. It is necessary to examine the nose gear shock strut at intervals to make sure the strut is filled with hydraulic fluid and is inflated to the correct air pressure. This procedure only gives instructions to fill the nose gear shock strut and to service the nose gear shock strut. For procedures to disassemble and repair, refer to Chapter 32, Nose Landing Gear - Maintenance Practices.

**2. Shock Strut Servicing Procedures**

- A. Service the nose gear shock strut as follows:
- (1) Remove the air valve cap and release all air.
  - (2) Remove the air valve housing assembly.
  - (3) Compress the strut fully until the strut's bottom fork touches the top barrel housing.
  - (4) Examine the hydraulic fluid level and add fluid as necessary.

**NOTE:** Fluid used must agree with specification MIL-PRF-5606.

- (a) Make sure the hydraulic fluid level is at the bottom of the air valve installation hole.
- (5) Fully extend the strut.
- (6) Install the air valve housing assembly.
- (7) With strut fully extended and the nose wheel off of the ground, inflate the strut to 55 to 60 PSI.

**NOTE:** The nose landing gear shock strut will use only minimum service. Strut extension pressure must be kept at 55 to 60 PSI. Use a clean, lint-free cloth soaked with MIL-PRF-5606 or kerosene to clean the machined surfaces of dirt and dust.

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**NOSE LANDING GEAR SHIMMY DAMPER - SERVICING**

**1. General**

- A. The nose gear shimmy damper (on airplanes that do not have the Lord Shimmy Damper) contains a compensating mechanism in the hollow piston rod. This is for thermal expansion and contraction of the hydraulic fluid in the damper. The shimmy damper must be filled fully with hydraulic fluid and be free of air. Before the servicing of the shimmy damper, make sure that the compensating piston is at the bottom in the piston rod. To disassemble the shimmy damper, refer to Chapter 32, Nose Gear - Maintenance Practices.
- B. The nose gear shimmy damper (on airplanes with the Lord Shimmy Damper) uses rubber with a lubricant to absorb nose wheel vibration. The damper piston shaft is attached to a stationary part, and the housing is attached to the nosewheel steering torque arm assembly, which moves as the nosewheel turns, causing relative motion between the damper shaft and the housing.

**2. Shimmy Damper Servicing (For airplanes that do not have the Lord Shimmy Damper)**

- A. Do the servicing of the shimmy damper as follows (Refer to Figure 301).
  - (1) Remove the shimmy damper from the airplane. Refer to Chapter 32, Nose Landing Gear - Maintenance Practices.
  - (2) Hold the shimmy damper in a vertical position with the filler plug pointed up.
  - (3) Loosen the filler plug to drain the unwanted fluid.
  - (4) Let the spring go to the bottom of the floating piston in the shimmy damper rod.
  - (5) When the flow of the fluid stops, put a length of rigid wire through the bleed air hole in the setscrew which is found at the end of the piston rod until the rigid wire touches the floating piston.
  - (6) Insert the wire to the depth of 3.81 inches (95.25 mm).

**NOTE:** If the wire insertion is less than 3.81 inches (95.25 mm), the floating piston will not move freely in the shaft.

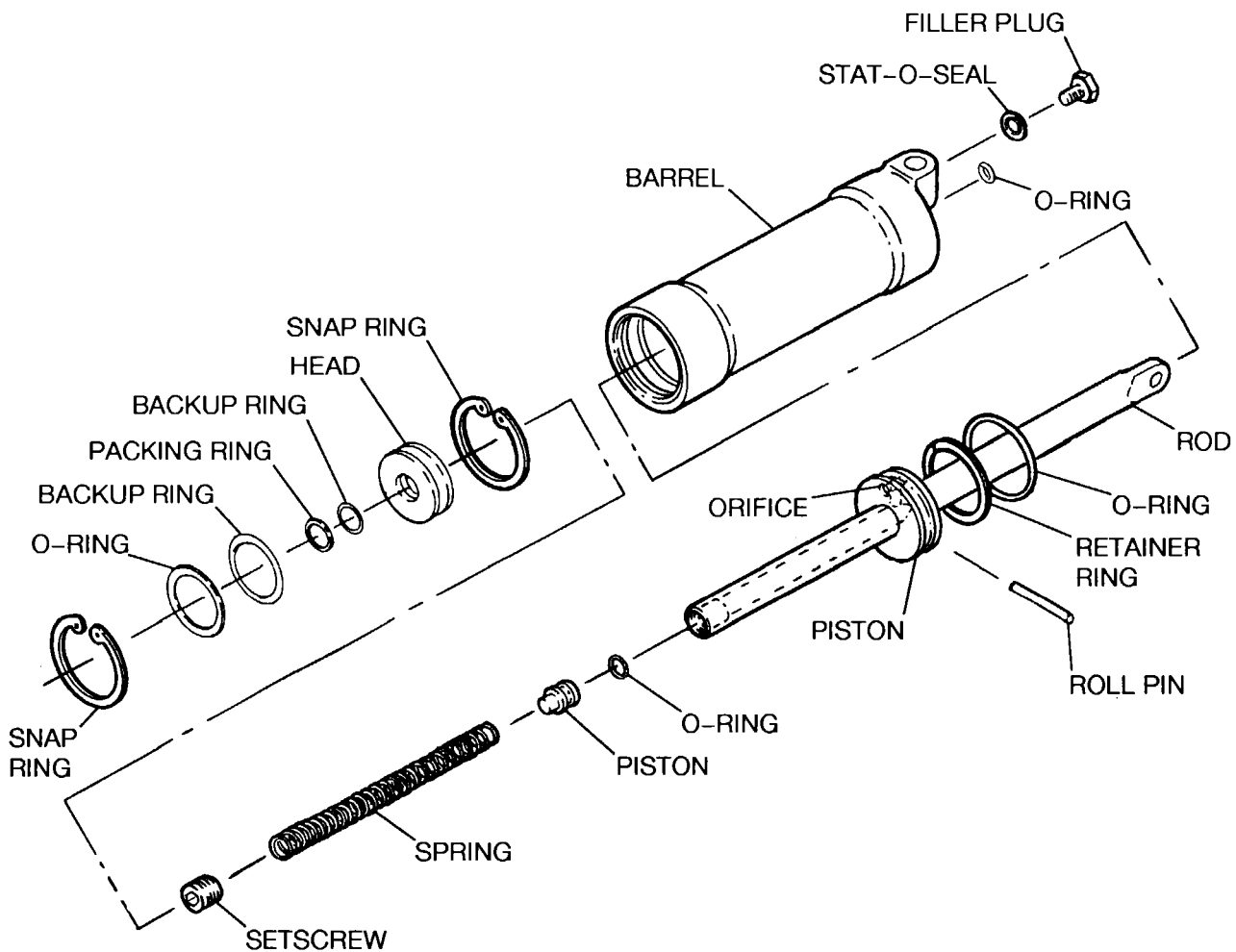
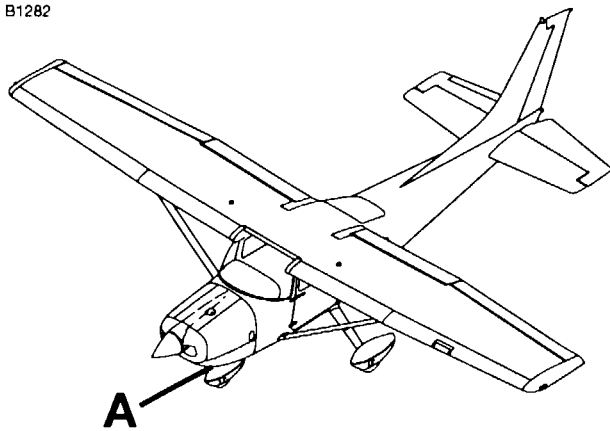
- (a) Use the rigid wire to release the floating piston.
    - (b) If the floating piston cannot be released with the rigid wire, you must replace the rod assembly and the piston.
  - (7) Make sure that the floating piston is at the bottom.
  - (8) Move the damper rod to put the piston at the end of the barrel which is opposite of the filler plug.

**CAUTION:** Dirt and dust can cut the seals in the barrel. Use a clean, lint-free cloth soaked with MIL-PRF-5606 hydraulic fluid or kerosene to keep the machined surfaces clean.

- (9) Remove the filler plug and fill the shimmy damper with hydraulic fluid.
    - (a) To fill the shimmy damper, make sure the shimmy damper and MIL-PRF-5606 hydraulic fluid are at 70°F to 80°F (21°C to 26°C).
    - (b) Keep the shimmy damper and the visual parts of the piston shaft clean from dirt and dust.
  - (10) Install the filler plug and clean the damper in cleaning agent.
  - (11) Dry the damper with a clean cloth.
  - (12) Install the damper on the airplane. Refer to Chapter 32, Nose Landing Gear - Maintenance Practices.

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**DETAIL A**

Shimmy Damper Servicing  
 Figure 301 (Sheet 1)

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**3. Shimmy Damper Servicing (On Airplanes with the Lord Shimmy Damper)**

- A. Lord Shimmy Dampers do not need special servicing. However, you must lubricate the nose wheel shimmy damper pivots with general purpose oil MIL-L-7870.
- B. Keep the shimmy damper clean.
  - (1) Clean the shimmy damper with a clean, lint-free cloth to prevent the collection of dust and grit.
  - (2) Make sure that the part of the damper piston shaft that you can see is always clean.
  - (3) Clean the machined surfaces of the shimmy damper with a clean, lint-free cloth to prevent the collection of dust and dust.
- C. If necessary, exercise a shimmy damper before installation.
  - (1) If a shimmy damper has been in storage for a long period, make sure that it moves freely before you install it.

**CAUTION:** Make sure that you do not push or pull on the shaft of the shimmy damper after it has reached its limit in either the up or the down position. If you continue to push a fully compressed, bottomed-out shaft, you can cause damage to the shimmy damper. If you continue to pull on a fully extended shaft, you can cause damage to the shimmy damper.

- (2) If the shimmy damper does not move freely, push and pull the shaft through complete cycles until it does move freely. When the shimmy damper shaft has come to its limit of travel up and down as you push and pull, make sure that you do not continue to push or pull it beyond that limit of travel.

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**HYDRAULIC BRAKES - SERVICING**

**1. General**

- A. Complete the brake master cylinders servicing as specified in the time intervals set in Chapter 5, Inspection Time Limits.
- B. Brake master cylinders are found on the rudder pedals and are filled with MIL-PRF-5606 hydraulic fluid. To fill and bleed the brake system, refer to Chapter 32, Brakes - Maintenance Practices.

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**FUEL AND ENGINE OIL - DESCRIPTION AND OPERATION**

**1. General**

- A. This section provides servicing procedures for the fuel and engine oil system. It is subdivided as follows:
- (1) The fuel system section includes procedures for adding fuel, defueling the airplane and mixing anti-icing additives to the fuel.
  - (2) The engine oil section includes procedures for checking, adding and changing engine oil.

**2. Fuel Precautions**

- A. Safety Precautions.
- (1) The safety precautions on fueling and defueling may be superseded by local directives. However, following is a typical list of precautions.
    - (a) Ground, by designated grounding cables, the fueling and/or defueling vehicle to the airplane. Also, a static ground device shall contact the fueling or defueling vehicle and ground.
    - (b) Fire fighting equipment shall be immediately available.
    - (c) Wear proper clothing.
      - 1 Do not wear clothing that has a tendency to generate static electricity, such as, nylon or synthetic fabrics.
      - 2 Do not wear metal taps on shoes when working in areas where fuel fumes may accumulate at ground level.
    - (d) The airplane shall be in a designated fuel loading or unloading area.
    - (e) High wattage, pulse transmitting avionics equipment shall not be operated in the immediate vicinity.
- B. Maintenance Precautions.
- (1) Use designated equipment for fuel loading and unloading to prevent contamination.
  - (2) Use proper procedures when adding fuel inhibitors.
  - (3) Use specified type of fuel.

**3. Oil Precautions**

- A. Maintenance Precautions.
- (1) Use proper servicing procedures; do not overfill, do not mix manufacturers brands of oil.

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**FUEL - SERVICING**

**1. General**

**A. Fuel Tanks.**

- (1) Each wing has a fuel tank. You can find the fuel tanks between the forward and aft spars that extend from WS 23.62 to WS 85.96. You must fill the fuel tanks immediately after each flight to decrease the amount of condensation that can be produced in the tanks and fuel lines. A fuel filler cap that vents is found on top of each wing to fuel and defuel each fuel tank.

**B. Fuel Drains.**

- (1) Fuel drains are at various places throughout the fuel system, and are used to collect fuel samples for analysis. To collect fuel samples, you put a fuel sample cup up to the valve and push up on the valve with the rod on the cup.

**NOTE:** For detailed description and maintenance practices related to the fuel system, refer to Chapter 28, Fuel - General.

**2. Safety and Maintenance Precautions**

**A. Safety Precautions.**

**WARNING: Keep fire fighting equipment available for all fuel system service procedures. To prevent accidental disconnection of a ground wire, you must use two ground wires from the tiedown rings on the airplane attached to approved ground stakes. Make sure the battery switch is turned off, unless otherwise specified.**

- (1) Connect an electrical ground.
  - (a) Ground the airplane with two ground wires. Connect the wires from the tie-down rings to the ground stakes.
  - (b) Ground the vehicle (or hose cart) to the same ground stakes as the airplane.
  - (c) Ground the vehicle (or hose cart) to the airplane.
  - (d) Ground the refuel nozzle to the airplane.
- (2) Make sure the equipment to fight fires is available.
- (3) Do not wear clothes such as nylon or synthetic fabrics that can make static electricity.
- (4) Do not wear metal taps on shoes.
- (5) The airplane must be in a designated fuel loading/unloading area.
- (6) High wattage, pulse transmitted avionics equipment must not be operated in the area when you fill or drain the fuel.

**B. Maintenance Precautions.**

- (1) Use approved equipment to fill or remove fuel to prevent contamination.
- (2) Use the authorized type of fuel and anti-ice additive. It is very important that the correct anti-ice additive mix procedures be followed. Incorrect mixture of the fuel and anti-ice additive will cause damage to the interior finish of the fuel tank, which increases corrosion.
- (3) Use an authorized type of fuel and anti-ice additive.
- (4) When you fuel the airplane, make sure you do not mix the fuel with the anti-ice additive and the fuel without the anti-ice additive.

**3. Fuel Servicing**

**A. Fuel Fill Procedures.**



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**CAUTION:** Make sure that the correct grade and type of fuel is used to service the airplane. Refer to Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for a list of approved fuels.

- (1) Electrically ground airplane and vehicle. Refer to the Safety and Maintenance Precautions.
- (2) Make sure that the battery switch is turned to OFF.
- (3) Put a protective mat around the fuel filler area and remove the fuel filler caps.
- (4) Fuel the airplane with the correct grade of aviation fuel.
- (5) Install the filler caps. Wipe up the excess fuel from the wing area.
- (6) Remove the equipment that you used to ground the airplane.

**B. Fuel Removal Procedures.**

- (1) Electrically ground the airplane and the vehicle.
- (2) Make sure that the battery switch is turned to OFF.
- (3) Remove the fuel filler caps.
- (4) Put the defueling nozzle into the fuel bay and begin to defuel.
- (5) Remove as much fuel as possible with the defuel nozzle.
- (6) Remove the drain valves from the bottom of the fuel tank and drain the remaining fuel.
- (7) Remove grounding equipment.

**4. Fuel Additive (DiEGME) Precautions**

**WARNING:** MIL-I-85470 anti-ice additive is toxic. It is dangerous to health when breathed and/or absorbed into the skin. When you service fuel with the anti-ice additive in an unventilated area, use applicable personal protective equipment such as eye goggles/shield, respirator with organic vapor cartridges, non-absorbing gloves and additional skin protection from spraying or splashing anti-ice additive. If anti-ice additive enters the eyes, flush with water and contact a physician immediately.

**WARNING:** Anti-icing additives that contain DiEGME are harmful if inhaled, swallowed, or absorbed through the skin and will cause eye irritation. DiEGME is also combustible. Before you use this material, refer to all of the safety information on the container.

**CAUTION:** It is extremely important to mix anti-ice additives with fuel correctly, because more concentration than recommended can cause damage to the fuel tanks, such as deterioration of protective primer and sealants and damage to O-rings and seals in the fuel system and engine compounds. Use only equipment that is recommended by the manufacturer to make sure that you get the correct proportion when you blend the anti-ice additives with the fuel.

**CAUTION:** Do not let the concentrated anti-ice additive come in contact with the airplane finish or fuel cell, as it can cause damage.

- A.** When you service fuel with anti-icing additives that contain Diethylene glycol monomethyl ether (DiEGME, MIL-I- 85470), remember that they are harmful if inhaled, swallowed, or absorbed through the skin, and will cause eye irritation. Also, they are combustible. Before you use this material, refer to all safety information on the container.
- B.** DiEGME is toxic under sustained exposure environments. When inhaled, DiEGME is primarily a central nervous system depressant, although various animal studies have revealed that acute inhalation overexposure may cause kidney injury. The primary symptoms of inhalation overexposure

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in confined or poorly ventilated areas include headache, drowsiness, blurred vision, weakness, lack of coordination, tremor, unconsciousness, and even death. When ingested (swallowed) in massive doses, DiEGME is reported to exhibit a narcotic action, but at lower dosage levels, death is delayed and is accompanied by lung edema (excessive serious fluid in lungs), slight liver injury and marked kidney injury. DiEGME is only mildly irritating to the eyes and skin; however, it can be readily absorbed through the skin in toxic amounts. Symptoms of overexposure due to skin absorption are essentially the same as those outlined for inhalation.

- C. In the event DiEGME contact is experienced, the following emergency and first aid procedures should be used.
  - (1) If DiEGME is inhaled, remove person to fresh air. If the person is not breathing, give artificial respiration, preferably mouth-to-mouth; however, if breathing is difficult, administer oxygen. Always call a physician.
  - (2) If ingested (swallowed), drink large quantities of water. Then induce vomiting by placing a finger far back into the throat. Contact a physician immediately. If vomiting cannot be induced, take victim immediately to the hospital or a physician. If victim is unconscious or in convulsions, take victim immediately to the hospital or a physician. Do not induce vomiting or give anything by mouth to an unconscious person.
  - (3) If eye or skin contact is experienced, flush with plenty of water (use soap and water for skin) for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Thoroughly wash contaminated clothing and shoes before reuse.
- D. Additional antistatic and biocidal protection may be provided using approved products. Refer to the Tools, Equipment and Materials section for approved manufacturers. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for concentration levels of these products.

## 5. Fuel Additive Procedures

- A. Strict adherence to recommended preflight draining instructions will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.
- B. One exception to this can be encountered when operating under the combined effect of: 1) use of certain fuels, with 2) high humidity conditions on the ground 3) followed by flight at high altitude and low temperature. Under these unusual conditions small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel system.
- C. While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.
- D. Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions, it is acceptable to add isopropyl alcohol or Diethylene glycol monomethyl ether (DiEGME) compound to the fuel supply.
- E. The introduction of alcohol or DiEGME compound into the fuel gives two distinct effects: 1) it absorbs the dissolved water from the gasoline and 2) alcohol has a freezing temperature depressant effect.
- F. Alcohol which meets specification MIL-F-5566 or Federal Specification TT-I-735 and has a maximum water content not exceeding 0.4 percent by volume, may be used. If used, it is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.
- G. The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To ensure proper mixing, the following is recommended:
  - (1) For best results the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
  - (2) An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2 to 3 gallon capacity) and then transfer this mixture to the tank prior to the fuel operation.

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- H. Diethylene glycol monomethyl ether (DiEGME) compound in compliance with MIL-I-85470, if used, must be carefully mixed. Refer to Pilot's Operating Handbook And FAA Approved Airplane Flight Manual for fuel/DiEGME mixing ratios.
- I. Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a concentration tester. It is imperative that the technical manual for the tester be followed explicitly when checking the additive concentration.

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**ENGINE OIL - SERVICING**

**1. General**

- A. This section provides instructions to examine and change the engine oil.

**2. Oil Change Intervals**

**NOTE:** An inspection of the filter can aid in the detection of premature engine wear. Refer to Lycoming Service Bulletin 480D or latest revision.

A. Oil Change Intervals.

- (1) Airplanes are delivered from the factory with aviation grade mineral oil conforming to SAE J1966. During the first 25 hours of engine operation, it may be necessary to add oil. Use an aviation grade mineral oil of the recommended viscosity conforming to SAE J1966. After the first 25 hours, drain the engine oil and change the filter. Fill the oil sump with aviation grade mineral oil of the recommended viscosity, conforming to SAE J1966. Use it until a total of 50 hours of engine operation has occurred or oil consumption has stabilized. Then the sump must be drained and ashless dispersant oil conforming to SAE J1899, must be added to the engine.

**NOTE:** The turbocharged engines use only ashless dispersant oil conforming to SAE J1899, even during the engine break-in period.

- (2) For other engine change intervals, refer to Chapter 5, Inspection Time Limits.

**3. Checking Engine Oil**

A. Engine Oil Checking Procedures. Refer to Chapter 71, Engine - Description And Operation, Figure 1.

- (1) Five to ten minutes after the engine has been stopped, exam the engine oil with the dipstick . The airplane must be in a level position as much as possible for the best indication.  
(2) Open the engine oil door on the upper cowl.  
(3) Remove the dipstick from the engine and wipe down with a clean cloth.  
(4) Insert the dip stick fully and remove.  
(5) Exam the oil level on the dipstick.  
(6) If the oil is low, add the correct quantity and viscosity of aviation grade engine oil.

**NOTE:** The airplane may be operating with SAE J1966 (straight mineral oil) during the initial break-in period or after an overhaul. After the break-in period, use a ashless dispersant oil conforming to SAE J1899. Make sure the proper oil type is used when servicing the engine.

- (7) Insert the dipstick in the filler tube and do a check for correct seating.  
(8) Close the engine oil door.

**4. Changing Engine Oil**

A. Oil Changing Procedures. Refer to Chapter 71, Figure 1 Engine - Description And Operation.

**NOTE:** The nose of the airplane must be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump.

- (1) Operate engine until oil temperature is at a normal operating temperature.

**NOTE:** Normal operating temperature is within the green arc of the oil temperature gage. The engine oil must be drained while the engine is still warm.

- (2) Shut off engine and remove the upper and lower cowl to get access to the oil drain plug and external oil filter. Refer to Chapter 71, Cowling - Maintenance Practices.

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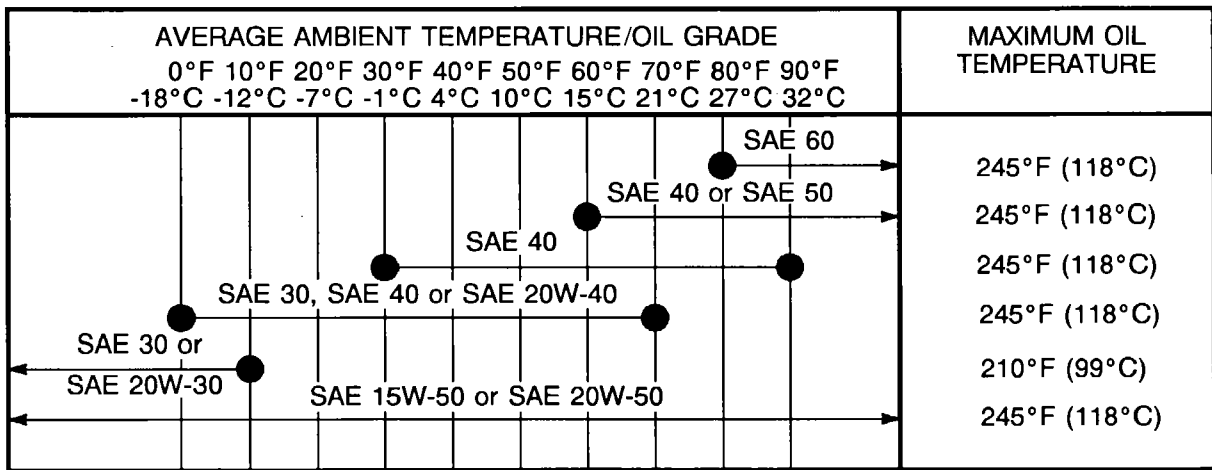
**WARNING: Avoid skin contact with engine oil. Any engine oil that inadvertently gets on the skin should be immediately removed.**

- (3) Remove and discard the wire from the drain plug.
- (4) Remove the drain plug and let the oil drain into an applicable container.
- (5) After the engine oil has drained, install and safety the drain plug with wire. Refer to the Lycoming SSP-1776 Table of Limits or latest revision, for torque requirements and refer to Chapter 20, Safetying - Maintenance Practices.
- (6) Remove the suction screen from the oil sump.
  - (a) Do an inspection for metal particles.
    - 1 If metal content is shown, keep the material for identification. Additional investigation will be required to determine the source of the metal and possible need for corrective maintenance. Refer to Lycoming SSP500 (or latest revision) and contact a Textron Lycoming representative.
  - (b) Install the suction screen with a new gasket. Refer to the Lycoming SSP-1776 Table of Limits or latest revision, for torque requirements.
  - (c) Safety the suction screen with wire. Refer to Chapter 20, Safetying - Maintenance Practices.
- (7) Remove the external oil filter.
  - (a) Open the filter can and check the oil from the filter for signs of metal in the filter.
  - (b) Carefully remove and unfold the paper element. Examine the material in the filter.
    - 1 If metal content is shown, keep the material for identification. Additional investigation will be required to determine the source of the metal and possible need for corrective maintenance. Refer to Lycoming SSP500 and contact a Textron Lycoming representative.
  - (c) Install a new external oil filter.
  - (d) Safety the oil filter with wire. Refer to Chapter 20, Safetying - Maintenance Practices.
- (8) Fill the engine oil sump through the filler tube. Use the correct grade and quantity of oil. Refer to Replenishing - Description and Operation for oil quantity. Refer to Figure 301 for oil grade verses temperature chart.
- (9) Install the dipstick and make sure proper seating on the filler tube.
- (10) Operate the engine until the normal operating temperature is reached.
- (11) Shut down the engine and do a leak check.

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SPECIFIED AVIATION GRADE OIL:



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Temperature Versus Oil Viscosity  
 Figure 301 (Sheet 1)

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**INDUCTION AIR FILTER - SERVICING**

**1. General**

- A. The induction air filter keeps dust and dirt from entering the induction system. The value of maintaining the air filter in a good clean condition can never be over stressed. More engine wear is caused through the use of a dirty or damaged air filter than is generally believed. The frequency with which the filter should be removed, inspected, and cleaned will be determined primarily by airplane operating conditions. Under extremely dusty conditions, daily servicing of the filter may be required.

**2. Air Filter Servicing**

- A. The CA3717 Induction Air Filter should be serviced at 50 hours, is life limited and must be replaced at 100 hours. The P198290 Induction Air Filter should be serviced at 50 hours, is life limited and must be replaced at 500 hours. (Refer to Chapter 5, Inspection Time Limits.)

**B. Servicing Procedures.**

- (1) To service the CA3717 Air filter:
- (a) Remove filter from airplane. If damaged or split, replace filter. If filter is in serviceable condition, proceed with following steps.
  - (b) Clean filter by blowing with compressed air from direction opposite of normal air flow.
  - (c) Ensure air box is clean and free of debris before installing filter.
  - (d) Install filter at entrance to air box.
- (2) To service the P198290 Air filter:
- (a) Remove the filter from the airplane.

**NOTE:** Use care to prevent damage to filter element when cleaning filter with compressed air.

- (b) Clean filter by blowing with compressed air (not over 100 psi) from direction opposite of normal air flow. Arrows on filter case indicate direction of normal air flow.
- (c) Check bonding of the paper pleats to the face screen. The bonding holds the paper pleats in place and if broken, the pleats are free to shift which can impair filtration. A face screen that is loose or gapping away from the paper pleats is indicative of broken bonding and is cause to replace the filter element.

**CAUTION:** Do not use solvent or cleaning fluids to wash filter. Use only a water and household detergent solution when washing the filter.

- (d) After cleaning as outlined in step "b", the filter may be washed, if necessary, in a solution of warm water and a mild household detergent. A cold water solution may be used.

**NOTE:** The filter assembly may be cleaned with compressed air a maximum of 30 times or it may be washed a maximum of 20 times. A new filter must be installed after using 500 hours of engine operating time or one year, whichever should occur first. However, a new filter must be installed anytime the existing filter is damaged. A damaged filter may have sharp or broken edges in the filtering panels which would allow unfiltered air to enter the induction system. Any filter that appears doubtful, shall have a new filter installed in its place.

- (e) After washing, rinse filter with clear water until rinse water draining from the filter is clear. Allow water to drain from filter and dry with compressed air (not over 100 psi).

**NOTE:** The filtering panels of the filter may become distorted when wet, but they will return to their original shape when dry.

- (f) Be sure airbox is clean, and inspect filter. If filter is damaged, a new filter must be installed.

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- (g) Install filter at entrance to airbox with gasket on aft face of filter frame and with flow arrows on filter frame pointed in the correct (normal air flow) direction.



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**VACUUM SYSTEM FILTERS - SERVICING**

**1. General**

- A. The vacuum system contains two filters which require occasional servicing. The vacuum system central air filter is located behind the instrument panel, and the vacuum system relief valve filter is located in the engine compartment.

**NOTE:** Smoking in cabin will significantly decrease the vacuum system central air filter life. If air filter becomes sufficiently clogged to cause suction gage readings to drop below 4.6 in.Hg, air filter must be replaced regardless of time remaining until inspection/replacement.

**2. Central Air Filter Servicing**

- A. The central air filter should be serviced using time intervals set forth in Chapter 5, Inspection Time Limits.
- B. Servicing Procedures (Refer to Figure 301).

**CAUTION:** Do not operate the vacuum system with air filter removed or with a vacuum line disconnected. Particles or dust or other foreign matter may enter the system and damage the vacuum operated instruments.

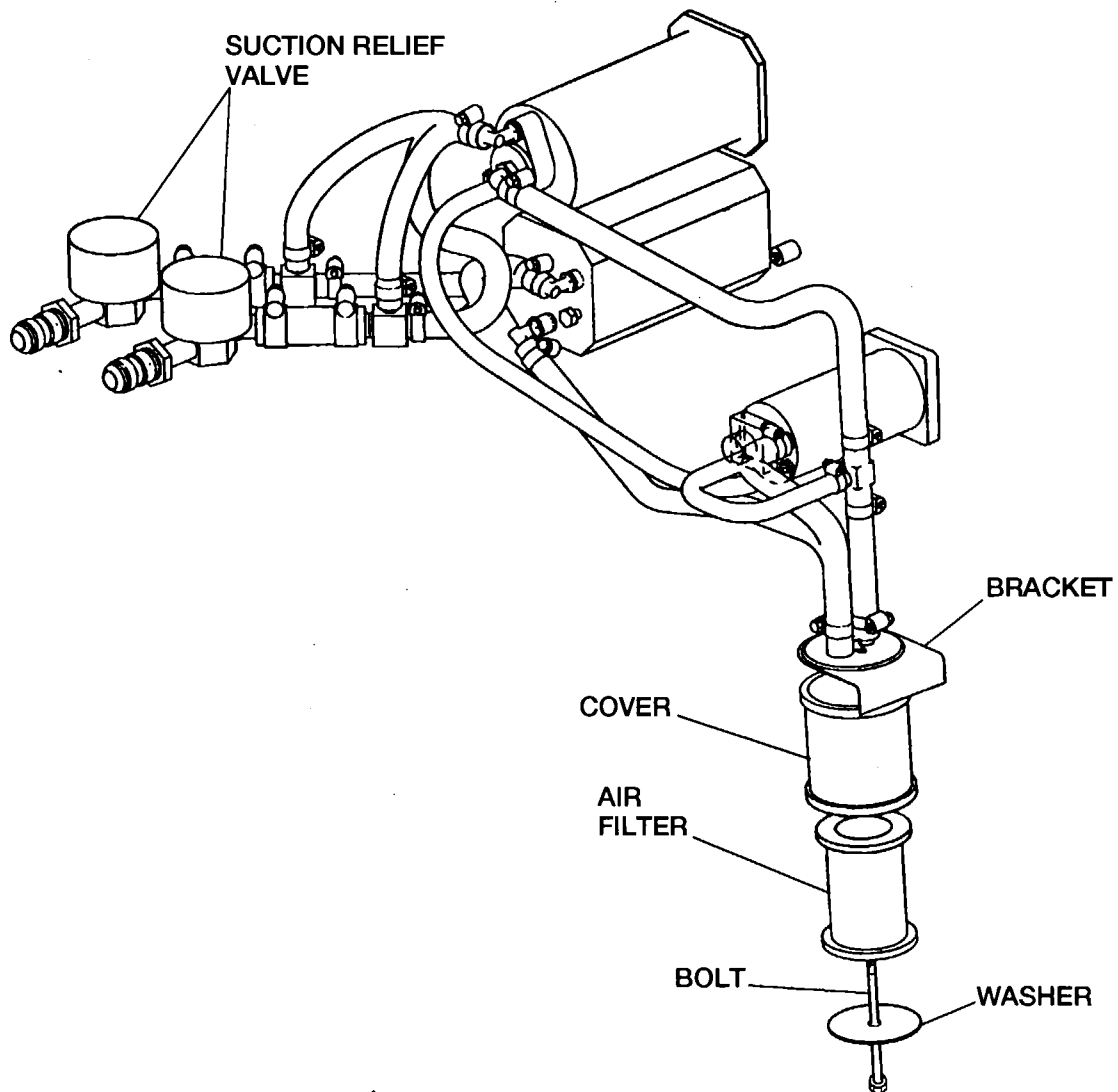
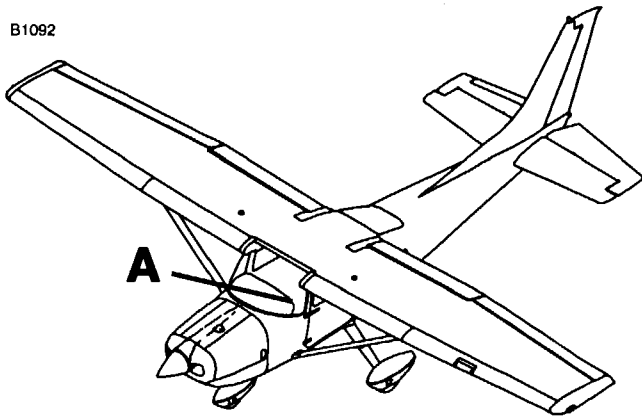
- (1) Locate air filter forward of instrument panel.
- (2) Remove bolt and washer securing air filter to cover.
- (3) Check for damage, deterioration and contamination. Clean (or replace) as required.
- (4) Install air filter in cover and secure using bolt and washer.

**3. Vacuum System Relief Valve Filter**

- A. The relief valve filter should be serviced using time intervals set forth in Chapter 5, Inspection Time Limits.

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**DETAIL A**

Vacuum System Air Filter - Servicing  
Figure 301 (Sheet 1)

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070T6009

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**BATTERY - SERVICING**

**1. General**

- A. This procedure provides instructions for adding water to the battery. For testing, charging and maintenance on the battery, refer to Chapter 24, Battery - Maintenance Practices.

**2. Battery Servicing**

- A. The battery should be serviced according to time limits set forth in Chapter 5, Inspection Time Limits.
- B. Battery servicing involves adding distilled water to maintain the electrolyte even with the horizontal baffle plate at the bottom of the filler holes, checking the battery cable connections, and neutralizing and cleaning off any spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and water to neutralize electrolyte or corrosion. Follow with a thorough flushing with a wire brush, then coat with petroleum jelly before connecting. The battery box should also be checked and cleaned if any corrosion is noted. Distilled water, not acid or "rejuvenators" should be used to maintain electrolyte level. Inspect the battery in accordance with time limits spelled out in Chapter 5, Inspection Time Limits.

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**TIRES - SERVICING**

**1. General**

- A. Servicing the tire by maintaining correct inflation pressure is the most important job in any tire preventative maintenance program. Improper inflation pressure causes uneven tread wear.
- (1) Under inflation, indicated by excessive wear in the shoulder area, is particularly damaging. It increases the chance of bruising sidewalls and shoulders against rim flanges. In addition, it shortens tire life by permitting excessive heat buildup.
  - (2) Over inflation is indicated by excessive wear in the center of the tire. This condition reduces traction, increases tire growth and makes treads more susceptible to cutting.

**2. Safety Precautions and Notes**

- A. Safety Precautions.
- (1) Tire should be allowed to cool before attempting to service.

**WARNING: The tendency of a bursting tire is to rupture along the bead. Standing in any position in front of either bead area could cause injury if the tire should burst.**

- (2) Personnel should stand at a 90-degree angle to the axle along the centerline of the tire during servicing.

**CAUTION: Applying a tire sealant to the tire may cause wheel corrosion.**

- (3) The use of tire sealant is not recommended.

B. Notes.

- (1) A tube type tire that has been freshly mounted and installed should be closely monitored during the first week of operation, ideally before every takeoff. Air trapped between the tire and the tube at the time of mounting could seep out under the bead, through sidewall vents or around the valve stem, resulting in an under inflated assembly.
- (2) The initial stretch or growth of a tire results in a pressure drop after mounting. Consequently, tires should not be placed in service until they have been inflated a minimum of 12 hours, pressures rechecked, and tires reinflated if necessary.
- (3) Inaccurate tire pressure gages are a major cause of improper inflation pressures. Ensure gages used are accurate.

**3. Tire Servicing**

- A. Check tire pressure regularly.
- (1) Tire pressure should be checked when tire is cold (at least 2 or 3 hours after flight) on a regular basis. Tire pressure should be checked prior to each flight when practical.
  - (2) When checking tire pressure, examine tires for wear, cuts, and bruises. Remove oil, grease and mud from tires with soap and water.
- B. Use recommended tire pressure. Consult the table below.

**NOTE:** Recommended tire pressures should be maintained, especially in cold weather. Any drop in temperature of the air inside a tire causes a corresponding drop in air pressure.

**Main Gear Tire Type:**

6.00 x 6, 6-ply rated tire

**Pressure**

42 PSI (2895 pa)

**Nose Gear Tire Type:**

5.00 x 5, 6-ply rated tire

49 PSI(3378 pa)

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**4. Cold Weather Servicing**

A. Cold Weather Servicing.

- (1) Check tires for excessive deflation.

**NOTE:** Tire air pressure will decrease somewhat as the temperature drops, but excessive deflation could indicate cold weather leakage at the air valve. Avoid unnecessary pressure checks.

- (2) If it is necessary to pressure check tires in cold climates, always apply heat to air valves and surrounding areas before unseating valves.
- (3) Continue application of heat during reinflation to ensure air valve seal flexibility when valve closes.
- (4) Do not allow tires to stand in snow soaked with fuel, or on fuel covered ramp areas.
- (5) If tires become frozen to parking ramp, use hot air or water to melt ice bond before attempting to move airplane.

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**SCHEDULED SERVICING - DESCRIPTION AND OPERATION**

**1. General**

- A. This section provides instructions necessary to carry out scheduled servicing as well as internal/external cleaning. It also includes instructions for lubricating specific points identified in periodic inspection and/or preventive maintenance programs. This section does not include lubrication procedures required for the accomplishment of maintenance practices.

**2. Description**

- A. This section is subdivided to provide maintenance personnel with charts, text and illustrations to prevent confusion. Also included in this section is a table containing a list of lubricants.
- (1) The subdivisions are separated according to airplane systems. This aids maintenance personnel in locating service information.

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**LUBRICANTS - DESCRIPTION AND OPERATION**

**1. General**

- A. This section is designed to assist the operator in selecting recommended lubricants. For best results and continued trouble free service, use clean and approved lubricants.
- B. For a list of recommended lubricants, refer to Recommended Lubricants Table.

**2. Lubrication Service Notes**

- A. Lubricant Application.
  - (1) Cleanliness is essential to good lubrication. Lubricants and dispensing equipment must be kept clean. Use only one lubricant in a grease gun or oil can.
  - (2) Store lubricants in a protected area. Containers should be closed at all times when not in use.
  - (3) Wipe grease fittings and areas to be lubricated with clean, dry cloths before lubricating.
  - (4) When lubricating bearings which are vented, force grease into fitting until old grease is extruded.
  - (5) After any lubrication, clean excess lubricant from all but actual working parts.
  - (6) All sealed or prepacked antifriction bearings are lubricated with grease by the manufacturer and require no further lubrication.
  - (7) Friction bearings of the porous, sintered- type are prelubricated. An occasional squirt can oiling of such bearings with general purpose oil (MIL-L-7870) extends its service life.
  - (8) Lubricate unsealed pulley bearings, rod ends, pivot end hinge points and any other friction point obviously needing lubrication, with general purpose oil (MIL-L- 7870).
  - (9) Paraffin wax rubbed on seat rails will ease sliding the seats fore and aft.
  - (10) Do not lubricate roller chains or cables except under sea coast conditions. Wipe with a clean, dry cloth.
  - (11) All piano hinges may be lubricated using (PG) powered graphite (SS-G-659) when assembly is installed.
  - (12) Lubricate door latching mechanism with MIL-G-81322 general purpose grease, applied sparingly to friction points, if binding occurs. No lubrication is recommended on the rotary clutch.

**3. Definition of "As Needed"**

- A. In the following sections, time requirements for lubrication are presented in one of two formats. When specific time intervals for lubrication exist, those intervals are defined in Chapter 5, Inspection Time Limits. When no time limit has been established, lubrication is on an "as needed" basis. This leaves much of the decision making process in the hands of the airframe and powerplant mechanic, who has been trained to make these types of decisions.
- B. In an effort to standardize the decision making process, the following guidelines may be considered to determine if a component needs lubrication. Any one of the following conditions would indicate a need for lubrication, and may additionally indicate the need for inspection:
  - (1) A visual inspection which indicates dirt or wear residue near the movement contact area.
  - (2) An audible inspection which indicates squeaks, grinding or other abnormal sounds.
  - (3) A tactile (touch and feel) inspection which indicates jerky or restricted movement throughout portions of the travel range.

**4. Recommended Lubricants Table**

**NOTE:** Equivalent substitutes may be used for the following items:

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Table 1. Recommended Lubricants

<b>SYMBOL</b>	<b>PROCURE- MENT SPECI- FICATION</b>	<b>LUBRICANT DESCRIPTION</b>	<b>PRODUCT PART NUMBER</b>	<b>SUPPLIER</b>
GR	MIL-G-81322	Grease, wide temperature range.	Mobil grease 28	Mobil Oil Corp. 150 E. 42nd Street New York, NY 10017
			Royco 22C	Royal Lubricants Co., Inc. River Road East Hanover, NJ 07936
			Aeroshell grease 22	Shell Oil Co. One Shell Plaza Houston, TX 77001
GH	MIL-G-23827	Grease, aircraft and instrument, gear and actuator screw.	Southwest Grease 16215	Southwest Petro- Chem, Inc. Division - Witco 1400 S. Harrison Olathe, KS 66061
			Aeroshell grease 7	Shell Oil Co.
			Royco 27A	Royal Lubricants Co., Inc.
			Supermil grease No. A72832	Amoco Oil Co. 200 East Randolph Dr. Chicago, IL 60601
			Braycote 6275	Burmah-Castrol, Inc. Bray Products Div. 16815 Von Karman Ave. Irving, CA 92714
			Castrollease A1	Burmah-Castrol, Inc.
			TG-11900 low temp grease EP	Southwest Petro-Chem, Inc.
			Brayco 885	Brumah-Castrol, Inc.
OG	MIL-L-7870	Oil, general purpose	Royco 363	Royal Lubricants Co., Inc.
			Petrotect 7870A	Penreco 106 South Main Street Butler, PA 16001
			Windsor lube L-1018	Anderson Oil & Chemical Co., Inc. Portland, CT 06480
			Octoil 70	Octagon Process, Inc. 596 River Road Edgewater, NJ 07020



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Table 1. Recommended Lubricants (continued)

SYMBOL	PROCURE- MENT SPECI- FICATION	LUBRICANT DESCRIPTION	PRODUCT PART NUMBER	SUPPLIER
PL	VV-P-236	Petrolatum technical		Available Commercially
PG	SS-G-659	Powdered Graphite		Available Commercially
GL	MIL-G-21164	High and Low Temperature Grease	Everlube 211-G Moly Grease	E/M Corporation Box 2200 Highway 52 N.W. West Lafayette, IN 47906
			Royco 64	Royal Lubricants Co., Inc.
GP	NONE	Number 10 weight, nondetergent oil		Available Commercially
OL	VV-L-800	Light Oil		Available Commercially
		Grease, general purpose	U000992	Cessna Aircraft Co. 1 Cessna Blvd. Wichita, Ks 67277-7704

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**BATTERY TERMINALS - SERVICING**

**1. General**

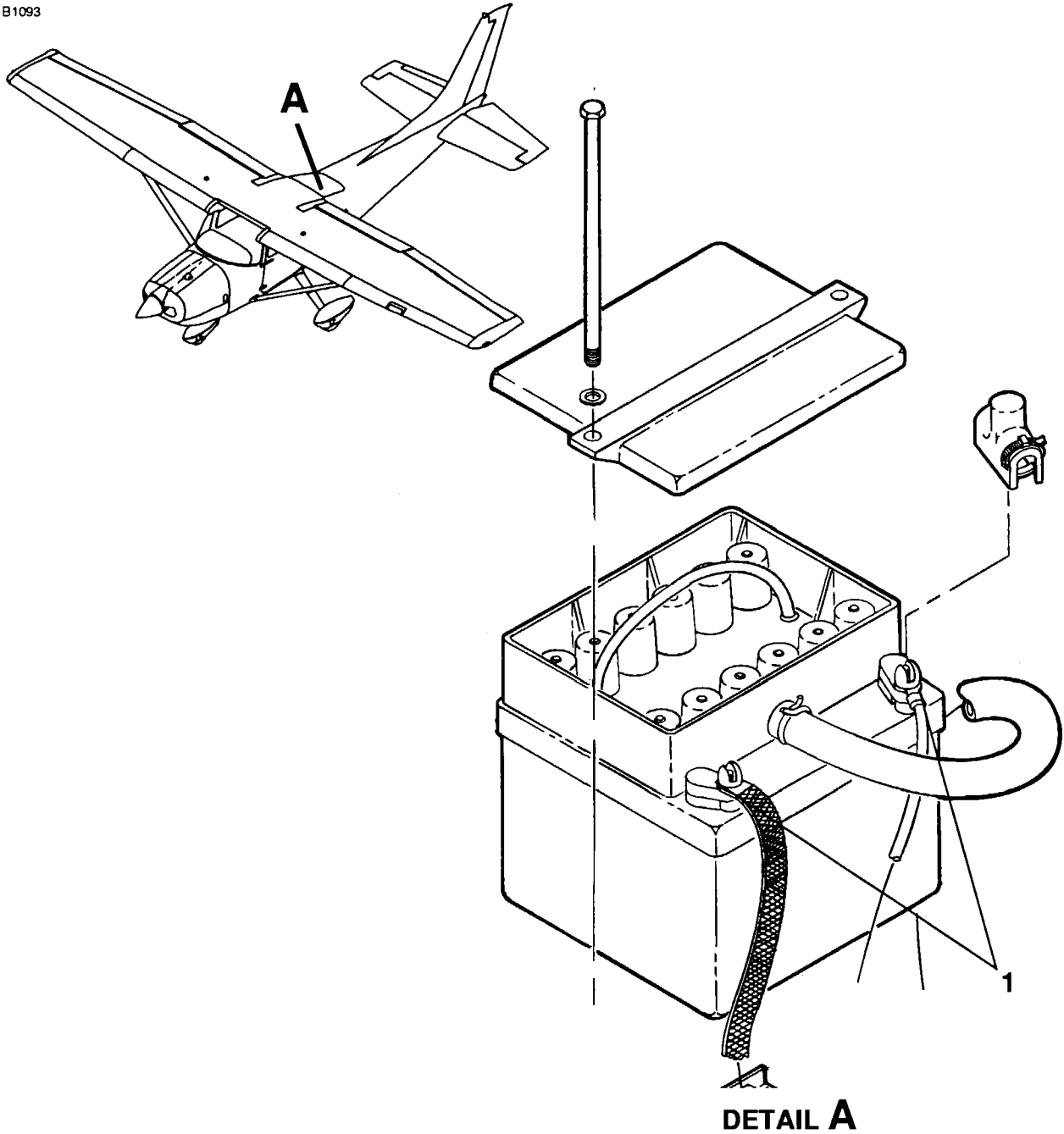
- A. It is recommended the airplane be secured in an area free of contamination from sand, dust or other environmental conditions that may contribute to improper lubrication practices.

**2. Battery Terminal Lubrication**

- A. Battery terminals should be lubricated when cables are installed to terminals.
- B. Refer to Figure 301 for lubrication requirements of the battery terminals.

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ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	BATTERY TERMINALS	PL	HAND
PL - GREASE, PETROLATUM - VV-P-236			

0710T1001  
0718T3002

Battery Terminals Lubrication  
Figure 301 (Sheet 1)

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**LANDING GEAR AND PARKING BRAKE - SERVICING**

**1. General**

- A. It is recommended that the airplane be secured in an area free of contamination from sand, dust or other environmental conditions that may contribute to improper lubrication practices.

**2. Wheel Bearing Lubrication**

- A. Wheel bearings should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.

**WARNING: When cleaning wheel bearings, use low-pressure shop air to dry bearings. Do not spin bearing cones with compressed air. Dry bearings without lubrication may explode at high rpm.**

- B. Refer to Figure 301 for lubrication requirements of the wheel bearings.

**3. Nose Gear Torque Link Lubrication**

- A. Nose gear torque links should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- B. Refer to Figure 301 for lubrication requirements of the nose gear torque links.

**4. Shimmy Dampener Pivots Lubrication**

- A. Shimmy dampener pivots should be lubricated on an "as needed" basis and when assembled or installed.
- B. Refer to Figure 301 for lubrication requirements of the shimmy dampener pivots.

**5. Steering System Needle Bearing Lubrication**

- A. Steering system needle bearings should be lubricated on an "as needed" basis and when assembled or installed.
- B. Refer to Figure 301 for lubrication requirements of the steering system needle bearings.

**6. Nose Gear Steering Pushrods Lubrication**

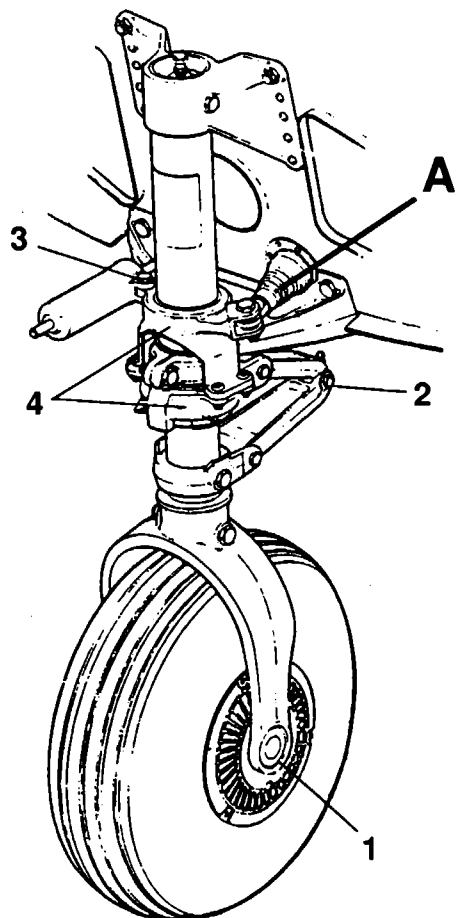
- A. Nose gear steering pushrods should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- B. Refer to Figure 301 for lubrication requirements of the nose gear steering pushrods.

**7. Parking Brake Handle Shaft Lubrication**

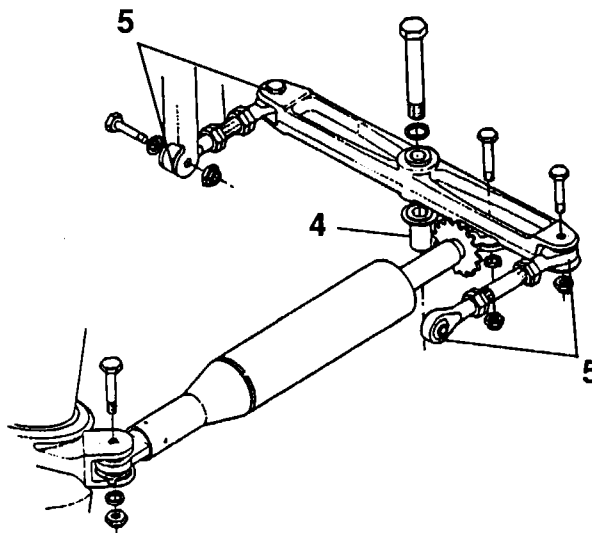
- A. The parking brake handle shaft should be lubricated on an "as needed" basis and when assembled or installed.
- B. Refer to Figure 302 for lubrication requirements of the parking brake handle shaft.

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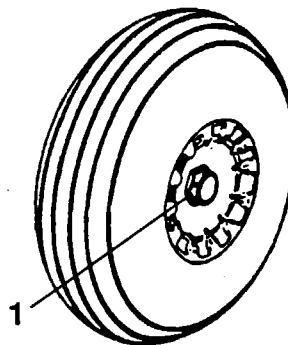
B1094



NOSE GEAR



DETAIL A



MAIN GEAR

ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	WHEEL BEARINGS	GR	HAND
2	TORQUE LINKS	GR	GUN
3	SHIMMY DAMPER PIVOTS	GR	OIL CAN
4	STEERING SYSTEM NEEDLE BEARINGS	GR	HAND
5	NOSE GEAR STEERING PUSHRODS	OG	OIL CAN

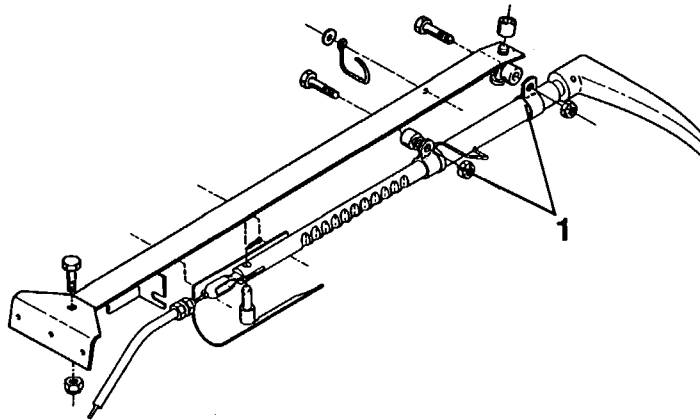
GR - GREASE, GENERAL PURPOSE - (MIL-G-81322)  
 OG - OIL, GENERAL PURPOSE - (MIL-L-7870)

0742T1001  
 A0742T1002  
 0741T1001

Landing Gear Lubrication  
 Figure 301 (Sheet 1)

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ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	PARKING BRAKE HANDLE SHAFT	OG	OIL CAN

OG - OIL, GENERAL PURPOSE - (MIL-L-7870)

0741T1002

Parking Brake Handle Shaft Lubrication  
Figure 302 (Sheet 1)

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**FLIGHT CONTROLS - SERVICING**

**1. General**

- A. It is recommended that the airplane be secured in an area free of contamination from sand, dust or other environmental conditions that may contribute to improper lubrication practices.

**2. Aileron System Lubrication**

- A. Bearings in the control column should be lubricated on an "as needed" basis and when assembled or installed.
- B. Piano hinges on the ailerons should be lubricated on an "as needed" basis and when assembled or installed.
- C. Needle bearings on the aileron bellcrank should be lubricated on an "as needed" basis and when assembled or installed.
- D. Rod end bearings on the aileron bellcrank should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- E. Refer to Figure 301 for lubrication requirements of the aileron system.

**3. Flap System Lubrication**

- A. Flap motor screw jack threads should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits. To lubricate the jack screw, operate flaps to full down position, clean screw threads with solvent rag, and dry with compressed air.

**NOTE:** It is not necessary to remove actuator from airplane to clean or lubricate threads.

- B. Needle bearings should be lubricated on an "as needed" basis and when assembled or installed.
- C. Refer to Figure 302 for lubrication requirements of the flap system.

**4. Elevator System Lubrication**

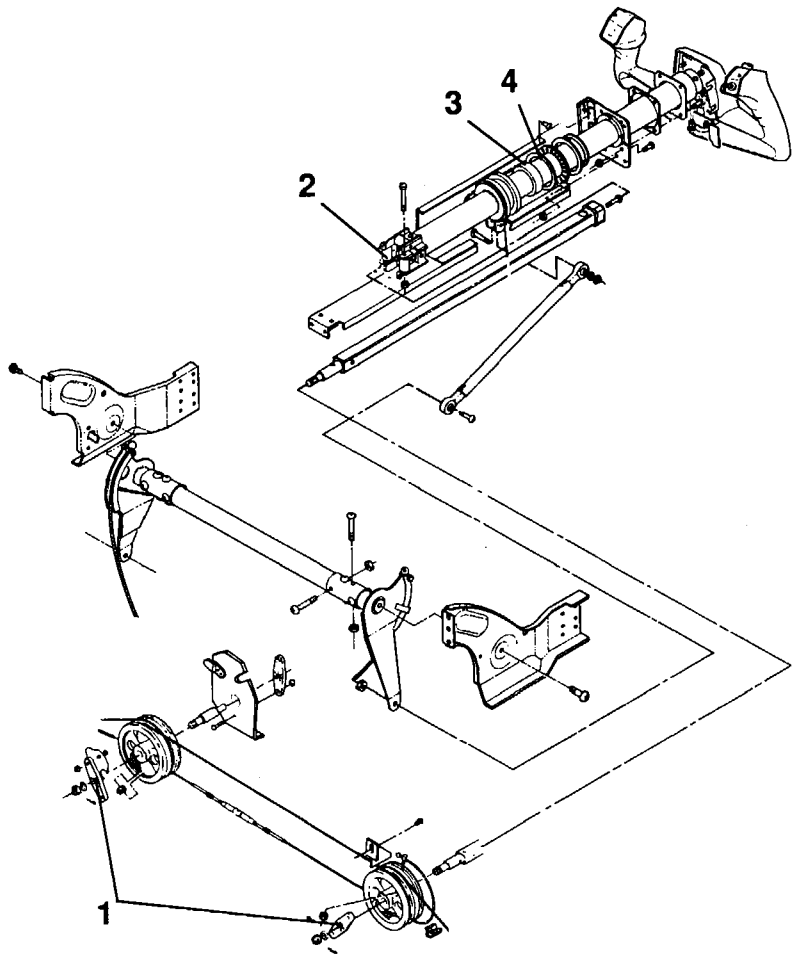
- A. Bearings in the trim wheel controls should be lubricated on an "as needed" basis and when assembled or installed.
- B. The elevator down spring link rub strip should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- C. Trim tab piano hinges should be lubricated on an "as needed" basis and when assembled or installed.
- D. The trim tab actuator should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- E. Refer to Figure 303 for lubrication requirements of the elevator system.

**5. Rudder System Lubrication**

- A. The rudder bar bearing block halves should be lubricated on an "as needed" basis and when assembled or installed.
- B. The oilite bearings in the rudder bar ends and linkage point pivots should be lubricated using time intervals set forth in Chapter 5, Inspection Time Limits.
- C. Refer to Figure 304 for lubrication requirements of the rudder system.

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ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	NEEDLE BEARINGS	GR	HAND
2	NEEDLE BEARING ROLLERS	GR	HAND
3	NEEDLE BEARING	GR	HAND
4	THRUST BEARING	GR	HAND

GR - GREASE, GENERAL PURPOSE - (MIL-G-81322)

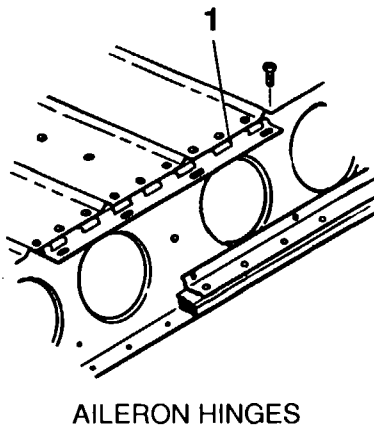
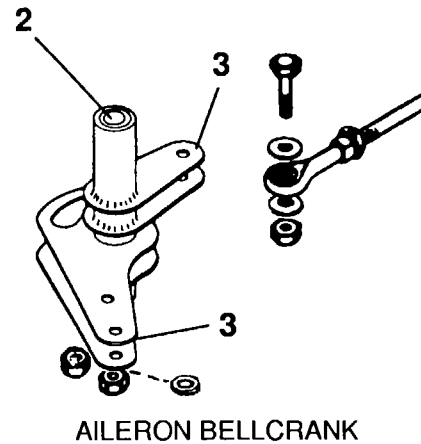
0724T1001

Aileron System Lubrication  
Figure 301 (Sheet 1)



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ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	AILERON PIANO HINGES	PG	SYRINGE
2	BELLCRANK NEEDLE BEARINGS	GR	HAND
3	ROD END BEARINGS	OG	OIL CAN

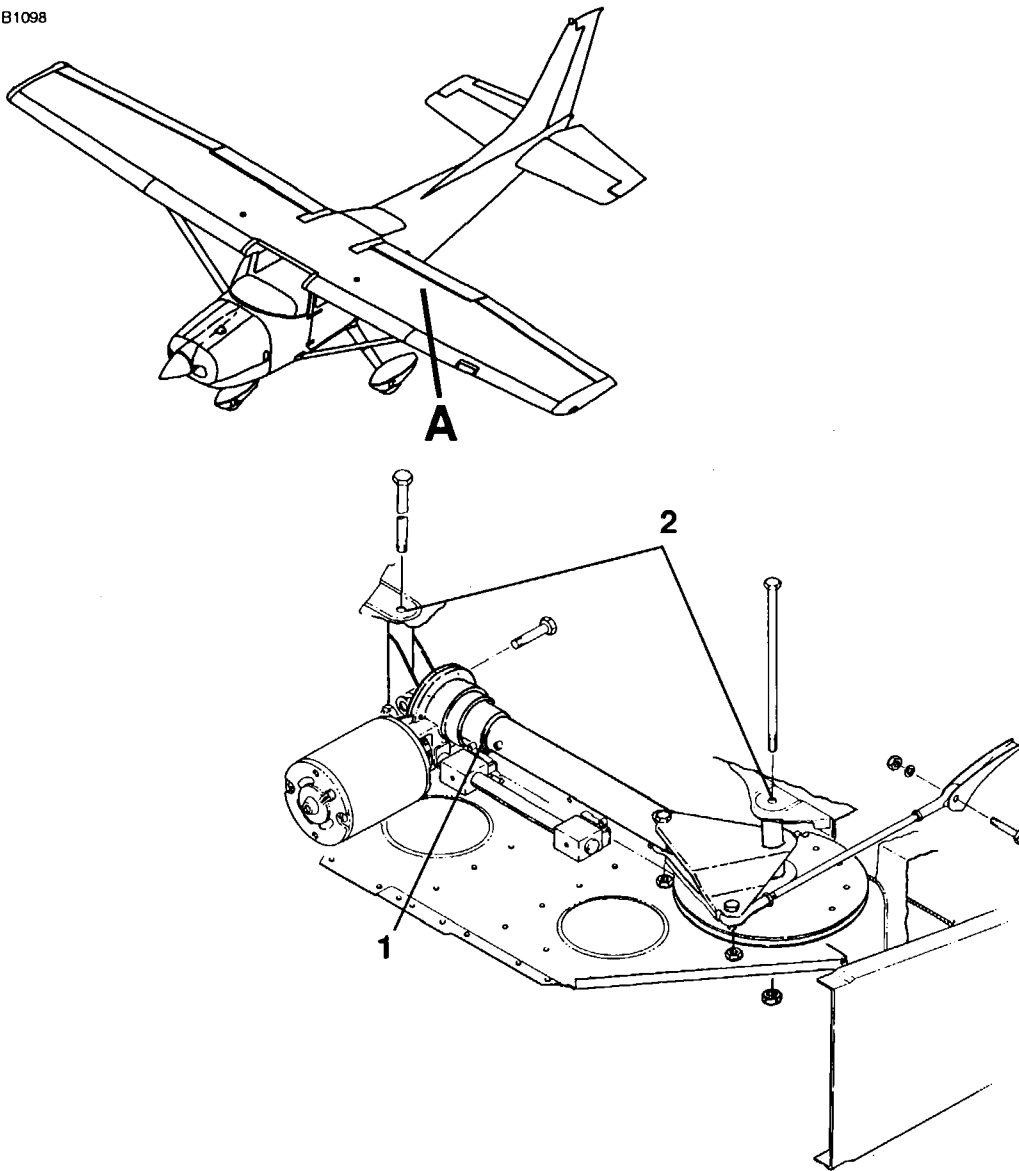
PG - POWDERED GRAPHITE (SS-G-659)  
 GR - GREASE, GENERAL PURPOSE - (MIL-G-81322)  
 OG - OIL, GENERAL PURPOSE - (MIL-L-7870)

0724T1002  
 0724T1003

Aileron System Lubrication  
 Figure 301 (Sheet 2)

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**DETAIL A**

ELECTRIC FLAP DRIVE MECHANISM

ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	FLAP MOTOR SCREW JACK THREADS	GP	OIL CAN
2	NEEDLE BEARINGS	GR	HAND

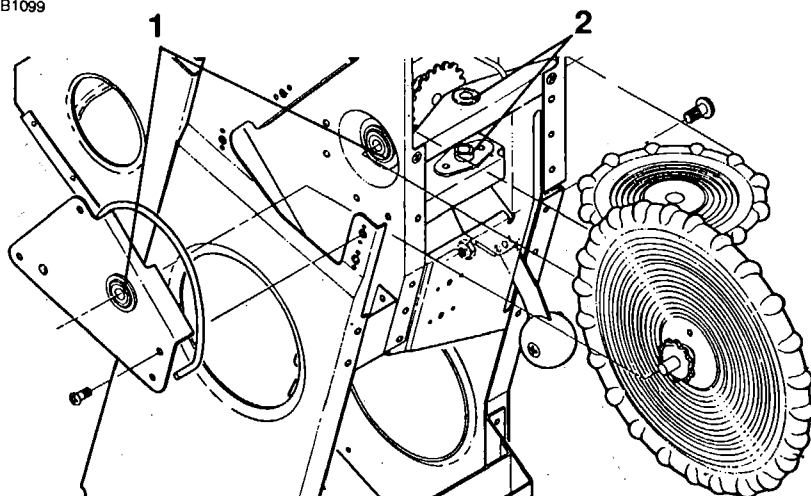
GP - OIL NO. 10-WEIGHT, NON-DETERGENT  
 GR - GREASE, GENERAL PURPOSE - (MIL-G-81322)

0718T1005

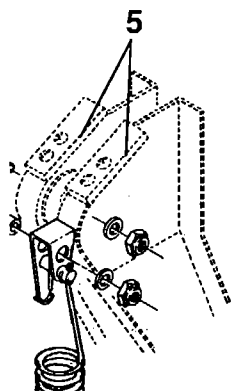
Flap System Lubrication  
 Figure 302 (Sheet 1)

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 MAINTENANCE MANUAL

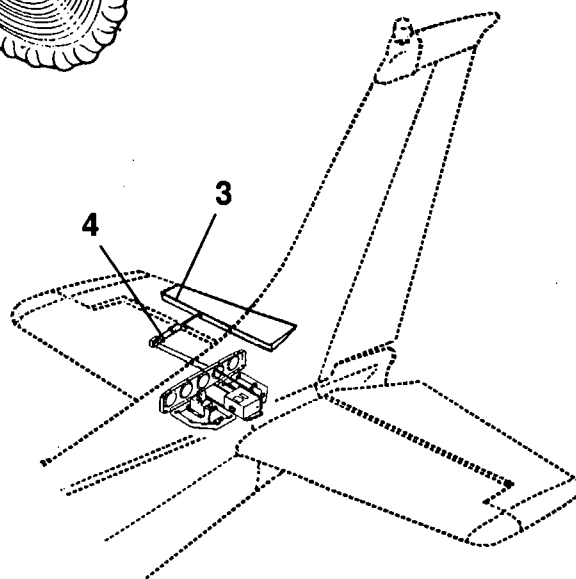
B1099



TRIM WHEEL



ELEVATOR RUB STRIP



ACTUATOR AND TRIM TAB

ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	NEEDLE BEARINGS	GR	HAND
2	OILITE BEARINGS	OG	OIL CAN
3	TRIM TAB PIANO HINGES	PG	SYRINGE
4	TRIM TAB ACTUATOR	GL	HAND
5	ELEVATOR DOWN SPRING LINK RUB STRIP	GR	HAND

GR - GREASE, GENERAL PURPOSE - (MIL-G-81322)

OG - OIL, GENERAL PURPOSE - (MIL-L-7870)

PG - POWDERED GRAPHITE (SS-G-659)

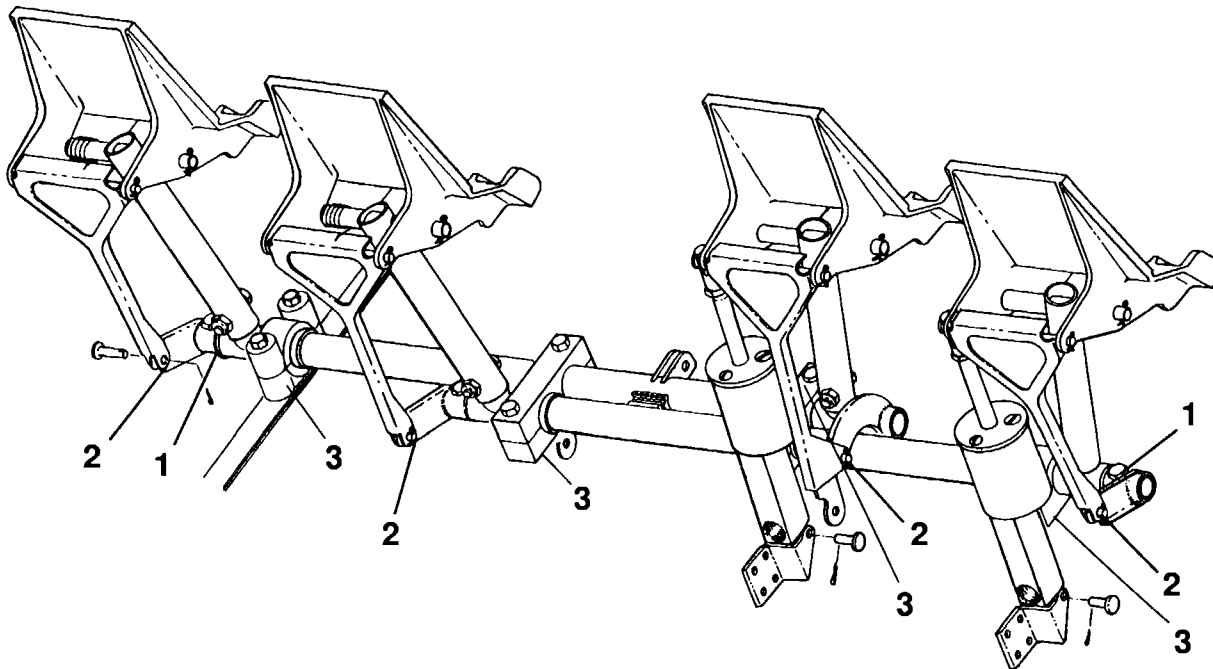
GL - GREASE, HIGH AND LOW TEMPERATURE (MIL-G-21164)

0718T4001  
 0734T1001  
 0734T1002

Elevator System Lubrication  
 Figure 303 (Sheet 1)

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ITEM NUMBER	ITEM DESCRIPTION	LUBE TYPE	APPLICATION
1	OILITE BEARING (RUDDER BAR ENDS)	OG	OIL CAN
2	ALL LINKAGE PIVOT POINTS	OG	OIL CAN
3	BEARING BLOCK HALVES	OG	OIL CAN

OG - OIL, GENERAL PURPOSE - (MIL-L-7870)

0562T2002

Rudder Pedals Lubrication  
 Figure 304 (Sheet 1)

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**ENGINE CONTROL CABLES - SERVICING**

**1. General**

- A. It is recommended that the airplane be secured in an area free of contamination from sand, dust or other environmental conditions that may contribute to improper lubrication practices.

**2. Engine Control Cables Lubrication**

- A. All housed, pull-type, push-pull or vernier controls should have each outer housing lightly lubricated internally with VV-L-800 General Purpose Lube Oil.

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**HEATING AND VENTILATION CONTROL CABLES - SERVICING**

**1. General**

- A. It is recommended that the airplane be secured in an area free of contamination from sand, dust or other environmental conditions that may contribute to improper lubrication practices.

**2. Heating And Ventilation Control Cables Lubrication**

- A. All housed, pull-type, push-pull or vernier controls should have each outer housing lightly lubricated internally with VV-L-800 General Purpose Lube Oil.

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**AIRPLANE EXTERIOR - CLEANING/PAINTING**

**1. General**

- A. The airplane must be cleaned frequently to keep the external surface in good condition and to prevent corrosion. The painted area of the airplane must be polished at intervals to remove chalking paint and to make sure that it has a smooth, glossy finish.
- B. Use water and detergent when you clean the external surface of the airplane.

**2. Precautions**

- A. Obey all manufacturer instructions, warnings, and cautions about all cleaning agents and solvent compounds.
- B. Do not use silicone-based wax to polish the external surface of the airplane. Silicone-based wax, especially if buffed to a high shine, can help to cause the buildup of P-static.
- C. Do not park or keep the airplane in an area where it can come into direct contact with fluid or vapors from methanol, denatured alcohol, gasoline, benzene, xylene, methyl-propyl ketone, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaners, paint strippers, or other types of solvents.
- D. Do not leave sun visors against the windshield when not in use. The reflected heat from these items increases the temperature on the windshield. If solar screens are installed on the inside of the airplane, make sure that they are the silver, reflective type.
- E. Do not use a power drill motor or other powered device to clean, polish, or apply wax to surfaces.

**3. Preventive Maintenance**

- A. Keep all surfaces of the windshield and the windows clean.
- B. If necessary, apply wax to acrylic surfaces.
- C. Put a cover over all surfaces while the airplane is painted, the engine is cleaned, or other procedure is done that uses any type of solvent or chemical. Table 701 gives approved protective coatings to prevent solvent damage.

Table 701. Approved Protective Coatings

NAME	NUMBER	MANUFACTURER	USE
Spray	MIL-C-6799, Type 1, Class II	Commercially Available	Gives surfaces protection from solvents.
Masking Paper	WPL-3	Champion Intl. Corp. Forest Product Division 7785 Bay Meadows Way Jacksonville, FL 32256	Gives surfaces protection from solvents.
Poly-Spotstick	SXN	Champion Intl. Corp.	Gives surfaces protection from solvents.
Protex 40		Mask Off Company 345 Marie Avenue Monrovia, CA	Gives surfaces protection from solvents.

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**4. Windshield and Window Cleaners**

**CAUTION:** Do not use methanol, gasoline, denatured alcohol, benzene, xylene, acetone, carbon tetrachloride, fire extinguisher fluid, deicer fluid, lacquer thinner, or commercial or household glass window cleaner when you clean the windshield and windows of the airplane. These solvents will cause damage to the plastic.

Table 702. Windshield and Window Cleaners/Polishers

NAME	NUMBER	MANUFACTURER	USE
Mild soap or detergent (household type without abrasives)		Commercially Available	Cleans windshields and windows.
Aliphatic Naphtha Type II	Federal Specification TT-N-95	Commercially Available	Removes deposits which cannot be removed with mild soap solution on acrylic windshields and windows.
Turtle Wax (paste)		Commercially Available	Gives protection to acrylic windshields and windows.
Permatex Plastic Cleaner No. 403D	Federal Specification P-P-560	Permatex Company, Inc. Kansas City, KS 66115	Gives protection to acrylic windshields and windows.
Soft cloth (cotton flannel or cotton terry cloth)		Commercially Available	Applies and removes wax and cleaning agents.

**NOTE:** Equivalent substitutes can be used for the items given in Table 702.

**5. Cleaning Windshield and Windows**

**CAUTION:** Obey all the correct procedures when you touch and clean the windshield and windows of the airplane. If you do not obey the correct procedures, you can easily cause damage to the windshield and windows.

**CAUTION:** Do not use methanol, gasoline, denatured alcohol, benzene, xylene, acetone, carbon tetrachloride, fire extinguisher fluid, deicer fluid, lacquer thinner, or commercial or household glass window cleaner when you clean the windshield and windows of the airplane. These solvents will cause damage to the plastic.

- A. Refer to Table 702 for cleaning materials.
- B. Windshield Cleaning Procedures.
  - (1) Put the airplane inside a hanger or in a shaded area and let the surface of the airplane cool.
  - (2) Let clean water flow over the surface of the windshield. Use bare hands with no jewelry to feel and rub away any dirt or abrasive materials.



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- (3) Use a mild soap or detergent (such as dishwashing liquid) in water to clean the surface of the windshield. Use bare hands to rub the solution over the surface. A clean cloth can be used to apply the soap solution to the surface, but you must be very careful to prevent scratches.
- (4) On acrylic windshields and windows only, if the windshield and windows are still dirty after they are cleaned with a mild detergent, use Type II aliphatic naphtha as a cleaning agent. Apply the agent only with a soft, clean cloth. Make sure that the cloth is frequently folded to avoid scratching the windshield with any abrasive particles.
- (5) Flush the surface with clean water and dry with a clean cloth.

**6. Waxing and Polishing Windshield and Windows**

**CAUTION:** Do not use rain repellent on acrylic surfaces because it can cause damage.

**NOTE:** Windshields and windows must be cleaned before you apply wax. When you apply and remove wax and cleaning agents, use a soft, clean cloth.

- A. Refer to Table 702 for polishing materials.
- B. Hand polishing wax (or other materials that meet Federal Specification P-P-560) must be applied to acrylic surfaces. The wax has an index of refraction almost the same as transparent acrylic and masks any scratches on the windshield surface.

**7. Aluminum Surfaces**

- A. The aluminum surfaces of the airplane can be cleaned with water to remove dirt and can be cleaned with non-alkaline grease solvents to remove oil and/or grease. Household detergent soap powders are good cleaners, but must be used carefully, since some of them are strongly alkaline. Many good aluminum cleaners, polishes, and waxes are available from commercial suppliers of airplane products.

**8. Painted External Surfaces**

- A. The painted surfaces of the airplane can be cleaned with water and mild soap, followed by a rinse with water and dried with cloths or a chamois. Abrasive soaps or detergents which can cause corrosion or scratches must not be used. Remove oil and grease with a cloth that is moist with Stoddard solvent.

**NOTE:** For more information on the external paint finish, refer to Chapter 20, Exterior Finish - Cleaning/Painting.

- B. To seal any small surface chips or scratches and give protection from corrosion, you must regularly apply wax to the airplane with a good automotive wax, in accordance with the manufacturer's instructions. If the airplane is operated in a seacoast area or other salt water environment, it must be cleaned and wax must be applied more frequently to make sure that the surface has sufficient protection. Special care must be taken to seal around rivet heads and skin laps, which are the areas more susceptible to corrosion. A thicker layer of wax on the leading edges of the wings and tail and on the cowl nose cap and propeller spinner will help decrease the abrasion found in these areas. A new layer of wax will be necessary after you clean the airplane with soap solutions or after chemical deicing operations.

**9. Cleaning the Engine and Engine Compartment**

- A. Notes and Precautions.
  - (1) Clean the engine and engine accessories during each 100-hour inspection to remove oil, grease, salt corrosion, or other contamination that can conceal component problems. Also, clean regularly to help prevent engine problems.

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**WARNING:** Put on protective devices (rubber gloves, aprons, face shields, etc.) and work only in a well-ventilated area when you use solvents and cleaning agents. These materials and their fumes are poisonous.

**WARNING:** Do not smoke or have an open flame within 100 feet of the work area because it can cause a fire. Many solvents and cleaning agents are very flammable. Make sure that sufficient fire and safety equipment are available.

**NOTE:** If you use compressed air to apply solvent or to dry components, adjust the pressure to the lowest possible setting.

- (2) Use a stiff-bristle brush as an alternative to a steel brush if cleaning agents do not remove unwanted grease and contamination while flushing the area.

B. Cleaning Procedures.

- (1) Remove the engine cowl.
- (2) Carefully put a cover on the coupling area between the vacuum pump and the engine drive shaft so no cleaning agent or solvent can touch the coupling or seal.
- (3) Put a cover on the open end of the vacuum discharge tube.
- (4) If the engine has salt or corrosive chemical contamination, first flush the engine compartment with clean water.

**WARNING:** Do not use gasoline or other flammable materials to clean the engine compartment. If used, these materials can cause a fire.

**WARNING:** Do not try to clean an engine that is hot or in operation. This can cause a fire, serious injury, or death. Always stop the engine and let the engine cool before cleaning.

**CAUTION:** Do not let cleaning agents or water touch the openings on the starter, magnetos, alternator, or vacuum pump. This can cause damage to these engine components.

- (5) Apply the solvent or cleaning agent to the engine compartment. The solutions that follow (or their equivalent) can be used to satisfactorily clean the engine compartment:
  - (a) Stoddard Solvent (Specification P-D-680, Type II).
  - (b) Water alkaline detergent cleaner (MIL-C-25769 mixed 1 part cleaner, with 2 to 3 parts water and 8 to 12 parts Stoddard Solvent).
  - (c) Solvent-based emulsion cleaner (MIL-C-4361 mixed 1 part cleaner with 3 parts Stoddard Solvent).
- (6) After you apply the cleaning agent or solvent, flush the engine compartment with clean warm water.

**NOTE:** Cleaning agents must not be left on engine components for an extended period of time. Failure to remove them can cause damage to the components and cause more corrosion. For example, solvents and cleaning agents can easily cause damage to neoprene seals and silicone fire sleeves.

- (7) Fully dry the engine and engine accessories with compressed air.
- (8) Remove the cover from the coupling area.
- (9) Remove the cover from the vacuum discharge tube.

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- (10) If necessary, the engine cowl can be cleaned with the same cleaning agents, then flushed with water and dried with a soft, clean cloth. After you clean the engine, lubricate all the control arms and moving parts, as necessary.
- (11) Install the engine cowl.

**WARNING:** Make sure that the magneto switches are off, the throttle is closed, the mixture control is in the idle cutoff position, and the airplane is stable before you turn the propeller by hand. Do not stay within the arc of the propeller blades while you turn the propeller. If the engine accidentally starts, the propeller blades can cause serious injury or death.

- (12) Before you start the engine, turn the propeller by hand a minimum of four full revolutions.

**10. Propeller**

- A. Rub clean, lightweight oil onto the propeller with a soft, clean cloth to remove grass and bug stains. In salt water areas, the oil will also help prevent corrosion of the propeller.

**11. Tires and Wheels**

- A. Remove oil, grease, and mud from the tires and wheels with soap and water.

**12. Stabilizer Abrasion Boots**

- A. Stabilizer abrasion boots must be cleaned and examined regularly. Keep the boots clean and free from oil, grease, and other solvents which can cause damage to the rubber.

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**INTERIOR - CLEANING/PAINTING**

**1. General**

- A. This section recommends different types of cleaning materials and cleaning procedures for the interior of the airplane.

**WARNING: Do these cleaning operations in an area with good airflow. Use the applicable safety precautions for each cleaning material that you use.**

**2. Interior Cleaning Materials**

**NOTE:** Equivalent substitutes can be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Protectant	Son-Of-A-Gun	Commercially available	To protect and shine interior components (excluding fabric materials).
All-Purpose Cleaner	Fantastik	Commercially available	For general purpose cleaning of interior components.
Aliphatic Naphtha	TT-N-94	Commercially available	To remove tar, asphalt, and similar materials from interior components.
Rug Shampoo		Commercially available	To clean carpet.
Perchloroethylene Cleaning Solvent		Commercially available	To spot clean carpet and seats.
Household Ammonia		Commercially available	To clean seat fabric.
Household Vinegar		Commercially available	To clean seat fabric.
Rubbing Alcohol		Commercially available	To clean seat fabric.
Ivory Liquid (white or colorless)		Commercially available	To clean seat fabric.
Detergent	Cheer	Commercially available	To clean seat fabric.

**3. Cleaning Interior Panels**

- A. Clean interior panels (headliners, sidewalls, door panels, and similar surfaces) with mild detergent solutions or premixed commercial cleaners. Remove stubborn deposits with aliphatic naphtha. Make sure that cleaners are compatible with the interior of the airplane. If in doubt, apply a small amount of cleaner to an inconspicuous place and test for reaction and fading.

**4. Cleaning Carpet**

- A. The carpet is made of a polypropylene weave combined with a fire-retardant backing. The polypropylene provides inherent stain-resistant qualities and normally requires only a minimal amount of maintenance.
- B. If the carpet is soiled, it can be cleaned with commercially-available carpet cleaning products.

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**5. Cleaning Seats**

- A. The seats are made of a flame-retardant Trevira polyester fiber and have inherent fire-retardant and stain-resistant properties. Seats must be vacuumed and cleaned on a regular basis to keep their appearance. Spills and stains must be blotted up immediately and the fabric cleaned as soon as possible.
- B. Table 701 gives instructions for specific stain removal. The table has two columns. The first column lists the stain and the second column lists the method and sequence of cleaning. For example, remove coffee and tea stains with processes 2, 4, 5, and 1. First, apply the ingredients in process 2 (dishwashing liquid with warm water) to the stain. Then apply the ingredients in process 4 (vinegar and water) to the stain. The third step is process 5 (laundry powder and warm water followed by blotting). Then apply process 1 (dry cleaning solvent applied to the stain) to finish the stain removal of coffee or tea stains.

Table 701. Methods To Clean Trevira Fabric on Seats

STAIN	PROCESS AND SEQUENCE	STAIN	PROCESS AND SEQUENCE
Antacid (Maalox)	1	Infant Formula	2,1
Betadine (Iodine)	2,3,4,6	Ink (ball point)	8
Blood *	2,3,5	Motor Oil	1,2,3,4
Catsup	2,3,5	Mud	2,1
Chewing Gum	7,1,2	Petroleum Jelly	1,2
Chocolate Syrup	5,1	Pepto Bismol	6,1
Coffee/Tea	2,4,5,1	Urine	2,3,4
Cola	2,3,4	Suntan Lotion	1,2
Cough Syrup	2	Shoe Polish	1,2,3
Egg	2,3,5,1	Vomit	2,3,4,5
Grape Drink	2,3,4,5	Wax	7,1
Ice Cream	2,3,4,5,1	Wine	2,3,4

- Process 1 - Apply a small amount of dry cleaning solvent to the stain. Do not smoke or use near open flame. Make sure that there is good airflow in the area when you clean.
- Process 2 - Mix one teaspoon of white or colorless dishwashing liquid with a cup of lukewarm water.
- Process 3 - Mix one tablespoon of household ammonia with half a cup of water.
- Process 4 - Mix one part household vinegar with two parts water.
- Process 5 - Mix a solution of laundry powder with water and allow to remain on stain. Follow label directions. Rinse with warm water and blot dry.
- Process 6 - Mix one part household bleach with nine parts water. Apply with dropper to stain. Rinse with water and blot dry.
- Process 7- Chill area with an ice cube wrapped in a plastic bag. Crack gum or wax off surface of fabric.
- Process 8 - Apply a small amount of rubbing alcohol to ink stain and blot to remove ink. Continue until ink is removed.

**NOTE:** \* All solutions must be cool when applied, or heat from the solutions will set the stain.

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6. **Cleaning the GDU 1040 Display Lens**

**NOTE:** The Primary Flight Display (PFD) and Multi-Function Display (MFD) are the GDU 1040 displays in airplanes with Garmin G1000.

**CAUTION:** If possible, do not touch the GDU 1040 display lens. The lens has a layer of anti-reflective material which is very sensitive to skin oils, waxes, and abrasive cleaners.

**CAUTION:** Do not use cleaners that contain ammonia. Ammonia will cause damage to the anti-reflective material.

A. Clean the GDU 1040 Display Lens.

- (1) To clean the lens, use a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective material.

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**UNSCHEDULED SERVICING - DESCRIPTION AND OPERATION**

**1. General**

- A. This section gives procedures and recommendations for normally unscheduled servicing.
- B. Instructions are given in the Cold Soak procedures for operation of the airplane during very cold temperatures.

**NOTE:** During operation at outside air temperatures below International Standard Atmosphere (ISA) Standard, the engine can develop more than its rated power at normal-rated RPM. This occurs more at lower altitudes.

**2. Extreme Weather Maintenance**

- A. Seacoast and Humid areas.
  - (1) In salt water areas, special care should be taken to keep engine, accessories, and airframe clean to help prevent oxidation.
  - (2) In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

**3. Ground Power Receptacle**

- A. Connect to 24-volt DC, negative ground power unit with a maximum output of 28.8 volts, for cold weather starting, and lengthy ground maintenance of the airplane electrical equipment, with exception of electronic equipment. Refer to Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for engine starting instructions with auxiliary power.

**NOTE:** The ground power receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is connected correctly to the airplane.

**4. Cold Soak**

- A. If extended exposure to cold weather is expected, refer to this procedure to prepare the airplane for cold soak. If the airplane has cold soaked for more than two hours at temperatures colder than -10 °C (14 °F), refer to this procedure and the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual to prepare the airplane for flight.
  - (1) Cold temperatures have an effect on control cable tension. Refer to Chapter 27, Aileron Control System - Maintenance Practices, Rudder Control System - Maintenance Practices, Elevator Control System - Maintenance Practices, Elevator Trim Control - Maintenance Practices, and Flap Control System - Maintenance Practices for flight control cable tensions.
  - (2) For information on lubrication and greasing of moving parts, refer to Chapter 12, Lubricants - Description and Operation.
  - (3) Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for the correct engine oil viscosity.
  - (4) Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for additional information on procedures for operation of the airplane in cold temperatures.
- B. The engine must be preheated before an engine start when exposed to very cold temperatures. Preheat the engine as follows:
  - (1) Direct warm air into the engine cooling inlets behind the propeller.

**CAUTION:** Do not use air with a temperature of more than 120 °C (248 °F) when you preheat the engine. Air with a temperature of more than 120 °C (248 °F) can do damage to the exterior paint of the airplane.

- (2) Make sure that the temperature of the warm air is no more than 120 °C (248 °F).

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**WARNING: Never bring open flames near the airplane. Use of a heater with an open flame to preheat the engine can cause damage to the airplane and injury to personnel.**

- (3) Do not use a heater with open flames to supply the warm air to preheat the engine.
- (4) Preheat the engine before an engine start if the engine temperature is less than  $-6^{\circ}\text{C}$  ( $20^{\circ}\text{F}$ ).
- (5) When the temperature is less than  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ), preheat the engine to more than  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ) before you start the engine again after an engine start and stop.

**NOTE:** When the temperature is less than  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ), water from combustion can freeze to the engine spark plugs if the engine does not continue to operate after it is started. This will prevent the engine from starting again.

- C. The Garmin GDU 1040 PFD/MFD requires warm-up time when exposed to very cold temperatures.
  - (1) A warm-up time of up to 30 minutes is necessary when the GDU is exposed to down to  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) for an extended period.
  - (2) A warm-up time of up to 15 minutes is necessary when the GDU is exposed to down to  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) for an extended period.
- D. Before takeoff, preheat the airplane cabin to more than  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) for correct operation of the standby altimeter.

**NOTE:** If there is no warning that an instrument is not operating correctly, all other instruments will operate continuously until at the minimum temperature of the airplane.



**CHAPTER**

**20**

**STANDARD  
PRACTICES -  
AIRFRAME**

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**STANDARD PRACTICES AIRFRAME - GENERAL**

**1. Scope**

- A. This Chapter describes the standard maintenance practices for maintaining and repairing items of the airframe and systems that are typical to more than one area or system. Maintenance practices which are unique to a particular system or subject are described in the appropriate chapter and section in the maintenance manual.
- B. For repairs beyond the scope of this manual, refer to the 1996 and On 100 Series Structural Repair Manual.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the subjects and sections incorporated in this chapter is as follows.
  - (1) The section on Material and Tool Cautions describes general cautions and warnings applicable to maintenance on or around the airplane.
  - (2) The section on Torque Data provides tables, formulas, requirements and torque limits for various type fasteners.
  - (3) The section on Safelying describes the proper methods and use of safety wire/lockwire, cotter pins and lock clip installations.
  - (4) The section on Control Cables and Pulleys describes the construction, examination and storage of cable assemblies and pulleys.
  - (5) The section on Solvents, Sealants and Adhesives provides the description and uses for solvents and cleaners; fuel, weather, pressure and high temperature sealing; and the application of adhesives and solvent bonding.
  - (6) The section on Conversion Data contains information converting the more commonly used measuring units found in the Maintenance Manual.

**MATERIAL AND TOOL CAUTIONS - DESCRIPTION AND OPERATION**

**1. Titanium**

**CAUTION:** Do not use cadmium-plated tools on titanium parts. Cadmium particles can stay on such parts. The cadmium particles will cause an unwanted condition with the titanium when heated. The titanium part will become brittle in the area of the unwanted condition and make cracks.

**CAUTION:** Do not let cadmium-plated fasteners touch titanium parts.

**2. Mercury**

**CAUTION:** Do not use thermometers and other mercury-based test equipment on the airplane.

**A. Corrosion Caused by Mercury.**

- (1) There is no known procedure to stop corrosion when it has started.
- (2) Mercury can go into any crack in the finish, paint, or seal layer of a metal. An oxide layer on a dry metal surface will prevent corrosion. A bright surface, a polished surface, or a surface with scratches will increase the rate of corrosion.
- (3) Dirt, grease, or other contaminants that have no effect on the metal surfaces will help prevent corrosion.
- (4) The corrosion and the embrittlement caused by corrosion can be very fast in structural members.

**3. Asbestos**

**WARNING: Do not let asbestos fibers make entry into the body of personnel. Asbestos fibers can cause injury or death.**

**A. Do not breathe the dust of asbestos fibers. To not breathe the dust of asbestos fibers, use either of the methods that follows.**

- (1) Use engineering control, which includes work in a correctly filtered exhaust chamber. Use wet procedures to keep personnel less than Occupational Safety Health Administration (OSHA) personnel exposure limits.
- (2) Use breathing equipment with high quality filters. Other protection must include protective clothing, gloves and eye protection.

**B. Refer to all local, state, and federal regulations to discard asbestos material.**

**4. Cadmium Plated Fasteners**

**CAUTION:** Put a complete layer of fuel sealant on cadmium plated fasteners that are used in fuel areas. Cadmium particles from cadmium plated fasteners can cause damage to the engine.

**5. Maintenance Precautions**

**WARNING: Obey the precautions during maintenance, repair, and service procedures of the airplane to prevent injury because of the different materials and environmental conditions.**

**A. Carefully read and follow all instructions.**

- (1) Obey all cautions and warnings given by the manufacturer of the product that is used.
  - (a) Use the applicable safety equipment such as goggles, face shields, breathing equipment, protective clothing and gloves.
- (2) Do not get dangerous chemicals in the eyes or on the skin.

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- (3) Do not breathe the fumes of dangerous chemicals.
- (4) Make sure the work area has good airflow and the applicable breathing equipment is used when composites or metals are sanded or work is done in an area where small particles can be made.

## 6. General Usage Solvents

- A. Airplane maintenance procedures frequently use solvents. A solvent is a material, usually a liquid, that can break down another material. Solvents usually have no color, dry quickly, and give off fumes in high quantities. Examples of general use solvents are as follows:
- Methyl n-Propyl Ketone
  - Toluene
  - Isopropyl Alcohol
  - Acetone
  - Methylene Chloride
  - 1,1,1 - Trichlorethane
  - Naptha
  - ASTM D4080
- B. Solvents can cause injury or death. Solvents usually have no color, dry quickly, and give off fumes in high quantities. The fumes are usually heavier than air. The fumes can collect in low-level areas and push air out of the areas that are not ventilated. This can remove the supply of oxygen from the area.
- (1) The solvent fumes are usually heavier than air.
  - (2) The solvent fumes can be breathed. Use applicable breathing equipment.
  - (3) Solvents can cause damage to the hands and the skin.
    - (a) Solvents dry out the skin and remove the natural oils. Damaged skin allows other contamination to make the condition worse.
    - (b) The contamination has easier access to the lowest levels of the skin.
      - 1 The human body can filter small amounts of solvents out of itself. This filtration function takes place in the liver. The liver receives blood which can be contaminated with solvents from both the lungs and the skin. If the quantities are low enough and not too frequent, the liver can filter out the contaminants. This is one of the scientific facts on which OSHA based its Permissible Exposure Limits. However, when exposures are constantly above these levels over an extended period of many years, the filter (liver) becomes clogged and the solvents can then affect other parts/portions of the body.
- C. Solvents are hazardous materials because of flammability. The rate of evaporation is related to flammability. The fumes are usually needed to ignite the liquid. Any ignition source can ignite solvent fumes. The low flash point of the solvent shows that the solvent can ignite easily. Usually the flash points of less than 100°F (37.8°C) are thought to be flammable. Examples of solvent flash points are as follows.

SOLVENT	FLASH POINT
Methyl n-Propyl Ketone	45°F (7.2°C)
Toluene	39°F (3.9°C)
Isopropyl Alcohol	53.6°F (12°C)
Acetone	1.4°F (-17°C)

- D. Solvents can be explosive when mixed with chemicals that release oxygen (oxidizer). For this reason, it is very important for personnel to know which chemicals are in use in the work area to avoid accidental mixture of solvents and oxidizers.
- (1) Know the container labels.
    - (a) Chemical manufacturers are required to put a label with a diamond-shaped symbol on each container.
      - 1 The red symbol on the label shows that the contents are flammable.
      - 2 The yellow symbol on the label shows that the contents are oxidizers.



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**7. National Emissions Standards for Hazardous Air Pollutants**

- A. National Emissions Standards for Hazardous Air Pollutants (NESHAP).
- (1) The NESHAP standards have put a limit on the use of certain chemicals and solvents.
  - (2) For complete details of the regulatory standards, see the Federal Register, 40 CFR Part 63, [Ad-FRL-5636-1], RIN 2060-AG65.
- B. NESHAP Requirements.
- (1) Hand-Wipe Cleaning.
    - (a) All hazardous air pollutants or organic compounds that release dangerous fumes that are used as hand wipe cleaning solvents must meet a composition requirement and have a vapor pressure less than or equal to 1.75 Hg at 69° (45 mm Hg at 20°C.)
    - (b) The requirements specified may be met by an alternative compliance plan used by the permitting authority and approved under Section 112(1) of the Clean Air Act.
  - (2) Primer Application.
    - (a) The organic hazardous air pollutant content is limited to 350 g/l (2.9 pounds-per-gallon), less water, as applied.
    - (b) The volatile organic compound limit is 350 g/l (2.9 pounds per gallon), less water, as applied.
    - (c) Use coatings below the content limit or use monthly volume-weighted averaging to get the content limits to meet content limits.
  - (3) Topcoat Application.
    - (a) The base coat organic hazardous air pollutant content must be less than 420 g/l (3.5 pounds-per-gallon), less water, as applied.
    - (b) The volatile organic compound limit is 420 g/l (3.5 pounds per gallon), less water, as applied.
    - (c) The topcoats must meet the requirements of MIL-C-85285.
    - (d) Stripe paint requirements are the same as the base coat requirements. If the recommended supplier cannot be used, then use base coat materials to paint stripes.

**NOTE:** All paints and primers must have specific application techniques. If an alternative is supplied, use only the materials that are less than or equal in emissions, to less than the HVLP or electrostatic spray application techniques.

**NOTE:** Operate all application equipment according to the manufacturer's specifications, company procedures or locally specified operating procedures.

- (4) Paint Removal
  - (a) Paint removal operations apply to the outer surface of the airplane and do not apply to parts or units normally removed. Fuselage, wings and stabilizers are covered. Radomes and parts normally removed are exempt from the following requirements:
    - 1 No organic hazardous air pollutants are to come from chemical strippers or softeners.
    - 2 Inorganic hazardous air pollutant fumes must be kept to a minimum during periods of non-chemical based equipment malfunctions.
    - 3 The use of organic hazardous air pollutant material for spot stripping and decal removal is kept to a minimum of 190 pounds per airplane per year.
  - (b) Operating requirements for paint removal operations that give airborne inorganic hazardous air pollutants include control with particulate filters or water wash systems.
  - (c) Mechanical and hand sanding are exempt from these requirements.

**8. Facilities and Equipment**

- A. Facilities
- (1) A system must be supplied to collect processing waters to treat for chromium and pH or to be removed.
  - (2) Facilities must have proper safety equipment.

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B. Equipment

- (1) Applied spray of cleaning solvents, paint removers or color chemical film treatment solutions is to be prevented unless all requirements of NESHAP are met.
- (2) Spraying equipment to wash the airplane with alkaline cleaner can be used. This equipment is sufficient to spray deoxidizer, chemical film solutions and rinse water.
- (3) A high pressure washer is recommended, with or without hot water.
- (4) Respirators and/or dust masks must be used.

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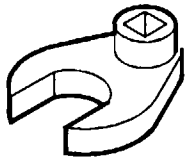
**TORQUE DATA - MAINTENANCE PRACTICES**

**1. General**

- A. To ensure security of installation and prevent over stressing of components during installation, the torque values outlined in this section and other applicable chapters of this manual should be used during installation and repair of components.
- B. The torque value tables, listed in this section, are standard torque values for the nut and bolt combinations shown. If a component requires special torque values, those values will be listed in the applicable maintenance practices section.
- C. Torque is typically applied and measured using a torque wrench. Different adapters, used in conjunction with the torque wrench, may produce an actual torque to the nut or bolt which is different from the torque reading. Figure 201 is provided to help calculate actual torque in relation to specific adaptors used with the torque wrench.
- D. Running Torque Value.
  - (1) Running torque value is the torque value required to rotate a nut on a threaded shaft, without tightening. Running torque value does not represent the torque values listed in the tables of this section. Torque values listed in the tables represent the torque values above running torque. For example, if final torque required is to be 150 inch-pounds and the running torque is 25 inch-pounds, then the running torque must be added to the required torque to achieve final torque of  $150 + 25 = 175$  inch-pounds.
  - (2) Breakaway torque value is the value of torque required to start a nut rotating on a thread shaft, and does not represent running torque value. It should be noted that on some installations the breakaway torque value cannot be measured.
- E. General Torquing Notes.
  - (1) These requirements do not apply to threaded parts used for adjustment, such as turnbuckles and rod ends.
  - (2) Torque values shown are for clean, non-lubricated parts. Threads should be free of any contamination. Lubricants, other than those on the nut as purchased, should not be used on any bolt installation unless specified.
  - (3) Assembly of threaded fasteners, such as bolts, screws and nuts, should conform to torque values shown in Table 201.
  - (4) When necessary to tighten from the bolt head, increase maximum torque value by an amount equal to shank friction. Measure shank friction with a torque wrench.
  - (5) Sheet metal screws should be tightened firmly, but not to a specific torque value.
  - (6) Countersunk washers used with close tolerance bolts must be installed correctly to ensure proper torquing (refer to Figure 202).
  - (7) For Hi-Lok fasteners used with MS21042 self-locking nuts, fastener and nut should be lubricated prior to tightening.
  - (8) Tighten accessible nuts to torque values per Table 201. Screws attached to nutplates, or screws with threads not listed in Table 201 should be tightened firmly, but not to a specific torque value. Screws used with dimpled washers should not be drawn tight enough to eliminate the washer crown.
  - (9) Table 201 is not applicable to bolts, nuts and screws used in control systems or installations where the required torque would cause binding, or would interfere with proper operation of parts. On these installations, the assembly should be firm but not binding.
  - (10) Castellated Nuts.
    - (a) Self-locking and non self-locking castellated nuts, except MS17826, require cotter pins and should be tightened to the minimum torque value shown in Table 201. The torque may be increased to install the cotter pin, but this increase must not exceed the alternate torque values.
    - (b) MS17826 self-locking, castellated nuts shall be torqued per Table 201.
    - (c) The end of the bolt or screw should extend through the nut at least two full threads including the chamfer.

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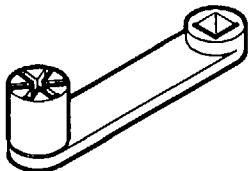
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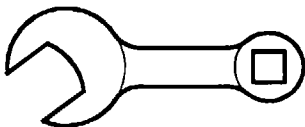
SHORT OPEN-END  
 ADAPTER



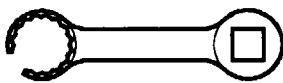
SETSCREW  
 ADAPTER



HOSE CLAMP  
 ADAPTER



OPEN-END WRENCH  
 ADAPTER

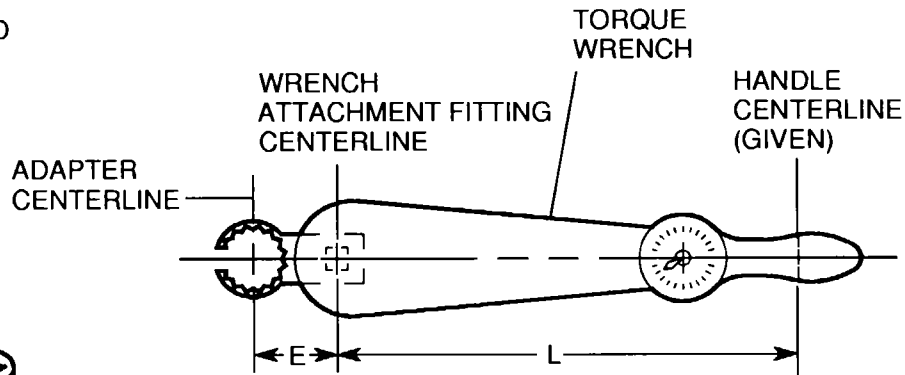


FLARE NUT WRENCH  
 ADAPTER



SPANNER WRENCH  
 ADAPTER

**NOTE:** A TORQUE WRENCH ADAPTER CHANGES THE DISTANCE FROM THE TORQUE WRENCH ATTACHMENT FITTING TO THE ADAPTER CENTERLINE. THE FORMULAS THAT FOLLOW CAN BE USED TO GET THE CORRECTED TORQUE INDICATION.



$$\text{FORMULA } T \times L = Y$$

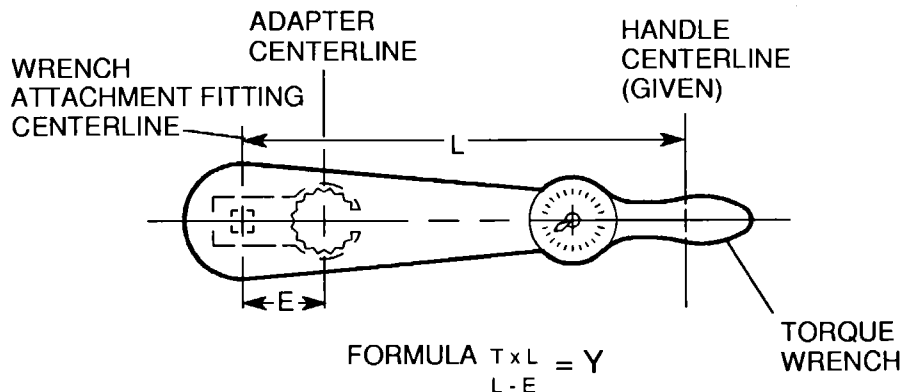
$$L + E$$

EXAMPLE (WITH "E" AS PLUS DIMENSION)

T = 135 IN-LB	Y = 135 x 10 = 117.39
Y = UNKNOWN	10 + 1.5
E = 1.5 IN	Y = 117 IN-LB
L = 10.0 IN	

**LEGEND**

T = TORQUE TO BE FOUND  
 Y = TORQUE SHOWN ON TORQUE WRENCH  
 L = LENGTH OF LEVER  
 E = LENGTH OF EXTENSION



$$\text{FORMULA } T \times L = Y$$

$$L - E$$

EXAMPLE (WITH "E" AS MINUS DIMENSION)

T = 135 IN-LB	Y = 135 x 10 = 1350 = 158.82
Y = UNKNOWN	10 - 1.5 8.5
L = 10.0 IN	
E = 1.5 IN	Y = 159 IN-LB

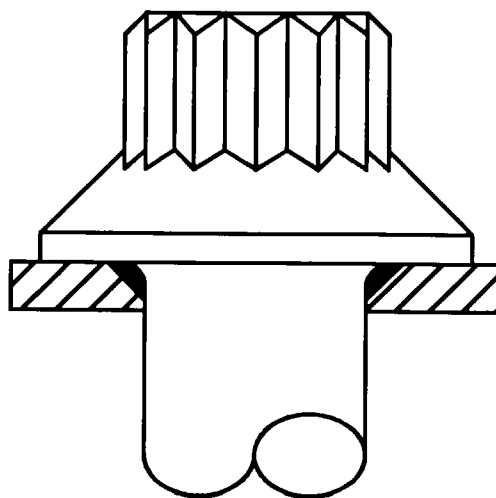
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Torque Wrench and Adapter Formulas  
 Figure 201 (Sheet 1)

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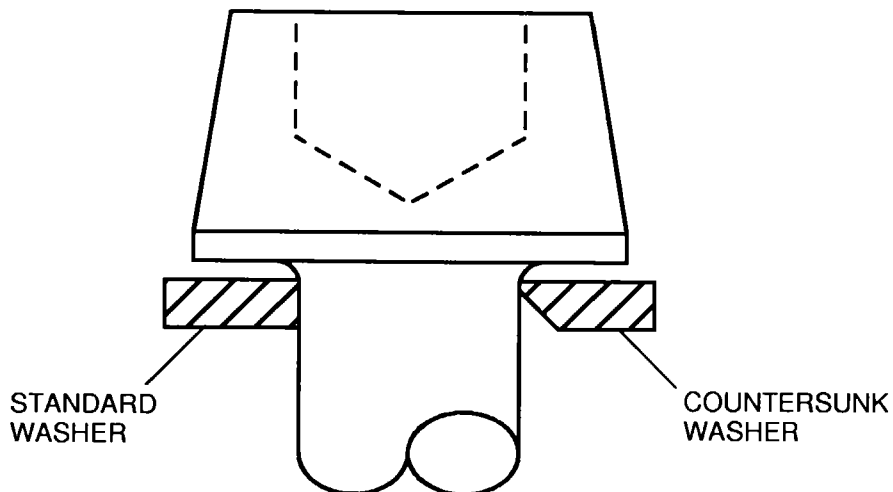
EXTERNAL WRENCHING HEAD



CORRECT INSTALLATION

INSTALL WASHER WITH COUNTERSUNK  
FACE NEXT TO BOLT HEAD RADIUS

INTERNAL WRENCHING HEAD



INCORRECT INSTALLATION

**CAUTION: NEVER INSTALL STANDARD  
WASHER OR COUNTERSUNK  
WASHER IN REVERSE WHEN  
USING BOLTS WITH RADIUS  
UNDER THE HEAD**

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Washer Installation Close Tolerance Bolts  
Figure 202 (Sheet 1)

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- (11) Joints containing wood, plastics, rubber or rubberlike materials should be torqued to values approximately 80 percent of the torque at which crushing is observed, or to the requirements of Table 201, whichever is lower, or as specified.

**2. Torque Requirements for Bolts, Screws and Nuts**

- A. Use Table 201 to determine torque requirements for bolts, screws and nuts.

Table 201. Torque Requirements For Steel Bolts, Screws, and Nuts (Inch-Pounds)

SIZE	FINE THREADED SERIES (TENSION TYPE NUTS)		FINE THREADED SERIES (SHEAR TYPE NUTS EXCEPT MS17826)		MS17826 NUTS	
	Standard Torque	Alternate Torque	Standard Torque	Alternate Torque	Standard Torque	Alternate Torque
8-36	12 to 15	- -	7 to 9	- -	- -	- -
10-32	20 to 25	20 to 28	12 to 15	12 to 19	12 to 15	12 to 20
1/4-28	50 to 70	50 to 75	30 to 40	30 to 48	30 to 40	30 to 45
5/16-24	100 to 140	100 to 150	60 to 85	60 to 100	60 to 80	60 to 90
3/8- 24	160 to 190	160 to 260	95 to 110	95 to 170	95 to 110	95 to 125
7/16-20	450 to 500	450 to 560	270 to 300	270 to 390	180 to 210	180 to 225
1/2-20	480 to 690	480 to 730	290 to 410	290 to 500	240 to 280	240 to 300
9/16-18	800 to 1000	800 to 1070	480 to 600	480 to 750	320 to 370	320 to 400
5/8-18	1100 to 1300	1100 to 1600	660 to 780	660 to 1060	480 to 550	480 to 600
3/4-16	2300 to 2500	2300 to 3350	1300 to 1500	1300 to 2200	880 to 1010	880 to 1100
7/8-14	2500 to 3000	2500 to 4650	1500 to 1800	1500 to 2900	1500 to 1750	1500 to 1900
1-14	3700 to 4500	3700 to 6650	2200 to 3300	2200 to 4400	2200 to 2700	2200 to 3000
1-1/8-12	5000 to 7000	5000 to 10000	3000 to 4200	3000 to 6300	3200 to 4200	3200 to 5000
1-1/4-12	9000 to 11000	9000 to 16700	5400 to 6600	5400 to 10000	5900 to 6400	5900 to 7000

Fine Thread Tension application nuts include: AN310, AN315, AN345, MS17825, MS20365, NASM21044 through MS21048, MS21078, NAS679, NAS1291

Fine Thread Shear application nuts include: AN316, AN320, MS21025, MS21042, MS21043, MS21083, MS21245, NAS1022, S1117

Coarse Thread application nuts include: AN340, MS20341, MS20365, MS35649

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(Newton Meters)

SIZE OF BOLT, NUT OR SCREW	FINE THREADED SERIES (TENSION TYPE NUTS)		FINE THREADED SERIES (SHEAR TYPE NUTS EXCEPT MS17826)		MS17826 NUTS	
	Standard	Alternate	Standard	Alternate	Standard	Alternate
8-36	1.4- 1.7	- -	0.8-1.0	- -	- -	- -
10-32	2.3-2.8	2.3-3.2	1.4-1.7	1.4-2.1	1.4-1.7	1.4-2.3
1/4-28	5.6-7.9	5.6-8.5	3.4-4.5	3.4-5.4	3.4-4.5	3.4-5.1
5/16-24	11.3-15.8	11.3-16.9	6.8-9.6	6.8-11.3	6.8-9.0	6.8-10.2
3/8- 24	18.1-21.5	18.1-29.4	10.7-12.4	10.7-19.2	10.7-12.4	10.7-14.1
7/16-20	50.8-56.5	50.8-63.3	30.5-33.9	30.5-44.1	20.3-23.7	20.3-25.4
1/2-20	54.2-78.0	54.2-82.5	32.8-46.3	32.8-56.5	27.1-31.6	27.1-33.9
9/16-18	90.4-113.0	90.4-120.9	54.2-67.8	54.2-84.7	36.2-41.8	36.2-45.2
5/8-18	124.3-146.9	124.3-180.8	74.6-88.1	74.6-119.8	54.2-62.1	54.2-67.8
3/4-16	259.9-282.5	259.9-378.5	146.9-169.5	146.9-248.6	99.4-114.1	99.4-124.3
7/8-14	282.5-339.0	282.5-525.4	169.5-203.4	169.5-327.7	169.5-197.7	169.5-214.7
1-14	418.0-508.4	418.0-751.3	248.6-372.9	248.6-497.1	248.6-305.1	248.6-339.0
1-1/8-12	564.9-790.9	564.9-1129.9	339.0- 474.5	339.0-711.8	361.6-474.5	361.6-564.9
1-1/4-12	1016.9- 1242.8	1016.9- 1886.9	610.1-745.7	610.1-1129.9	666.6-723.1	666.6-790.9

### 3. Torque Requirements for Hi-Lok Fasteners

A. Use Table 202 to determine torque requirements for Hi-Lok fasteners.

**NOTE:** This table is used in conjunction with MS21042 self- locking nuts.

Table 202. Torque Values Hi-Lok Fasteners (Used with MS21042 Self-Locking Nuts)

NOMINAL FASTENER DIAMETER	ALLOY STEEL 180 - 200 KSI (INCH-POUNDS)
6-32	8-10
8-32	12-15
10-32	20-25
1/4-28	50-70
5/16-24	100-140
3/8-24	160-190
7/16-20	450-500
1/2-20	480-690

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**4. Torque Requirements for Electrical Current Carrying And Airframe Ground Fasteners**

- A. Use Table 203 to determine torque requirements for threaded electrical current carrying fasteners.
- (1) Torque values shown are clean, nonlubricated parts. Threads shall be free of dust and metal filings. Lubricants, other than on the nut as purchased, shall not be used on any bolt installations unless specified in the applicable chapters of this manual.
  - (2) All threaded electrical current carrying fasteners for relay terminals, shunt terminals, fuse limiter mount block terminals and bus bar attaching hardware shall be torqued per Table 203.

**NOTE:** There is no satisfactory method of determining the torque previously applied to a threaded fastener. When retorquing, always back off approximately 1/4 turn or more before reapplying torque.

- B. Use Table 204 to determine torque requirements for threaded fasteners used as airframe electrical ground terminals.

Table 203. Torque Values Electrical Current Carrying Fasteners

FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
6-32	8-12
8-32	13-17
10-32	20-30
3/16	20-30
1/4	40-60
5/16	80-100
3/8	105-125
1/2	130-150

Table 204. Torque Values Airframe Electrical Ground Terminals

FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
5/16	130-150
3/8	160-190

**5. Torque Requirements for Rigid Tubing and Hoses**

- A. Use Table 205 to determine torque requirements for tubes and hoses.



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Table 205. Tubing/Hose Torque Limits (Inch-Pounds)

Hose Size	Tubing O.D.	Flared or Flareless fitting with Aluminum or Annealed Stainless Steel Tubing, and Hose with Aluminum Inserts		Flared or Flareless fitting with Steel Tubing, and Hose with Steel Inserts	
		Min	Max	Min	Max
-2	1/8	20	30	75	85
-3	3/16	25	35	95	105
-4	1/4	50	65	135	150
-5	5/16	70	90	170	200
-6	3/8	110	130	270	300
-8	1/2	230	260	450	500
-10	5/8	330	360	650	700
-12	3/4	460	500	900	1000
-16	1	500	700	1200	1400
-20	1 1/4	800	900	1520	1680
-24	1 1/2	800	900	1900	2100

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**SAFETYING - MAINTENANCE PRACTICES**

**1. General**

**A. Safety Wire.**

- (1) Inconel (Uncoated), Monel (Uncoated).
  - (a) Used for general safety wiring purposes. Safety wiring is the application of wire to prevent relative movement of structural or other critical components subjected to vibration, tension, torque, etc. Monel to be used at temperatures up to 700°F (370 °C) and inconel to be used at temperatures up to 1500°F (815°C). Identified by the color of the finish, monel and inconel color is natural wire color.
- (2) Copper, Cadmium Plated and Dyed Yellow in accordance with FED-STD 595.
  - (a) This wire will be used for shear and seal wiring applications. Shear applications are those where it is necessary to purposely break or shear the wire to permit operation or actuation of emergency devices. Seal applications are those where the wire is used with a lead seal to prevent tampering or use of a device without indication. Identified by the color of the finish, copper wire is dyed yellow.
- (3) Aluminum Alloy (Alclad 5056), Anodized and Dyed Blue in accordance with FED-STD 595.
  - (a) This wire will be used exclusively for safety wiring magnesium parts.

**NOTE:** Surface treatments which obscure visual identification of safety wire are prohibited.

- (4) Inconel, monel, wire can be substituted for same diameter and length of carbon steel or corrosion resistant wire.
- (5) Wires are visually identifiable by their colors: natural for inconel and monel, yellow for copper, and blue for aluminum.

**B. Cotter Pin.**

- (1) The selection of material shall be in accordance with temperature, atmosphere and service limitations.

**2. Safety Wire**

**A. Wire Size.**

- (1) The size of the safety wire shall be in accordance with the requirements of Table 201.
  - (a) 0.032 inch diameter safety wire is for general purpose use, however, 0.020 inch diameter safety wire may be used on parts having a nominal hole diameter of less than 0.045 inch; on parts having a nominal hole diameter between 0.045 and 0.062 with spacing between parts of less than two inches; or on closely spaced screws and bolts of 0.25 inch diameter and smaller.
  - (b) 0.020 inch diameter copper wire shall be used for shear and seal wire applications.
  - (c) When employing the single wire method of locking, the largest nominal size wire for the applicable material or part which the hole will accommodate shall be used.

Table 201. Safety Wire

MATERIAL	SIZE AND NUMBER (NASM20995-XXX)							
	.015	.020	.032	.040	.041	.047	.051	.091
Ni-Cu Alloy (Monel)		NC20	NC32	NC40			NC51	NC91
Ni-Cr-Fe Alloy (Inconel)		N20	N32	N40			N51	N91
Carbon Steel		F20	F32		F41	F47		F91

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Table 201. Safety Wire (continued)

<b>MATERIAL</b>	<b>SIZE AND NUMBER (NASM20995-XXX)</b>							
	<b>.015</b>	<b>.020</b>	<b>.032</b>	<b>.040</b>	<b>.041</b>	<b>.047</b>	<b>.051</b>	<b>.091</b>
Corrosion Resistant Steel	C15	C20	C32		C41	C47		C91
Aluminum Alloy (Blue)		AB20	AB32		AB41	AB47		AB91
Copper (Yellow)	CY15	CY20						

### 3. Safety Wire Installation

#### A. Method (Refer to Figure 201).

**CAUTION:** Screws in closely spaced geometric patterns which secure hydraulic or air seals, hold hydraulic pressure, or used in critical areas should use the double twist method of safety wiring.

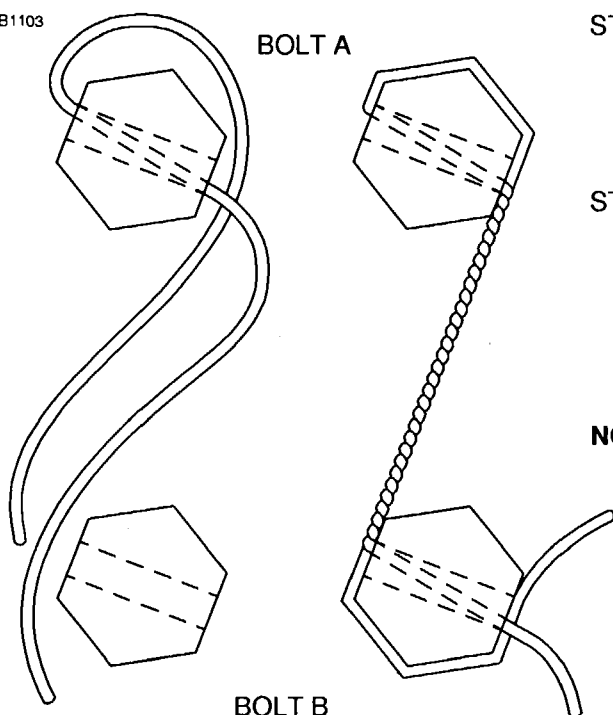
- (1) Single wire method of safety wiring shall use the largest nominal size wire listed in Table 201, which will fit the hole.
- (2) The double twist method of safety wiring shall be used as the common method of safety wiring. It is really one wire twisted on itself several times. The single wire method of safety wiring may be used in a closely spaced, closed geometrical pattern (triangle, square, circle, etc.), on parts in electrical systems, and in places that would make the single wire method more advisable. Closely spaced shall be considered a maximum of two inches between centers.
- (3) Use single wire method for shear and seal wiring application. Make sure the wire is installed so that it can be easily broken when required in an emergency situation. For securing emergency devices where it is necessary to break the wire quickly, use copper only.
- (4) Safety wiring by the double twist method shall be done as follows:
  - (a) One end of the safety wire shall be inserted through one set of safety wire holes in the bolt head. The other end of the safety wire shall preferably be looped firmly around the head to the next set of safety wire holes in the same unit and inserted through this set of safety wire holes. The "other end" may go over the head when the clearances around the head are obstructed by adjacent parts.
  - (b) The strands, while taut, shall be twisted until the twisted part is just short of the nearest safety wire hole in the next unit. The twisted portion shall be within 1/8 inch of the holes in each unit. The actual number of twists will depend upon the wire diameter, with smaller diameters being able to have more twists than larger diameters. The twisting shall keep the wire taut without over stressing or allowing it to become nicked, kinked or mutilated. Abrasions from commercially available twist pliers shall be acceptable.
  - (c) The wire shall be twisted to form a pigtail of 3 to 5 twists after wiring the last unit. The excess wire shall be cut off. The pigtail shall be bent toward the part to prevent it from becoming a snag. Safety wiring multiple groups by the double twist double hole method shall be the same as the previous double twist single hole method except the twist direction between subsequent fasteners may be clockwise or counterclockwise.

#### B. Spacing.

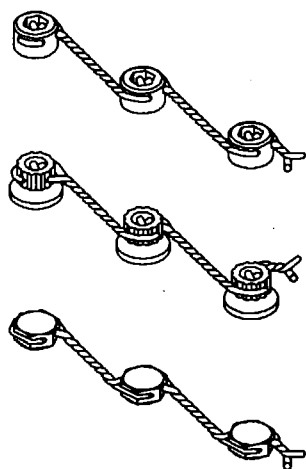
- (1) When safety wiring widely spaced multiple groups by the double twist method, three units shall be the maximum number in a series.
- (2) When safety wiring closely spaced multiple groups, the number of units that can be safety wired by a twenty four inch length of wire shall be the maximum number in a series.
- (3) Widely spaced multiple groups shall mean those in which the fastenings are from four to six inches apart. Safety wiring 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 the safety wire to less than six inches.

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DOUBLE-WIRE SAFETYING

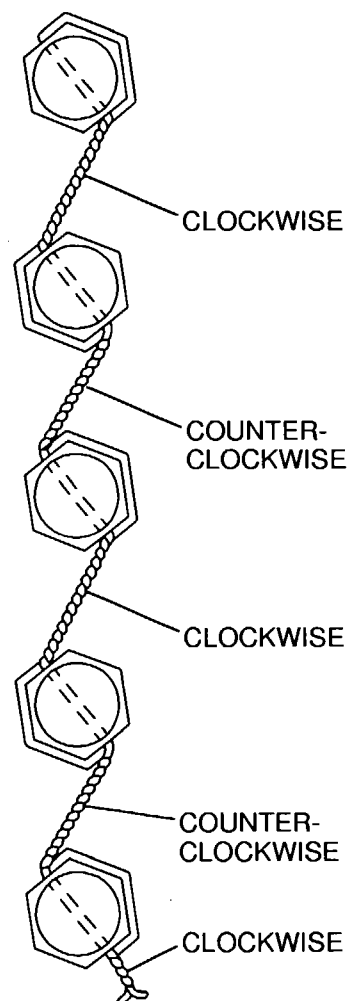


MULTIPLE FASTENER  
 APPLICATION DOUBLE  
 TWIST - MULTIPLE  
 HOLE METHOD.

STEP 1. INSERT WIRE THROUGH BOLT A AND BEND AROUND BOLT (IF NECESSARY, BEND WIRE ACROSS BOLT HEAD). TWIST WIRES CLOCKWISE UNTIL THEY REACH BOLT B.

STEP 2. INSERT ONE END OF WIRE THROUGH BOLT B. BEND OTHER END AROUND BOLT (IF NECESSARY, BEND WIRE ACROSS HEAD OF BOLT). TWIST WIRES COUNTERCLOCKWISE 1/2 INCH OR SIX TWISTS. CLIP ENDS. BEND PIGTAIL BACK AGAINST PART.

NOTE: RIGHT THREADED PARTS SHOWN:  
 REVERSE DIRECTIONS FOR LEFT PARTS.



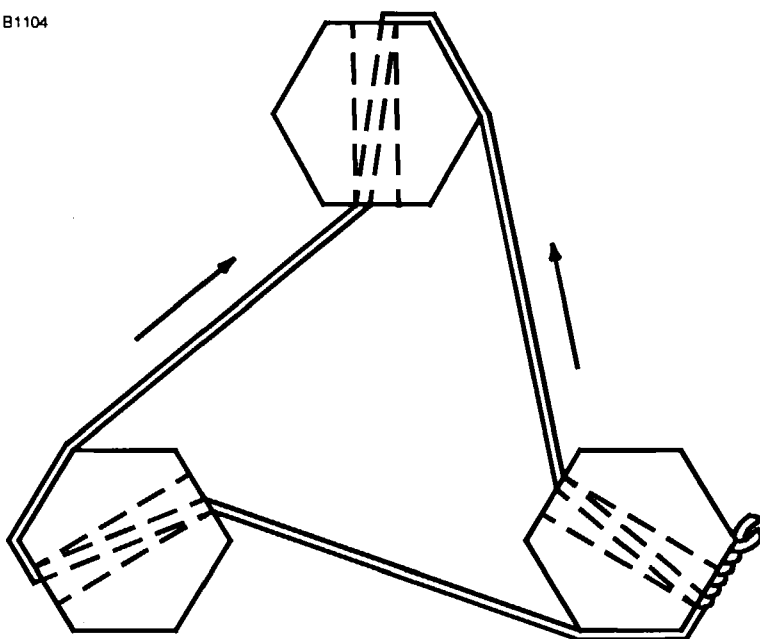
DOUBLE-TWIST SAFETYING  
 SINGLE HOLE METHOD

5598T2001  
 5599T2001  
 6598T1029

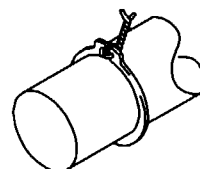
Lockwire Safetying  
 Figure 201 (Sheet 1)

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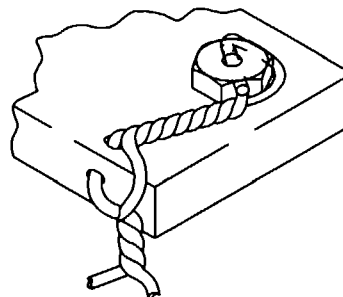
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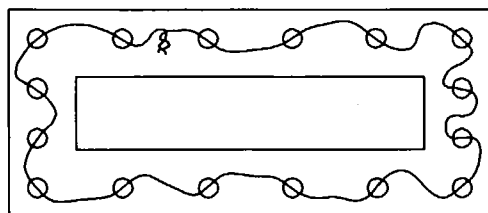
BOLTS IN CLOSELY SPACED, CLOSED  
 GEOMETRICAL PATTERN, SINGLE  
 WIRE METHOD



EXTERNAL SNAP RING  
 SINGLE-WIRE METHOD



SINGLE FASTENER APPLICATION  
 DOUBLE-TWIST METHOD



SMALL SCREWS IN CLOSELY SPACED, CLOSED  
 GEOMETRICAL PATTERN, SINGLE WIRE METHOD

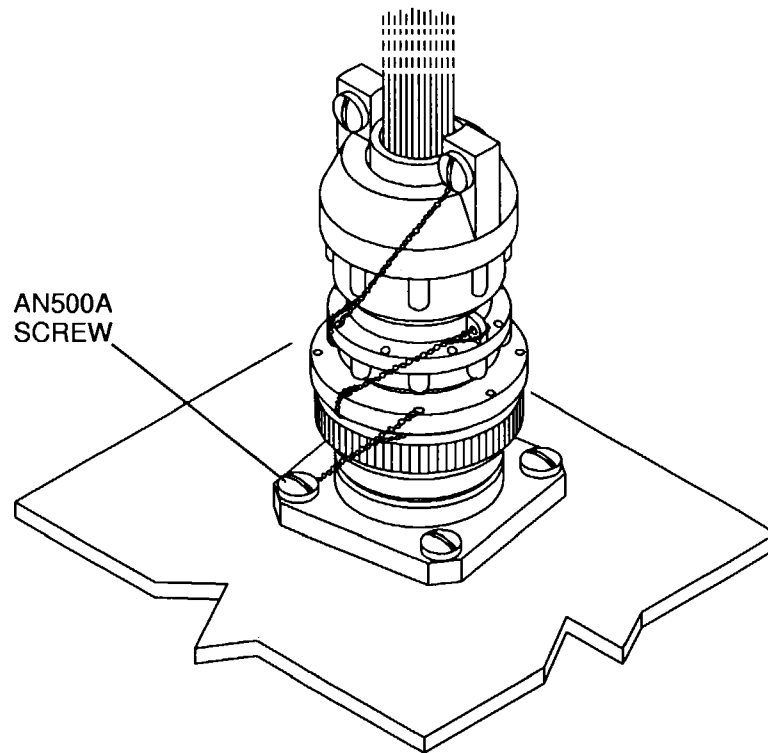
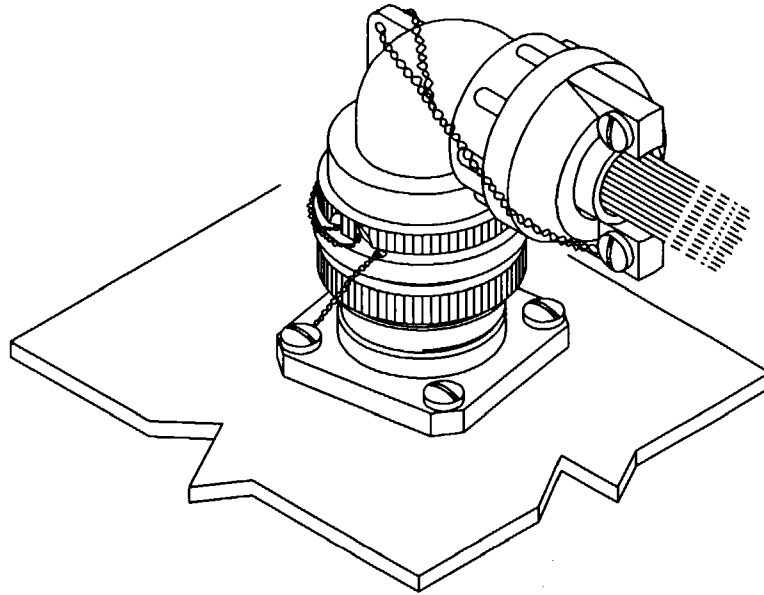
**NOTE:** RIGHT THREADED  
 PARTS SHOWN. REVERSE  
 DIRECTION FOR LEFT  
 THREADS

5598T1003  
 5598T1024  
 5598T1024  
 5598T1024

Lockwire Safetying  
 Figure 201 (Sheet 2)

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5598T1001  
5598T1001

Lockwire Safelying  
Figure 201 (Sheet 3)

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C. Tension.

- (1) Parts shall be safety wired in such a manner that the safety wire shall be put in tension when the part tends to loosen. The safety wire should always be installed and twisted so that the loop around the head stays down and does not tend to come up over the bolt head and leave a slack loop.

**NOTE:** The safety wire on a castellated nut can be more secure if it is on the side of the stud when the slot is close to the top of the nut.

- (2) Care shall be exercised when installing safety wire to ensure that it is tight but not over stressed.

D. Usage.

- (1) A pigtail of 0.25 to 0.50 inch (3 to 5 twists) shall be made at the end of the wiring. This pigtail shall be bent back or under to prevent it from becoming a snag.
- (2) Safety wire shall be new upon each application.
- (3) When castellated nuts are to be secured with safety wire, tighten the nut to the low side of the selected torque range, unless otherwise specified, and if necessary, continue tightening until a slot aligns with the hole.
- (4) In blind tapped hole applications of bolts or castellated nuts on studs, the safety wiring shall be as described in these instructions.
- (5) Hollow head bolts are safetied in the manner prescribed for regular bolts.
- (6) Drain plugs and cocks may be safetied to a bolt, nut or other part having a free lock hole in accordance with the instructions described in this text.
- (7) External snap rings may be locked, if necessary, in accordance with the general locking principles as described and illustrated. Internal snap rings shall not be safety wired.
- (8) When safety wiring is required on electrical connectors which use threaded coupling rings, or on plugs which employ screws or rings to fasten the individual parts of the plug together, they shall be safety wired with 0.020 inch diameter wire in accordance with the safety wiring principles as described and illustrated. 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.
- (9) Drilled head bolts and screws need not be safety wired if installed into self-locking nuts or installed with lock washers. Castellated nuts with cotter pins or safety wire are preferred on bolts or studs with drilled shanks but self-locking nuts are permissible within the limitations of MS33588.
- (10) Larger assemblies, such as hydraulic cylinder heads for which safety wiring is required but not specified, shall be safety wired as described in these instructions.
- (11) Safety wire shall not be used to secure nor shall safety wire be dependent upon fracture as the basis for operation of emergency devices such as handles, switches, guards covering handles, etc., that operate emergency mechanism such as emergency exits, fire extinguishers, emergency cabin pressure release, emergency landing gear release and the like. However, where existing structural equipment or safety of flight emergency devices require shear wire to secure equipment while not in use, but which are dependent upon shearing or breaking of the safety wire for successful emergency operation of equipment, particular care shall be exercised to that wiring under these circumstances shall not prevent emergency operations of these devices.

**4. Cotter Pin Installation**

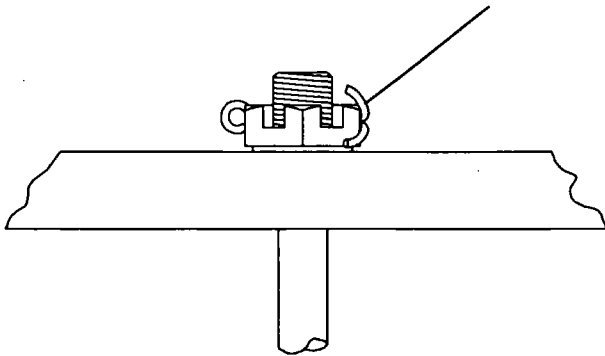
A. General instruction for the selection and application of cotter pins (Refer to Figure 202).

- (1) Select cotter pin material in accordance with temperature, atmosphere and service limitations.
- (2) Cotter pins shall be new upon each application.
- (3) When nuts are to be secured to the fastener with cotter pins, tighten the nut to the low side (minimum) of the applicable specified or selected torque range, unless otherwise specified, and if necessary, continue tightening until the slot aligns with the hole. In no case shall the high side (maximum) torque range be exceeded.
- (4) Castellated nuts mounted on bolts may be safetied with cotter pins or safety wire. The preferred method is with the cotter pin. An alternate method where the cotter pin is mounted normal to the axis of the bolt may be used where the cotter pin in the preferred method is apt to become a snag.

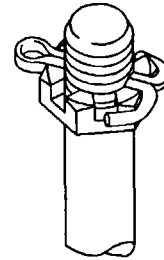
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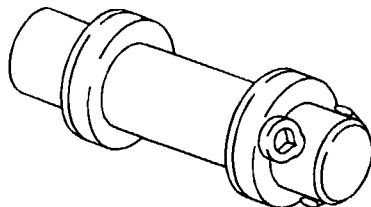
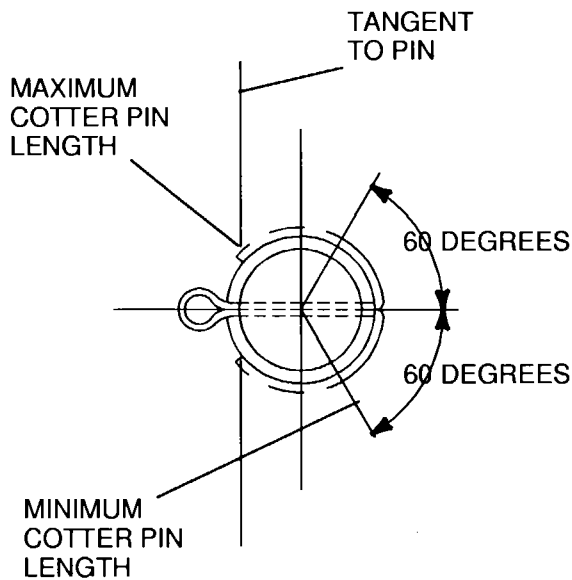
TO PROVIDE CLEARANCE  
 PRONG MAY BE CUT HERE



CASTELLATED NUT ON BOLT  
 PREFERRED METHOD



CASTELLATED NUT ON BOLT  
 ALTERNATE METHOD



PIN APPLICATION

THREAD SIZE	MINIMUM PIN SIZE (INCH)
6	0.028
8	0.044
10	0.044
1/4	0.044
5/16	0.044
3/8	0.072
7/16	0.072
1/2	0.072
9/16	0.086
5/8	0.086
3/4	0.086
7/8	0.086
1	0.086
1 1/8	0.116
1 1/4	0.116
1 3/8	0.116
1 1/2	0.116

5598T1025  
 5598T1025  
 5598T1025  
 5598T1025

Cotter Pin Safetying  
 Figure 202 (Sheet 1)



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- (5) In the event of more than 50 percent of the cotter pin diameter is above the nut castellation, a washer should be used under the nut or a shorter fastener should be used. A maximum of two washers may be permitted under a nut.
- (6) The largest nominal diameter cotter pin listed in MS24665, which the hole and slots will accommodate, shall be used; but in no application to a nut, bolt or screw shall the pin size be less than the sizes described in Figure 202.
- (7) Install the cotter pin with the head firmly in the slot of the nut with the axis of the eye at right angles to the bolt shank, and bend prongs so that the head and upper prong are firmly seated against the bolt.
- (8) In the pin applications, install the cotter pin with the axis of the eye parallel to the shank of the clevis pin or rod end. Bend the prongs around the shank of the pin or rod end.
- (9) Cadmium plated cotter pins shall not be used in applications bringing them in contact with fuel, hydraulic fluid or synthetic lubricants.

**5. Safelying Turnbuckles**

**A. Use of Locking Clips (Refer to Figure 203).**

- (1) Prior to safelying, both threaded terminals should be screwed an equal distance into the turnbuckle barrel, and should be screwed in, at a minimum, so no more than three threads of any terminal are exposed outside the body.
- (2) After the turnbuckle has been adjusted to its locking position, with the groove on terminals and slot indicator notch on barrel aligned, insert the end of the locking clip into the terminal and barrel until the "U" curved end of the locking clip is over the hole in the center of the barrel.
  - (a) Press the locking clip into the hole to its full extent.
  - (b) The curved end of the locking clip will latch in the hole in the barrel.
  - (c) To check proper seating of locking clip, attempt to remove pressed "U" end from barrel hole with fingers only.

**NOTE:** Do not use a tool as the locking clip could be distorted.

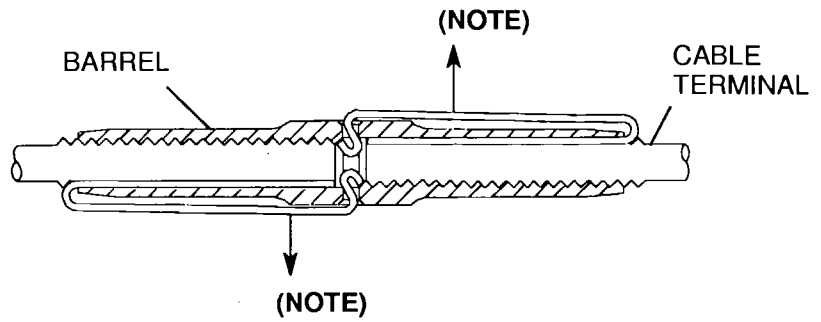
- (3) Locking clips are for one time use only and should not be reused.
- (4) Both locking clips may be inserted in the same hole of the turnbuckle barrel or in opposite holes of the turnbuckle barrel.

**B. Use of Safety Wire (Refer to Figure 204).**

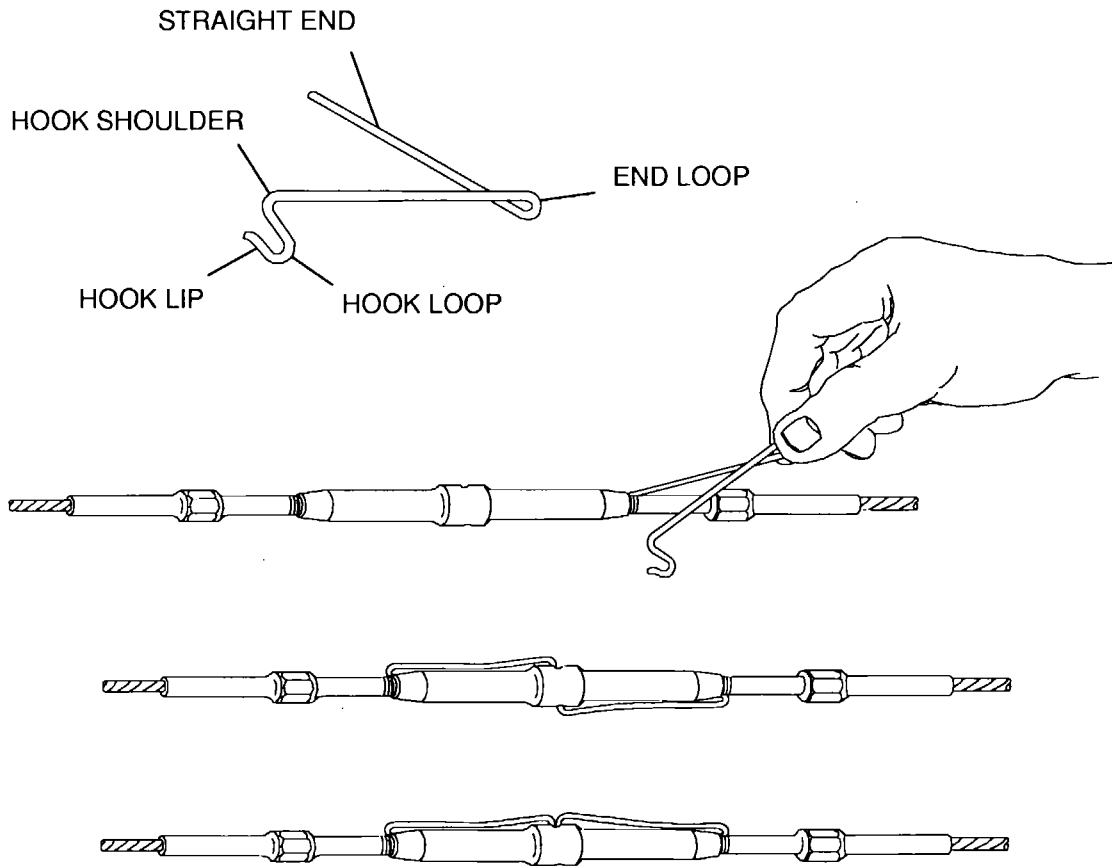
- (1) Some turnbuckles use safety wire. For more information, refer to Federal Publication AC 43-13.1B, Safety Methods For Turnbuckles.

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**NOTE:** PULL WITH YOUR FINGERS FOR AN INSPECTION TO MAKE SURE THE CLIP WILL NOT COME OUT.

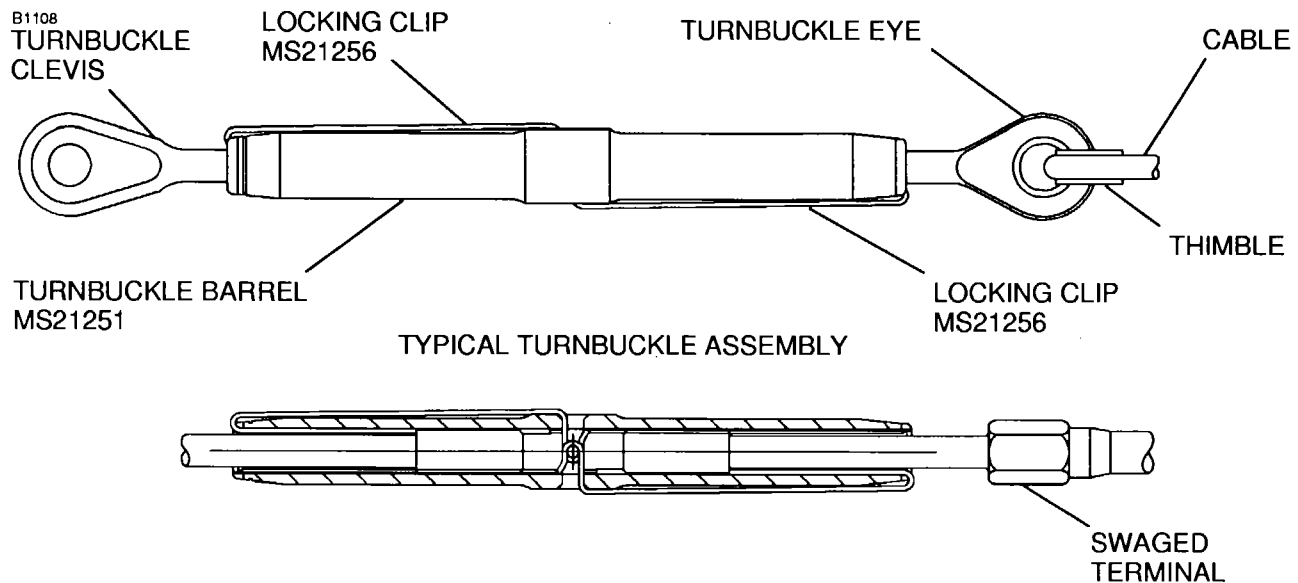


**SAFETY CLIP INSTALLATION**

0798T1005  
0798T1003  
0798T1004

Safetying Turnbuckle Assemblies with Safety Clips  
Figure 203 (Sheet 1)

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METHOD OF ASSEMBLING LOCKING CLIPS, TURNBUCKLE BARREL AND TERMINAL

NOMINAL CABLE DIA.	THREAD UNF-3	LOCKING CLIP MS21256 (NOTE )	TURNBUCKLE BODY MS21251
1/16	No. 6-40	-1	-2S
3/32	No. 10-32		-3S
		-2	-3L
		-1	-4S
1/8		-2	-4L
5/32	1/4-28	-1	-5S
		-2	-5L
			-6S
3/16	5/16-24	-1	-6L
7/32			-7L
1/4	3/8-24	-2	-8L
9/32	7/16-20		-9L
5/16	1/2-20	-3	-10L

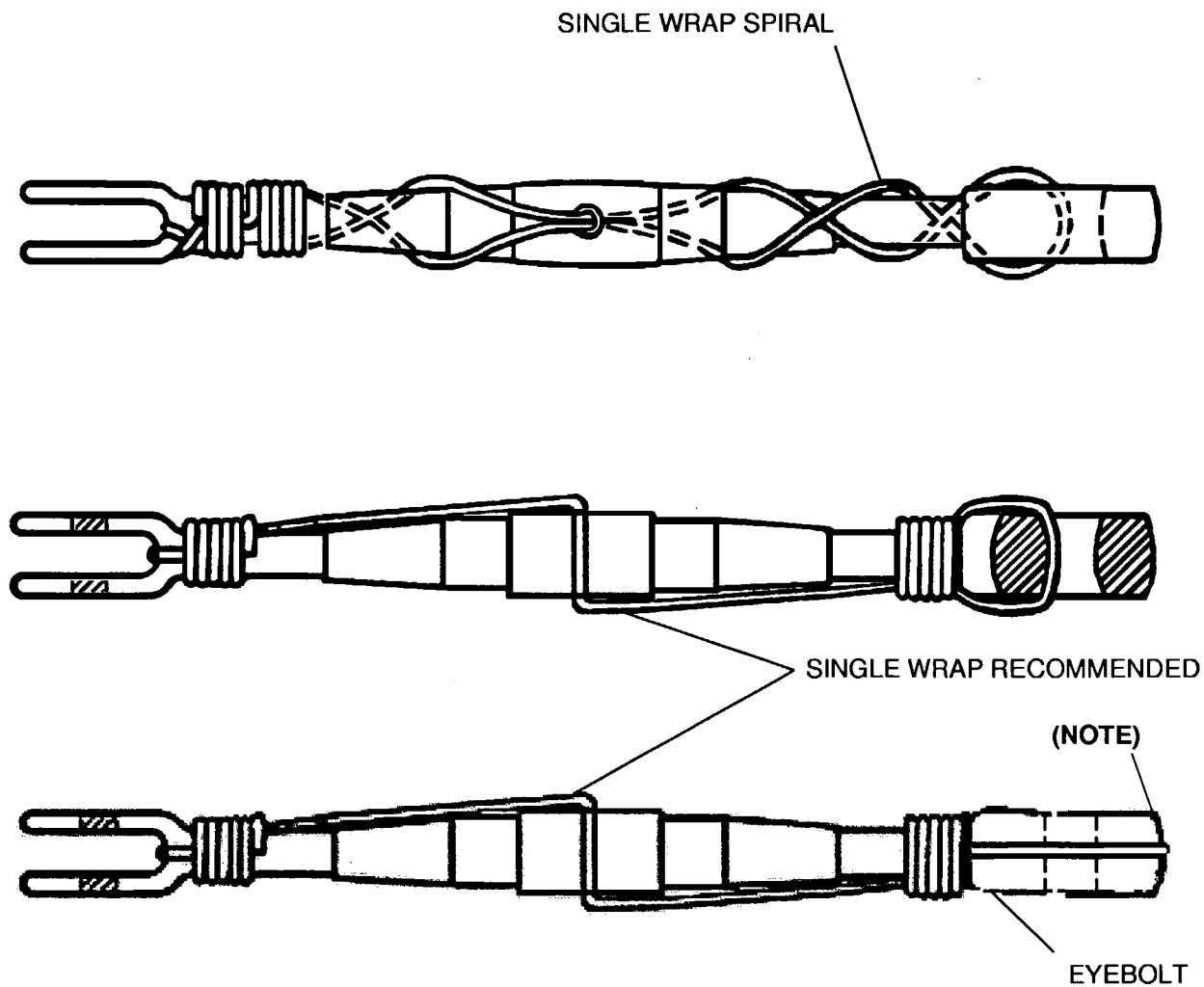
**NOTE :** TWO LOCKING CLIPS REQUIRED FOR EACH TURNBUCKLE.

5598T1023  
 5598T1023

Safetying Turnbuckle Assemblies with Safety Clips  
 Figure 203 (Sheet 2)

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**NOTE:** IF THERE IS NO SAFETY WIRE HOLE TO USE, PUT THE SAFETY WIRE AROUND THE CIRCUMFERENCE OF THE EYEBOLT

A0714R1047

Safetying Turnbuckle Assemblies with Lockwire  
Figure 204 (Sheet 1)

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**CONTROL CABLE WIRE BREAKAGE AND CORROSION LIMITATIONS - MAINTENANCE PRACTICES**

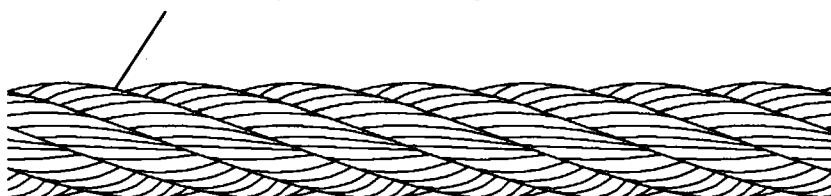
**1. Examination of Control Cables**

- A. Control cable assemblies are subject to a variety of environmental conditions and forms of deterioration. Some deterioration, such as wire or strand breakage, is easy to recognize. Other deterioration, such as internal corrosion or cable distortion, is harder to identify. The following information will aid in detecting these cable conditions.
- B. Broken Wire Examination (Refer to Figure 201).
  - (1) Examine cables for broken wires by passing a cloth along length of cable. This will detect broken wires, if 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.
  - (2) Wire breakage criteria for cables in flap, aileron, rudder, and elevator systems are as follows:
    - (a) Individual broken wires at random locations are acceptable in primary and secondary control cables when there are no more than six broken wires in any given ten-inch cable length.
- C. Corrosion.
  - (1) 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 cable if internal corrosion is found. If a cable has been wiped clean of its corrosion-preventive lubricant and metal-brightened, the cable shall be examined closely for corrosion. For description of control cable corrosion, refer to Chapter 51, Corrosion and Corrosion Control - Maintenance Practices.

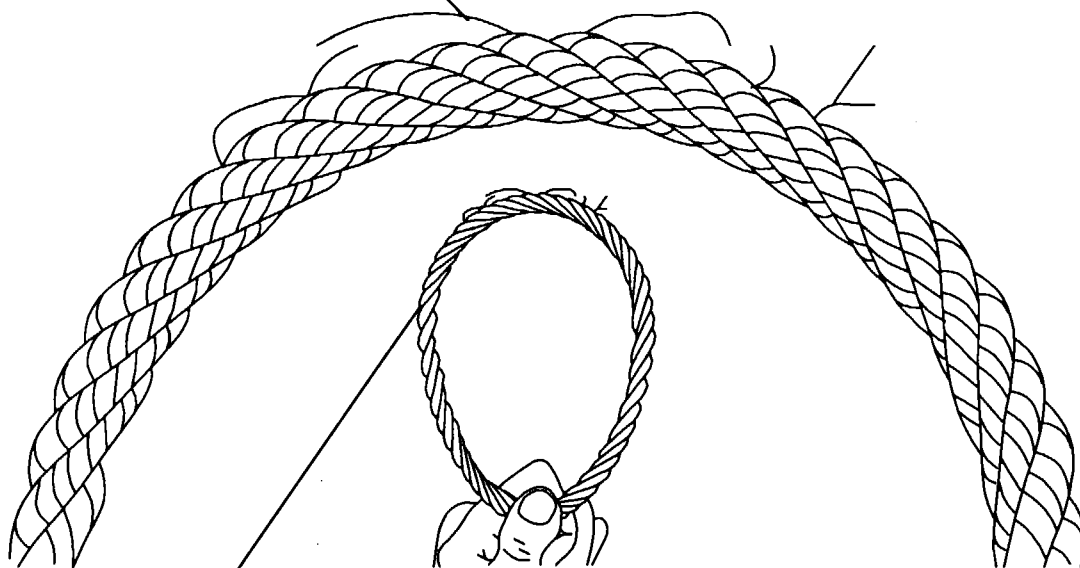
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B1109

BROKEN WIRE UNDETECTED BY  
WIPING CLOTH ALONG CABLE



BROKEN WIRE DETECTED VISUALLY  
WHEN CABLE WAS REMOVED  
AND BENT



DO NOT BEND INTO LOOP SMALLER  
THAN 50 CABLE DIAMETERS

NORMAL TECHNIQUE FOR  
BENDING CABLE AND  
CHECKING FOR BROKEN WIRES

5561T1119

Cable Broken Wire Examination  
Figure 201 (Sheet 1)

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**SOLVENTS, SEALANTS, AND ADHESIVES - DESCRIPTION AND OPERATION**

**1. General**

- A. Solvents, sealants and adhesives are composed of a group of chemicals that often prove toxic. Anyone engaged in maintenance, repair and operation of airplane and airplane accessories may be exposed to these chemicals.
- B. To help avoid the effects of these toxic substances, work only in a clean, well-lighted and well-ventilated area. Rubber gloves and protective clothing should be worn. Avoid breathing spray vapors as they are highly toxic.
- C. When working with toxic substances, always be alert for symptoms of poisoning. If symptoms are observed, immediate removal of the victim from the contaminated area is most important.

**2. Description**

- A. For clarification, the description of solvents, sealants and adhesives are presented in individual paragraphs.
  - (1) Solvents.
    - (a) Solvents are composed of chemicals which are capable of dissolving other materials and are primarily used as a cleaning agent. Solvent cleaning should be used when it is not practical to clean parts by vapor degreasing or immersion in chemical cleaners.
  - (2) Sealants.
    - (a) Sealants are composed of chemical compounds which are primarily used as a seal against the passage of air and liquids. Classification of sealants are categorized by type according to their application.
  - (3) Adhesives.
    - (a) Adhesives are composed of a mixture of chemicals which make an adherent that is primarily used for bonding like or unlike materials, and are classified according to their application.

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**ACCEPTABLE REPLACEMENTS FOR CHEMICALS AND SOLVENTS - DESCRIPTION AND OPERATION**

**1. General**

- A. In response to the Aerospace National Emissions Standards for Hazardous Air Pollutants (NESHAP), this data is being issued to inform customers of acceptable replacements for chemicals and solvents in the Maintenance Manual that have been restricted or prohibited by the standards.
- B. For complete details of the regulatory standards, refer to Federal Register, 40 CFR Part 63 (AD-FRL-5636-1), RIN 2060-AG65.
- C. Compliance with the standard is mandatory by September 1, 1998.

**2. Hand-Wipe Cleaning Operations**

**NOTE:** All hazardous air pollutants (HAP) or volatile organic compounds (VOC) hand-wipe cleaning solvents must meet a composition requirement, have a vapor pressure less than or equal to 45 MM Hg at 20°C, or meet the requirements specified in an alternative compliance plan administered by the permitting authority and approved under Section 112 (1) of the Clean Air Act.

Table 1. Replacement Products for Hand-Wipe Cleaning Operations

<b>SURFACE</b>	<b>APPROVED PRODUCT/NUMBER</b>	<b>SUPPLIER ADDRESS</b>
<b>All Metals and Painted Surfaces</b>	Methyl n-propyl ketone (CAS No. 107-87-9)	Eastman Chemical Products Wilcox Dr. and Lincoln St Kingsport, TN
	Desoclean 110 (020K19)	Courtaulds Aerospace Glendale, CA 91203
	DS108	Dynamold Solvents, Incorporated 2905 Shamrock Ave Fort Worth, TX 76107
<b>All Plastics (Except Windows and Windshields)</b>	Isopropyl Alcohol (TT-I-735)	Available Commercially
<b>All Rubber (Natural or Synthetic) and Silicone</b>	Isopropyl Alcohol	Available Commercially

**3. Priming Operations**

**NOTE:** Priming operations may not exceed a maximum Hazardous Air Pollutant (HAP) limit of 2.9 lb./Gallon (350 Grams/Liter) (less water) per application. Priming operations may not exceed a volatile organic compounds (VOC) limit of 2.9 lb./Gallon (350 Grams/Liter) (less water and exempt solvents) per application. Compliance of this limit may be achieved through the use of coatings which fall below content limits, or by using monthly volume-weighted averaging to meet content limits.



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Table 2. Replacement Products for Priming Operations

PRIMER APPLICATION	APPROVED PRODUCT/NUMBER	SUPPLIER ADDRESS
<b>Corrosion Primer</b> (Notes 1,4)	Corrosion Primer (513 X 419)(910 X 942)	Courtaulds Aerospace 1608 Fourth St. Berkeley, CA 94710
	Corrosion Primer (02-Y-40)(02-4-40 CATA)	DEFT, Inc. 17451 Von Karman Ave. Irvine, CA 92714
	Corrosion Primer (U-1201F/U-1202F)	Sterling Lacquer Mfg. 3150 Brannon Ave. St. Louis, MO 63139
	Corrosion Primer R4001-K14 MAX COR	U.S. Paint Corp. 831 S. 21st St. St. Louis, MO 63103
<b>Fuel Bay Primer</b> (Notes 2, 4)	Fuel Bay Primer (10P30-5)	Dexter Crown Metro Aerospace East Water St. Waukegan, IL 60085
<b>Pretreatment Primer</b> (Notes 3, 4)	Pretreatment Primer (728- 013/702-701)	Pratt & Lambert Industrial Coatings 630 E. 13th St. Andover, KS 67002

NOTE 1: Primers with MIL-PRF-23377G or later requirements can be used.

NOTE 2: This primer is restricted to the fuel bay area.

NOTE 3: Any pretreatment primers which meet DOD-P-15328 may be used.

NOTE 4: Specific application techniques must be used. If alternative is sought, it can only be used if emissions are less than or equal to HVLP or electrostatic spray application techniques. All application equipment must be operated according to manufacturer's specifications, company procedures, or locally specified operating procedures.

#### 4. Topcoat Operations

**NOTE:** Topcoat operations may not exceed a maximum Hazardous Air Pollutant (HAP) limit of 3.5 lb./Gallon (420 Grams/Liter) (less water) per application. Topcoat operations may not exceed a volatile organic compounds (VOC) limit of 3.5 lb./Gallon (420 Grams/Liter) (less water and exempt solvents) per application. Compliance of this limit may be achieved through the use of coatings which fall below content limits, or by using monthly volume-weighted averaging to meet content limits. Topcoats which meet the requirements of MIL-C-85285 may also be used.

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Table 3. Replacement Products for Topcoat Painting Operations

TOPCOAT APPLICATION	APPROVED PRODUCT/NUMBER	SUPPLIER ADDRESS
<b>Basecoat</b> (Note 4)	830 Series High Solids Acry Glo	Pratt & Lambert
	Low VOC Enamel	Sterling Lacquer Mfg.
	24-F 20 Series	Dexter Crown Metro Aerospace
<b>Paint Stripes</b> (Note 4)	Low VOC Acrylic 830 Series	Pratt & Lambert

**5. Paint Stripping Operations**

**NOTE:** Unless exempted, no organic Hazardous Air Pollutant (HAP) are to be emitted from chemical strippers or solvents. Use of organic HAP materials for spot stripping and decal removal is limited to 190 pounds per airplane per year.

Table 4. Replacement Products for Paint Stripping Operations

APPLICATION	APPROVED PRODUCT/NUMBER	SUPPLIER ADDRESS
<b>Chemical Stripping</b>	Turco T-6776 LO	Turco Products, Inc. Westminster, CA 92684
<b>Mechanical Stripping</b> (Note 5)	180 Grit or finer	Available Commercially

NOTE 5: Mechanical and hand- sanding operations are exempt from these requirements.

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**GENERAL SOLVENTS/CLEANERS - MAINTENANCE PRACTICES**

**1. General**

- A. Solvents are used in a wide range of cleaning activities. Selected solvents, which are used to remove oil, grease, and dirt from objects, cause no damage to metal, plastics, or elastomeric parts.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items.

NAME	NUMBER	MANUFACTURER	USE
Detergent		Commercially available	General cleaning.
ScotchBrite Pads	Type A	Minnesota Mining and Mfg. Co. 3M Center St. Paul, MN 55101	Light abrasion of metal surfaces.
Sandpaper	320 Grit	Commercially available	Light abrasion of metal surfaces.
Rymple Cloth		Commercially available	Wiping and applying cleaning agents.
Wiping cloth white, oil free, absorbent		Commercially available	Wiping and applying cleaning agents.

**3. Safety Precautions**

- A. Solvents are composed of a group of chemicals that often proves toxic. Anyone engaged in maintenance, repair and operation of airplane and airplane accessories may be exposed to these chemicals.
- B. To help avoid the effects of these toxic substances, work only in a clean, well-lighted, and well-ventilated area. Rubber gloves and protective clothing must be worn. Avoid breathing spray vapors as they are highly toxic.
- C. When working with toxic substances, always be alert for symptoms of poisoning. If symptoms are observed, immediate removal of the victim from the contaminated area is most important.

**4. Description**

- A. Solvents exhibit a selective solvent action which permits its use in the removal of oil, grease or dirt. For selection of proper solvent, refer to Table 201. For the cleaning of metal, plastics or rubber, proceed as follows:

(1) Metal.

**NOTE:** Prior to bonding or priming, lightly abrade surface with either a ScotchBrite pad or sandpaper prior to cleaning.

- (a) Wipe off all excess oil, grease or dirt from surface.
- (b) Apply solvent to a clean cloth by pouring solvent on the cloth from a safety can or other approved container. The cloth should be well saturated but not to the point of dripping.
- (c) Wipe the surface with the moistened cloth as required to dissolve or loosen soil. Work on small enough area so the surface being cleaned remains wet.
- (d) With a clean dry cloth, immediately wipe the surface while the solvent is still wet. Do not allow the surface to evaporate dry.
- (e) Repeat steps (b) through (d) until there is no discoloration on the drying cloth.

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(2) Plastic or Rubber.

**NOTE:** If cleaning a bonding surface, lightly abrade the bonding surface with sandpaper prior to cleaning.

- (a) Remove heavy soil from surface by washing with a water detergent solution.
- (b) Apply solvent to a clean cloth by pouring solvent onto cloth from a safety can or other approved container. The cloth should be well saturated but not to the point where dripping.
- (c) Wipe the surface with the moistened cloth as required to dissolve or loosen soil. Work on a small enough area so that the surface being clean remains wet.
- (d) Using a clean dry cloth, immediately wipe the surface while the surface is still wet. Do not allow the surface to evaporate dry.
- (e) Repeat steps (b) through (d) until there is no discoloration on the drying cloth.

Table 201. General Solvents

<b>CLEANER/ SOLVENT</b>	<b>FED- ERAL SPECIFI- CATION</b>	<b>TYPE CLASSIFI- CATION</b>	<b>USE/ DESCRIPTION FUNCTION</b>	<b>CAUTION/ WARNING</b>
Dry	MIL- PRF-680	Type I -100°F Type II -140°F	General cleaning solvent. Dry cleaning of textile materials. Grease removal.	FLAMMABLE.
1,1,1 Inhibited Technical Trichloroethane	O- T-620	Type I - Regular Type II - with dauber Type III - Aerosol	Spot removing from fabrics. General cleaning solvent. Cleaning of assembled equipment.	USE WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPOR. AVOID PROLONGED CONTACT WITH SKIN.
Turco Seal Solvent Turco Products			Cleaning/Degreasing metal parts.	
Penwalt 2331			Preparing metal plate for painting.	ACID ACTIVATED SOLVENT, DO NOT USE ON PLASTICS.
Carbon Removing Compound	P-C- 111A		Use in soak tank to facilitate removal of carbon, gum, oil and other surface contaminants except rust or corrosion from engine and other metal parts.	REMOVES PAINT. AVOID CONTACT WITH SKIN.
Cleaning Compound	P- C-535		Heavy duty electro cleaner used for removal of soils from ferrous metal surfaces prior to electroplating or other treatments.	

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Table 201. General Solvents (continued)

<b>CLEANER/ SOLVENT</b>	<b>FED- ERAL SPECIFI- CATION</b>	<b>TYPE CLASSIFI- CATION</b>	<b>USE/ DESCRIPTION FUNCTION</b>	<b>CAUTION/ WARNING</b>
Cleaning Compound, Unfinished Aluminum	MIL-C-5410	Type I - Viscous Emulsion Type II - Clear Liquid	Used full strength for overhaul of unfinished aluminum surfaces. Use full strength or diluted with mineral spirits and water for maintenance of airplane unfinished aluminum surfaces.	
Trichloroethylene	O-T-634B	Type I - Regular Type II - Vapor Degreasing	Cleaning of metal parts. Degreasing of metal parts. Special purpose solvent.	REMOVES PAINT AND DAMAGES PLASTICS. USE ONLY WITH ADEQUATE VENTILATION. HIGH CONCENTRATIONS OF VAPOR ARE ANESTHETIC AND DANGEROUS TO LIFE. VERY TOXIC.
Polish, Metal Aluminum	MIL-P-6888C	Type I -Liquid Type II Paste	Metal polish for use on airplane aluminum surfaces.	FLAMMABLE.
Naphtha, Aliphatic	TT-N-958	Type I Type II	For use with organic coatings only. Cleaner for acrylic plastics and may be used in place of Type I General cleaning agent.	FLAMMABLE. VAPOR HARMFUL. AVOID PROLONGED OR REPEATED BREATHING OR CONTACT WITH SKIN.
Methyl Propyl Ketone			Paint and adhesive thinner, cleaning agent.	FLAMMABLE.
Isopropyl Alcohol	TT-I-735	Grade B -0.4% water	For use with organic coatings and as an anti-icing fluid. General Solvent for synthetic rubbers.	DO NOT USE WITH ACRYLIC PLASTICS.

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Table 201. General Solvents (continued)

<b>CLEANER/ SOLVENT</b>	<b>FED- ERAL SPECIFI- CATION</b>	<b>TYPE CLASSIFI- CATION</b>	<b>USE/ DESCRIPTION FUNCTION</b>	<b>CAUTION/ WARNING</b>
Wax, Airplane, Waterproof Solvent Type	MIL- W- 18723C		A waterproof wax that can be dissolved or dispersed with an organic solvent.	DO NOT USE SOLVENTS THAT MAY DAMAGE PAINT OR FINISH FOR REMOVAL OF WAX.
Cleaning Compound, Aluminum	MIL-C- 5410B	Type I - Vis- cous Emul- sionType II - Clear Liquid	Use full strength for maintenance of unfinished aluminum surfaces. Use full strength or diluted with mineral spirits and water for maintenance of unfinished aluminum surfaces.	RUBBER OR SYNTHETIC RUBBER GLOVES AND EYE PROTECTION SHOULD BE USED WHEN HANDLING THE COMPOUND. WASH FROM SKIN IMMEDIATELY WITH WATER OR A SOLUTION OF SODIUM BICARBONATE AND APPLY GLYCERIN OR PETROLEUM JELLY. WASH FROM EYES AS PER MANUFACTURER'S INSTRUCTIONS AND REPORT TO NEAREST MEDICAL FACILITY.
Toluene	A-A- 59107		Use as a solvent or thinner for organic layers, various resins, and chlorinated rubber. Also used to dilute cellulose lacquers and dopes.	FLAMMABLE VAPOR. VAPOR HARMFUL.

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**INTERIOR AND EXTERIOR FINISH - CLEANING/PAINTING**

**1. General**

- A. Interior and exterior finish cleaning/painting consists of general information and instructions for applying chemical film treatments, primer and topcoats to the airplane.

**2. Interior and Exterior Finishes**

- A. Detail aluminum parts are chemically pretreated and epoxy primed prior to assembly. The chem-film pretreatment and the epoxy primer are primary coatings and must be maintained and preserved for corrosion control. Exterior assemblies that are to be topcoated receive ScotchBrite, hand solvent cleaning and another overall application of epoxy primer. The airplane exterior then receives an overall topcoat of polyurethane paint including stripes.

**CAUTION:** All plastic and fiberglass parts, except bushings, bearings, grommets and certain purchased antenna covers which are not colored or painted, shall be colored or painted to match adjacent surface. The head of the pitot tube must be open and free from paint and other foreign objects. The surface adjacent to static port must be smooth and free from all paint imperfection. Do not paint pitot tube, fuel caps, trim tab pushrods where they operate in an actuator, oleo strut sliding surfaces, standard polished spinners, exhausts, stall warning vanes, chromed items (handles, locks, etc.) or the tie-down lugs (located on struts) or light lens. Paint the landing gear barrels and torque links to match the overall color.

**3. Paint Facility**

- A. Painting facilities must include the ability to maintain environmental control of temperature at a minimum of 65°F (18°C). All paint equipment must be clean. Accurate measuring containers should be available for mixing protective coatings. Use of approved respirators while painting is a must for personal safety. All solvent containers should be grounded to prevent static buildup. Catalyst materials are toxic, therefore, breathing fumes or allowing contact with skin can cause serious irritation. Material stock should be rotated to allow use of older materials first, because its useful life is limited. All supplies should be stored in an area where temperature is higher than 50°F (10°C), but lower than 90°F (32°C). Storage at 90°F (32°C) is allowable for no more than sixty days, providing it is returned to room temperature for mixing and use.
- (1) Areas in which cleaning or painting are done shall have adequate ventilation and shall be protected from uncontrolled spray, dust, or fumes.
  - (2) Areas for prolonged storage of cleaned parts and assemblies awaiting painting shall be free from uncontrolled spray, dust, or fumes, or else positive means of protecting part cleanliness such as enclosed bins or wrapping in kraft paper shall be provided.
  - (3) Areas in which cleaning or painting are done shall be periodically cleaned and dusted.
  - (4) Compressed air used for dusting and paint spraying shall be free from oil, water and particulate matter.

**4. Sanding Surfacers**

- A. Purpose and Requirements.
- (1) Surfacers are applied over fiberglass and ABS assemblies to provide aerodynamic contour, smoothness and to seal porous surfaces. Application of surfacer also provides a good surface for a polyurethane finish.
  - (2) The objective of a surfacer is to fill local depressions, pits, pin holes and other small surface defects so a smooth surface is obtained for paint. The total surfacer thickness shall not be greater than 15 mils (0.38 mm). Only enough surfacer shall be applied to obtain a smooth surface for paint. If less thickness will provide a smooth surface, this is better. A thick layer of surfacer is less flexible and may crack in service.

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- (3) To complete the airplane's polyurethane finish over surfacer, begin by applying the intermediate coat. Apply topcoat (polyurethane enamel) using same procedure.
- (4) Should a repair be required (cracked or chipped paint) to areas where surfacer is applied, sanding surfacer should be removed to expose fiberglass or Kevlar. It may be necessary to remove all sanding surfacer on that individual assembly and/or component to obtain a satisfactory finish. For additional information, refer to Cleaning.
- (5) Sanding surfacer methods.
  - (a) Do not intermix vendor material or substitute material. Also, do not substitute instructions. Select and use one vendor's material and use the corresponding instructions.

B. Cleaning.

**CAUTION:** Do not use chemical strippers on ABS plastic and fiberglass assemblies. Paint stripper solvent will damage these assemblies.

**CAUTION:** Sanding of paint and/or sanding surfacer must be very carefully accomplished. Do not sand into the fabric layers of composite assemblies as this will result in loss of strength.

- (1) Remove paint covering sanding surfacer by sanding. Paint should be removed well beyond damaged area. For best results, it is recommended to remove all paint covering sanding surfacer of that individual composite component.
- (2) Remove sanding surfacer by sanding from individual component to expose fabric.
- (3) Scuff sand area to be refinished with 320 grit paper. Do not over expose fabric.
- (4) Clean surface with Methyl n-Propyl Ketone. Follow manufacturer's instructions for final cleaning prior to sanding surfacer application.

5. **Paint Stripping**

A. Mechanical Stripping

- (1) Mechanical methods of stripping include power sanding with a disc or jitterbug type sander, grinder, hand sanding, and wire brushing.
  - (a) Ensure mechanical methods do not damage surfaces being stripped. Damage may include, but is not limited to, cutting fibers of composite structures or scratches in the surface of metallic surfaces.

**CAUTION:** Do not use low carbon steel brushes on aluminum, magnesium, copper, stainless steel or titanium surfaces. Steel particles may become embedded in the surfaces, and later rust or cause galvanic corrosion of the metal surfaces.

- (2) Mechanical stripping must be used for stripping composite or plastic surfaces.
- (3) Mechanical stripping is recommended for surfaces which might entrap chemical strippers and result in corrosion.
- (4) Mechanical stripping is required for painted surfaces masked during chemical stripping.

B. Chemical Stripping.



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**WARNING:** All paint strippers are harmful to eyes and skin. All operators should wear goggle-type eyeglasses, rubber gloves, aprons and boots. In case of contact with skin, flush with water. In case of contact with eyes, flush eyes thoroughly with water and consult physician immediately. Paint stripping should be done in a well ventilated area.

**WARNING:** Use of a heater with an open flame in an area in which stripping with a methylene chloride-type stripper is used produces hydrochloric acid fumes. If acid is deposited on airplane it will corrode all surfaces.

- (1) Thoroughly clean airplane surfaces to remove all grease and other dirt which might keep stripping agent from attacking paint.
- (2) All seams and joints must be protected by applying a tape, resistant to strippers, to every joint to prevent stripping chemicals from entering the skin joints. Chemicals used for stripping polyurethane paint are very difficult to remove from joints, and may promote corrosion or deteriorate bonding agents used in assembly of airplane.
- (3) Mask following surfaces using plastic sheeting or waxed paper and plastic tape so as to make a safety margin of at least one-half inch (13 mm) between protected surface and surface to be stripped.

**NOTE:** Do not use masking tape.

- (a) Mask all windows and transparencies.

**CAUTION:** Acrylic windows may be softened or otherwise damaged by paint stripper, solvent or paint. Use water and grease-proof barrier material and polyethylene coated tape to protect windows.

- 1 Place barrier material over window and seal around periphery with polyethylene backed masking tape.
  - 2 Cut second sheet of barrier material an inch (26 mm) or more larger than window.
  - 3 Place second sheet of barrier material over window and seal with polyethylene tape.
- (b) Mask all rubber and other non metals.
- (c) Composites if possible, shall be removed from airplane prior to stripping.
- (d) Mask all honeycomb panels and all fasteners which penetrate honeycomb panels.
- (e) Mask all pivots, bearings and landing gear.
- (f) Titanium, if used on airplane, must be protected from strippers.
- (g) Mask all skin laps, inspection holes, drain holes, or any opening that would allow stripper to enter airplane structure.

**CAUTION:** Do not allow paint stripper to contact high heat treated steel pins, such as pins attaching landing gear components. Paint strippers may induce hydrogen embrittlement in high heat treated steel.

- (4) Apply approved stripper by spray or brush method.

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**WARNING:** Use normal safety precautions when using flammable materials during cleaning and painting procedures.

**WARNING:** Paint stripper solution is harmful to eyes and skin. Wear goggles, rubber gloves, apron and boots when working with paint stripper. Also wear appropriate respirator when applying "spray-on" strippers. The chemical supplier bulletins and instructions should be closely followed for proper mixing of solution, application methods and safety precautions.

- (a) If using spray method, apply a mist coat to area to be stripped, then when paint begins to lift, apply a second heavy coat.
- (b) If applying with brush, brush across the surface only once, in one direction.
- (5) Allow stripper coating to lay on the surface until paint lifts.
- (6) After paint begins to lift, use a propylene bristle brush to agitate stripper to allow deeper penetration of stripper.
- (7) Remove lifted paint with a plastic squeegee. Dispose of residue in accordance with local regulations.
- (8) Inspect all surfaces for incomplete paint removal.
  - (a) Repeat previous procedural steps as necessary until all paint is removed.
- (9) After stripping airplane, thoroughly rinse to remove any stripping residue.
- (10) Remove tape applied to protect joints and other masked areas.
- (11) Carefully remove remaining paint at skin joints and masked areas by sanding with a hand or jitterbug type sander.
- (12) If necessary to remove paint from inside skin joints, refer to Cleanout of Skin Joints.
- (13) If corrosion is encountered, refer to Structural Repair Manual, Chapter 51, Corrosion/Repair, for corrosion treatment.

C. Cleanout of Skin Joints.

- (1) Install a surface conditioning disc on a pneumatic drill.
- (2) Taper edge of disc to an edge which will allow edge to fit into skin joint seam.
  - (a) Run disc against a piece of coarse abrasive paper or a mill file until edge is tapered.

**CAUTION:** Excessive pressure or dwell time will cause scratches or grooves in metal. Ensure doubler at bottom of joint is not damaged or gouged in any way by this process.

- (3) Using tapered surface conditioning disc, remove paint and other material from joint seams.
- (4) Carefully, and using as low speed as possible, remove paint and all other material from joint.

**NOTE:** Surface conditioning disc will wear rapidly, it will be necessary to sharpen (retaper) disc frequently.

6. Hand Solvent Cleaning

**WARNING:** Work in a well ventilated area free from sources of ignition. Use only approved solvents and materials.

**CAUTION:** Airplane shall be grounded during solvent wipe.

A. Surface Cleaning.

- (1) Apply solvent to a clean wiping cloth by pouring from a safety can or other approved container. The cloth should be well saturated with solvent. Avoid dipping wipers into open solvent containers as this contaminates the solvent.
- (2) Wipe the surface with the wet cloth as required to dissolve or loosen soils. Work on a small enough area so that the area being cleaned remains wet with solvent.

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- (3) With a clean dry cloth, immediately wipe dry the area being cleaned. Do not allow the surface to evaporate dry.
- (4) Repeat steps (1) through (3) as required and change cloths often.

**7. Maintenance of the Interior and Exterior Primary Coatings and Topcoat**

- A. Rework and repair primary coatings on airplane interior and exterior surfaces for protection and corrosion control.
  - (1) Minor scratches or defects, which do not penetrate the epoxy primer or which penetrate the primer and expose bare metal, with the total area of exposed bare metal less than the size of a dime, touch up as follows:
    - (a) Hand solvent clean and sand with 320 grit or finer sandpaper.
    - (b) Clean with compressed air, hand solvent clean again, then wipe with a tack rag.
    - (c) Mix and reapply epoxy primer (MIL P-23377 or equivalent) as directed by the primer manufacturer or supplier.
    - (d) On a properly prepared surface, mix and apply polyurethane topcoat as directed by the paint manufacturer or supplier.
  - (2) Major defects which expose bare metal to an area larger than the size of a dime, touch up as follows:
    - (a) Hand solvent clean and sand with 320 grit or finer sandpaper.
    - (b) Clean with compressed air, hand solvent clean again, then wipe with a tack rag.
    - (c) Apply a spray wash primer or (preferred method) brush chem film primer. Mask the area to minimize the amount of primer from spreading over the existing epoxy primer. Let cure according to the product manufacturers recommendations.
    - (d) Mix and apply epoxy primer (MIL P-23377 or equivalent) to the affected area within four hours.
    - (e) If an exterior painted surface, mix and apply polyurethane topcoat as directed by the paint manufacturer or supplier.

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**FUEL, WEATHER AND HIGH-TEMPERATURE SEALING - MAINTENANCE PRACTICES**

**1. General**

- A. Procedures for application of sealants are provided for various types of sealing required for the airplane.

**2. Tools and Equipment**

**NOTE:** Specified sealants, cleaning solvents, parting agents, adhesion inhibitors and equipment are listed for use. Suitable substitutes may be used for sealing equipment only.

**SEALANTS TYPE I, CLASS A- 1/2, OR A-2 - AMS-S-8802**

NAME	NUMBER	MANUFACTURER	USE
Sealants	GC-408	Goal Chemical Sealant Corp. 3137 East 26th Street Los Angeles, CA 90023	Fuel, pressure and weather sealant brush application.
	Pro-Seal 890	PRC-DeSoto International 5454 San Fernando Rd. Glendale, CA 91209	
	PR-1440	PRC-DeSoto International	

**SEALANTS TYPE I, CLASS B-1/4, QUICK REPAIR - MIL-S-83318**

Sealant	GC-435	Goal Chemical Sealant Corp.	Fuel, pressure and weather sealant. For limited repairs requiring rapid curing sealant.
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**SEALANTS TYPE I, CLASS B-1/2, B- 2 OR B-4 - AMS-S-8802**

NAME	NUMBER	MANUFACTURER	USE
Sealants	PR-1440	PRC-DeSoto International	Fuel pressure and weather sealant, suitable for application by extrusion gun and spatula.
	AC-236	Advanced Chemistry And Technology	
	CS 3204	Flamemaster Corporation	
	Pro Seal 890	PRC-DeSoto International	

**SEALANTS TYPE I, CLASS C-20, C-48 OR C-80**

Sealant	Pro-Seal 890	PRC-DeSoto International	Fuel, pressure and weather sealant. Suitable for faying surface sealing.
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**SEALANTS TYPE IV**

Sealant	Dapco 2100	D. Aircraft Inc. Anaheim, CA 92807	Firewall and wire bundle sealing.
	Pro Seal 700	PRC-DeSoto International	Firewall sealing (except wire bundles).
	Q3-6077	Dow Corning	Wire bundle firewall sealing.

**SEALANTS TYPE VI**

Sealant	FA-0606 125	HB Fuller St. Paul, MN 55116	Water and weather-tight acrylic latex sealant for windows and metal lap joints.
Sealant	SM8500	Schnee-Moorehead Irving, TX 75017	Water and weather-tight acrylic latex sealant for windows and metal lap joints.

**SEALANT TYPE VIII, CLASS B-1/2 ORB2 - MIL-S-8784**

Sealant	PR-1428 Class	PRC-DeSoto International	Low adhesion access door, fuel, pressure and weather sealing.
	PR-1081 Class	PRC-DeSoto International	

**SEALANT TYPE XI**

Sealant	U000927S	Available from Cessna Parts Distribution Cessna Aircraft Company Department 701 5800 E. Pawnee Rd. Wichita, KS 67218-5590	Permanently pliable extruded tape for fixed windows.
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**CLEANING SOLVENTS**

NAME	NUMBER	MANUFACTURER	USE
1, 1, 1 - Trichloroethane Technical Inhibited (Methyl Chloroform)	Federal Specification ASTM D4126	Commercially Available	Before sealing cleaning.
Methyl Propyl Ketone		Commercially Available	Cleaning organic coating.

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**CLEANING SOLVENTS**

NAME	NUMBER	MANUFACTURER	USE
Naphtha Type II	Federal Specification TT-N-95	Commercially Available	Before sealing cleaning.
Cleaning compound	A-A-59281	Commercially Available	Before sealing cleaning.
Isopropyl alcohol	Federal Specification TT-I-735	Commercially Available	Cleaning plastic. (Except plastic transparencies)

**PARTING AGENTS**

NAME	NUMBER	MANUFACTURER	USE
Silicone compound	AS 8660	Commercially available	Prevent sealant sticking.
Petrolatum technical	Federal Specification VV-P-236	Commercially available	Prevent sealant sticking.

**EQUIPMENT**

Pneumatic sealing gun.	Semco Number 250 with accessories (or equivalent)	PRC-DeSoto International	Injection sealing.
Hand-operated sealing gun	Semco Number 850	PRC-DeSoto International	Injection sealing.
Nozzles,		PRC-DeSoto International	Application of sealant.
Round 1/16 orifice	Semco Number 420		
Round 1/8 orifice	Semco Number 440		
Duckbill	Semco Number 8615		
Duckbill	Semco Number 8648		
Comb	Semco Number 8646		
Polyethylene cartridges with plungers and caps for sealant gun.		Commercially available	Application of sealant.
Metal spatulas with either stainless steel or glass plates.		Commercially available	Mixing sealant.

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**EQUIPMENT**

Plastic lined cups, wax-free with caps		Commercially available	Mixing sealant.
Sealant fairing tools		Commercially available	To fair-in sealant.
Cheesecloth, lint-free		Commercially available	Cleaning.
Plastic scraper, 45- degree cutting edge.		Commercially available	Removing old sealant.
Durometer	Rex Model 1500 (or equivalent)	Rex Gauge Company, Inc. 3230 West Lake Avenue P.O. Box 46 Glenview, IL 60025	Testing cure of sealant.
Gloves, lightweight lint-free white cotton		Commercially available	Removing old sealant.
Nylon bristle brushes		Commercially available	Removing old sealant.
Pipe cleaners		Commercially available	Cleaning.
Funnel brushes		Commercially available	Cleaning.

**3. Definition of Sealing Terms**

- A. The following definitions are included to provide a basic concept of the special terms used in sealing. This list is not all inclusive but the more common terms are listed.
- (1) Absolute Sealing - There can be no leakage allowed. All openings of any nature through the seal plane are positively sealed. This is the first level of sealing. (All holes, slots, joggles, fasteners and seams must be sealed.)
  - (2) Accelerator (Activator) - Curing agent for sealants.
  - (3) Application Time - The length of time sealant remains workable or suitable for application to structure by brush, extrusion gun, spatula or roller.
  - (4) Base Compound - The major component of a two-part sealing compound which is mixed with the accelerator prior to application to produce a fuel, temperature, pressure, weather and/or firewall sealing material.
  - (5) Brush Coat - Apply an overcoat or continuous film of appropriate sealing compound by use of a brush.
  - (6) Fay Seal or Faying Surface Seal - A seal barrier created by the sandwiching of sealant between mating surfaces of structure. Special attention must be taken to avoid metal chips or dirt at the faying surface.
  - (7) Fillet Seal - Sealant material applied at the seam, joint or fastener after the assembly has all permanent fasteners installed and shall conform to the dimension in applicable figure.
  - (8) Hole - An opening that has no appreciable depth, such as a tool hole. Holes that penetrate the seal plane must be metal filled with a fastener, gusset or patch.
  - (9) Injection Seal - Filling of channels by forcing sealant into a void or cavity after assembly.
  - (10) Integral Tank - Composition of structure and sealant material which forms a tank that is capable of containing fuel without a bladder.
  - (11) Intermediate Seal - The second level of sealing. All holes, slots, joggles and seams in the seal plane must be sealed. A minor amount of leakage is tolerable and permanent fasteners are not required to be sealed.
  - (12) Post-Assembly Seal - A seal that is applied after the structure is assembled. (Fillet and injection seals.)

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- (13) Preassembly Seal - Sealant material that must be applied during or prior to the assembly of the structure. (Faying surface and pre-pack seals.)
- (14) Pre-Pack Seal - A preassembly seal used to fill voids and cavities; can be a primary seal used to provide seal continuity when used in conjunction with a fillet seal. It can be used as a backup seal to support a fillet across a void. Fill the entire cavity to be prepacked. Usage as a primary seal should be kept to a minimum.
- (15) Primary Seal - Sealant material that prevents leakage and forms a continuous seal plane. This seal is in direct contact with fuel, vapor, air, acid, etc. With few exceptions, it is in the form of a fillet seal.
- (16) Sealant - A compound applied to form a seal barrier.
- (17) Seal Plane - A surface composed of structure, sealant and fasteners on which the continuity of seal is established.
- (18) Shank Sealing - Sealant compound shall be applied to the hole or to both the shank and the under head area of the fastener in sufficient quantity that the entire shank is coated and a small continuous bead of sealant is extruded out around the complete periphery of each end of the fastener when installed. The fastener shall be installed within the application time of the sealing compound used.
- (19) Squeeze-Out Life - Length of time sealant remains suitable for structure assembly in faying surface seal application.
- (20) Tack-Free Time - Tack-free time is a stage, during the cure of the sealant compound, after which the sealant compound is no longer tacky. When the sealant compound is pressed firmly with the knuckles, but no longer adheres to the knuckles, the sealant compound is tack-free.

#### 4. Materials

A. Type of Sealants - Sealants are categorized by type of usage. Type I sealants are separated into classes to differentiate the materials according to method of application. Dash numbers following the class designation indicate the minimum application time (in hours) for Class A and Class B, and minimum work life (in hours) for Class C. Refer to Table 201 for application time, curing rate, etc., for Type I sealants.

- (1) Type I - Fuel, pressure, and weather sealant.
  - (a) Class A - Sealant which is suitable for brush application.
  - (b) Class B - Sealant which is suitable for application by extrusion gun, spatula, etc.
  - (c) Class C - Sealant which is suitable in faying surface applications.
  - (d) Quick Repair Sealant - This material is for use only in making repairs when an extremely rapid curing sealant is required. A possible application includes sealing a leaking fuel tank on an airplane which must be dispatched within a few hours.

**CAUTION:** Quick repair sealant must be applied within its working life of 15 minutes. Attempts to work quick repair sealant beyond working life will result in incomplete wetting of surface and will result in a failed seal.

- (2) Type VIII - Low Adhesion Access Door Sealant. This Class B sealant is designed for sealing faying surfaces where easy separation of the joined surfaces is required. The sealant has low adhesion and forms a gasket that molds itself to fill all irregularities between two surfaces. The sealant is exceptionally resistant to fuels, greases, water, most solvents and oils including hydraulic oil.

**NOTE:** Time periods presented below are based on a temperature of 77°F (25°C) and 50 percent relative humidity. Any increase in either temperature or relative humidity may shorten these time periods and accelerate the sealant cure.



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Table 201. Curing Properties of Type I Sealant

CLASS	APPLICATION TIME (HOURS, MINIMUM)	WORK LIFE (HOURS, MINIMUM)	TACK-FREE TIME (HOURS, MAXIMUM)	CURING RATE (HOURS, MAXIMUM)
A-1/2	1/2		10	40
A-2	2		40	72
B-1/2	1/2		4	6
B-2	2		40	72
B-4	4		48	90
C-24	8	24	96	168 (7 days)
C-48	12	48	120	336 (14 days)
C-80	8	80	120	504 (21 days)

## 5. General Requirements

### A. When working with sealants observe the following requirements.

- (1) Unmixed sealants shall not be more than two months old when received. These sealants shall not be more than six months old when used.
- (2) Unmixed sealants stored at temperatures exceeding 80°F (27°C) shall be used within five weeks.
- (3) Sealants which have been premixed, degassed and flash frozen shall be maintained at -40°F (-40°C) or lower and shall not be received more than two weeks beyond the date of mixing. These sealants shall not be used more than six weeks after the date of mixing.
- (4) Frozen sealant shall be thawed before being used. If sealant were applied at a temperature below 60°F (15°C), it would not be sufficiently pliable for proper application and adhesion could be critically reduced by condensation of moisture. On the other hand, although sealant must extrude freely for proper application, it would be subject to excessive slumping if applied at a temperature above 80°F (27°C). Frozen sealant may be thawed by any suitable means which does not cause contamination or overheating of the sealant and does not shorten the application time of the sealant to an impractical period. Examples: Thawing by exposure to ambient air temperature, accelerated thawing by exposure in a constant temperature bath (using clean, hot water), accelerated thawing in a microwave oven. In any case, thawing temperature and time shall be adjusted to give a thawed sealant temperature between 60°F, and 80°F (15°C and 27°C) at the time the sealant is applied.
- (5) Mixed, frozen sealants which have thawed shall not be refrozen.
- (6) Complete preassembly operations, such as fitting, filing, drilling, countersinking, dimpling and deburring, prior to cleaning and sealant application.
- (7) Surfaces must be clean and dry, free from dust, lint, grease, chips, oil condensation or other moisture and all other contaminating substances prior to the application of sealant.
  - (a) All exposed bonding primer or bonded assemblies which are to be sealed shall be cleaned using Scotch Brite followed by solvent cleaning using Trichloroethane.

**NOTE:** Bond primer shall not be removed; just lightly scuffed with Scotch Brite.

- (8) Sealant materials may be applied to unprimed or primed surfaces. Nonchromated or epoxy primers shall have good adhesion to the substrate material and shall have aged at least 48 hours prior to sealant application. Adhesive bonding primer shall be scotchbried and cleaned before applying sealant.
- (9) Sealants shall not be applied when the temperature of either the sealant or the structure is below 60°F (15°C).
- (10) Sealant applied by the fillet or brush coat methods shall always be applied to the pressure side of a joint if possible.

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- (11) After application, sealants shall be free of entrapped air bubbles and shall not exhibit poor adhesion. All fillets shall be smoothed down and pressed into the seam or joint with a filleting tool before the sealant application time has expired.
- (12) Where fasteners have been shank or under head sealed, extruded sealant shall be evident around the complete periphery of the fastener to indicate adequate sealing. Sealant extruded through a hole by a rivet shall be wiped from the end of the rivet before bucking. Threaded fasteners which have been shank or under head sealed shall not be retorqued after the expiration of the application time of the sealant. Prior to torquing, sealant shall be removed from the threads. In torquing, turn the nut rather than the bolt, if possible.
- (13) Pressure testing shall not be accomplished until the sealant is cured.
- (14) Sealant shall not be applied over ink, pencil or wax pencil marks. If these materials extend into the sealing area, they must be removed.
- (15) If sealing is to be accomplished over primer and the primer is removed during the cleaning process, it is permissible to seal directly over the cleaned area and then touch up the exposed areas after the sealant has been applied and is tack free.
- (16) Sealed structure shall not be handled or moved until sealant is tack free (sealant may be dislodged or have the adhesion damaged). Excessive vibration of structure, such as riveting, engine run up, etc. is not permitted.
- (17) Drilling holes and installing fasteners through a fayed sealed area shall be performed during the working life of the faying sealant or the entire shank and area under fastener head shall be fayed sealed.

## 6. Sealant Curing

### A. Room Temperature.

- (1) Room temperature curing properties are based on a temperature of 77°F, +5 or -5°F (25°C, +3 or - 3°C) and a relative humidity of 50 percent unless otherwise indicated.
- (2) Room temperature curing properties of Type I sealants are given in Table 201.
- (3) Curing properties of Type VIII, Class B sealants are the same as for Type I, Class B. Adhesion to aluminum should be (peel) less than two pounds per inch width (1.4 N per 10 mm width).

### B. Accelerated Curing.

- (1) Accelerated curing of sealant can be accomplished in several ways. The procedure to be used is dependent on the type of sealant and other factors.
- (2) The cure of Type I sealants can be accelerated by an increase in temperature and/or relative humidity. Warm circulating air at a temperature not to exceed 140°F (60°C) may be used to accelerate cure. Heat lamps may be used if the surface temperature of the sealant does not exceed 140°F (60°C). At temperatures above 120°F (49°C), the relative humidity will normally be so low (below 40 percent) that sealant curing will be retarded. If necessary, the relative humidity may be increased by the use of water containing less than 100 parts per million total solids and less than 10 parts per million chlorides.

## 7. Mixing of Sealants

### A. Requirements.

- (1) Sealants shall be mixed or thinned in accordance with the manufacturers recommendations and thoroughly blended prior to application. All mixed sealant shall be as void free as possible.
- (2) Prior to mixing, the sealing compound base and its curing agent, both in their respective original unopened containers, shall be brought to a temperature between 75°F and 90°F (24°C and 32°C) along with all required mixing equipment.

### B. Hand Mixing of Sealant.

- (1) Weigh into clean, wax free containers the correct amount of base and curing agent, per manufacturers instructions, immediately prior to mixing. An alternate method is to mix the sealant on a flat plate with a spatula. The scales and weighing process must be controlled within +2 or -2 percent to ensure good quality.
- (2) Do not allow the accelerator to come into contact with the sides of the container.
- (3) Materials shall be accurately weighed on scales that are calibrated and maintained for required accuracy.

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- (4) Mix the components until the color is uniform taking care not to trap air in the sealant.
- (5) Transfer the sealant to another clean container and complete the mix.

C. Sem-Kit Mixing. (Refer to Figure 201)

**WARNING: The cartridge should be held firmly, but must not be squeezed, as the dasher blades may penetrate the cartridge and injure the hand.**

- (1) Pull dasher rod to the FULL OUT position so that the dasher is at the nozzle end of the cartridge.
- (2) Insert ramrod in the center of the dasher rod against the piston and push the piston in approximately one inch (25 mm).

**NOTE:** Extra force will be needed on the ramrod at the beginning of accelerator injection into the base material.

- (3) Move the dasher rod in approximately one inch (25 mm), then push the piston in another inch (25 mm). Repeat this action until accelerator is distributed along the entire length of the cartridge.

**NOTE:** The accelerator has been fully injected into the cartridge when the ramrod is fully inserted into the dasher rod.

- (4) Remove and properly discard the ramrod.

**NOTE:** Mixing the accelerator and base material can be accomplished manually, or as an alternate method, with the use of a drill motor.

(5) Manual Mixing.

- (a) Begin mixing operation by rotating the dasher rod in a clockwise direction while slowly moving it to the FULL OUT position.

**NOTE:** Do not rotate the dasher rod counterclockwise; the four blade dasher inside the cartridge will unscrew and separate from the dasher rod.

- (b) Continue clockwise rotation and slowly move the dasher rod to the FULL IN position.  
1 A minimum of five full clockwise revolutions must be made for each full out stroke and for each full in stroke of the dasher rod. Approximately sixty strokes are necessary for a complete mix.

**NOTE:** If streaks are present in the sealant (viewing through the side of the cartridge), the sealant is not completely mixed.

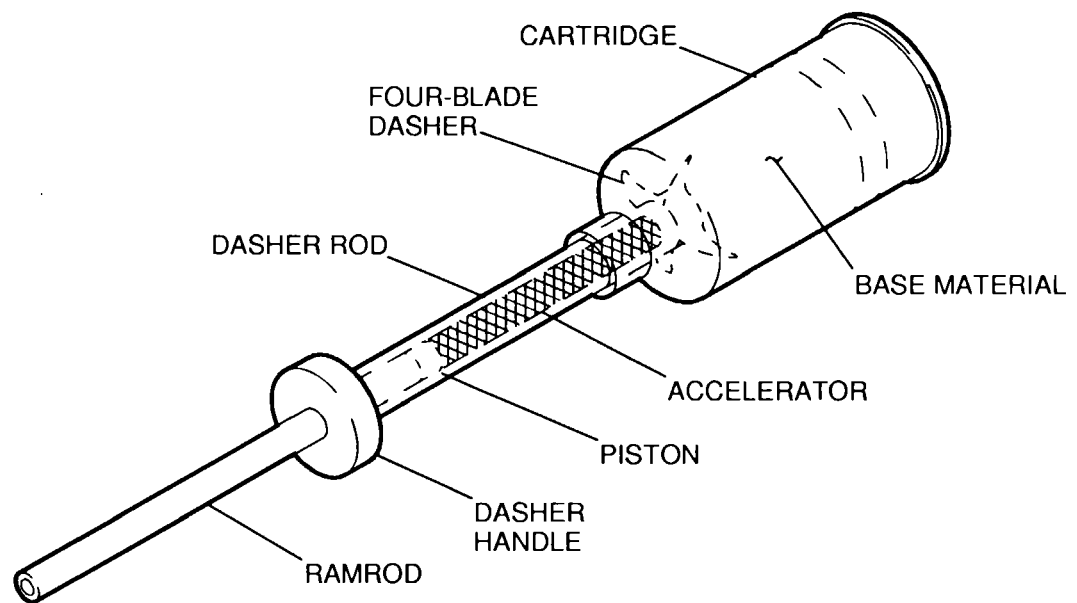
- (c) End mixing operation with the four blade dasher at the bottom of the cartridge.
  - (d) Hold cartridge upright; unscrew dasher rod from the four blade dasher by gripping the cartridge at the four blade dasher and turn the dasher rod counterclockwise. Remove dasher rod.
  - (e) Screw appropriate nozzle into the cartridge. If sealant gun is to be used, install cartridge in gun.
- (6) Drill motor mixing.

**NOTE:** A tapered rotary file or a 25/64 inch drill bit may be used with a drill motor to turn the dasher rod.

- (a) Insert the rotary file/drill bit into the dasher rod approximately 1/2 inch (13 mm).

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**NOTE:** CARTRIDGE IS DISPOSABLE AFTER USE.

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Two-Part Sealant Cartridge  
Figure 201 (Sheet 1)

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**WARNING: The cartridge should be held firmly, but not squeezed, as the dasher blades may penetrate the cartridge and injure the hand.**

- (b) Verify the drill motor will rotate the dasher rod clockwise (looking toward the nozzle end of the cartridge).
- (c) With the cartridge held firmly in one hand and the drill motor in the other, rotate the dasher rod at approximately 50 revolutions-per-minute while moving the dasher rod to FULL IN and FULL OUT positions.
  - 1 Mix sealant for at least 50 strokes (a stroke is one complete full in and full out stroke of the dasher rod).

**NOTE:** If streaks are present in the sealant (viewing through the side of the cartridge), the sealant is not completely mixed.

- (d) End mixing operation with the four blade dasher at the bottom of the cartridge.
- (e) Hold cartridge upright; remove drill motor and rotary file/drill bit from the dasher rod; unscrew dasher rod from the four blade dasher by gripping the cartridge at the four blade dasher and turn the dasher rod counterclockwise. Remove dasher rod.
- (f) Screw appropriate nozzle into the cartridge. If sealant gun is to be used, install cartridge in gun.

## 8. Cleaning

- A. All surfaces to which sealant is to be applied shall be clean and dry.
- B. Remove all dust, lint, chips, shavings, etc. with a vacuum cleaner where necessary.
- C. Cleaning shall be accomplished by scrubbing the surface with clean cheesecloth moistened with solvent. The cloth shall not be saturated to the point where dripping will occur. For channels and joggles, pipe cleaners and/or funnel brushes may be used instead of cheesecloth.
  - (1) Use solvent A-A-59281 to first clean the integral fuel tank.
  - (2) Use 0-T-620, 1, 1, 1 - Trichloroethane, Technical, Inhibited only must be used last to finish clean.
- D. The cleaning solvent should never be poured or sprayed on the structure.
- E. The cleaning solvent shall be wiped from the surfaces before evaporation using a piece of clean, dry cheesecloth in order that oils, grease, wax etc., will not be redeposited.
- F. It is essential that only clean cheesecloth and clean solvent be used in the cleaning operations. Solvents shall be kept in safety containers and shall be poured onto the cheesecloth. The cheesecloth shall not be dipped into the solvent containers and contaminated solvents shall not be returned to the clean solvent containers.
- G. Final cleaning shall be accomplished immediately prior to sealant application by the person who is going to apply the sealant.
  - (1) The area which is to be sealed shall be thoroughly cleaned. A small clean paint brush may be needed to clean corners, gaps, etc. Always clean an area larger than the area where the sealant is to be applied. Never clean an area larger than 30 inches (0.8 m) in length when practical. When the area is being scrubbed with a moistened cloth in one hand, another clean dry cloth shall be held in the other hand and shall be used to dry the structure. The solvent must be wiped from the surfaces before it evaporates.
  - (2) The above procedure shall be repeated until there is no discoloration on the clean drying cloth. Marks resulting from wax or grease pencils must be removed from parts prior to sealing.
- H. Allow all cleaned surfaces to dry a minimum of 5 minutes before the application of sealant materials.
- I. Sealant shall be applied as soon as possible after cleaning and drying the surfaces to be sealed. Do not handle the parts between the cleaning and sealing operations. Sealant application personnel handling cleaned surfaces shall wear clean white gloves to prevent surface contamination. In the event contamination does occur, the surfaces shall be recleaned.

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- J. Safety precautions should be observed during the cleaning and sealing operation. Cleaning solvents are toxic and flammable in most cases. Fresh air masks and/or adequate ventilation are required for all closed areas. The structure shall be electrically grounded before starting any cleaning or sealing operation.

**9. Sealing Application**

**A. General (Refer to Figure 202).**

- (1) All new sealing shall be accomplished using the type of sealing material required for the area being sealed. All sealant repairs shall be accomplished using the same type of sealing material as that which is being repaired.
- (2) Application time of the sealing compound shall be strictly observed. Material which becomes too stiff and difficult to work or which does not wet the surface properly shall be discarded even though the application time has not expired.
- (3) Prior to sealant application, all surfaces to be sealed must be cleaned. Refer to Cleaning.

**B. Fay Surface Sealing (Refer to Figure 202).**

- (1) A fay surface seal must be made when a new structure is added to the airplane and a fay surface seal is necessary.
  - (a) The fay sealed joints must be closed and attached before the work life is expired as given in Table 201.
- (2) A fay surface seal must be made when the structure and/or parts have been disassembled for causes other than a defective seal.
  - (a) Fay sealed joints must be closed and attached before the work life is expired as given in Table 201.
- (3) A fay sealed joint must have sufficient sealant applied so the space between the assembled fay surfaces is filled with sealant.
  - (a) A small quantity of sealant must come out in a continuous bead around the edges.
- (4) Countersink or ream the holes through the fay sealed joints with temporary or permanent fasteners installed.
  - (a) Metal work operations must be completed before the clean and seal operations.

**NOTE:** Fabrication and changes done after the seal are not recommended.

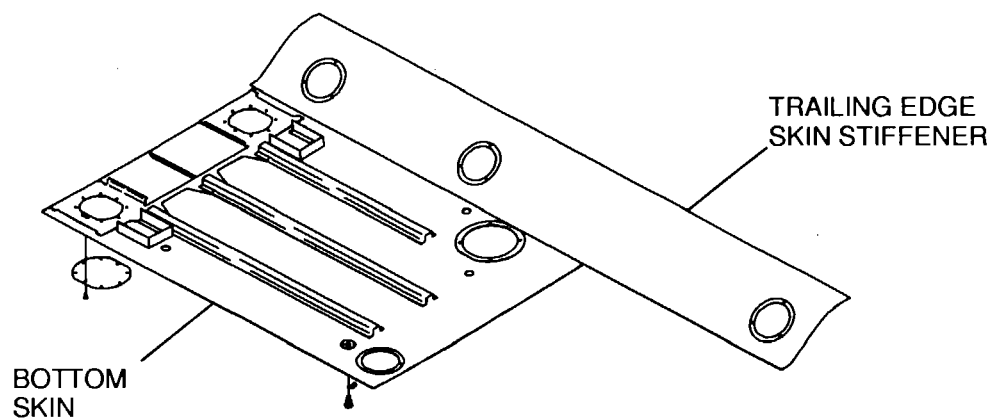
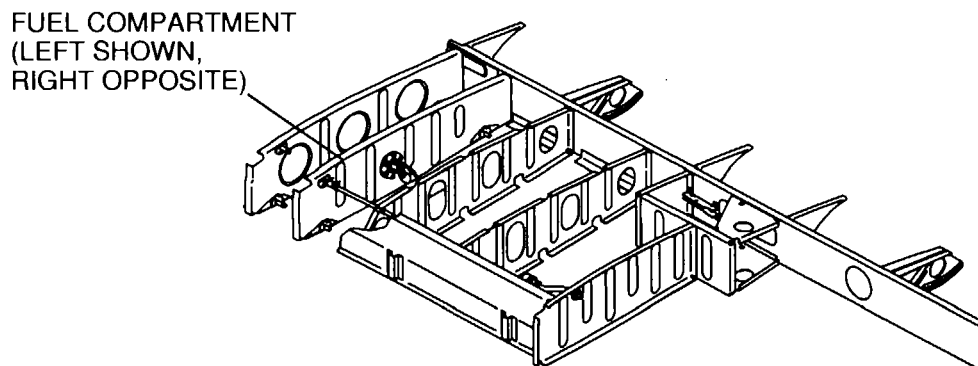
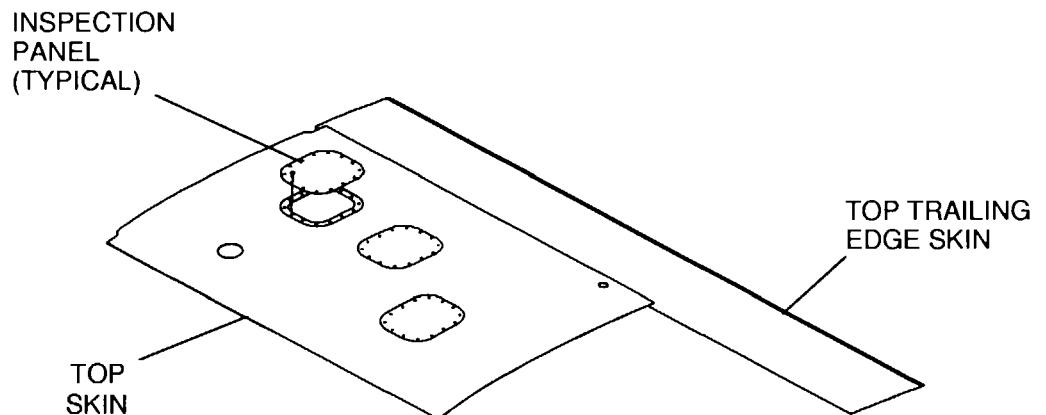
- (b) Countersink or ream holes through the fay sealed joint with permanent fasteners in every other hole.
  - 1 Use temporary fasteners (Clecocs or bolts) if assembly with permanent fasteners is not possible.
  - 2 Temporary fasteners must be replaced by permanent fasteners before the expiration of the fay surface sealant.
  - 3 Remove temporary fasteners and install permanent fasteners with wet sealing compound.
- (5) Immediately after the assembly is completed and all permanent fasteners are installed, remove any sealant that has not cured and unwanted sealant with clean rags moist with A-A-59107, Toluene or Methyl Propyl Ketone.

**C. Injection Sealing (Refer to Figure 202).**

- (1) Sealant must be put into the channel, void or any open space from one point only with a pneumatic sealant tool.
  - (a) After sealant is added, air must not be trapped and the channel, void or any open area.
  - (b) Sealant must be seen at the opposite opening.
    - 1 Cause a blockage at each channel or exit as the sealer is applied in the area so that sealant is seen at the openings of all applicable channels.
- (2) Sealant must be put into wire bundles that go through firewalls and bulkheads to fill any voids and open areas between the wires.
  - (a) Bundle ties must be no more than 6 inches (152.4 mm) from the location to be sealed.
  - (b) Pull the wires apart from each other.
    - 1 Layer each wire with sealant over the length which goes through the bulkhead or seal assembly.

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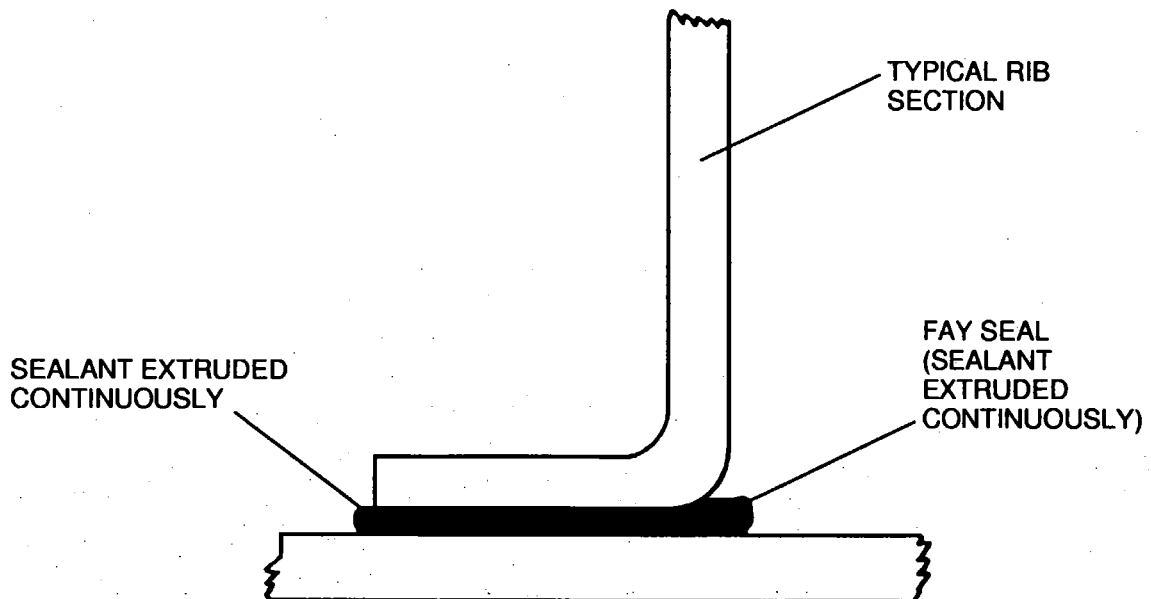
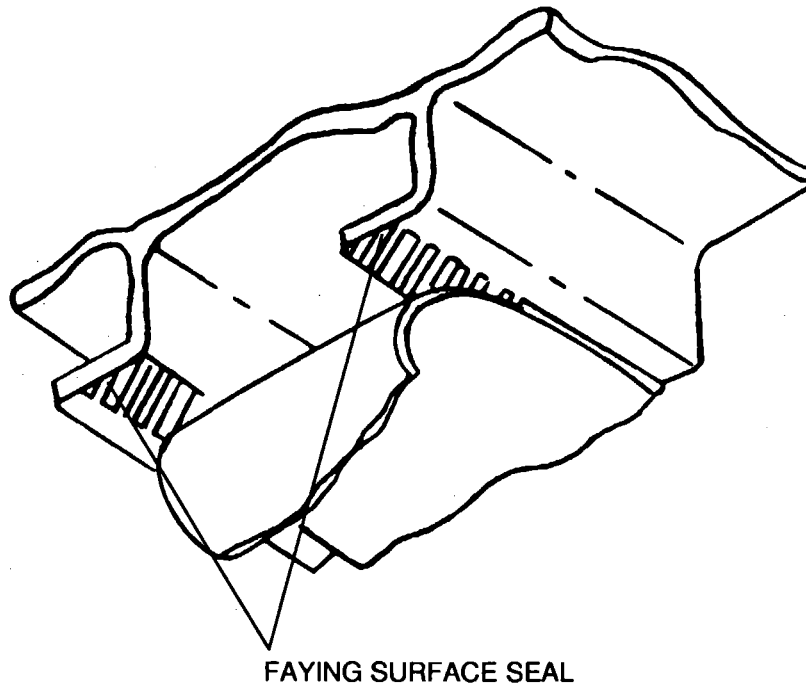


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Integral Fuel Compartment Sealing  
Figure 202 (Sheet 1)

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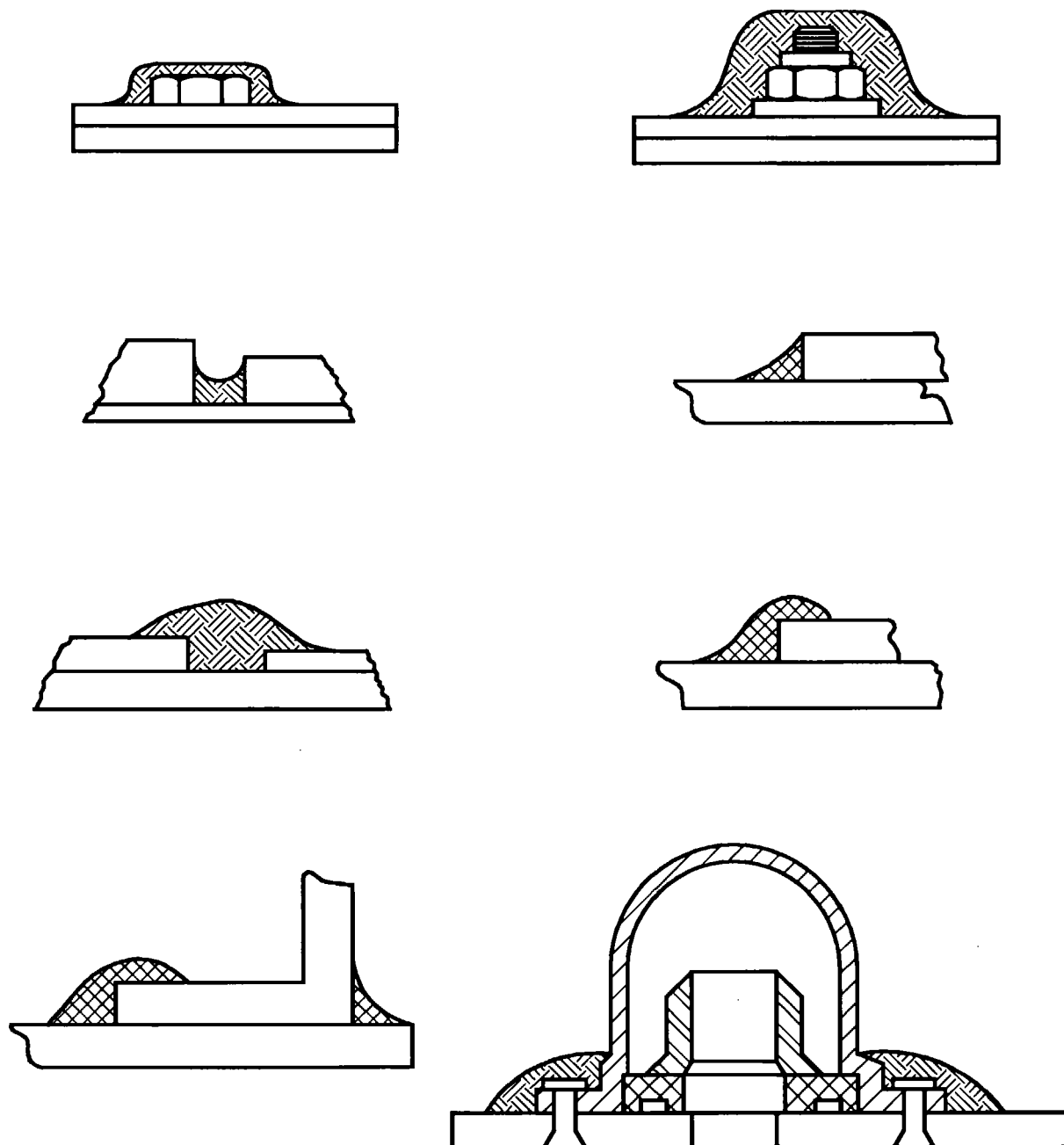
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Integral Fuel Compartment Sealing  
Figure 202 (Sheet 2)



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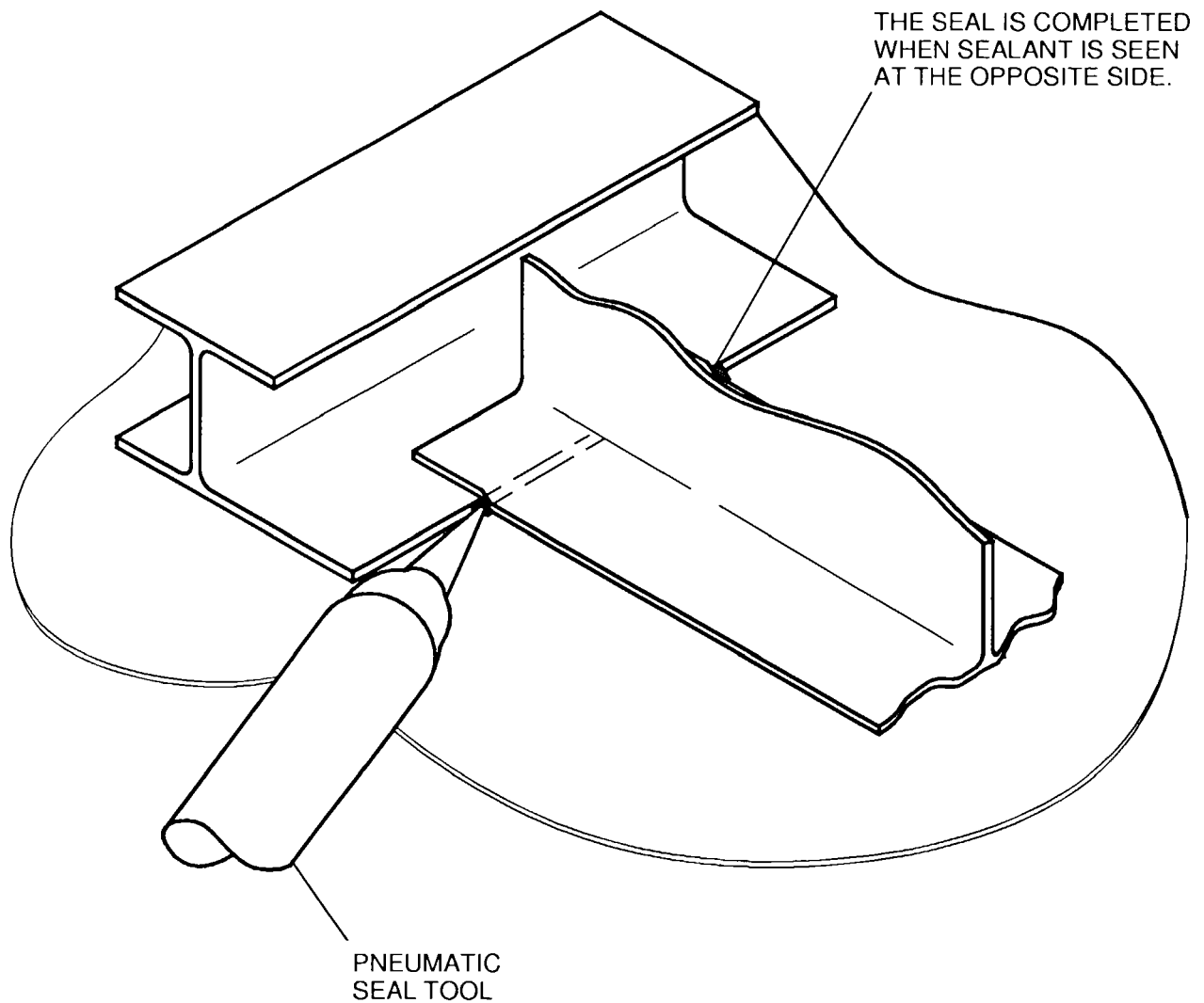
**NOTE:** THE EXAMPLES SHOW TYPICAL CROSS SECTIONS OF DIFFERENT SEAL METHODS USED IN THE FUEL COMPARTMENT. THE MINIMUM SEALANT THICKNESS AT ANY POINT MUST NOT BE LESS THAN 0.060 INCH (1.5 mm).

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Integral Fuel Compartment Sealing  
Figure 202 (Sheet 3)

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Integral Fuel Compartment Sealing  
Figure 202 (Sheet 4)

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- 2 Layer each wire with sealant 0.5 inch (12.7 mm) added length on each side of the bulkhead or seal assembly.
  - 3 Pull the wires through the bulkhead or seal assembly into position.
  - 4 Fill the open areas of the wires that remain until the sealant is seen from the opposite side.
- (3) Remove unwanted sealant before the work life of the sealant is expired.
  - (4) Use an applicable tool to make the sealant smooth and flush with the surface.

D. Fillet Sealing.

- (1) Fastener considerations:
  - (a) Do not fillet seal any parts until they are held completely together by permanent fasteners.
  - (b) Prior to filleting the periphery of bolted structure and fittings, it is necessary that all bolts, accomplishing the attachment, be properly torqued.
- (2) The sealant shall be applied using a sealant gun or spatula.
- (3) When using a sealant gun for fillet sealing, the nozzle tip shall be pointed into the seam or joint and shall be maintained nearly perpendicular to the line of travel. A continuous bead of sealant shall precede the tip and the tip size, shape and rate of travel shall be such that sufficient sealant shall be applied to produce the required fillet.
- (4) Fillets shall be shaped or formed to meet the size and shape requirements as shown in applicable figures using the nozzle tip and/or fairing tools to press against the sealant while moving parallel to the bead. Exercise caution to prevent folds and entrapment of air during application and shaping of the fillet and work out any visible air bubbles. The fillet shall be formed so that the highest portion of the fillet is centered over the edge of the structure or fitting. Lubrication in any form shall not be used for smoothing purposes. In all cases, fillet size shall be kept as near minimum as practical.
- (5) Where it is more convenient or fillet slumping is encountered, the fillet may be applied in two stages. A small first fillet should be applied which is allowed to cure to a tack-free state, followed by a second application of sealant sufficient to form the final fillet conforming to the specified dimensions for a fillet seal. If the first fillet has cured, it must be cleaned before the second application of sealant is made. If the fillet has only cured to a tack-free state, it shall be wiped lightly with a gauze pad or cheesecloth pad dampened with cleaning solvent.
- (6) Allow the sealant to cure to a tack-free condition prior to the airplane being moved, handled and/or worked on.
- (7) In cases where a fillet seal connects to an injection seal, the full bodied fillet shall extend past the end of the injection and then taper out.
- (8) Lap joint and seam fillets shall be as shown in Figure 202, Sheet 3.
- (9) Butt joint fillets shall be as shown in Figure 202, Sheet 3.
- (10) Bolts shall be fillet sealed as shown in Figure 202, Sheet 3. The area for sealing shall consist of the area of the structure surrounding the base of the fastener end plus the entire exposed area of the fastener. An optional method of sealing threaded fasteners is to apply a brush coat of Type I, Class A sealant. Where brush coating is used as the method of sealing threaded fasteners, the sealant must be worked around each fastener with a stiff brush and considerable care to be effective. A simple pass of the brush with the sealant is not sufficient to produce an effective seal.
- (11) Dome type nutplates shall be fillet sealed as shown in Figure 202, Sheet 3. The area for sealing shall consist of the area of the structure surrounding the base of the fastener and from there up over the rivets to the dome.
- (12) Hole filling and slot fillets shall be as shown in Figure 202, Sheet 3.
  - (a) Tooling holes shall be plugged with a shank sealed soft rivet and then brush coated with Type I, Class A sealant.

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**10. Sealant Repair**

- A. Materials - Repairs, in general, shall be accomplished with the same type of material as that being repaired.

**NOTE:** Type I, Class B-1/2 is recommended for use during cold weather to obtain an accelerated cure.

**NOTE:** Type I, Quick Repair sealant may be used as a repair for sealant in fuel tanks if desired for fast cure and rapid dispatch.

- B. Temperature Requirements.

- (1) The structure shall be above 60°F (15°C) before the sealant is applied and shall remain above 60°F (15°C) until the sealant is tack-free.

**NOTE:** For outside operations only, the temperature of the structure may be allowed to drop below 60°F (15°C) but not below 58°F (14°C), after application for a period of time not to exceed 48 hours; however, the structure must be subsequently heated to above 60°F (15°C) and the sealant allowed to become tack-free before the tanks are refueled.

- (2) The maximum air temperature allowed to come in contact with the curing sealant is 120°F (49°C).

- C. Fillet and Fastener Sealing Repairs.

- (1) Repair of damaged or faulty sealant applications shall be accomplished as follows:

- (a) Remove all damaged or faulty sealant to ensure solid residual material.
- (b) Sealant shall be cut to produce a smooth continuous scarfed face. The sealant shall be completely removed in the affected areas. The cutting tools should only be made from nonmetallic materials that are softer than aluminum.
- (c) Inspect repair areas for clean and smooth cuts. Loose chunks or flaps of sealant on the cut areas shall be removed.
- (d) Clean the area to be sealed, including the scarfed face of the old seal. Refer to Cleaning.
- (e) Apply new fillet seals. Slight overlapping of the fresh material over the existing fillet is permissible. A large buildup of sealant shall not be allowed.
- (f) Rework of a fillet which has been oversprayed or brushed with primer shall be accomplished by a scarfed joint and removal of the fillet having primer on it, in the area of the repair. The primer shall not be sandwiched between the old and new sealants.
- (g) If the primer is removed during the cleaning operation, it is permissible to apply the new fillet seal directly over the clean bare metal and then touch up with the proper primer all exposed areas of bare metal after the sealant has been applied.

- D. Faying Surface Sealing Repair - After determining the area which contains the faulty and/or leaking faying surface seal, the repair shall be accomplished by applying a fillet seal along the edge of the part adjacent to the faying surface seal long enough to fully cover the area of the faulty and/or leaking seal.

- E. Brush Coat Sealing Repair - Repair of damaged or leaking brush coat seals shall be accomplished by removing the discrepant brush coat. Clean the area of sealant removal and the surrounding structure and sealant. Refer to Cleaning.

- F. Integral Fuel Tank Sealing Using PR-1826 Class B Rapid Curing Sealant.

- (1) Remove damaged section of sealant with a sharp plexiglass scraper. Taper all cuts in old sealant at 45-degree angles.

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- (2) Thoroughly clean with solvent and abrade old areas which are to be over coated. Clean one small area at a time, then dry with a clean cloth before the solvent evaporates.

**NOTE:** Always pour solvent on the cloth to maintain a clean solvent supply.

**NOTE:** In fuel tanks which have been in operation, the sealant will be soaked and should be dried in area of the repair with a vapor proof heat lamp or hot air blower before new sealant is applied.

- (3) After the surface has been cleaned and dried, apply a sufficient layer of PR-1826 Adhesion Promoter with a clean brush or gauze pad. Allow adhesion promoter a minimum of 30 minutes to dry.

**NOTE:** Care must be taken to get a equal, thin layer of adhesion promoter applied to the surface. There must be a sufficient layer for the full surface, but not too much that will cause it to drip.

- (4) Mix PR-1826 Class B sealant according to instructions supplied with the material.  
(5) Apply PR-1826 Class B sealant, 0.125 to 0.375 inch (3.2 to 9.5 mm) thick, to the repair area with a spatula or paddle shaped tool. Firmly press sealant in place and form to desired shape. Overlap PR-1826 Class B sealant over old sealant from 0.125 to 0.25 inch (3.2 to 6.4 mm).

**NOTE:** Sealant may be applied up to 8 hours after the application of adhesion promoter. After 8 hours, the surface should be recleaned and adhesion promoter reapplied.

- (6) Allow sealant to cure a minimum of 2 hours at 77°F (25°C) before refueling. Curing time is based solely on temperature and will be halved for every 18°F (10°C) increase, and doubled for every 18°F (10°C) decrease from the standard 77°F (25°C).

G. Firewall Wire Bundle Seal Assembly.

- (1) Fay surface seal the mating parts of the seal assembly plate and the firewall. Refer to Sealing Application.  
(a) Seal only with Type IV DAPCO 2100 from D. Aircraft Inc. or seal with Type IV Q3-6077 from Dow Corning. Refer to Tools and Equipment.  
(2) Injection seal the wire bundle that passes through the seal assembly. Refer to Sealing Application.  
(a) Seal only with Type IV DAPCO 2100 from D. Aircraft Inc. or seal with Type IV Q3-6077 from Dow Corning. Refer to Tools and Equipment.

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**CONVERSION DATA - DESCRIPTION AND OPERATION**

**1. General**

- A. This section contains information converting the more commonly used measuring units found in this manual from the North American system to the metric system.
- B. Tables have been prepared for the convenience of the user. Formulas, examples and a table of conversion factors are included for individual computations.

**2. Formulas for Conversion Computations**

- A. Work and Energy.
  - (1) Mechanical Energy Formula - Refer to conversion factors in Figure 1 to convert inch-pounds and foot-pounds into metric measure of centimeter kilograms and meter kilograms.
  - (2) Figure 2 is a table containing conversion data for converting inch-pounds to centimeter kilograms, centimeter kilograms to inch-pounds, foot-pounds to meter kilograms, meter kilograms to foot-pounds.
- B. Distance and Length.
  - (1) Formula - One multiplied by 2.540 = centimeter; inch = 2.54 cm. One multiplied by 25.40 = millimeter; inch = 25.40 mm.

**NOTE:** Reference conversion factors in Figure 1.

- (2) Figure 3 is a table containing conversion data for converting inches to millimeters. The procedure for converting inches to millimeters by using figure as follows: Example, convert 0.032 inches to millimeters.
    - (a) Read down inch column to 0.003.
    - (b) Read across top inch column to 0.0002.
    - (c) Locate where these two columns intersect (0.0032 inch is 0.0812 millimeters).
  - (3) Figure 4 is a table containing conversion data for converting fraction of an inch to decimal equivalent and to millimeter. Locate fraction of an inch figure and move to the right horizontally to locate decimal equivalent figure in the decimal equivalent column and millimeter numeral in the millimeter column.
- C. Temperature.
  - (1) Formula:  $^{\circ}\text{F} = 9/5 (^{\circ}\text{C} + 32)$   $^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$
  - (2) Figure 5 is a table containing conversion data for converting temperature from either Celsius to Fahrenheit or Fahrenheit to Celsius.
    - (a) Select the desired number in the middle column of the three column presentation. If the number you selected is in degrees Celsius, read the degrees Fahrenheit equivalent in the right column of the three-column presentation.
    - (b) Select the desired number in the middle column of the three-column presentation. If the number selected is in degrees Fahrenheit, read degrees Celsius equivalent in the left column of the three-column presentation.
- D. Drill Sizes and Tap Sizes.
  - (1) Figure 6 is a table containing conversion data for converting standard and millimeter drill sizes to decimal equivalents. Also included is a chart for determining tap size when a hole ID is known.
    - (a) To find decimal equivalent of a standard drill size, go down the chart to the standard drill size and read decimal equivalent in the right column.
    - (b) To find standard drill size for a known decimal equivalent size, go down decimal column to decimal size and read drill size in the left column.
    - (c) To find decimal equivalent of a millimeter drill size, go down the chart to the millimeter drill size and read decimal equivalent in the right column.
    - (d) To find millimeter drill size for a known decimal equivalent size, go down the chart to the decimal equivalent size and read millimeter drill size in the left column.
    - (e) To find a tap size, go down the hole ID chart to the size hole to be tapped and read the tap size in the left column.

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MULTIPLY	BY	TO OBTAIN
CENTIMETERS	0.3937 0.03281	INCHES FEET
CUBIC CENTIMETERS	0.001 0.06102 0.0002642	LITERS CUBIC INCHES U.S. GALLONS
CUBIC FEET	28,320 1,728 7.481 28.32	CUBIC CENTIMETERS CUBIC INCHES U.S. GALLONS LITERS
CUBIC INCHES	16.39 0.01639 0.004329 0.01732	CUBIC CENTIMETERS LITERS U.S. GALLONS QUARTS
CUBIC METERS	1,000,000 35.31 61,023 264.2 999.97	CUBIC CENTIMETERS CUBIC FEET CUBIC INCHES GALLON LITERS
FEET	0.3048 12,000 304.8 0.3333	METERS MILS MILLIMETERS YARDS
FOOT-POUNDS	0.1383 0.001285 0.000000376	METER-KILOGRAMS BRITISH THERMO UNIT KILOWATTS PER HOUR
FLUID OUNCE	8 29.6	DRAM CUBIC CENTIMETERS
GALLON, IMPERIAL	277.4 1.201 4.546	CUBIC INCHES U.S. GALLON LITERS
GALLON, U.S. DRY	268.8 0.1556 1.164 4.405	CUBIC INCHES CUBIC FEET U.S. GALLON, LIQUID LITERS
GALLON, U.S. LIQUID	231.0 0.1337 3.785 0.8327 128	CUBIC INCHES CUBIC FEET LITERS IMPERIAL GALLON FLUID OUNCES
INCHES	2.540 .08333	CENTIMETERS FEET

Conversion Factors  
 Figure 1 (Sheet 1)

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MULTIPLY	BY	TO OBTAIN
Joules	0.000948 0.7376	BRITISH THERMO UNIT FOOT-POUNDS
Kilograms	2.205 35.27 1000	POUNDS OUNCES GRAMS
Liters	1000 61.03 0.03532 0.2642 0.22 1.057	CUBIC CENTIMETERS CUBIC INCHES CUBIC FEET U.S. GALLON IMPERIAL GALLON QUARTS
Meters	39.37 3.281 1000	INCHES FEET MILLIMETERS
Meter-Kilogram	7.233 9.807	FOOT-POUNDS Joules
Ounces, Avoirdupois	0.0625 28.35 437.5	POUND, AVOIRDUPOIS GRAMS GRAINS
Ounces, Fluid	29.57 1.805	CUBIC CENTIMETERS CUBIC INCHES
Pound, Avoirdupois	453.6 7000 16.0	GRAMS GRAINS OUNCES
Square Inch	6.4516	Square Centimeters
Pound per Square Inch (PSI)	0.0703	Kilogram-Centimeter Squared
Statute Mile	1.609 0.0684	Kilometer NAUTICAL MILE
Nautical Mile	1.151	Statute Mile
Quart	0.9463	Liter
Millimeter	1000	Micron
Micron	0.001 0.00003937	MILLIMETER INCH
Inch Pounds	11.521	Meter Grams
Inch Ounces	0.72	Meter Grams

Conversion Factors  
 Figure 1 (Sheet 2)



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**INCH-POUNDS TO CENTIMETER-KILOGRAMS**

INCH-POUNDS	CENTIMETER-KILOGRAMS	INCH-POUNDS	CENTIMETER-KILOGRAMS	INCH-POUNDS	CENTIMETER-KILOGRAMS
5	5.76	45	51.84	85	97.82
10	11.52	50	57.60	90	103.68
15	17.28	55	63.36	95	109.44
20	23.04	60	69.12	100	115.20
25	28.80	65	74.88	105	120.96
30	34.56	70	80.64	110	126.72
35	40.32	75	86.40	115	132.48
40	46.08	80	92.16	120	138.24

**CENTIMETER-KILOGRAMS TO INCH-POUNDS**

CENTIMETER-KILOGRAMS	INCH-POUNDS	CENTIMETER-KILOGRAMS	INCH-POUNDS	CENTIMETER-KILOGRAMS	INCH-POUNDS
50	43.4	300	260.4	550	477.4
100	86.8	350	303.8	600	520.8
150	130.2	400	347.2	650	564.2
200	173.6	450	390.6	700	607.6
250	217.0	500	434.0		

**FOOT-POUNDS TO METER-KILOGRAMS**

FOOT-POUNDS	METER-KILOGRAMS	FOOT-POUNDS	METER-KILOGRAMS	FOOT-POUNDS	METER-KILOGRAMS
2.5	.346	67.5	9.332	165	22.813
5.0	.691	70.0	9.678	170	23.504
7.5	1.037	72.5	10.024	175	24.195
10.0	1.383	75.0	10.369	180	24.887
12.5	1.728	77.5	10.715	185	25.578
15.0	2.074	80.0	11.060	190	26.269
17.5	2.419	82.5	11.406	195	26.960
20.0	2.765	85.0	11.752	200	27.652
22.5	3.111	87.5	12.097	205	28.343
25.0	3.456	90.0	12.443	210	29.034
27.5	3.802	92.5	12.789	215	29.726
30.0	4.148	95.0	13.134	220	30.417
32.5	4.493	97.5	13.480	225	31.108
35.0	4.839	100.0	13.826	230	31.800
37.5	5.185	102.5	14.171	235	32.491
40.0	5.530	105.0	14.517	240	33.182
42.5	5.876	110.0	15.900	245	33.873
45.0	6.222	120.0	16.591	250	34.565
47.5	6.567	125.0	17.282	255	35.256
50.0	6.913	130.0	17.974	260	35.947
52.5	7.258	135.0	18.665	265	36.639
55.0	7.604	140.0	19.356	270	37.330
57.5	7.950	145.0	20.047	275	38.021
60.0	8.285	150.0	20.739	280	38.713
62.5	8.641	155.0	21.430	285	39.404
65.0	8.987	160.0	22.121	290	40.095
				295	40.786
				300	41.478

Torque Conversion Chart  
 Figure 2 (Sheet 1)

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METER-KILOGRAMS TO FOOT-POUNDS					
METER- KILOGRAMS	FOOT- POUNDS	METER- KILOGRAMS	FOOT- POUNDS	METER- KILOGRAMS	FOOT- POUNDS
1	7.23	8	57.86	15	108.49
2	14.46	9	65.89	16	115.72
3	21.69	10	72.32	17	122.95
4	28.93	11	79.56	18	130.19
5	36.16	12	86.79	19	137.42
6	43.39	13	94.02	20	144.65
7	50.63	14	101.26	21	151.89
				22	159.12

Torque Conversion Chart  
Figure 2 (Sheet 2)

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<b>INCHES—</b>	<b>0.0000</b>	<b>0.0001</b>	<b>0.0002</b>	<b>0.0003</b>	<b>0.0004</b>	<b>0.0005</b>	<b>0.0006</b>	<b>0.0007</b>	<b>0.0008</b>	<b>0.0009</b>
	<b>MILLIMETER</b>									
0.000		0.0025	0.0050	0.0076	0.0101	0.0127	0.0152	0.0177	0.0203	0.0228
0.001	0.0254	0.0279	0.0304	0.0330	0.0355	0.0381	0.0406	0.0431	0.0457	0.0482
0.002	0.0508	0.0533	0.0558	0.0584	0.0609	0.0635	0.0660	0.0685	0.0711	0.0736
0.003	0.0762	0.0787	0.0812	0.0838	0.0863	0.0889	0.0914	0.0939	0.0965	0.0990
0.004	0.1016	0.1041	0.1066	0.1092	0.1117	0.1143	0.1168	0.1193	0.1219	0.1244
0.005	0.1270	0.1295	0.1320	0.1346	0.1371	0.1397	0.1422	0.1447	0.1473	0.1498
0.006	0.1524	0.1549	0.1574	0.1600	0.1625	0.1651	0.1676	0.1701	0.1727	0.1752
0.007	0.1778	0.1803	0.1828	0.1854	0.1879	0.1905	0.1930	0.1955	0.1981	0.2006
0.008	0.2032	0.2057	0.2082	0.2108	0.2133	0.2159	0.2184	0.2209	0.2235	0.2260
0.009	0.2286	0.2311	0.2336	0.2362	0.2387	0.2413	0.2438	0.2463	0.2489	0.2514

<b>INCHES—</b>	<b>0.000</b>	<b>0.001</b>	<b>0.002</b>	<b>0.003</b>	<b>0.004</b>	<b>0.005</b>	<b>0.006</b>	<b>0.007</b>	<b>0.008</b>	<b>0.009</b>
	<b>MILLIMETER</b>									
0.00		0.025	0.050	0.076	0.101	0.127	0.152	0.177	0.203	0.228
0.01	0.254	0.279	0.304	0.330	0.355	0.381	0.406	0.431	0.457	0.482
0.02	0.508	0.533	0.558	0.584	0.609	0.635	0.660	0.685	0.711	0.736
0.03	0.762	0.787	0.812	0.838	0.863	0.889	0.914	0.939	0.965	0.990
0.04	1.016	1.041	1.066	1.092	1.117	1.143	1.168	1.193	1.219	1.244
0.05	1.270	1.295	1.320	1.346	1.371	1.397	1.422	1.447	1.473	1.498
0.06	1.524	1.549	1.574	1.600	1.625	1.651	1.676	1.701	1.727	1.752
0.07	1.778	1.803	1.828	1.854	1.879	1.905	1.930	1.955	1.981	2.006
0.08	2.032	2.057	2.082	2.108	2.133	2.159	2.184	2.209	2.235	2.260
0.09	2.286	2.311	2.336	2.362	2.387	2.413	2.438	2.463	2.489	2.514

Inches to Millimeter (0.0001 to 10 inches)  
Figure 3 (Sheet 1)

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<b>INCHES</b> —	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	<b>MILLIMETER</b>									
0.0		0.254	0.508	0.762	0.016	1.270	1.524	1.778	2.032	2.286
0.1	2.540	2.794	3.048	3.302	3.556	3.810	4.064	4.318	4.572	4.826
0.2	5.080	5.334	5.588	5.842	6.096	6.350	6.604	6.858	7.112	7.366
0.3	7.620	7.874	8.128	8.382	8.636	8.890	9.144	9.398	9.652	9.906
0.4	10.160	10.414	10.668	10.922	11.176	11.430	11.684	11.938	12.192	12.446
0.5	12.700	12.954	13.208	13.462	13.716	13.970	14.224	14.478	14.732	14.986
0.6	15.240	15.494	15.748	16.002	16.256	16.510	16.764	17.018	17.272	17.526
0.7	17.780	18.034	18.288	18.542	18.796	19.050	19.304	19.558	19.812	20.066
0.8	20.320	20.574	20.828	21.082	21.336	21.590	21.844	22.098	22.352	22.606
0.9	22.860	23.114	23.368	23.622	23.876	24.130	24.384	24.638	24.892	25.146

<b>INCHES</b> —	0.00	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	<b>MILLIMETER</b>									
0		2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86
1	25.40	27.94	30.48	33.02	35.56	38.10	40.64	43.18	45.72	48.26
2	50.80	53.34	55.88	58.42	60.96	63.50	66.04	68.58	71.12	73.66
3	76.20	78.74	81.28	83.82	86.36	88.90	91.44	93.98	96.52	99.06
4	101.60	104.14	106.68	109.22	111.76	114.30	116.84	119.38	121.92	124.46
5	127.00	129.54	132.08	134.62	137.16	139.70	142.24	144.78	147.32	149.86
6	152.40	154.94	157.48	160.02	162.56	165.10	167.64	170.18	172.72	175.26
7	177.80	180.34	182.88	185.42	187.96	190.50	193.04	195.58	198.12	200.66
8	203.20	205.74	208.28	210.82	213.36	215.90	218.44	220.98	223.52	226.06
9	228.60	231.14	233.68	236.22	238.76	241.30	243.84	246.38	248.92	251.46

Inches to Millimeter (0.0001 to 10 inches)  
Figure 3 (Sheet 2)

**CESSNA AIRCRAFT COMPANY**  
**MODEL 182/T182**  
**MAINTENANCE MANUAL**

B1900

<b>FRACTION</b>	<b>DECIMAL EQUIV.</b>	<b>MILLI- METER</b>	<b>FRACTION</b>	<b>DECIMAL EQUIV.</b>	<b>MILLI- METER</b>
1/64	0.015	0.396	33/64	0.515	13.096
1/32	0.031	0.793	17/32	0.531	13.493
3/64	0.046	1.190	35/64	0.546	13.890
1/16	0.062	1.587	9/16	0.562	14.287
5/64	0.078	1.984	37/64	0.578	14.684
3/32	0.093	2.381	19/32	0.593	15.081
7/64	0.109	2.778	39/64	0.609	15.478
1/8	0.125	3.175	5/8	0.625	15.875
9/64	0.140	3.571	41/64	0.640	16.271
5/32	0.156	3.968	21/32	0.656	16.668
11/64	0.171	4.365	43/64	0.671	17.065
3/16	0.187	4.752	11/16	0.687	17.462
13/64	0.203	5.159	45/64	0.703	17.859
7/32	0.218	5.556	23/32	0.718	18.256
15/64	0.234	5.953	47/64	0.734	18.653
1/4	0.250	6.350	3/4	0.750	19.050
17/64	0.265	6.746	49/64	0.765	19.446
9/32	0.281	7.143	25/32	0.781	19.843
19/64	0.296	7.540	51/64	0.796	20.240
5/16	0.312	7.937	13/16	0.812	20.637
21/64	0.328	8.334	53/64	0.828	21.034
11/32	0.343	8.731	27/32	0.843	21.431
23/64	0.359	9.128	55/64	0.859	21.828
3/8	0.375	9.525	7/8	0.875	22.225
25/64	0.390	9.921	57/64	0.890	22.621
13/32	0.406	10.318	29/32	0.906	23.018
27/64	0.421	10.715	59/64	0.921	23.415
7/16	0.437	11.112	15/16	0.937	23.812
29/64	0.453	11.509	61/64	0.953	24.209
15/32	0.468	11.906	31/32	0.968	24.606
31/64	0.484	12.303	63/64	0.984	25.003
1/2	0.500	12.700	1	1.000	25.400

Fraction to Decimal to Millimeter Conversion  
Figure 4 (Sheet 1)

**CESSNA AIRCRAFT COMPANY**  
**MODEL 182/T182**  
**MAINTENANCE MANUAL**

B1901

READ LEFT COLUMN TO CONVERT TO CELSIUS			READ KNOWN TEMPERATURE IN THIS COLUMN (FAHRENHEIT OR CELSIUS)			READ RIGHT COLUMN TO CONVERT TO FAHRENHEIT					
C	F		C	F		C	F		C	F	
-73.3	-100	-148.0	-51.1	-60	-76.0	-28.9	-20	-4.0	-6.7	20	68.0
-72.8	-99	-146.2	-50.6	-59	-74.2	-28.3	-19	-2.2	-6.1	21	69.8
-72.2	-98	-144.4	-50.0	-58	-72.4	-27.8	-18	-0.4	-5.6	22	71.6
-71.7	-97	-142.6	-49.4	-57	-70.6	-27.2	-17	1.4	-5.0	23	73.4
-71.1	-96	-140.8	-48.9	-56	-68.8	-26.7	-16	3.2	-4.4	24	75.2
-70.6	-95	-139.0	-48.3	-55	-67.0	-26.1	-15	5.0	-3.9	25	77.0
-70.0	-94	-137.2	-47.8	-54	-65.2	-25.6	-14	6.8	-3.3	26	78.8
-69.4	-93	-135.4	-47.2	-53	-63.4	-25.0	-13	8.6	-2.8	27	80.6
-68.9	-92	-133.6	-46.7	-52	-61.6	-24.4	-12	10.4	-2.2	28	82.4
-68.3	-91	-131.8	-46.1	-51	-59.8	-23.9	-11	12.2	-1.7	29	84.2
-67.8	-90	-130.0	-45.6	-50	-58.0	-23.3	-10	14.0	-1.1	30	86.0
-67.2	-89	-128.2	-45.0	-49	-56.2	-22.8	-9	15.8	-0.6	31	87.8
-66.7	-88	-126.2	-44.4	-48	-54.4	-22.2	-8	17.6	0.0	32	89.6
-66.1	-87	-124.6	-43.9	-47	-52.6	-21.7	-7	19.4	0.6	33	91.4
-65.6	-86	-122.8	-43.5	-46	-50.8	-21.1	-6	21.2	1.1	34	93.2
-65.0	-85	-121.0	-42.8	-45	-49.0	-20.6	-5	23.0	1.7	35	95.0
-64.4	-84	-119.2	-42.2	-44	-47.2	-20.0	-4	24.8	2.2	36	96.8
-63.9	-83	-117.4	-41.7	-43	-45.4	-19.4	-3	26.6	2.8	37	98.6
-63.3	-82	-115.6	-41.1	-42	-43.6	-18.9	-2	28.4	3.3	38	100.4
-62.8	-81	-113.8	-40.6	-41	-41.8	-18.3	-1	30.2	3.9	39	102.2
-62.2	-80	-112.0	-40.0	-40	-40.0	-17.8	0	32.0	4.4	40	104.0
-61.7	-79	-110.2	-39.4	-39	-38.2	-17.2	1	33.8	5.0	41	105.8
-61.1	-78	-108.4	-38.9	-38	-36.4	-16.7	2	35.6	5.6	42	107.6
-60.6	-77	-106.6	-38.3	-37	-34.6	-16.1	3	37.4	6.1	43	109.4
-60.0	-76	-104.8	-37.8	-36	-32.8	-15.6	4	39.2	6.7	44	111.2
-59.4	-75	-103.0	-37.2	-35	-31.0	-15.0	5	41.0	7.2	45	113.0
-58.9	-74	-101.2	-36.7	-34	-29.0	-14.4	6	42.8	7.8	46	114.8
-58.3	-73	-99.4	-36.1	-33	-27.4	-13.9	7	44.6	8.3	47	116.6
-57.8	-72	-97.6	-35.6	-32	-25.6	-13.3	8	46.4	8.9	48	118.4
-57.2	-71	-95.8	-35.0	-31	-23.8	-12.8	9	48.2	9.4	49	120.2
56.7	-70	-94.0	-34.4	-30	-22.0	-12.2	10	50.0	10.0	50	122.0
-56.1	-69	-92.2	-33.9	-29	-20.2	-11.7	11	51.8	10.6	51	123.8
-55.6	-68	-90.4	-33.3	-28	-18.4	-11.1	12	53.6	11.1	52	125.6
-55.0	-67	-88.6	-32.8	-27	-16.6	-10.6	13	55.4	11.7	53	127.4
-54.4	-66	-86.8	-32.2	-26	-14.8	-10.0	14	57.2	12.2	54	129.2
-53.9	-65	-85.0	-31.7	-25	-13.0	-9.4	15	59.0	12.8	55	131.0
-53.3	-64	-83.2	-31.1	-24	-11.2	-8.9	16	60.8	13.3	56	132.8
-52.8	-63	-81.4	-30.6	-23	-9.4	-8.3	17	62.6	13.9	57	134.6
-52.2	-62	-79.6	-30.0	-22	-7.6	-7.8	18	64.4	14.4	58	136.4
-51.7	-61	-77.8	-29.4	-21	-5.8	-7.2	19	66.2	15.0	59	138.2

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
 Figure 5 (Sheet 1)

**CESSNA AIRCRAFT COMPANY**  
**MODEL 182/T182**  
**MAINTENANCE MANUAL**

B1902

C			F			C			F			C			F			C			F		
15.6	60	140.0	37.8	100	212.0	60.0	140	284.0	82.2	180	356.0	114.4	218	435.5	136.0	277	510.6	147.8	300	572.4	168.0	328	630.4
16.1	61	141.8	38.3	101	213.8	60.6	141	285.8	82.8	181	357.8	114.9	219	437.0	136.6	278	512.1	148.4	301	574.1	168.6	329	632.1
16.7	62	143.6	38.9	102	215.6	61.1	142	287.6	83.3	182	359.6	115.4	220	438.5	137.1	279	513.8	149.0	302	576.8	169.2	330	634.2
17.2	63	145.4	39.4	103	217.4	61.7	143	289.4	83.9	183	361.4	115.9	221	440.0	137.7	280	515.5	149.6	303	579.5	169.8	331	636.2
17.8	64	147.2	40.0	104	219.2	62.2	144	291.2	84.4	184	363.2	116.4	222	441.5	138.3	281	517.1	150.2	304	582.2	170.4	332	638.3
18.3	65	149.0	40.6	105	221.0	62.8	145	293.0	85.0	185	365.0	116.9	223	443.0	138.9	282	518.8	150.8	305	584.8	171.0	333	640.4
18.9	66	150.8	41.1	106	222.8	63.3	146	294.8	85.6	186	366.8	117.4	224	444.5	139.5	283	520.4	151.4	306	587.4	171.6	334	642.5
19.4	67	152.6	41.7	107	224.6	63.9	147	296.6	86.1	187	368.6	117.9	225	446.0	140.1	284	522.1	152.0	307	590.0	172.2	335	644.6
20.0	68	154.4	42.2	108	226.4	64.4	148	298.4	86.7	188	370.4	118.4	226	447.5	140.7	285	523.8	152.6	308	592.6	172.8	336	646.7
20.6	69	156.2	42.8	109	228.2	65.0	149	300.2	87.2	189	372.2	118.9	227	449.0	141.3	286	525.4	153.2	309	595.2	173.4	337	648.8
21.1	70	158.0	43.3	110	230.0	65.6	150	302.0	87.8	190	374.0	119.4	228	450.5	141.9	287	527.1	153.8	310	597.8	174.0	338	650.9
21.7	71	159.8	43.9	111	231.8	66.1	151	303.8	88.3	191	375.8	119.9	229	452.0	142.5	288	528.8	154.4	311	600.4	174.6	339	653.0
22.2	72	161.6	44.4	112	233.6	66.7	152	305.6	88.9	192	377.6	120.4	230	453.5	143.1	289	530.4	155.0	312	603.0	175.2	340	655.1
22.8	73	163.4	45.0	113	235.4	67.2	153	307.4	89.4	193	379.4	120.9	231	455.0	143.7	290	532.1	155.6	313	605.6	175.8	341	657.2
23.3	74	165.2	45.6	114	237.2	67.8	154	309.2	90.0	194	381.2	121.4	232	456.5	144.3	291	533.8	156.2	314	608.2	176.4	342	659.3
23.9	75	167.0	46.1	115	239.0	68.3	155	311.0	90.6	195	383.0	121.9	233	458.0	144.9	292	535.4	156.8	315	610.8	177.0	343	661.4
24.4	76	168.8	46.7	116	240.8	68.9	156	312.8	91.1	196	384.8	122.4	234	459.5	145.5	293	537.1	157.4	316	613.4	177.6	344	663.5
25.0	77	170.6	47.2	117	242.6	69.4	157	314.6	91.7	197	386.6	122.9	235	461.0	146.1	294	538.8	158.0	317	616.0	178.2	345	665.6
25.6	78	172.4	47.8	118	244.4	70.0	158	316.4	92.2	198	388.4	123.4	236	462.5	146.7	295	540.4	158.6	318	618.6	178.8	346	667.7
26.1	79	174.2	48.3	119	246.2	70.6	159	318.2	92.8	199	390.2	123.9	237	464.0	147.3	296	542.1	159.2	319	621.2	179.4	347	669.8
26.7	80	176.0	48.9	120	248.0	71.1	160	320.0	93.3	200	392.0	124.4	238	465.5	147.9	297	543.8	159.8	320	623.8	180.0	348	671.9
27.2	81	177.8	49.4	121	249.8	71.7	161	321.8	93.9	201	393.8	124.9	239	467.0	148.5	298	545.4	160.4	321	626.4	180.6	349	674.0
27.8	82	179.6	50.0	122	251.6	72.2	162	323.6	94.4	202	395.6	125.4	240	468.5	149.1	299	547.1	161.0	322	629.0	181.2	350	676.1
28.3	83	181.4	50.6	123	253.4	72.8	163	325.3	95.0	203	397.4	125.9	241	470.0	149.7	300	548.8	161.6	323	631.6	181.8	351	678.2
28.9	84	183.2	51.1	124	255.2	73.3	164	327.2	95.6	204	399.2	126.4	242	471.5	150.3	301	550.4	162.2	324	634.2	182.4	352	680.3
29.4	85	185.0	51.7	125	257.0	73.9	165	329.0	96.1	205	401.0	126.9	243	473.0	150.9	302	552.1	162.8	325	636.8	183.0	353	682.4
30.0	86	186.8	52.2	126	258.8	74.4	166	330.8	96.7	206	402.8	127.4	244	474.5	151.5	303	553.8	163.4	326	639.4	183.6	354	684.5
30.6	87	188.6	52.8	127	260.6	75.0	167	332.6	97.2	207	404.6	127.9	245	476.0	152.1	304	555.4	164.0	327	642.0	184.2	355	686.6
31.1	88	190.4	53.3	128	262.4	75.6	168	334.4	97.8	208	406.4	128.4	246	477.5	152.7	305	557.1	164.6	328	644.6	184.8	356	688.7
31.7	89	192.2	53.9	129	264.2	76.1	169	336.2	98.3	209	408.2	128.9	247	479.0	153.3	306	558.8	165.2	329	647.2	185.4	357	690.8
32.2	90	194.0	54.4	130	266.0	76.7	170	338.0	98.9	210	410.0	129.4	248	480.5	153.9	307	560.4	165.8	330	649.8	186.0	358	692.9
32.8	91	195.8	55.0	131	267.8	77.2	171	339.8	99.4	211	411.8	129.9	249	482.0	154.5	308	562.1	166.4	331	652.4	186.6	359	695.0
33.3	92	197.6	55.6	132	269.6	77.8	172	341.6	100.0	212	413.6	130.4	250	483.5	155.1	309	563.8	167.0	332	655.0	187.2	360	697.1
33.9	93	199.4	56.1	133	271.4	78.3	173	343.4	100.6	213	415.4	130.9	251	485.0	155.7	310	565.4	167.6	333	657.6	187.8	361	699.2
34.4	94	201.2	56.7	134	273.2	78.9	174	345.2	101.1	214	417.2	131.4	252	486.5	156.3	311	567.1	168.2	334	660.2	188.4	362	701.3
35.0	95	203.0	57.2	135	275.0	79.4	175	347.0	101.7	215	419.0	131.9	253	488.0	156.9	312	568.8	168.8	335	662.8	189.0	363	703.4
35.6	96	204.8	57.8	136	276.8	80.0	176	348.8	102.2	216	420.8	132.4	254	489.5	157.5	313	570.4	169.4	336	665.4	189.6	364	705.5
36.1	97	206.6	58.3	137	278.6	80.6	177	350.6	102.8	217	422.6	132.9	255	491.0	158.1	314	572.1	170.0	337	668.0	190.2	365	707.6
36.7	98	208.4	58.9	138	280.4	81.1	178	352.4	103.3	218	424.4	133.4	256	492.5	158.7	315	573.8	170.6	338	670.6	190.8	366	709.7
37.2	99	210.2	59.4	139	282.2	81.7	179	354.2	103.9	219	426.2	133.9	257	494.0	159.3	316	575.4	171.2	339	673.2	191.4	367	711.8

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
Figure 5 (Sheet 2)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B1903

C	F	C	F	C	F	C	F
104.4	220	428.0	148.9	300	572.0	260.0	500
105.0	221	429.8	151.7	305	581.0	262.8	505
105.6	222	431.6	154.4	310	590.0	265.6	510
106.1	223	433.4	157.2	315	599.0	268.3	515
106.7	224	435.2	160.0	320	608.0	271.1	520
107.2	225	437.0	162.8	325	617.0	273.9	525
107.8	226	438.8	165.6	330	626.0	276.7	530
108.3	227	440.6	168.3	335	635.0	279.4	535
108.9	228	442.4	171.1	340	644.0	282.2	540
109.4	229	444.2	173.9	345	653.0	285.0	545
110.0	230	446.0	176.7	350	662.0	287.8	550
110.6	231	447.8	179.4	355	671.0	290.6	555
111.1	232	449.6	182.2	360	680.0	293.3	560
111.7	233	451.4	185.0	365	689.0	296.1	565
112.2	234	453.2	187.8	370	698.0	298.9	570
112.8	235	455.0	190.6	375	707.0	301.7	575
113.3	236	456.8	193.3	380	716.0	304.4	580
113.9	237	458.6	196.1	385	725.0	307.2	585
114.4	238	460.4	198.9	390	734.0	310.0	590
115.0	239	462.2	201.7	395	743.0	312.8	595
115.6	240	464.0	204.4	400	752.0	315.6	600
116.1	241	465.8	207.2	405	761.0	318.3	605
116.7	242	467.6	210.0	410	770.0	321.1	610
117.2	243	469.4	212.8	415	779.0	323.9	615
117.8	244	471.2	215.6	420	788.0	326.7	620
118.3	245	473.0	218.3	425	797.0	329.4	625
118.9	246	474.8	221.1	430	806.0	332.2	630
119.4	247	476.6	223.9	435	815.0	335.0	635
120.0	248	478.4	226.7	440	824.0	337.8	640
120.6	249	480.2	229.4	445	833.0	340.6	645
121.1	250	482.0	232.2	450	842.0	343.3	650
123.9	255	491.0	235.0	455	851.0	346.1	655
126.7	260	500.0	237.8	460	860.0	348.9	660
129.4	265	509.0	240.6	465	869.0	351.7	665
132.2	270	518.0	243.3	470	878.0	354.4	670
135.0	275	527.0	246.1	475	887.0	357.2	675
137.8	280	536.0	248.9	480	896.0	360.0	680
140.6	285	545.0	251.7	485	905.0	362.8	685
143.3	290	554.0	254.4	490	914.0	365.6	690
146.1	295	563.0	257.2	495	923.0	368.3	695
371.1	700	1292.0	373.9	705	1301.0	376.7	710
376.7	710	1310.0	379.4	715	1319.0	382.2	720
385.0	725	1337.0	387.8	730	1346.0	390.6	735
393.3	740	1364.0	396.1	745	1373.0	398.9	750
401.7	755	1391.0	404.4	760	1400.0	407.2	765
410.0	770	1418.0	412.8	775	1427.0	415.6	780
418.3	785	1445.0	421.1	790	1454.0	423.9	795
426.7	800	1472.0	429.4	805	1481.0	432.2	810
435.0	815	1499.0	437.8	820	1508.0	440.6	825
443.3	830	1526.0	448.9	840	1544.0	451.7	845
454.4	850	1562.0	457.2	855	1571.0	460.0	860
462.8	865	1589.0	465.6	870	1598.0	468.3	875
471.1	880	1616.0	476.7	890	1634.0	479.4	895
479.4	895	1643.0					

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
Figure 5 (Sheet 3)



**CESSNA AIRCRAFT COMPANY**  
**MODEL 182/T182**  
**MAINTENANCE MANUAL**

B1904

C			F			C			F			C			F			C			F		
482.2	900	1652.0	593.3	1100	2012.0	704.4	1300	2372.0	815.6	1500	2732.0	510.0	950	1742.0	621.1	1150	2102.0	732.2	1350	2462.0	843.3	1550	2822.0
485.0	905	1661.0	596.1	1105	2021.0	707.2	1305	2381.0	818.3	1505	2741.0	512.8	955	1751.0	623.9	1155	2111.0	735.0	1355	2471.0	846.1	1555	2831.0
487.8	910	1670.0	598.9	1110	2030.0	710.0	1310	2390.0	821.1	1510	2750.0	515.6	960	1760.0	626.7	1160	2120.0	737.8	1360	2480.0	848.9	1560	2840.0
490.6	915	1679.0	601.7	1115	2039.0	712.8	1315	2399.0	823.9	1515	2759.0	518.3	965	1769.0	629.4	1165	2129.0	740.6	1365	2489.0	851.7	1565	2849.0
493.3	920	1688.0	604.4	1120	2048.0	715.6	1320	2408.0	826.7	1520	2768.0	521.1	970	1778.0	632.2	1170	2138.0	743.3	1370	2498.0	854.4	1570	2858.0
496.1	925	1697.0	607.2	1125	2057.0	718.3	1325	2417.0	829.4	1525	2777.0	523.9	975	1787.0	635.0	1175	2147.0	746.1	1375	2507.0	857.2	1575	2867.0
498.9	930	1706.0	610.0	1130	2066.0	721.1	1330	2426.0	832.2	1530	2786.0	526.7	980	1796.0	637.8	1180	2156.0	748.9	1380	2516.0	860.0	1580	2876.0
501.7	935	1715.0	612.8	1135	2075.0	723.9	1335	2435.0	835.0	1535	2795.0	529.4	985	1805.0	640.6	1185	2165.0	751.7	1385	2525.0	862.8	1585	2885.0
504.4	940	1724.0	615.6	1140	2084.0	726.7	1340	2444.0	837.8	1540	2804.0	532.2	990	1814.0	643.3	1190	2174.0	754.4	1390	2534.0	865.6	1590	2894.0
507.2	945	1733.0	618.3	1145	2093.0	729.4	1345	2453.0	840.6	1545	2813.0	535.0	995	1823.0	646.1	1195	2183.0	757.2	1395	2543.0	868.3	1595	2903.0
537.8	1000	1832.0	648.9	1200	2192.0	760.0	1400	2552.0	871.1	1600	2912.0	540.6	1005	1841.0	651.7	1205	2201.0	762.8	1405	2561.0	873.9	1605	2921.0
540.6	1005	1841.0	651.7	1205	2201.0	762.8	1405	2561.0	873.9	1605	2921.0	543.3	1010	1850.0	654.4	1210	2210.0	765.6	1410	2570.0	876.7	1610	2930.0
543.3	1010	1850.0	654.4	1210	2210.0	765.6	1410	2570.0	876.7	1610	2930.0	546.1	1015	1859.0	657.2	1215	2219.0	768.3	1415	2579.0	879.4	1615	2939.0
546.1	1015	1859.0	657.2	1215	2219.0	768.3	1415	2579.0	879.4	1615	2939.0	548.9	1020	1868.0	660.0	1220	2228.0	771.1	1420	2588.0	882.2	1620	2948.0
548.9	1020	1868.0	660.0	1220	2228.0	771.1	1420	2588.0	882.2	1620	2948.0	551.7	1025	1877.0	662.8	1225	2237.0	773.9	1425	2597.0	885.0	1625	2957.0
551.7	1025	1877.0	662.8	1225	2237.0	773.9	1425	2597.0	885.0	1625	2957.0	554.4	1030	1886.0	665.6	1230	2246.0	776.7	1430	2606.0	887.8	1630	2966.0
554.4	1030	1886.0	665.6	1230	2246.0	776.7	1430	2606.0	887.8	1630	2966.0	557.2	1035	1895.0	668.3	1235	2255.0	779.4	1435	2615.0	890.6	1635	2975.0
557.2	1035	1895.0	668.3	1235	2255.0	779.4	1435	2615.0	890.6	1635	2975.0	560.0	1040	1904.0	671.1	1240	2264.0	782.2	1440	2624.0	893.3	1640	2984.0
560.0	1040	1904.0	671.1	1240	2264.0	782.2	1440	2624.0	893.3	1640	2984.0	562.8	1045	1913.0	673.9	1245	2273.0	785.0	1445	2633.0	896.1	1645	2993.0
562.8	1045	1913.0	673.9	1245	2273.0	785.0	1445	2633.0	896.1	1645	2993.0	565.6	1050	1922.0	676.7	1250	2282.0	787.8	1450	2642.0	898.9	1650	3002.0
565.6	1050	1922.0	676.7	1250	2282.0	787.8	1450	2642.0	898.9	1650	3002.0	568.3	1055	1931.0	679.4	1255	2291.0	790.0	1455	2651.0	901.7	1655	3011.0
568.3	1055	1931.0	679.4	1255	2291.0	790.0	1455	2651.0	901.7	1655	3011.0	571.1	1060	1940.0	682.2	1260	2300.0	793.3	1460	2660.0	904.4	1660	3020.0
571.1	1060	1940.0	682.2	1260	2300.0	793.3	1460	2660.0	904.4	1660	3020.0	573.9	1065	1949.0	695.0	1265	2309.0	796.1	1465	2669.0	907.2	1665	3029.0
573.9	1065	1949.0	695.0	1265	2309.0	796.1	1465	2669.0	907.2	1665	3029.0	576.7	1070	1958.0	687.8	1270	2318.0	798.9	1470	2678.0	910.0	1670	3038.0
576.7	1070	1958.0	687.8	1270	2318.0	798.9	1470	2678.0	910.0	1670	3038.0	579.4	1075	1967.0	690.6	1275	2327.0	801.7	1375	2687.0	912.8	1675	3047.0
579.4	1075	1967.0	690.6	1275	2327.0	801.7	1375	2687.0	912.8	1675	3047.0	582.2	1080	1976.0	693.3	1280	2336.0	804.4	1480	2696.0	915.6	1680	3056.0
582.2	1080	1976.0	693.3	1280	2336.0	804.4	1480	2696.0	915.6	1680	3056.0	585.0	1085	1985.0	696.1	1285	2345.0	807.2	1485	2705.0	918.3	1685	3065.0
585.0	1085	1985.0	696.1	1285	2345.0	807.2	1485	2705.0	918.3	1685	3065.0	587.8	1090	1994.0	698.9	1290	2354.0	810.0	1490	2714.0	921.1	1690	3074.0
587.8	1090	1994.0	698.9	1290	2354.0	810.0	1490	2714.0	921.1	1690	3074.0	590.6	1095	2003.0	701.7	1295	2363.0	812.8	1495	2723.0	923.9	1695	3083.0
590.6	1095	2003.0	701.7	1295	2363.0	812.8	1495	2723.0	923.9	1695	3083.0												

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
Figure 5 (Sheet 4)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B1905

C			F			C			F			C			F								
926.7	1700	3092.0	1037.8	1900	3452.0	1148.9	2100	3812.0	1260.0	2300	4172.0	929.4	1705	3101.0	1040.6	1905	3461.0	1151.7	2105	3821.0	1262.8	2305	4181.0
932.2	1710	3110.0	1043.3	1910	3470.0	1154.4	2110	3830.0	1265.6	2310	4190.0	935.0	1715	3119.0	1046.0	1915	3479.0	1157.2	2115	3839.0	1268.3	2315	4199.0
937.8	1720	3128.0	1048.9	1920	3488.0	1160.0	2120	3848.0	1271.1	2320	4208.0	940.6	1725	3137.0	1051.7	1925	3497.0	1162.8	2125	3857.0	1273.9	2325	4217.0
943.3	1730	3146.0	1054.4	1930	3506.0	1165.6	2130	3866.0	1276.7	2330	4226.0	946.1	1735	3155.0	1057.2	1935	3515.0	1168.3	2135	3875.0	1279.4	2335	4235.0
948.9	1740	3164.0	1060.0	1940	3524.0	1171.1	2140	3884.0	1282.2	2340	4244.0	951.7	1745	3173.0	1062.8	1945	3533.0	1173.9	2145	3893.0	1285.0	2345	4255.0
954.4	1750	3182.0	1065.6	1950	3542.0	1176.7	2150	3902.0	1287.8	2350	4262.0	957.2	1755	3191.0	1068.3	1955	3551.0	1179.4	2155	3911.0	1290.6	2355	4271.0
960.0	1760	3200.0	1071.1	1960	3560.0	1182.2	2160	3920.0	1293.3	2360	4280.0	962.8	1765	3209.0	1073.9	1965	3569.0	1185.0	2165	3929.0	1296.1	2365	4289.0
965.6	1770	3218.0	1076.7	1970	3578.0	1187.8	2170	3938.0	1298.9	2370	4298.0	968.3	1775	3227.0	1079.4	1975	3587.0	1190.6	2175	3947.0	1301.7	2375	4307.0
971.1	1780	3236.0	1082.2	1980	3596.0	1193.3	2180	3956.0	1304.4	2380	4316.0	973.9	1785	3245.0	1085.0	1985	3605.0	1196.1	2185	3965.0	1307.2	2385	4325.0
976.7	1790	3254.0	1087.8	1990	3614.0	1198.9	2190	3974.0	1310.0	2390	4334.0	979.4	1795	3263.0	1090.6	1995	3623.0	1201.7	2195	3983.0	1312.8	2395	4343.0
982.2	1800	3272.0	1093.6	2000	3632.0	1204.4	2200	3992.0	1315.6	2400	4352.0	985.0	1805	3281.0	1096.1	2005	3641.0	1207.2	2205	4001.0	1318.3	2405	4361.0
987.8	1810	3290.0	1098.9	2010	3650.0	1210.0	2210	4010.0	1321.1	2410	4370.0	990.6	1815	3299.0	1101.7	2015	3659.0	1212.8	2215	4019.0	1323.9	2415	4379.0
993.3	1820	3308.0	1104.4	2020	3668.0	1215.6	2220	4028.0	1326.7	2420	4388.0	996.1	1825	3317.0	1107.2	2025	3677.0	1218.3	2225	4037.0	1329.4	2425	4397.0
998.9	1830	3326.0	1110.0	2030	3686.0	1221.1	2230	4046.0	1332.2	2430	4406.0	1001.7	1835	3335.0	1112.8	2035	3695.0	1223.9	2235	4055.0	1335.0	2435	4415.0
1004.4	1840	3344.0	1115.6	2040	3704.0	1226.7	2240	4064.0	1337.8	2440	4424.0	1007.2	1845	3353.0	1118.3	2045	3713.0	1229.4	2245	4073.0	1340.6	2445	4433.0
1010.0	1850	3362.0	1121.1	2050	3722.0	1232.2	2250	4082.0	1343.3	2450	4442.0	1012.8	1855	3371.0	1123.9	2055	3731.0	1235.0	2255	4091.0	1346.1	2455	4451.0
1015.6	1860	3380.0	1126.7	2060	3740.0	1237.8	2260	4100.0	1348.9	2460	4460.0	1018.3	1865	3389.0	1129.4	2065	3749.0	1240.6	2265	4109.0	1351.7	2465	4469.0
1021.1	1870	3398.0	1132.2	2070	3758.0	1243.3	2270	4118.0	1354.4	2470	4478.0	1023.9	1875	3407.0	1135.0	2075	3767.0	1246.1	2275	4127.0	1357.2	2475	4487.0
1026.9	1880	3416.0	1137.8	2080	3776.0	1248.9	2280	4136.0	1360.0	2480	4496.0	1029.4	1885	3425.0	1140.6	2085	3785.0	1251.7	2285	4145.0	1362.8	2485	4505.0
1032.2	1890	3434.0	1143.3	2090	3794.0	1254.4	2290	4154.0	1365.6	2490	4514.0	1035.0	1895	3443.0	1146.1	2095	3803.0	1257.2	2295	4163.0	1368.3	2495	4523.0

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
Figure 5 (Sheet 5)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

B1906

C			F			C			F			C			F		
1371.1	2500	4532.0	1398.9	2550	4622.0	1426.7	2600	4712.0	1471.1	2650	4777.0	1498.9	2700	4862.0	1526.7	2750	4947.0
1373.9	2505	4541.0	1401.7	2555	4631.0	1429.4	2605	4721.0	1473.9	2655	4786.0	1501.7	2705	4871.0	1529.4	2755	4956.0
1376.7	2510	4550.0	1404.4	2560	4640.0	1432.2	2610	4730.0	1476.7	2660	4795.0	1504.4	2710	4880.0	1532.2	2760	4965.0
1379.4	2515	4559.0	1407.2	2565	4649.0	1435.0	2615	4739.0	1479.4	2665	4804.0	1507.2	2715	4889.0	1535.0	2765	4974.0
1382.2	2520	4568.0	1410.0	2470	4658.0	1437.8	2620	4748.0	1482.2	2670	4813.0	1510.0	2720	4894.0	1537.8	2770	4983.0
1385.0	2525	4577.0	1412.8	2575	4667.0	1440.6	2625	4757.0	1485.0	2675	4822.0	1512.8	2725	4903.0	1540.6	2775	4992.0
1387.8	2530	4586.0	1415.6	2580	4676.0	1443.3	2630	4766.0	1487.8	2680	4831.0	1515.6	2730	4912.0	1543.3	2780	5001.0
1390.6	2535	4595.0	1418.3	2585	4685.0	1446.1	2635	4775.0	1490.6	2685	4840.0	1518.3	2735	4921.0	1546.1	2785	5010.0
1393.3	2540	4604.0	1421.1	2590	4694.0	1448.9	2640	4784.0	1493.3	2690	4849.0	1521.1	2740	4930.0	1548.9	2790	5019.0
1396.1	2545	4613.0	1423.9	2595	4703.0	1451.7	2645	4793.0	1496.1	2695	4858.0	1523.9	2745	4939.0	1551.7	2795	5028.0

Fahrenheit and Celsius (Centigrade) Temperature Conversion  
 Figure 5 (Sheet 6)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

**STANDARD DRILL SIZES**

DRILL	DECIMAL	DRILL	DECIMAL	DRILL	DECIMAL	DRILL	DECIMAL	DRILL	DECIMAL
80	0.0135	45	0.0820	12	0.1890	S	0.3480	55/64	0.8594
79	0.0145	44	0.0860	11	0.1910	T	0.3580	7/8	0.8750
1/64	0.0156	43	0.0890	10	0.1935	23/64	0.3594	57/64	0.8906
78	0.0160	42	0.0935	9	0.1960	U	0.3680	29/32	0.9062
77	0.0180	3/32	0.0937	8	0.1990	3/8	0.3750	29/64	0.9219
76	0.0200	41	0.0960	7	0.2010	V	0.3770	15/16	0.9375
75	0.0210	40	0.0980	13/64	0.2031	W	0.3860	61/64	0.9531
74	0.0225	39	0.0995	6	0.2040	25/64	0.3906	31/32	0.9687
73	0.0240	38	0.1015	5	0.2055	X	0.3970	63/64	0.9844
72	0.0250	37	0.1040	4	0.2090	Y	0.4040	1	1.0000
71	0.0260	36	0.1065	3	0.2130	13/32	0.4062		
70	0.0280	7/64	0.1093	7/32	0.2187	Z	0.4130		
69	0.0292	35	0.1100	2	0.2210	27/64	0.4219		
68	0.0310	34	0.1110	1	0.2280	7/16	0.4375		
1/32	0.0313	33	0.1130	A	0.2340	29/64	0.4531		
67	0.0320	32	0.1160	15/64	0.2344	15/32	0.4687		
66	0.0330	31	0.1200	B	0.2380	31/64	0.4843		
65	0.0350	1/8	0.1250	C	0.2420	1/2	0.5000		
64	0.0360	30	0.1285	D	0.2460	33/64	0.5156		
63	0.0370	29	0.1360	E	0.2500	17/32	0.5312		
62	0.0380	28	0.1405	1/4	0.2500	35/64	0.5469		
61	0.0390	9/64	0.1406	F	0.2750	9/16	0.5625		
60	0.0400	27	0.1440	G	0.2610	37/64	0.5781		
59	0.0410	26	0.1470	17/64	0.2656	19/32	0.5937		
58	0.0420	25	0.1495	H	0.2660	39/64	0.6094		
57	0.0430	24	0.1520	I	0.2720	5/8	0.6250		
56	0.0465	23	0.1540	J	0.2770	41/64	0.6406		
3/64	0.0469	5/32	0.1562	K	0.2811	21/32	0.6562		
55	0.0520	22	0.1570	9/32	0.2812	43/64	0.6719		
54	0.0550	21	0.1590	L	0.2900	11/16	0.6875		
53	0.0595	20	0.1610	M	0.2950	45/64	0.7031		
1/16	0.0625	19	0.1660	19/64	0.2968	23/32	0.7187		
52	0.0635	18	0.1695	N	0.3020	47/64	0.7344		
51	0.0670	11/64	0.1719	5/16	0.3135	3/4	0.7500		
50	0.0700	17	0.1730	O	0.3160	49/64	0.7656		
49	0.0730	16	0.1770	P	0.3230	25/32	0.7812		
48	0.0760	15	0.1800	21/64	0.3281	51/64	0.7969		
5/64	0.0781	14	0.1820	Q	0.3320	13/16	0.8125		
47	0.0785	13	0.1850	R	0.3390	53/64	0.8281		
46	0.0810	3/16	0.1875	11/32	0.3437	27/32	0.8437		

Drill and Tap Decimal Conversion  
Figure 6 (Sheet 1)

**CESSNA AIRCRAFT COMPANY**  
**MODEL 182/T182**  
**MAINTENANCE MANUAL**

**MILLIMETER DRILL SIZES**

<b>mm</b>	<b>DECIMAL</b>	<b>mm</b>	<b>DECIMAL</b>	<b>mm</b>	<b>DECIMAL</b>	<b>mm</b>	<b>DECIMAL</b>	<b>mm</b>	<b>DECIMAL</b>
.35	0.0138	2.10	0.0827	4.60	0.1811	7.50	0.2953	12.50	0.4921
.40	0.0157	2.15	0.0846	4.70	0.1850	7.60	0.2992	13.00	0.5118
.45	0.0177	2.20	0.0866	4.75	0.1870	7.70	0.3031	13.50	0.5315
.50	0.0197	2.25	0.0886	4.80	0.1890	7.75	0.3051	14.00	0.5512
.55	0.0217	2.30	0.0905	4.90	0.1929	7.80	0.3071	14.50	0.5709
.60	0.0236	2.35	0.0925	5.00	0.1968	7.90	0.3110	15.00	0.5906
.65	0.0256	2.40	0.0945	5.10	0.2008	8.00	0.3150	15.50	0.6102
.70	0.0276	2.45	0.0965	5.20	0.2047	8.10	0.3189	16.00	0.6299
.75	0.0295	2.50	0.0984	5.25	0.2067	8.20	0.3228	16.50	0.6496
.80	0.0315	2.55	0.1004	5.30	0.2087	8.25	0.3248	17.00	0.6693
.85	0.0335	2.60	0.1024	5.40	0.2126	8.30	0.3268	17.50	0.6890
.90	0.0354	2.65	0.1043	5.50	0.2165	8.40	0.3307	18.00	0.7087
.95	0.0374	2.70	0.1063	5.60	0.2205	8.50	0.3346	18.50	0.7283
1.00	0.0394	2.75	0.1083	5.70	0.2244	8.60	0.3386	19.00	0.7480
1.05	0.0413	2.80	0.1102	5.75	0.2264	8.70	0.3425	19.50	0.7677
1.10	0.0433	2.90	0.1142	5.80	0.2283	8.75	0.3445	20.00	0.7874
1.15	0.0453	3.00	0.1181	5.90	0.2323	8.80	0.3465	20.50	0.8071
1.20	0.0472	3.10	0.1220	6.00	0.2362	8.90	0.3504	21.00	0.8268
1.25	0.0492	3.20	0.1260	6.10	0.2401	9.00	0.3543	21.50	0.8465
1.30	0.0512	3.25	0.1280	6.20	0.2441	9.10	0.3583	22.00	0.8661
1.35	0.0531	3.30	0.1299	6.25	0.2461	9.20	0.3622	22.50	0.8858
1.40	0.0551	3.40	0.1339	6.30	0.2480	9.25	0.3642	23.00	0.9055
1.45	0.0571	3.50	0.1378	6.40	0.2520	9.30	0.3661	23.50	0.9252
1.50	0.0591	3.60	0.1417	6.50	0.2559	9.40	0.3701	24.00	0.9449
1.55	0.0610	3.70	0.1457	6.60	0.2598	9.50	0.3740	24.50	0.9646
1.60	0.0629	3.75	0.1477	6.70	0.2638	9.60	0.3780	25.00	0.9843
1.65	0.0650	3.80	0.1496	6.75	0.2658	9.70	0.3819		
1.70	0.0669	3.90	0.1535	6.80	0.2677	9.75	0.3839		
1.75	0.0689	4.00	0.1575	6.90	0.2716	9.80	0.3858		
1.80	0.0709	4.10	0.1614	7.00	0.2756	9.90	0.3898		
1.85	0.0728	4.20	0.1654	7.10	0.2795	10.00	0.3937		
1.90	0.0748	4.25	0.1674	7.20	0.2835	10.50	0.4134		
1.95	0.0768	4.30	0.1693	7.25	0.2855	11.00	0.4330		
2.00	0.0787	4.40	0.1732	7.30	0.2874	11.50	0.4528		
2.05	0.0807	4.50	0.1771	7.40	0.2913	12.00	0.4724		

Drill and Tap Decimal Conversion  
Figure 6 (Sheet 2)

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**TAP HOLE SIZES**

<b>TAP SIZE</b>	<b>HOLE ID</b>	
	<b>MINIMUM</b>	<b>MAXIMUM</b>
0-80	0.0616	0.0619
1-64	0.0746	0.0749
1-72	0.0746	0.0749
2-56	0.0876	0.0879
2-64	0.0876	0.0879
3-48	0.1011	0.1014
3-56	0.1006	0.1009
4-40	0.1146	0.1149
4-48	0.1141	0.1144
5-40	0.1276	0.1279
5-44	0.1271	0.1274
6-32	0.1411	0.1414
6-40	0.1406	0.1409
8-32	0.1671	0.1674
8-36	0.1666	0.1669
10-24	0.1941	0.1944
10-32	0.1931	0.1934
12-24	0.2201	0.2204
12-28	0.2196	0.2199
1/4-20	0.2551	0.2555
1/4-28	0.2536	0.2540
5/16-18	0.3181	0.3185
5/16-24	0.3166	0.3170
3/8-16	0.3811	0.3815
3/8-24	0.3791	0.3795
7/16-14	0.4446	0.4450
7/16-20	0.4426	0.4430
1/2-13	0.5076	0.5080
1/2-20	0.5051	0.5055
9/16-12	0.5701	0.5705
9/16-18	0.5681	0.5685
5/8-11	0.6331	0.6335
5/8-18	0.6306	0.6310
3/4-10	0.7592	0.7596
3/4-16	0.7562	0.7566
7/8-9	0.8852	0.8856
7/8-14	0.8822	0.8826
1-8	1.0112	1.0116
1-14	1.0072	1.0076

Drill and Tap Decimal Conversion  
 Figure 6 (Sheet 3)

**CHAPTER**

**21**

**AIR CONDITIONING**

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**LIST OF EFFECTIVE PAGES**

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21-Title		
21-List of Effective Pages		
21-Record of Temporary Revisions		
21-Table of Contents		
21-00-00	Page 1	April 1/2002
21-20-00	Page 1	April 1/2002
21-20-00	Pages 101-102	April 1/2002
21-20-00	Pages 201-203	Mar 1/2005
21-21-00	Pages 201-206	Jan 2/2006
21-40-00	Pages 101-102	April 1/2002
21-40-00	Pages 201-206	Jan 1/2007





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**AIR CONDITIONING - GENERAL**

**1. Scope**

- A. This chapter describes those units and components which furnish a means of heating and ventilating the cockpit/cabin area.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Type II Sealant	PR1488	Courtaulds Aerospace 5426 San Fernando Rd. Glendale, CA 91209	To secure cabin duct to various air outlets.
Type IV Sealant	Pro-Seal 700	Courtaulds Aerospace	To seal shutoff valve to firewall.
Type IV Sealant	GC- 1900	Courtaulds Aerospace	To seal shutoff valve to firewall.

**3. Definition**

- A. This chapter is divided into sections to aid maintenance technicians in locating information. Consulting the table of contents will further assist in locating a particular subject. A brief description of the sections follows:
- (1) The section on distribution describes that portion of the system used to distribute fresh and heated air throughout the cockpit/cabin area.
  - (2) The section on heating describes those components used to generate (but not distribute) heat for the cockpit/cabin area.
  - (3) The section on temperature control describes components used to control heat in the cockpit/cabin area.

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**FRESH AIR DISTRIBUTION - DESCRIPTION AND OPERATION**

**1. General**

- A. The cockpit/cabin area is ventilated with fresh air by means of external wing root openings, an adjustable air scoop, and internal ducting.

**2. Description**

- A. Fresh air enters the cabin from one of three sources. Two of those sources are located on the leading edge of the wing (one left and one right) and the other source is located on the right and left sides of the fuselage, between the firewall and the forward door post.
- (1) Fresh air from the leading edge inlets is distributed through a series of ducts to adjustable air outlet valves (Wemacs). Each wing feeds three Wemacs, with a total of six Wemacs located throughout the cabin. Wemacs are located at the upper corner of the windshield, between the instrument panel and forward doorpost, and overhead in the rear passenger area.
  - (2) Fresh air entering from the right side of the fuselage is controlled by an infinitely positionable scoop (door). This air is ducted directly into the heated air plenum and is distributed throughout the cabin.

**3. System Operation**

- A. The amount of fresh air entering the cabin can be controlled by any of the six Wemacs. Rotating the Wemac valve will vary the airflow from fully closed to fully open.
- B. Air flow into the cabin can also be adjusted by the CABIN AIR control cable. Pulling the control fully aft allows the maximum amount of fresh air to flow through the distribution system. Pushing the control fully forward closes the scoop (door) and allows no fresh air to flow through the distribution system.

**NOTE:** Air temperature in the distribution system can be altered by use of the CABIN HT control. As the CABIN HT control is gradually pulled out, more and more heated air will blend with the fresh air from the scoop, and is distributed into the cabin. Either one or both of the controls may be set at any position from full open to full closed.

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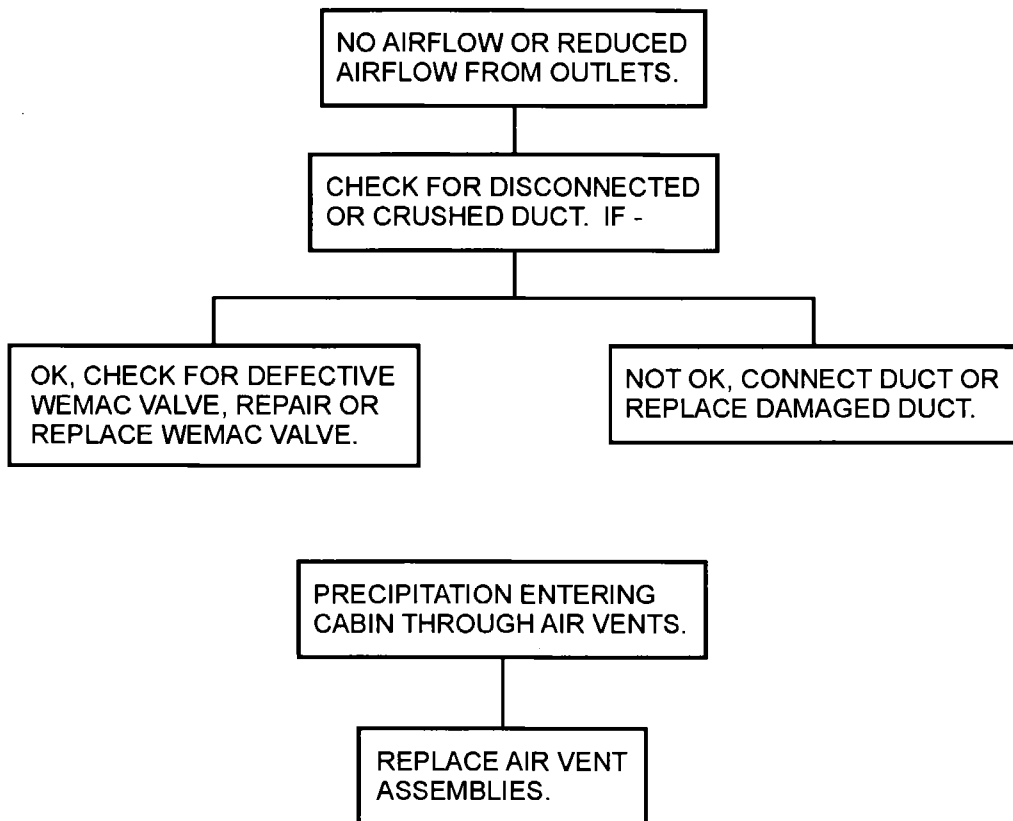
**FRESH AIR DISTRIBUTION - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

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Fresh Air System Troubleshooting Chart  
Figure 101 (Sheet 1)

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**FRESH AIR DISTRIBUTION - MAINTENANCE PRACTICES**

**1. General**

- A. Fresh air is distributed through ducts from two inlet openings, one in each wing leading edge, to air outlet valves located in the cockpit/cabin area at the wing roots by the upper corners of the windshield, in the side walls just aft of the instrument panel, and above the passenger seat. Air outlet valve removal/installation is typical at each location. A door assembly, located on the right side of the fuselage between the firewall and door post, also allows fresh air to be routed into the heat ducts. The door is operated by a control on the instrument panel labeled CABIN AIR.

**2. Air Outlet Valve Removal/Installation**

- A. Remove Air Outlet Valve (Refer to Figure 201).  
(1) Remove retaining ring from air outlet valve.  
(2) Remove upholstery panel or headliner. Refer to chapter 25, Interior Upholstery - Maintenance Practices.  
(3) Remove clamp securing ducting hose to air outlet valve adapter.  
(4) Remove air outlet valve and adapter.
- B. Install Wing Root Air Outlet Valve (Refer to Figure 201).  
(1) Install air outlet valve and valve adapter to ducting. Secure with clamp.  
(2) Install upholstery panel or headliner. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.  
(3) Install retaining ring to air outlet valve.

**3. Cabin Air Control Cable Removal/Installation**

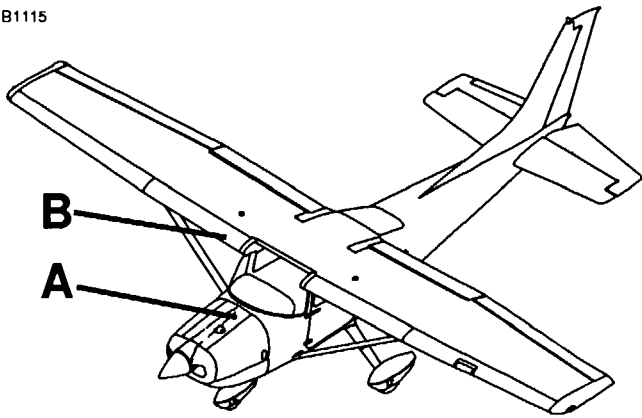
- A. Remove Cabin Air Control Cable (Refer to Figure 201).  
(1) Carefully straighten end of CABIN AIR control cable.  
(2) Loosen clamp bolt on control arm and withdraw cable from control arm.  
(3) Remove screws securing clamp.  
(4) Gain access to the backside of the CABIN AIR control cable.  
(5) Loosen nut on backside of control cable.  
(6) Carefully withdraw cable from instrument panel.
- B. Install Cabin Air Control Cable (Refer to Figure 201).  
(1) Thread end of control cable through hole in instrument panel.  
(2) Secure CABIN AIR control cable to backside of instrument panel using existing jamnut.  
(3) Thread end of control cable through the clamp bolt.  
(4) Clamp control housing.  
(5) Test control cable to ensure full range of travel. Travel may be adjusted by positioning control housing in clamps.  
(6) When full range of travel has been established, bend end of control cable around clamp bolt.

**4. Distribution Duct Removal/Installation**

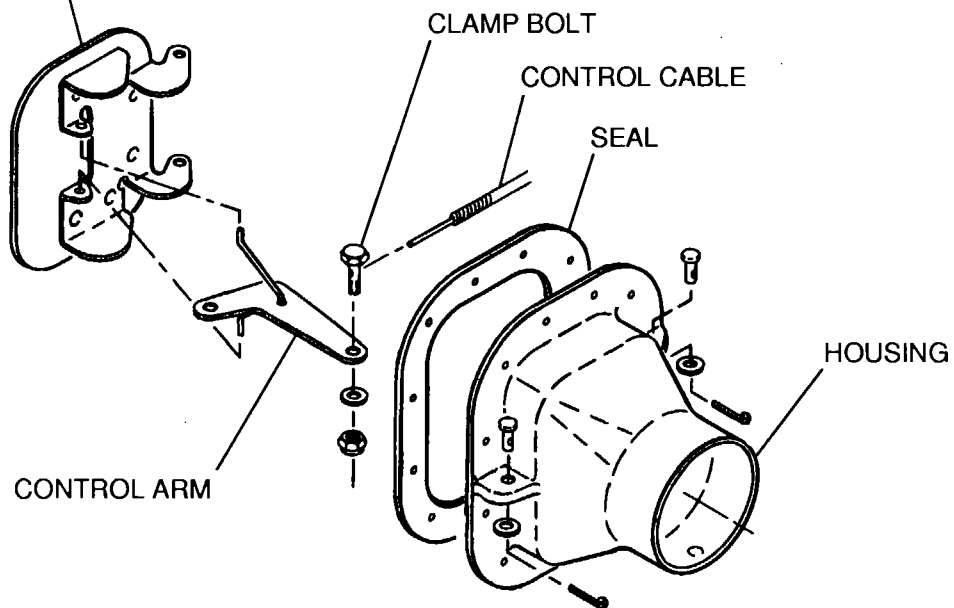
- A. The majority of the fresh air distribution system components are riveted to the airframe and do not require replacement during normal maintenance. Ducts are secured to these components using clamps. If ducts become damaged or worn, they should be replaced.

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DOOR ASSEMBLY



**DETAIL A**

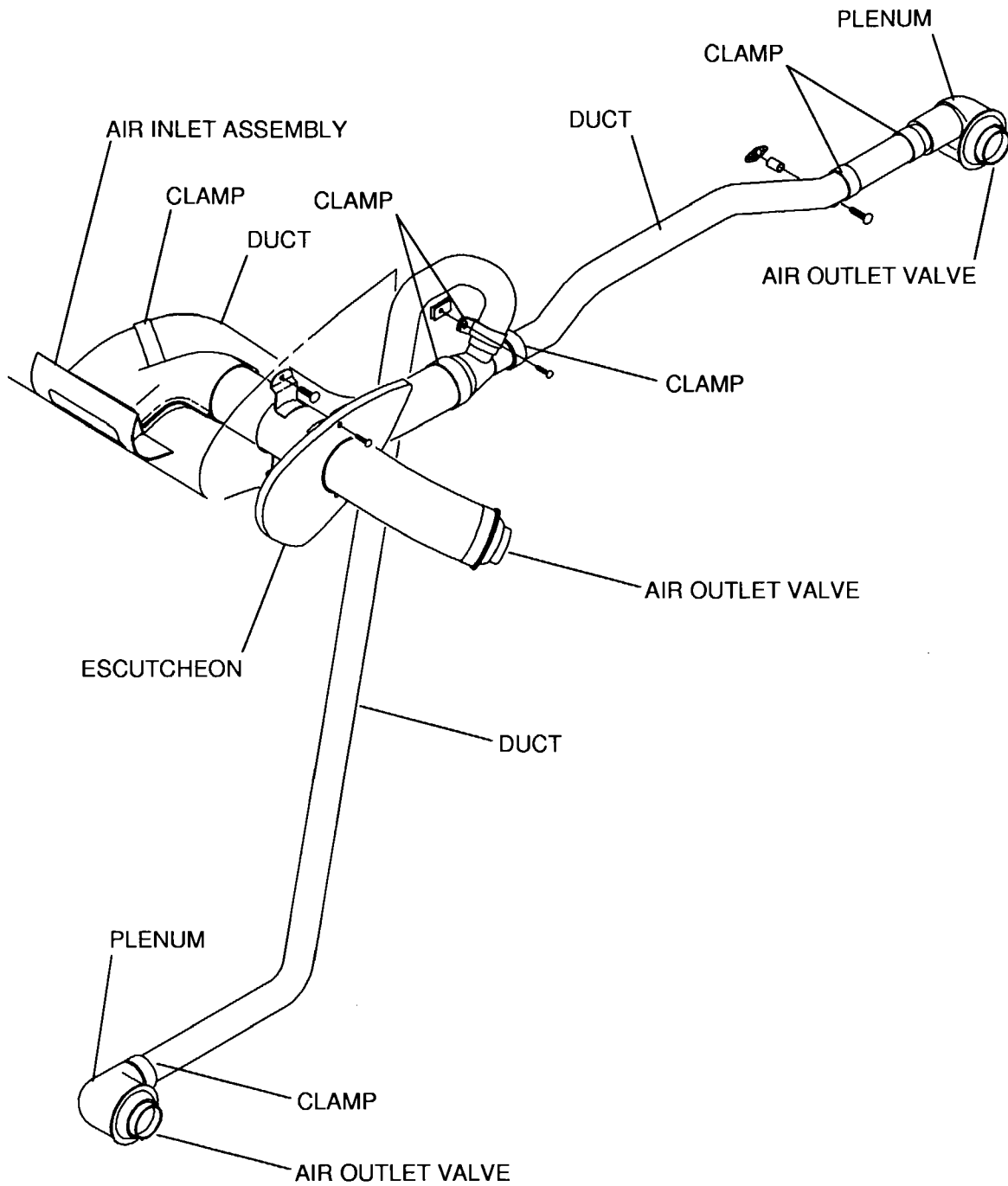
0710T1001  
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Fresh Air System Installation  
Figure 201 (Sheet 1)



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**DETAIL B**  
RIGHT SIDE SHOWN  
LEFT SIDE OPPOSITE

A0714T1001

Fresh Air System Installation  
Figure 201 (Sheet 2)

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**AVIONICS COOLING - MAINTENANCE PRACTICES**

**1. General**

- A. The maintenance procedures that follow are for the removal and installation of the avionics cooling fan(s).
- B. Airplanes with the standard avionics system have one cooling fan for the instrument panel installed on the forward top right side of the firewall. The fan is used to cool the different components in the radio stack.
- C. Airplanes with the Garmin G1000 avionics system have four avionics fans. Two of the fans are installed behind the instrument panel to help cool each Control Display Unit (CDU). The third fan is installed in the deck skin to pull hot air out from the forward side of the instrument panel. The fourth fan is installed in the tailcone next to the avionics.

**2. Firewall Avionics Cooling Fan Removal/Installation (Airplanes without Garmin G1000)**

- A. Remove the Firewall Avionics Cooling Fan (Refer to Figure 201).
  - (1) Make sure that the airplane MASTER and AVIONICS switches are in the off position.
  - (2) Remove the screws that attach the fan to the firewall.
  - (3) Disconnect the electrical connector (PC901) from the wire bundle.
  - (4) Cut the tie straps and disconnect the flexible ducts from the fan.
  - (5) Remove the fan from the airplane.
- B. Install the Firewall Avionics Cooling Fan (Refer to Figure 201).
  - (1) Connect the flexible ducts to the fan.
  - (2) Install the tie straps on the ducts.
  - (3) Connect the electrical connector (PC901) to the wire bundle.
  - (4) Install the fan to the firewall with screws.
  - (5) Do a test of the fan.
    - (a) Put the MASTER switch in the BATT position.
    - (b) Put the MASTER switch in the ON position and listen for the fan operation.
  - (6) Put the MASTER switch and the AVIONICS switch in the off position.

**3. Primary Flight Display (PFD) Fan Removal/Installation (Airplanes with Garmin G1000)**

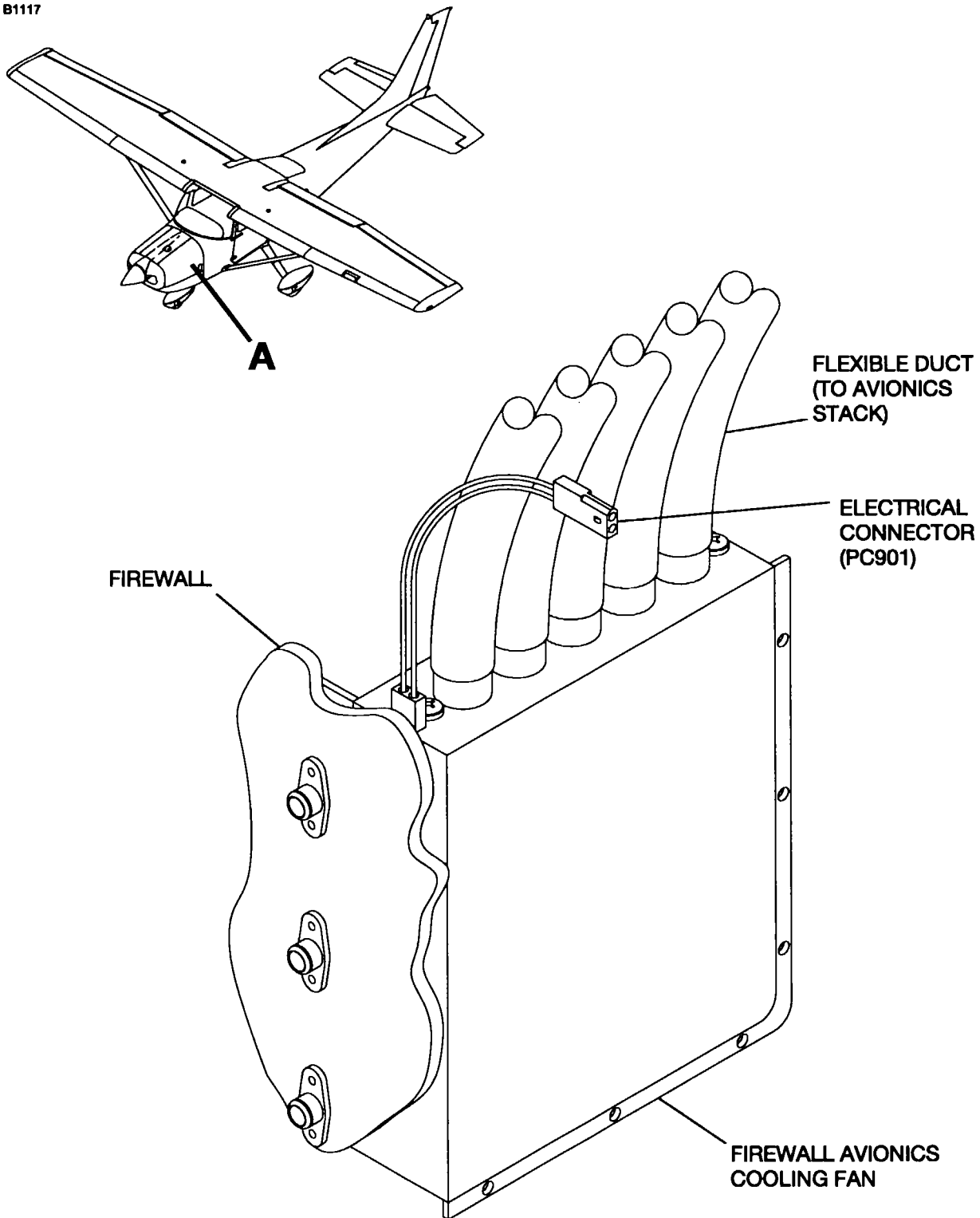
- A. Remove the PFD Fan (Refer to Figure 202).
  - (1) Make sure that the MASTER switch and the AVIONICS switch are in the off position.
  - (2) Remove the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (3) Record the fan airflow direction.
  - (4) Remove the screws and nuts that attach the fan to the fan bracket.
  - (5) Disconnect the electrical connector (PI316) from the wire bundle.
  - (6) Remove the fan from the airplane.
- B. Install the PFD Fan (Refer to Figure 202).
  - (1) Connect the electrical connector (PI316) to the wire bundle.
  - (2) Install the screws and nuts that attach the fan to the fan bracket.
  - (3) Do a test of the fan.
    - (a) Put the MASTER switch in the BATT position.
    - (b) Put the AVIONICS switch in the ON position and listen for the fan operation.
    - (c) Make sure that the direction of the airflow is toward the PFD.
  - (4) Put the AVIONICS switch and the MASTER switch in the off position.
  - (5) Install the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.

**4. Multi-Function Display (MFD) Fan Removal/Installation (Airplanes with Garmin G1000)**

- A. Remove the MFD Fan (Refer to Figure 202).
  - (1) Make sure that the MASTER switch and the AVIONICS switch are in the off position.
  - (2) Remove the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.

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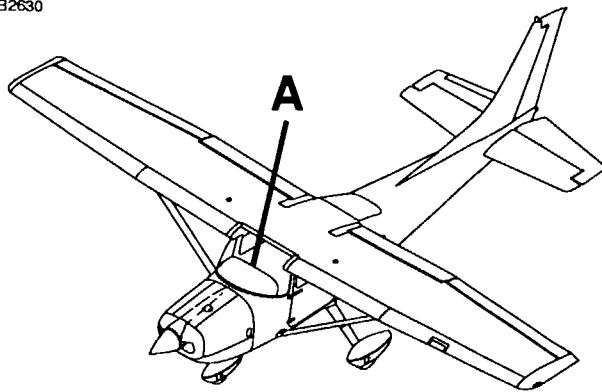
**DETAIL A**

Firewall Avionics Fan Installation (Airplanes without Garmin G1000)  
Figure 201 (Sheet 1)

0710T1001  
A0518T1026

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PRIMARY FLIGHT  
 DISPLAY (PFD) FAN

NUT

WASHER

SCREW

DECK SKIN FAN

NUT

MULTI-FUNCTION  
 DISPLAY (MFD)  
 FAN

NUT

WASHER

SCREW

SCREW



**DETAIL A**

0710T1001  
 A0718T1063

Avionics Cooling Installation (Garmin G1000)  
 Figure 202 (Sheet 1)

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- (3) Remove the turn coordinator. Refer to Chapter 34, Attitude and Direction - Maintenance Practices.
- (4) Record the fan airflow direction.
- (5) Remove the screws and nuts that attach the fan to the fan bracket.
- (6) Disconnect the electrical connector (PI315) from the wire bundle.
- (7) Remove the fan from the airplane.

**B. Install the MFD Fan (Refer to Figure 202).**

- (1) Connect the electrical connector (PI315) to the wire bundle.
- (2) Make sure that the airflow direction is towards the MFD.
- (3) Install the screws and nuts that attach the fan to the fan bracket.
- (4) Do a test of the fan.
  - (a) Put the MASTER switch in the BATT position.
  - (b) Put the AVIONICS switch to the ON position and listen for the fan operation.
- (5) Put the AVIONICS switch and the MASTER switch in the off position.
- (6) Install the turn coordinator. Refer to Chapter 34, Attitude and Direction - Maintenance Practices.
- (7) Install the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.

**5. Deck Skin Fan Removal/Installation (Airplanes with Garmin G1000)**

**A. Remove the Deck Skin Fan (Refer to Figure 202).**

- (1) Make sure that the MASTER switch and the AVIONICS switch are in the off position.
- (2) Remove the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
- (3) Record the airflow direction.
- (4) Remove the screws and nuts that attach the fan to the deck skin.
- (5) Disconnect the electrical connector (PI314) from the wire bundle.
- (6) Remove the fan from the airplane.

**B. Install the Deck Skin Fan (Refer to Figure 202).**

- (1) Connect the electrical connector (PI314) to the wire bundle.
- (2) Make sure that the direction of the airflow is away from the deck skin and toward the windshield.
- (3) Install the screws and nuts that attach the fan to the deck skin.
- (4) Do a test of the fan.
  - (a) Put the MASTER switch in the BATT position.
  - (b) Put the AVIONICS switch to the ON position and listen for the fan operation.
- (5) Put the AVIONICS switch and the MASTER switch in the off position.
- (6) Install the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.

**6. Remote Avionics Cooling Fan Removal/Installation (Airplanes with Garmin G1000)**

**A. Remove the Remote Avionics Cooling Fan (Refer to Figure 203).**

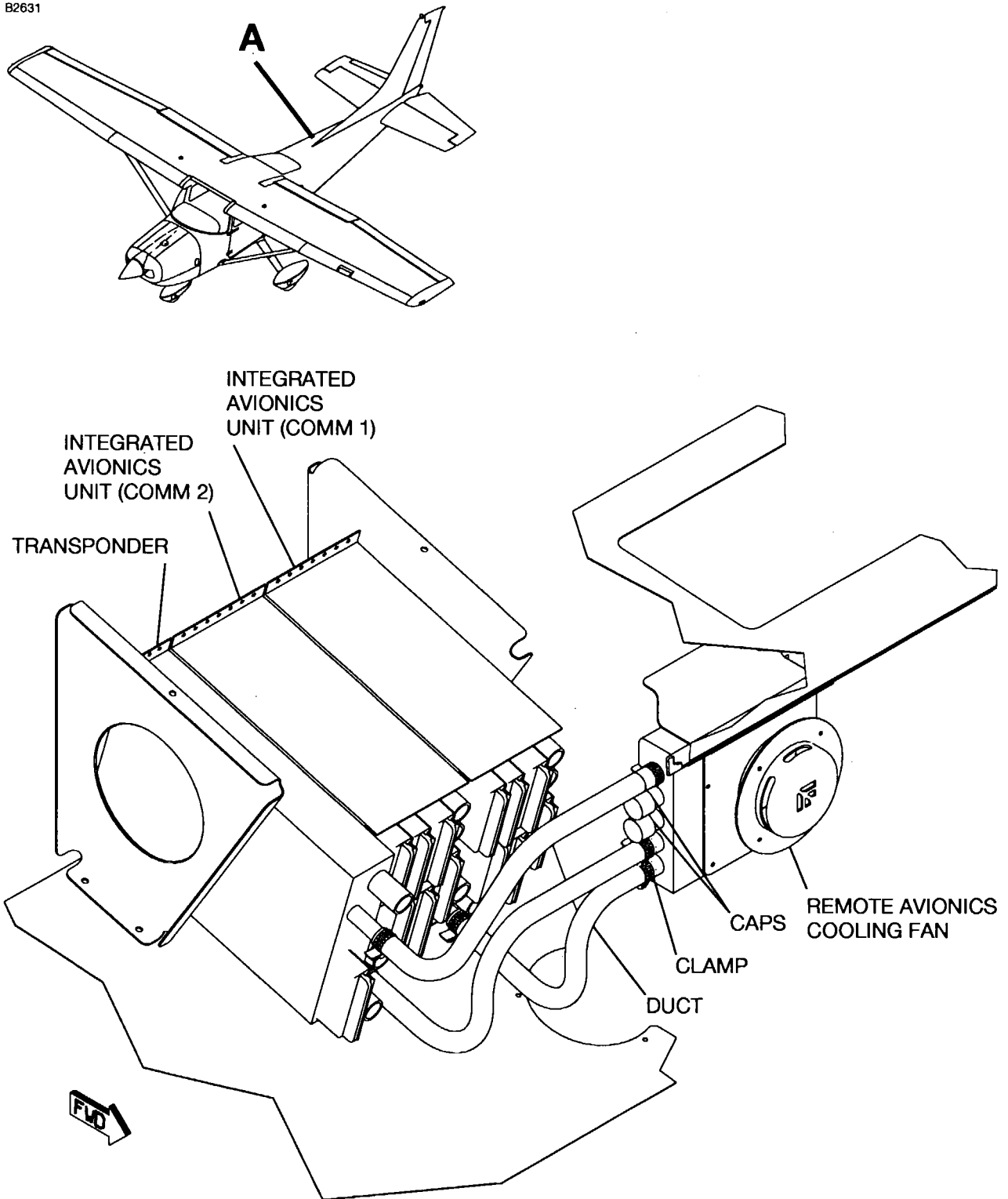
- (1) Make sure that the MASTER switch and the AVIONICS switch are in the off position.
- (2) Remove the upholstery. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
- (3) Remove the screws that attach the fan to the structure.
- (4) If necessary, remove the caps from the unused ports.
- (5) Disconnect the electrical connector (PT901) from the wire bundle.
- (6) Remove the clamps from the flexible ducts of the fan.
- (7) Disconnect the flexible ducts from the fan.
- (8) Remove the fan from the airplane.

**B. Install the Remote Avionics Cooling Fan (Refer to Figure 203).**

- (1) Connect the flexible ducts to the fan.
- (2) Put the clamps on the flexible ducts.
- (3) Connect the electrical connector (PT901) to the wire bundle.
- (4) Install the screws that attach the fan to the structure.
- (5) If necessary, install the caps on the unused ports.
- (6) Do a test of the fan.
  - (a) Put the MASTER switch in the BATT position.
  - (b) Put the AVIONICS switch to the ON position and listen for the fan operation.
- (7) Put the AVIONICS switch and the MASTER switch in the off position.

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**DETAIL A**

Remote Avionics Cooling Fan Installation (Garmin G1000)  
Figure 203 (Sheet 1)

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(8) Install the upholstery. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**7. Primary Flight Display (PFD) and Multi-Function Display (MFD) Fan Operational Check (Airplanes with Garmin G1000)**

- A. PFD and MFD Fan Operational Check (Refer to Figure 202).
  - (1) Remove the PFD and the MFD. Refer to Control Display Unit - Maintenance Practices.
  - (2) Put the MASTER switch and AVIONICS switch in the ON position.
  - (3) Listen and look for the correct operation of both fans.
  - (4) Install the PFD and the MFD. Refer to Control Display Unit - Maintenance Practices.

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**HEATING AND DEFROSTING - TROUBLESHOOTING**

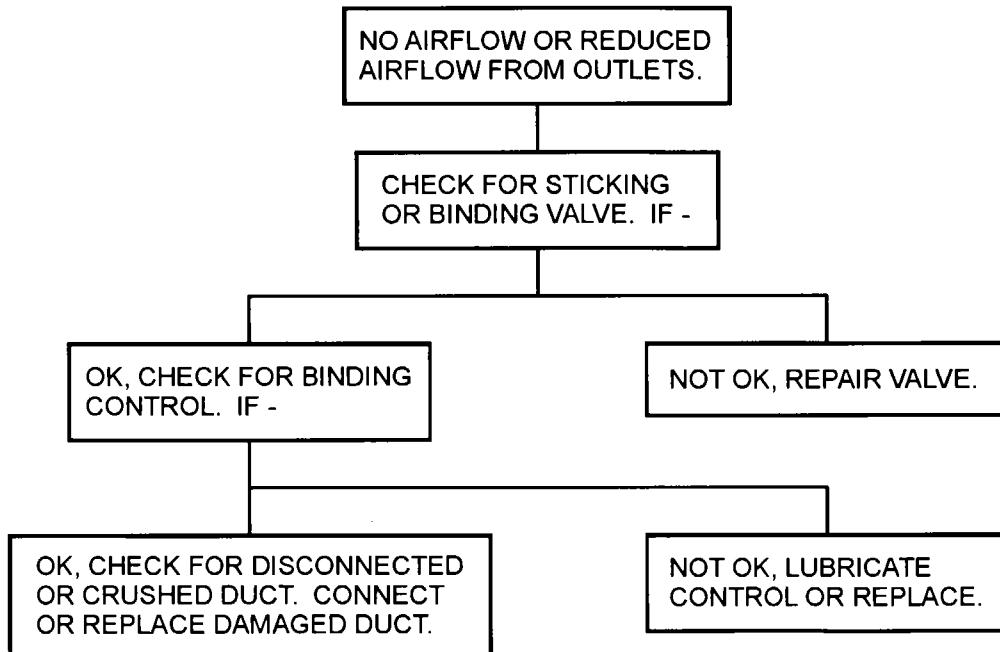
**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.



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Heating and Defrosting System Troubleshooting Chart  
Figure 101 (Sheet 1)

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**HEATING AND DEFROSTING - MAINTENANCE PRACTICES**

**1. General**

- A. The heating and defrosting system is comprised of the heat exchange section of the exhaust mufflers, a shutoff valve mounted on the firewall, defrosting valve outlet located under the deck just aft of the windshield, push-pull controls on the instrument panel, outlets, and flexible ducting connecting the system.

**2. System Operation**

- A. Ram air enters the engine compartment through cowling inlets located aft of the propeller. A portion of this air is directed toward an exit point in the rear engine baffle. This air is directed, via ducting, to the heat exchange section around the left exhaust muffler. As air passes into the heat shroud and around the exhaust muffler, it picks up heat from the engine exhaust. The heated air is then directed to the right exhaust heat shroud. This heated air exits the right heat shroud and is directed, via ducting, to a firewall shutoff valve. The shutoff valve is cable controlled from the cockpit, and controls the amount of heated air entering the cockpit area distribution plenum. From the plenum, various ducts distribute the heated air to floorboard and defroster outlets.

**NOTE:** The cockpit area distribution plenum is also plumbed to receive outside fresh air from the right external air scoop (door). This arrangement allows a combination of fresh air and heated air to be mixed and distributed throughout the system.

**3. Heat Shroud Removal/Installation**

- A. Remove Heat Shroud (Refer to Figure 201 and Figure 202).
- (1) Remove engine cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (2) Remove clamps securing flexible ducts to left heat shroud.
  - (3) Remove sheet metal screws securing heat shroud to itself.
  - (4) Carefully remove shroud from around left muffler.
  - (5) Remove clamps securing flexible ducts to right heat shroud.
  - (6) Remove sheet metal screws securing heat shroud to itself.
  - (7) Carefully remove heat shroud from around right muffler.
  - (8) Muffler must be carefully examined and inspected for leaks or cracks. Refer to Chapter 5, Inspection Time Limits for normal inspection time frame. Refer to Chapter 78, Exhaust System - Maintenance Practices for inspection criteria of the muffler.
- B. Install Heat Shroud (Refer to Figure 201 and Figure 202).
- (1) Carefully wrap heat shroud around right muffler.
  - (2) Secure heat shroud to itself using sheet metal screws.
  - (3) Carefully wrap heat shroud around left muffler.
  - (4) Secure heat shroud to itself using sheet metal screws.
  - (5) Secure flexible ducts to heat shrouds using clamps.
  - (6) Install engine cowling. Refer to Chapter 71, Cowling - Maintenance Practices.

**4. Shutoff Valve Removal/Installation**

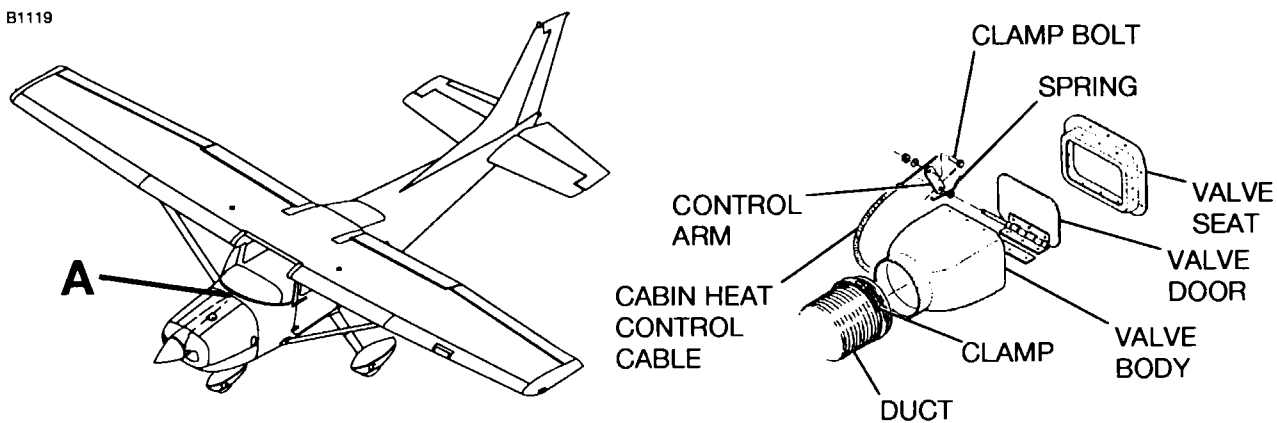
- A. The shutoff valve is riveted to the firewall and is not removed from the airplane during normal maintenance. If valve is replaced, firewall must be sealed using Type IV sealant upon reattachment of shutoff valve to firewall. For a list of Type IV sealants refer to Chapter 21, Air Conditioning - General.

**5. Cabin Heat Control Cable Removal/Installation**

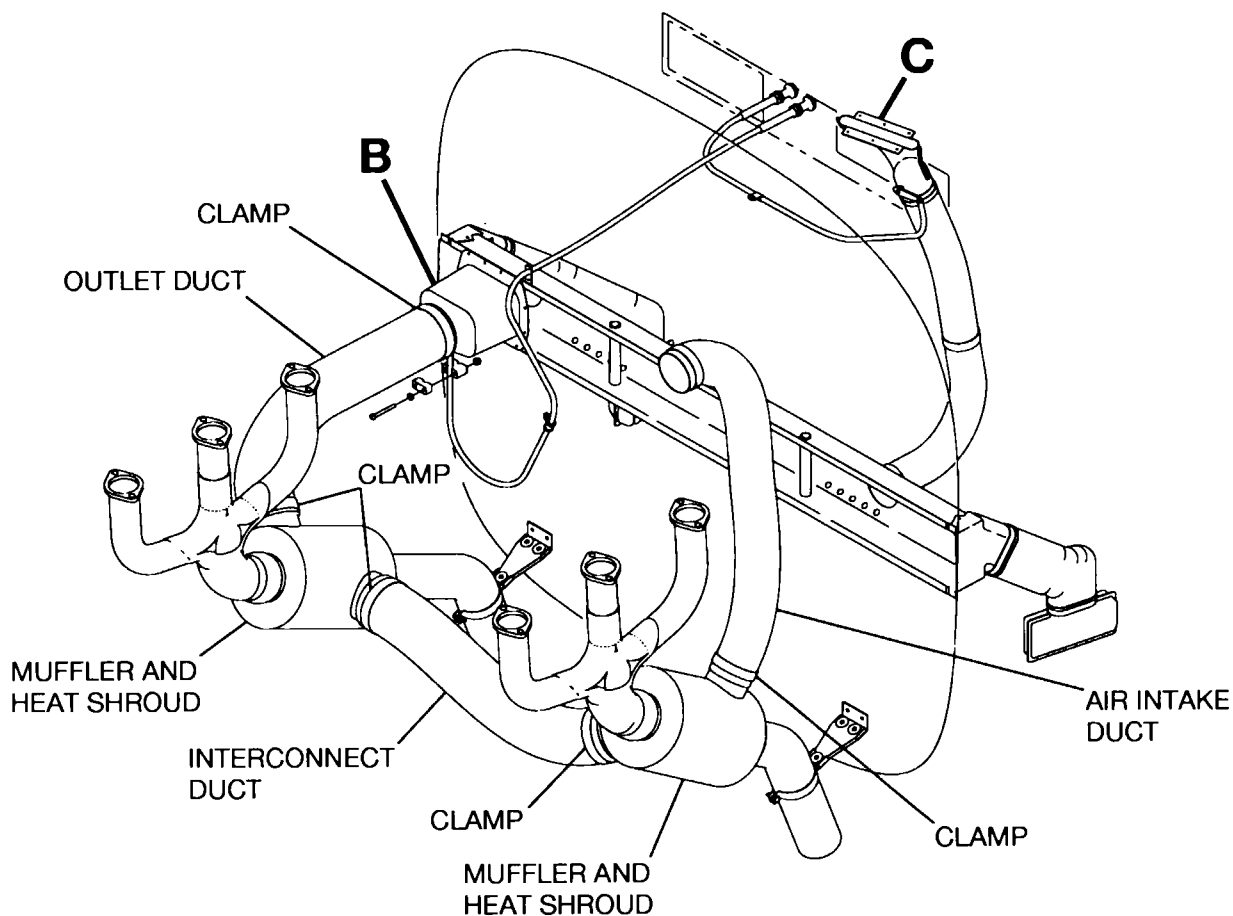
- A. Remove Control Cable (Refer to Figure 201 and Figure 202).
- (1) Remove engine cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (2) Carefully straighten end of cabin heat control cable.
  - (3) Loosen clamp bolt on control arm and withdraw cable from control arm.
  - (4) Remove screws securing clamps to firewall.
  - (5) From inside the cabin, gain access to the backside of the CABIN HT control cable.

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**DETAIL B**



**DETAIL A**

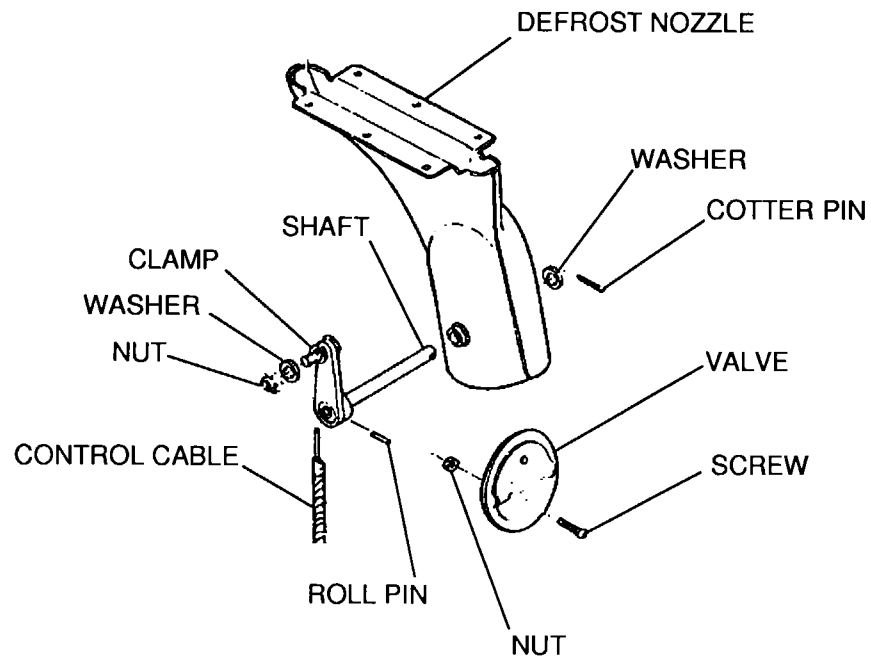
AIRPLANES 18280001 AND ON

Cabin Heating and Defrosting Installation  
 Figure 201 (Sheet 1)

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 A0714T1009  
 B0714R1030

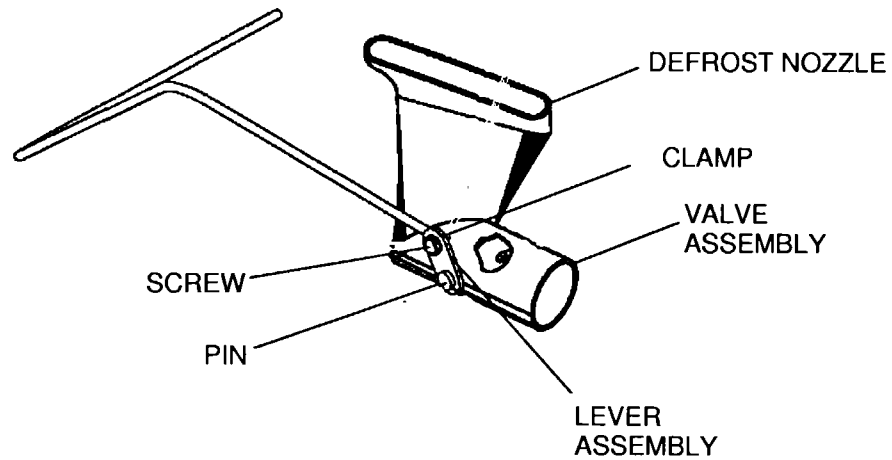
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**DETAIL C**

AIRPLANES 18280001 THRU 18280944



**DETAIL C**

AIRPLANES 18280945 AND ON

C0714R1032  
 C0714R1031

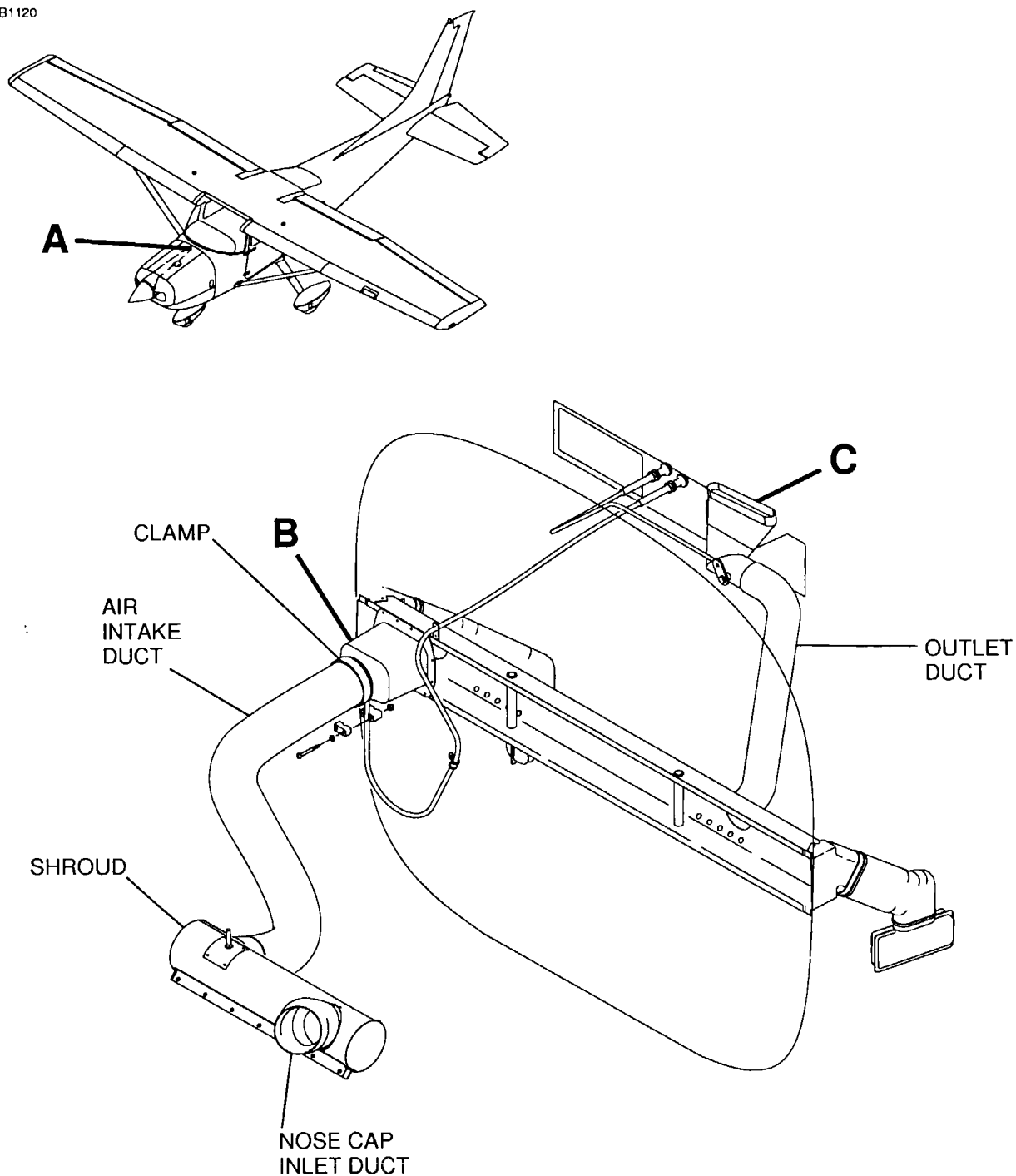
Cabin Heating and Defrosting Installation  
 Figure 201 (Sheet 2)

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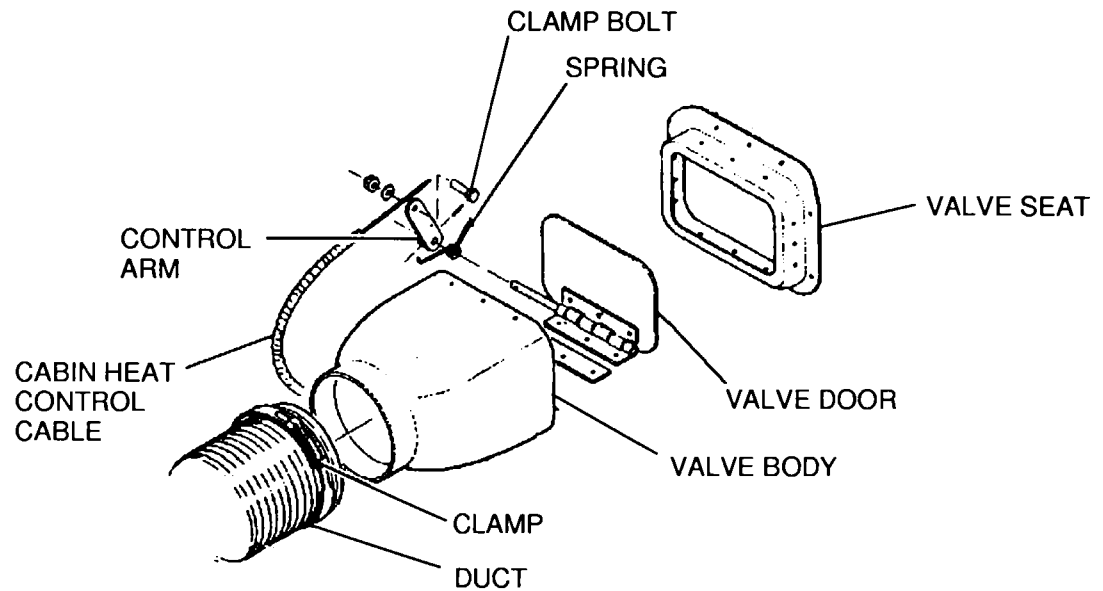
**DETAIL A**  
AIRPLANES T18208001 AND ON

Cabin Heating and Defrosting Installation  
Figure 202 (Sheet 1)

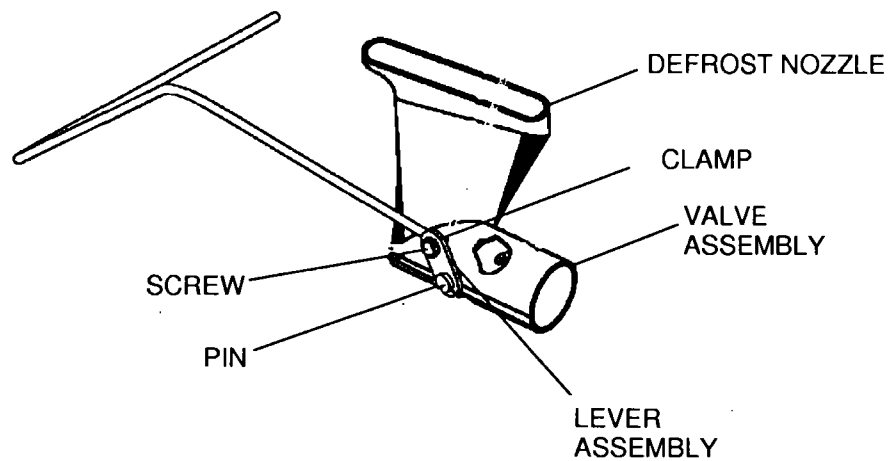
0710T1001  
A0724T1024

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**DETAIL B**



**DETAIL C**

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Cabin Heating and Defrosting Installation  
Figure 202 (Sheet 2)

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- (6) Loosen nut on backside of control cable.
- (7) Carefully withdraw cable from instrument panel and firewall.

**B. Install Control Cable (Refer to Figure 201 and Figure 202).**

- (1) Thread end of control cable through hole in instrument panel and through hole in firewall.
- (2) Secure CABIN HT control cable to backside of instrument panel using existing jamnut.
- (3) Thread end of control cable through the clamp bolt and tighten clamp bolt.
- (4) Clamp control to firewall.
- (5) Test control cable to ensure full range of travel. Travel may be adjusted by positioning control housing in clamp on firewall.
- (6) When full range of travel has been established, bend end of control cable around clamp bolt.
- (7) Install engine cowling. Refer to Chapter 71, Cowling - Maintenance Practices.

**6. Defrost Control Cable Removal/Installation**

**A. Remove Defrost Control Cable (Refer to Figure 201 and Figure 202).**

- (1) Carefully straighten end of defrost control cable.
- (2) Loosen clamp bolt on control arm and withdraw cable from control arm.
- (3) Remove screws securing clamps.
- (4) From inside the cabin, gain access to the backside of the DEFROST control cable.
- (5) Loosen nut on backside of control cable.
- (6) Carefully withdraw cable from instrument panel.

**B. Install Defrost Control Cable (Refer to Figure 201 and Figure 202).**

- (1) Thread end of control cable through hole in instrument panel.
- (2) Secure DEFROST control cable to backside of instrument panel using existing jamnut.
- (3) Thread end of control cable through the clamp bolt.
- (4) Clamp control housing.
- (5) Test control cable to ensure full range of travel. Travel may be adjusted by positioning control housing in clamps.
- (6) When full range of travel has been established, bend end of control cable around clamp bolt.

**7. Distribution System Components Removal/Installation**

- A.** The majority of heated air distribution system components are riveted to the airframe and do not require replacement during normal maintenance. Ducts are secured to these components using clamps. If ducts become damaged or worn, they should be replaced with new ducts.
- B.** Ducts are typically attached to various outlets using tie straps.

• **CHAPTER**

• **22**

**AUTO FLIGHT**

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**LIST OF EFFECTIVE PAGES**

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22-List of Effective Pages		
22-Record of Temporary Revisions		
22-Table of Contents		
22-00-00	Page 1	Jan 1/2007
22-10-00	Pages 201-212	Jul 1/2007
22-11-00	Pages 201-207	Jan 1/2007



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GFC-700 Autopilot Flight Computer Removal/Installation .....	22-11-00 Page 201
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**AUTO FLIGHT - GENERAL**

**1. Scope and Definition**

- A. The GFC-700 flight control system is a two-axis (pitch and roll) autopilot system. The GFC-700 flight control system has the GIA-63W Integrated Avionics Unit, Primary Flight Display (PFD), Multi-Function Display (MFD), roll axis servo, pitch axis servo, pitch trim servo, and servo mounts.
- B. The KAP-140 flight control system can be one of two autopilot systems: single-axis (roll) or two-axis (pitch and roll).
  - (1) The KAP-140 single-axis configuration has the flight computer, configuration module, roll axis servo actuator, rate gyro, directional gyro and servo mount.
  - (2) The KAP-140 two-axis configuration has the flight computer, configuration module, roll axis servo actuator, pitch axis servo actuator, pitch trim servo actuator, rate gyro, directional gyro and servo mounts.
- C. This chapter gives the removal and installation procedures for the KAP-140 (single and two-axis) and GFC-700 autopilot flight computers and servo actuators.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent alternatives can be used for the items that follow.

NAME	NUMBER	MANUFACTURER	USE
Test Stand	071-06028-0000	Honeywell International, Inc. 1 Technology Center Olathe, KS 66061	To hold the servo mount in position while the servo clutch torque setting is adjusted.
Adapter Tool	071-06021-0003	Honeywell International, Inc.	To adjust the servo clutch torque setting.
Adapter Pin	071-06021-0002	Honeywell International, Inc.	To adjust the servo clutch torque setting.

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**AUTOPILOT - MAINTENANCE PRACTICES**

**1. General**

- A. A single-axis autopilot with heading hold is installed as standard equipment on the airplane. Heading hold is used on the directional gyro input and can have VOR or Localizer input as required.
- B. A dual-axis autopilot is available as an option. The dual-axis system gives both vertical speed and altitude hold selection.

**2. KC- 140 (Single-Axis) Autopilot Flight Computer Removal/Installation**

- A. Remove the Autopilot (Single-Axis) Flight Computer (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Loosen the screw on the face of the autopilot flight computer.
  - (3) Remove the autopilot flight computer from the mounting tray.
- B. Install the Autopilot Flight Computer (Refer to Figure 201).
  - (1) Put the autopilot flight computer in position in the mounting tray.
  - (2) Tighten the screw on the face of the autopilot flight computer.
  - (3) Put the MASTER and AVIONICS switches in the ON position.
  - (4) Do a test of the autopilot. Refer to Introduction, the List of Manufacturers Technical Publications for the manufacturer's installation manual.

**3. KC-140 (Dual-Axis) Autopilot Flight Computer Removal/Installation**

**NOTE:** Autopilot (Dual-Axis) Flight Computer Removal/Installation is typical for airplanes with and without the Garmin G1000 installation.

- A. Remove the Autopilot (Dual-Axis) Flight Computer (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Loosen the screw on the face of the autopilot flight computer.
  - (3) Remove the autopilot flight computer from the mounting tray.
- B. Install the Autopilot Flight Computer (Refer to Figure 201).
  - (1) Put the autopilot flight computer in position in the mounting tray.
  - (2) Tighten the screw on the face of the autopilot flight computer.
  - (3) Put the MASTER and AVIONICS switches in the ON position.
  - (4) Do a test of the autopilot. Refer to Introduction, the List of Manufacturers Technical Publications for the manufacturer's installation manual.

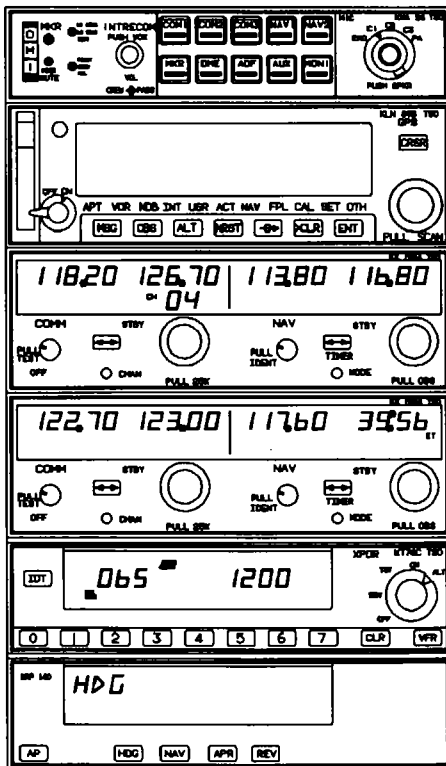
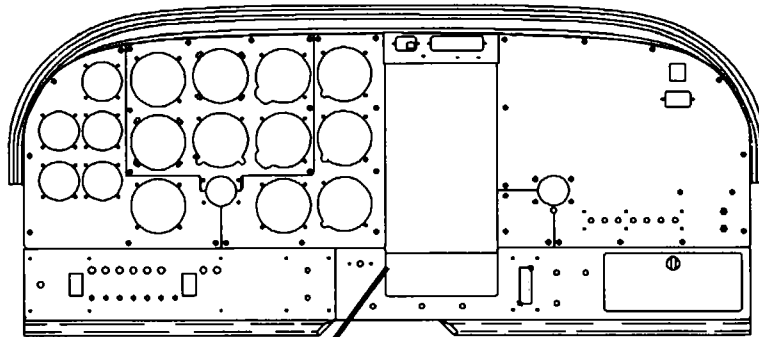
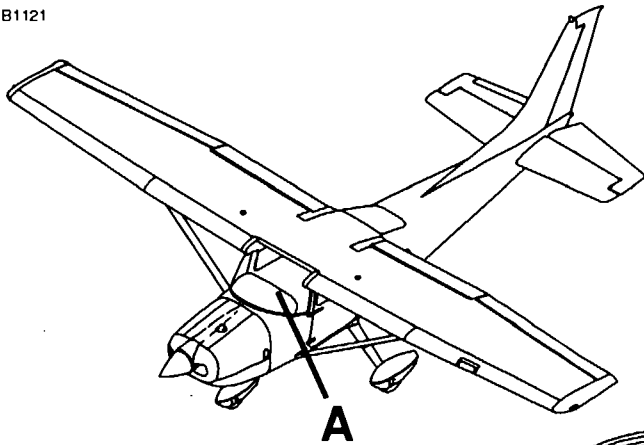
**4. Roll Servo Removal/Installation**

**NOTE:** The autopilot roll servo removal/installation is typical for single-axis and dual-axis autopilot installations.

- A. Remove the Roll Servo (Refer to Figure 202).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the access panel (620GB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector (PR301) from the roll servo.
  - (4) Release the control cable tension and loosen the roll servo control cable at the turnbuckle.
  - (5) Remove the bolts and washers that attach the roll servo to the bracket assembly.
  - (6) Remove the roll servo from the airplane.
  - (7) Do an inspection of the roll servo. Refer to Roll Servo Inspection.
- B. Install the Roll Servo (Refer to Figure 202).
  - (1) Put the roll servo in position on the bracket assembly and attach with the bolts and washers.
  - (2) Connect the electrical connector (PR301) to the roll servo.
  - (3) Install the roll servo control cable on the roll servo.
  - (4) Make sure the aileron and bell crank are in the neutral position.

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**DETAIL B**

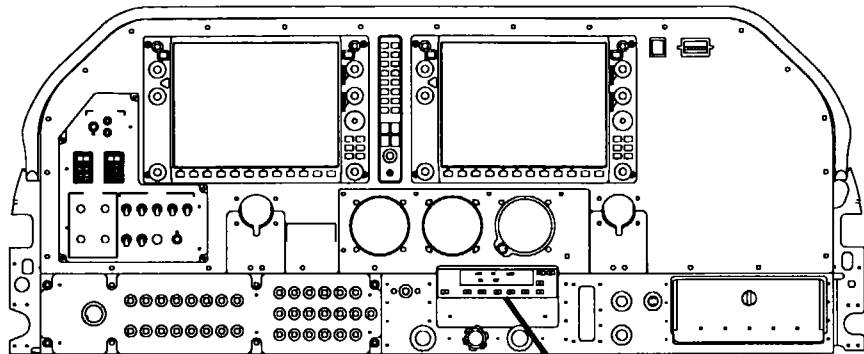
AUTOPILOT CONTROLLER

KAP-140 Autopilot Installation  
 Figure 201 (Sheet 1)

0710T1001  
 A0718T1002  
 B0718T1001

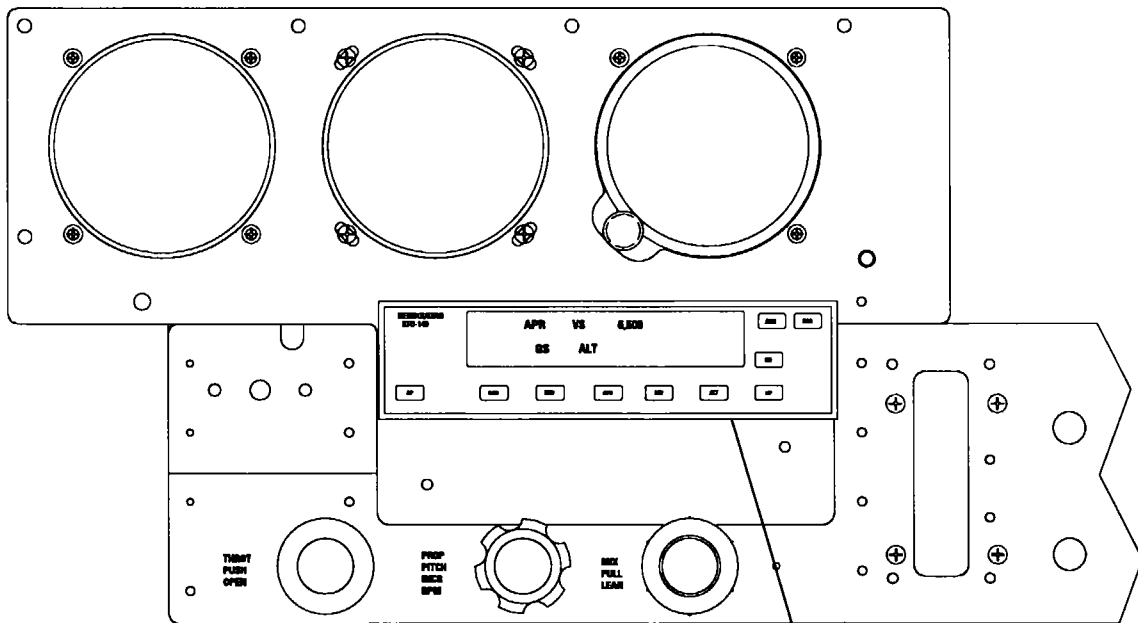
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**DETAIL A**

**B**



**AUTOPILOT  
 CONTROLLER**

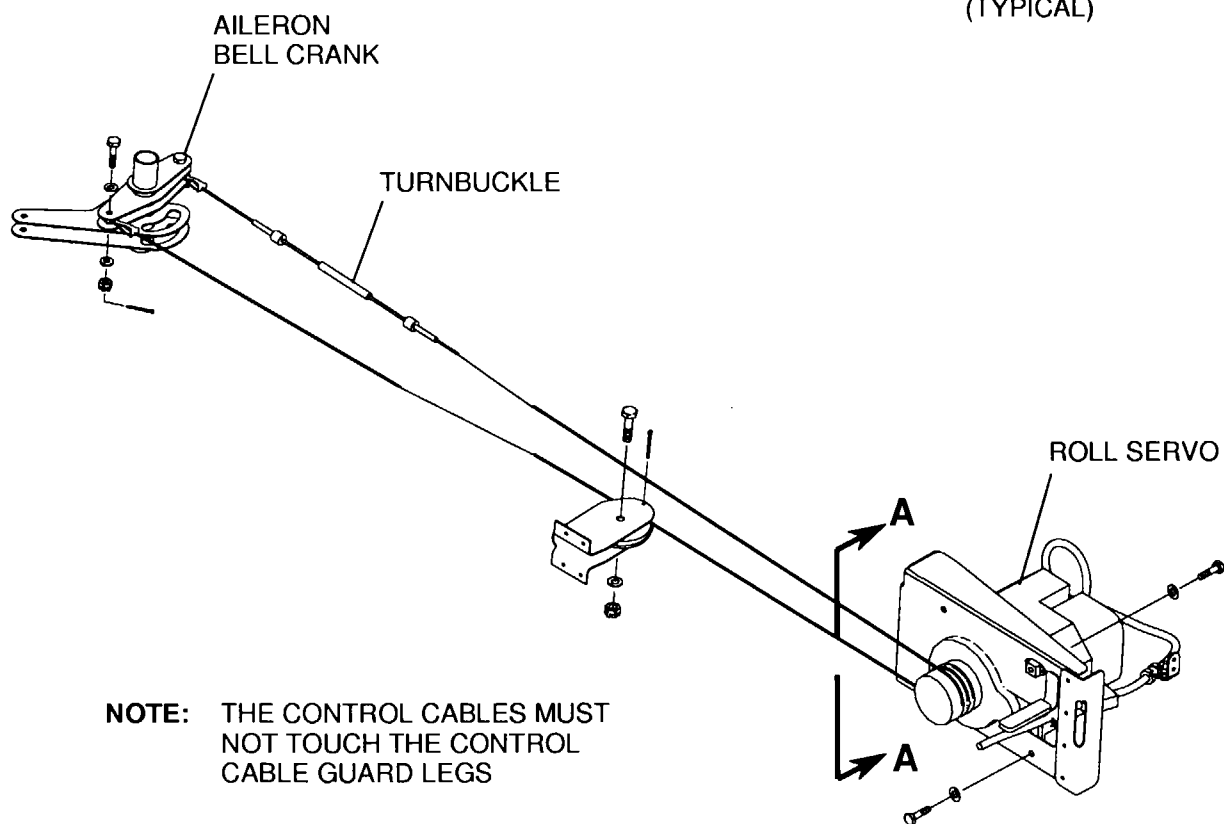
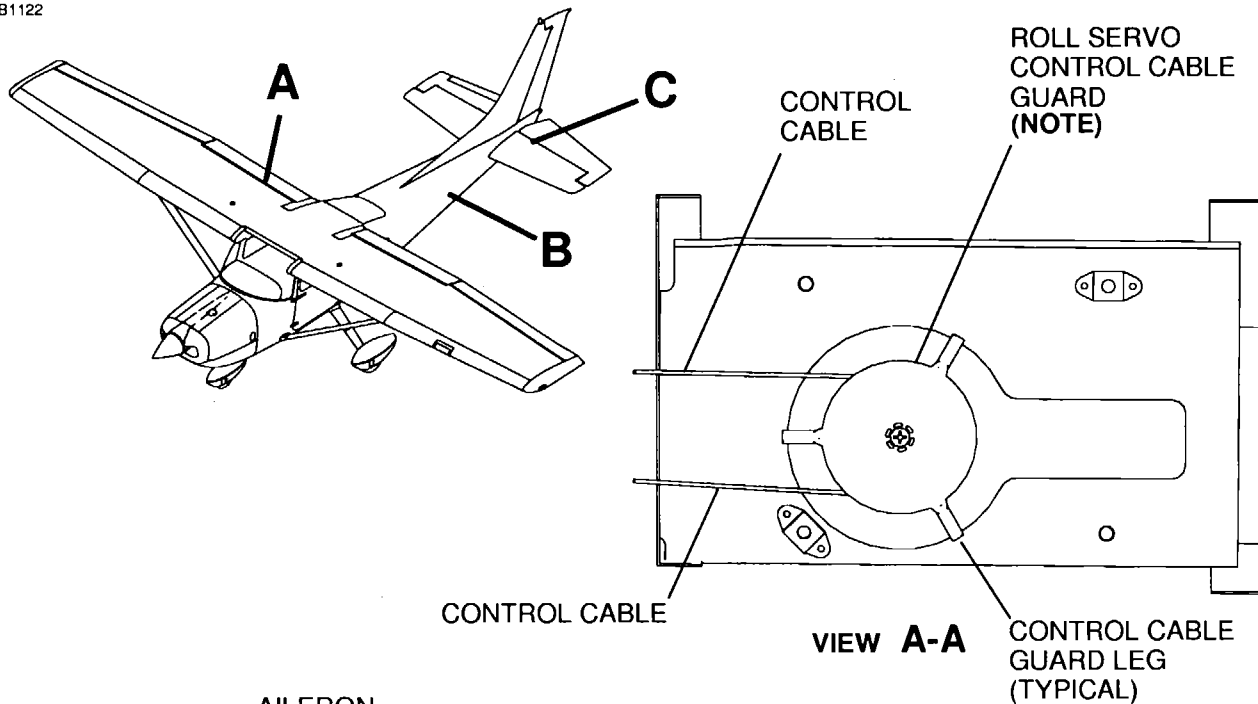
**DETAIL B**  
 AIRPLANES WITH GARMIN G1000

KAP-140 Autopilot Installation  
 Figure 201 (Sheet 2)

A0718T1053  
 B0718T1053

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**NOTE:** THE CONTROL CABLES MUST NOT TOUCH THE CONTROL CABLE GUARD LEGS

**DETAIL A**

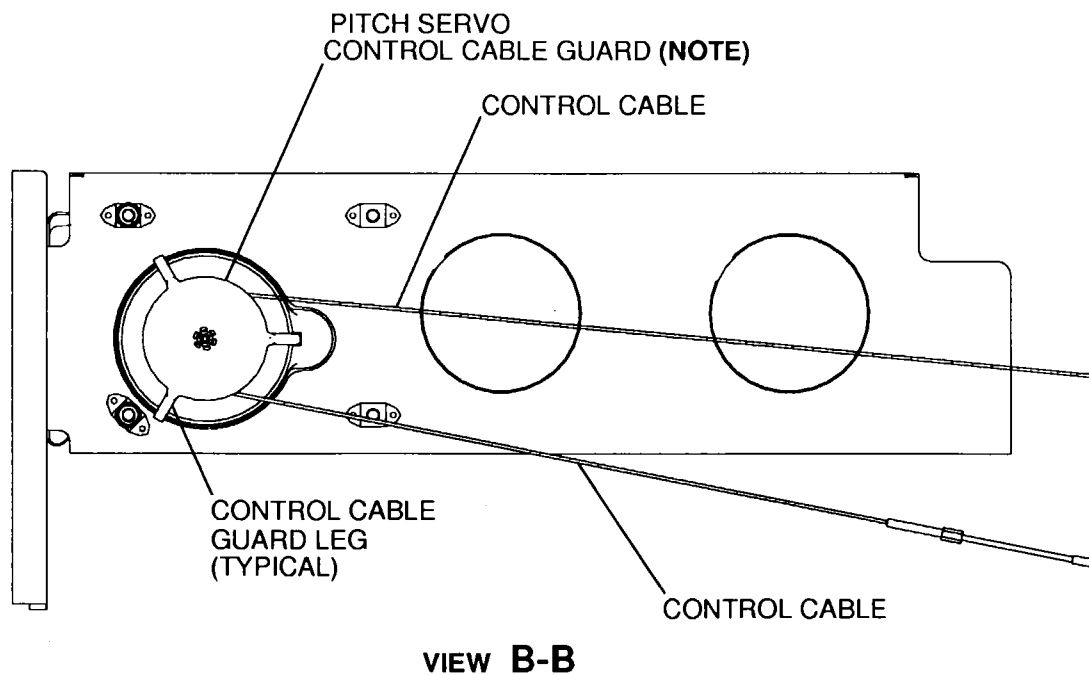
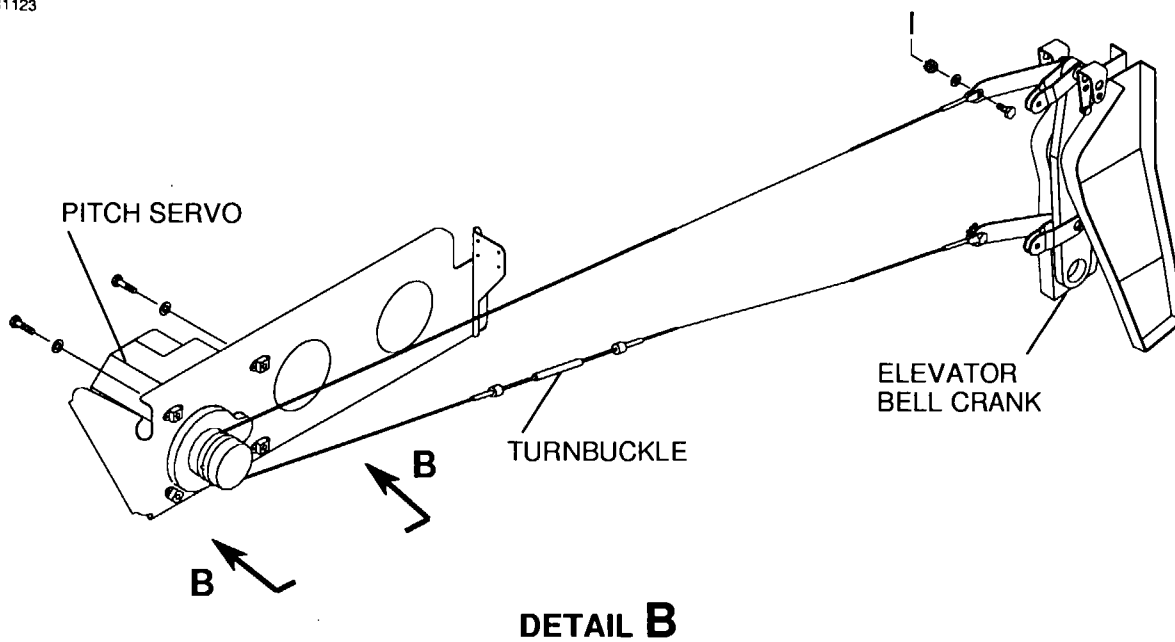
0710T1001  
 A0760T1013  
 AA0760T1009

Autopilot Servo Installation  
 Figure 202 (Sheet 1)



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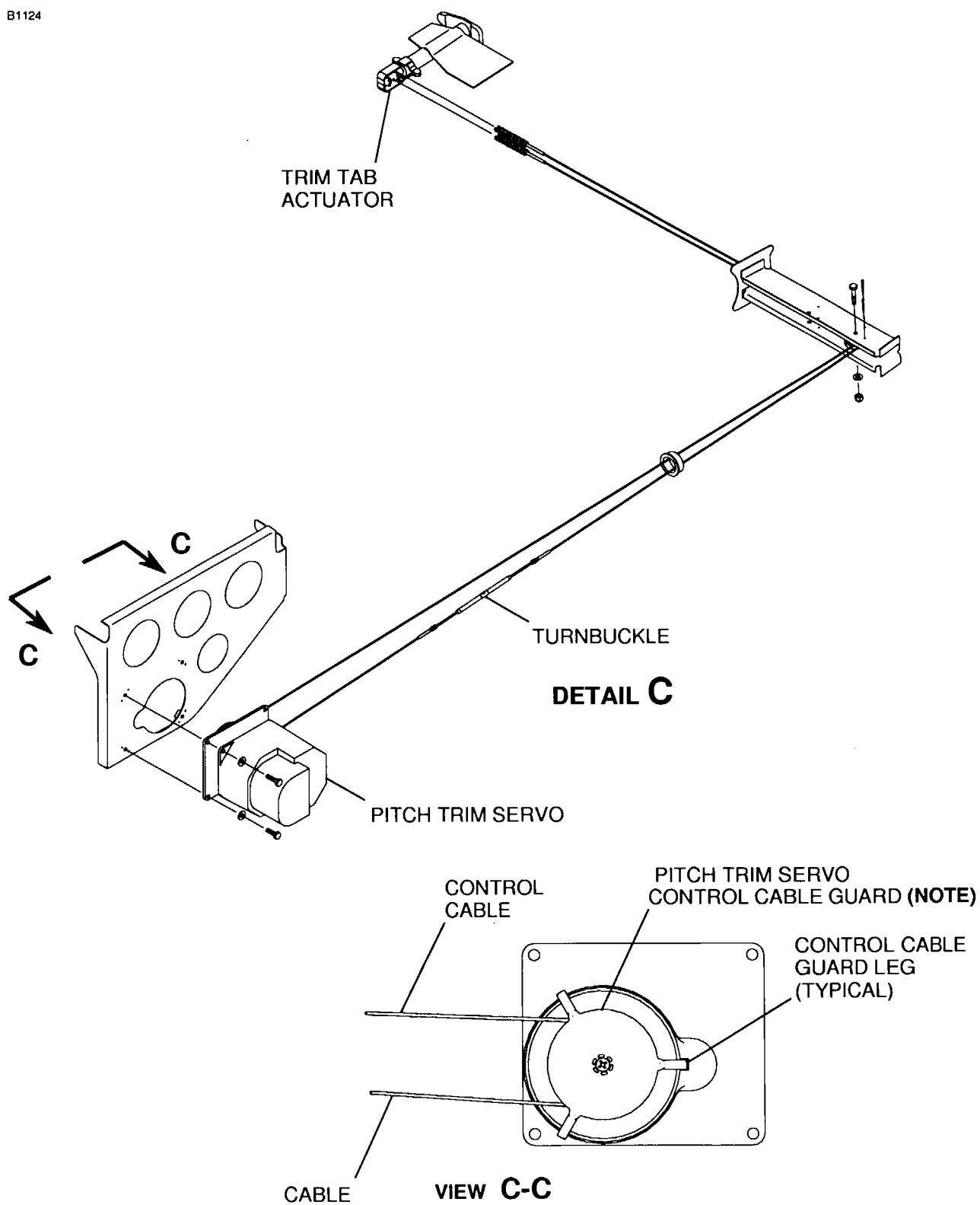


Autopilot Servo Installation  
Figure 202 (Sheet 2)

B0760T1003  
BB0760T1010

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Autopilot Servo Installation  
 Figure 202 (Sheet 3)

C0760T1004  
 CC0760T1011

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- (5) Wind the control cable around the servo drum approximately 1.25 turns in each direction from the swaged ball (drum ball detent inboard).
- (6) Make sure the flanges of the control cable guard do not touch the control cable.
- (7) Make sure the flanges of the control cable guard are on each side of the notches around the outer edge of the mount.
- (8) Use the turnbuckle to adjust the roll servo control cable tension to 15 pounds, +3 or -3 pounds.
- (9) Install the access panel (520GB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (10) Put the MASTER and AVIONICS switches in the ON position.
- (11) Do a test of the autopilot to make sure it operates correctly. Refer to Introduction, the List of Manufacturers Technical Publications for the manufacturer's installation manual.

**5. Pitch Servo Removal/Installation**

- A. Remove Pitch Servo (Refer to Figure 202).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the access panels (310AR, 340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector (PT300) from the pitch servo.
  - (4) Release the control cable tension and loosen the pitch servo control cable at the turnbuckle.
  - (5) Remove the bolts and washers that attach the pitch servo to the bracket assembly.
  - (6) Remove the pitch servo from the airplane.
  - (7) Do an inspection of the pitch servo. Refer to Pitch Servo Inspection.
- B. Install the Pitch Servo (Refer to Figure 202).
  - (1) Put the pitch servo in position on the bracket assembly and attach with the bolts and washers.
  - (2) Connect the electrical connector (PT300) to the pitch servo.
  - (3) Install the pitch servo control cable on the pitch servo actuator.
  - (4) Make sure the aileron and bellcrank are in the neutral position.
  - (5) Wind the control cable around the servo drum approximately 1.25 turns in each direction from the swaged ball (drum ball detent inboard).
  - (6) Make sure the flanges of the control cable guard do not touch the control cable.
  - (7) Make sure the flanges of the control cable guard are on each side of the notches around the outer edge of the mount.
  - (8) Use the turnbuckle to adjust the pitch servo cable tension to 15 pounds, +3 or -3 pounds.
  - (9) Install the access panels (310AR, 340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (10) Put the MASTER and AVIONICS switches in the ON position.
  - (11) Do a test of the autopilot to make sure it operates correctly. Refer to Introduction, the List of Manufacturers Technical Publications for the manufacturer's installation manual.

**6. Pitch Trim Servo Removal/Installation**

- A. Remove the Pitch Trim Servo (Refer to Figure 202).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the access panels (310AR, 340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector (PT301) from the pitch trim servo.
  - (4) Release the control cable tension and loosen the pitch trim servo control cable at the turnbuckle.
  - (5) Remove the bolts and washers that attach the pitch trim servo to the bracket assembly.
  - (6) Remove the pitch trim servo from the airplane.
  - (7) Do an inspection of the pitch trim servo. Refer to Pitch Trim Servo Inspection.
- B. Install the Pitch Trim Servo (Refer to Figure 202).
  - (1) Put the pitch trim servo in position on the bracket assembly and attach with the bolts and washers.
  - (2) Connect the electrical connector (PT301) to the pitch trim servo.

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- (3) Do the pitch trim servo control cable rigging.
  - (a) The servo trim chain must be on the aft sprocket of the actuator before the manual trim system rigging can be done.
  - (b) You must do the manual trim system rigging before the servo trim system rigging. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices, Trim Tab Control Adjustment/ Test.
  - (c) Put the elevator in the neutral position.
  - (d) Use an inclinometer to put the trim tab to 5 degrees up in relation to the elevator.

**NOTE:** The chain sprocket on the actuator will be at approximately the halfway point in its rotation from the mechanical stops.

- (e) Move the servo trim chain on the aft sprocket of the actuator so that equal lengths of the chain are on either side of the sprocket.
  - (f) Wind the control cable around the pitch trim servo drum approximately 1.25 turns each direction from the swaged ball.
  - (g) Make sure the flanges of the control cable guard do not touch the control cable.
  - (h) Make sure the flanges of the control cable guard are on either side of the notches around the outer edge of the mount.
  - (i) Use the turnbuckle to adjust the pitch trim servo control cable tension to 15 pounds, +3 or -3 pounds.
- (4) Install the access panels (310AR, 340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (5) Put the MASTER and AVIONICS switches in the ON position.
- (6) Do a test of the autopilot to make sure it operates correctly. Refer to Introduction, the List of Manufacturers Technical Publications, for the manufacturer's installation manual.

## 7. Roll Servo Inspection

- A. Do Inspection the Roll Servo (Refer to Figure 202).

- (1) Remove the servo cover.

**CAUTION:** Make sure the maintenance personnel and the table are electrically grounded. Do disassembly or assembly of the servo at an electrostatic-safe area.

- (a) Put an electrical ground on the maintenance personnel and table.
  - (b) Remove the two screws that attach the cover to the unit.
  - (c) Carefully remove the cover over the wiring harness.
  - (d) Put the servo on the table so the inner parts of the unit will not be damaged.
- (2) Do inspection of the solenoid and clutch.
  - (a) Make sure the solenoid shaft moves freely in and out of the solenoid body.
  - (b) Make sure there is no dirt, contamination or corrosion around the solenoid shaft.
  - (c) Make sure the release spring freely pulls the shaft out of the solenoid and against the stop fitting.
  - (d) Make sure the pinion gear turns and does not touch the clutch gears.
- (3) Do a general inspection of the roll servo.
  - (a) Examine the electrical wiring for indication of wear or damage of the insulation.
  - (b) Examine the servo for any loose hardware or other defects.
- (4) Install the cover.
  - (a) Carefully put the cover in position.
  - (b) Install the screws with Loctite 222 or Loctite 242.
- (5) Remove the servo capstan assembly and do a check of the slip-clutch torque setting (Refer to Servo Capstan Clutch Adjustment).

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**8. Pitch Servo Inspection**

- A. Do Inspection of the Pitch Servo (Refer to Figure 202).  
(1) Remove the servo cover.

**CAUTION:** Make sure the maintenance personnel and the table are electrically grounded. Do disassembly or assembly of the servo at an electrostatic-safe area.

- (a) Put an electrical ground on the maintenance personnel and table.
- (b) Remove the two screws that attach the cover to the unit.
- (c) Carefully remove the cover from the wiring harness.

**CAUTION:** Do not move any wires, tie wraps or the spring clamp. The position of each is set by the manufacturer and is necessary for correct operation.

- (d) Put the servo on the table so the inner parts of the unit will not be damaged.
- (2) Do inspection of the solenoid and clutch.
  - (a) Make sure the solenoid shaft moves freely in and out of the solenoid body.
  - (b) Make sure there is no dirt, contamination or corrosion around the solenoid shaft.
  - (c) Make sure the release spring freely pulls the shaft out of the solenoid and against the stop fitting.
  - (d) Make sure the pinion gear turns and does not touch the clutch gears.
- (3) Do a general inspection.
  - (a) Examine the electrical wiring for indication of wear or damage of the insulation.
  - (b) Examine the servo for any loose hardware or other defects.
- (4) Do an inspection of the pitch servo motor.
  - (a) Put the servo in position so the baseplate is on the bottom side of the unit.
  - (b) Hold the top section of the motor and carefully turn the motor shaft.
  - (c) The motor shaft must turn freely from side to side a small quantity.
- (5) Install the cover.
  - (a) Carefully put the cover in position.
  - (b) Install the screws with Loctite 222 or Loctite 242.
- (6) Remove the servo capstan assembly and do a check of the slip-clutch torque setting (Refer to Servo Capstan Clutch Adjustment).

**9. Pitch Trim Servo Inspection**

- A. Do Inspection of the Pitch Trim Servo (Refer to Figure 202).  
(1) Remove the servo cover.

**CAUTION:** Make sure the maintenance personnel and the table are electrically grounded. Do disassembly or assembly of the servo at an electrostatic-safe area.

- (a) Put an electrical ground on the maintenance personnel and table.
- (b) Remove the two screws that attach the cover to the unit.
- (c) Carefully remove the cover over the wiring harness.
- (d) Put the servo on the table so the inner parts of the unit will not be damaged.
- (2) Do inspection of the solenoid and clutch.
  - (a) Make sure the solenoid shaft moves freely in and out of the solenoid body.
  - (b) Make sure there is no dirt, contamination or corrosion around the solenoid shaft.
  - (c) Make sure the release spring freely pulls the shaft out of the solenoid and against the stop fitting.
  - (d) Make sure the pinion gear turns and does not touch the clutch gears.

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- (3) Do a general inspection.
  - (a) Examine the electrical wiring for indication of wear or damage of the insulation.
  - (b) Examine the servo for any loose hardware or other defects.
- (4) Install the cover.
  - (a) Carefully put the cover in position.
  - (b) Install the screws with Loctite 222 or Loctite 242.
- (5) Remove the servo capstan assembly and check the slip-clutch torque setting (Refer to Servo Capstan Clutch Adjustment).

## 10. Pitch Trim Rigging Inspection

- A. Do a check of the pitch trim rigging.
  - (1) Attach an inclinometer to the trim tab.
  - (2) Put the trim tab in the 0 degree position.
  - (3) Manually operate the trim tab to the up and down limits.
  - (4) Record the limits of travel.
  - (5) Put an observer at the right-hand access opening of the tailcone.
  - (6) Put the electrical trim to the full nose-up position until the observer sees the clutch slip.
  - (7) Turn the manual trim wheel nose-up (test load condition) 1/4 turn more while the clutch slips.
  - (8) Make sure the swaged ball on the control cable assembly does not turn aft of the tangent point.
  - (9) Release the trim wheel and disengage the autopilot.
  - (10) Manually operate the trim to the full nose-up position.
  - (11) Do a check of the trim tab position with an inclinometer.
  - (12) Trim tab position that is greater than the limits of travel values recorded is an indication that the stop blocks slipped.
    - (a) Do the trim system rigging again.
    - (b) Make sure the stop block bolts torque is correct.
    - (c) Repeat the check of the pitch trim rigging.
  - (13) If necessary, make adjustments to the swaged ball position.
    - (a) Put the control cable assembly chain in the applicable position on the gear teeth of the actuator sprocket.

**NOTE:** One chain link adjustment is related to approximately 17 degrees of travel on the capstan.

- (b) Apply the applicable tension to the control cable and repeat the check of the pitch trim rigging.
- (14) Do the procedure again for the full nose-down trim condition.

## 11. Servo Capstan Clutch Adjustment

- A. Do a check of the clutch torque setting.
  - (1) Remove the servo capstan.
  - (2) Remove the control cable guard from the servo capstan.
  - (3) Attach the servo capstan on the capstan test stand. Refer to Autopilot - General for a list of tools and equipment.
  - (4) Place the adapter tool over the servo capstan.
  - (5) Insert the adapter pin from the straight up position to attach the adapter tool.
  - (6) Insert the torque wrench.
  - (7) Apply 28 VDC (1 amp maximum) electrical power to the test stand.
  - (8) Do a check of the torque reading with the test stand motor in the clockwise operation.

**NOTE:** The check of the torque reading will be done three times.

- (a) Put the capstan switch in the clockwise position.
    - (b) Record the torque reading of the torque wrench.
    - (c) Put the switch in the off position.

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- (9) Do a check of the torque reading with the test stand motor in the counterclockwise operation.

**NOTE:** The check of the torque reading will be done three times.

- (a) Put the capstan switch in the counterclockwise position.
  - (b) Record the torque reading of the torque wrench.
  - (c) Put the switch in the off position.
- (10) Average the six torque readings.

**NOTE:** The torque reading to be used is the average of the six torque readings.

- (11) Refer to Table 201 for the correct torque reading of the servo capstan.

Table 201. KAP-140 Autopilot Servo Clutch Torque Setting

	182S	182T/T182T
Roll Servo Capstan	55, +5 or -5 inch-pounds (6.2, +0.56 or -0.56 N-m)	35, +3 or -3 inch-pounds (3.95, +0.34 or -0.34 N-m)
Pitch Servo Capstan	26, +2 or -2 inch-pounds (2.9, +0.23 or -0.23 N-m)	38, +3 or -3 inch-pounds (4.3, +0.34 or -0.34 N-m)
Pitch Trim Servo Capstan	45, +5 or -5 inch-pounds (5.1, +0.56 or -0.56 N-m)	45, +5 or -5 inch-pounds (5.1, +0.56 or -0.56 N-m)

- (a) If the torque indication is below the value given in Table 201, rotate the clutch adjust nut clockwise and do the check of the torque readings again.
  - (b) If the torque indication is above the value given in Table 201, rotate the clutch adjust nut counterclockwise and do the check of the torque readings again.
- (12) Record the slip clutch torque indication, airplane type, axis, and date on the decal attached to the servo mount body.
- (13) Install the control cable guard on the servo capstan.
- (14) Install the servo capstan.

## 12. Set the Autopilot Roll Null

- A. Set the Autopilot Roll Null (If the Autopilot is Installed).
- (1) Make sure the autopilot flight computer completes the pre-flight test.
  - (2) Disconnect the roll servo connector from the airplane harness.
  - (3) Apply a ground to pin K of the harness connector.
  - (4) Connect a digital multimeter across the harness connector at pins D and L to monitor the servo drive voltage.
  - (5) Push the autopilot AP button on the autopilot flight computer to engage it.
    - (a) Make sure the default ROL mode is set.

**NOTE:** For example, the HDG, NAV or APR modes are not engaged.

- (b) Use a DMM to measure the DC voltage across pins D and L of the roll servo harness connector.
- (c) Adjust the pot until a value of 0 volts, +0.020 or -0.020 volts are measured.  
 1 If the end of the pot movement is reached before the servo drive is nulled, disengage the autopilot, turn the pot fully to the opposite stop and then engage the autopilot.
- (d) The roll null adjustment range emulates a four turn pot that lets the method of the pot adjustment range to be set.

**NOTE:** This adjustment lets offsets be in the roll axes. This includes the turn coordinator.

- (e) Continue to turn the pot to null the voltage.

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- (6) Connect the airplane roll servo harness connector to the servo connector.



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**AUTOPILOT - MAINTENANCE PRACTICES**

**1. General**

- A. The GFC-700 is a dual-axis autopilot with heading, altitude, and vertical speed hold.

**2. GFC-700 Autopilot Flight Computer Removal/Installation**

- A. Remove the Autopilot Flight Computer.  
(1) Refer to Chapter 23, Communications - Maintenance Practices
- B. Install the Autopilot Flight Computer.  
(1) Refer to Chapter 23, Communications - Maintenance Practices

**3. Roll Servo Actuator Removal/Installation**

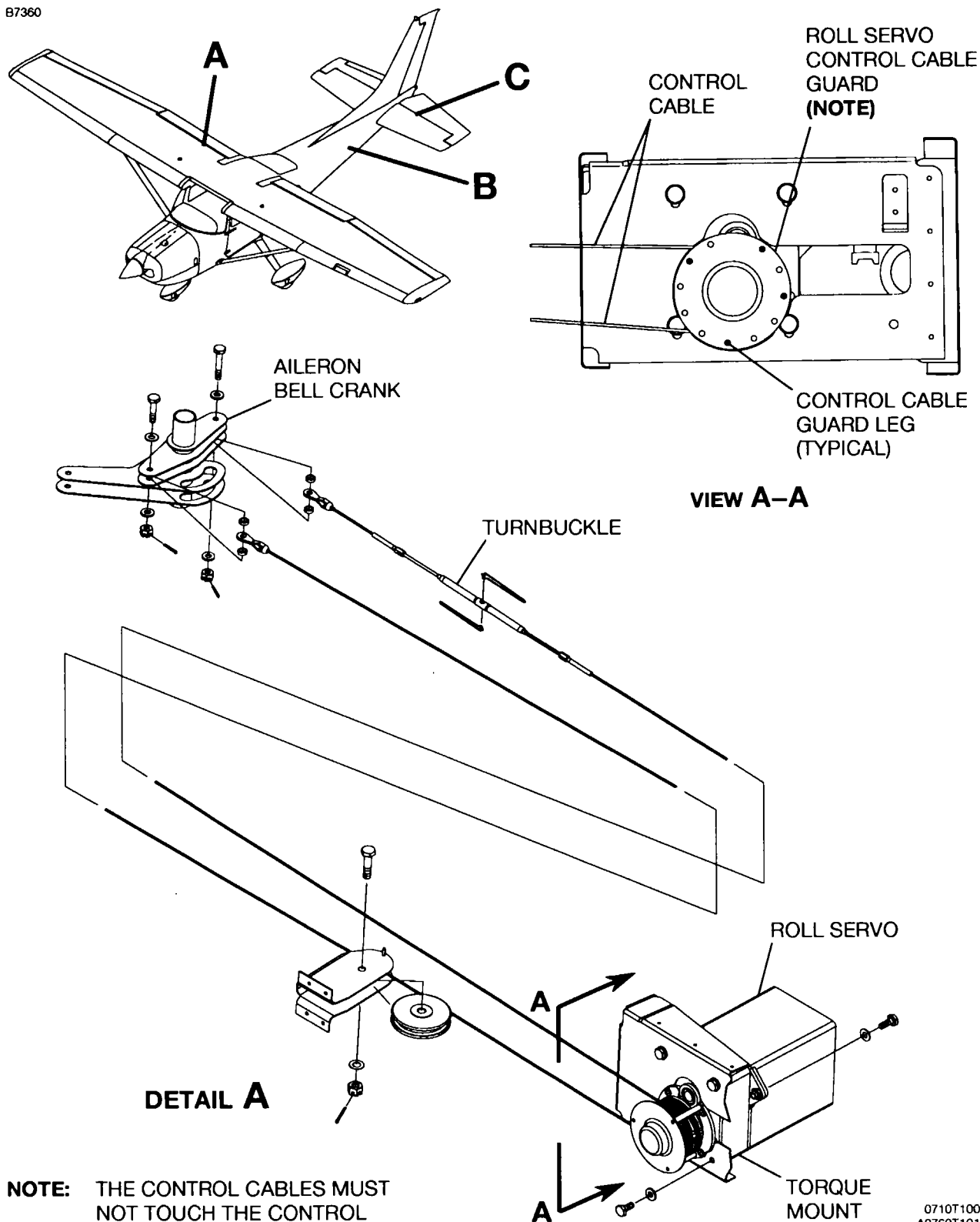
- A. Remove the Roll Servo (Refer to Figure 201).  
(1) Make sure the MASTER and AVIONICS switches are in the OFF position.  
(2) Remove the 620GB access panel. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.  
(3) Disconnect the electrical connector from the roll servo actuator.  
(4) Remove the bolts and washers that attach the roll servo actuator to the torque mount.  
(5) Remove the roll servo actuator from the airplane.
- B. Install the Roll Servo (Refer to Figure 201).  
(1) Put the roll servo actuator in position on the torque mount and attach with bolts and washers.  
(2) Connect the electrical connector to the roll servo actuator.  
(3) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.  
(4) Install the 620GB access panel. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**4. Roll Servo And Cable Removal/Installation**

- A. Remove the Roll Servo and Cable (Refer to Figure 201).  
(1) Make sure the MASTER and AVIONICS switches are in the OFF position.  
(2) Remove the 620GB access panel to get access to the roll servo and the cable. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.  
(3) Disconnect the electrical connector.  
(4) Release the servo cable tension at the turnbuckle.  
(5) Remove the cable guard.  
(6) Record how the cable is installed on the capstan.  
(7) Disconnect the cable from the turnbuckle.  
(8) Remove the cable from the capstan.  
(9) Remove the bolts that attach the servo assembly to the bracket.  
(10) Remove the servo from the airplane.
- B. Install the Roll Servo and Cable (Refer to Figure 201).  
(1) Put the servo and the cable in position at the servo mount and install the bolts.  
(2) Put the servo cable in position on the capstan.  
(3) Wind the cable approximately 1.25 turns each direction around the capstan.  
(4) Install the cable guard.  
(5) Connect the cable to the turnbuckle.  
(6) Use the turnbuckle to adjust the roll servo cable tension to 15 pounds, +3 or -3 pounds.  
(7) Connect the electrical connector.  
(8) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.  
(9) Install the 620GB access panel. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

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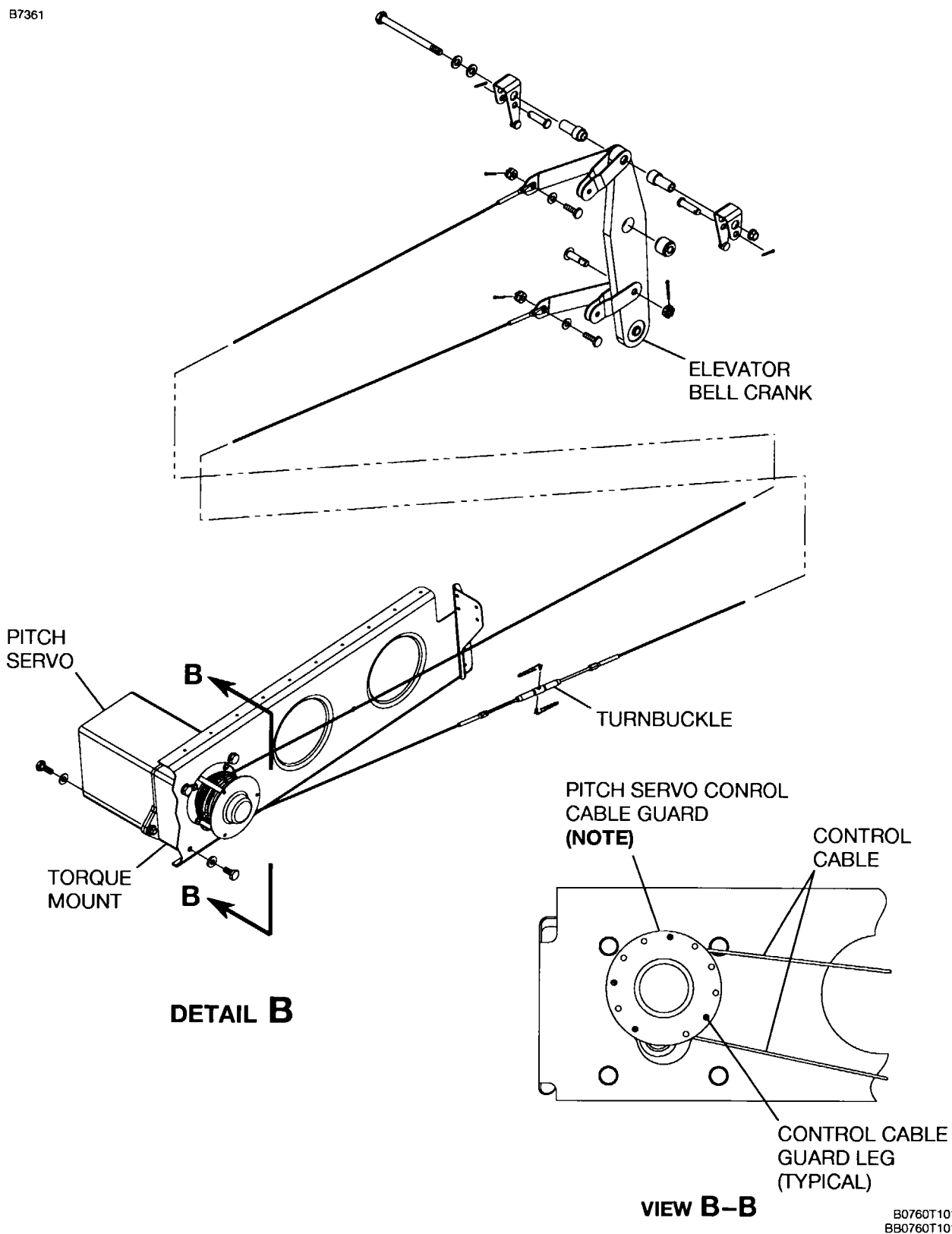
**NOTE:** THE CONTROL CABLES MUST NOT TOUCH THE CONTROL CABLE GUARDS LEGS.

Autopilot Servo Installation  
 Figure 201 (Sheet 1)

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 A0760T1015  
 AA0760T1015

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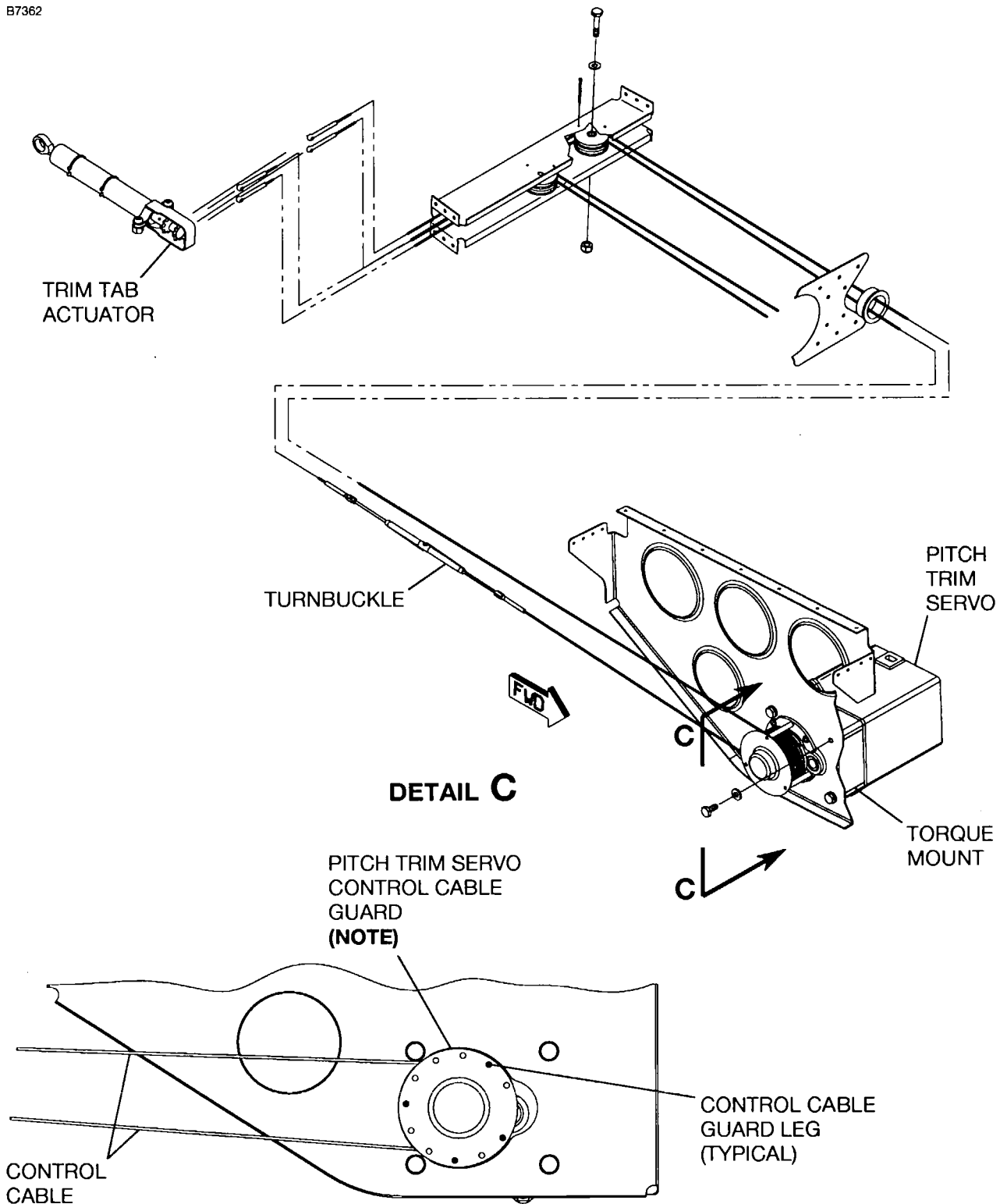
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Autopilot Servo Installation  
Figure 201 (Sheet 2)

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**VIEW C-C**

Autopilot Servo Installation  
Figure 201 (Sheet 3)

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CC0760T1014

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**5. Pitch Servo Motor Removal/Installation**

- A. Remove Pitch Servo (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the OFF position.
  - (2) Remove the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector from the pitch servo.
  - (4) Remove the bolts and washers that attach the pitch servo to the torque mount.
  - (5) Remove the pitch servo actuator from the airplane.
- B. Install the Pitch Servo (Refer to Figure 201).
  - (1) Put the pitch servo in position on the torque mount and attach with the bolts.
  - (2) Connect the electrical connector to the pitch servo.
  - (3) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.
  - (4) Install the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**6. Pitch Servo And Cable Removal/Installation**

- A. Remove the Pitch Servo and Cable (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the OFF position.
  - (2) Remove the 310AR, 340AL and 340AR access panels to get access to the pitch servo and the cable. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
  - (3) Disconnect the electrical connector .
  - (4) Release the servo cable tension at the turnbuckle.
  - (5) Remove the cable guard.
  - (6) Record how the cable is installed on the capstan.
  - (7) Disconnect the cable from the turnbuckle.
  - (8) Remove the cable from the capstan.
  - (9) Remove the bolts that attach the servo assembly to the bracket.
  - (10) Remove the servo from the airplane.
- B. Install the Pitch Servo and Cable (Refer to Figure 201).
  - (1) Put the servo and the cable in position at the servo mount and install the bolts.
  - (2) Put the servo cable in position on the capstan.
  - (3) Wind the cable approximately 1.25 turns each direction around the capstan.
  - (4) Install the cable guard.
  - (5) Connect the cable to the turnbuckle.
  - (6) Use the turnbuckle to adjust the roll servo cable tension to 15 pounds, +3 or -3 pounds.
  - (7) Connect the electrical connector.
  - (8) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.
  - (9) Install the 310AR, 340AL and 340AR access panel. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

**7. Pitch Trim Servo Actuator Removal/Installation**

- A. Remove the Pitch Trim Servo (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the OFF position.
  - (2) Remove the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector from the pitch trim servo.
  - (4) Remove the bolts and washers that attach the pitch trim servo to the torque mount.
  - (5) Remove the pitch trim servo from the airplane.
- B. Install the Pitch Trim Servo (Refer to Figure 201).
  - (1) Put the pitch trim servo in position on the torque mount and attach with the bolts and washers.
  - (2) Connect the electrical connector to the pitch trim servo.

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- (3) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.
- (4) Install the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**8. Pitch Trim Servo and Cable Removal/Installation**

- A. Remove the Pitch Trim Servo (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the OFF position.
  - (2) Remove the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector from the pitch trim servo.
  - (4) Release the control cable tension and loosen the pitch trim servo control cable at the turnbuckle.
  - (5) Remove the bolts and washers that attach the pitch trim servo to the bracket.
  - (6) Remove the pitch trim servo from the airplane.
- B. Install the Pitch Trim Servo (Refer to Figure 201).
  - (1) Put the pitch trim servo in position on the bracket and attach with the bolts and washers.
  - (2) Connect the electrical connector to the pitch trim servo.
  - (3) Do the pitch trim servo control cable rigging.
    - (a) The servo trim chain must be on the aft sprocket of the actuator before the manual trim system rigging can be done.
    - (b) You must do the manual trim system rigging before the servo trim system rigging. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices, Trim Tab Control Adjustment/Test.
    - (c) Put the elevator in the neutral position.
    - (d) Use an inclinometer to put the trim tab to 5 degrees up in relation to the elevator.

**NOTE:** The chain sprocket on the actuator will be at approximately the halfway point in its rotation from the mechanical stops.

- (e) Move the servo trim chain on the aft sprocket of the actuator so that equal lengths of the chain are on either side of the sprocket.
- (f) Wind the control cable around the pitch trim servo drum approximately 1.25 turns each direction from the swaged ball.
- (g) Make sure the flanges of the control cable guard do not touch the control cable.
- (h) Make sure the flanges of the control cable guard are on either side of the notches around the outer edge of the mount.
- (i) Use the turnbuckle to adjust the pitch trim servo control cable tension to 15 pounds, +3 or -3 pounds.
- (4) Do a check to make sure the servo operates correctly. Refer to the Garmin G1000 Maintenance Manual, Revision G or later.
- (5) Install the 310AR, 340AL and 340AR access panels. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**9. Pitch Trim Rigging Inspection**

- A. Do a check of the pitch trim rigging.
  - (1) Attach an inclinometer to the trim tab.
  - (2) Put the trim tab in the 0 degree position.
  - (3) Manually operate the trim tab to the up and down limits.
  - (4) Record the limits of travel.
  - (5) Put an observer at the right-hand access opening of the tailcone.
  - (6) Put the electrical trim to the full nose-up position until the observer sees the clutch slip.
  - (7) Turn the manual trim wheel nose-up (test load condition) 1/4 turn more while the clutch slips.
  - (8) Make sure the swaged ball on the control cable assembly does not turn aft of the tangent point.
  - (9) Release the trim wheel and disengage the autopilot.
  - (10) Manually operate the trim to the full nose-up position.
  - (11) Do a check of the trim tab position with an inclinometer.

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- (12) Trim tab position that is greater than the limits of travel values recorded is an indication that the stop blocks slipped.
- (a) Do the trim system rigging again.
  - (b) Make sure the stop block bolts torque is correct.
  - (c) Do the check of the pitch trim rigging again.
- (13) If necessary, make adjustments to the swaged ball position.
- (a) Put the control cable assembly chain in the applicable position on the gear teeth of the actuator sprocket.

**NOTE:** One chain link adjustment is related to approximately 17 degrees of travel on the capstan.

- (b) Apply the applicable tension to the control cable and do the check of the pitch trim rigging again.
- (14) Do the procedure again for the full nose-down trim condition.

**10. Servo Capstan Clutch Adjustment**

- A. Adjust the servo capstan clutch in accordance with the manufactures installation manual. Refer to Introduction, the List of Manufacturers Technical Publications for the manufacturer's installation manual.

Roll Servo Clutch Plate	55, +7 or -7 inch-pounds (6.2, +0.79 or -0.79 N-m)
Pitch Servo Clutch Plate	35, +5 or -5 inch-pounds (3.95, +0.56 or -0.56 N-m)
Pitch Trim Servo Clutch Plate	45, +6 or -6 inch-pounds (5.1, +0.68 or -0.68 N-m)

**CHAPTER**

**23**

**COMMUNICATIONS**



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23-List of Effective Pages		
23-Record of Temporary Revisions		
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23-10-00	Pages 201-209	Jan 1/2007
23-50-00	Pages 201-204	Mar 1/2004
23-60-00	Pages 201-202	April 1/2002



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**COMMUNICATIONS - GENERAL**

**1. Scope**

- A. This chapter describes and provides maintenance instructions for equipment which furnishes a means of communicating from one part of the airplane to another, and between the airplane and other airplanes or ground stations
- B. Additional information on communications equipment can be found in the Wiring Diagram Manual supplied with the airplane.
- C. Technical publications available from the manufacturer of the various components and systems which are not covered in this manual must be utilized as required for maintenance of those components and systems.

**2. Definition**

- A. Information contained in this chapter provides the basic procedures which can be accomplished at the flight line level; such as, removal and installation of components and system operation.
- B. This chapter is divided into sections to aid maintenance personnel in locating information. A brief description of each section is as follows:
  - (1) The speech communication section describes radio equipment used for reception and transmission of voice communication.
  - (2) The audio integrating system section describes that portion of the system which controls the output of the communications and navigation receivers into the pilot and passengers headphones and speakers, and the output of the pilot's microphone into the communications transmitters.
  - (3) The static discharging section describes the static discharge wicks used to dissipate static electricity.

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**COMMUNICATIONS - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance practices for the NAV/COM component removal and installation.
- B. The dual navigation/communications (NAV/COM/) radio is in the instrument panel.
- C. For airplanes with the Garmin G1000, the center of the Garmin G1000 is the GIA 63 Integrated Avionics Unit (IAU), which is in the tailcone. The GIA 63 operates as a primary communications center that connects all of the Line Replaceable Units (LRUs) with the Primary Function Display (PFD) and Multi-Function Display (MFD). The GIA 63 has the GPS receiver, VHF NAV/COM receivers, and system integration microprocessors. The GIA 63W has the Wide Area Augmentation System (WAAS) installed. The GIA 63 transmits directly to the PFD and MFD by a High-Speed Data Bus (HSDB) Ethernet connection. Software and configurations are sent from the displays through the GIA 63 to the LRU's in the system.

**2. Troubleshooting**

- A. For troubleshooting procedures of the GIA 63 Integrated Avionics Units in airplanes with Garmin G1000, refer to the Garmin G1000 Line Maintenance Manual.

**3. NAV/COM Radio Removal/Installation**

**CAUTION:** Do not interchange the KX-155A and the KX-165A NAV/COM radios. The wiring is not the same for the two different radios. If these radios are interchanged and used with the same wiring, damage can occur to the KX-155A and/or the KX-165A NAV/COM radios.

**NOTE:** The airplane has dual NAV/COM units installed. One NAV/COM unit contains the glideslope function. The removal and installation are typical.

- A. Remove the NAV/COM Unit (Refer to Figure 201).
  - (1) Put the MASTER switch in the OFF position.
  - (2) Put the NAV/COM switch in the OFF position.
  - (3) Disengage the NAV/COM 1 and/or NAV/COM 2 circuit breaker.
  - (4) Turn the recessed mounting screw on the face of the NAV/COM unit counterclockwise until the locking paw releases from the mounting tray.
  - (5) Move the NAV/COM unit aft out of the mounting tray to disconnect the electrical connectors (PI1004, PI1000, and PI1002).
  - (6) Remove the NAV/COM unit from the mounting tray.
- B. Install the NAV/COM Unit (Refer to Figure 201).
  - (1) Put the NAV/COM unit in the mounting tray and move the unit forward.
  - (2) Connect the electrical connectors (PI1004, PI1000, and PI1002).
  - (3) Turn the recessed mounting screw on the face of the NAV/COM unit clockwise until the NAV/COM unit is attached to the mounting tray.
  - (4) Engage the NAV/COM 1 and/or NAV/COM 2 circuit breaker.
  - (5) Put the MASTER switch in the ON position.
  - (6) Put the NAV/COM switch in the ON position and make sure that the electronic display comes on.
  - (7) Put the MASTER and NAV/COM switches in the OFF position.

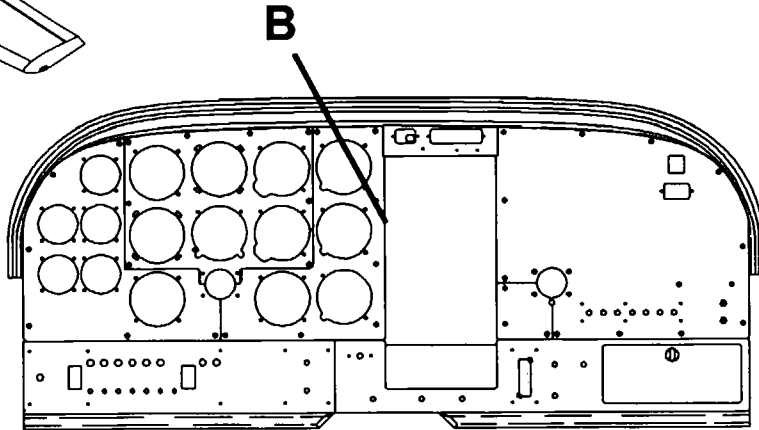
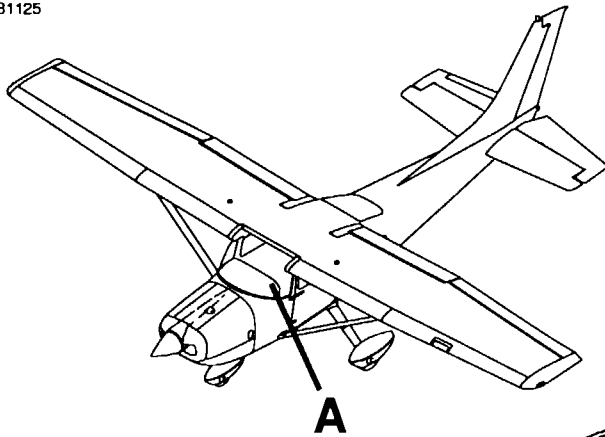
**4. GIA 63 Integrated Avionics Unit (Garmin G1000) Removal/Installation**

**NOTE:** The airplane has dual integrated avionics units installed. The removal and installation are typical.

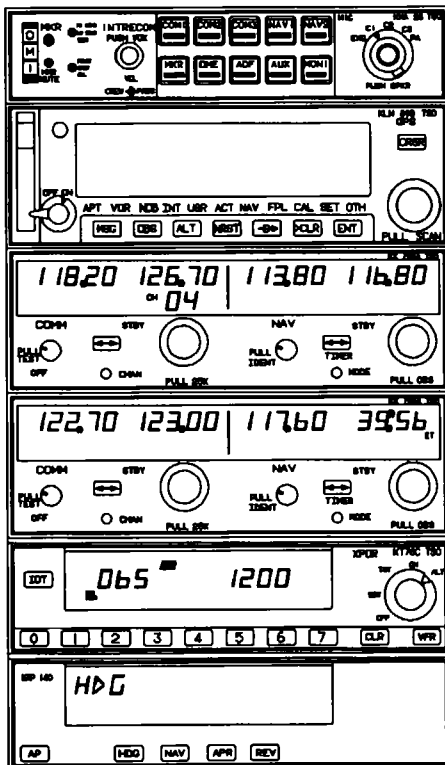
- A. Remove the Integrated Avionics Unit (Refer to Figure 202).
  - (1) Put the MASTER switch in the OFF position.
  - (2) Disengage the NAV/COM 1 and/or NAV/COM 2 circuit breaker.

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**DETAIL A**



NAV/COM WITH GLIDESLOPE

NAV/COM

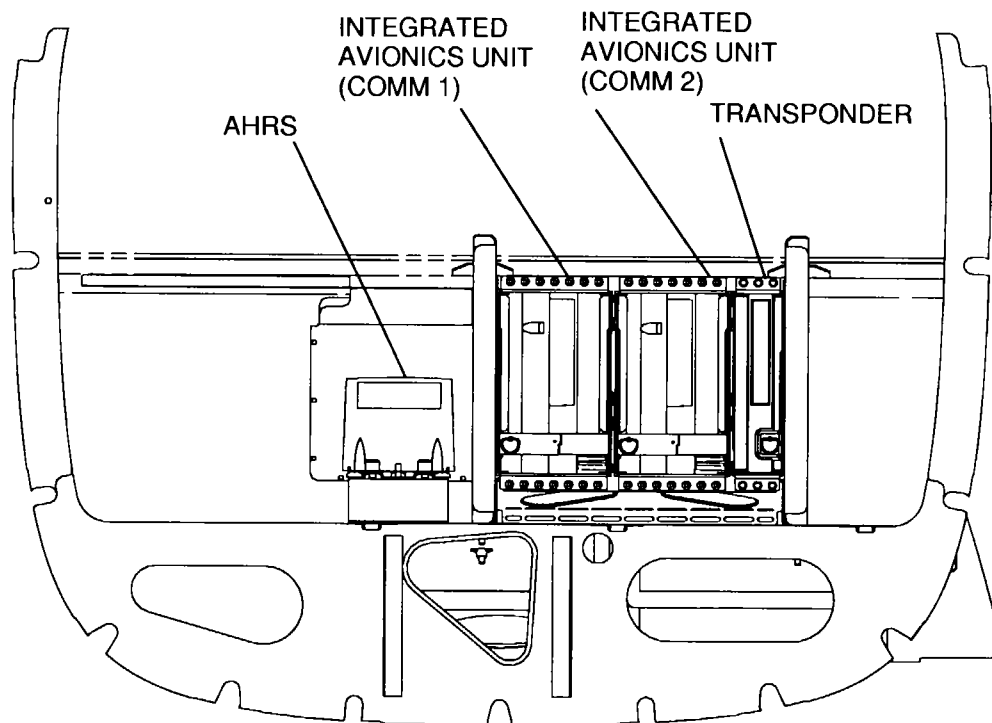
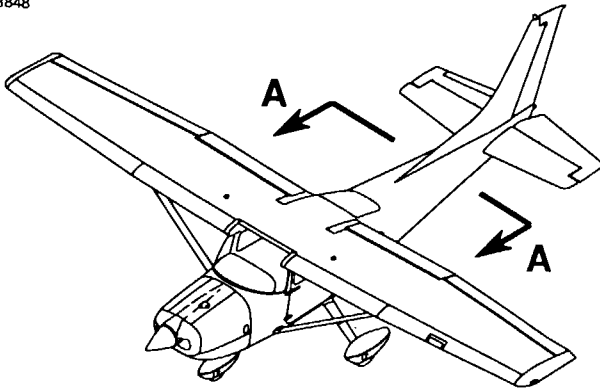
**DETAIL B**

NAV/COM Installation  
 Figure 201 (Sheet 1)

0710T1001  
 A0718T1002  
 B0718T1001

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**MODEL 182/T182**  
MAINTENANCE MANUAL

B848



**VIEW A-A**

LOOKING FORWARD AT FS 140  
AIRPLANES THAT HAVE  
THE GARMIN G1000

Tailcone Avionics Installation  
Figure 202 (Sheet 1)

0710T1001  
A0714T1044

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- (3) Remove the tailcone access/inspection plate (310AR) to get access to the integrated avionics units. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Push on the screw and turn it 90 degrees counterclockwise to release the lever.
- (5) Move the lever up to disengage the locking stud with the dogleg slot in the mounting rack.
- (6) Remove the unit from the mounting rack.

- B. Install the Integrated Avionics Unit (Refer to Figure 202).

**CAUTION:** Make sure that the unit goes into position without resistance. Damage to the connectors, unit, or mounting rack will occur if the unit is pushed into position with force.

**NOTE:** The unit must be in position in the mounting rack to let the locking stud engage the channel.

- (1) Carefully put the unit in position in the mounting rack.
- (2) Push the lever down toward the bottom of the unit to engage the locking stud with the dogleg slot in the mounting rack.
- (3) Push on the screw and turn it 90 degrees clockwise to attach the lever.
- (4) Install the tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (5) Engage the NAV/COM 1 and/or NAV/COM 2 circuit breaker.
- (6) Put the MASTER switch in the ON position.
- (7) Do a check for correct operation. Refer to the Garmin G1000 Line Maintenance Manual.
- (8) Put the MASTER and NAV/COM switches in the OFF position.

## 5. VHF Antenna Removal/Installation

**NOTE:** The removal and installation procedures are typical for all VHF antennas.

**NOTE:** The left VHF antenna is also the GDL-69A antenna and a GPS antenna.

- A. Remove the VHF Antenna (Refer to Figure 203).

- (1) Put the MASTER switch in the OFF position.
- (2) Remove the four screws that attach the VHF antenna to the upper surface of the fuselage.
- (3) Pull the antenna away from the fuselage to disconnect the coax connector from the antenna.

**NOTE:** Coax connector reference designators for airplanes without the Garmin G1000 are PC1001 for VHF1 and PC1002 for VHF2.

**NOTE:** Coax connector reference designators for airplanes with the Garmin G1000 are PF1002 for VHF1 and PC1007 for VHF2.

- (4) Attach the coax cable to the airplane structure so it will not fall into the headliner area.

- B. Install the VHF Antenna (Refer to Figure 203).

- (1) Connect the coaxial connector to the antenna.

**NOTE:** Coax connector reference designators for airplanes without the Garmin G1000 are PC1001 for VHF1 and PC1002 for VHF2.

**NOTE:** Coax connector reference designators for airplanes with the Garmin G1000 are PF1002 for VHF1 and PC1007 for VHF2.

- (2) Attach the antenna to the upper surface of the fuselage with the four screws.

## 6. NAV Antenna Removal/Installation

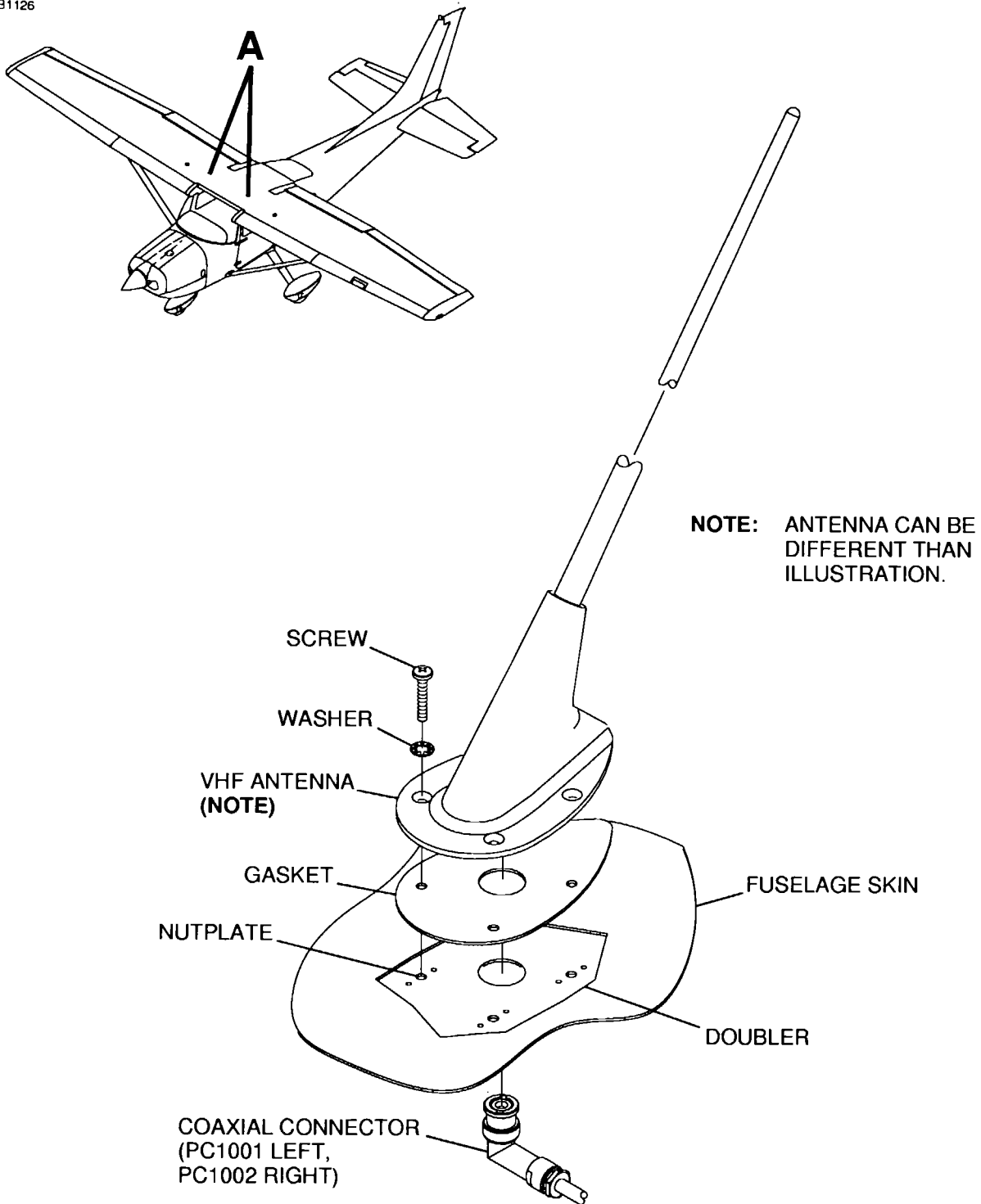
- A. Remove the NAV Antenna (Refer to Figure 204).

- (1) Put the MASTER switch in the OFF position.



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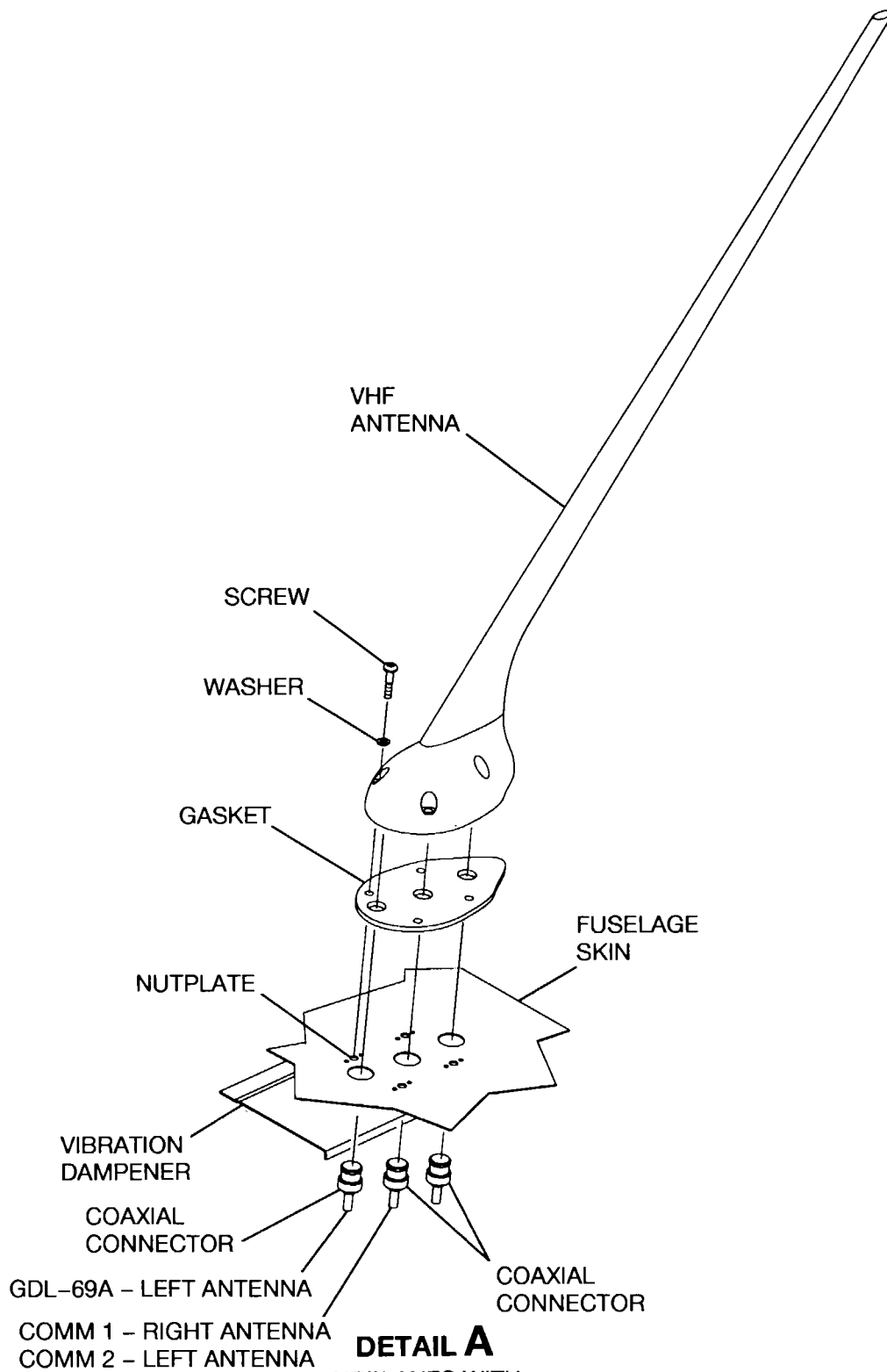
**DETAIL A**  
AIRPLANES WITH VHF ANTENNA

VHF Communication Antenna Installation  
Figure 203 (Sheet 1)

0710T1001  
A0518T1025

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**DETAIL A**

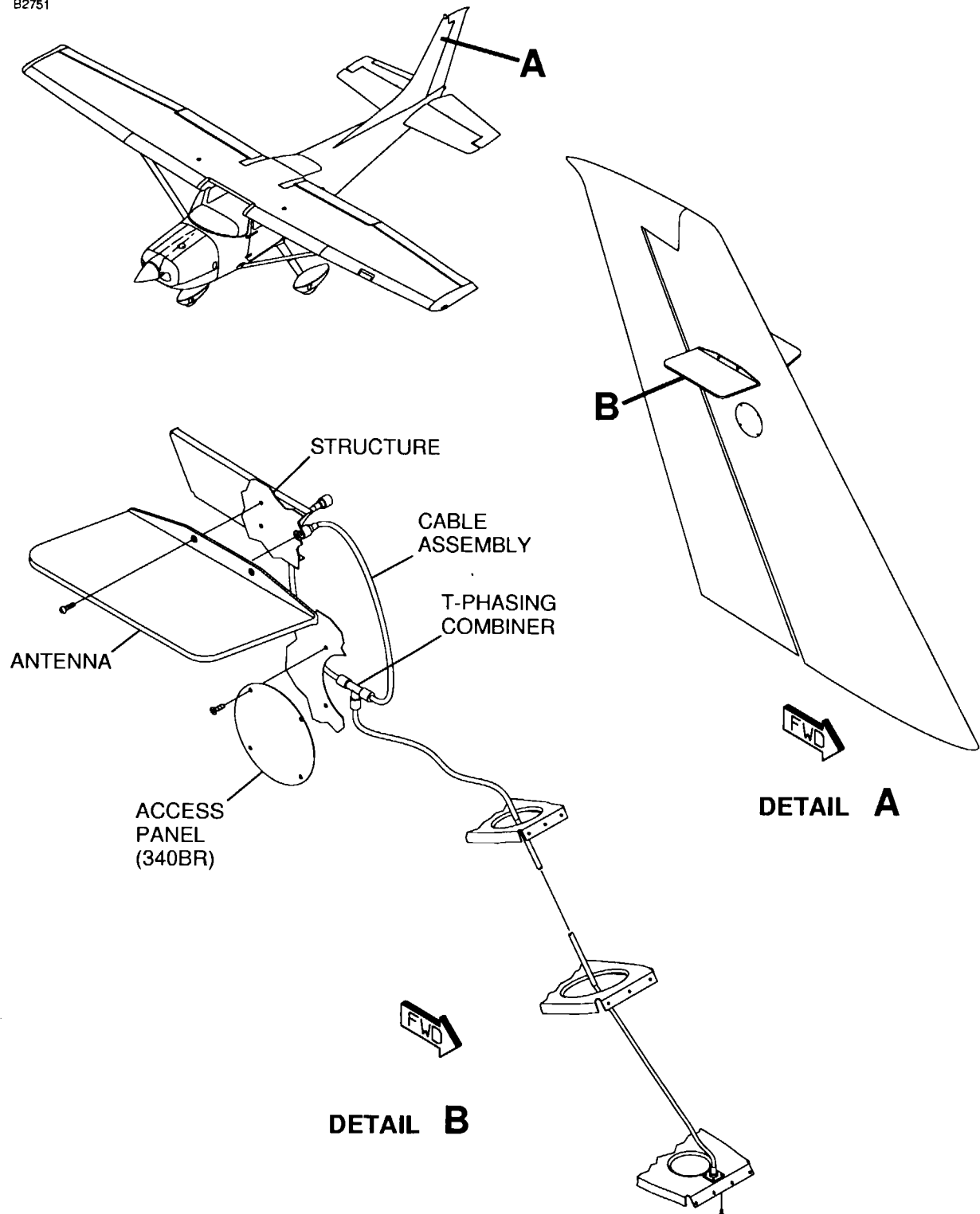
AIRPLANES WITH  
 GARMIN G1000

VHF Communication Antenna Installation  
 Figure 203 (Sheet 2)

A0518T1107

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NAV Antenna Installation  
Figure 204 (Sheet 1)

0710T1001  
A0718T1061  
B0718T1062

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- (2) Remove the screws that attach the NAV antenna to the tail.
- (3) Carefully remove the fillet seal from the junction of the NAV antenna and the skin of the airplane.
- (4) Pull the antenna away from the fuselage to disconnect the coax connector from the antenna.

B. Install the NAV Antenna (Refer to Figure 204).

- (1) Connect the coaxial connector to the antenna.
- (2) Attach the antenna to the tail with the screws.
- (3) Clean and fillet seal the interface area of the antenna base and fuselage with Type VI sealant. Refer to Chapter 20, Fuel, Weather and High Temperature Sealing for a list of Type VI sealants.

**7. Microphone Switch Removal/Installation**

A. Remove the Microphone Switch (Refer to Figure 205).

- (1) Remove the nut that attaches the microphone switch (S1) to the escutcheon.
- (2) Remove the screw that attaches the escutcheon to the control wheel.
- (3) Lift up the escutcheon to get access to the microphone switch and disconnect the microphone switch from the control wheel connection.

B. Install the Microphone Switch (Refer to Figure 205).

- (1) Connect the microphone switch (S1) to the connection in the control wheel.
- (2) Attach the microphone switch to the escutcheon with the nut.
- (3) Set the escutcheon in position and install the screw in the escutcheon.

**8. Microphone Switch Button Cleaning**

A. Clean the Switch Button (Refer to Figure 205).

**CAUTION:** Make sure that you clean the switch. Oil and dirt can collect on the internal electrical contacts of the switch and cause the button to operate incorrectly.

- (1) Apply a sufficient quantity of electrical contact cleaning spray around the full edge of the button so it will soak down into the switch.

**NOTE:** The electrical cleaner will help to remove oil and dirt from the internal electrical contacts of the switch. The recommended contact cleaner is Electro Contact Cleaner 03116 or equivalent, which can be supplied by LPS Laboratories, Inc. The phone number is 1-800-241-8334.

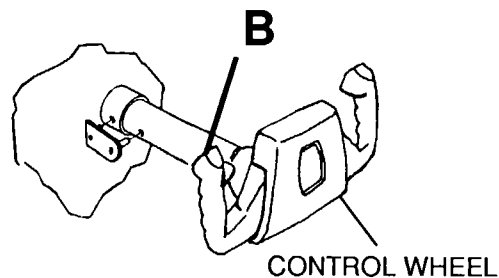
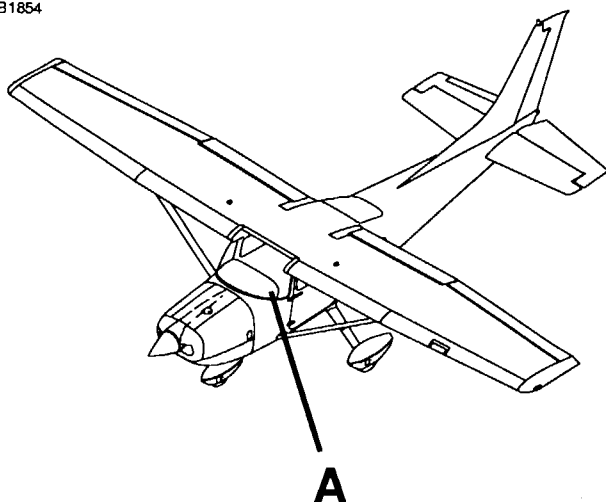
- (2) Press the button many times to make sure the cleaner gets into the internal electrical contacts of the switch.
- (3) Complete an operational check of the switch.

**NOTE:** The transmit light on the com radio will come on when the power is turned on.

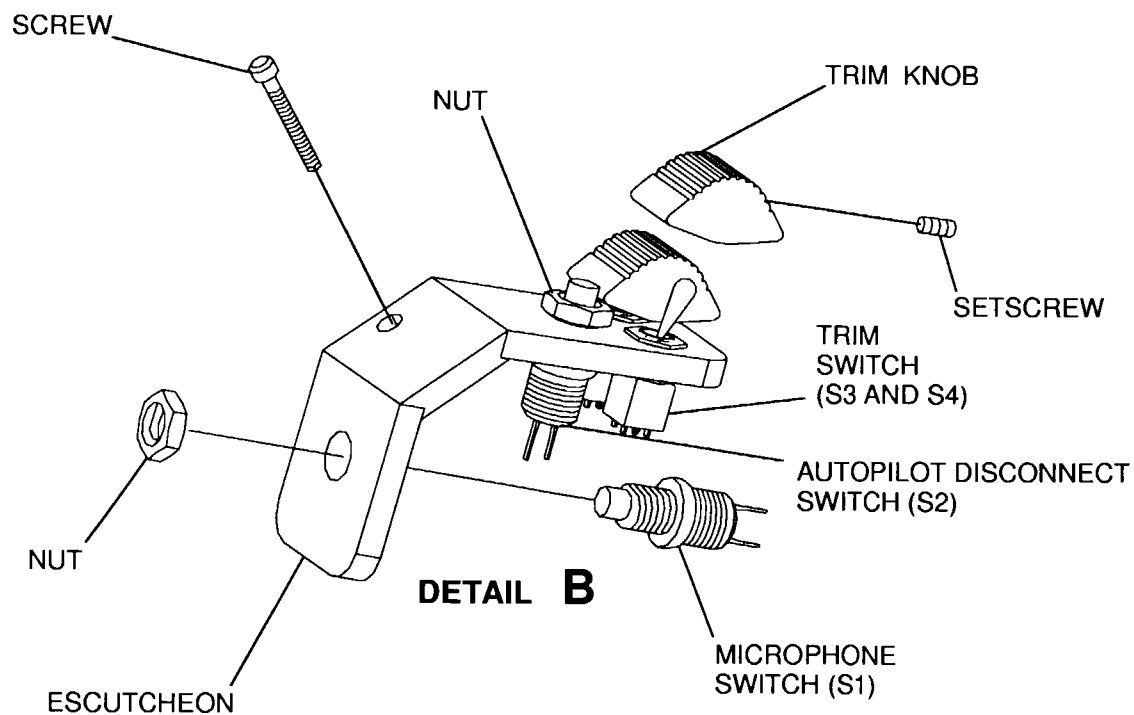
- (4) If the button does not operate after the first application of the electric cleaner, apply more cleaner.
- (5) If the button continues to operate incorrectly, replace the microphone switch. Refer to Microphone Switch Removal/Installation.

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**DETAIL A**



**DETAIL B**

Microphone Switch  
 Figure 205 (Sheet 1)

0710T1001  
 A0760R1007  
 B0715T1004

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**AUDIO PANEL - MAINTENANCE PRACTICES**

**1. General**

- A. The audio panel is in the center of the instrument panel. It has audio function, intercom function, and marker beacon indicators in a single unit.
- B. Maintenance practices for the audio panel have procedures for the removal/installation of the audio panel and the intercom jacks.
- C. For removal/installation of the overhead speaker, refer to Chapter 25, Interior Upholstery - Maintenance Practices.
- D. For removal/installation of the marker beacon antenna, refer to Chapter 34, Marker Beacon - Maintenance Practices.

**2. Audio Panel Removal/Installation**

**NOTE:** Audio panel removal and installation is typical for all avionics packages.

- A. Remove the Audio Panel (Refer to Figure 201).
  - (1) Make sure the AVIONICS and MASTER switches are in the off position.
  - (2) Turn the recessed screw on the face of the audio panel counterclockwise until the locking paw releases from the mounting tray.
  - (3) Carefully pull the audio panel out of the mounting tray.
- B. Install the Audio Panel (Refer to Figure 201).
  - (1) Put the audio panel in position and move it forward into the mounting tray.
  - (2) Turn the recessed screw on the face of the audio panel clockwise until the audio panel is attached to the mounting tray.

**3. Pilot/Front Intercom Jacks Removal/Installation**

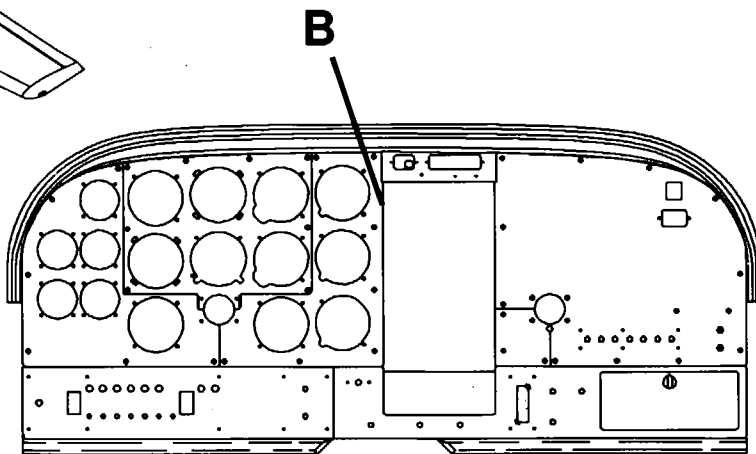
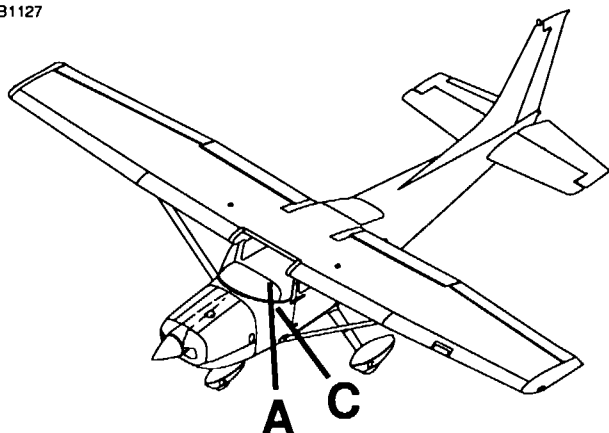
- A. Remove the Pilot/Front Passenger Intercom Jacks (Refer to Figure 201).
  - (1) Make sure the AVIONICS and MASTER switches are in the off position.
  - (2) To get access to the jacks, remove the interior sidewall panel between the instrument panel and the forward doorpost. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (3) Remove the jamnut that attaches the jack to the interior panel.
  - (4) Put a label on the applicable wires of the microphone jack (small plug) or the headphone jack (large plug).
  - (5) Cut the wires near the soldered joint of the applicable jack.
- B. Install the Pilot/Front Passenger Intercom Jacks (Refer to Figure 201).
  - (1) If applicable, remove unwanted solder from the jack.
  - (2) Solder the applicable wires to the jack. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
  - (3) Attach the jack to the sidewall panel with the jamnut.
  - (4) Install the sidewall panel. Refer to the Chapter 25, Interior Upholstery - Maintenance Practices.

**4. Rear Passenger Intercom Jacks Removal/Installation**

- A. Remove the Rear Passenger Intercom Jacks (Refer to Figure 201).
  - (1) Make sure the AVIONICS and MASTER switches are in the off position.
  - (2) Remove the rear seat. Refer to Chapter 25, Rear Seats - Maintenance Practices.
  - (3) Remove the rear sidewall panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (4) Put a label on the applicable wires of the microphone jack (small plug) or the headphone jack (large plug).
  - (5) Cut the wires near the soldered joint of the applicable jack.
  - (6) Remove the jamnut that attaches the jack to the interior panel.

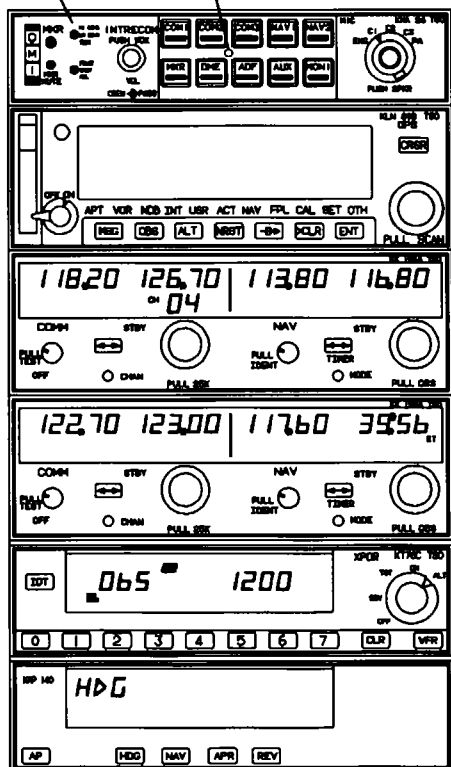
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AUDIO PANEL  
 LOCKING SCREW

DETAIL A



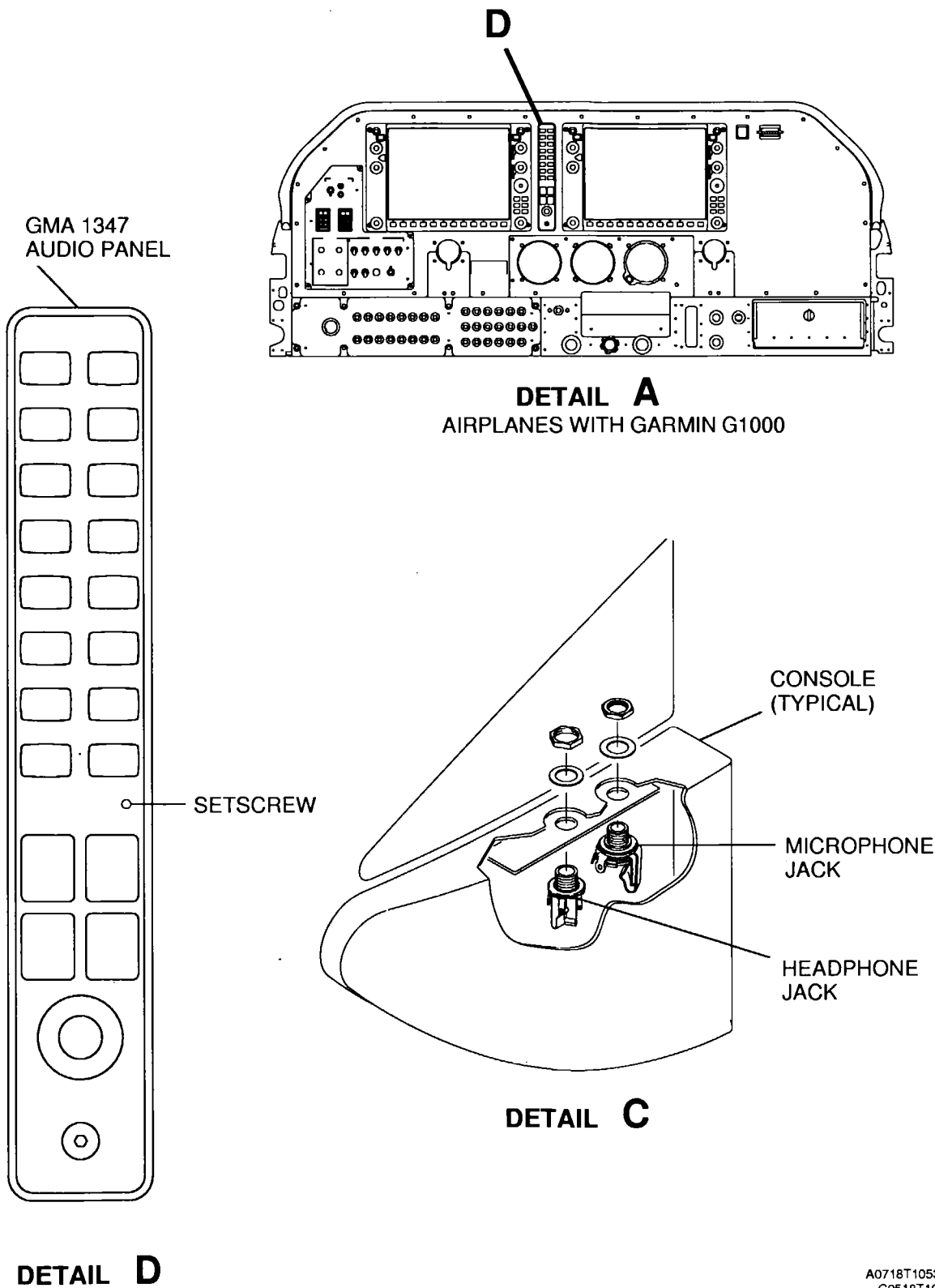
DETAIL B

Audio Panel Installation  
 Figure 201 (Sheet 1)

0710T1001  
 A0718T1002  
 B0718T1001

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Audio Panel Installation  
 Figure 201 (Sheet 2)

A0718T1053A  
 C0518T1041  
 D0718T1053A



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- B. Install the Rear Passenger Intercom Jacks (Refer to Figure 201).
- (1) If applicable, remove unwanted solder from the jack.
  - (2) Solder the applicable wires to the jack. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
  - (3) Attach the jack to the sidewall panel with the jamnut.
  - (4) Install the rear sidewall panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (5) Install the rear seat. Refer to Chapter 25, Rear Seats - Maintenance Practices.

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**STATIC WICKS - MAINTENANCE PRACTICES**

**1. General**

- A. Maintenance of the static (discharger) wicks consists of removal/replacement of the wick assembly and ensuring that bonding straps are properly connected between control surfaces and primary structure.
- B. Static wicks are mounted on the trailing edges of the ailerons, rudder and the elevators. Bonding straps are secured to flight control surfaces and electrically connect those surfaces to the primary structure.

**2. Tools and Equipment**

- A. For a list of applicable tools and equipment, refer to Communications - General.

**3. Static Wicks Removal/Installation**

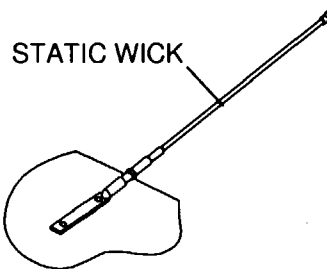
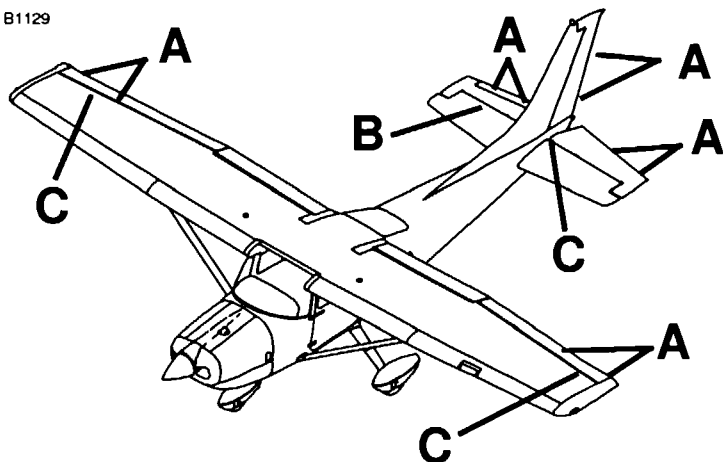
- A. Remove Static Wick (Refer to Figure 201).
  - (1) Carefully drill out mounting rivets which attach static wick to structure. Ensure holes are not drilled oversize.
  - (2) Remove static wick from the airplane skin.
- B. Install Static Wick (Refer to Figure 201).
  - (1) Clean surface of airplane skin where static wick will attach to skin. Remove all traces of contaminants (including paint/primer) using scotchbrite and P-D-680 solvent.
  - (2) Secure static wick to airplane skin using rivets.
  - (3) Repaint base of new wick (if required).

**4. Bonding Straps Removal/Installation**

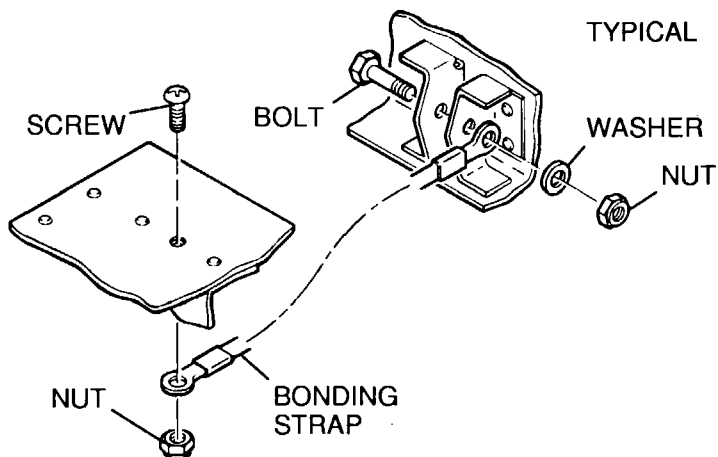
- A. Bonding straps are provided to ensure that electrical potential between primary and secondary structure remains nearly equal. If bonding straps are removed, they should be reinstalled using hardware called out in the Model 182 Illustrated Parts Catalog.
- B. The maximum allowable resistance (in ohms) for bonding straps is 0.0025 ohms.
- C. Primary and secondary structure should be cleaned using scotchbrite pad and P-D- 680 solvent before installing bonding hardware. Aluminum surfaces should be chemically protected (alodine or equivalent) before attaching bonding hardware to surface.

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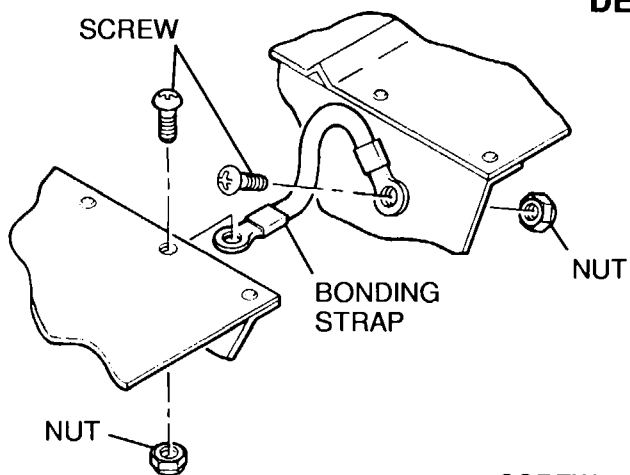
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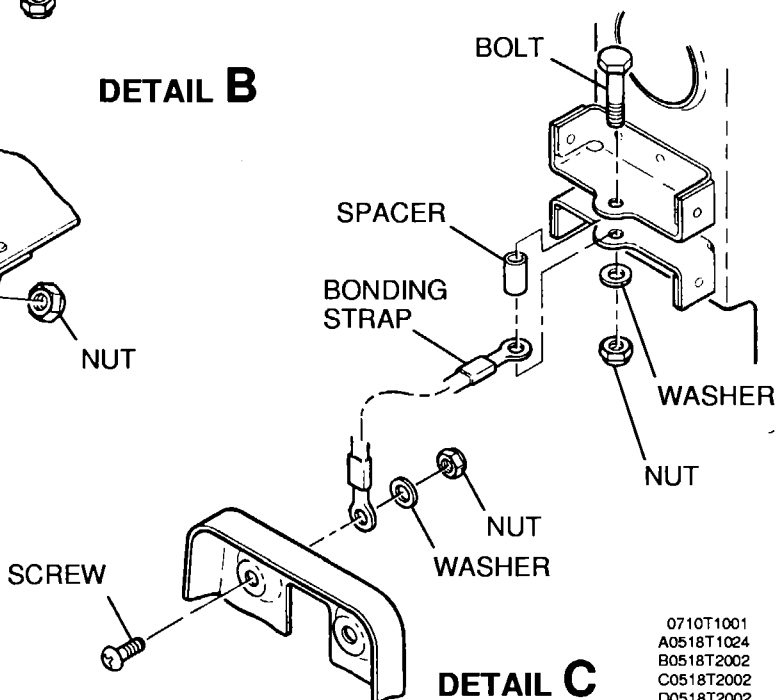
**DETAIL A**  
 TYPICAL



**DETAIL B**



**DETAIL D**



**DETAIL C**

0710T1001  
 A0518T1024  
 B0518T2002  
 C0518T2002  
 D0518T2002

Static Discharger Installation  
 Figure 201 (Sheet 1)

**CHAPTER**

**24**

**ELECTRICAL POWER**

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24-List of Effective Pages		
24-Record of Temporary Revisions		
24-Table of Contents		
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**ELECTRICAL POWER - GENERAL**

**1. Scope**

- A. This chapter gives the electrical units and components which control and supply electrical power for the airplane systems. This includes the alternator, batteries, and relays.
- B. Electrical energy for the airplanes is supplied by a 28-volt, direct current, single primary bus, negative ground electrical system. A single 24-volt main battery supplies power to the starting system and gives a reserve source of power if an alternator failure were to occur. Airplanes that have the Garmin G1000 system also have a standby battery. The standby battery is controlled and monitored by the standby battery controller and supplies power to the G1000 essential bus if there is a failure of the main battery and the alternator. A power junction box, also referred to as a Master Control Unit (MCU), is attached to the forward left side of the firewall and includes electrical relays, an alternator control unit (ACU), an ammeter sensor, an external power receptacle, fuses and/or circuit breakers, in a single box. An engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by the ACU. The external power receptacle is used for ground operation of the electrical equipment and helps the main battery during ground starts.
- C. Electrical power is supplied to the two primary electrical busses through two 30A fuses, two 30A circuit breakers, or two 40A circuit breakers in the junction box. These electrical busses supply power to two avionics busses through 15A circuit breakers. The two avionics busses are controlled by an avionics master switch. Airplanes that have propeller heat have three electrical busses that supply power through three 30A fuses, three 30A circuit breakers, or three 40A circuit breakers.
- D. The operation of the main battery and alternator system is controlled by the MASTER ALT BAT switch. The switch is an interlocking split rocker and is found on the left side of the switch panel. The right half of the rocker controls the main battery and the left half controls the alternator. It is possible in this configuration for the main battery to be on-line without the alternator. However, operation of the alternator without the main battery is not possible. The BAT MASTER switch, when operated, connects the main battery contactor coil to ground so that the contacts close and supply power to the system from the main battery only. The ALT MASTER switch, when ON, applies positive voltage to the ACU and to the alternator contactor coil at the same time, which then applies field voltage to the alternator field and supplies power to the electrical system from the alternator.
- E. The operation of the standby battery, if installed, is controlled by a three-position STDBY BATT switch. Normal flight operation is with the switch in the ARM position that lets the standby battery charge from the G1000 essential bus. If there is an alternator failure, the standby battery controller will not let the standby battery discharge to the G1000 essential bus until the depletion or failure of the main battery. It is necessary during preflight to do an energy level acceptance test. Refer to the Pilot's Operating Handbook, Chapter 4, Starting Engine, for details of the "energy level" acceptance test.
- F. The main battery ammeter is controlled by a sensor found in the power junction box. In flight, without the use of external power, the meter shows the quantity of current that flows to or from the battery. With a low battery and the engine at cruise speed, the ammeter will show a large positive output and a charge of the main battery. When the main battery is fully charged, the ammeter will show a minimum charge rate.
- G. The standard main battery is a 24-volt, 12.75 Amp-hour (5-hour rate), flooded lead-acid type. The battery is installed in the tailcone. A heavy-duty main battery is installed in airplanes with propeller heat systems. The heavy-duty battery is a 24-volt, 15.5 Amp-hour (5-hour rate), flooded lead-acid type.

**2. Tools, Equipment, and Materials**

**NOTE:** Equivalent substitutes can be used for the following items:



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<b>NAME</b>	<b>NUMBER</b>	<b>MANUFACTURER</b>	<b>USE</b>
Adhesive	41-30	Mid-West Industrial Chemical Company 1509 Sublette St. Louis, MO 63110	Used to bond the battery vent drain tubes to the battery case elbows.
Battery Charger	TDMC-81	Cessna Aircraft Company	Charges the battery.
Cleaning Cloth		Available Commercially	Cleans the battery.
Digital Voltmeter	Model 87	John Fluke Mfg. Co. 6920 Seaway Blvd. Everett, WA 98206	General electrical use.
Hydrometer (1.100 to 1.310 specific gravity range)		Available Commercially	Measures the specific gravity of electrolytes.
MCU Test Set (With instructions, LI-0021)	TE04	Lamar Technology Inc. 14900 40th Avenue North East Marysville, WA 98271	To do the tests and troubleshooting for the J-box, (MCU) and alternator systems.
Nonmetallic Brush (Acid-Resistant)		Available Commercially	Cleans battery cells.
Rubber Gloves, Rubber Apron, and Protective Goggles.		Available Commercially	Give protection when you clean the battery.
Small syringe		Available Commercially	Service of the battery.
Variable Power Supply		Available Commercially	Supplies external power for ground maintenance.
12 Volt DC Power Adapter	D02-0042	Cessna Aircraft Company Cessna Parts Distribution Department 701, CPD 2 5800 East Pawnee Road Wichita, KS 67218-5590	Cabin Power System. Commercial Airline Connector adapts to Automotive Power Port Connector.
24-Volt Battery Charger	TSC-01V	Teledyne Continental Motors Battery Products 840 West Brockton Avenue Redlands, CA 92374 Phone: 1-800-456-0070	Charges the battery.

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**ALTERNATOR SYSTEM - TROUBLESHOOTING**

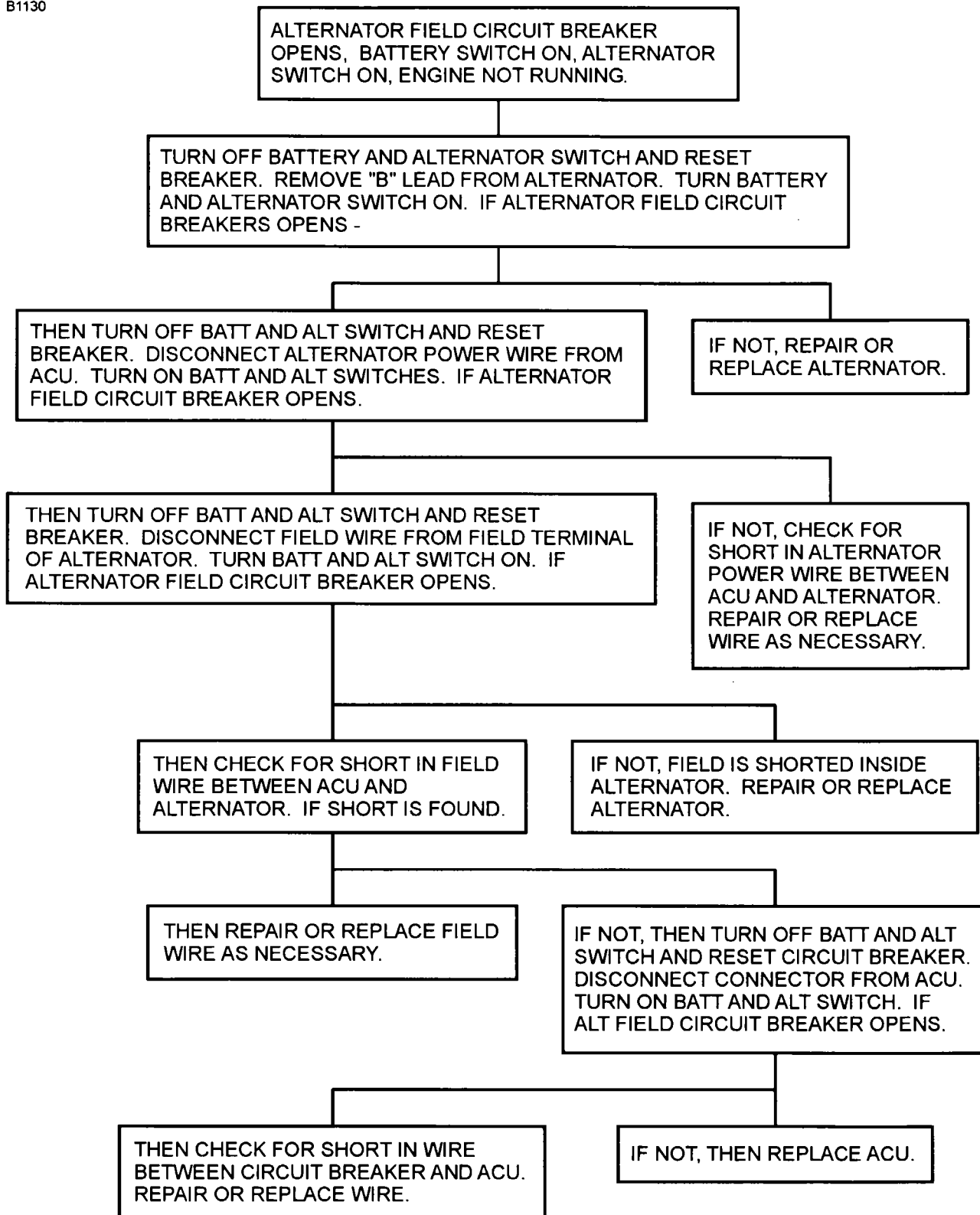
**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

**NOTE:** Refer to the Lamar TE04 MCU Test Set and the LI-0021 instructions for additional testing procedures of the alternator system. Refer to Electrical Power - General, Tools, Equipment, and Materials.

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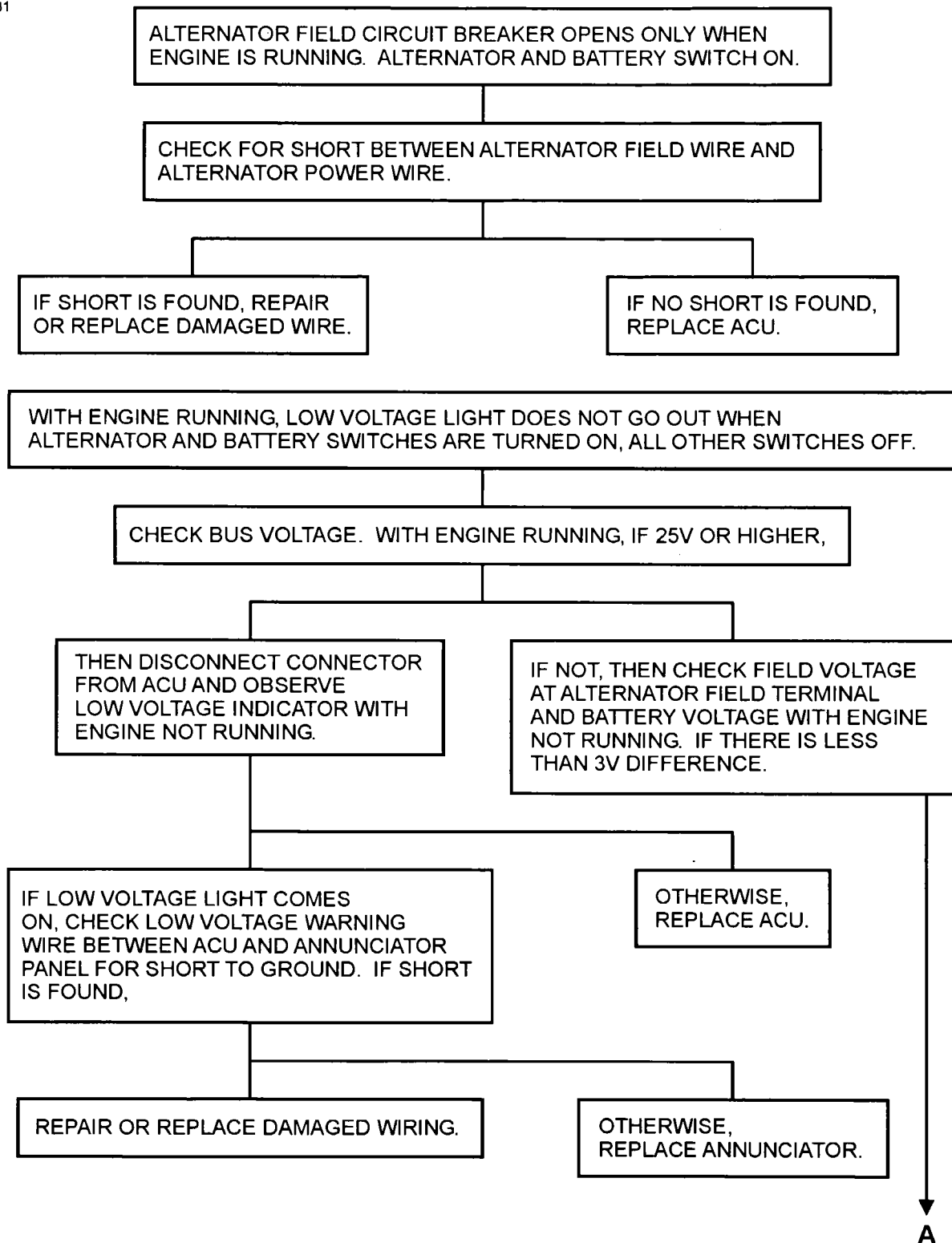
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Alternator System Troubleshooting Chart  
Figure 101 (Sheet 1)

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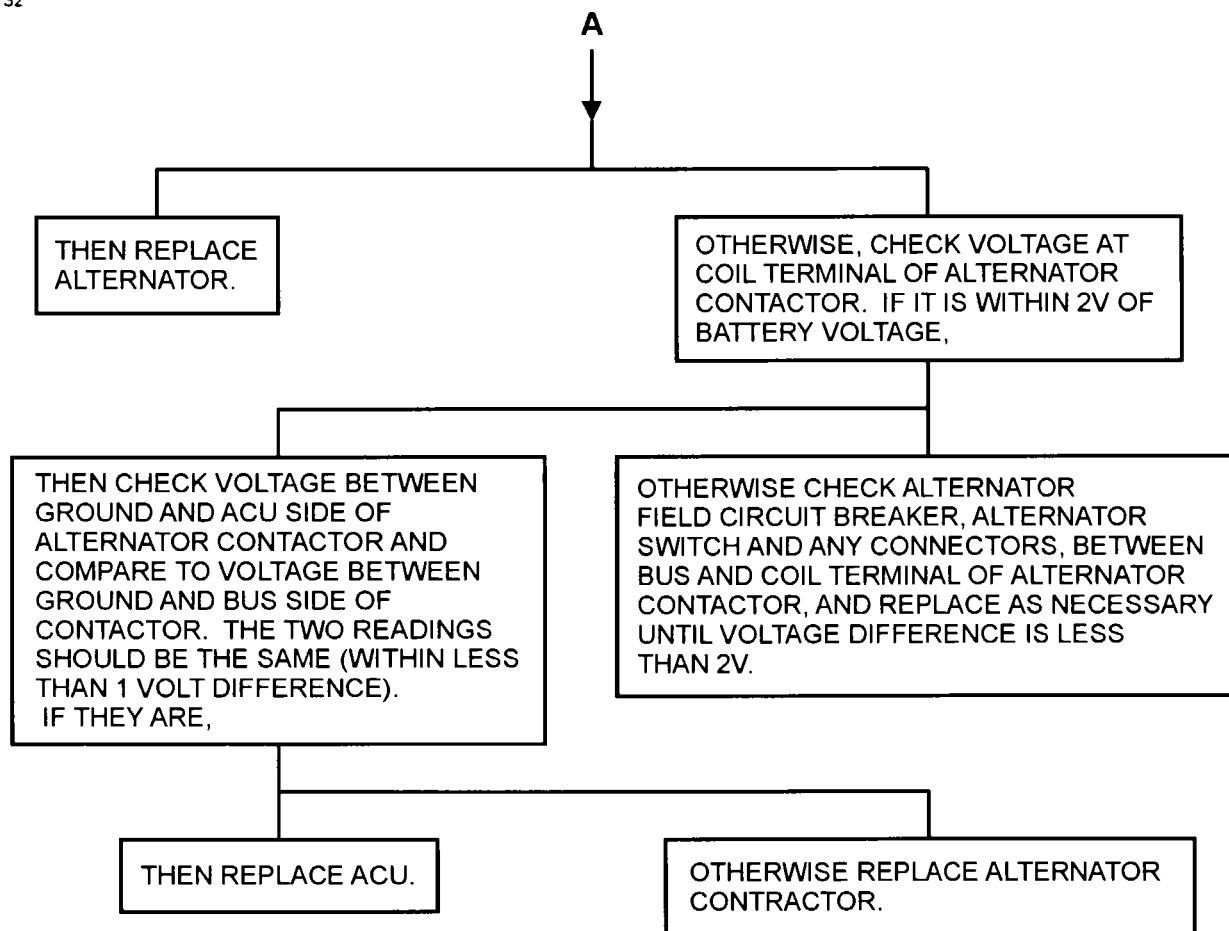
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Alternator System Troubleshooting Chart  
Figure 101 (Sheet 2)

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Alternator System Troubleshooting Chart  
Figure 101 (Sheet 3)

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WITH ENGINE RUNNING ALTERNATOR MAKES ABNORMAL WHINING NOISE.

CHECK FOR SHORTED DIODE IN ALTERNATOR. TURN OFF BATTERY SWITCH AND REMOVE CABLE FROM "BAT" TERMINAL OF ALTERNATOR. USING A DIGITAL MULTIMETER WITH THE DIODE FUNCTION SELECTED, PLACE NEGATIVE LEAD ON "BAT" TERMINAL OF ALTERNATOR AND POSITIVE LEAD ON CASE OR "GND" TERMINAL AND A READING OF APPROXIMATELY 0.8 TO 1.0 SHOULD BE SEEN. REVERSE THE TEST LEADS AND THE METER SHOULD INDICATE AN OPEN CIRCUIT. IF THE RESISTANCE FUNCTION OF THE METER IS SELECTED OR IF USING OLDER ANALOG METERS THE READINGS WILL BE DIFFERENT BUT ONE DIRECTION SHOULD YIELD AN OPEN CIRCUIT AND THE OTHER A NUMERICAL VALUE OF VERY HIGH RESISTANCE (USUALLY GREATER THAN 1 MEGA OHM). SINCE THE ALTERNATOR HAS AN INTERNAL CAPACITOR, READINGS TAKEN WITH METERS SELECTED ON RESISTANCE MAY BE UNSTABLE. IF READINGS ARE OBTAINED THAT DIFFER FROM PREVIOUSLY STATED,

THEN REPAIR OR REPLACE ALTERNATOR.

Alternator System Troubleshooting Chart  
Figure 101 (Sheet 4)

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**ALTERNATOR - MAINTENANCE PRACTICES**

**1. General**

- A. The alternator is installed on the forward side of the engine, below and to the right of the crankshaft.
- (1) A 60-amp alternator is standard for all airplanes. A 95-amp alternator is optional for some model 182T's and for all T182T's.

**2. Alternator Removal/Installation**

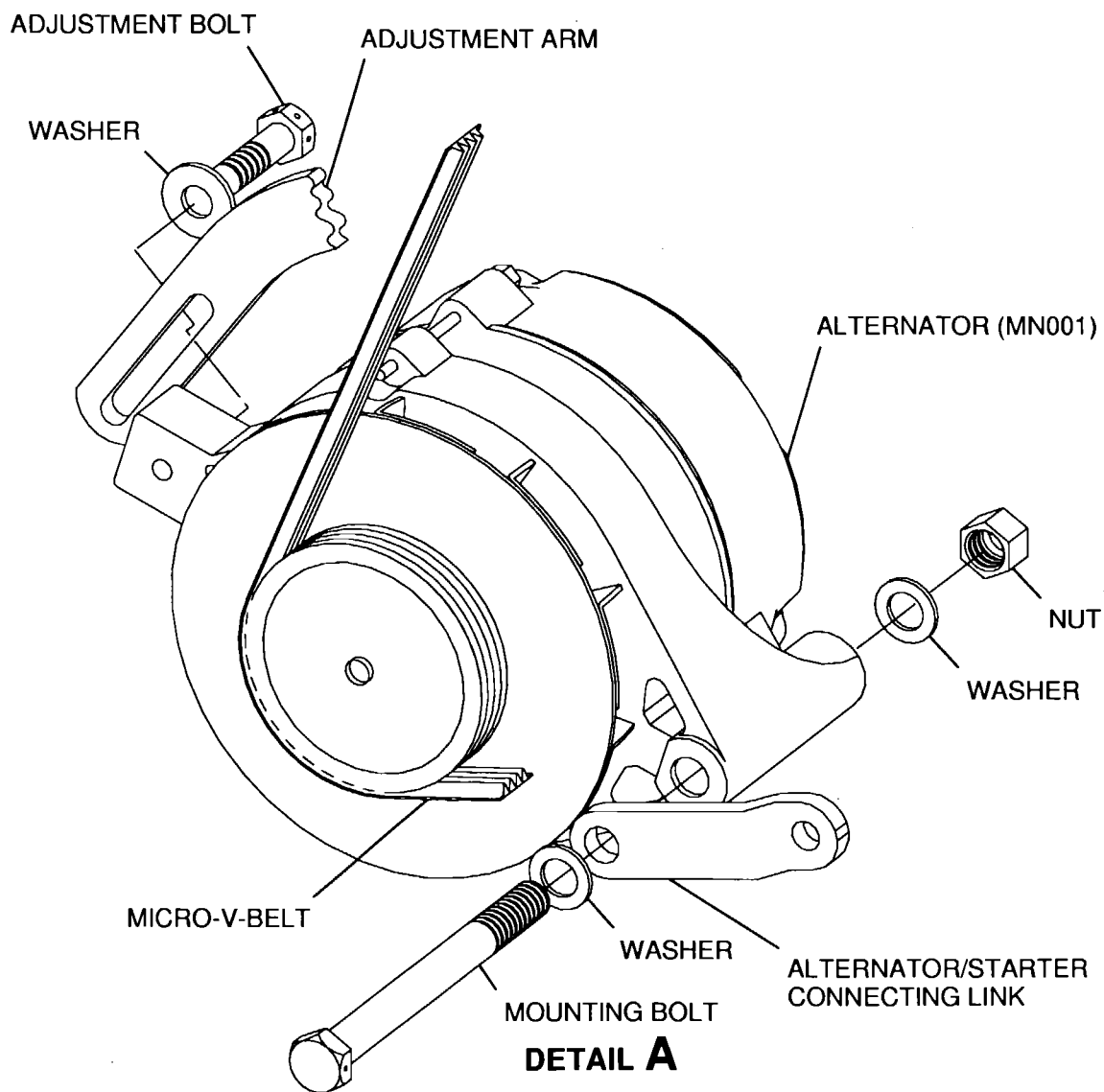
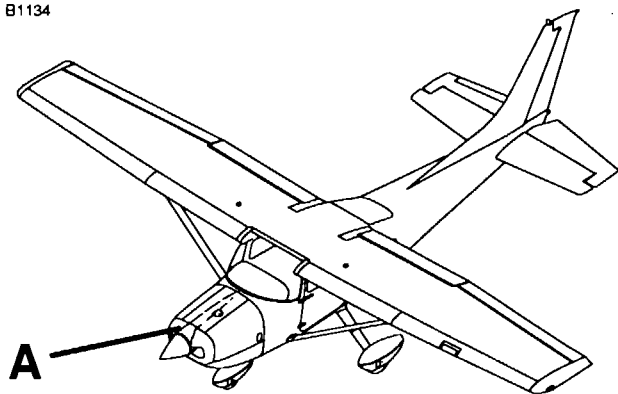
- A. Remove Alternator (Refer to Figure 201).
- (1) Remove the cowls. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (2) Disconnect battery cables.
  - (3) Disconnect the connector terminals (UC001) from the alternator (MN001).
  - (4) Remove safety wire from adjusting bolt. Loosen bolt.
  - (5) Loosen alternator mounting bolt.
  - (6) Rotate alternator and remove drive belt from alternator pulley.
  - (7) Remove adjusting bolt and mounting bolt, then remove alternator from airplane.
- B. Install Alternator (Refer to Figure 201).
- (1) Set the alternator (MN001) on the mounting bracket and install the mounting bolt and nut. Do not tighten at this time.
  - (2) Place drive belt on alternator pulley.
  - (3) Install adjusting bolt.

**CAUTION:** Any airplane with a new alternator belt installed, including new airplanes, belt tension must be checked within the first 10 to 25 hours of operation.

- (4) Apply a torque wrench to the nut on alternator pulley and adjust the belt tension so the belt slips at 7 foot-pounds to 9 foot-pounds (9.49 N.m to 12.20 N.m) of torque with a used belt, or 11 foot-pounds to 13 foot-pounds (14.91 N.m to 17.62 N.m) of torque with new belt.
- (5) Tighten and safety wire adjusting bolt.
- (6) Tighten alternator mounting bolt.
- (7) Connect electrical connectors to alternator.
- (8) Install the cowls. Refer to Chapter 71, Cowl - Maintenance Practices.

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Alternator Installation  
Figure 201 (Sheet 1)

0710T1001  
A0750T1004



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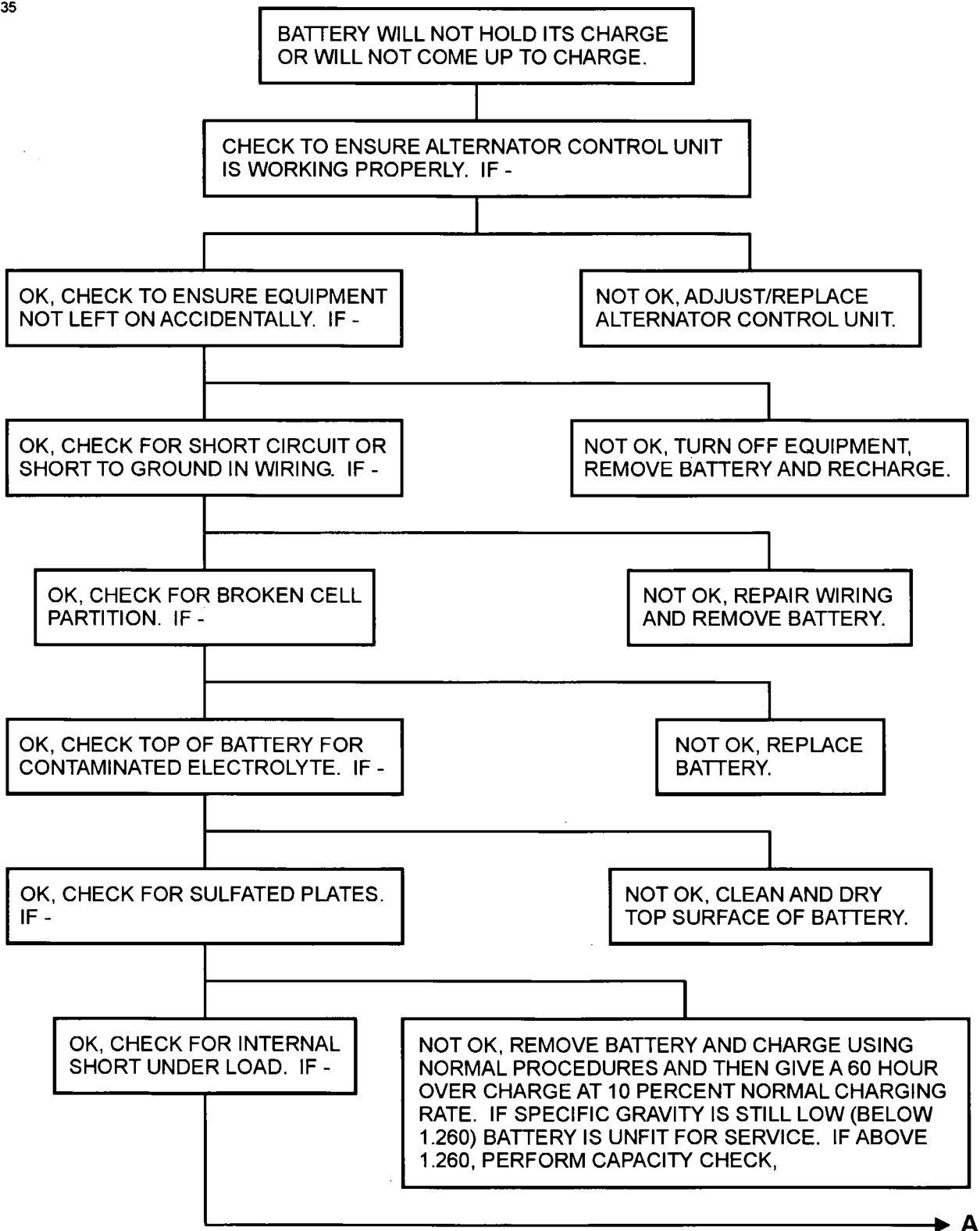
**BATTERY - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart is included to aid in maintenance of the battery system. Refer to Figure 101.

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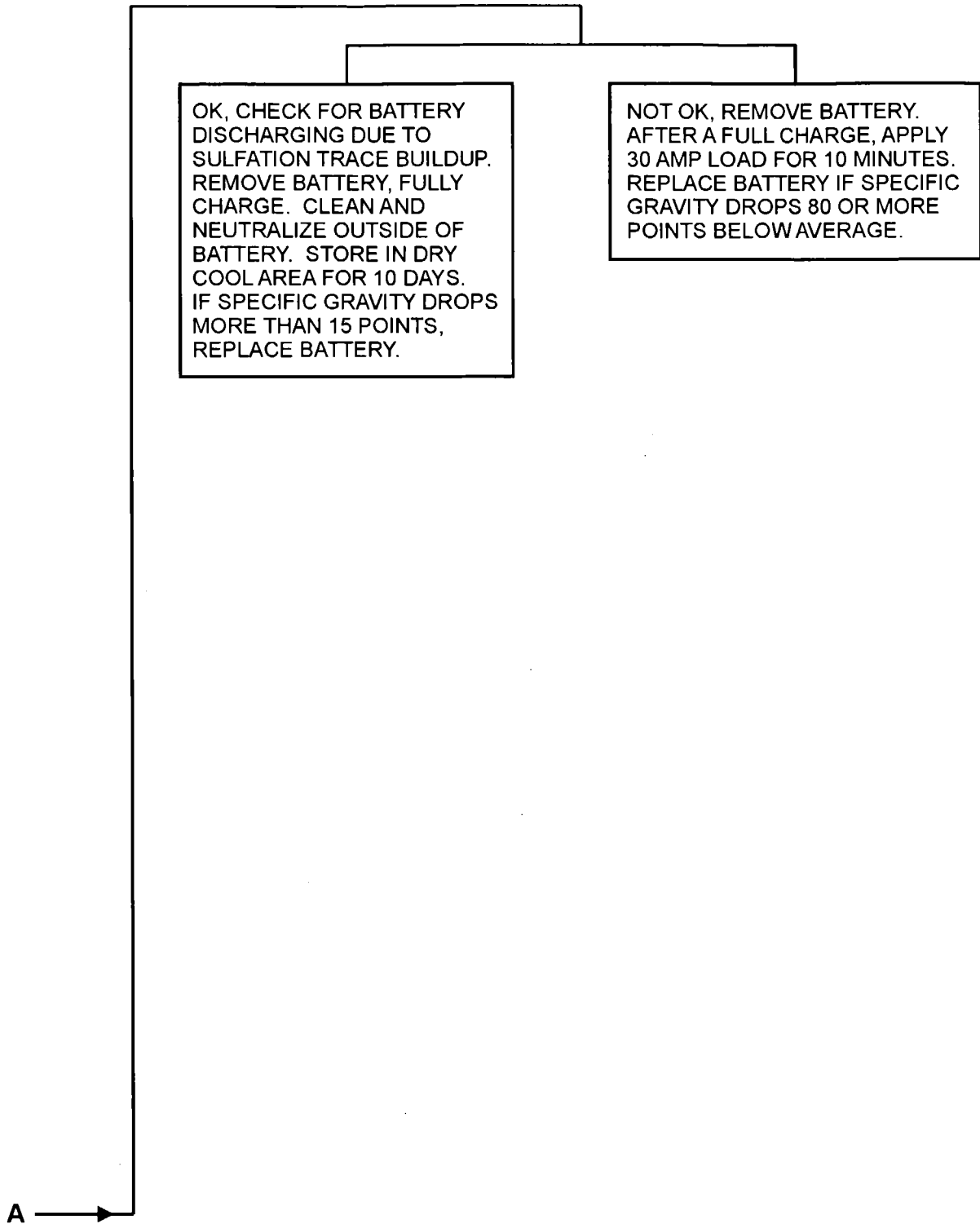
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Battery Troubleshooting Chart  
Figure 101 (Sheet 1)

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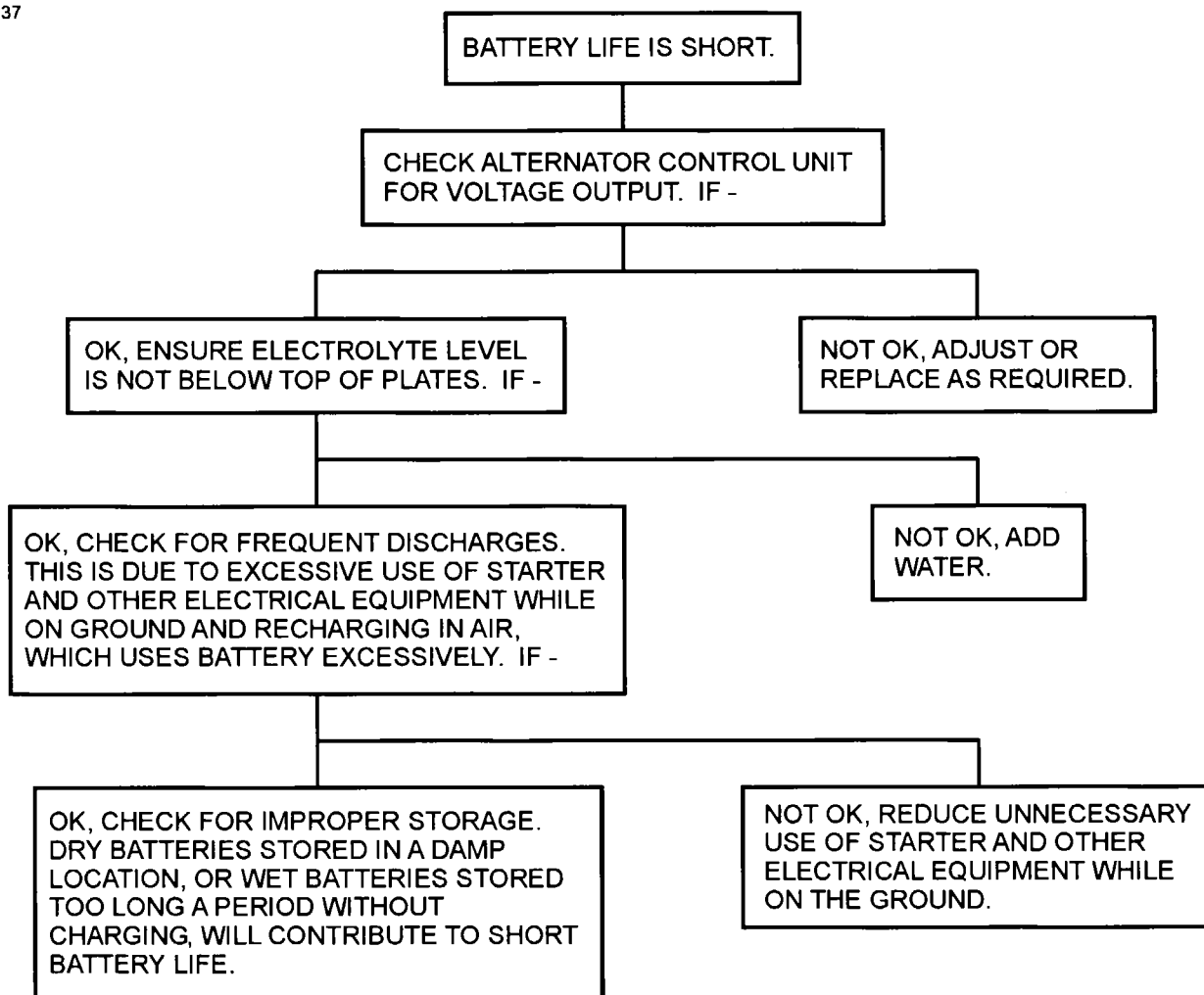
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Battery Troubleshooting Chart  
Figure 101 (Sheet 2)

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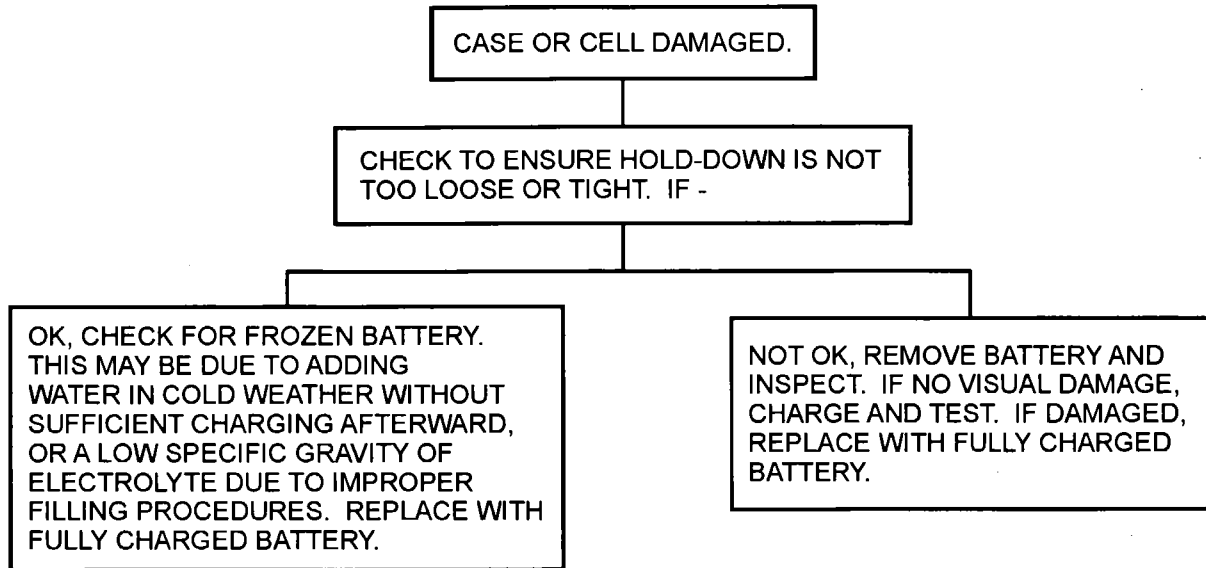
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Battery Troubleshooting Chart  
Figure 101 (Sheet 3)

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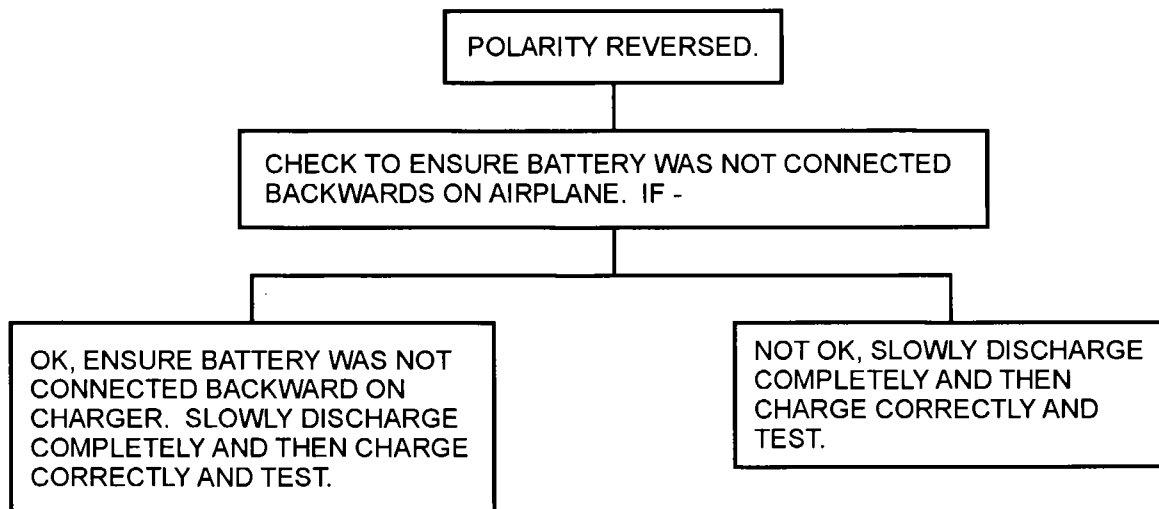
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Battery Troubleshooting Chart  
Figure 101 (Sheet 4)

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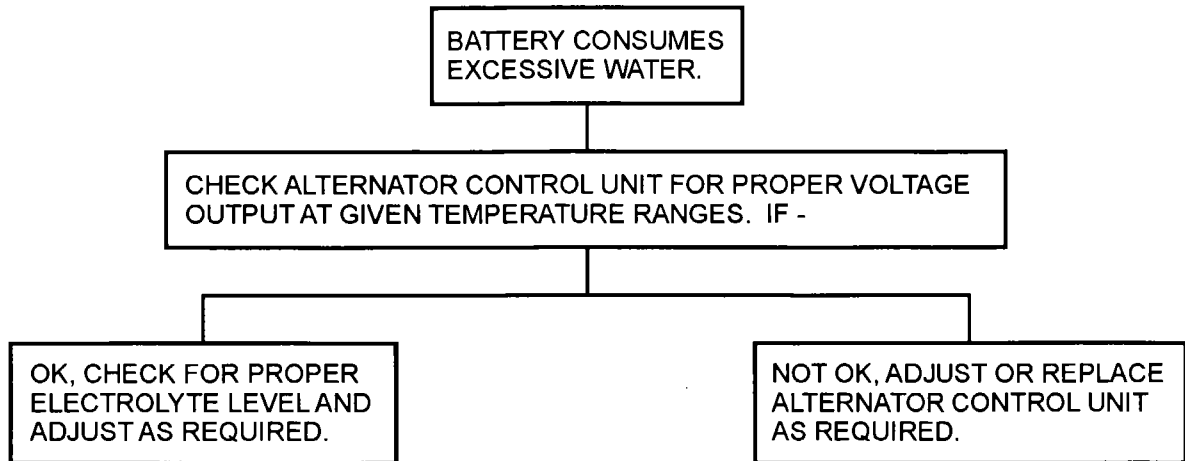
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Battery Troubleshooting Chart  
Figure 101 (Sheet 5)

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Battery Troubleshooting Chart  
Figure 101 (Sheet 6)

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**BATTERY - MAINTENANCE PRACTICES**

**1. General**

- A. The battery is a 24-Volt, 12.75 Amp-hour or an optional heavy-duty 15.5 Amp-hour flooded lead acid type. Either of these batteries can be installed. The battery is installed in the tailcone, aft of the baggage compartment on the left side.

**NOTE:** The Amp-hour rate is based on a five hour discharge rate.

**2. Battery Removal/Installation**

- A. Remove the Battery (Refer to Figure 201).
- (1) Remove the access plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) Cut the tie straps to the positive terminal cover.
  - (3) Remove the positive terminal cover.

**CAUTION:** Disconnect the negative battery cable first, then the positive cable. This will prevent an accidental short of the battery from hand tools.

- (4) Disconnect the negative cable from the battery.
- (5) Disconnect the positive cable from the battery.
- (6) Disconnect the drain tube from the battery.
- (7) Remove the battery hold-down bolts and washers.
- (8) Remove the battery cover.
- (9) Remove the battery from the airplane.

- B. Install the Battery (Refer to Figure 201).
- (1) Set the battery in position and install the battery hold-down bolts.

**CAUTION:** Do not tighten the hold-down bolts too much or you will damage the hold-down strap.

- (2) Tighten the hold-down bolts until the bolt head touches the battery cover and add one turn.
- (3) Connect the battery drain tubes with the hose clamps.

**CAUTION:** Connect the positive battery cable first, then the negative cable. This will prevent an accidental short of the battery from hand tools.

- (4) Connect the positive battery cable.
- (5) Install the positive battery terminal cover.
- (6) Attach tie-straps to the terminal cover.
- (7) Connect the negative battery cable.
- (8) Install the access plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**3. Battery Cleaning**

- A. Clean the Battery (Refer to Figure 201).

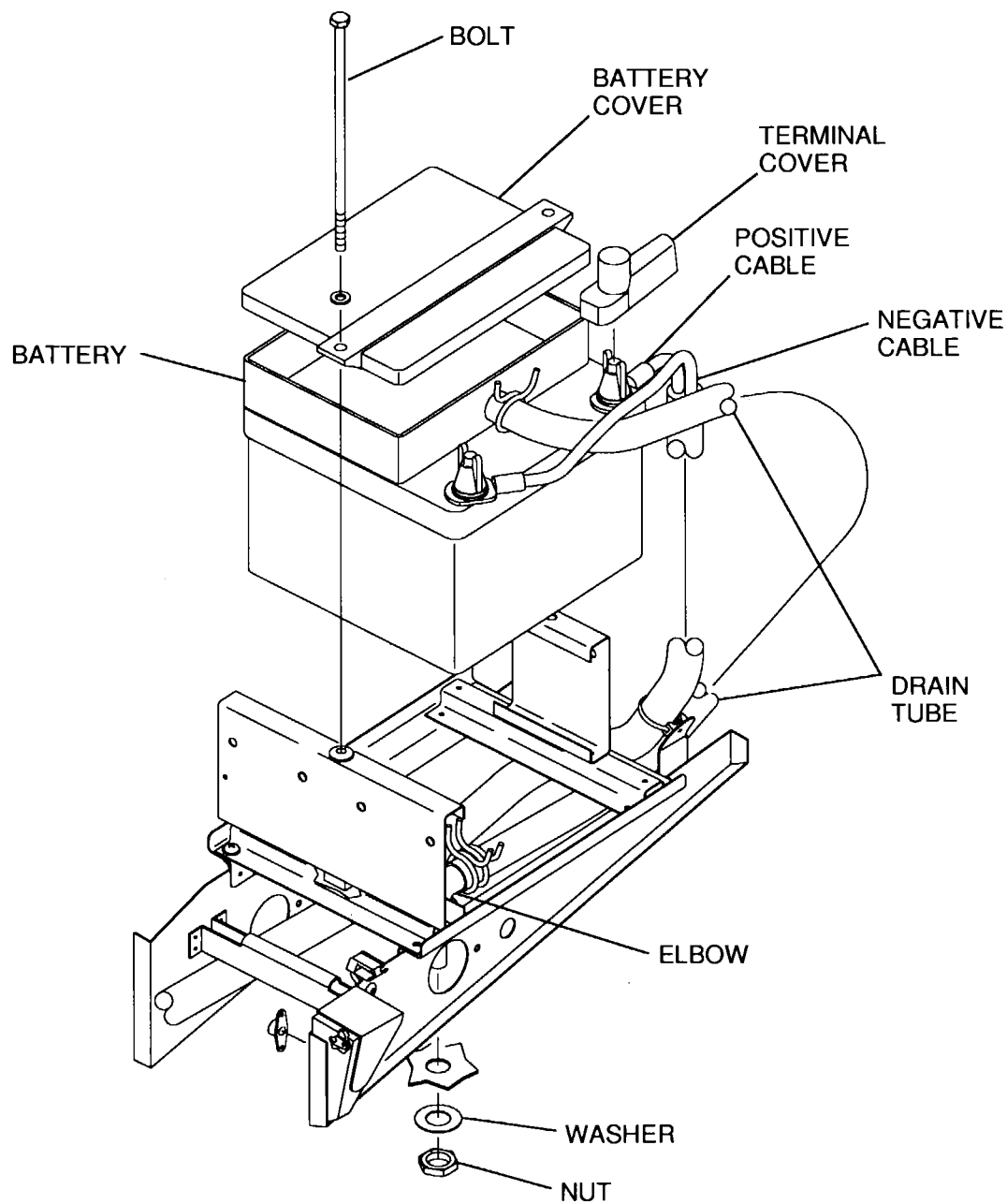
**NOTE:** For correct operation, the battery and connections must be clean at all times.

- (1) Remove the battery. Refer to Battery Removal/Installation.
- (2) Tighten the battery cell filler caps to prevent the cleaning solution from entering the cells.
- (3) Use a clean cloth moistened with a solution of bicarbonate (baking soda) and water to clean the battery cable ends, battery terminals and the surfaces of the battery.
- (4) Rinse with clear water.



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Battery Installation  
Figure 201 (Sheet 1)

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- (5) Use a dry cloth to clean off the water and let the battery dry.
- (6) Polish the cable ends and battery terminals with an emery cloth or a wire brush.
- (7) Install the battery. Refer to Battery Removal/Installation.
- (8) Apply petroleum jelly or an ignition spray product to the battery terminals to decrease corrosion.

**4. New Battery Activation**

**A. Activate the New Battery.**

- (1) Do a specific gravity check to make sure the correct strength of electrolyte is used. The electrolyte must be 1.285 +0.005 or -0.005 specific gravity when it is measured between 75°F to 85°F (24°C to 30°C).
- (2) To charge a new battery, use the manufacturer's instructions supplied with the battery.
- (3) Before you install the battery, clean the battery box. Refer to Chapter 12, Battery - Servicing.
- (4) Install the battery in the airplane. Refer to Battery Removal/Installation.

**5. Battery Charging**

**NOTE:** The procedures that follow are for batteries that use a Gill TSC-01V or a Gill TDMC Battery Charger.

**WARNING:** You must keep sparks and open flame away from the battery. The battery makes hydrogen and oxygen gases when it is charged. The gases will collect and create a hazardous, explosive condition. You must have free ventilation of the battery area when you charge it.

**WARNING:** The battery cell temperature must not be more than 115°F (46°C). Reduce the charge rate if the temperature increases more than 115°F (46°C). The charge must not cause acid to be blown from the vents.

**A. If you use a Gill TSC-01V battery charger, do the instructions that follow.**

**NOTE:** The Gill TSC-01V is automated with a typical charge time of approximately two hours. Some batteries will take more time to charge as a result of the battery condition.

- (1) Remove the battery from the airplane and place it in a well ventilated area to charge. Refer to Battery Removal/Installation.
- (2) Remove the vent caps and make sure the electrolyte level is above the plates and separator material. Do not fill the battery to the split rings at this time.
- (3) Do a specific gravity check of the battery electrolyte with a hydrometer such as the Gill FR-1 (or equivalent) to determine the battery charge. Refer to Table 201 and Table 202.
- (4) Record the value for each battery cell.
- (5) Install the vent caps.
- (6) Attach the red cable to the positive battery terminal and the black cable to the negative battery terminal.
- (7) Connect the charger to AC power. The procedures that follow will result:
  - (a) The AC POWER ON indicator light will come on.
  - (b) The three battery level indicators will flash one time.
  - (c) The EMPTY battery level indicator will flash on and remain on.

**NOTE:** The EMPTY battery level indicator shows that the battery is correctly connected and charging.

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- (8) If the battery is not fully charged, the PARTIALLY CHARGED indicator light will come on. Make sure that the battery stays connected at this time.

**NOTE:** Make sure that you let the battery fully charge. This will make sure of a good battery life and performance.

- (a) Do not disconnect the battery. The charger will not operate correctly if the battery is disconnected and then connected after the PARTIALLY CHARGED indicator light comes on. If the battery is disconnected, you must disconnect and connect the charger at the electrical outlet to start the charge process.
- (9) When the battery is fully charged, the BATTERY READY indicator will come on.
- (10) The electrolyte level must touch the bottom of the split ring while the battery is warm and still on the charger.
- (a) If the electrolyte level needs to be increased, use only distilled or mineral free water to adjust the electrolyte level. The battery must be warm when the electrolyte level is increased.

**NOTE:** The electrolyte level decreases as the battery temperature decreases.

- (11) Do not add any more fluid after these instructions unless the battery electrolyte spills.
- (a) If the fluid level is below the plates and separator material because a spill occurs, add electrolyte with a value of 1.285 specific gravity.
- (12) When the BATTERY READY indicator light comes on, turn the AC power off.
- (13) Disconnect the battery charger from the electrical outlet.
- (14) Disconnect and remove the battery from the charger.
- (15) Do a specific gravity check of the battery electrolyte. Refer to Table 201 and Table 202.
- (a) The specific gravity values between cells must not have a difference of more than 0.020.
- (b) Acceptable specific gravity values that are adjusted for temperature, must be between 1.260 and 1.290.
- (c) If the battery does not give sufficient power to crank the engine with the starter, then replace it with a new battery. Refer to New Battery Activation.

**B.** If you use a Gill TDMC battery charger, do the instructions that follow.

- (1) Remove the battery from the airplane and place it in a well ventilated area to charge. Refer to Battery Removal/Installation.
- (2) Remove the vent caps and make sure the electrolyte level is above the plates and separator material. Do not fill the battery to the split rings at this time.
- (3) Do a specific gravity check of the battery electrolyte with a hydrometer such as the Gill FR-1 (or equivalent) to determine the battery charge. Refer to Table 201 and Table 202.
- (4) Record the value for each battery cell.
- (5) Install the vent caps.
- (6) Click the Gill TDMC charger ON button two times to select the 24 volt position.
- (7) Set the timer for 8 to 10 hours.

**NOTE:** The charger is in a constant current mode when the timer is on.

- (8) Set the charge rate to 1.5 amps.

**CAUTION:** Do not let the battery charger charge at 32 volts for more than thirty minutes.

- (9) Charge the battery until the voltage stabilizes for three consecutive hours or shows 32 volts, whichever occurs first.

**NOTE:** The charge is measured across the battery terminals with the charger on.

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- (10) The electrolyte level must touch the bottom of the split ring while the battery is warm and still on the charger.
- (a) If the electrolyte level needs to be increased, use only distilled or mineral free water to adjust the electrolyte level. The battery must be warm when the electrolyte level is increased.

**NOTE:** The electrolyte level decreases as the battery temperature decreases.

- (11) Do not add any more fluid after these instructions unless the battery electrolyte spills.
- (a) If the fluid level is below the plates and separator material because a spill occurs, add electrolyte with a value of 1.285 specific gravity.
- (12) Do a specific gravity check of the battery electrolyte. Refer to Table 201 and Table 202.
- (a) The specific gravity values between cells must not have a difference of more than 0.020.
- (b) Acceptable specific gravity values that are adjusted for temperature, must be between 1.260 and 1.290.
- (c) If the battery does not give sufficient power to crank the engine with the starter, then replace it with a new battery. Refer to New Battery Activation.

## 6. Battery Test

A. Complete a Specific Gravity Check. Refer to Table 201 and Table 202.

- (1) Measure the specific gravity of the battery with a hydrometer to find the condition of the battery charge.

**NOTE:** Some hydrometers will have a built-in temperature compensation chart and a thermometer.

- (2) The battery condition for various hydrometer values with an electrolyte temperature of 80°F (27°C) is shown in Table 201.
- (a) Electrolyte measurements with the hydrometer must be compensated for the temperature of the electrolyte. Refer to Table 202.

**NOTE:** For increased temperatures, the values will be lower. For decreased temperatures, the values will be higher.

- (3) If the specific gravity indicates the battery is not fully charged, refer to Battery Charging.

**NOTE:** For more accurate results, you can use a load type tester after you charge the battery.

**NOTE:** A specific gravity check can be completed after the charge. This check will not find cells that short circuit under loads or have broken connectors between cell plates.

Table 201. Battery Hydrometer Values at 80°F (27°C).

VALUE	BATTERY CONDITION
1.280 Specific Gravity	100% Charged
1.250 Specific Gravity	75% Charged
1.220 Specific Gravity	50% Charged
1.190 Specific Gravity	25% Charged
1.160 Specific Gravity	Not Charged

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Table 202. Specific Gravity Correction to 80° (27°C)

ELECTROLYTE TEMPERATURE	ADD TO VALUE	SUBTRACT FROM VALUE
140°F (60°C)	1.024	
130°F (54°C)	1.020	
120°F (49°C)	1.016	
110°F (43°C)	0.012	
100°F (38°C)	0.008	
90°F (32°C)		
80°F (27°C)		
70°F (21°C)		
60°F (16°C )		0.008
50°F (10°C)		0.012
40°F (4°C)		0.016
30°F (-1°C)		0.020
20°F (-7°C)		0.024
10°F (-12°C)		0.028
0°F (-18° C)		0.032
-10°F (-23°C)		0.036
-20°F (-29°C)		0.040
-30°F (-34°C)		0.044

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**STANDBY BATTERY - MAINTENANCE PRACTICES**  
Airplanes with Garmin G1000

**1. General**

- A. The maintenance procedures that follow give procedures for the removal and installation of the standby battery, which is found behind the Primary Flight Display (PFD). If there is no primary power source, the standby battery will give power to the essential bus for a period of time. The standby battery PC board is installed on the back of the switch panel. The standby battery PC board controls and monitors the release of electrical power to and from the standby battery.

**2. Standby Battery Removal/Installation**

- A. Remove the Standby Battery (Refer to Figure 201).
- (1) Make sure that the STDBY BATT switch is in the OFF position.
  - (2) Make sure that the MASTER ALT/BAT switch is in the OFF position.
  - (3) Remove the Primary Flight Display. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (4) Disconnect the electrical connection to the battery.
  - (5) Remove the nut and washers from the bracket.
  - (6) Loosen the forward bolt on the bracket.
  - (7) Carefully remove the battery from the airplane.
- B. Install the Standby Battery (Refer to Figure 201).
- (1) Carefully set the battery in position on the tray.
  - (2) Set the bracket in position on the top of the battery and install the washer and the nut.
  - (3) Attach the safety wire to the nut.
  - (4) Connect the electrical connection to the battery.
  - (5) Install the Primary Flight Display. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (6) Turn the standby battery switch to the ARM position to make sure that the standby battery and essential bus voltage for the primary flight display operates.

**3. Standby Battery Printed Circuit Board Removal/Installation**

- A. Remove the Standby Battery Printed Circuit Board (PCB) (Refer to Figure 202).

**CAUTION:** Make sure that you use a wrist strap when the standby battery PCB is removed. The standby battery PCB is sensitive to electrostatic discharge.

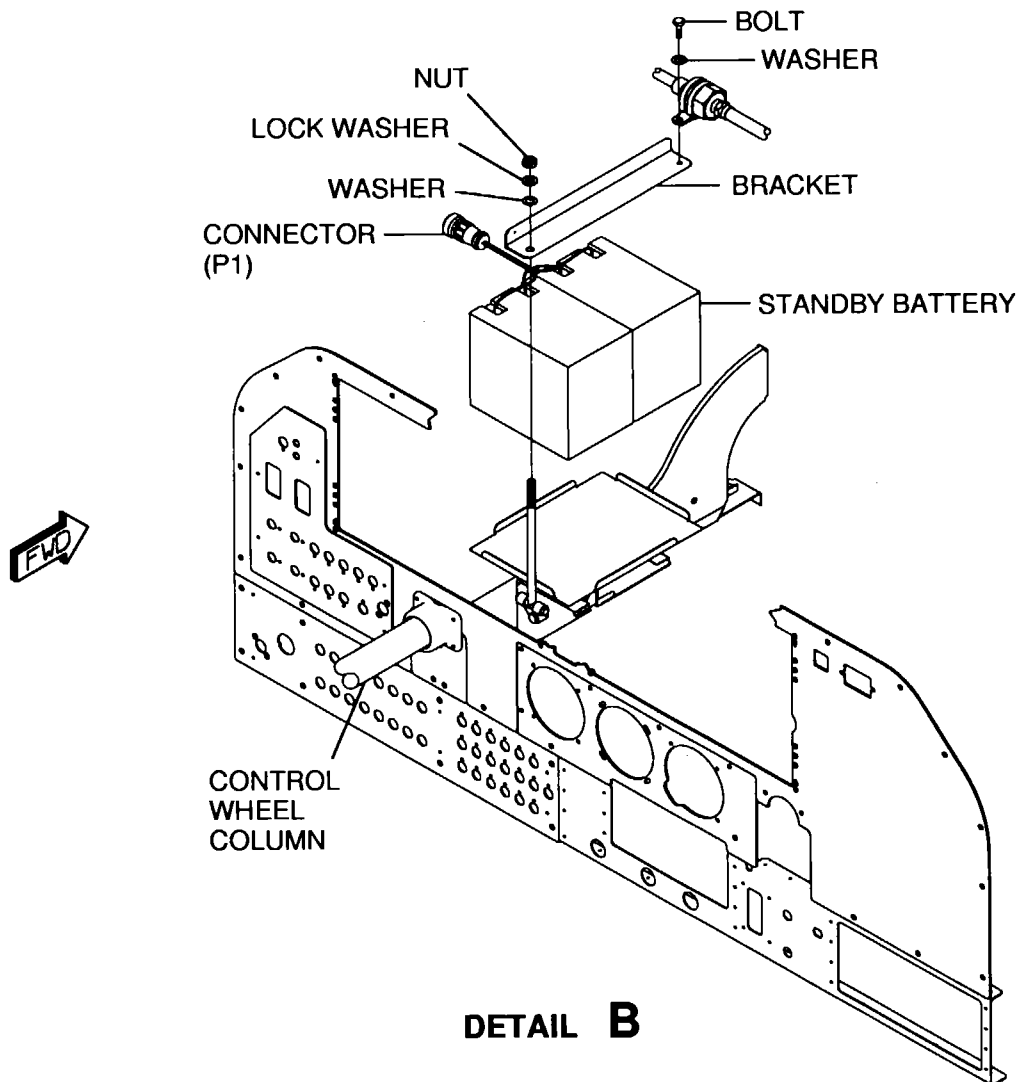
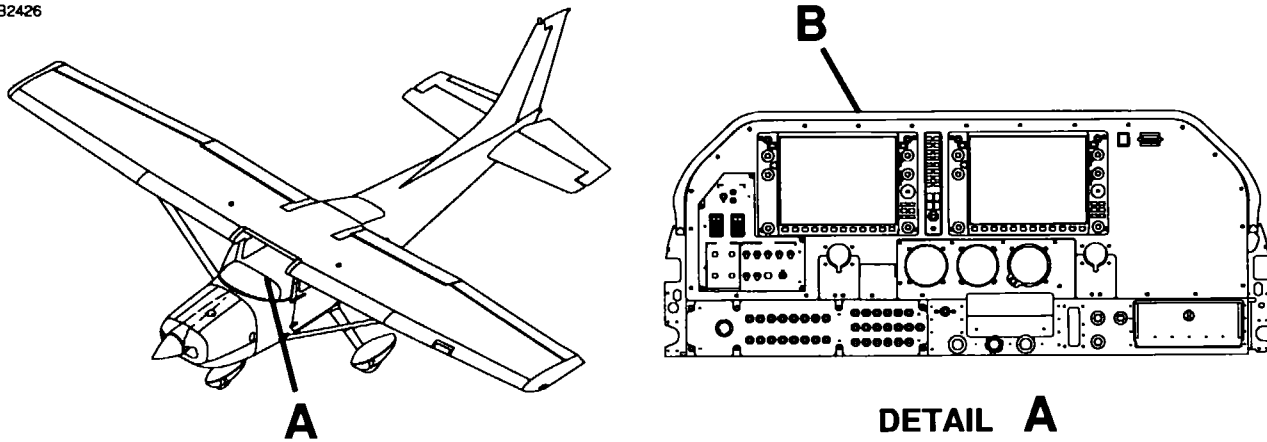
- (1) Make sure that the STDBY BATT switch is in the OFF position.
  - (2) Make sure that the MASTER ALT/BAT switch is in the OFF position.
  - (3) Remove the switch panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Put on a wrist strap and ground the wrist strap to the airframe.
  - (5) Disconnect the standby PCB from the electrical connector (PI036).
  - (6) Remove the screws that attach the standby battery PC board (NZ001) to the extrusion.
  - (7) Carefully remove the board from the extrusion.
  - (8) If applicable, put the PC board in a electrostatic-safe bag.
- B. Install the Standby Battery PC Board (Refer to Figure 202).

**CAUTION:** Make sure that you use a wrist strap when the standby battery PC board is installed. The standby battery PC board is sensitive to electrostatic discharge.

- (1) Put on a wrist strap and ground the wrist strap to the airframe.
- (2) Carefully install the PC board in the extrusion.

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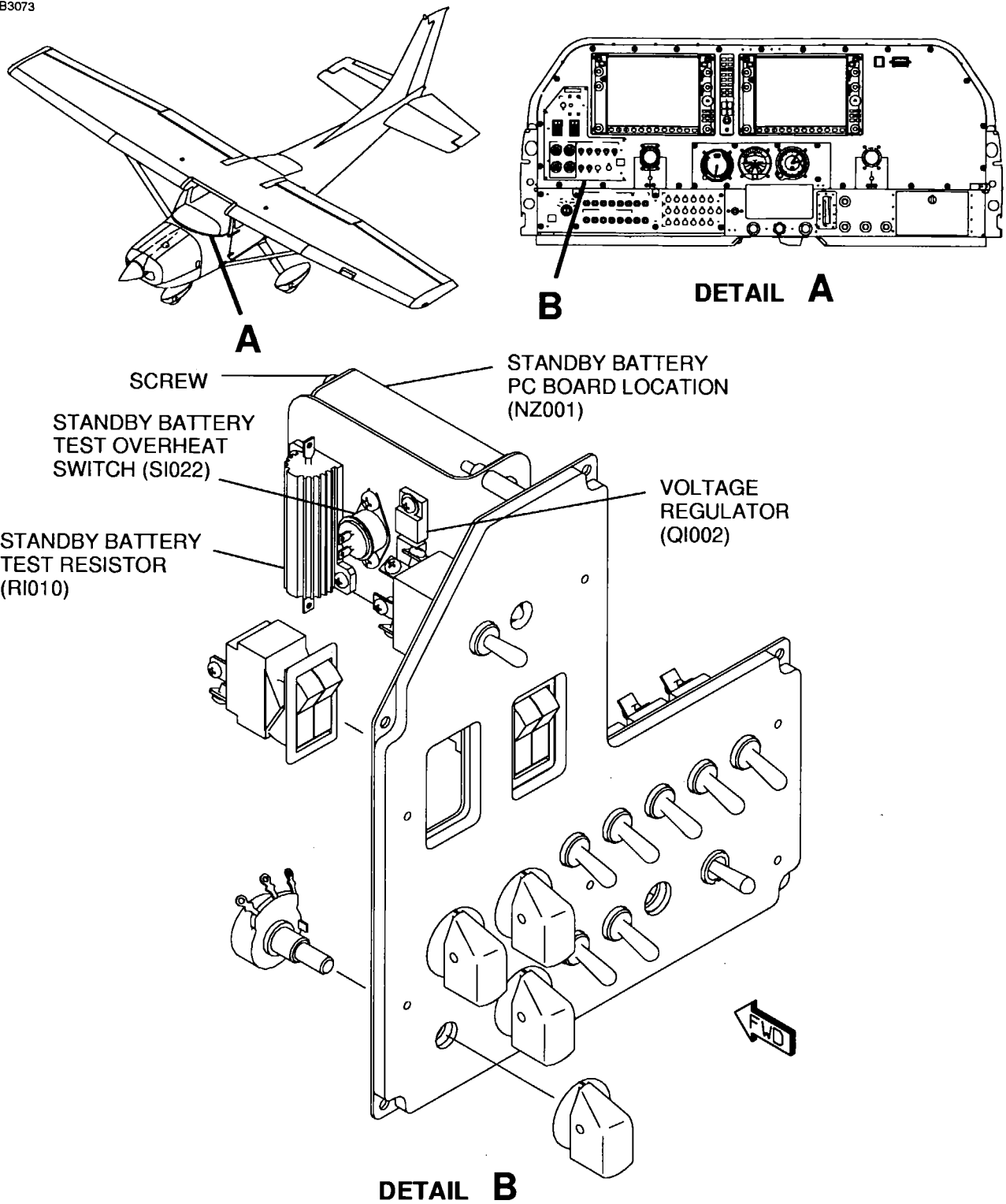


Standby Battery Installation  
 Figure 201 (Sheet 1)

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 A0718T1053A  
 B0718T1060

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Standby Battery Printed Circuit Board Installation  
 Figure 202 (Sheet 1)

0710T1001  
 A1218T1001A  
 B1218T1047



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- (3) Install the screws that attach the board to the extrusion.
- (4) Connect the board to the electrical connector (PI036).
- (5) Install the switch panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

#### 4. Standby Battery Charging

##### A. Charge the Battery.

- (1) Remove the battery from the airplane and put it in a well-ventilated area to charge. Refer to Chapter 24, Standby Battery - Removal/Installation.
- (2) Connect the battery to the charger with the black, round Standby Battery Connector (P1). A mating connector (JC032) is available from Cessna Aircraft Company. Refer to the Model 182S/182T/T182T Wiring Diagram Manual, Chapter 24 Electrical Power - Battery System.

**NOTE:** To charge the standby battery, a constant voltage charger, constant current charger, or a modification of both is used. Use only chargers that are made to charge lead acid batteries. A constant voltage "fast" charge can be done with a charger that has a DC voltage between 28.3 and 30.0 volts. A "float" charge can be done with a charger that has a DC voltage between 27.2 and 28.2 volts.

**CAUTION:** Never set the charger to a level higher than 30.0 volts or you can damage the battery.

- (3) For a constant current charger, charge the battery per the charger's instructions.

**NOTE:** There is no limit on the initial charge current as long as the voltage is not more than 30.0 volts. If it is necessary to set the charger to the battery capacity, use 8 amp-hour as the standby battery capacity.

- (4) For a constant voltage charger, charge the battery for up to 16 hours with a "fast" charge voltage between 28.3 and 30.0 volts.

**NOTE:** Charge times of less than 16 hours can be done, depending on the state of charge of the battery. The battery can be thought to be completely charged if the charge current stays stable (approximately .1 to .2 amps) for a minimum of one hour. You can charge the battery for more than 16 hours if you keep the charge voltages between the recommended float charge range (between 27.2 and 28.2 volts).

- (5) Install the battery. Refer to Chapter 24, Standby Battery - Removal/Installation.
- (6) Do the Standby Battery Energy Level Test in the Pilot's Operating Handbook, Chapter 4 - Starting Engine Procedures. Make sure that the green test light for the standby battery comes on and stays on for the specified time period.

#### 5. Standby Battery Storage

- A. For the best battery life, keep the standby battery in a fully charged state when not in use. This is true when installed on the aircraft and when in long-term storage. To leave the battery in an uncharged state for a given period of time will decrease the life of the battery. It is recommended to charge the battery at a minimum of once every three months of inactivity. In warm climates, a more frequent charge will be necessary.
- B. Do not keep the battery in storage for long periods of time in an environment where the temperature is more than approximately 77 °F (25 °C). Sun shades that cover the aircraft deck skin that decrease the temperature of the battery are recommended when the aircraft is parked in direct sunlight.

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**6. Standby Battery Capacity Test**

A. The battery capacity must be tested. Refer to Chapter 5, Inspection Time Limits. This test is also necessary to give the battery condition if the battery voltage decreases to less than 20.0 volts, such as in unintentional deep discharge.

B. Battery Capacity Test

- (1) Make sure that the battery is fully charged before the capacity test is started. If charge condition is unknown, charge the battery. Refer to Chapter 24 Standby Battery - Maintenance Practices.
- (2) Put the airplane in an area where there are high cabin light levels. Use sunlight or a well-lit hangar facility.

**NOTE:** The photocell on the PFD must cause the PFD light level to be full bright. The AVIONICS rheostat cannot operate with the primary alternator and battery off.

- (3) Turn the STDBY IND rheostat to the full clockwise position.

**NOTE:** A stopwatch will be necessary in the following steps to time the battery discharge.

- (4) With the BAT/ALT MASTER switch in the OFF position, set the STDBY BATT switch to the ARM position and immediately start the stopwatch.
- (5) Make sure that all of the equipment on the essential bus operates correctly.

**NOTE:** After initialization, the PFD operates in full bright mode with only red X's over the NAV 2, COM 2, and XPDR functions.

- (6) Make sure that all the standby indicator lights come on.
- (7) Make sure that the MFD and all the other electrical and avionic equipment on the primary busses are not on.
  - (a) If the conditions in steps 6 through 8 are not met, stop the test and correct these conditions.
  - (b) Start at Step 1 when the condition has been corrected.

**NOTE:** The standby battery initial current discharge is between 2.1 and 3.1 amps as shown on the PFD standby battery ammeter. The essential bus initial voltage is approximately 24.2 volts as shown on the PFD essential bus voltmeter.

- (8) Continuously monitor the essential bus voltage as shown on the PFD essential bus voltmeter. The battery capacity is satisfactory if the bus voltage stays above 20.0 volts for a minimum of 55 minutes.
- (9) Set the STDBY BATT switch to OFF if the essential bus decreases to 20.0 volts or after 55 minutes.

**CAUTION:** Do not let the essential bus voltage decrease below 20.0 volts or you can cause damage to the standby battery. Set the STDBY BATT switch to the OFF position before the voltage drops below 20.0 volts. Voltage values less than 22.5 volts can decrease quickly so monitor the voltage closely. If the voltage drops below 20.0 volts, charge the battery immediately and do the test again.

**NOTE:** If the standby battery does not stay above 20.0 volts for 55 minutes during the capacity test, the battery is not acceptable for return to service.

- (10) Charge the battery. Refer to Chapter 24, Battery - Maintenance Practices, Battery Charging.

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**12-VOLT CABIN POWER SYSTEM - TROUBLESHOOTING**

**1. General**

- A. The 12-volt cabin power outlet on the pedestal uses a power converter to convert 28-volt DC input power to 13.8-volt DC output power. In airplanes with the Garmin G1000 the power converter is in the cockpit on the aft, right side of the firewall. The power converter in all other airplanes is in the tailcone.
- B. The 12-volt cabin power outlet behind the copilot's seat and near the headset jacks on airplanes with Garmin G1000 uses a power converter to convert 28-volt DC input power to 13.8-volt DC output power. The 20 amps of 12-volt power are split evenly between the forward and the aft power outlets. In airplanes with the Garmin G1000 installed, a CABIN PWR 12V switch is located on the switch panel.
- C. The converter output is used to power electrical devices that require a 12-volt power input. The electrical connections are made with the use of a terminal block that is on the side of the converter. The converter's output can be turned on and off by the use of the ON/OFF signal terminal on the converter's terminal block. When 28 VDC is applied to this terminal, the converter will turn the output on. When the 28 VDC is removed from the terminal, the output is turned off.

**2. Cabin Power Interface**

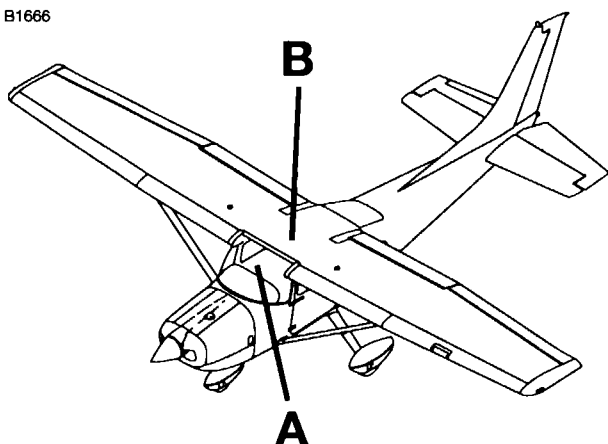
- A. Complete a Test of the Cabin Power Interface (Refer to Figure 101).
  - (1) Make sure the ALT/BAT Master switch is in the ON position.
  - (2) For airplanes with serials 18280001 thru 18281197 and airplanes T18208001 thru T18208185, use a 12-Volt DC power adapter to do the test. Refer to Tools, Equipment and Materials.
    - (a) Attach the adapter to the cabin power system.
  - (3) Use a voltmeter to make sure the output shows 13.4 volts, +0.9 or -0.9 volts at the cabin power interface.
  - (4) If the correct voltage is not indicated, refer to the Power Converter troubleshooting procedures.

**3. Power Converter**

- A. Test the Power Converter (Refer to Figure 102 and to the Model 182 Wire Diagram Manual, Chapter 24, Power Interface).
  - (1) Disconnect the connector (JI).
  - (2) Test for approximately 24-Volts between VI+ and VI- at the connector (JI).
  - (3) Test for approximately 24-Volts between the ON/OFF and VI- at the connector (JI).
  - (4) If there is no voltage, examine the wiring from the power converter to the connector (JI) for damage or bad connections.
    - (a) Repair or replace the connector (JI) or the wiring as necessary.
      - 1 Attach the connector (JI).
      - 2 Test the cabin power interface for correct operation. Refer to Cabin Power Interface.
      - 3 Proceed to step 3.A.(5) if the cabin power interface does not operate correctly.
  - (5) Test the pins VO+ and VO- for an output of 13.4 volts, +0.9 or -0.9 volts.
    - (a) If the correct voltage is supplied, test the continuity from the connector (JI) to the cabin power interface in Figure 101.
      - 1 If the wire continuity is not correct or the wire is damaged, replace the wiring as necessary.
      - 2 If the wire continuity is correct, replace the power converter.

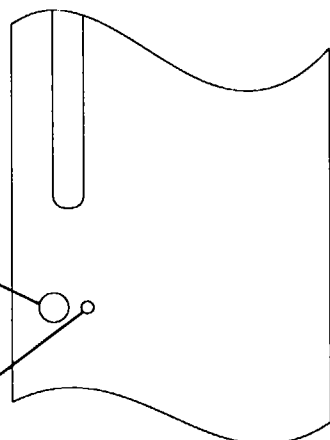
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**MODEL 182/T182**  
 MAINTENANCE MANUAL

B1666



CABIN  
POWER  
INTERFACE

AUDIO IN



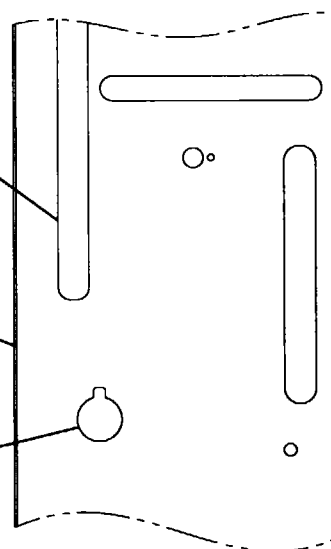
**DETAIL A**

AIRPLANES 18280001 THRU 18280944,  
 AIRPLANES 18280945 THRU 18281197 AND  
 AIRPLANES T18208001 THRU T18208185

TRIM  
WHEEL

PEDESTAL  
COVER

CABIN  
POWER  
INTERFACE



**DETAIL A**

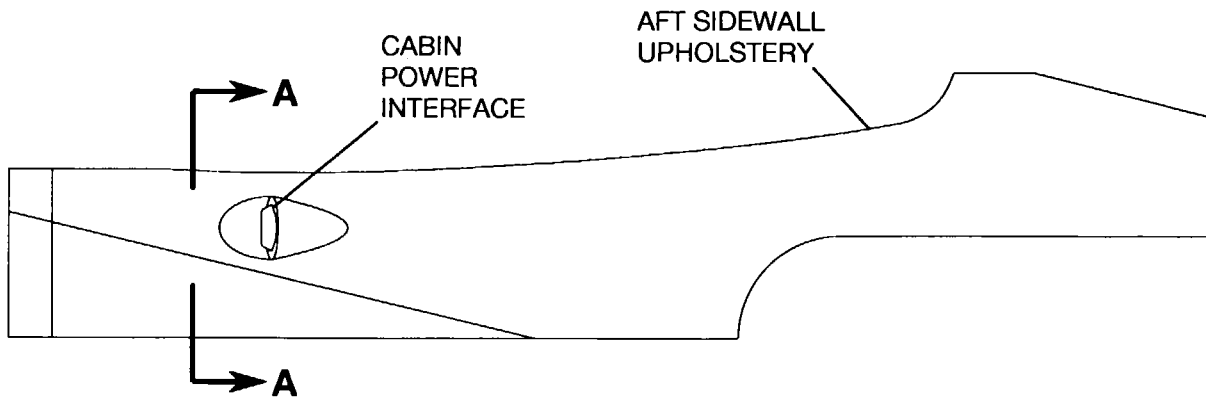
AIRPLANES 18281198 AND ON AND  
 AIRPLANES T18208186 AND ON

Cabin Power Interface  
 Figure 101 (Sheet 1)

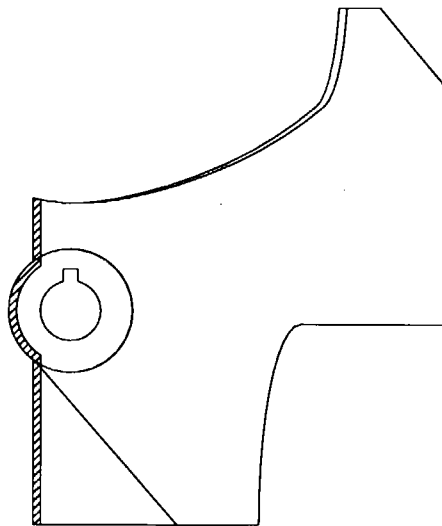
0710T1001  
 A0719T1031  
 A0719T1032

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**DETAIL B**  
VIEW LOOKING OUTBOARD  
ON RIGHT SIDE



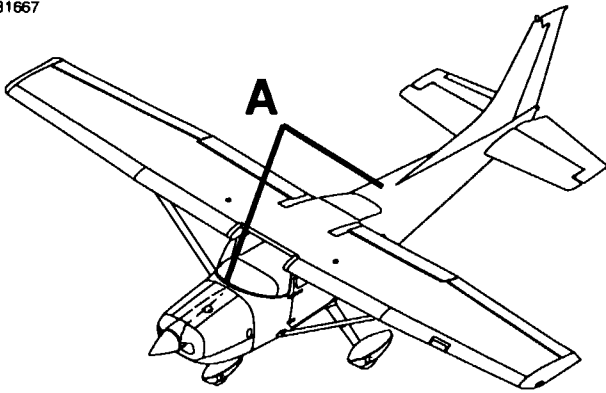
**VIEW A-A**  
VIEW WITH CAP REMOVED

Cabin Power Interface  
Figure 101 (Sheet 2)

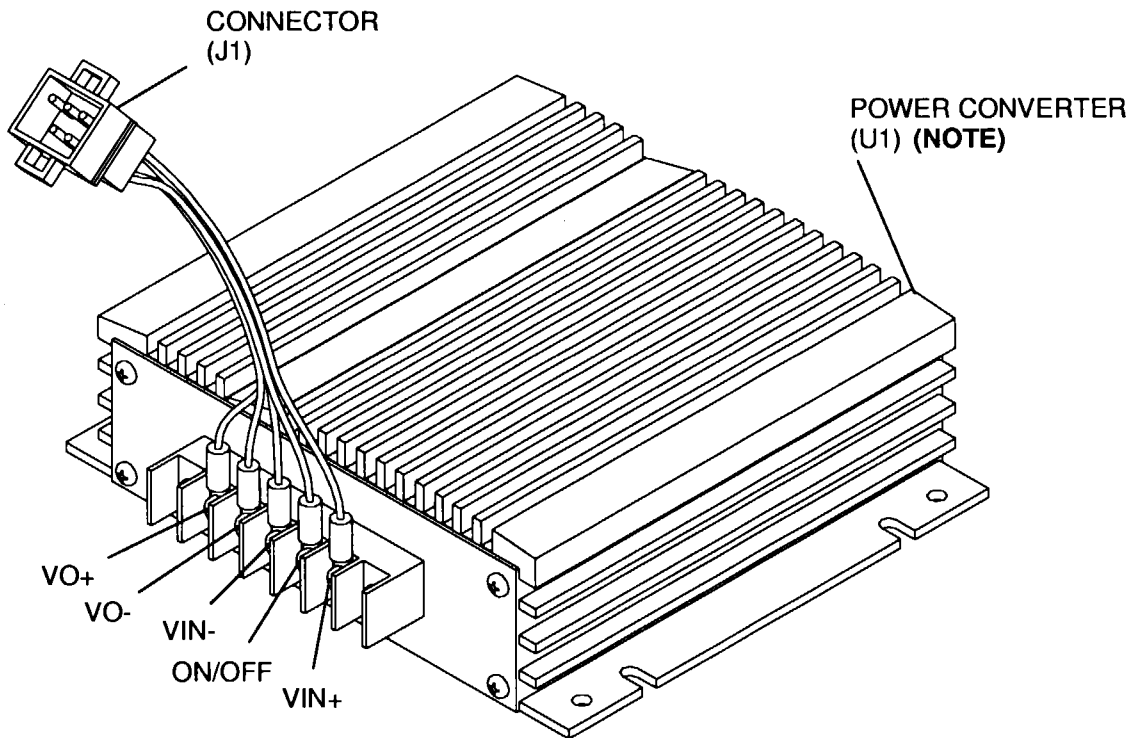
B0719T1094  
AA0719T094

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**NOTE:** THE POWER CONVERTER CAN BE IN DIFFERENT LOCATIONS. IN AIRPLANES WITH THE GARMIN G1000 IT IS IN THE COCKPIT ON THE AFT, RIGHT SIDE OF THE FIREWALL. IN AIRPLANES WITH STANDARD AVIONICS IT IS IN THE TAILCONE.



**DETAIL A**

Power Converter  
Figure 102 (Sheet 1)

0710T1001  
A1260T1012

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**POWER JUNCTION BOX - MAINTENANCE PRACTICES**

**1. General**

- A. The power junction box, also referred to as a Master Control Unit (MCU), is installed on the forward, left side of the firewall. The power junction box has a battery relay, starter relay, alternator relay, current sensor, external power relay, alternator control unit, power distribution bus, and bus fuses (or circuit breakers as applicable).

**2. Power Junction Box Removal/Installation**

- A. Remove the Power Junction Box (Refer to Figure 201).
- (1) Remove the access plate (310AR) and disconnect the battery cables (UC001). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) Remove the cover from the power junction box.
  - (3) Disconnect the electrical connectors, cables, and ground strap from the power junction box.
  - (4) Remove the screws that attach the power junction box to the firewall.
  - (5) Remove the power junction box.
- B. Install the Power Junction Box (Refer to Figure 201).
- (1) Position the power junction box on the firewall and attach it with the screws.
  - (2) Connect the electrical connectors, cables, and ground strap to the power junction box.
  - (3) Install the cover on the power junction box.
  - (4) Connect the battery cables (UC001), and install the access plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**3. Component Removal/Installation**

- A. General Precautions and Notes.

**CAUTION:** Make sure that all electrical power is removed from the airplane and that the battery is disconnected before you work on components of the junction box.

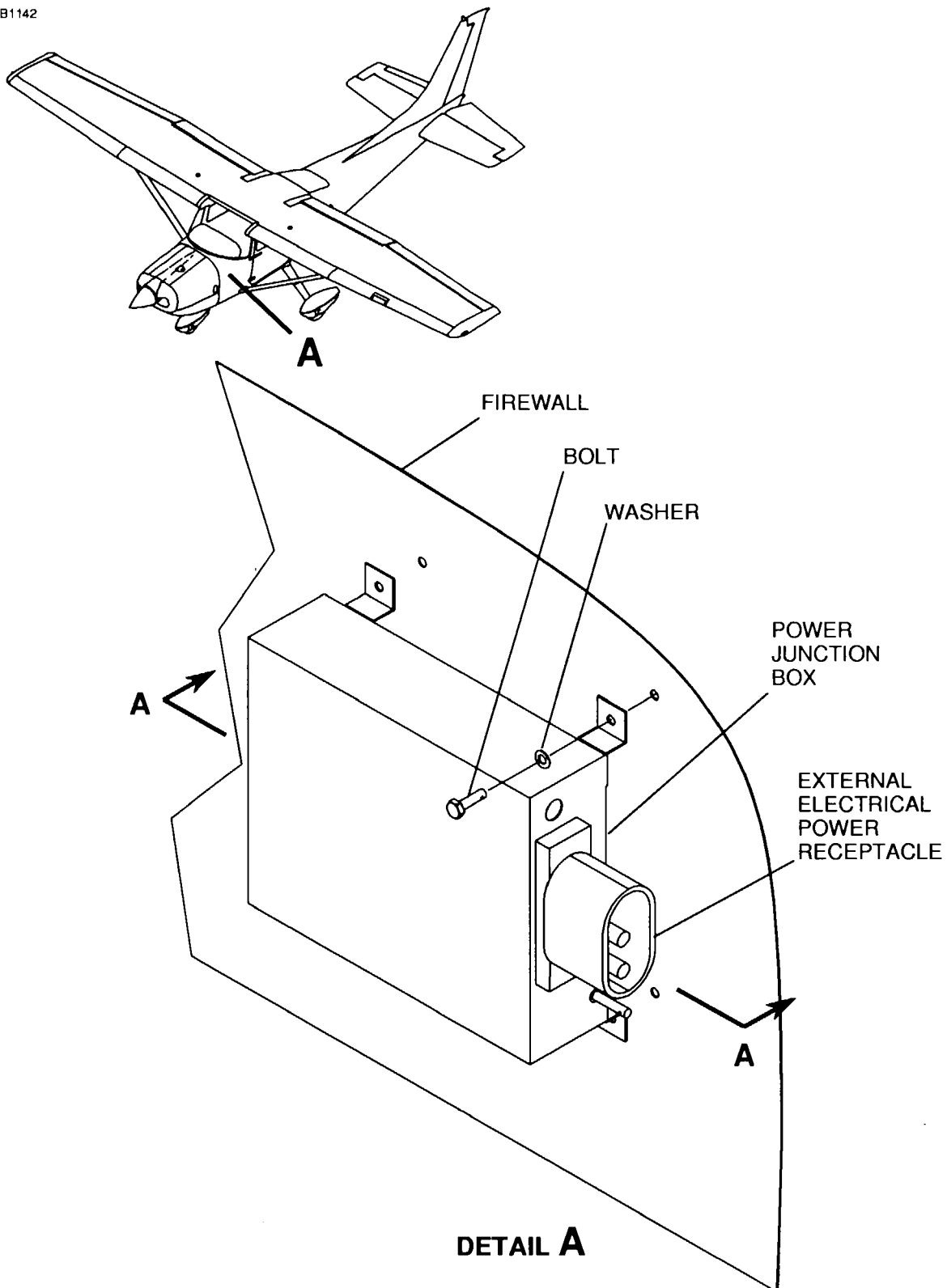
- (1) Individual components such as relays, transducers, and the alternator control unit can be replaced on an as-needed basis. Refer to the Model 182 Illustrated Parts Catalog for replacement part numbers.
- (2) Before you disconnect the wires, identify and put a label on the wires for later installation.
- (3) Torque values for ground and current-carrying studs can be found in Chapter 20, Torque Data - Maintenance Practices.

**4. Power Junction Box Troubleshooting**

- A. Complete the Power Junction Box Troubleshooting.
- (1) The power junction box troubleshooting is done with the Lamar TE04 MCU Test Set. Use the LI-0021 instructions. Refer to Electrical Power - General, Tools, Equipment, and Materials.

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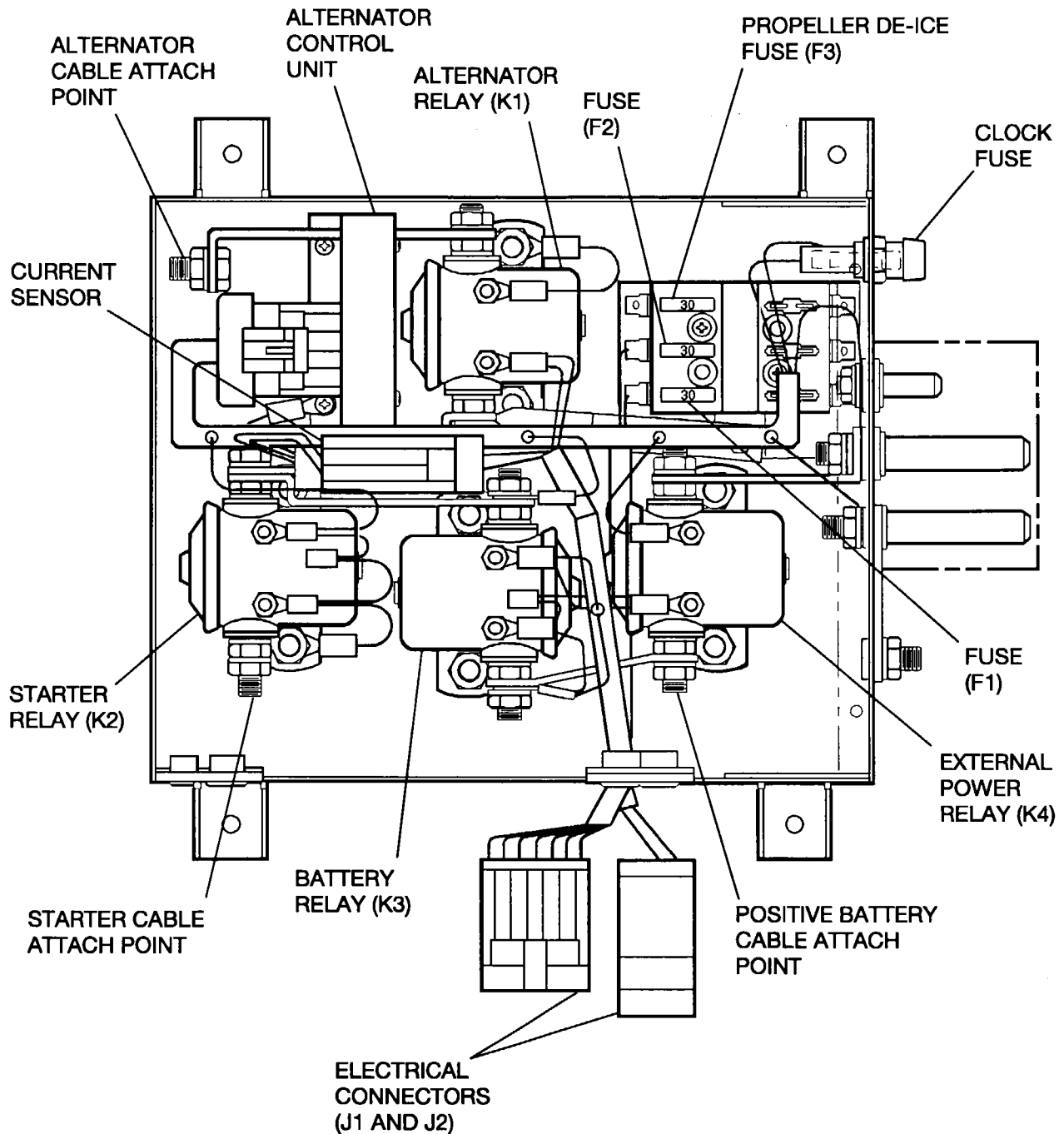
0710T1001  
A0558T1001

Power Junction Box Installation  
Figure 201 (Sheet 1)



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**VIEW A-A**

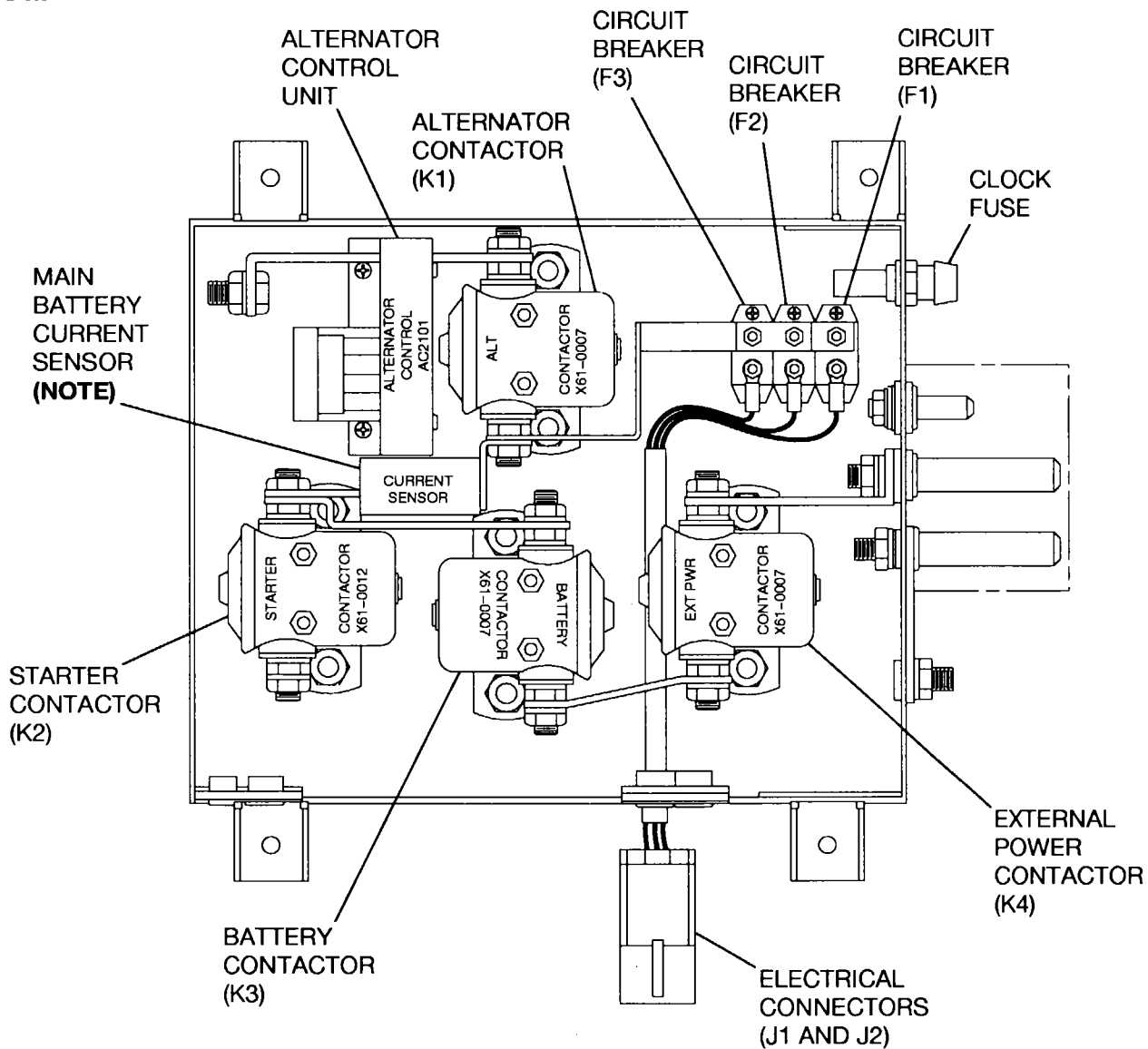
AIRPLANES 18280001 THRU 18280944

AA0558R1002

Power Junction Box Installation  
 Figure 201 (Sheet 2)

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**VIEW A-A**

AIRPLANES 18280945 AND ON AND  
 AIRPLANES T18208001 AND ON AND  
 AIRPLANES 18280001 THRU 18280944  
 INCORPORATING SB00-24-01

**NOTE:** CS3100 CURRENT SENSOR SHOWN  
 CS3200 CURRENT SENSOR SIMILAR  
 FOR J-BOXES MC01-3A(IC10) AND ON.

AA0558T1007

Power Junction Box Installation  
 Figure 201 (Sheet 3)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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**ALTERNATOR CONTROL UNIT - MAINTENANCE PRACTICES**

**1. General**

- A. The Alternator Control Unit (ACU) is found inside the power junction box, also referred to as a Master Control Unit (MCU) or J-Box. The alternator system includes the ACU, Alternator Contactor, and alternator field circuit. The ACU functions are as follows:
- (1) Alternator Voltage Regulation - The ACU controls the alternator field circuit to supply a main bus voltage of approximately 28.5 volts.
  - (2) Low Voltage Annunciation - The ACU monitors the main bus voltage in the power junction box and supplies an output for low voltage (less than 24.5 +0.35 or -0.35 volts) for the annunciation.
  - (3) Over-voltage Protection - The ACU monitors the main bus voltage in the power junction box and disengages the aircraft ALT FIELD circuit breaker. This removes the power from the alternator system if there is an over-voltage condition greater than 31.75 +0.5 or -0.5 volts.
  - (4) Reverse Alternator Current Protection - The ACU monitors the alternator output current and disengages the aircraft ALT FIELD circuit breaker. This removes the power from the alternator system if there is a reverse alternator current.
  - (5) Excess Field Current Protection - The ACU monitors the alternator field current and disengages the aircraft ALT FIELD circuit breaker. This removes the power from the alternator system if there is an excessive field current.

**2. Alternator Control Unit Removal/Installation**

- A. Remove the Alternator Control Unit. Refer to Power Junction Box - Maintenance Practices, Component Removal/Installation.
- B. Install the Alternator Control Unit. Refer to Power Junction Box - Maintenance Practices, Component Removal/Installation.

**3. Over-voltage Protection Circuit Test**

- A. General.
- (1) The ACU Over-voltage Protection Circuit must be tested in accordance with the time limits in Chapter 5, Inspection Time Limits. Use one of the two procedures that follow to do the test of the Over-voltage Protection Circuit. The recommended procedure uses the Lamar TE04 MCU Test Set. The external battery procedure can be used if a TE04 test set is not available.
- B. Over-voltage Protection Circuit Test with the Lamar TE04 MCU Test Set
- (1) Use a Lamar TE04 MCU Test Set and do steps 4.2, 4.3.A, 4.3.B, and 4.3.I in the Lamar's TE04 MCU Test Set instructions LI-0021 (refer to Electrical Power - General, Tools, Equipment, and Materials).
  - (2) If the ACU TRIP indicator on the TE04 MCU Test Set does not illuminate in step 4.3.I, the Over-voltage Protection Circuit is not operational.
    - (a) Replace the ACU.
    - (b) Do this test again.
  - (3) If the ACU TRIP indicator does illuminate in step 4.3.I, the Over-voltage Protection Circuit is operational.
    - (a) Complete the Lamar procedure 4.3.I.
    - (b) Remove the TE04 MCU Test Set.
    - (c) Continue with step D in this section.

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C. Over-voltage Protection Circuit Test with External Batteries

**NOTE:** It is necessary to use two general non-rechargeable 9 volt batteries in new condition to apply a temporary over-voltage condition on the ACU Sense wire. A locally fabricated battery test harness is also necessary. The test harness uses two 9-volt snap connectors and two insulated alligator clips. (Refer to Figure 201.) These components are available at most battery supply stores. For ground safety reasons, only general household 9 volt batteries which have a relatively low ampere rating are used.

- (1) Make sure the BAT MASTER, ALT MASTER, AVIONICS master, and all electrical system switches are in the OFF position.
- (2) Remove the upper cowl. Refer to Chapter 71, Cows – Maintenance Practices.
- (3) Disconnect the airplane 24 volt battery cables from the battery. Refer to Battery – Maintenance Practices.
- (4) Remove the cover from the power junction box.
- (5) Find the orange ACU sense wire attached to the upper Battery Contactor terminal inside the power junction box. Refer to Figure 201.
  - (a) Remove the nut, washer, and orange ACU sense wire ring terminal from the upper Battery Contactor terminal.

**NOTE:** The ACU sense wire is connected to Pin B in the ACU connector.

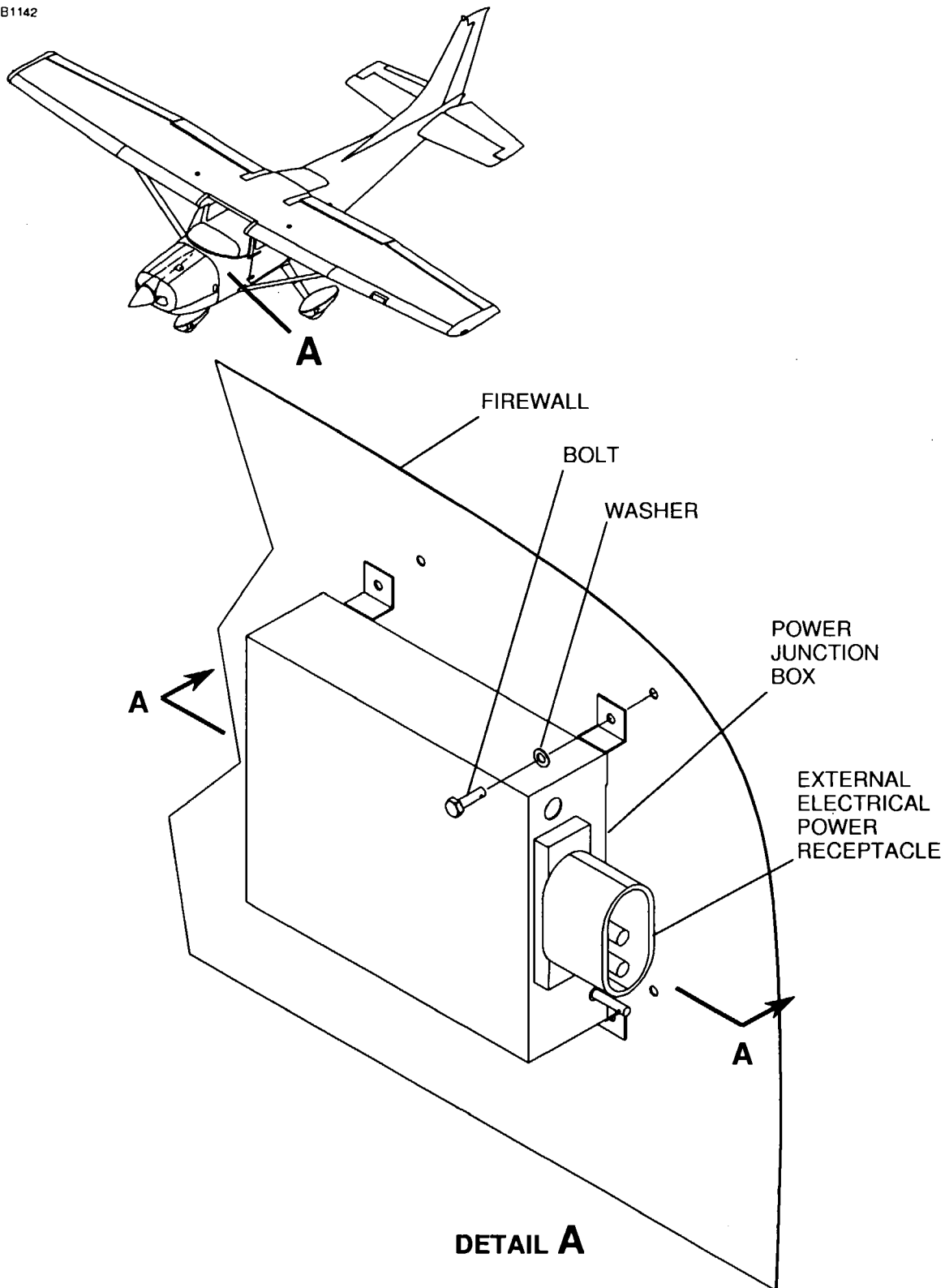
- (6) Connect the battery test harness in series with the orange ACU Sense wire and the upper Battery Contactor terminal as shown in Figure 201.
  - (a) Use tape or an equivalent as electrical insulation on the bare sense wire ring terminal.

**NOTE:** This will help prevent accidental electrical shorts.

- (7) Connect two new 9-volt batteries to the harness.
  - (a) Put the 9 volt batteries in position below the power junction box as shown in Figure 201.
- (8) Connect the airplane 24 volt battery cables to the battery. Refer to Battery – Maintenance Practices.
- (9) Make sure the ALT FIELD circuit breaker on the pilot's circuit breaker panel is engaged.
- (10) Put the BAT and ALT MASTER switches to the ON position for 5 seconds and then return to the OFF position.
  - (a) Make sure the ALT Field circuit breaker opens or the cap pops out.
  - (b) If the circuit breaker opens, the Over-voltage Protection circuit is operational. Continue with step 11.
  - (c) If the circuit breaker does not open, do step 10 a second time.
    - 1 Use a digital voltmeter and measure the voltage between the orange ACU sense wire ring terminal and the power junction box ground stud.
  - (d) If the circuit breaker does not open the second time and the ACU sense voltage is greater than 34 volts, the Over-voltage Protection Circuit is not operational.
    - 1 Replace the ACU.
  - (e) Do step 10 again after a new ACU is installed.
- (11) Engage the ALT Field circuit breaker.
- (12) Disconnect the airplane 24 volt battery cables from the battery. Refer to Battery – Maintenance Practices.
- (13) Disconnect the two 9-volt batteries from the harness.
- (14) Disconnect the battery test harness.
- (15) Install the nut, washer, and orange ACU sense wire ring terminal to the upper Battery Contactor terminal.
  - (a) Torque the terminal nut from 35 to 45 inch-pounds.
- (16) Install the cover on the power junction box.
- (17) Connect the airplane 24 volt battery cables to the battery. Refer to Battery – Maintenance Practices.
- (18) Install the upper cowl. Refer to Chapter 71, Cows – Maintenance Practices.
- (19) Continue with step D in this section.

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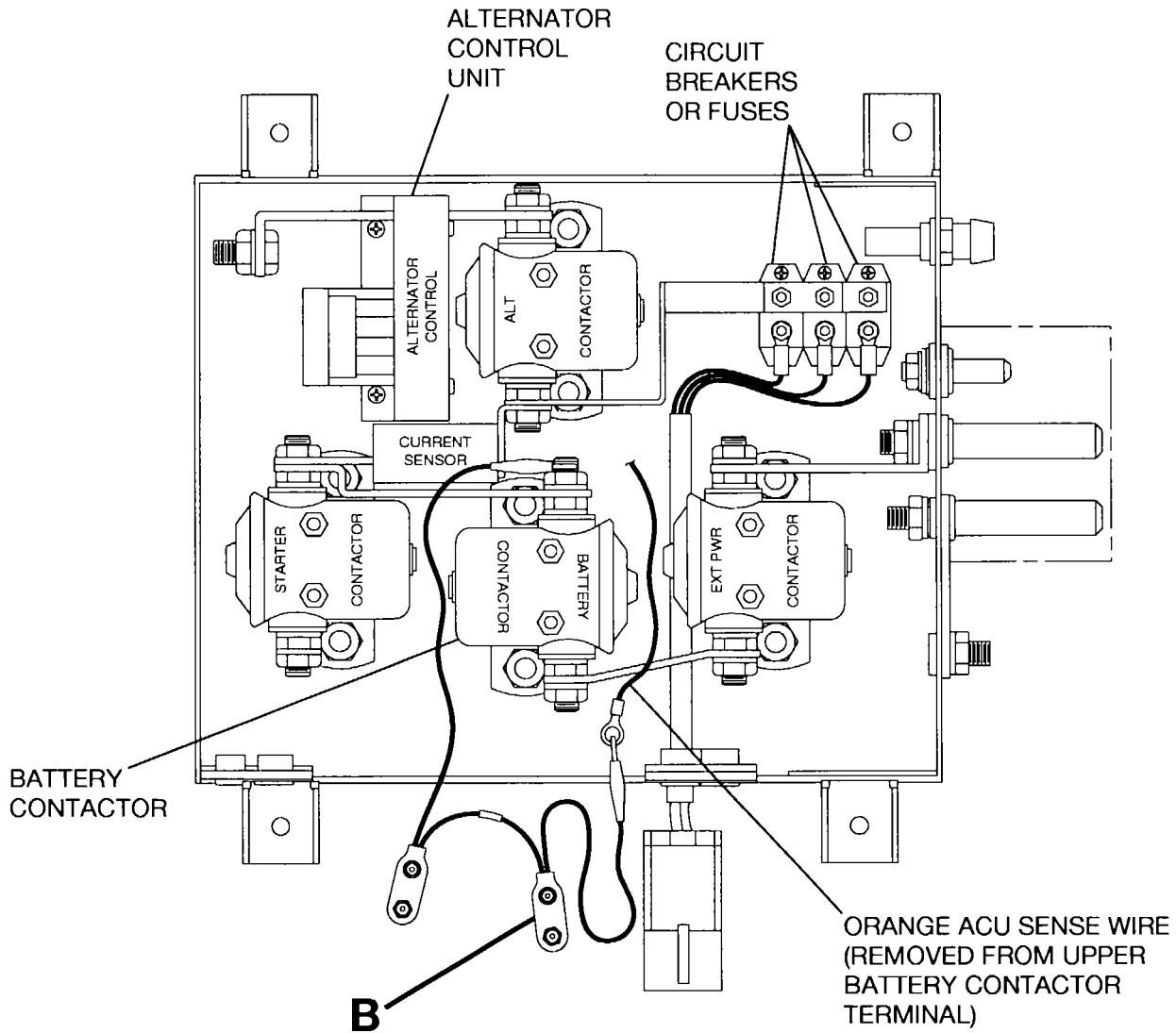
**DETAIL A**

0710T1001  
A0558T1001

Over-Voltage Protection Circuit Test with External Batteries  
Figure 201 (Sheet 1)

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**MODEL 182/T182**  
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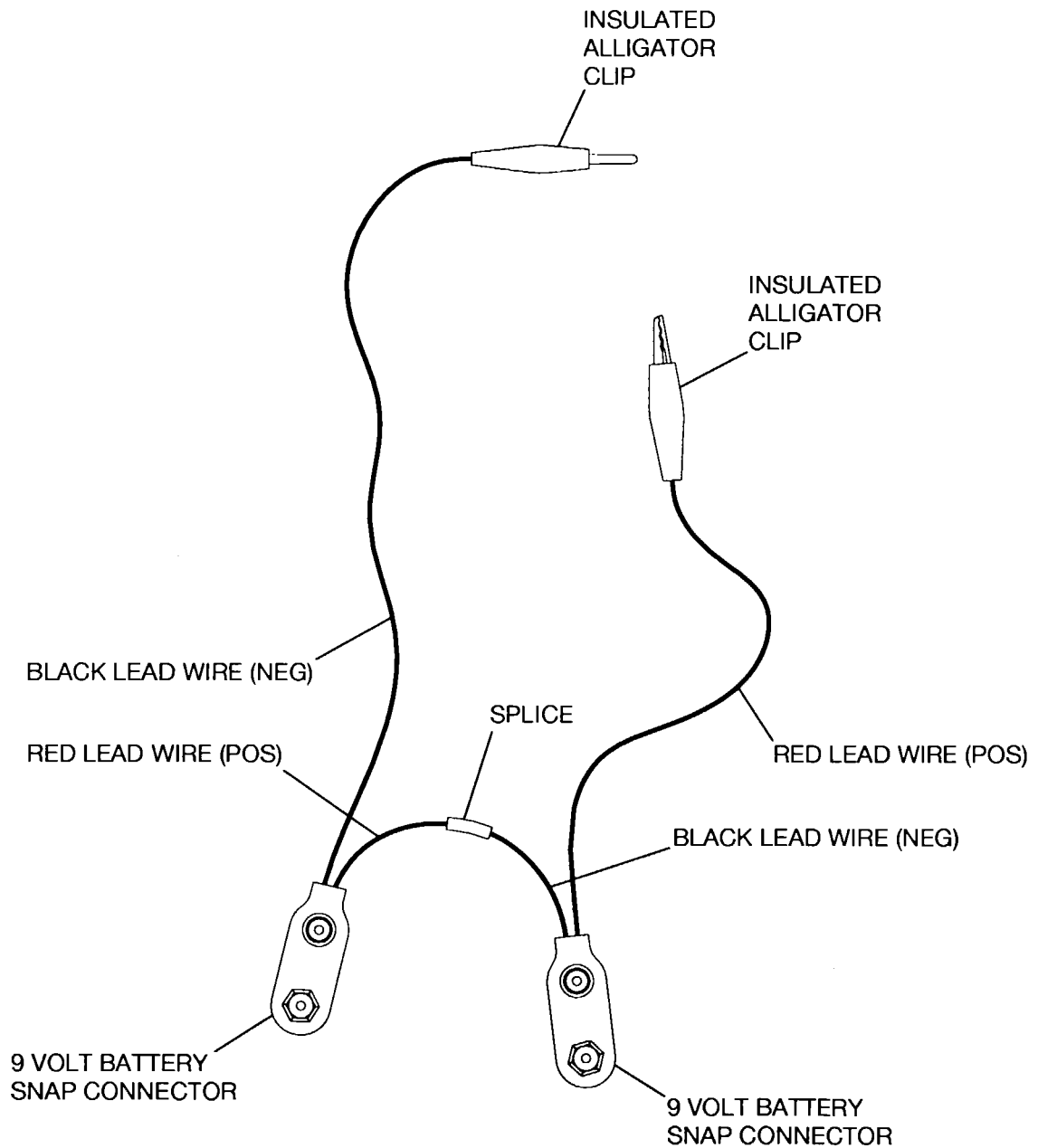
**VIEW A-A**

AA0558T1007

Over-Voltage Protection Circuit Test with External Batteries  
Figure 201 (Sheet 2)

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**MODEL 182/T182**  
MAINTENANCE MANUAL

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**DETAIL B**

B0558T1007

Over-Voltage Protection Circuit Test with External Batteries  
Figure 201 (Sheet 3)

# CESSNA AIRCRAFT COMPANY MODEL 182/T182 MAINTENANCE MANUAL

- D. Make sure of the correct ACU functions immediately after the next engine start.
  - (1) Start the engine in accordance with the Pilot's Operating Handbook, Starting Engine (Using Battery) procedure but make sure the ALT MASTER switch is in the OFF position.
  - (2) After the engine start and oil pressure check, set the engine RPM to idle.
  - (3) Make sure the Low Voltage annunciator is On.
  - (4) While you monitor the aircraft voltmeter, set the ALT MASTER switch to the ON position.
    - (a) If the voltmeter shows more than 29 volts, immediately set the ALT MASTER switch to the OFF position and stop the engine.

**NOTE:** The ACU regulation circuit is non operational. The ALT FLD circuit breaker should open if the voltage is more than 32 volts.

- 1 Replace the ACU and do the Over-voltage Protection Test again.
    - (b) If the voltmeter shows less than 29 volts, slowly increase the throttle to an engine speed of 1300 RPM.
  - (5) If the voltmeter shows approximately 28 volts at an engine speed of 1300 RPM the ACU regulation circuit is operational.
  - (6) Make sure the battery charge is shown on the aircraft battery ammeter.
  - (7) Make sure the LOW VOLTS annunciator is off.

#### 4. Alternator Control Unit Troubleshooting

- A. Complete the Alternator Control Unit Troubleshooting.
- (1) The Alternator Control Unit troubleshooting is done with the Lamar TE04 MCU Test Set. The instructions are contained in the test set. Refer to Electrical Power - General, Tools, Equipment, and Materials.



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**CIRCUIT BREAKER - MAINTENANCE PRACTICES**

**1. General**

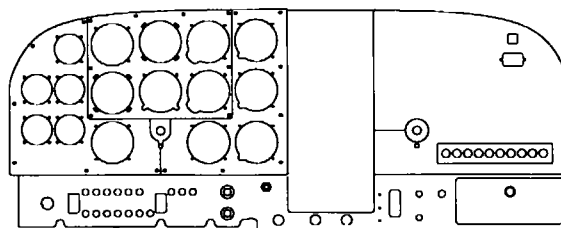
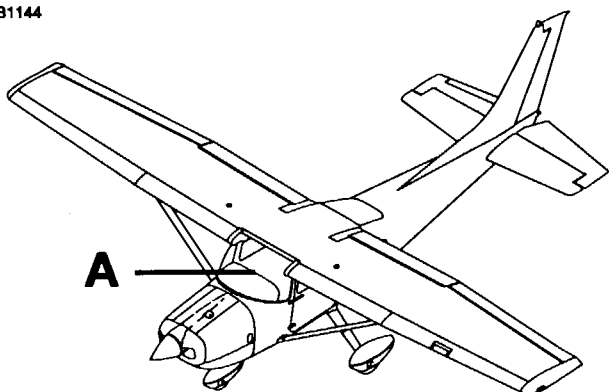
- A. The circuit breaker panel is on the left lower instrument panel, below the pilot's control wheel. The circuit breaker panel has electrical circuit breakers, the ignition/magneto switches, the master switch, the avionics master switch, and the light switches.

**2. Circuit Breaker Removal/Installation**

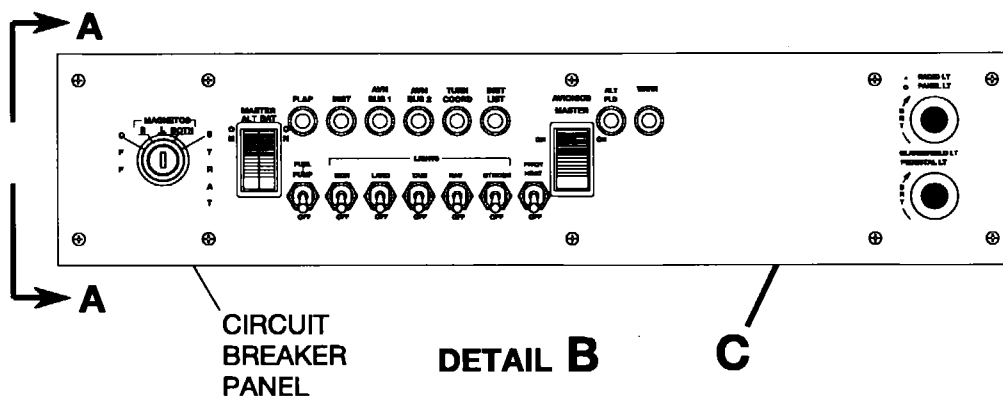
- A. Remove the Circuit Breaker (Refer to Figure 201 or Figure 202).
- (1) Remove the access/inspection plate (310AR) and disconnect the battery (UC001) cables. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) In the cockpit, remove the screws that attach the circuit breaker panel to the lower instrument panel.
  - (3) Remove the screws that attach the circuit breaker cover to the circuit breaker panel.
  - (4) Remove the circuit breaker cover.
  - (5) Put a label on the applicable circuit breaker wires.
  - (6) Disconnect the applicable circuit breaker wires.
  - (7) Remove the screws and the washers that attach the bus bar to the circuit breakers.
  - (8) Remove the bus bar.
  - (9) Remove the nut that attaches the circuit breaker to the circuit breaker panel.
  - (10) Remove the circuit breaker.
- B. Install the Circuit Breaker (Refer to Figure 201 or Figure 202).
- (1) Put the circuit breaker in the circuit breaker panel and attach the circuit breaker with the nut.
  - (2) Attach the bus bar to the circuit breakers with the screws and washers.
  - (3) Remove the labels and connect the wires to the circuit breakers.
  - (4) Install the circuit breaker cover assembly.
    - (a) Put three tie straps between the circuit breakers and the panel.
    - (b) Put the circuit breaker cover assembly over the circuit breakers.
    - (c) The flanges on the cover fit between the circuit breakers and the panel.
    - (d) The recessed areas in the cover must align with the screw holes in the panel.
    - (e) Put the main power bus wires and the circuit breaker panel assembly wire bundle out of the left side of the cover.
    - (f) Attach the cover with three tie straps.
  - (5) Attach the circuit breaker cover to the circuit breaker panel with the screws.
  - (6) Put the circuit breaker panel on the lower instrument panel and attach with the screws.
  - (7) Connect the battery cables (UC001) and install the access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

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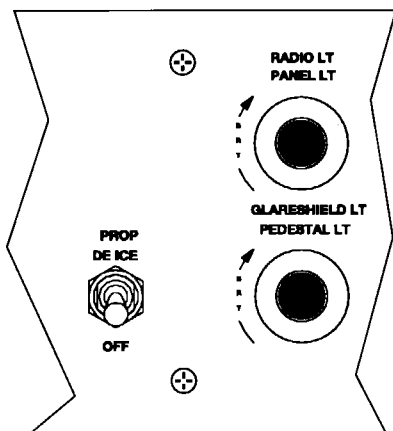
B1144



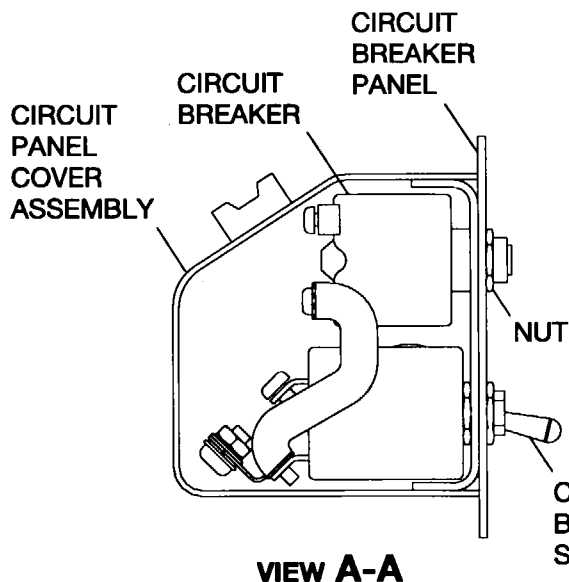
**DETAIL A**



**DETAIL B**



**DETAIL C**  
 PROPELLER DE-ICE  
 CIRCUIT BREAKER/  
 SWITCH (T182 ONLY)

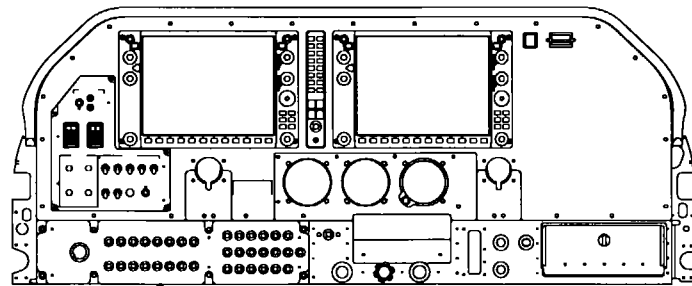
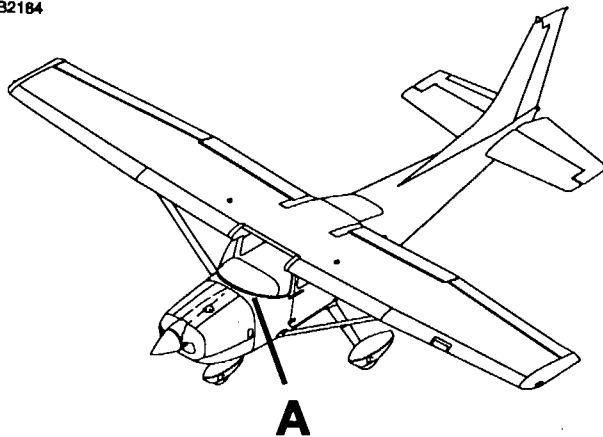


**VIEW A-A**

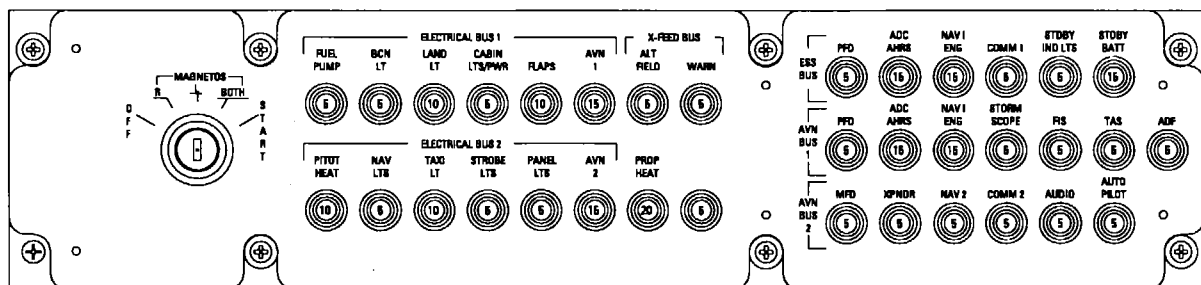
0710T1001  
 A0714T1041  
 AA0718T1059  
 B1218T1003  
 C1218T1003

Circuit Breaker Panel Installation  
 Figure 201 (Sheet 1)

**B2184**

**B**

### DETAIL A



## CIRCUIT BREAKER PANEL

### DETAIL B

## AIRPLANES WITH GARMIN G1000

0710T1001  
A0718T1053  
B0718T1054

Circuit Breaker Panel Installation  
Figure 202 (Sheet 1)

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**ESSENTIAL AND CROSSFEED BUS DIODES - MAINTENANCE PRACTICES**

**1. General**

- A. Airplanes that have the Garmin G1000 avionics system have an essential bus and a crossfeed bus. Airplanes without the Garmin G1000 avionics have only a crossfeed bus.
- B. The essential and crossfeed bus diodes are found on the circuit breaker panel. The diodes give power to the essential and crossfeed busses from the two primary busses, and at the same time isolate the two primary busses.

**2. Essential and Crossfeed Bus Diode Removal/Installation**

- A. Remove the essential or crossfeed bus diode. Refer to Figure 201.
  - (1) Remove the circuit breaker panel. Refer to Chapter 24, Circuit Breaker - Maintenance Practices.
  - (2) Carefully remove the heat shrinkable tubing from the diode.
  - (3) Remove the solder from the wire and from the diode. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
  - (4) Remove the nut and the washer from the diode.
  - (5) Remove the diode.
- B. Install the essential or crossfeed bus diode. Refer to Figure 201.
  - (1) Put the diode in position on the circuit breaker panel.
  - (2) Attach the diode with the nut and the washer to the circuit breaker panel.
  - (3) Install the heat shrinkable tubing over the wire. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Heat Shrinkable Tubing - Maintenance Practices.
  - (4) Add solder to attach the wire to the diode. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
  - (5) Apply heat to the heat shrinkable tubing with a heat gun until the tubing fits tightly around the wire and diode. Refer to Model 182 Wiring Diagram Manual, Chapter 20, Heat Shrinkable Tubing - Maintenance Practices.
  - (6) Install the circuit breaker panel. Refer to Chapter 24, Circuit Breaker - Maintenance Practices.

**3. Essential and Crossfeed Bus Diode Inspection**

**NOTE:** Do inspections of the essential and crossfeed bus diodes in accordance with the time limits given in Chapter 5, Inspection Time Limits.

**NOTE:** When the diodes are replaced, the inspections that follow (3A, 3B, or 3C) must be done to make sure that all of the diodes operate correctly.

**NOTE:** The Lamar TE04 MCU Test Set is used as an alternative to inspections 3A, 3B, or 3C. Refer to the Lamar TE04 MCU Test Set, instructions LI-0021 steps 4.3.A through 4.3.E.

- A. Do an inspection of the crossfeed bus diodes. Refer to Figure 201. The inspection procedure that follows is for power junction boxes that have primary bus fuses.

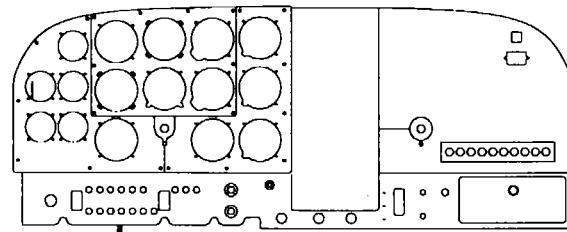
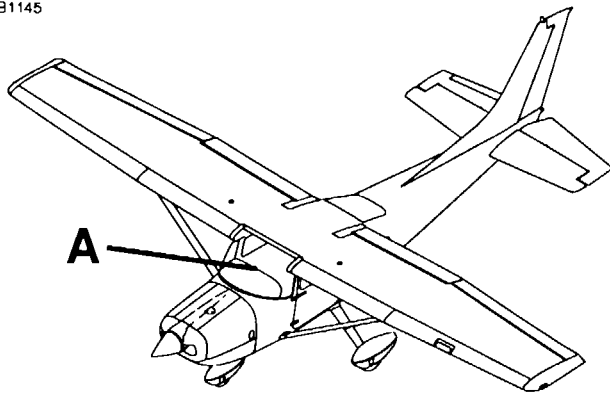
**NOTE:** Airplanes 18280945 and ON, Airplanes T18208001 and ON, and Airplanes 18280001 thru 18280944 incorporating SB00-24-01 do not use fuses in the power junction box.

**CAUTION:** Do not remove any fuses with the MASTER BAT switch in the ON position.

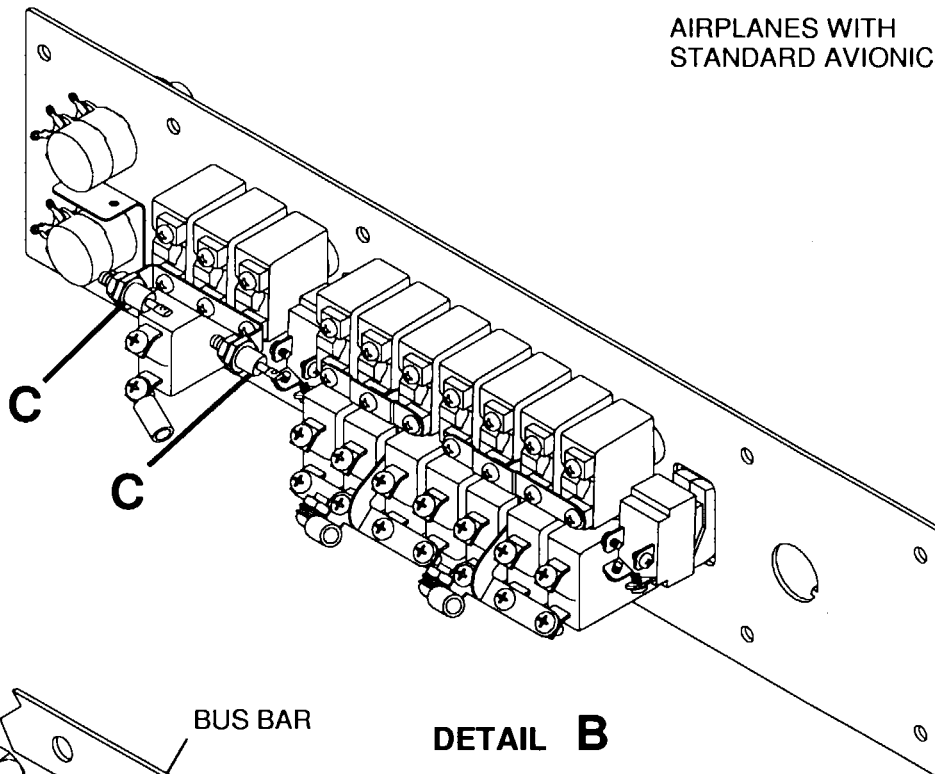
- (1) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (2) Make sure that the landing light, taxi light, and oil pressure annunciator come on.
- (3) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (4) Remove the screws that attach the power junction box cover.
- (5) Remove the junction box cover.
- (6) Remove the fuse (F1). Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (7) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.

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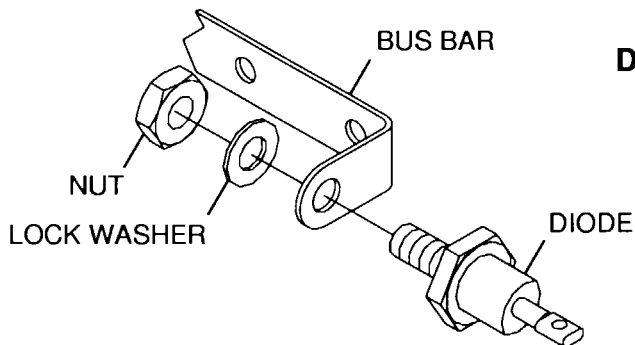
B1145



**B**  
**DETAIL A**  
 AIRPLANES WITH  
 STANDARD AVIONICS



**DETAIL B**



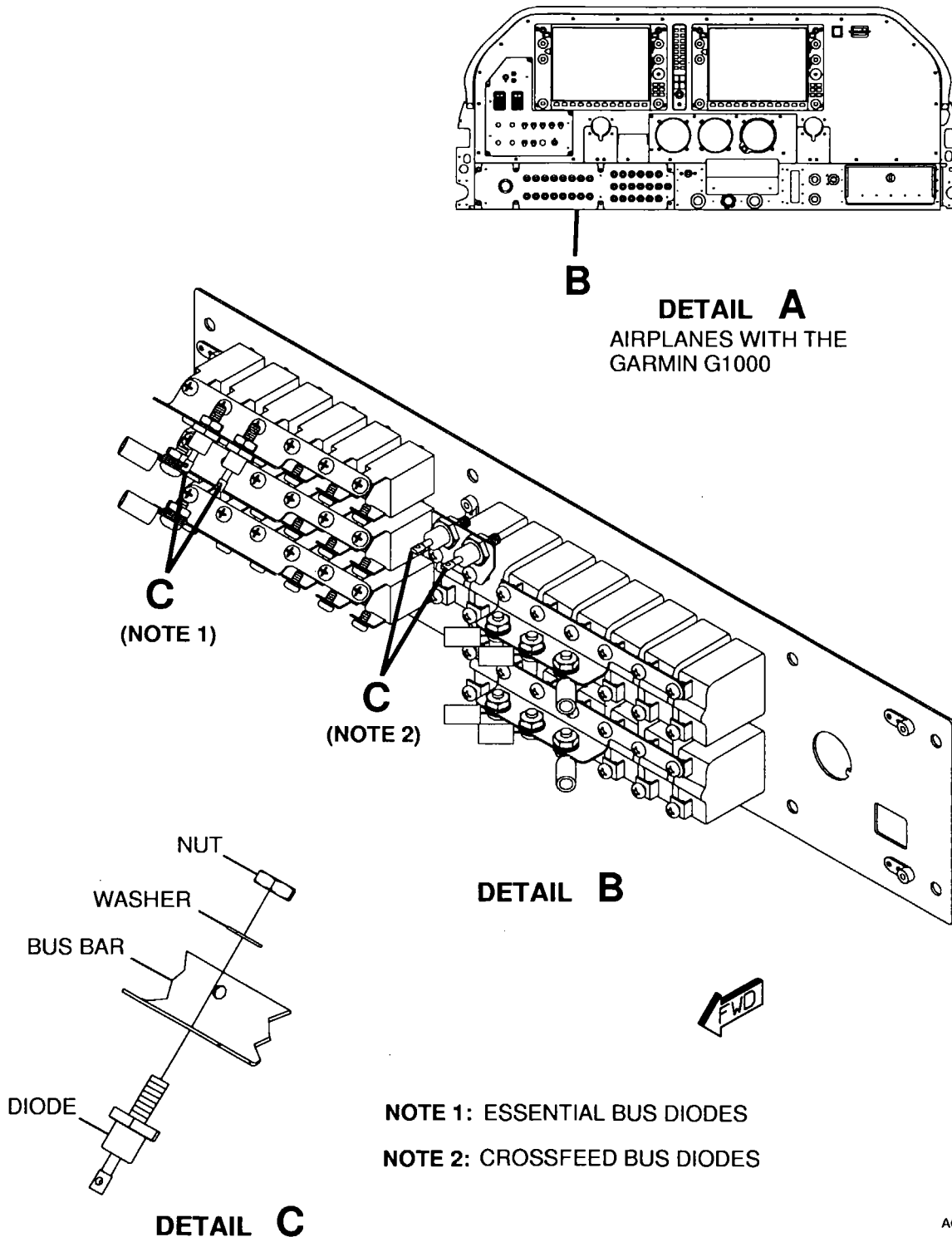
**DETAIL C**

0710T1001  
 A0714T1041  
 B0718T1057  
 C0718T1058

Essential Bus Diode Installation  
 Figure 201 (Sheet 1)

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B2245



Essential Bus Diode Installation  
Figure 201 (Sheet 2)

A0718T1053A  
B0718T1056  
C0718T1055

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- (8) Make sure that the landing light and oil pressure annunciator come on. If the taxi light comes on or the oil pressure annunciator does not come on, do a test of the crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (9) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (10) Install the fuse (F1) into the power junction box.

**NOTE:** If the fuse is pitted, arced, or does not fit tightly into the fuse receptacle, replace the fuse with one of the same type. Do not replace the fuse with a fuse with thinner blades.

- (11) Remove the fuse (F2). Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (12) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (13) Make sure that the taxi light and oil pressure annunciator come on. If the landing light comes on, or the oil pressure annunciator does not come on, do a test of the crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (14) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (15) Install the fuse (F2) into the power junction box.

**NOTE:** If the fuse is pitted, arced, or does not fit tightly into the fuse receptacle, replace the fuse with one of the same type. Do not replace the fuse with a fuse with thinner blades.

**NOTE:** If the diodes are replaced, do this test again to make sure that all the diodes operate correctly.

- (16) Install the junction box cover with the screws.

- B. Do an inspection of the crossfeed bus diodes. Refer to Figure 201. The inspection procedure that follows is for power junction boxes that have primary bus circuit breakers.

**NOTE:** The inspection procedure that follows is for airplanes without the Garmin G1000 avionics system.

**CAUTION:** Do not remove bus wires from the circuit breakers with the MASTER BAT switch in the ON position.

- (1) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (2) Make sure that the landing light, taxi light, and oil pressure annunciator come on.
- (3) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (4) Remove the screws that attach the power junction box cover.
- (5) Remove the power junction box cover.
- (6) Remove the hex nut and the lock washer that connect the bus wire to the circuit breaker (F1). Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (7) Remove the wire terminal from the F1 circuit breaker stud that has a label of AUX and isolate the end of the bus wire.
- (8) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (9) Make sure that the landing light and oil pressure annunciator come on. If the taxi light comes on or the oil pressure annunciator does not come on, do a test of the crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (10) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (11) Install the bus wire to the F1 circuit breaker terminal. Use the same hex nut and the washer that were removed.
- (12) Torque the nut to between 20 and 25 inch-pounds (between 2.3 and 2.8 N-m).
- (13) Remove the hex nut and the lock washer that connect the bus wire to the circuit breaker (F2). Refer to Power Junction Box - Maintenance Practices, Figure 201.

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- (14) Remove the wire terminal from the F2 circuit breaker stud with the label of AUX and isolate the end of the bus wire.
- (15) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (16) Make sure that the taxi light and the oil pressure annunciator come on. If the landing light comes on or the oil pressure annunciator does not come on, do a test of the crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (17) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (18) Install the bus wire to the F2 circuit breaker terminal with the hex nut and the washer that were removed. Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (19) Torque the nut to between 20 and 25 inch-pounds (between 2.3 and 2.8 N-m).

**NOTE:** If the diodes are replaced, do this test again to make sure that all the diodes operate correctly.

- (20) Install the junction box cover with the screws.

C. Do an inspection of the essential and crossfeed bus diodes. Refer to Figure 201. The inspection procedure that follows is for airplanes that have the Garmin G1000 avionics system.

**CAUTION:** Do not remove bus wires from the circuit breakers with the MASTER BAT switch in the ON position.

- (1) Set the battery MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (2) Make sure that the STDBY BATT switch and the AVIONICS master switch are in the OFF position.
- (3) Make sure that the landing and taxi lights come on.
- (4) Make sure that a minimum of 20 volts shows on the primary flight display (PFD) for the main and essential bus voltmeters.

**NOTE:** A minimum of 20 volts shows that there is power to the crossfeed and essential busses. The GEA-71 must be on to show the voltage of the crossfeed bus. If there are no red X's on the engine indicators, the GEA-71 is on.

- (5) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (6) Remove the screws that attach the power junction box cover to the power junction box.
- (7) Remove the power junction box cover.
- (8) Remove the hex nut and lock washer that connect the bus wire to the circuit breaker (F1). Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (9) Remove the wire terminal from the F1 circuit breaker stud that has a label of AUX and isolate the end of the bus wire.
- (10) Set the battery MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (11) Make sure that the landing light comes on and the main and essential bus voltages show a minimum of 20 volts on the PFD. If the taxi light comes on, the main and essential bus voltages do not show a minimum of 20 volts, or the PFD does not come on, do a test of the essential and crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (12) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (13) Install the bus wire to the circuit breaker (F1) terminal. Use the same hex nut and washer that was removed.
- (14) Torque the nut to between 20 and 25 inch-pounds (between 2.26 and 2.82 N-m).
- (15) Remove the hex nut and lock washer that connects the bus wire to circuit breaker (F2). Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (16) Remove the wire terminal from the F2 circuit breaker stud with the label of AUX and isolate the end of the bus wire.
- (17) Set the battery MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.



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- (18) Make sure that the taxi light comes on and the main and essential bus voltages show a minimum of 20 volts on the PFD. If the landing light comes on, or the main and essential bus voltages do not show a minimum of 20 volts, or if the PFD does not come on, do a test of the essential and crossfeed bus diodes with the diode test function of a digital multimeter to find which diodes must be replaced. Refer to Essential and Crossfeed Bus Diode Multimeter Test.
- (19) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the OFF position.
- (20) Install the bus wire to the circuit breaker (F2) terminal. Use the same hex nut and washer that was removed. Refer to Power Junction Box - Maintenance Practices, Figure 201.
- (21) Torque the nut to between 20 and 25 inch-pounds (between 2.26 and 2.82 N-m).

**NOTE:** If the diodes are replaced, do this test again to make sure that all the new diodes operate correctly.

- (22) Install the power junction box cover with the screws.

#### 4. Essential and Crossfeed Bus Diode Multimeter Test

**NOTE:** Do the essential or crossfeed bus diode inspection procedure applicable to your airplane before the test that follows is done. Refer to Essential and Crossfeed Bus Diode Inspection.

**NOTE:** The test that follows must be done only if required by the essential or crossfeed bus diode inspections. The replacement of all the essential and crossfeed diodes can be done as an alternative to the test procedure that follows.

A. Do a test of the essential and crossfeed bus diodes.

- (1) Remove the circuit breaker panel to get access to the essential and crossfeed bus diodes. Refer to Circuit Breaker - Maintenance Practices.
- (2) Remove the nut and washer from each diode. Refer to Figure 201.
- (3) Isolate the diode from the bus bar on the circuit breaker panel. Do not remove the heat shrinkable tubing or the wire from the diode.
- (4) Do a test of each diode with the diode test function of a Fluke 75, 77, or 87 digital multimeter (or equivalent digital multimeter with a diode test function).
  - (a) Connect the negative (-), or common lead of the meter to the threaded part of the diode and the positive (+) lead of the meter to the opposite end of the wire to which the diode is soldered. If the diode operates correctly, it will be conductive of an electric current and the meter will show the forward voltage drop of the diode (approximately 0.2 to 0.8 volts).
  - (b) Interchange the meter leads. Connect the positive (+) lead of the meter to the threaded part of the diode and the negative (-), or common lead of the meter to the opposite end of the wire to which the diode is soldered. If the diode operates correctly, it will not be conductive of an electric current and the meter will give an open circuit indication. This indication on the meter will be the same as if the leads are not connected.
  - (c) Replace each diode that does not give a satisfactory indication during the multimeter test. Refer to Essential and Crossfeed Bus Diode Removal/Installation.
- (5) Install the diodes that give a satisfactory indication during the multimeter test. Refer to Essential and Crossfeed Bus Diode Removal/Installation.

**NOTE:** When the diodes are replaced, do the applicable essential and crossfeed diode inspection (3A, 3B, or 3C) again to make sure that all the diodes operate correctly.

- (6) Install the circuit breaker panel. Refer to Circuit Breaker - Maintenance Practices.

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**ELECTRICAL LOAD ANALYSIS - DESCRIPTION AND OPERATION**

**1. General**

A. The tables give an electrical load analysis of some of the components used on the airplane.

Table 1. Components on all airplanes

<b>Component</b>	<b>Draw at 24.0 VDC (Amperes)</b>	<b>Draw at 28.0 VDC (Amperes)</b>
Landing Light (4596 Lamp)	7.65	8.93
Landing Light (4591 Lamp)	3.06	3.57
Landing Light (35 Watt HID)	1.65	1.41
Taxi Light (4587 Lamp)	7.65	8.93
Taxi Light (4626 Lamp)	4.59	5.36
Taxi Light (35 Watt HID)	1.65	1.41
Navigation Lights	2.65	3.1
Wing Anti-collision Lights (average value) (Qty. 2)	1.98	1.7
Beacon Light (peak value)	1.07	1.25
Under Wing Courtesy Lights (Qty. 2)	0.98	1.14
Pilot Overhead Light (1864 Lamp)	0.14	0.16
Pilot Overhead Light (LED Lamp)	0.02	0.02
Copilot Overhead Light (1864 Lamp)	0.14	0.16
Copilot Overhead Light (LED Lamp)	0.02	0.02
Passenger Overhead Light (1864 Lamp)	0.14	0.16
Passenger Overhead Light (LED Lamp)	0.02	0.02
Map Light	0.08	0.09
Instrument Light (2 and 3 inch round) (Each)	0.02	0.02
Oxygen Control/Gauge Light	0.02	0.02
Pedestal Lights (Qty. 2)	0.08	0.10
Flap Motor	2.06	2.4
Fuel Pump	2.74	3.2
Pitot Heat	3.33	3.89
Stall Warning Heat	1.46	1.7
Stall Warning Horn	0.4	0.35
Prop Heat	13.3	15.5
12V Cabin Power Converter (Peak 10A out)	6.33	5.42

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Table 1. Components on all airplanes (continued)

<b>Component</b>	<b>Draw at 24.0 VDC (Amperes)</b>	<b>Draw at 28.0 VDC (Amperes)</b>
Hourmeter	0.01	0.02
Battery Relay Coil	0.29	0.33
Start Relay Coil	0.85	N/A
Alternator Relay Coil	0.29	0.33
Alternator Field and ACU Power (Maximum)	1.63	1.9
ACU Bus Sense	0.02	0.02
Start Motor	100	N/A
Autopilot Computer (KAP 140)	0.58	0.5
Pitch Servo & Clutch	0.58	0.5
Pitch Trim Servo & Clutch	0.58	0.5
Roll Servo & Clutch	0.53	0.45
Turn Coordinator	0.27	0.33
Stormscope (WX-500)	0.93	0.8
ADF Receiver (KR 87)	0.6	0.52

Table 2. Components used only on airplanes that do not have Garmin G1000 installation.

<b>Component</b>	<b>Draw at 24 VDC (Amperes)</b>	<b>Draw at 28 VDC (Amperes)</b>
Glareshield Light (Fluorescent)	0.86	1
Glareshield Light (LED)	0.17	0.2
Radio Lights	0.17	0.2
Annunciator Panel (All annunciations on)	0.35	0.3
Avionics Fan	0.43	0.5
Engine and Fuel Gauges	0.38	0.45
Audio Panel (KMA-26) (Maximum)	1.5	1.29
Audio Panel (KMA-28) (Maximum)	1.5	1.29
MFD (KMD-550)	0.93	0.8
GPS (KLN 89/89B)	1.45	1.25
GPS (KLN 94)	1.4	1.2
Transponder (KT 73) (Maximum)	1.07	1.25
Transponder (KT 76) (Maximum)	0.6	0.7
Altitude Encoder (SSD120)	0.2	0.23
HSI (KCS 55A) (Maximum)	1.46	1.25

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Table 2. Components used only on airplanes that do not have Garmin G1000 installation. (continued)

<b>Component</b>	<b>Draw at 24 VDC (Amperes)</b>	<b>Draw at 28 VDC (Amperes)</b>
#1 Nav/Comm (KX 155A) (Receive)	0.8	0.69
#1 Nav/Comm (KX 155A) (Transmit) (Maximum)	6	6
#2 Nav/Comm (KX 165A) (Receive)	0.8	0.69
#2 Nav/Comm (KX 165A) (Transmit) (Maximum)	6	6

Table 3. Components used only on airplanes that have Garmin G1000 installation.

<b>Component</b>	<b>Draw at 24 VDC (Amperes)</b>	<b>Draw at 28 VDC (Amperes)</b>
Circuit Breaker Panel Light (LED)	0.06	0.07
Switch Panel Light (LED)	0.07	0.08
Avionics Panel Lights (MFD, PFD, A/P)	0.17	0.2
Throttle/Flap Panel Light (LED)	0.07	0.08
Standby Battery Main Volt Sense	0.001	0.001
Standby Battery Controller	0.007	0.008
Standby Battery Test	2	N/A
Main Bus Voltage Sense	0.001	0.001
Essential Bus Voltage Sense	0.001	0.001
Deck Skin Fan	0.28	0.33
PFD Fan	0.08	0.09
MFD Fan	0.08	0.09
#1 Comm (GIA 63) (Receive)	0.22	0.19
#1 Comm (GIA 63) (Transmit) (VSWR 3)	4.96	4.16
#2 Comm (GIA 63) (Receive)	0.22	0.19
#2 Comm (GIA 63) (Transmit) (VSWR 3)	4.96	4.16
#1 Nav (GIA 63)	0.94	0.8
#2 Nav (GIA 63)	0.94	0.8
PFD (GDU 1040)	1.46	1.25
MFD (GDU 1040)	1.46	1.25
AHRS (GRS 77)	0.29	0.25
Air Data Computer (GDC 74)	0.25	0.21
Engine/Airframe Unit (GEA 71)	0.2	0.17
Transponder (GTX 33)	1.17	1

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Table 3. Components used only on airplanes that have Garmin G1000 installation. (continued)

Component	Draw at 24 VDC (Amperes)	Draw at 28 VDC (Amperes)
Audio Panel (GMA 1347)	1.58	1.36
FIS (GDL 69A)	0.42	0.36
TAS (KTA 870)	1.34	1.15

**CHAPTER**

**25**

**EQUIPMENT/  
FURNISHINGS**

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**EQUIPMENT/FURNISHING - GENERAL**

**1. Scope**

- A. This chapter describes the interior equipment and furnishings used throughout the airplane. Also included in this chapter is information on the emergency locator transmitter (PT900) and the carbon monoxide detector.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following listed items:

NAME	NUMBER	MANUFACTURER	USE
Aeroflex Communications Test Set	IFR 4000	Aeroflex, Wichita Division 10200 West York Street Wichita, KS 67215-8935	To complete the functional test of the Artex ELT ME406 Emergency Locator Transmitter.
Spray Adhesive	Airtac 2	Advanced Materials Group 2542 East Del Amo Blvd. Box 6207 Carson, CA 90745	To adhere soundproofing and insulation to fuselage structure.
V23 System Diagnostic Tool	508668-201	Cessna Aircraft Co. Cessna Parts Distribution Department 701, CPD 2, 5800 East Pawnee Road Wichita, KS 67218-5590	Test of the inflatable restraint system.
SARSAT Beacon Test Set	453-0131	Artex PO Box 1270 Canby, OR 97013	To complete the functional test of the Artex ELT.
30-dB Attenuator			To test the ELT.

**3. Definition**

- A. The chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the subjects and sections incorporated in this chapter is as follows:
- (1) The section on Flight Compartment covers those items installed in the cabin area, including seats, seat belts, carpets and interior panels.
  - (2) The section on emergency equipment covers the emergency locator transmitter (PT900) installed behind the aft baggage compartment. It also covers the carbon monoxide detector installed forward of the instrument panel on airplanes that are equipped with Garmin G1000.
  - (3) The section on soundproofing and insulation covers the material used to deaden sound throughout the airplane.

## FRONT SEATS AND RAILS - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practices section covers removal and installation for the front seats and seat rails. For removal/installation of seat belts and harnesses, refer to Seat Belts/Restraints - Maintenance Practices. For removal/installation of the rear seats, refer to Rear Seat - Maintenance Practices.

**WARNING: If the airplane has AMSAFE inflatable restraints, do not do maintenance on the crew seats, seat rails, seat belts, or shoulder harnesses until you first look at and obey all applicable precautions and instructions supplied in AMSAFE publications and this maintenance manual. If you do not obey these instructions and safety precautions, damage to equipment and harm to personnel can occur.**

- B. If your airplane has the AMSAFE inflatable restraint system, do not do maintenance on the seats or the seat restraint system unless you first obey all applicable precautions and instructions in the E508804 Supplemental Amsafe Maintenance Manual and this Maintenance Manual. Refer to Inflatable Restraint System - Maintenance Practices.

### 2. Seat Removal/Installation

- A. Seat Removal (Refer to Figure 201).

**WARNING: If the airplane has AMSAFE inflatable restraints, do not remove seats with the seat belts buckled or the EMA connected. Damage can occur to the system and an accidental deployment of the system can cause injury.**

- (1) Disarm the AMSAFE Inflatable Restraints. Refer to AMSAFE Inflatable Restraint Disarm/Arm.  
(2) Remove the seat stops from the front and aft of the two seat tracks.  
(3) Unlatch the seat from the seat track and move the seat forward on the seat track until the forward roller clears the seat track.  
(4) Move the seat aft on the seat track until the aft rollers clear the seat track.  
(5) Remove the seat from the airplane.
- B. Seat Installation (Refer to Figure 201).  
(1) Put the aft roller of the seat in position on the seat track.  
(2) Move the seat forward on the seat track until you can install the front roller on the seat track.

**WARNING: Make sure the seat stops are set correctly. Incorrectly installed seat stops can let the seat move during flight, with the result of serious injury or death.**

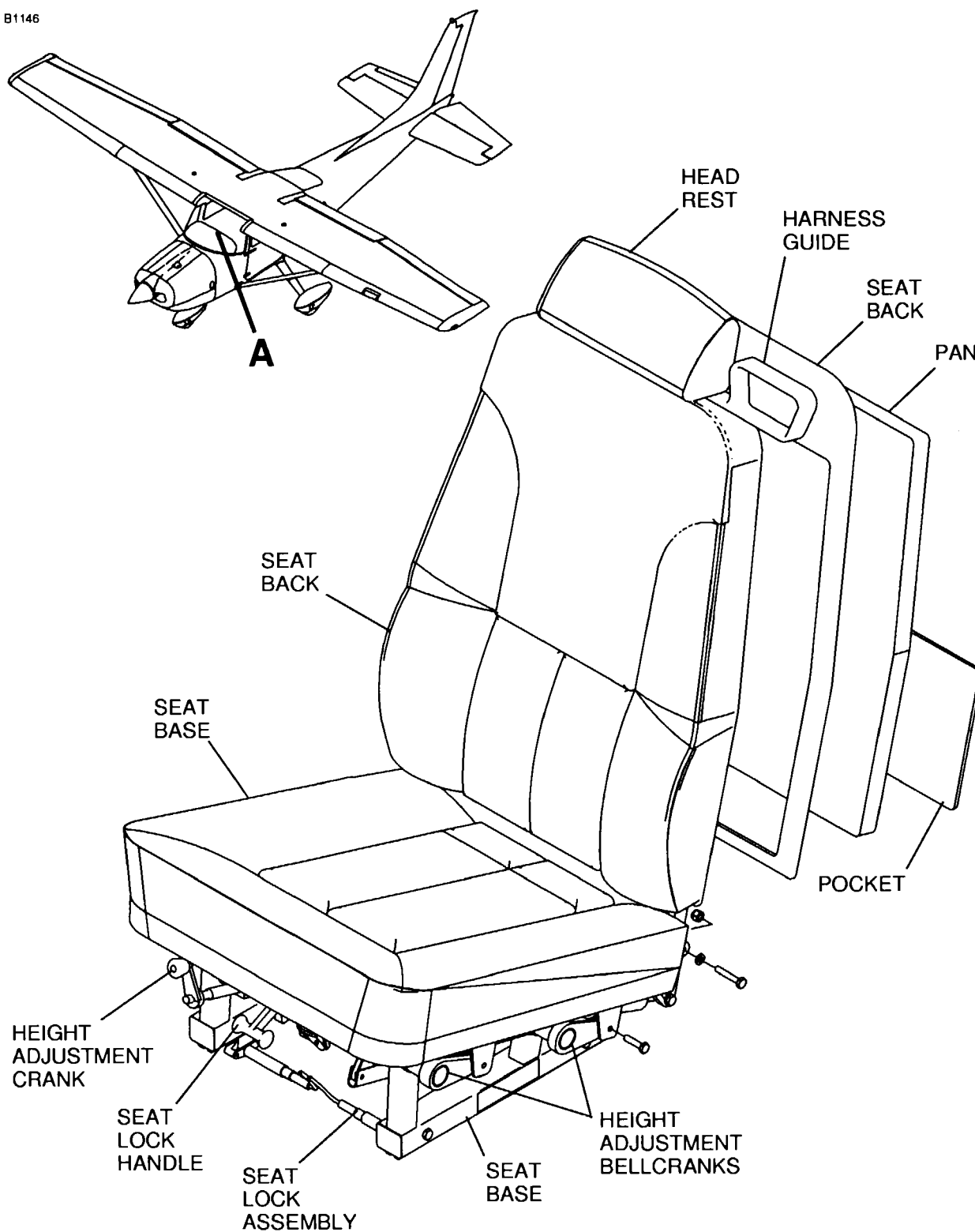
- (3) Install the seat stops to the front and the rear of the seat track.  
(4) Make sure that the seat stops are installed correctly.  
(5) Do a test of the seat through the full range of motion to make sure of the correct operation.  
(6) Arm the AMSAFE Inflatable Restraints. Refer to AMSAFE Inflatable Restraint Disarm/Arm.

### 3. Seat Rail Removal/Installation

- A. Seat Rail Removal (Refer to Figure 202).  
(1) Remove the bolts that attach the seat rails to the fuselage.
- B. Seat Rails Installation (Refer to Figure 202).  
(1) Install the seat rails to the fuselage with the bolts.

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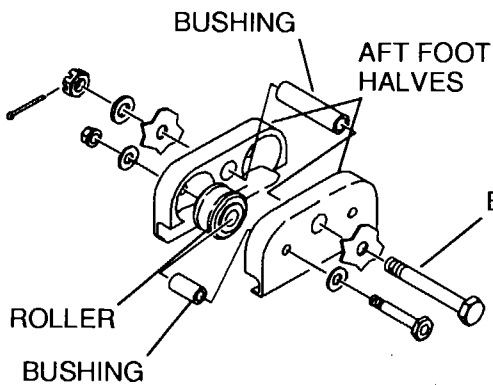
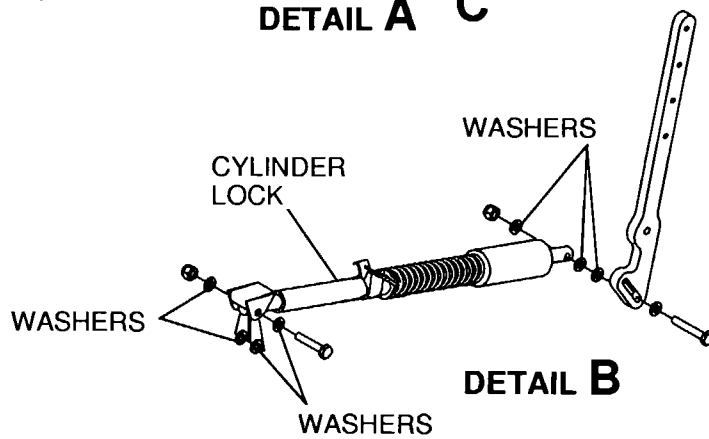
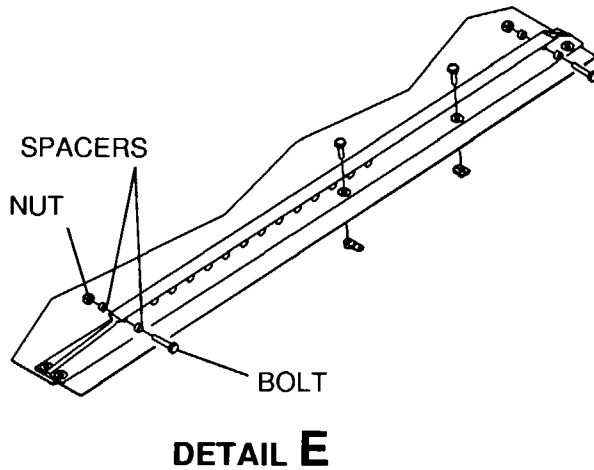
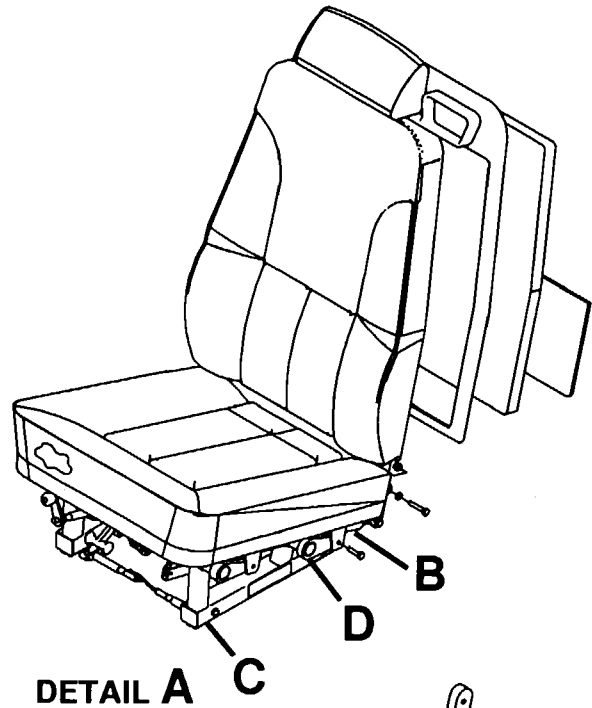
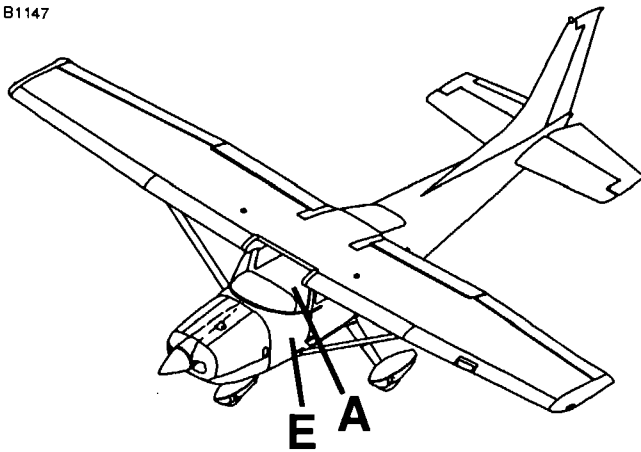
**DETAIL A**

Seat Installation  
Figure 201 (Sheet 1)

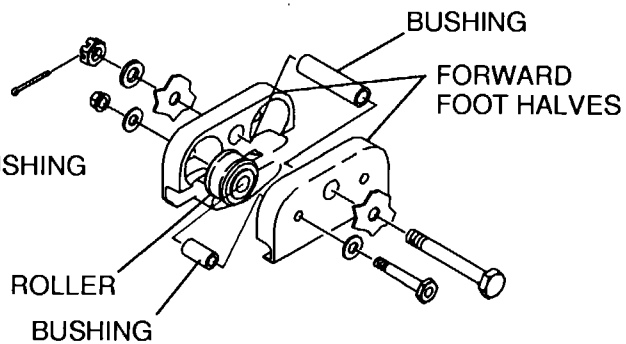
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**DETAIL D**  
 AFT FOOT ASSEMBLY



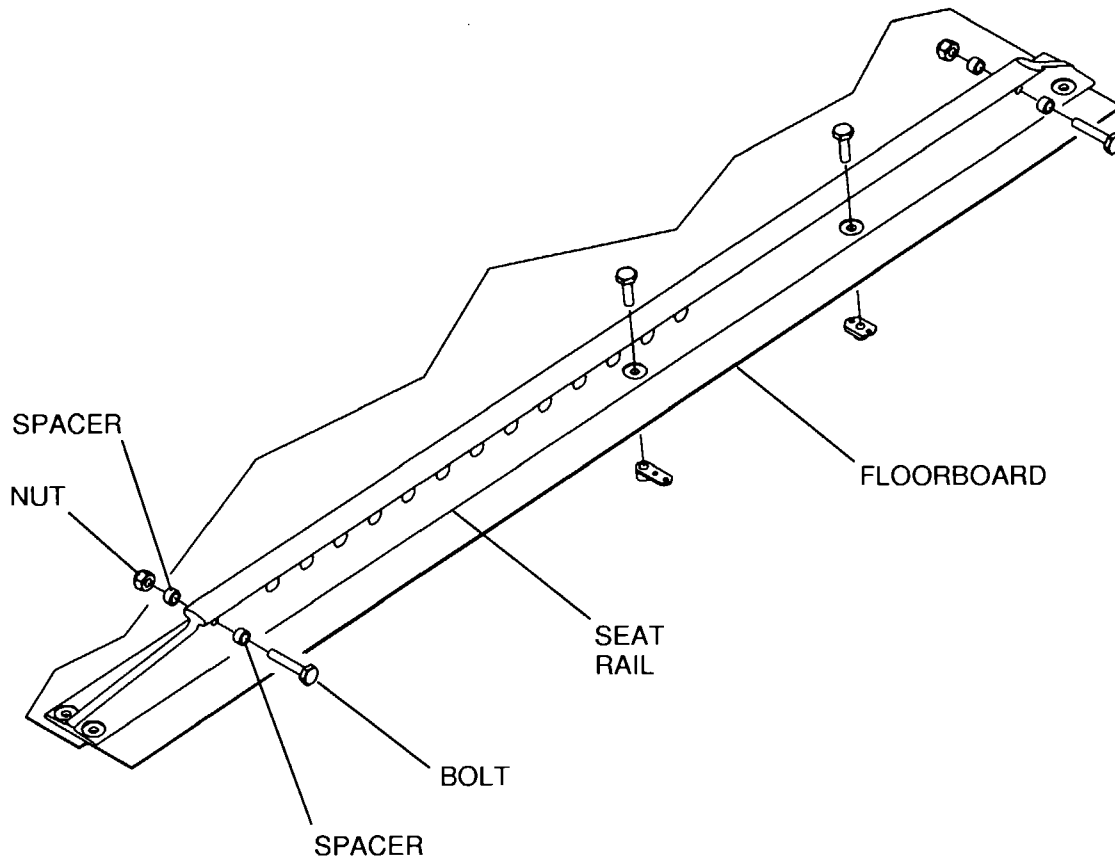
**DETAIL C**  
 FORWARD FOOT ASSEMBLY

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Seat Installation  
 Figure 201 (Sheet 2)

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**WARNING: IT IS EXTREMELY IMPORTANT THAT PILOT'S SEAT STOPS ARE INSTALLED, SINCE ACCELERATION AND DECELERATION COULD POSSIBLY PERMIT SEAT TO BECOME DISENGAGED FROM SEAT RAILS AND CREATE A HAZARDOUS SITUATION, ESPECIALLY DURING TAKEOFF AND LANDING.**

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Seat Stop Installation  
Figure 202 (Sheet 1)

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**MAP COMPARTMENT - MAINTENANCE PRACTICES**

**1. General**

- A. This maintenance practices section consists of removal and installation of the map compartment.

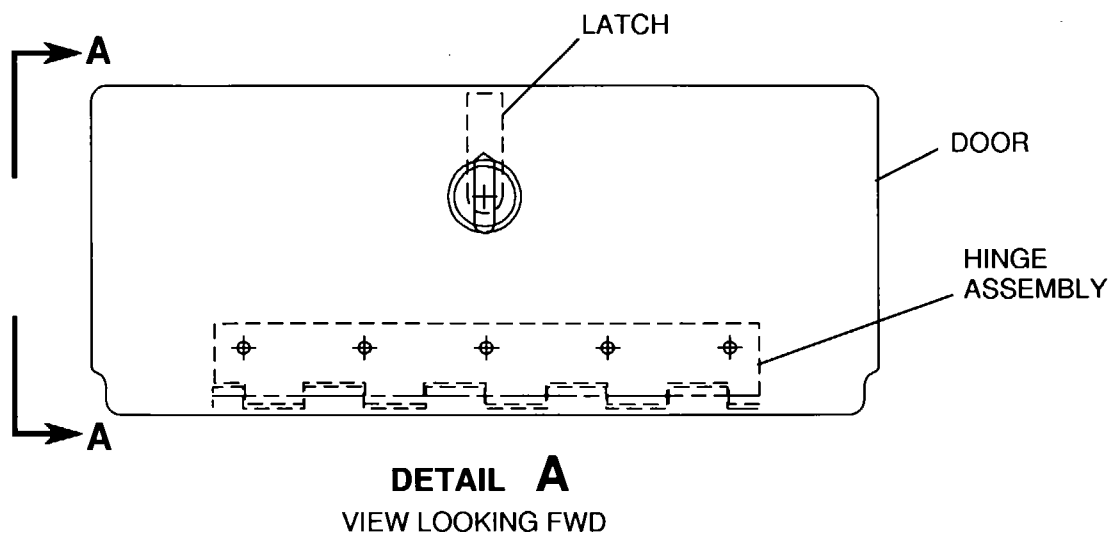
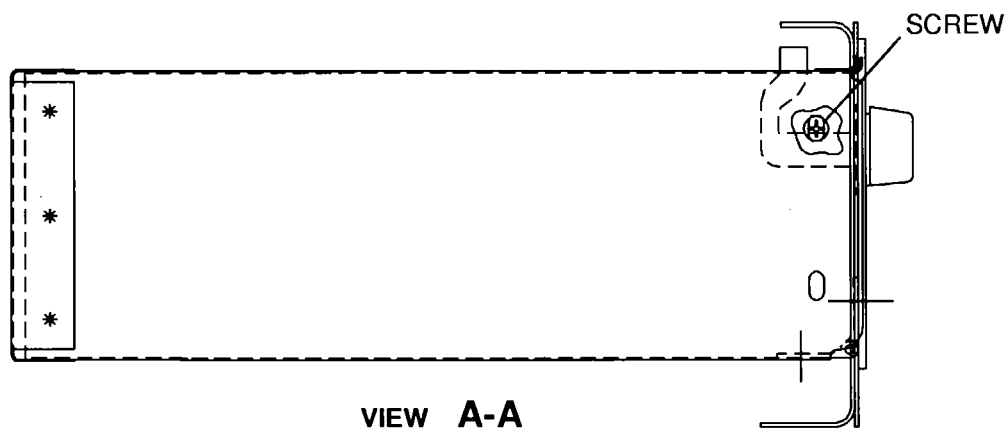
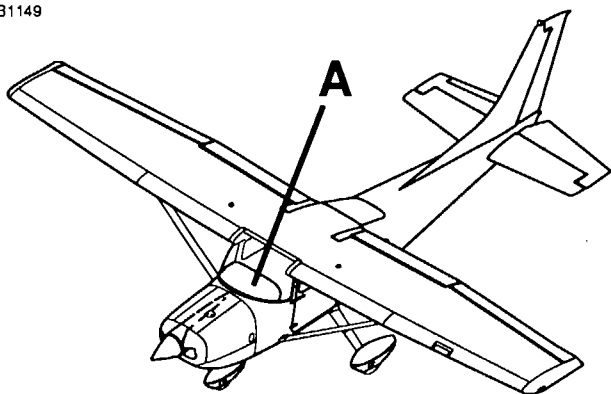
**2. Map Compartment Removal/Installation**

- A. Remove Map Compartment (Refer to Figure 201).  
(1) Remove interior screws securing map compartment to instrument panel structure.
- B. Install Map Compartment (Refer to Figure 201).  
(1) Place map compartment in position and secure to instrument panel structure using screws.



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Map Compartment Installation  
Figure 201 (Sheet 1)

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**SEAT BELTS/RESTRAINTS - MAINTENANCE PRACTICES**

**1. General**

- A. The airplane has inertia style reels which let the user lean forward, but will lock in position with sudden movement. The seat belts retract and stow in position when not in use. This maintenance practices section covers removal and installation for restraints used in both the front and rear positions.
- B. The restraint system components are non-repairable field items. If any component in the restraint system is not operating correctly, the system must be replaced.

**WARNING: If the airplane has AMSAFE inflatable restraints, do not do maintenance on the seat belts until you look at and obey all applicable precautions and instructions supplied in AMSAFE publications and this Maintenance Manual. If you do not obey and follow these instructions and safety precautions, damage to equipment and harm to personnel can occur.**

- C. If your airplane has the AMSAFE inflatable restraint system, do not do maintenance on the seats or the seat restraint system unless you first obey all applicable precautions and instructions in the E508804 Supplemental Amsafe Maintenance Manual and this Maintenance Manual. Refer to Inflatable Restraint System - Maintenance Practices.

**2. Seat Belt/Restraints Removal and Installation**

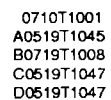
**NOTE:** The seat belt/restraint assembly removal/installation is typical for restraints in all locations.

- A. Pilot's and Copilot's Seat Belt/Restraint Removal (Refer to Figure 201).
  - (1) Remove the access cover on the overhead console to get access to the restraint inertia reel assemblies.
  - (2) Remove the nuts, bolts, and washers that attach the inertia reel assemblies to the bracket assembly.
  - (3) Remove the nuts, washers, bolts, and spacers that attach the restraint assemblies to the seats.
- B. Pilot's and Copilot's Seat Belt/Restraint Installation (Refer to Figure 201).
  - (1) Attach the restraint inertia reel assemblies to the bracket assembly above the overhead console with the bolts, washers, and nuts.
  - (2) Install the access cover on the overhead console.
  - (3) Attach the restraint assemblies to the seats with the bolts, washers, spacers, and nuts.
  - (4) Do a check of the system for correct installation and operation.
- C. Bench Seat Restraint Removal (Refer to Figure 201).
  - (1) Remove the bolt and the washer that attach the seat restraint inertia reel to the aft cabin structure.
  - (2) Remove the bolts, washers, and spacers that attach the restraint inertia reels to the seat frame.
- D. Bench Seat Restraint Installation (Refer to Figure 201).
  - (1) Attach the restraint inertia reels to the seat frame with the spacers, washers, and bolts.
  - (2) Attach the restraint inertia reels to the aft cabin structure with the washers and the bolts.

**3. Restraint Testing**

- A. Inspect the restraint system in accordance with the time intervals set forth in Chapter 5, Inspection Time Limits. In addition to these scheduled inspections, the restraint assemblies have life limits. Refer to Chapter 5, Component Time Limits.

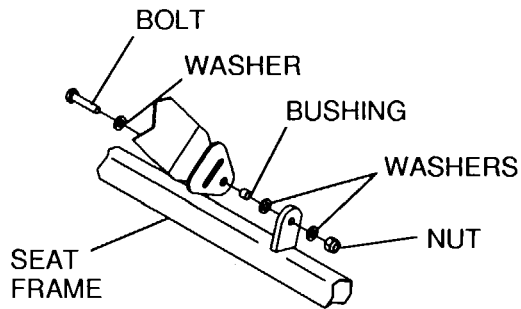
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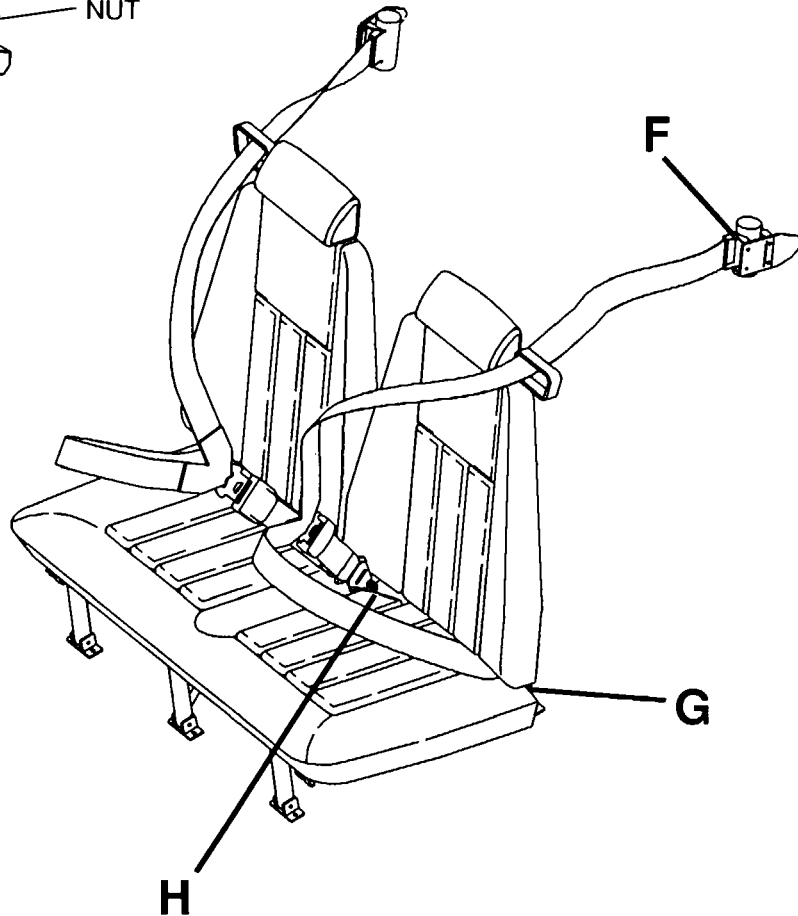
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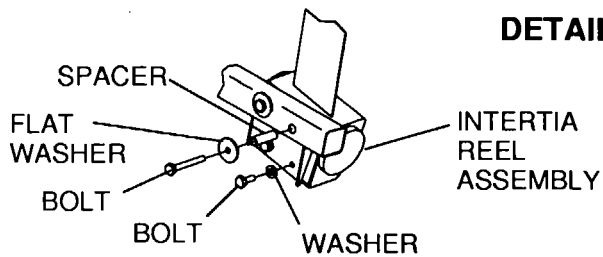
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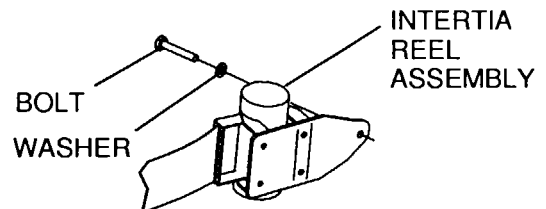
**DETAIL H**



**DETAIL E**



**DETAIL G**



**DETAIL F**

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Seat Belts and Restraints Installation  
 Figure 201 (Sheet 2)

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**INFLATABLE RESTRAINTS - MAINTENANCE PRACTICES**  
**Airplanes with AMSAFE Inflatable Restraint System**

**1. General**

- A. This section gives maintenance information for the AMSAFE Aviation Inflatable Restraint (AAIR). The AAIR is a self-contained, modular, three-point restraint system that protects occupants from head-impact injury during an accident. The AAIR system has four core components: the air bag assembly, the inflator assembly, the electronics module assembly (EMA), and the cable interface assembly.

**WARNING:** Do not try to open the inflator assembly. Do not apply an electric current to the electronics connection. The inflator assembly is a stored, gas/energetic material device and can cause injury if accidentally deployed.

**2. Inflatable Restraint Component Cleaning**

- A. AMSAFE recommends that the AAIR components be cleaned on a regular (annual) basis. Buildup of dirt and unwanted material can cause problems with system operation, decrease the life of the system, and cause corrosion of the metal parts in the system. Clean the belt assembly, hoses, cables, inflation device/cap assembly, and the EMA.

**CAUTION:** Use care to keep contamination and cleaning agents away from the hardware assemblies.

**CAUTION:** Do not let any part of the AAIR soak in any solution. This can cause damage to the AAIR system. Do not use too much water when you clean the AAIR parts. Too much water can cause damage to the internal components and cause them to be unserviceable.

**CAUTION:** Only use sufficient cleaning agent to make minimal suds. Excess soap must be removed before the part is installed in the system.

**CAUTION:** Do not dry the belt assembly in sunlight or near any source of heat. Do not dry clean the belt assembly. Do not put the belt assembly fully into water.

**CAUTION:** Keep the isopropyl alcohol away from the webbing, air bag cover, and the gas hose material.

**CAUTION:** Do not use soap or water on metal parts.

- (1) Clean non-metallic parts with warm water and a household soap/laundry detergent and a moist cloth.
- (2) Flush the parts with clear water on a clean cloth.
- (3) Use a soft brush, and cold soapy solution to clean the webbing, air bag cover, and gas hose by hand. Use a household liquid soap or detergent
- (4) Let the belt assembly dry by air.
- (5) Clean all spacers, washers, nuts, and bolts with a lint-free cloth and isopropyl alcohol.
- (6) Cover the cable opening into the EMA with pieces of cloth. Clean the inflator and cables by hand with a lint-free cloth and a cold water and mild soap solution.

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### 3. Inflatable Restraint - Inspection

- A. Do an inspection of the AAIR system parts.
  - (1) Air bag assembly.
    - (a) Make sure that the attachments are tightly connected.
    - (b) Do a visual inspection for dirt, oil, grease, or other unwanted material.
    - (c) Do a check for wear on the edges of the belt.
    - (d) Do a check for damage of the stitching or fabric threads.
    - (e) Do a check for holes or wear on the air bag cover.
    - (f) Do a check of the end fittings, buckle, and connector for cracks, dents, or corrosion.
  - (2) Inflator hose.
    - (a) Do a check for frayed edges, wear, or tears.
  - (3) Cable interface assembly.
    - (a) Make sure that all attachments are tightly connected.
  - (4) Inflator assembly.
    - (a) Do a check for loose mounting hardware.
    - (b) Do a check of the hose connection.
    - (c) Do a check of the electrical connection.
  - (5) Electronics module assembly (EMA).
    - (a) Do a check for loose connections and mounting hardware.

### 4. Storage of Spares

- A. Inflator Assembly.

**NOTE:** The maximum continuous storage time for the inflator assembly is seven years from the date of manufacture. After seven years, send the inflator assembly to AMSAFE Aviation for inspection and repair.

- (1) Keep the inflator assembly in a cool and dry area. The inflator assembly must be kept at a temperature between -22°F and 131°F (-30°C and 55°C).
- (2) Keep the inflator assembly away from sunlight, dust, moisture, and other contamination.
- (3) Keep the inflator assembly away from high electromagnetic, radio frequency, and electrostatic environments.
- (4) Obey all local storage regulations.

- B. Electronics Module Assembly (EMA).

**NOTE:** The maximum continuous storage time for the EMA is seven years from the date of manufacture. After seven years, send the EMA to AMSAFE Aviation for inspection and repair.

- (1) Keep the EMA assembly in a cool and dry area. The EMA assembly must be kept at a temperature between -22°F and 131°F (-30°C and 55°C).
- (2) Keep the EMA away from sunlight, dust, moisture, and other contamination.
- (3) Keep the EMA away from high electromagnetic, radio frequency, and electrostatic environments.
- (4) Obey all local storage regulations.

- C. Air Bag Assembly.

- (1) Keep the air bag assembly in a cool and dry area. The air bag assembly must be kept at a temperature between -22°F and 131°F (-30°C and 55°C).
- (2) Keep the air bag assembly away from sunlight, dust, moisture, and other contamination.

### 5. AMSAFE Inflatable Restraint Disarm/Arm

- A. Disarm the AMSAFE Inflatable Restraints.
  - (1) Make sure all seat belts are unbuckled.
  - (2) Find the end-release connector at the seat base.
  - (3) Remove the tie straps that attach the cable and end-release connector.

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- (4) Disconnect the end-release connector to disable the inflatable restraint.
- B. Arm the AMSAFE Inflatable Restraints.
  - (1) Connect the end-release connector.
  - (2) Attach the cable and end-release connector to the seat frame with tie wraps.

**6. Inflatable Restraint - Removal/Installation**

**WARNING: Keep all magnetic fields away from the EMA during the removal and installation procedure. Accidental deployment of the system can cause injury.**

- A. Restraint System Removal (Refer to Figure 201).

**WARNING: Do not remove seats from the airplane with the seat belts buckled or the electronic module assembly (EMA) connected. Damage can occur to the system, and accidental deployment of the system can cause injury.**

**WARNING: Do not connect the EMA to the cable interface assembly unless the EMA is mounted to the airplane structure.**

- (1) Disarm the AMSAFE inflatable restraints. Refer to AMSAFE Inflatable Restraint Disarm/Arm.
- (2) Disconnect the squib connector from the inflator assembly.
- (3) Disconnect the gas hose from the inflator assembly.

**NOTE:** The gas hose barb has a layer of Loctite and is tightly attached to the fitting. Use soft-grip channel-lock type pliers to hold the barb while you disconnect the hose

- (4) Loosen the clamps on the inflator assembly mounting bracket.
- (5) Remove the inflator assembly from the mounting bracket.
- (6) Put shipping caps on the inflator hose connector fitting (Refer to Table 201).

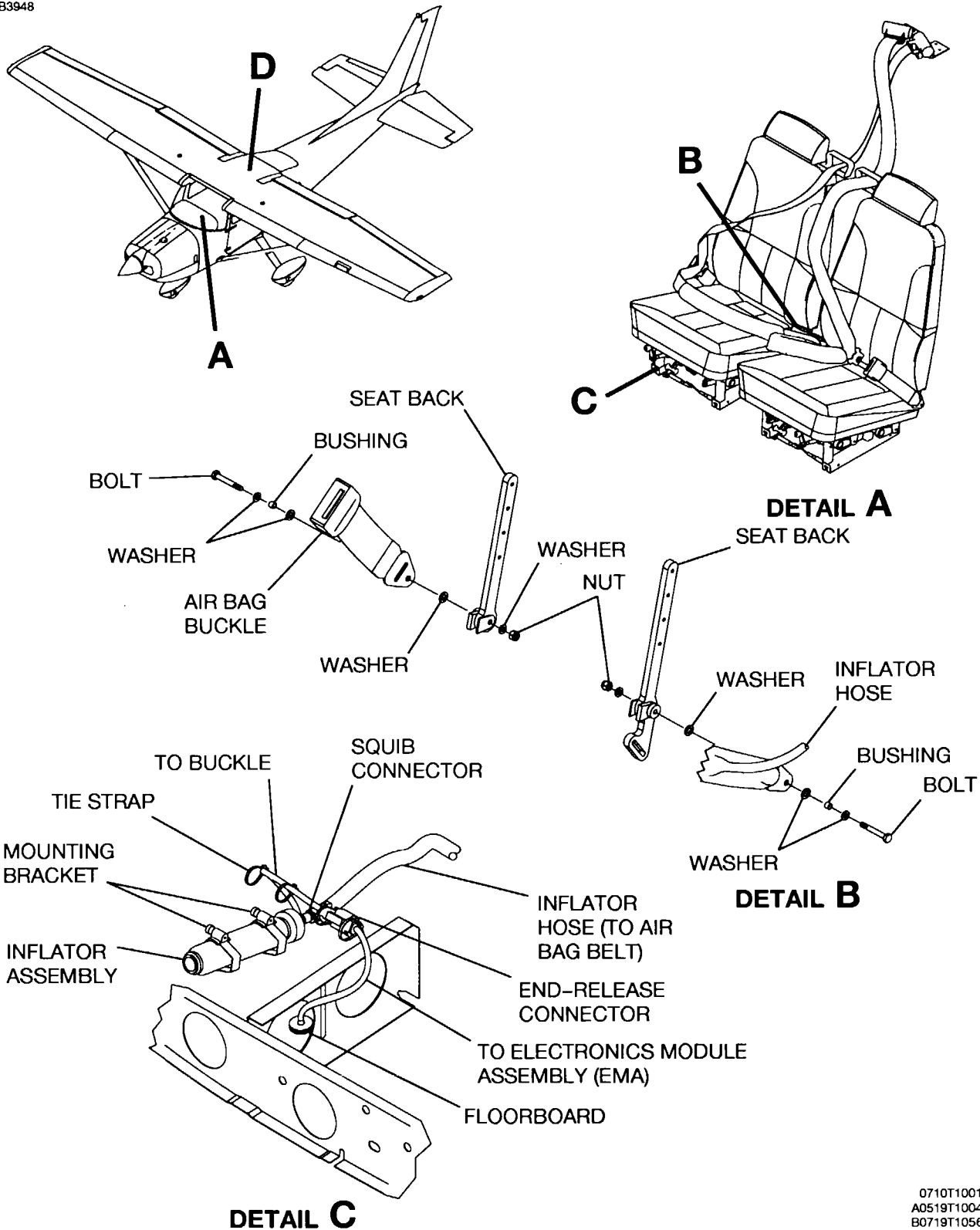
Table 201. Torque Values and Tool Sizes

PART DESCRIPTION	RELATED SUBASSEMBLY	TOOL AND SIZE	TORQUE (IN. LBS.)
Inflator Shipping Cap	Inflator Assembly	Torque Wrench (In. Lb. type)	5 - 10
Hose Connection to the Inflator	SAA/Inflator Assembly	Torque Wrench (In. Lb. type)	110 - 130

- (7) Remove the inertia reel (three-point air bag belt) from the airplane. Refer to Chapter 25, Seat Belts/Restraints- Maintenance Practices.
- (8) Remove the end-release buckle assembly from the airplane. Refer to Chapter 25, Seat Belts/ Restraints - Maintenance Practices.
- (9) Disconnect the cable interface assembly from the EMA.
  - (a) Push down on the locking clip on the EMA connector and pull on the connector.
- (10) Remove the cable interface assembly from the airplane.
- (11) Remove the EMA from the aircraft.
  - (a) Remove the nuts, washers and bolts that attach the EMA to the floorboard.
  - (b) Carefully remove the EMA from the aircraft.

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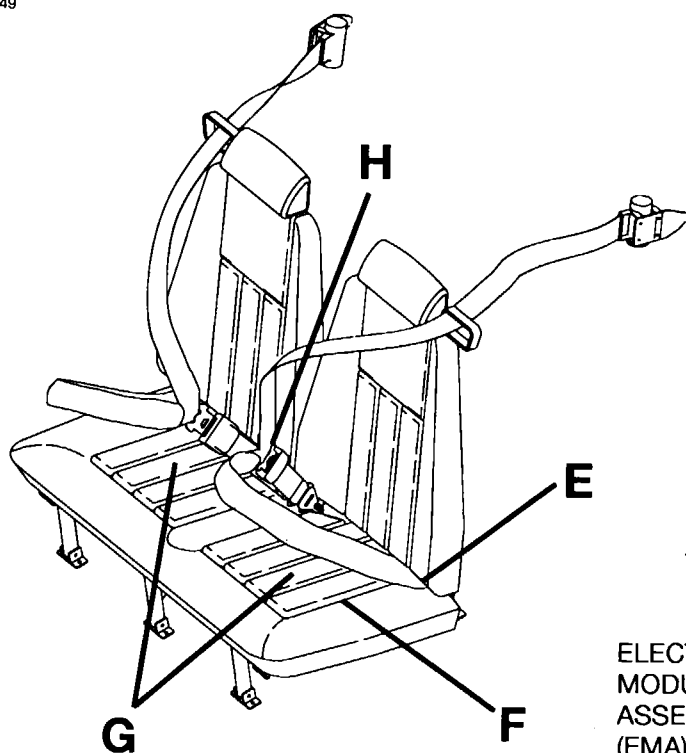


AMSAFE Aviation Inflatable Restraint System  
 Figure 201 (Sheet 1)

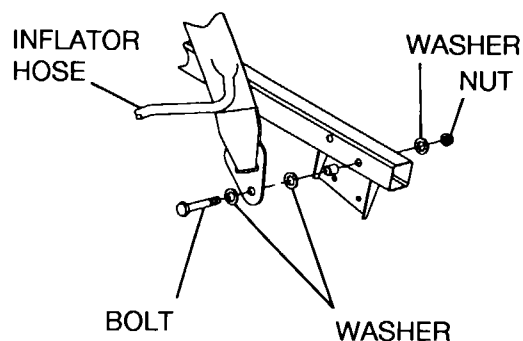


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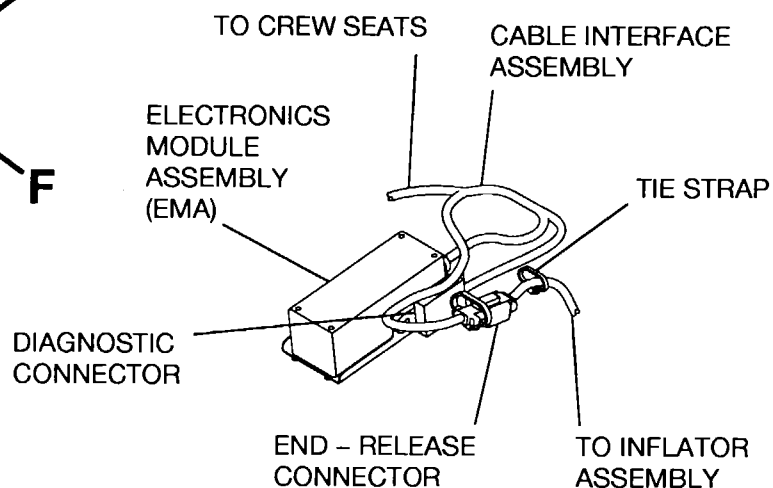
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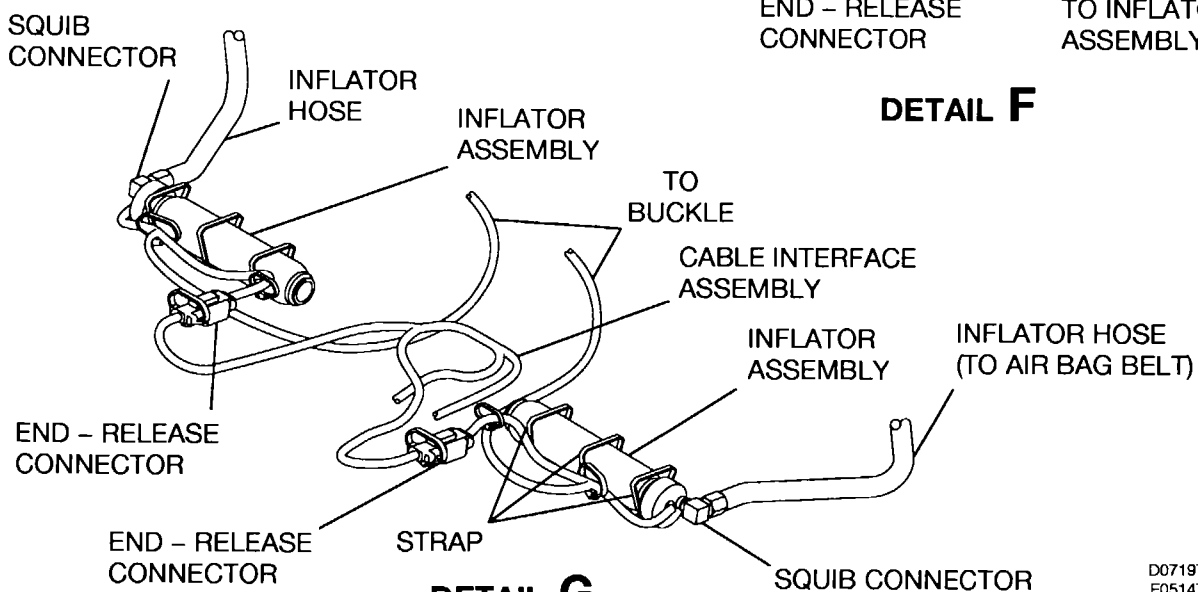
**DETAIL D**



**DETAIL E**



**DETAIL F**



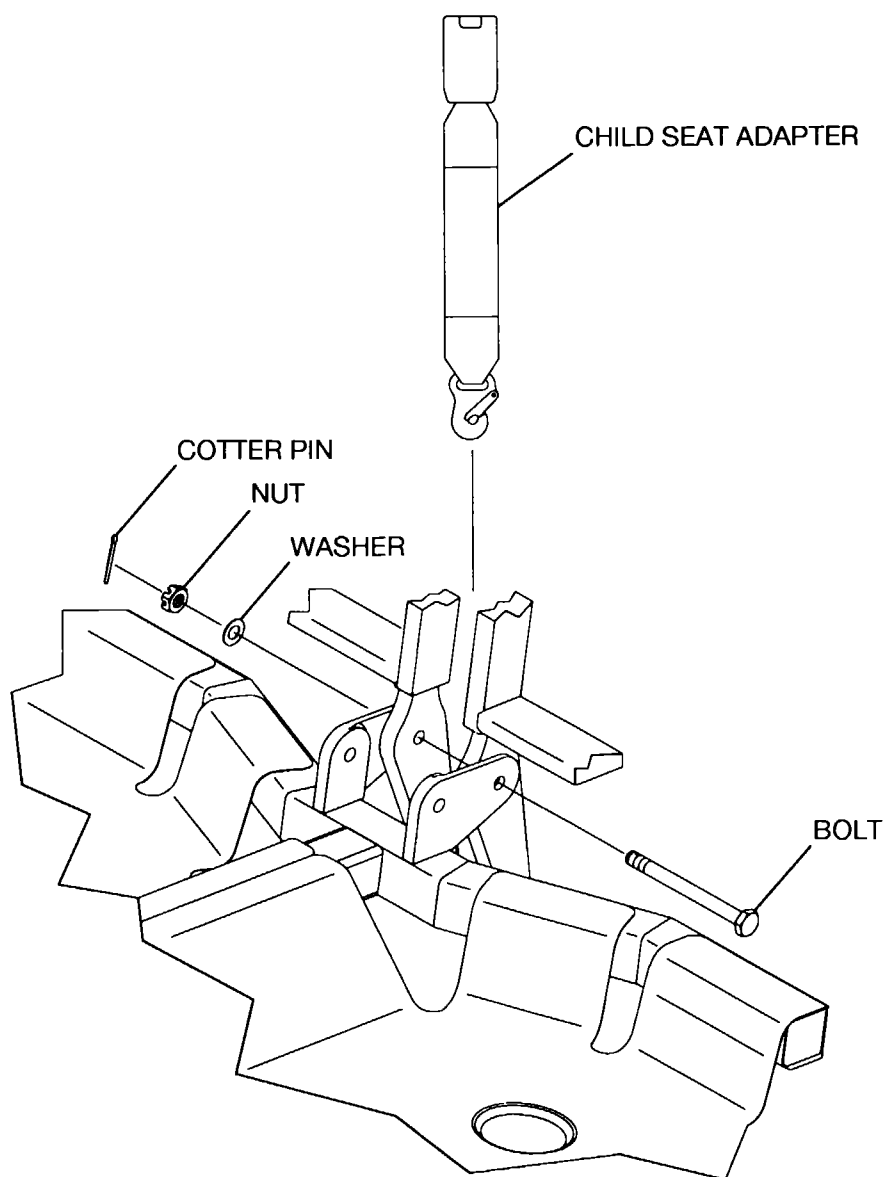
**DETAIL G**

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AMSAFE Aviation Inflatable Restraint System  
 Figure 201 (Sheet 2)

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**DETAIL H**

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AMSAFE Aviation Inflatable Restraint System  
Figure 201 (Sheet 3)

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B. Restraint System Installation (Refer to Figure 201).

**NOTE:** Keep the protective plastic bag on the air bag belt during installation to keep it clean.

- (1) Remove and keep the shipping caps from the inflator-hose connector fitting.

**NOTE:** The shipping caps can be used again.

- (2) Put the inflator assembly into the mounting bracket. Do not tighten the clamps on the mounting bracket.  
(3) Remove and discard the end cap plug (if new) from the three-point air bag belt hose. Do not remove the safety cable tie for the air bag connector tongue.

**NOTE:** If the three-point air bag belt is not new, and the inflator is new, apply a thin layer of Loctite 242 thread-locking compound on the hose barb threads before you attach the inflator assembly.

- (4) Make sure that the three-point seat belt air bag belt is aligned correctly.

**NOTE:** If aligned correctly, the gas hose will be on top of the seat belt attachment hardware. The label will be on the aft side of the belt.

- (5) Connect the gas hose from the three-point air bag belt to the inflator assembly with the correct torque (Refer to Table 201).

**NOTE:** The inflator hose connector fitting is a pressure fitting which must be fully extended onto the gas hose barb to make an airtight connection.

- (6) Attach the squib connector to the inflator assembly.  
(7) Tighten the clamps on the mounting bracket to between 21 and 25 inch-pounds of torque.  
(8) Attach the EMA to the floorboard with the washers, nuts, and bolts.  
(9) Connect the cable interface assembly to the EMA.  
(10) Make sure that the cables and hoses of the AAIR are clear of the height-adjustment crank, the seat lock handle, and the seat-back adjustment lever.  
(11) Install the inertia reel (three-point air bag belt) in the airplane. Refer to Chapter 25, Seat Belt/ Restraints - Maintenance Practices.  
(12) Arm the AMSAFE inflatable restraints. Refer to AMSAFE Inflatable Restraint Disarm/Arm.  
(13) Remove the safety cable tie from the air bag buckle tongue.  
(14) Do a seat operation test on the pilot's seat and copilot's seat.  
    (a) Move the seat-back aft and forward to its maximum travel.  
    (b) Move the seat-base up and down to its maximum travel.  
    (c) Move the seat-base aft and forward to its maximum travel.  
(15) Do a functional test on the system. Refer to the AMSAFE Aviation AAIR Supplemental Maintenance Manual, V23 System Diagnostic Tool - Operation and Maintenance Manual.

7. **AMSAFE Aviation Inflatable Restraint (AAIR) System Adjustment/Test**

- A. The AAIR diagnostic check gives a system functional test of the AAIR circuits. To find problems in system components, use a replace-and-test procedure. There are two seats to each AAIR system. The 1 LED light will show an indication for the first seat on the AAIR system circuit. The 2 LED light will show an indication for the second seat on the AAIR system circuit. Once the V23 system diagnostic tool (SDT) is connected to the airplane, a check of the system is done one seat at a time.
- B. The V23 system diagnostic tool uses a 9-volt battery that can be replaced. A check of the diagnostic tool must be done yearly. The label on the back of the diagnostic tool will show when a check of the tool needs to be done. The diagnostic tool must only be sent to AMSAFE to be calibrated.

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**CAUTION:** Calibrate the V23 system diagnostic tool again before use if it is hit, shaken, or if it falls to the floor.

C. Before the V23 system diagnostic tool is connected to the airplane, do the steps that follow.

- (1) Set the SDT ON/OFF Switch to the ON position.
- (2) Look at the Tool Battery Indicator LED light.
  - (a) If the LED light is green, the battery condition is satisfactory.
  - (b) If the LED light is red, replace the 9-volt battery on the back of the SDT.

D. Do the System Functional Test.

**NOTE:** There are two seats in each AAIR system. This functional test must be completed for each AAIR system on the airplane.

- (1) Make sure that the seat belt safety buckles are not connected.
- (2) Remove the protective cap from the cable interface assembly.
- (3) Connect the V23 system diagnostic tool to the diagnostic connector.
- (4) Set the SDT ON/OFF Switch to the ON position.
- (5) Look at the Seat Position PASS/FAIL LED light.
- (6) If the 1 and 2 LED lights are amber, do the steps that follow. If the 1 and 2 LED lights do not give an amber indication, troubleshoot the system. Refer to AMSAFE Aviation Inflatable Restraint (AAIR) System Troubleshooting.
  - (a) Connect the air bag safety buckle on the first seat location.
  - (b) If the 1 LED light is green, the AAIR system for that seat is satisfactory.
  - (c) If there is an amber LED light indication, a red indication, or no indication, troubleshoot the system. Refer to AMSAFE Aviation Inflatable Restraint (AAIR) System Troubleshooting.
  - (d) Disconnect the air bag safety buckle.
  - (e) Do steps (a) thru (d) again for the second seat location.

**NOTE:** For the second seat location, the 2 LED light will be used to give an indication.

- (7) Set the SDT ON/OFF Switch to the OFF position.
- (8) Disconnect the V23 system diagnostic tool from the diagnostic connector.
- (9) Put the protective cap on the cable interface assembly.

## 8. AMSAFE Aviation Inflatable Restraint (AAIR) System Troubleshooting

A. The procedures in this section must be done if the V23 system diagnostic tool gives an unsatisfactory indication for the seats in the AAIR System Adjustment/Test. An unsatisfactory indication by the seat LED light is an amber indication, red indication, or no indication. If the V23 system diagnostic tool gives a satisfactory indication after the replacement of the individual components, stop the troubleshooting procedure.

- (1) If an unsatisfactory indication is given before the safety buckle is connected, do the steps that follow.
  - (a) Do a check of all connections and tighten loose connections that are found. Do the Adjustment/Test procedure again if there are loose connections found.
  - (b) Replace the cable interface assembly. Do the Adjustment/Test procedure again.
  - (c) Replace the EMA. Do the Adjustment/Test procedure again.
  - (d) Replace the inflator. Do the Adjustment/Test procedure again.
- (2) If an unsatisfactory indication is given after the safety buckle is connected, do the steps that follow.
  - (a) Replace the cable interface assembly. Do the Adjustment/Test procedure again.
  - (b) Replace the air bag safety buckle. Do the Adjustment/Test procedure again.
  - (c) Replace the EMA. Do the Adjustment/Test procedure again.
  - (d) Replace the inflator. Do the Adjustment/Test procedure again.

## REAR SEAT - MAINTENANCE PRACTICES

### 1. General

- A. This section provides instruction for removal and installation of the rear seat.

**WARNING: If the airplane has AMSAFE inflatable restraints, do not do maintenance on the seats until you look at and obey all applicable precautions and instructions supplied in the AMSAFE publications and this maintenance manual. If you do not obey and follow these instructions and safety precautions, damage to equipment and harm to personnel can occur.**

- B. If your airplane has the AMSAFE inflatable restraint system, do not do maintenance on the seats or the seat restraint system unless you first obey all applicable precautions and instructions in the E508804 Supplemental Amsafe Maintenance Manual and this maintenance manual. Refer to Inflatable Restraint System - Maintenance Practices.

### 2. Rear Seat Removal/Installation

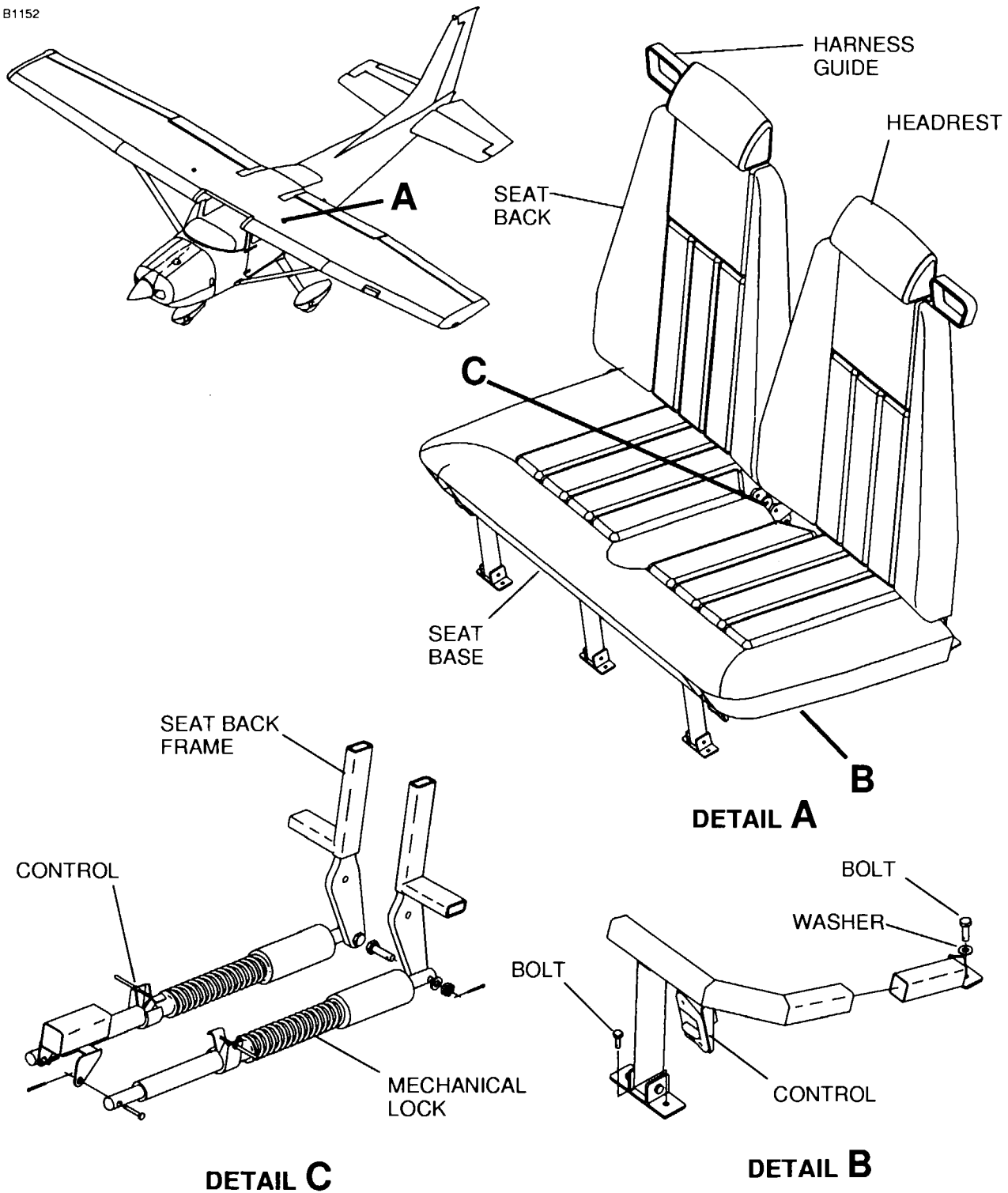
- A. Rear Seat Removal (Refer to Figure 201).

**WARNING: If the airplane has AMSAFE inflatable restraints, do not remove the seats with the seat belts buckled or the EMA connected. Damage can occur to the system and an accidental deployment of the system can cause injury.**

- (1) Remove the restraints before you remove the seats. Refer to Seat Belts/Restraints - Maintenance Practices.
  - (2) Remove the bolts and the washers that attach the seat frame to the fuselage.
  - (3) Remove the seat from the airplane.
- B. Rear Seat Installation (Refer to Figure 201).
- (1) Install the seat to the fuselage with the bolts and the washers.
  - (2) Install the restraints. Refer to Seat Belts/Restraints - Maintenance Practices.

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 B0719T1004  
 C0719T1005

Aft Bench Seat Installation  
 Figure 201 (Sheet 1)

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**INTERIOR UPHOLSTERY - MAINTENANCE PRACTICES**

**1. General**

- A. This section provides general instructions for removal and installation of the interior panels and carpet.

**2. Cabin Panels Removal/Installation**

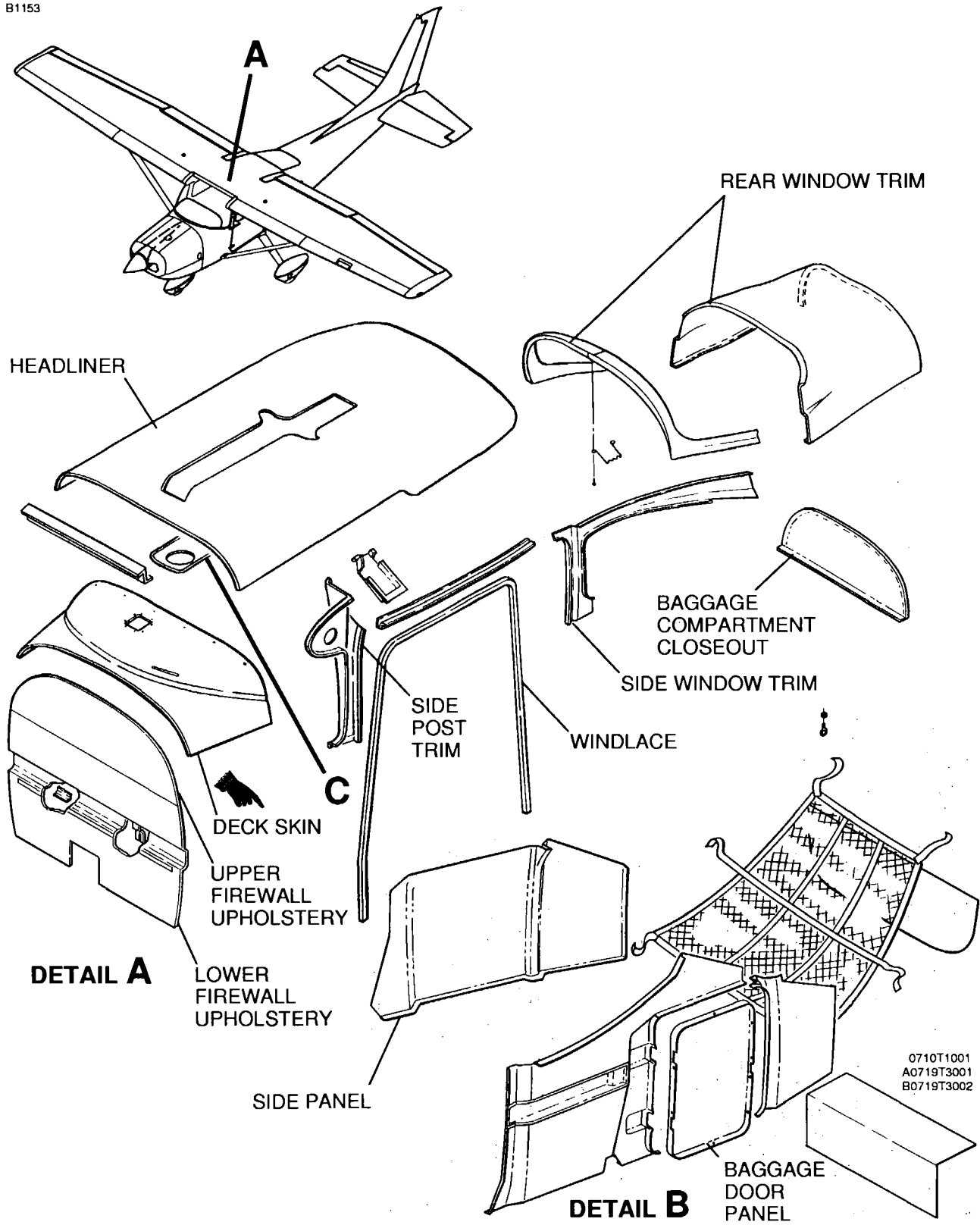
- A. Interior panels are typically attached to fuselage structure using screws. Refer to Figure 201 for an exploded view of the interior panels, headliner and overhead console.

**3. Door Panels and Carpet Removal/Installation**

- A. Cabin door panels are typically attached to the fuselage and door structure using small screws. Carpet is attached to the floorboard using velcro. Refer to Figure 202 for a view of the side panels and carpet.

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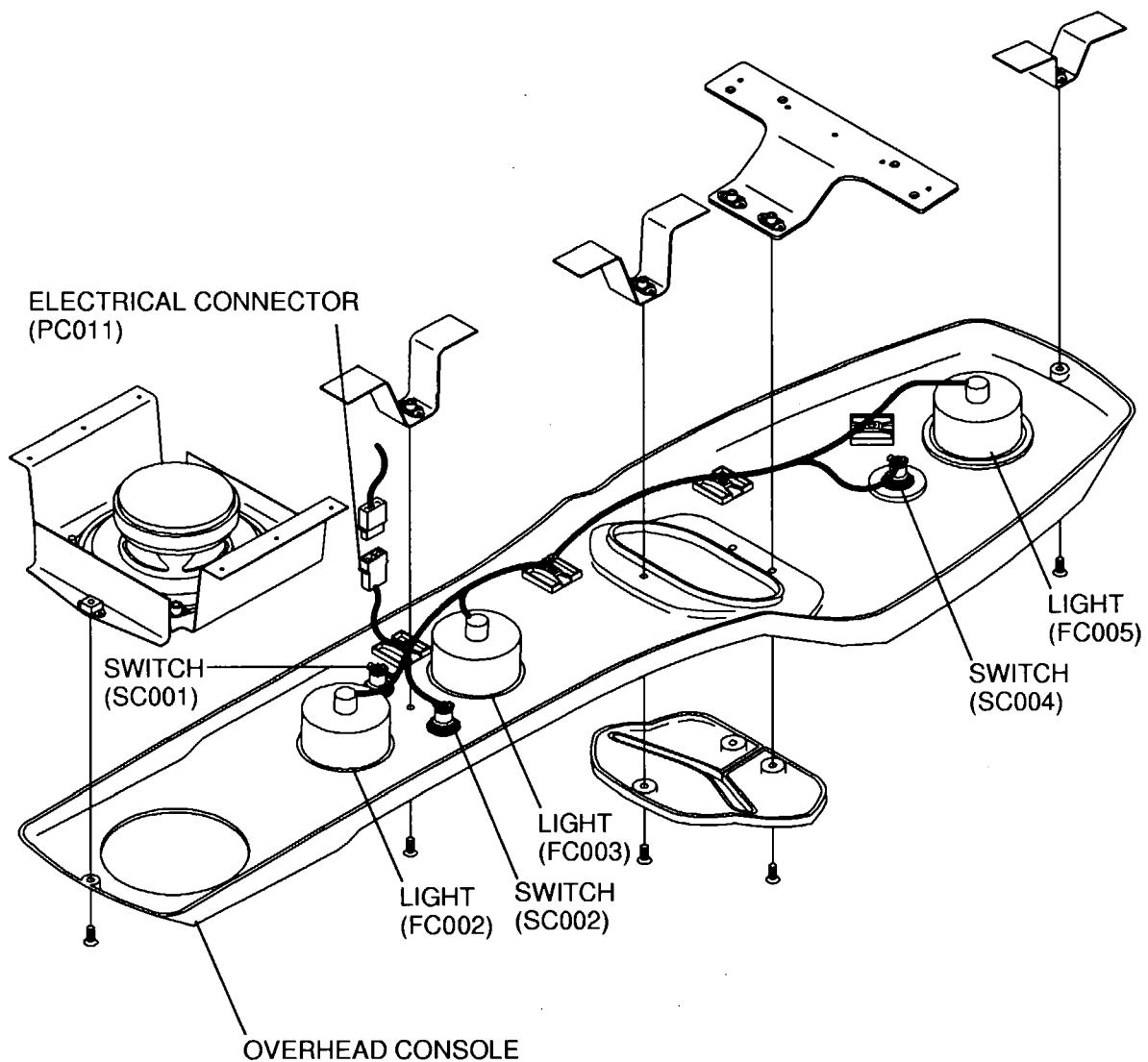


Cabin Top and Interior Installation  
 Figure 201 (Sheet 1)



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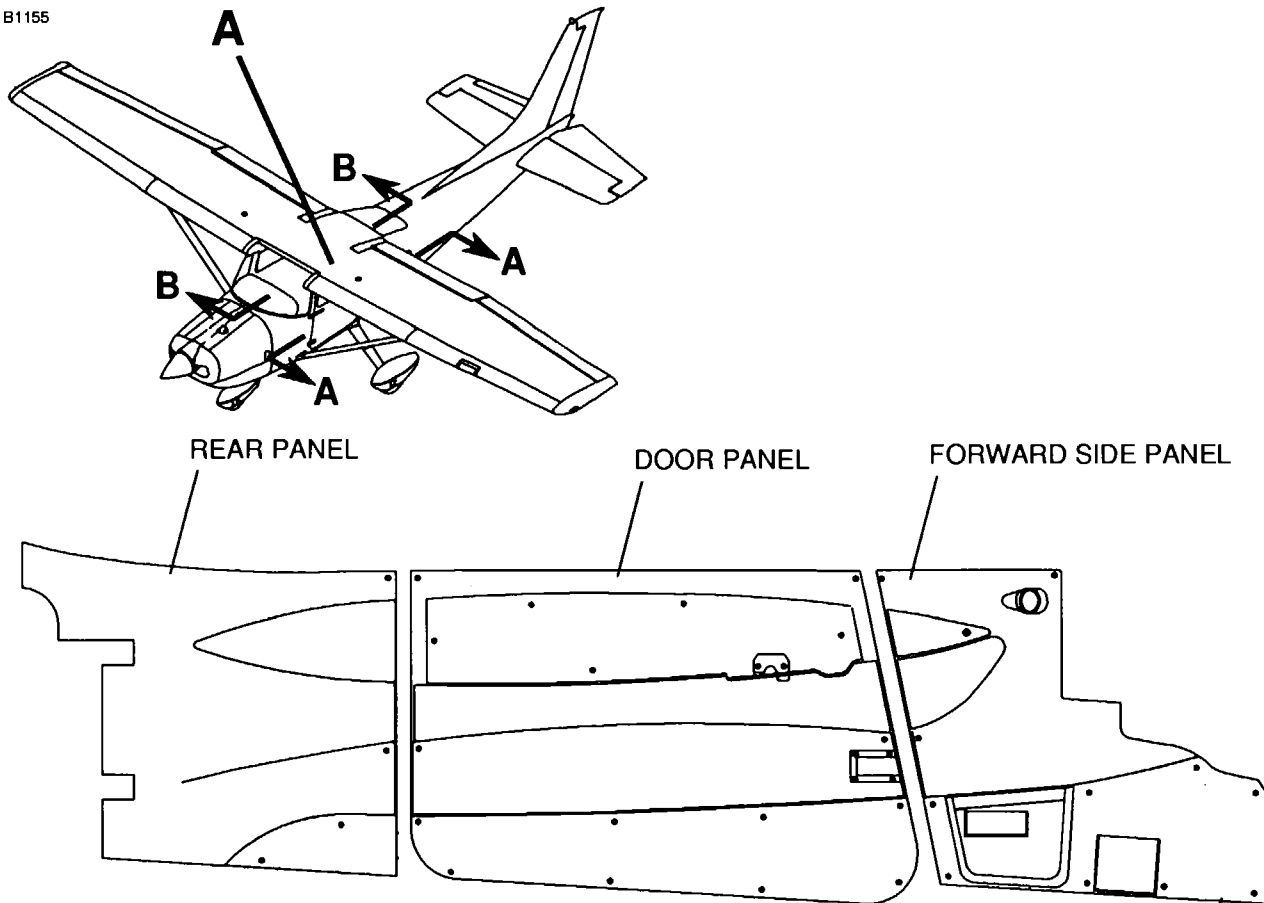
**DETAIL C**

C0519T1050

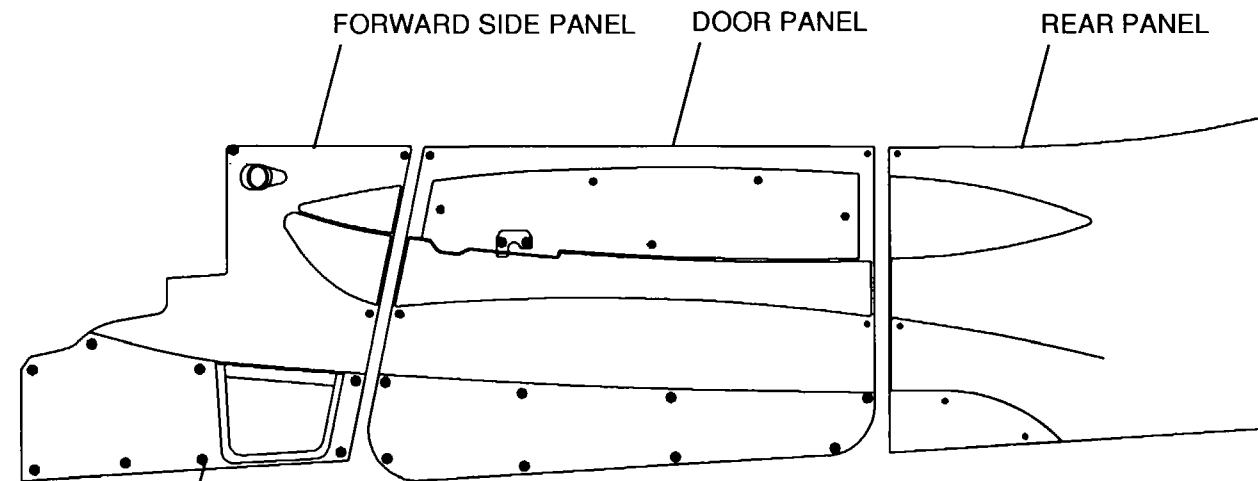
Cabin Top and Interior Installation  
Figure 201 (Sheet 2)

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**VIEW A-A**



**VIEW B-B**

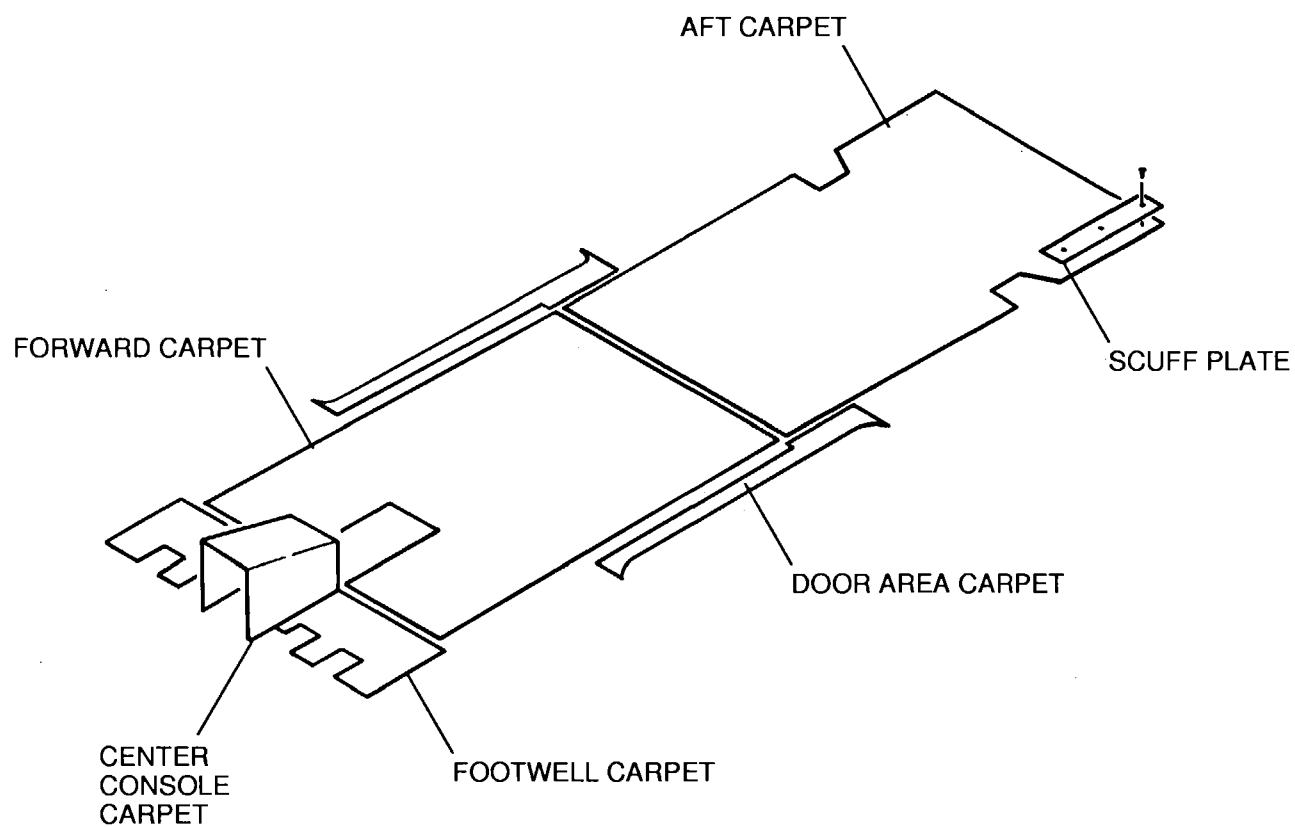
ACCENT TRIM

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Cabin Side Panel and Floorboard Upholstery Installation  
 Figure 202 (Sheet 1)

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**DETAIL A**

A0519T1040

Cabin Side Panel and Floorboard Upholstery Installation  
Figure 202 (Sheet 2)

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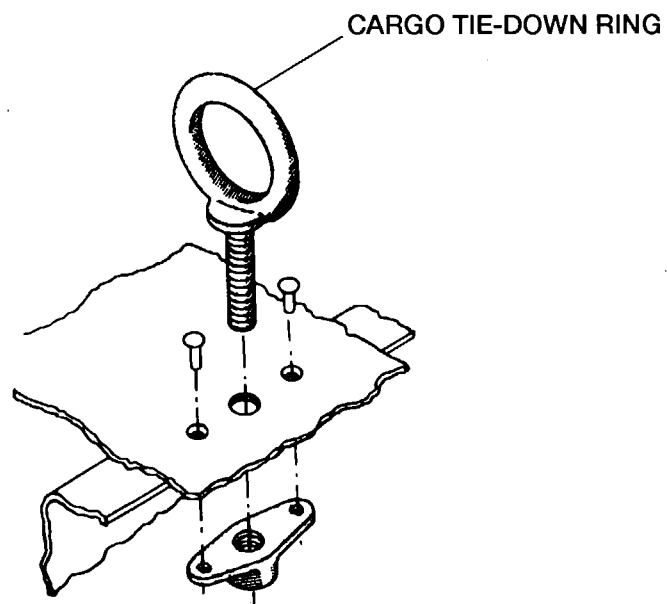
**CARGO TIE-DOWNS - MAINTENANCE PRACTICES**

**1. General**

- A. Cargo tie-downs are provided for the airplane to accommodate a variety of loading positions. These tie-downs are secured directly through nutplates. Refer to Figure 201 for an illustration of tie-downs.

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Cargo Tie-Downs Installation  
Figure 201 (Sheet 1)

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**POINTER EMERGENCY LOCATOR TRANSMITTER - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance practices for the Emergency Locator Transmitter (ELT). The ELT is activated automatically by an internal G-switch or manually by a remote switch on the instrument panel, or by the ELT master switch. The ELT transmits an emergency distress signal on 121.5/243.0 MHz.

**2. Pointer ELT Removal/Installation**

- A. ELT Removal (Refer to Figure 201).
- (1) Put a support stand under the tail tiedown ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (2) Remove the rear seat. Refer to Rear Seat - Maintenance Practices.
  - (3) Remove the baggage curtain to get access to the transmitter. Refer to Interior Upholstery - Maintenance Practices.
  - (4) Put the ELT master switch in the OFF/RESET (center) position.

**CAUTION:** Do not disconnect the ELT remote connector before you put the ELT master switch in the OFF/RESET (center) position. ELT internal fuse failure can occur if the ELT remote connector is disconnected before the ELT master switch is put in the OFF/RESET (center) position.

- (5) Disconnect the ELT antenna coaxial cable from the ELT.
- (6) Disconnect the ELT remote connector from the ELT.
- (7) Disengage the attach strap from around the ELT and remove the ELT from the airplane.

- B. ELT Installation (Refer to Figure 201).

- (1) Complete an ELT G-Switch Operation Check. Refer to ELT Operational Test, ELT G-Switch Operation Check

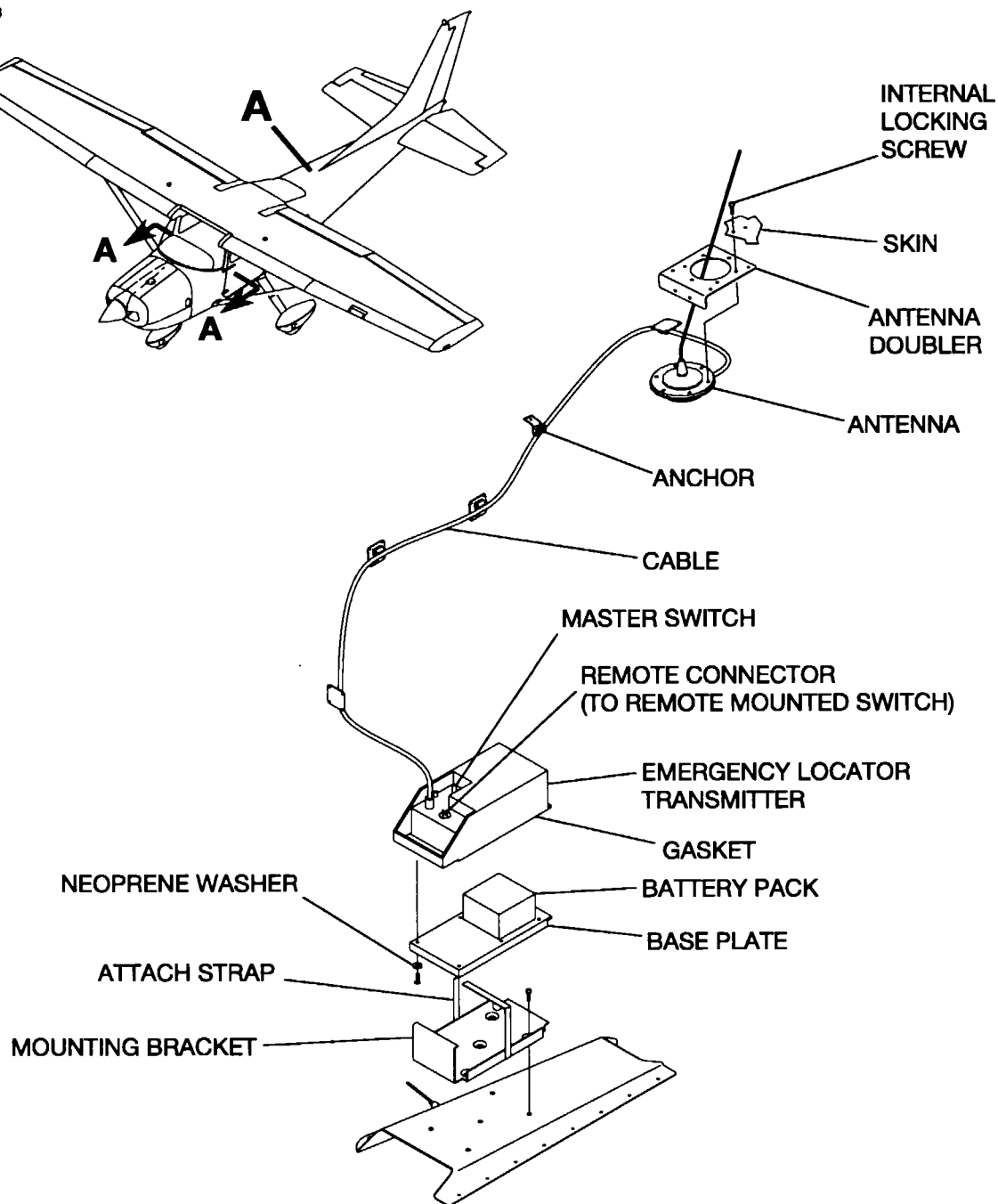
**CAUTION:** Make sure that the direction of flight arrow on the ELT points to the nose of the airplane.

**CAUTION:** Make sure that the ELT master switch is in the OFF/RESET position. ELT internal fuse failure can occur if the ELT remote connector is installed with the ELT master switch in the ON or AUTO position.

- (2) Put the ELT into the ELT bracket and tighten the ELT attach strap.
- (3) Connect the ELT remote connector to the ELT.
- (4) Connect the ELT antenna coaxial cable to the ELT.
- (5) Put the ELT master switch in the AUTO position.
- (6) Complete the Control Tower Monitored or Locally Monitored ELT Operational Test. Refer to the ELT Operational Test, Control Tower Monitored ELT Operational Test or Locally Monitored ELT Operational Test.
- (7) Install the baggage curtain. Refer to Interior Upholstery - Maintenance Practices.
- (8) Install the rear seat. Refer to Rear Seat - Maintenance Practices.
- (9) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

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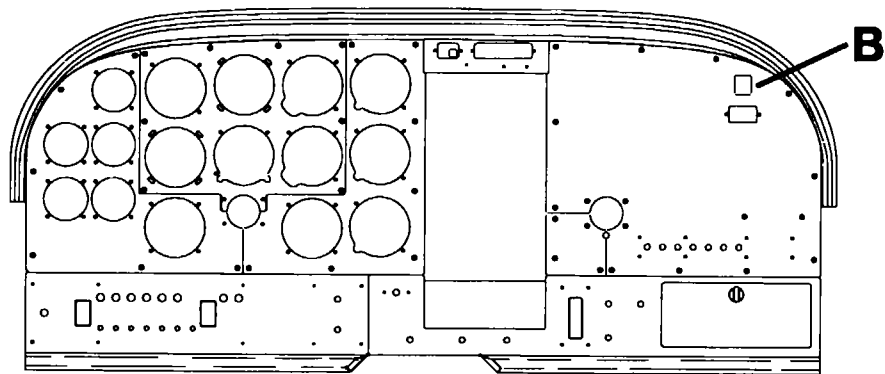
**DETAIL A**

Pointer Emergency Locator Transmitter Installation  
Figure 201 (Sheet 1)

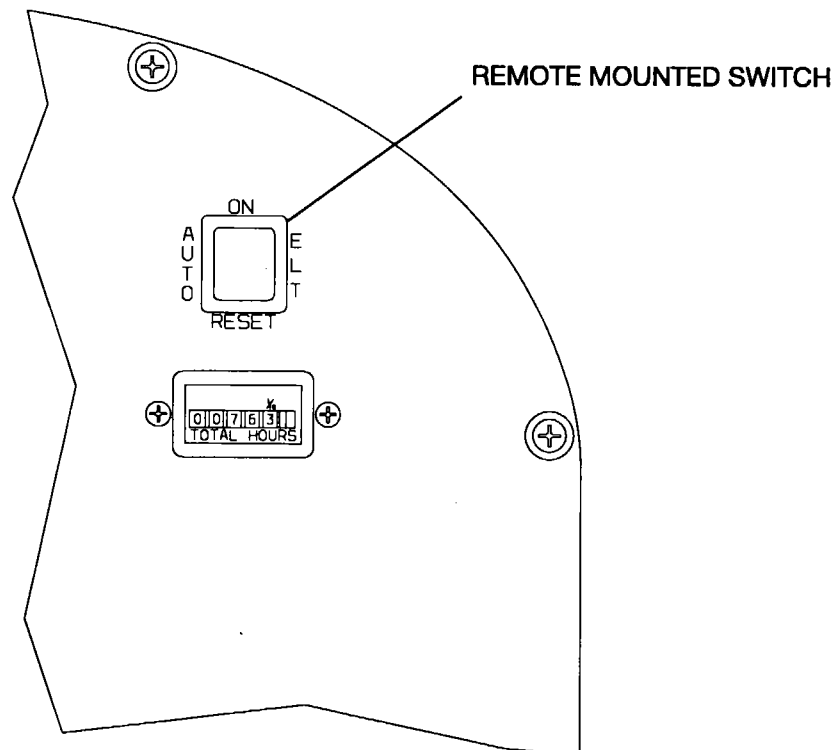
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**VIEW A-A**



**DETAIL B**

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Pointer Emergency Locator Transmitter Installation  
Figure 201 (Sheet 2)



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**3. Pointer ELT Remote Switch Removal/Installation**

**CAUTION:** Do not disconnect the ELT remote connector before you put the ELT master switch in the OFF/RESET (center) position. ELT internal fuse failure can occur if the ELT remote connector is disconnected before the ELT master switch is put in the OFF/RESET (center) position.

**CAUTION:** Disconnect the ELT remote connector from the ELT before you remove the ELT remote switch or disconnect the ELT remote switch connector. ELT internal fuse failure can occur if the ELT remote switch or disconnect is removed before the ELT remote connector is disconnected.

- A. ELT Remote Switch Removal (Refer to Figure 201 ).
  - (1) Put the aircraft master switch (ALT/BAT) in the OFF position.
  - (2) Get access to the back of the remote mounted switch.
  - (3) Put the ELT master switch in OFF/RESET (center) position.
  - (4) Disconnect the electrical connector (PT905) from the ELT.
  - (5) Get access to the back of the ELT remote switch (Zone 221).
  - (6) Disconnect the ELT remote switch connector.
- B. ELT Remote Switch Installation (Refer to Figure 201).
  - (1) Hold the edges of the ELT remote switch and put it into the instrument panel cutout.
  - (2) Make sure that the locking tabs engage and that the switch is correctly installed.
  - (3) Connect the ELT remote switch connector.
  - (4) Put the ELT remote switch in the AUTO position.
  - (5) Connect the electrical connector (PT905) to the ELT.
  - (6) Make sure that the ELT master switch is set to the OFF position.
  - (7) Complete the Control Tower Monitored or Locally Monitored ELT Operational Test. Refer to ELT Operational Test, Control Tower Monitored ELT Operational Test, or Locally Monitored ELT Operational Test.

**4. ELT Antenna Removal/Installation (Integral Base with Coax Cable)**

- A. ELT Antenna Removal (Refer to Figure 201).
  - (1) Remove the panel (310AR) from the right side of the tailcone to get access to the ELT. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) Disconnect the ELT antenna coaxial cable from the ELT.
  - (3) Remove all of the tie straps that attach the ELT antenna coaxial cable to the fuselage.
  - (4) On the external skin of the airplane, remove the six internal locking screws that attach the ELT antenna to the fuselage.

**NOTE:** The ELT antenna has an integral base and coaxial cable.

- (5) Remove the ELT antenna from the inside of the airplane.
- B. ELT Antenna Installation (Refer to Figure 201).
  - (1) From inside the airplane, put the ELT antenna in position on the fuselage with the ELT antenna pointing aft.
  - (2) On the external skin of the airplane, use the internal locking screws to attach the ELT antenna base to the fuselage.
  - (3) Connect the ELT antenna coaxial cable to the ELT.
  - (4) Use tie straps to attach the ELT antenna coaxial cable to the fuselage.
  - (5) Complete the Control Tower Monitored or Locally Monitored ELT Operational Test. Refer to ELT Operational Test - Control Tower Monitored ELT Operational Test or Locally Monitored ELT Operational Test.
  - (6) Install the panel (310AR) on the right side of the tailcone. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

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**5. ELT Whip Antenna Removal/Installation**

- A. ELT Whip Antenna Removal (Refer to Figure 201).
- (1) Get access to the ELT and ELT whip antenna through the panel (310AR) on the right side of the tailcone.
  - (2) Disconnect the ELT whip antenna coaxial cable from the ELT whip antenna.
  - (3) From inside the airplane, remove the nut and washer that attach the ELT whip antenna to the fuselage.
  - (4) Remove the ELT whip antenna from the external skin of the airplane.
- B. ELT Whip Antenna Installation (Refer to Figure 201).
- (1) Put the ELT whip antenna in position on the external skin of the fuselage with the ELT whip antenna pointing aft.
  - (2) From inside the airplane, use the nut and washer to connect the ELT whip antenna to the fuselage.
  - (3) Connect the ELT antenna coaxial cable to the ELT whip antenna.
  - (4) Complete the Control Tower Monitored or Locally Monitored ELT Operational Test. Refer to ELT Operational Test, Control Tower Monitored ELT Operational Test, or Locally Monitored ELT Operational Test.
  - (5) Install the panel (310AR) on the right side of the tailcone. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**6. Pointer ELT Battery Pack Removal/Installation**

- A. ELT Battery Pack Removal (Refer to Figure 201).

**WARNING: Obey the correct procedures to discard the unserviceable ELT battery packs to prevent damage to the environment and personal injury.**

- (1) Remove the ELT from the airplane. Refer to ELT Removal/Installation.
  - (2) Remove the screws that attach the ELT base plate to the ELT.
  - (3) Disconnect the battery pack connector for the ELT.
  - (4) Remove the ELT battery pack from the ELT.
- B. ELT Battery Pack Installation (Refer to Figure 201).

**CAUTION:** Use only the recommended battery pack for the ELT. If you use other types of battery packs, the operating life and/or signal strength of the ELT will decrease. The incorrect battery pack can also change the mechanical configuration, which will cause too much vibration and corrosion.

- (1) Put the ELT battery pack in the ELT.
- (2) Connect the ELT battery pack connector.

**CAUTION:** Do not tighten the ELT gasket and screws too much.

- (3) Use screws to attach the ELT base plate and gasket to the ELT.

**NOTE:** When the new battery pack expiration date is put in the airplane records, it is also recommended that you record the expiration date in the ELT owner's manual for quick reference.

- (4) Put the new replacement date on the outside of ELT transmitter with a stamp. Put the date on the ELT switch nameplate, on the side of the ELT transmitter, and in instruction nameplate on top of the ELT transmitter.

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- (5) Install the ELT in the airplane. Refer to ELT Removal/Installation.

**7. Pointer ELT Operational Test**

A. Control Tower Monitored ELT Operational Test.

**CAUTION:** Operate the Emergency Locator Transmitter (ELT) system only during the first five minutes of each hour. Refer to the FAA Advisory Circular AC-91-44A.

- (1) Get permission from the control tower and/or flight service station to do a test of the ELT system.

**CAUTION:** Do not operate the ELT system for more than three pulses of the audio signal. Longer operation can decrease the ELT battery power supply.

**NOTE:** Do not use the airplane's VHF receiver or ADF to measure the power of the ELT audio signal.

- (2) Put the ELT remote switch in the ON position.
- (3) Contact the control tower and/or flight service station to make sure that the ELT system operates correctly.
- (4) Momentarily put the ELT remote switch to the RESET position.
- (5) Put the ELT remote switch in the AUTO position.
- (6) Contact the control tower and/or flight service station to make sure that the ELT stopped transmission.

B. Locally Monitored ELT Operational Test.

**CAUTION:** Operate the Emergency Locator Transmitter (ELT) system only during the first five minutes of each hour. Refer to the FAA Advisory Circular AC-91-44A.

- (1) (1) Put a small, hand held AM radio tuned to any frequency, within six inches of the ELT antenna.

**CAUTION:** Do not operate the ELT system for more than three pulses of the audio signal. Longer operation can decrease the ELT battery power supply.

**NOTE:** Do not use the airplane's VHF receiver or ADF to measure the power of the ELT audio signal.

- (2) Put the ELT remote switch in the ON position.
- (3) Make sure that the ELT signal is heard on the AM radio.
- (4) Momentarily put the ELT remote switch to the RESET position.
- (5) Put the ELT remote switch in the AUTO position.

C. ELT Master Switch Operational Test.

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**CAUTION:** Operate the Emergency Locator Transmitter (ELT) system only during the first five minutes of each hour. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the ELT system for more than three pulses of the audio signal. Longer operation can decrease the ELT battery power supply.

- (1) Put the ELT master switch in the ON position.
  - (2) Make sure that the signal is heard by the Control Tower, Flight Service Station, or AM radio.
  - (3) Put the ELT master switch in the OFF/RESET position.
  - (4) Put the ELT master switch in the AUTO position.
- D. ELT G-Switch Operational Check.
- (1) Remove the ELT from the airplane. Refer to ELT Removal/Installation.
  - (2) Put the ELT master switch in the AUTO position.
  - (3) Hold the ELT tightly in one hand, and move the ELT fast in one direction, followed by a sudden reversal of direction.
  - (4) Make sure that the ELT G-switch has been activated.
  - (5) Put the ELT master switch in the OFF/RESET position to reset the ELT G-switch.
  - (6) Install the ELT in the airplane. Refer to ELT Removal/Installation.

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**ARTEX C406-N EMERGENCY LOCATOR TRANSMITTER - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance practices for the emergency locator transmitter (ELT) system. Components in the ELT system include the ELT, antenna, remote switch, and buzzer.

**2. Artex C406-N ELT Removal/Installation**

- A. ELT Removal (Refer to Figure 201).
- (1) Put a support stand under the tail tie-down ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (2) Remove the rear seat. Refer to Rear Seat - Maintenance Practices.
  - (3) Remove the baggage curtain to get access to the transmitter. Refer to Interior Upholstery - Maintenance Practices.
  - (4) Put the ELT master switch in the OFF position.
  - (5) Disconnect the electrical connector (PT905) and the coaxial connector (PT1029) from the ELT.
  - (6) Loosen the knurl nuts on the end cap of the transmitter and the mounting tray.
  - (7) Pull the front cover away from the transmitter and the mounting tray.
  - (8) Carefully pull the mounting tray end and the tray away from the ELT.
  - (9) Remove the ELT from the mounting tray.
  - (10) Remove the screws that attach the mounting tray to the shelf assembly.
- B. ELT Installation (Refer to Figure 201).
- (1) Attach the mounting tray to the shelf assembly with the screws.

**CAUTION:** Make sure that the direction-of-flight arrow on the ELT points to the nose of the airplane.

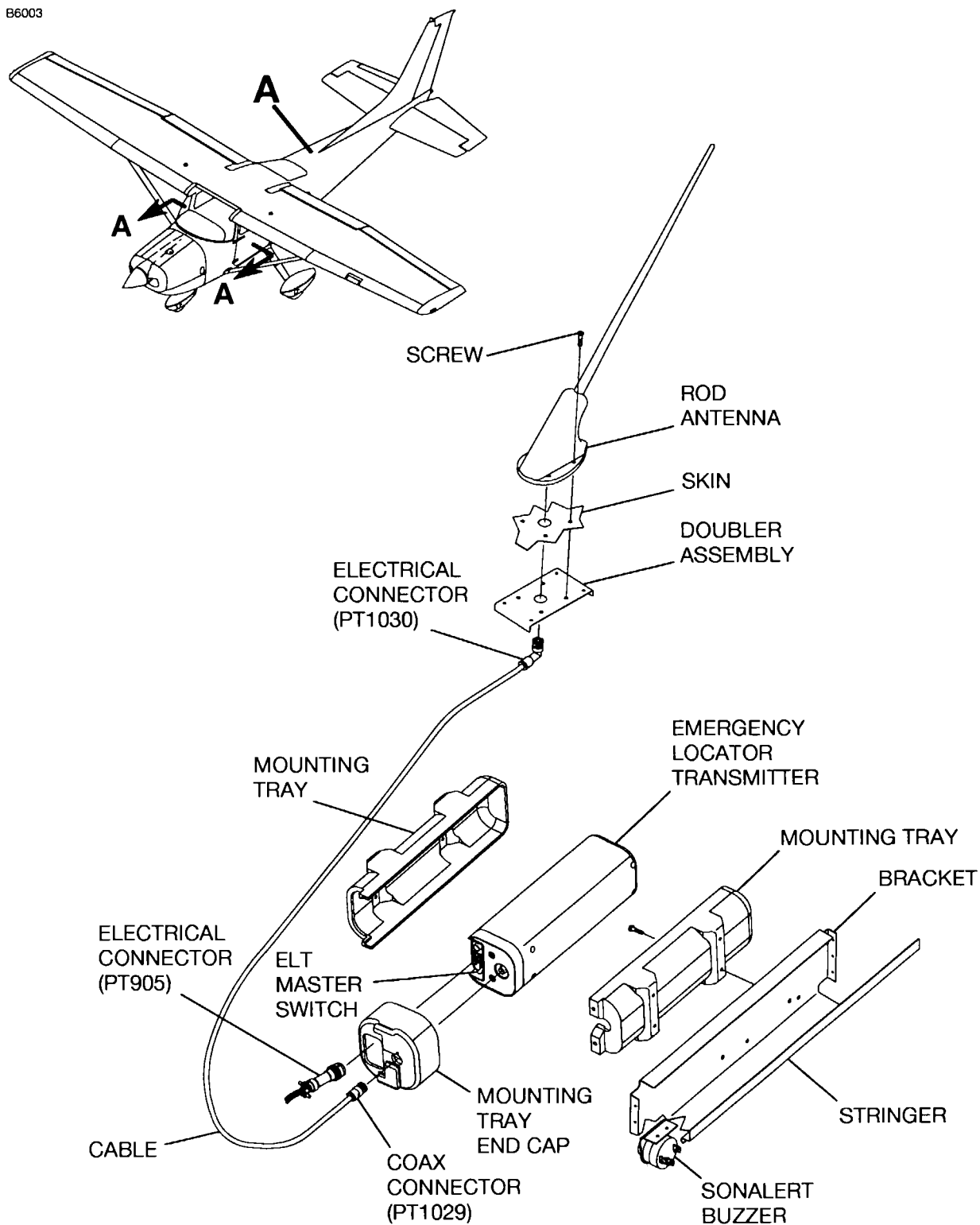
- (2) Put the ELT transmitter in position in the tray at an angle. Move the locking ears at the end opposite to the direction-of-flight arrow into the mounting tray locking slots.
- (3) Make sure that the ELT switch on the ELT is in the OFF position.
- (4) Put the ELT in the mounting tray at an angle to engage the locking mechanism at the opposite end of the ELT.
- (5) Push the ELT down into the mounting tray until it is fully installed in the tray.
- (6) Put the top cover on the top of the transmitter.
- (7) Make sure that the top cover locks into the aft end of the transmitter.
- (8) Put the end cap on the transmitter and mounting tray.
- (9) Tighten the knurl nuts.
- (10) Connect the electrical connectors (PT905) and (PT1029) to the ELT transmitter.
- (11) Connect the electrical power to the airplane.
- (12) Do a functional test of the ELT. Refer to Artex C406-N ELT Functional Test.
- (13) Install the baggage curtain. Refer to Interior Upholstery - Maintenance Practices.
- (14) Install the rear seat. Refer to Rear Seat - Maintenance Practices.
- (15) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**3. Artex C406-N ELT Remote Switch Removal/Installation**

- A. ELT Remote Switch Removal (Refer to Figure 201 ).
- (1) Put the aircraft master switch (ALT/BAT) in the OFF position.
  - (2) Get access to the ELT.
  - (3) Put the ELT master switch in the OFF position.
  - (4) Disconnect the ELT remote connector from the ELT.
  - (5) Get access to the back of the ELT remote switch (Zone 221).
  - (6) Disconnect the ELT remote switch connector.
  - (7) Remove the screws that attach the ELT remote switch to the instrument panel.
  - (8) Remove the ELT remote switch from the airplane.
- B. ELT Remote Switch Installation (Refer to Figure 201).
- (1) Put the ELT remote switch in position in the instrument panel.

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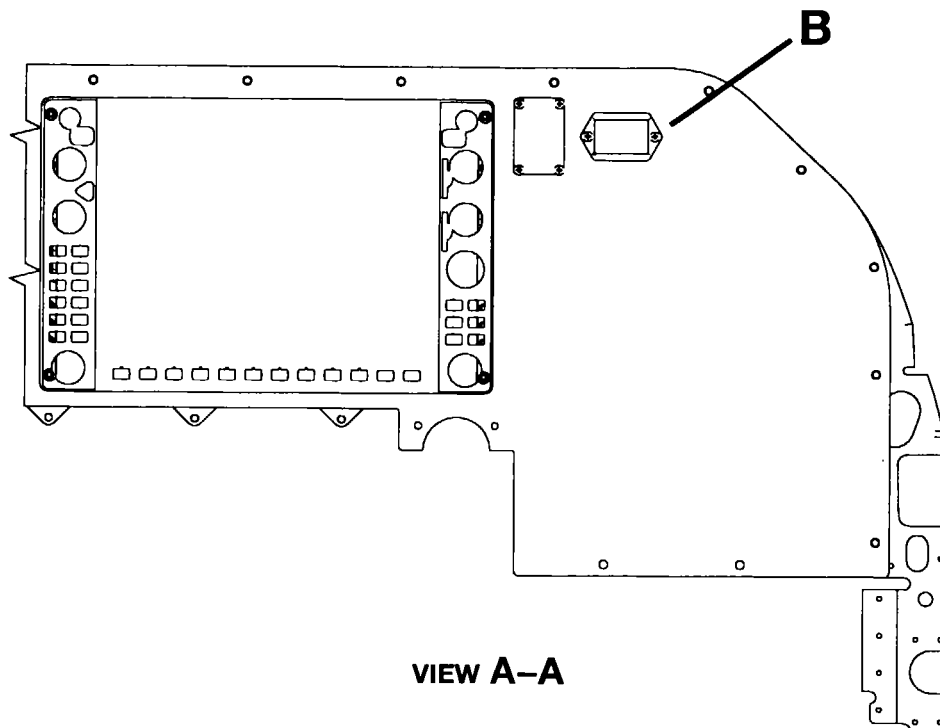
**DETAIL A**

Artex C406-N ELT Installation  
 Figure 201 (Sheet 1)

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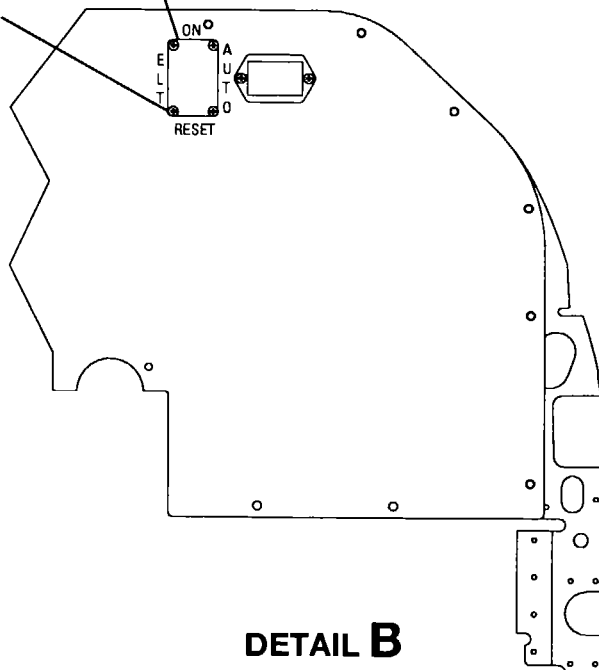
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**VIEW A-A**

REMOTE MOUNTED SWITCH

SCREW



**DETAIL B**

Artex C406-N ELT Installation  
 Figure 201 (Sheet 2)

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 B3940T445

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- (2) Attach the ELT remote switch to the instrument panel with the screws.
- (3) Connect the ELT remote switch connector.
- (4) Put the ELT remote switch to the AUTO position.
- (5) Connect the ELT remote connector to the ELT.
- (6) Make sure that the ELT master switch is set to the OFF position.
- (7) Do a functional test of the ELT. Refer to Artex C406-N ELT Functional Test.

**4. Artex C406-N ELT Rod Antenna Removal/Installation**

**A. ELT Antenna Removal (Refer to Figure 201).**

- (1) Put a support stand under the tail tie-down ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
- (2) Remove the rear seat. Refer to Rear Seat - Maintenance Practices.
- (3) Remove the baggage curtain to get access to the transmitter. Refer to Interior Upholstery - Maintenance Practices.
- (4) Disconnect the coaxial cable connector (PT1029) for the antenna.
- (5) Remove the tie strap that attaches the ELT antenna coaxial cable to the fuselage.
- (6) Remove the four screws that attach the ELT antenna to the fuselage.
- (7) Remove the ELT antenna from the airplane.

**B. ELT Antenna Installation (Refer to Figure 201).**

- (1) Remove all of the old sealant from the ELT rod antenna and from the airplane skin. Refer to Chapter 20, General Solvents/Cleaners - Maintenance Practices.
- (2) Put the ELT antenna in position on the fuselage with the ELT antenna pointing aft.
- (3) Install the four screws that attach the ELT antenna to the fuselage.
- (4) Connect the ELT antenna coaxial cable to the ELT.
- (5) With the tie strap, attach the ELT antenna coaxial cable to the mount on the fuselage.
- (6) Make sure that there is a correct electrical bond between the antenna and the airplane structure.
  - (a) Remove one screw.
  - (b) With an ohmmeter, measure the electrical resistance from the antenna base metal insert to the structure at the screw position.

**NOTE:** The maximum allowable resistance (in ohms) at each of the four measured positions is 0.0025.

- (c) Install the screw and remove and install each of the remaining screws in turn as you measure the electrical resistance at each screw hole.
- (7) Apply a fillet seal around the antenna with Type I Class B Sealant. Do not cover the screw head with the sealant. Refer to Chapter 20, Fuel, Weather and High-Temperature Sealing - Maintenance Practices.
- (8) Do a functional test of the ELT. Refer to Artex C406-N ELT Functional Test.
- (9) Install the baggage curtain. Refer to Interior Upholstery - Maintenance Practices.
- (10) Install the rear seat. Refer to Rear Seat - Maintenance Practices.
- (11) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**5. Artex C406-N Buzzer Removal/Installation**

**A. Buzzer Removal (Refer to Figure 201).**

- (1) Put a support stand under the tail tie-down ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
- (2) Remove the rear seat. Refer to Rear Seat - Maintenance Practices.
- (3) Remove the baggage curtain to get access to the transmitter. Refer to Interior Upholstery - Maintenance Practices.
- (4) Make sure that the ELT master switch on the ELT transmitter is in the OFF position.
- (5) Tag the wires and terminals for identification.
- (6) Remove the screws that attach the electrical terminals to the buzzer.
- (7) Loosen the black retainer ring on the outboard side of the buzzer.
- (8) Remove the buzzer from the bracket.



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- B. Buzzer Installation (Refer to Figure 201)
- (1) Put the buzzer in the bracket.
  - (2) Install the black retainer ring on the outboard face of the buzzer.
  - (3) Connect the electrical wires to the buzzer with the screws.
  - (4) Do a functional test of the ELT. Refer to Artex C406-N ELT Functional Test.
  - (5) Install the baggage curtain. Refer to Interior Upholstery - Maintenance Practices.
  - (6) Install the rear seat. Refer to Rear Seat - Maintenance Practices.
  - (7) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

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**ARTEX C406-N EMERGENCY LOCATOR TRANSMITTER - INSPECTION/CHECK**

**1. General**

- A. This section gives the procedures that are necessary to do the inspection and operational checks are necessary to comply with 14 CFR 91.207, for the Artex C406-N Emergency Locator Transmitter (ELT) System.

**2. Artex C406-N ELT Functional Test**

**CAUTION:** Operate the Emergency Locator Transmitter system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the emergency locator transmitter for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz signal after the ELT is active for approximately 50 seconds. This signal is identified as a distress signal

- A. Prepare for the Artex C406-N ELT Functional Test.
- (1) You must replace the ELT battery with a new ELT battery if one or more of the conditions that follow occur:
    - Use of the ELT battery in an emergency
    - Operation for an unknown amount of time
    - Use for more than one hour of cumulative time
    - On or before the replacement date shown on the battery label.
  - (2) Examine the ELT battery to make sure that it is not due for replacement.
  - (3) If the battery must be replaced, follow the manufacturer's instructions to replace it.
  - (4) Supply +28 V, +0.25 or -0.25 V, external electrical power to the airplane.
  - (5) Initialize the global positioning system (GPS) on the multi-function display (MFD).
- B. Do the ELT Transmitter Test.
- (1) Adjust the volume to make sure that the transmissions from the radio are heard in the cockpit.
  - (2) Adjust the COM 1 frequency to 121.50 MHz. Make sure that the audio is heard through the cockpit speakers.
  - (3) Put the cockpit ELT switch in the ON position for approximately one second.
  - (4) Make sure that the ELT audio signal and the cockpit ELT switch light adjacent to the ELT remote switch come on.
  - (5) Immediately put the cockpit ELT switch in the ARM position.
  - (6) Make sure that the LED stays on for approximately one second before it goes off.
  - (7) If the ELT system has sensed a fault in the system, the LED will flash a fault code at this time. Refer to the Installation and Operation Manual for the Artex ELT system for information on the possible codes.
- C. Do the NAV Interface Test.
- (1) Hold the SARSAT tester no more than fifteen feet from the antenna.

**NOTE:** The SARSAT tester is used as an example to gather test information. However, other equivalent test equipment such as the Aeroflex IFR 4000 Communications Test Set is acceptable.

- (2) Turn on the SARSAT tester.
- (3) Engage the receive function of the SARSAT tester.
- (4) Make sure that the display on the tester shows that it is searching for a signal.
- (5) Put the ELT remote switch in the ON position.
- (6) Within 15 seconds, put the ELT remote switch in the ARM position.

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- (7) Monitor the SARSAT tester to see if it received a signal from the ELT system.
  - (a) If no signal was received, do the test again after the 15-second off cycle.
- (8) Make sure that the tail number on the SARSAT tester is correct.
- (9) Make sure that the Mode S code shown on the SARSAT tester is the same as the number that is on the back of the transmitter.
- (10) Make sure that the latitude and longitude information is the same as that shown on the MFD display.
- (11) Turn the SARSAT tester off.
- (12) Disconnect external electrical power from the aircraft.

D. Do the G-Switch Operational Test.

**CAUTION:** Operate the Emergency Locator Transmitter system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the emergency locator transmitter for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz signal after the ELT is active for approximately 50 seconds. This signal is identified as a distress signal.

- (1) Remove the ELT from the airplane. Refer to ELT Removal/Installation (On airplanes with the Artex C406-N.
- (2) Install a jumper wire between pins 12 and 13 on the electrical connector of the ELT.

**NOTE:** The ELT will not activate with the G-switch unless electrical pins 12 and 13 have a jumper wire installed between them (this happens automatically when the ELT is locked into the mount tray with the electrical connector in position). Because of the potential physical damage that can occur if the jumper wire is not installed correctly, it is recommended that an experienced technician do this procedure.

- (3) Put the ELT switch in the OFF position.
- (4) Use a receiver, and set it to 121.5 MHz to listen for the aural warning sweep tone.
- (5) Hold the ELT transmitter tightly in one hand and make a throwing movement followed by an opposite movement of the ELT transmitter.
- (6) Make sure that the G-switch operates and that the aural warning sweep tone is heard on the receiver set to 121.5 MHz.
- (7) Set the ELT switch to the ON position and then back to the OFF position to reset the G-switch.
- (8) Remove the jumper wire from electrical pins 12 and 13 on the electrical connector of the ELT.
- (9) Install the emergency locator transmitter in the airplane. Refer to ELT Removal/Installation (On airplanes with the Artex C406-N.

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**ARTEX ME406 EMERGENCY LOCATOR TRANSMITTER SYSTEM - DESCRIPTION AND OPERATION**

**1. General**

- A. An Artex ME406 Emergency Locator Transmitter (ELT) System is installed to help rescue teams find the airplane in the event of a crash. It is made to operate in a wide range of environmental conditions and is resistant to the forces caused by many types of accidents.

**2. Description**

- A. Artex ME406 ELT.
- (1) The Artex ME406 Emergency Locator Transmitter (ELT) system includes an ELT unit, an integral battery pack, warning buzzer, internal G-switch, antenna, remote switch, cable assembly, and antenna coaxial cable. The ELT unit transmits on 121.5 MHz and 406.028 MHz.
  - (2) The battery pack has two D-size lithium cells mounted under a battery cover. The battery pack is replaced as necessary in the field.
  - (3) The ELT activates a buzzer that is installed near the ELT assembly. The buzzer makes a loud noise to let people know that the ELT is on.
  - (4) The G-switch is internally installed in the ELT transmitter and is activated with a sudden reduction in forward speed.
- B. Artex ELT Antenna.
- (1) The ELT system uses an antenna to transmit the emergency locator signal. The ELT antenna is installed on top of the tailcone skin, forward of the vertical stabilizer. The ELT antenna is connected with a coaxial cable to the ELT unit inside the dorsal.
- C. ELT Remote Switch.
- (1) The ELT remote switch is installed on the right panel. The ELT remote switch is a two-position rocker switch that can be set in the ARM or the ON positions.

**3. Operation**

**CAUTION:** Operate the emergency locator transmitter (ELT) system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the emergency locator transmitter (ELT) for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz signal after the ELT is active for approximately 50 seconds. This signal is identified as a distress signal.

- A. Artex ME406 ELT.
- (1) During an accident, the ELT will activate automatically and transmit a standard swept tone on 121.5 MHz (emergency frequency). The 121.5 MHz signal will continue until the ELT battery has expired. Every 50 seconds for 440 milliseconds, the 406.028 MHz transmitter will activate and send a message to the satellite. The 406.028 MHz transmission will continue for 24 hours and then stop. During operation, the ELT will receive electrical power from the ELT battery pack only.
- B. ELT Remote Switch.
- (1) The ELT can also be activated manually in the cockpit with the ELT remote switch. To manually activate the ELT, put the ELT remote switch in the ON position. The red LED will come on when the remote switch is set in the ON position. The ELT remote switch can also be used to do a test of the ELT system (refer to Artex ME406 Emergency Locator Transmitter - Troubleshooting). During typical operation, the ELT remote switch will be in the ARM position.

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**ARTEX ME406 EMERGENCY LOCATOR TRANSMITTER SYSTEM - TROUBLESHOOTING**

**1. General**

- A. This section contains the information that is needed to complete the self test for the ARTEX ME406 Emergency Locator Transmitter system. The system transmits on two frequencies at the same time.

**2. Tools and Equipment**

- A. For information on tools and equipment, refer to Equipment and Furnishings - General.

**3. ME406 Emergency Locator Transmitter Self Test Preparation**

**CAUTION:** Operate the Emergency Locator Transmitter system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the emergency locator transmitter for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz signal after the ELT is active for approximately 50 seconds. This signal is identified as a distress signal.

- A. Prepare the Airplane for the ME406 Emergency Locator Transmitter Troubleshooting.
- (1) Put the BATTERY switch in the ON position.
  - (2) Examine the ELT battery to make sure that it is serviceable.
    - (a) If the battery must be replaced, follow the manufacturers instructions to replace it.
- B. ELT 121.5 MHz Test.
- (1) Tune the receiver (usually the aircraft radio) to 121.5 MHz.
  - (2) Set the ELT instrument panel remote switch to the ON position and wait for 3 sweeps on the receiver which takes about 1 second.
  - (3) Set the remote switch back to the ARM (OFF) position immediately and the switch LED and buzzer will give 1 pulse. If more pulses are displayed, find the problem from the list below.
    - (a) One flash - Shows that the system is operational and that no error conditions were found.
    - (b) Three flashes - Shows an open or short condition on the antenna output or cable. Use the list below to isolate and repair the problem:
      - 1 Examine that the coaxial cable is connected and in good condition. Do a continuity check of the center conductor and shield. Examine for a shorted cable.
      - 2 Examine for a intermittent connection in the coaxial cable.
      - 3 Examine the antenna installation if this error code persists. This can be examined with a VSWR meter. Examine the antenna for opens, shorts, and a resistive ground plane connection.
    - (c) Four flashes - This shows a low power condition. This occurs if the output power is below approximately 33 dBm (2 watts) for the 406.028 MHz signal, or 17 dBm (50mW) for the 121.5 MHz signal. Also this can show that the 406.028 MHz signal is off frequency. For this error code the ELT must be sent back for repair or replacement.
    - (d) Five flashes - This shows that the ELT has not been programmed, however this does not show erroneous or corrupted programmed data.
    - (e) Six flashes - This shows that the G-switch loop between pins 5 and 12 at the D-sub connector is not installed. The ELT will not activate during a crash.
      - 1 Do a resistance test to make sure the harness D-sub jumper is installed. There must be less than 1 ohm of resistance between pins 5 and 12.
    - (f) Seven flashes - This shows that the ELT battery has too much accumulated operation time and must be replaced to meet FAA specifications.
- C. Put the BATTERY switch in the OFF position.

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**ARTEX ME406 EMERGENCY LOCATOR TRANSMITTER SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance practices for the emergency locator transmitter (ELT) system. Components in the ELT system include the ELT, antenna, remote switch, and buzzer.

**2. Emergency Locator Transmitter (ELT) Removal/Installation**

- A. Remove the Emergency Locator Transmitter (ELT) (Refer to Figure 201).
- (1) Make sure the MASTER switch is in the OFF position.
  - (2) Get access to the ELT.
    - (a) Put a support stand under the tail tiedown ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
    - (b) Remove access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
  - (3) Keep the ON/ARM switch on the ELT in the ARM position.

**CAUTION:** Although the ELT is off with the electrical connector removed, the ELT can be activated if the switch on the front is moved to the ON position. Be careful not to move the switch to the ON position.

- (4) Disconnect the BNC connector (PT1029) and the electrical connector (PT907) from the ELT.

**NOTE:** The ELT is off when the electrical connector is removed from the ELT.

- (5) Open the Velcro strap that holds the ELT to the mounting tray.
- (6) Remove the ELT from the airplane.

- B. Install the Emergency Locator Transmitter (ELT) (Refer to Figure 201).

**NOTE:** The ELT is off when the electrical connector is removed from the ELT.

**CAUTION:** Although the ELT is off with the electrical connector removed, the ELT can be activated if the switch on the front is moved to the ON position. Be careful not to move the switch to the ON position.

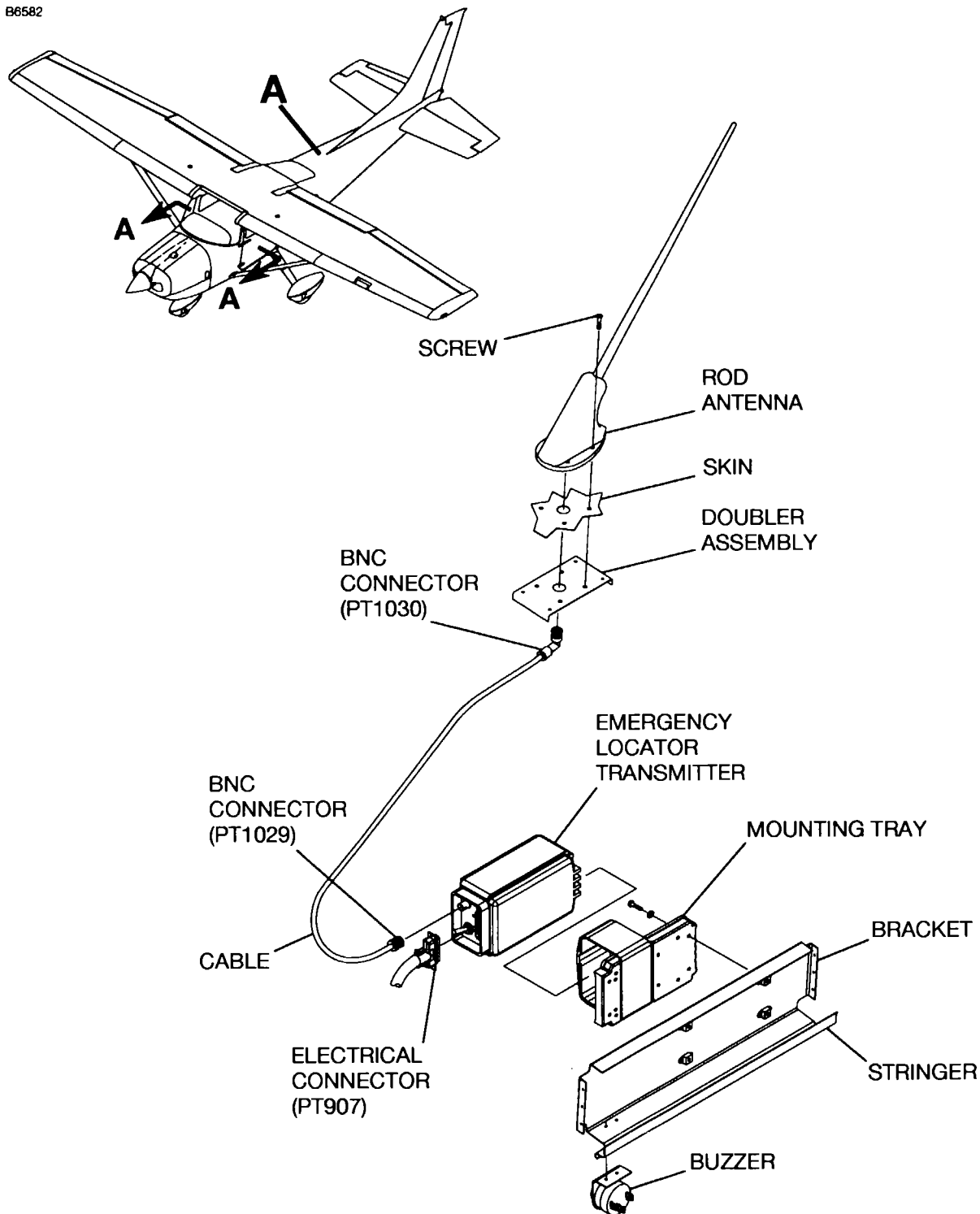
- (1) Put the ELT in the mounting tray at an angle to engage the lock mechanism at the opposite end of the ELT.
- (2) Push the ELT down into the mounting tray until it is fully installed in the tray.
- (3) Connect the Velcro strap that holds the ELT firmly to the mounting tray.
- (4) Connect the BNC connector and the electrical connector to the ELT.
- (5) Make sure the ON/ARM switch is in the ARM position.
- (6) Complete a functional test of the ELT system to make sure the installation is correct. Refer to Artex ME406 Emergency Locator Transmitter - Adjustment/Test.
- (7) Install access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
- (8) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**3. ELT Buzzer Removal/Installation**

- A. Remove the ELT Buzzer (Refer to Figure 201).
- (1) Get access to the ELT.
    - (a) Put a support stand under the tail tiedown ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
    - (b) Remove access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
  - (2) Make sure that the ELT master switch on the ELT transmitter is in the ARM position.

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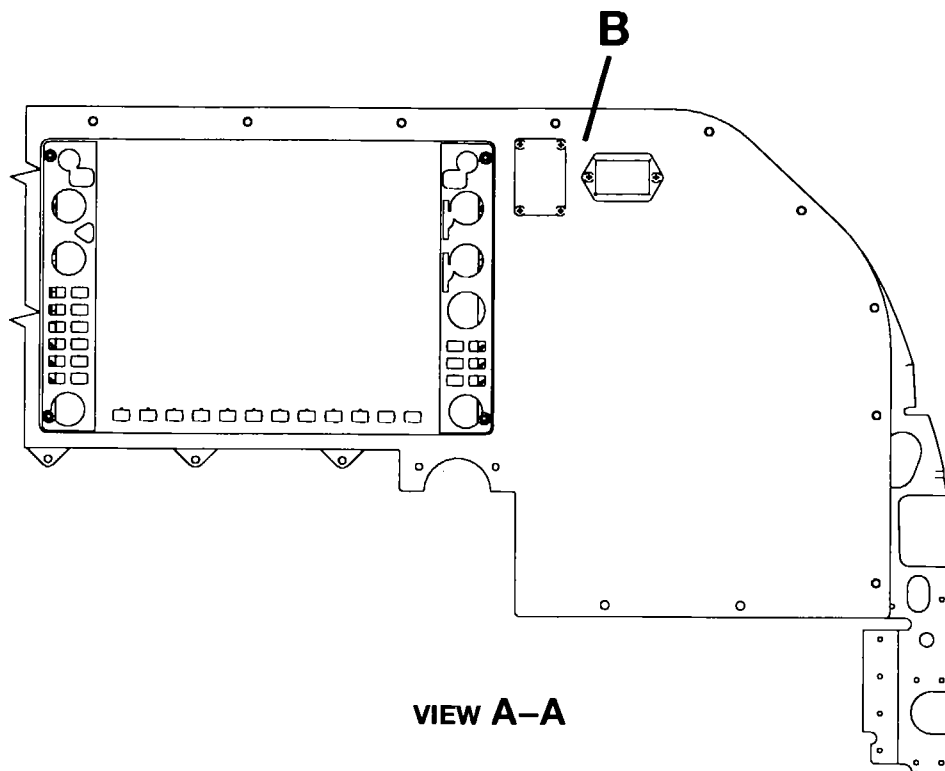
**DETAIL A**

Artex ME406 Emergency Locator Transmitter System Installation  
Figure 201 (Sheet 1)

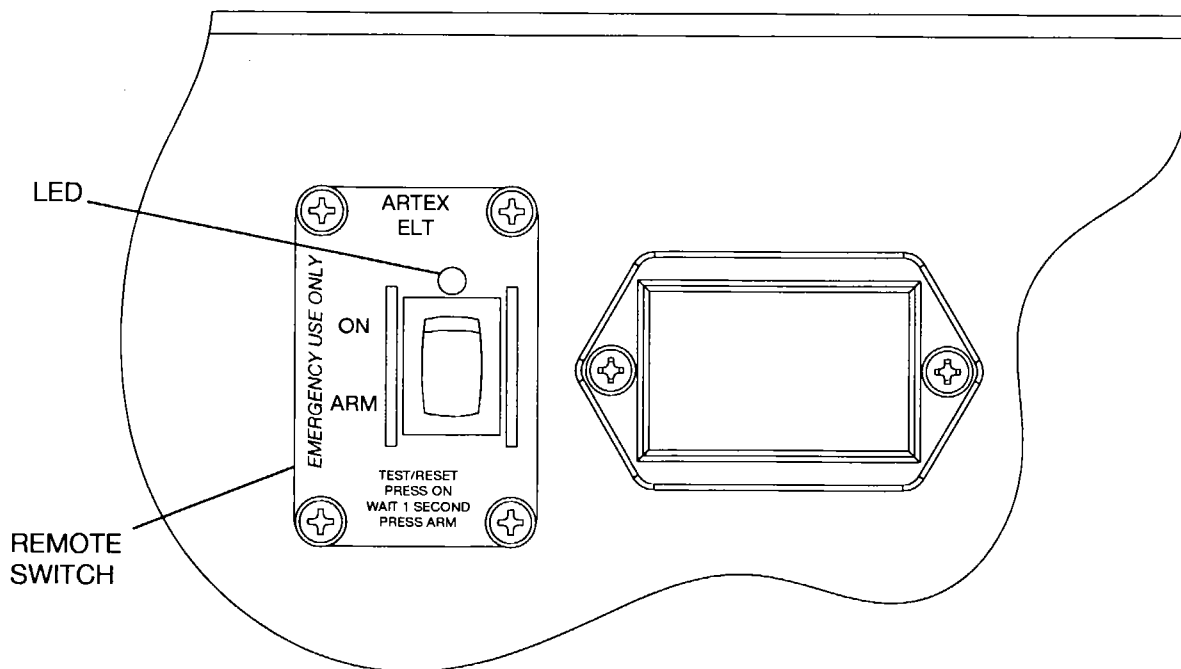
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**VIEW A-A**



**DETAIL B**

Artex ME406 Emergency Locator Transmitter System Installation  
 Figure 201 (Sheet 2)

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- (3) Tag the wires and terminals for identification.
- (4) Remove the screws that attach the electrical terminals to the buzzer.
- (5) Loosen the black retainer ring on the outboard side of the buzzer.
- (6) Remove the buzzer from the bracket.

**B. Install the ELT Buzzer (Refer to Figure 201).**

- (1) Put the buzzer in the bracket.
- (2) Install the black retainer ring on the outboard face of the buzzer.
- (3) Remove the tags from the wires and terminals.
- (4) Connect the electrical wires to the buzzer with the screws.
- (5) Do a check of the ELT system. Refer to Refer to Artex ME406 ELT Functional Test.
- (6) Install access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
- (7) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**4. Remote Switch Removal/Installation**

**A. Remove the Remote Switch. Refer to Figure 201.**

- (1) Remove electrical power from the aircraft.
- (2) Get access to the ELT.
  - (a) Put a support stand under the tail tiedown ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (b) Remove the access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
- (3) Disconnect the electrical connector (PT907) from the ELT.
- (4) Remove the screws from the front of the remote switch.
- (5) Pull the remote switch from the panel to get to the electrical connector.
  - (a) Disconnect the connector from the back of the switch.

**B. Install the Remote Switch. Refer to Figure 201.**

- (1) Connect the electrical connector to the back of the switch.
- (2) Put the remote switch into the panel.
  - (a) Install the screws that attach the switch to the panel.
- (3) Connect the electrical connector to the ELT.
- (4) Complete a functional test of the ELT system to make sure the installation is correct. Refer to Artex ME406 Emergency Locator Transmitter - Adjustment/Test.
- (5) Install access panel (310AR) on the right side of the tailcone. Refer to Access/Inspection Plates - Description and Operation
- (6) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**5. ELT Antenna Removal/Installation**

**A. Remove the ELT Antenna (Refer to Figure 201).**

- (1) Remove the screws that attach the antenna to the fuselage.
- (2) Pull the antenna upward from fuselage and disconnect the BNC connector (PT1030) from antenna.
- (3) Remove the antenna from the airplane.
- (4) Remove sealant from antenna and airplane.

**B. Install the ELT Antenna (Refer to Figure 201).**

- (1) Put the antenna near the mounting position and connect the BNC connector (PT1030) to the antenna.
- (2) Install the screws that attach the antenna to the fuselage.
- (3) Make sure that there is a correct electrical bond between the antenna and the airplane structure.
  - (a) Remove one screw.
  - (b) With an ohmmeter, measure the electrical resistance from the antenna base metal insert to the structure at the screw position.

**NOTE:** The maximum allowable resistance (in ohms) at each of the four measured positions is 0.0025.

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- (c) Install the screw and remove and install each of the remaining screws in turn as you measure the electrical resistance at each screw hole.
- (4) Apply a fillet seal around the antenna with Type I Class B Sealant. Do not cover the screw head with the sealant. Refer to Chapter 20, Fuel, Weather and High-Temperature Sealing - Maintenance Practices.
- (5) Do a functional test of the ELT system. Refer to Artex ME406 Emergency Locator Transmitter - Adjustment/Test.

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**ARTEX ME406 EMERGENCY LOCATOR TRANSMITTER (ELT) SYSTEM - INSPECTION/CHECK**

**1. General**

- A. This section gives the procedures that are necessary to do the inspection and operational checks necessary to comply with 14 CFR 91.207, for the Artex ME406 Emergency Locator Transmitter (ELT) System. The system transmits on two frequencies. The 121.5 MHz frequency has the standard swept tone that rescue personnel can follow to the source. The other frequency is 406.028 MHz and is used to activate a satellite tracking system. The 406.028 MHz frequency includes other information such as the country code of the airplane, the aircraft identification beacon serial number, the 24-bit address, the tail number, or other identification.

**2. Tools and Equipment**

- A. For information on tools and equipment, refer to Equipment and Furnishings - General.

**3. Artex ME406 Emergency Locator Transmitter (ELT) Inspection**

- A. Get access to the ELT.
- (1) Put a support stand under the tail tiedown ring to support the tailcone. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (2) Remove the rear seat. Refer to Rear Seat - Maintenance Practices.
  - (3) Remove the baggage curtain to get access to the transmitter. Refer to Interior Upholstery - Maintenance Practices.
- B. Do an inspection of the ELT, mounting tray, antenna, and the ELT battery for condition and correct installation.
- (1) Make sure that the ELT switch, found on the forward end of the ELT, is set to the ARM position.
  - (2) Remove the ELT from the mounting tray. Refer to Artex ELT ME406 Emergency Locator Transmitter System - Maintenance Practices.

**CAUTION:** Do not use solvents to clean the ELT, mounting tray, or electrical contacts. Solvents used in these areas can cause damage to the ELT housing.

- (3) Examine the ELT and the mounting tray for correct installation, cleanliness, cracks, or other damage.
- (4) Examine the ELT battery for corrosion.
- (5) Look at the battery expiration date.
  - (a) Make sure that the battery life limit is not expired.
  - (b) Make sure that the battery expiration date is shown correctly in the Maintenance Records.

**NOTE:** The battery manufacturer puts a mark on the battery to show the battery life limit. When you install a new battery in an ELT, make sure a record of the expiration date is put in the space given on the ELT name and data plate.

- (c) If you have to replace the ELT battery, refer to Artex Maintenance Manual 570-1600.
- (d) You must replace the ELT battery with a new battery if one or more of the conditions that follow occur:
  - Use of the ELT battery in an emergency
  - Operation for an unknown amount of time
  - Use for more than one hour of cumulative time
  - Replacement date shown on the battery label has expired.
- (e) Record the new battery expiration date in the maintenance log if you replaced it.
- (6) Examine the ELT antenna for correct installation and cracks or other damage.
- (7) Install the ELT into the mounting tray. Refer to Artex ELT ME406 Emergency Locator Transmitter System - Maintenance Practices.

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- (8) Closeout to the lower baggage area (Zone 240). Refer to Airplane Zoning - Description and Operation.
  - (a) Install the baggage curtain. Refer to Interior Upholstery - Maintenance Practices.
  - (b) Install the rear seat. Refer to Rear Seat - Maintenance Practices.
  - (c) Remove the support stand. Refer to Chapter 7, Jacking - Maintenance Practices.

**4. Artex ME406 Emergency Locator Functional Test**

**NOTE:** If possible, do the test procedure for the emergency locator transmitter inside a metal hangar with the doors closed to decrease the signal transmission from the ELT unit during the test.

**A. Do a G-Switch Operational Test:**

**CAUTION:** Operate the Emergency Locator Transmitter (ELT) system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the Emergency Locator Transmitter (ELT) for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz distress signal after it is activated for approximately 50 seconds.

- (1) Remove the ELT from the airplane. Refer to Artex ELT ME406 Emergency Locator Transmitter System - Maintenance Practices.
- (2) Install a jumper wire between pins 5 and 12 on the electrical connector of the ELT.

**CAUTION:** It is recommended that an experienced technician do this procedure because of the potential physical damage that can occur if the jumper wire is not installed correctly.

**NOTE:** The ELT will not activate with the G-switch unless electrical pins 5 and 12 have a jumper wire installed between them (this happens automatically when the ELT is locked into the mount tray with the electrical connector in position).

- (3) Make sure the ELT switch is in the ARM position.
- (4) Use a receiver set to 121.5 MHz to listen for the aural warning sweep tone.
- (5) Hold the ELT transmitter tightly in one hand and make a throwing movement followed by an opposite movement of the ELT transmitter.
- (6) Make sure that the G-switch operates and that the aural warning sweep tone is heard on the receiver set to 121.5 MHz.
- (7) Set the ELT switch to the ON position and then back to the ARM position to reset the G-switch.
- (8) Remove the jumper wire from electrical pins 5 and 12 on the electrical connector of the ELT.
- (9) Install the emergency locator transmitter in the airplane. Refer to Artex ELT ME406 Emergency Locator Transmitter System - Maintenance Practices.

**B. Do a Transmitter Test of the Artex ME406 Emergency Locator Transmitter (ELT) System:**

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**CAUTION:** Operate the Emergency Locator Transmitter (ELT) system only during the first five minutes of each hour. If you must complete the functional test at a time other than the first five minutes of the hour, you must do the test with a direct connection to the ELT and a 30 dB attenuator. Refer to the FAA Advisory Circular AC-91-44A.

**CAUTION:** Do not operate the Emergency Locator Transmitter (ELT) for more than five seconds at a time. Do not operate the ELT again for 15 seconds. The ELT will transmit a 406.028 MHz distress signal after it is activated for approximately 50 seconds.

- (1) Make sure the BATTERY switch and the AVIONICS switches are in the OFF position.
- (2) Connect external electrical power to the airplane.
- (3) Make sure that the COM/NAV 1 and AUD/MKR circuit breakers on the circuit breaker panel are engaged.
- (4) Set the BATTERY switch to the ON position.
- (5) Set the AVIONICS switches to the ON position.
- (6) Remove the ELT from the airplane. Refer to Artex ELT ME406 Emergency Locator Transmitter System - Maintenance Practices.
- (7) Make sure that the ELT remote switch on the right panel is in the ARM position.
- (8) Set one of the communication units to receive a frequency of 121.5 MHz.
- (9) Set the communication unit to the airplane speakers at an audio level loud enough to be heard.

**NOTE:** The SARSAT tester is used as an example to gather test information. However, other equivalent test equipment such as the Aeroflex IFR 4000 Communications Test Set is acceptable.

- (10) Have another person use the SARSAT tester set to the RECV function. Refer to Figure 601.

**NOTE:** The SARSAT tester must be less than 15 feet from the ELT antenna and must have a line-of-sight between the ELT antenna and SARSAT tester.

**NOTE:** The person with the SARSAT tester must make sure that the ELT buzzer is heard during the test.

**NOTE:** If it is necessary to do the transmitter test after the first five minutes of the hour, the SARSAT tester is connected directly to the ELT with a coaxial cable and a 30 dB attenuator. You will not hear the sweep tone from the ELT on the airplane speakers with the attenuator installed.

- (11) Install the 30 dB attenuator between the ELT and SARSAT tester if necessary (Refer to Figure 601).
- (12) Set the ELT remote switch on the right panel to the ON position.
- (13) Let the ELT make three sweeps on the airplane speakers.

**NOTE:** This will take one second. The ELT remote switch will start to flash.

- (14) Set the ELT remote switch back to the ARM position and monitor the LED.

**NOTE:** The ELT will do a self-test. The LED will stay on for one second and the ELT sweeps are not audible on the airplane speakers if the ELT operation is normal.

**NOTE:** The ELT does not transmit a 406.028 MHz test signal to the SARSAT tester until the ELT remote switch is set back to the ARM position.

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- (15) If the LED continues to flash, refer to Artex ME406 Emergency Locator Transmitter System - Troubleshooting.
- (16) If the SARSAT tester did not receive a 406.028 MHz signal and the ELT remote switch LED does not show a transmitter problem, do the test again.
- (17) When the SARSAT tester receives a 406.028 MHz signal, scroll the pages on the tester and make sure of the information that follows:
  - (a) Make sure the information shown by the SARSAT tester agrees with the placard on the ELT.

**NOTE:** The information that follows must match the data on the ELT placard:

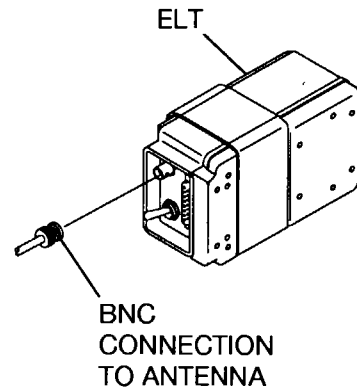
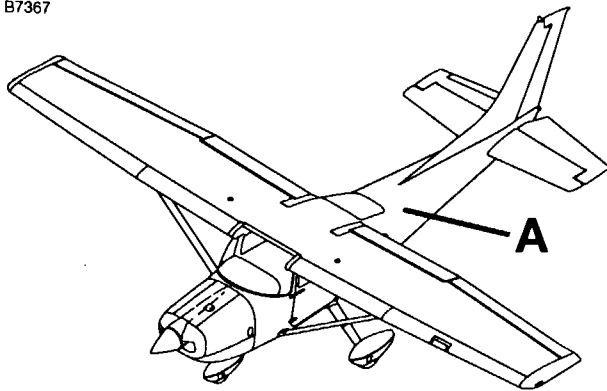
- COUNTRY code
  - 15-digit Hex code ID
  - Aircraft identification number.
- (b) Make sure that the SARSAT tester shows the messages that follow:
    - S' TEST OK
    - Frequency - PASS
    - Homing frequency
    - Message format (short).

**NOTE:** When ownership of an aircraft is transferred within the same country, the ME406 ELT should be reregistered with the applicable authority. When an aircraft with a ME406 ELT changes tail number or country registration, the ELT will need to have the new identification data entered. The ELT will also need to be registered with the applicable authority.

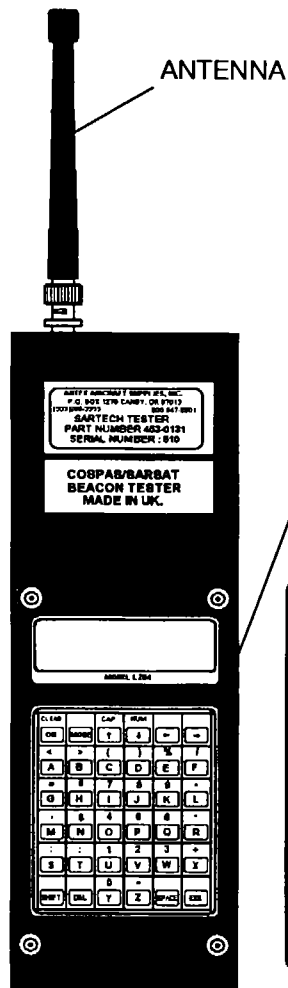
- (18) Install the bolts, tiedowns, and plastic closeout to the lower baggage area (Zone 240). Refer to Airplane Zoning - Description and Operation.

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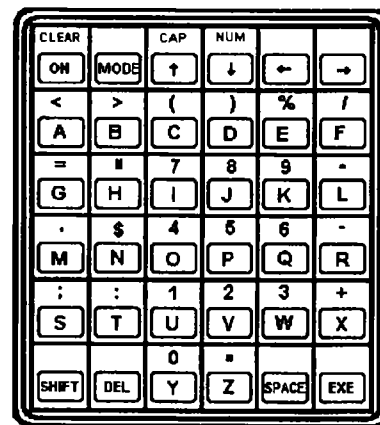
**DETAIL A**



LIFT THE DOOR TO GET  
 ACCESS TO THE CONTRAST  
 KNOB ADJUSTMENT



COVER

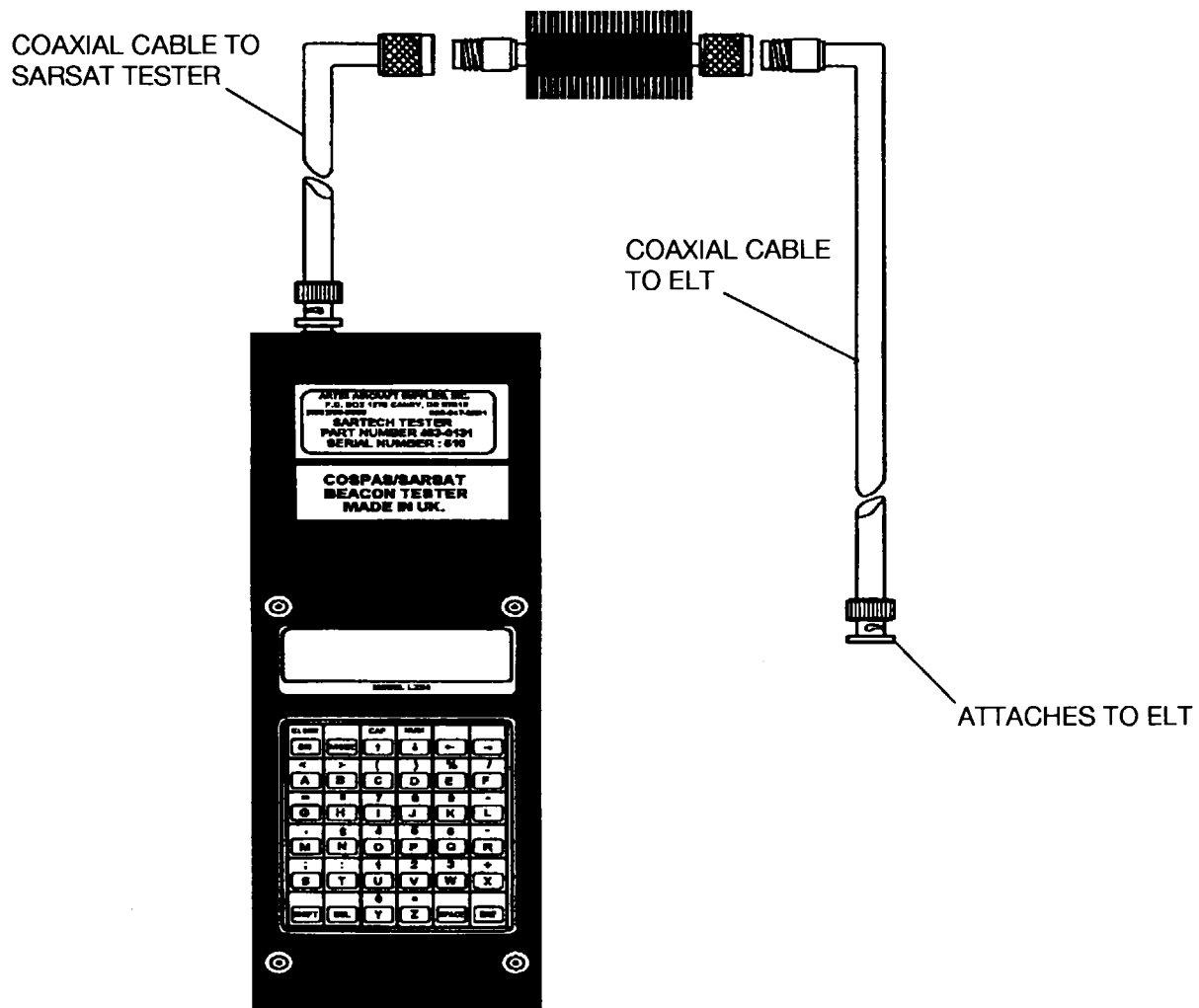


Artex ME406 Emergency Locator Transmitter (ELT) SARSAT Test Set-up  
 Figure 601 (Sheet 1)

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 A2618T1109  
 6618T1379

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6618T1380

Artex ME406 Emergency Locator Transmitter (ELT) Sarsat Test Set-up  
 Figure 601 (Sheet 2)



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**CARBON MONOXIDE DETECTOR - MAINTENANCE PRACTICES**

**1. General**

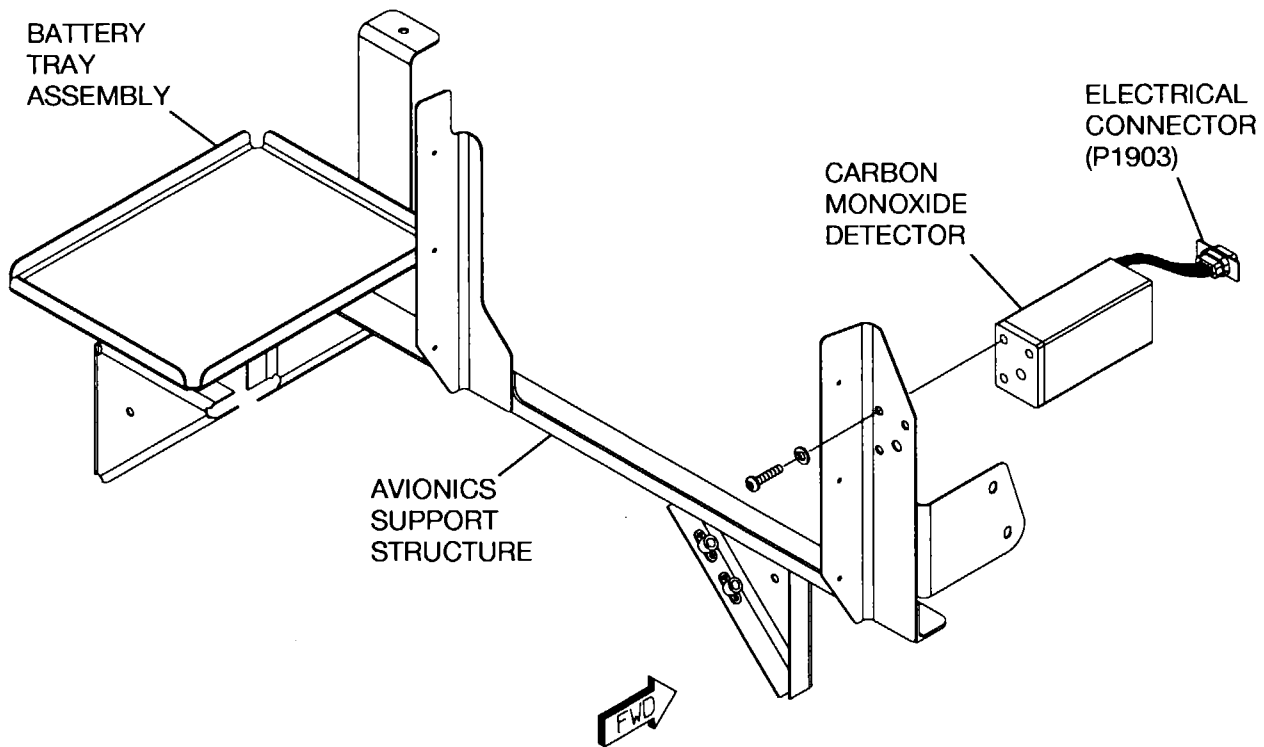
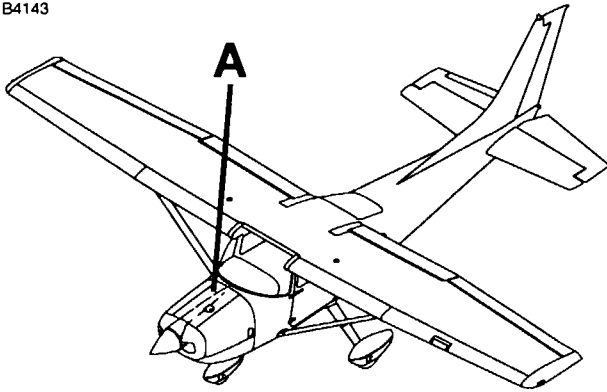
- A. The carbon monoxide (CO) detector is installed on Airplanes 182081742 and On and Airplanes T182008481 and On that have the Garmin G1000.
- B. The CO detector detects, measures, and gives an alert to the crew before the cockpit level of CO reaches a critical level. The CO data is displayed and controlled through the CO detector RS232 interface with the multi-function display (MFD).

**2. Carbon Monoxide Detector Removal/Installation**

- A. Carbon Monoxide Detector Removal (Refer to Figure 201).
  - (1) Put the AVIONICS MASTER switch in the off position.
  - (2) Remove the MFD from the copilot side of the instrument panel. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (3) Disconnect the electrical connector (P1903) from the CO detector.
  - (4) Remove and keep the three screws and three washers that connect the CO detector to the avionics support structure.
  - (5) Remove the CO detector from the airplane.
- B. Carbon Monoxide Detector Installation (Refer to Figure 201).
  - (1) Put the CO detector in position on the avionics support structure.
  - (2) Attach the CO detector to the structure with the three kept screws and three kept washers.
  - (3) Connect the electrical connector (P1903) to the CO detector.
  - (4) Install the MFD on the copilot side of the instrument panel. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (5) Put the AVIONICS MASTER switch in the ON position.
  - (6) On the primary flight display (PFD), do a check to make sure that the CO detector operates correctly.

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**DETAIL A**

LOOKING FORWARD AT FS 17.00  
AIRPLANES THAT HAVE GARMIN G1000

Carbon Monoxide Detector Installation  
Figure 201 (Sheet 1)

0710T1001  
A0718T1095

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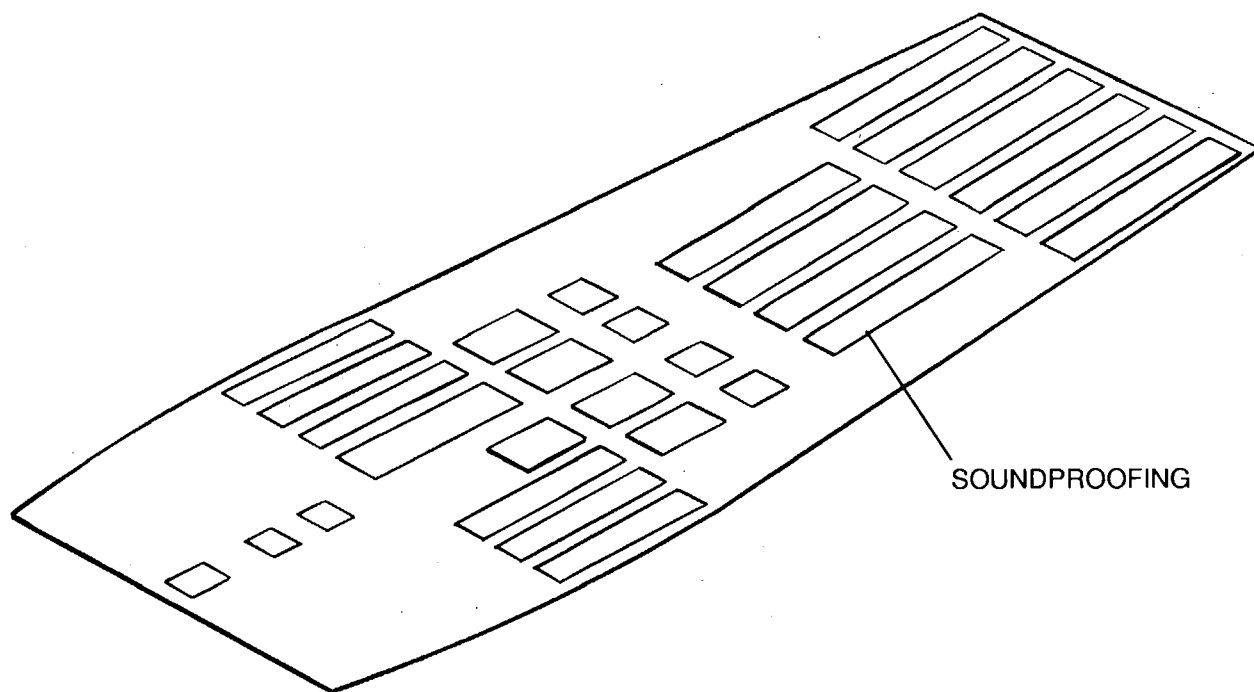
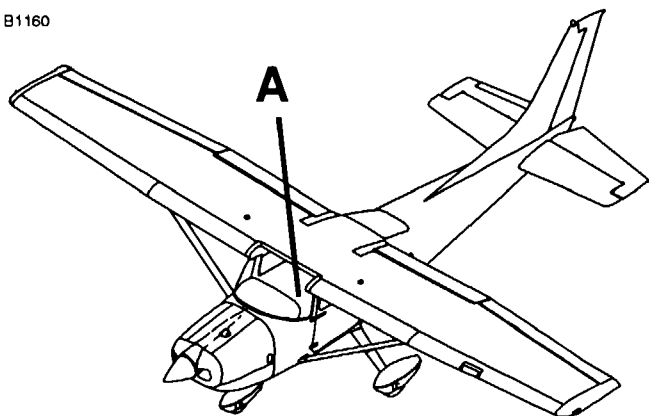
**SOUNDPROOFING AND INSULATION - MAINTENANCE PRACTICES**

**1. General**

- A. The airplane utilizes soundproofing and insulation throughout the fuselage area. This material is glued into place using spray adhesive. Any time old material is being replaced, care should be taken to ensure all traces are removed from fuselage skin before reapplication. For a list of spray adhesives, refer to Equipment/Furnishing - General.
- B. For an illustration of soundproofing and insulation locations, refer to Figure 201 and Figure 202.

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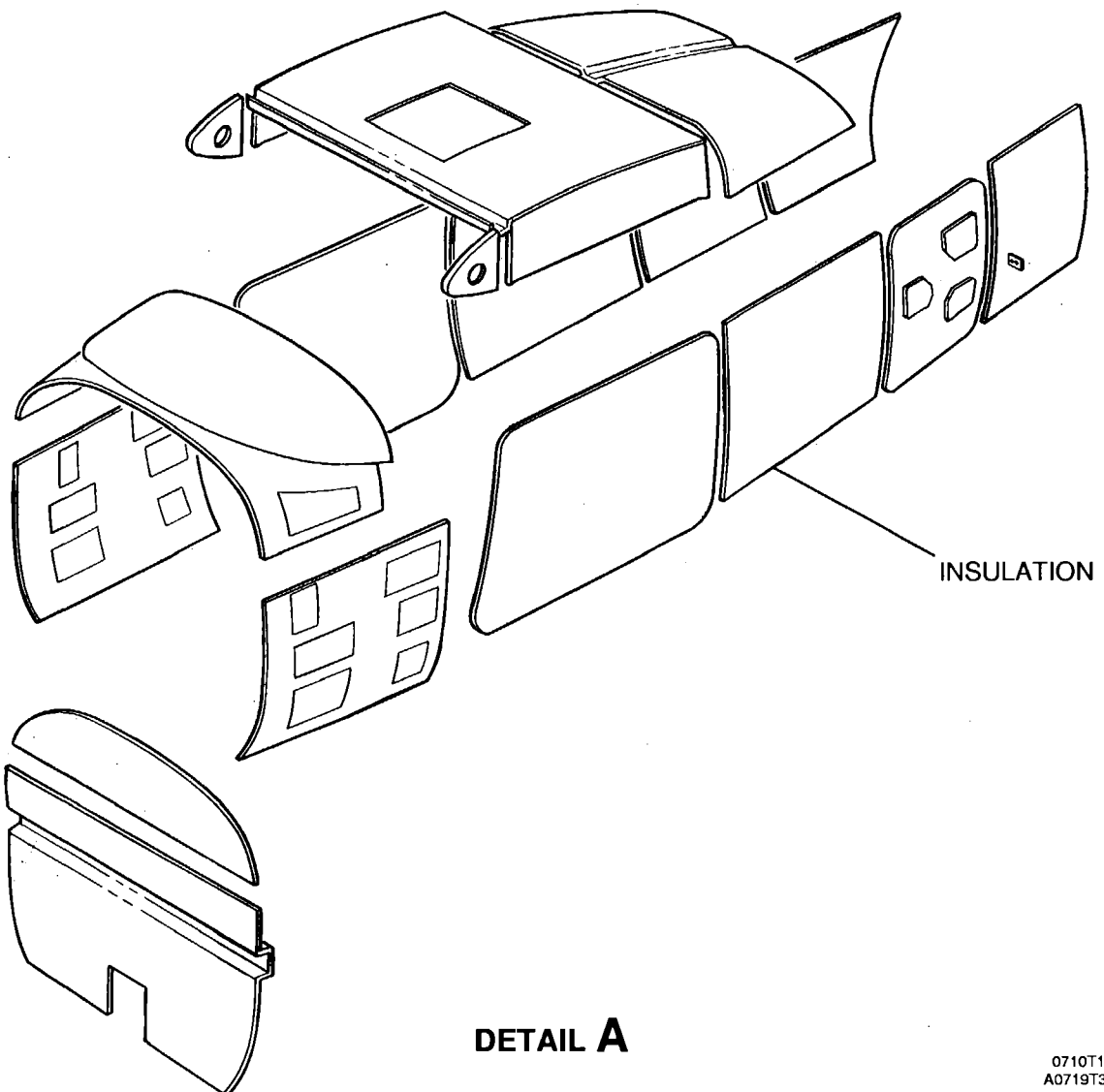
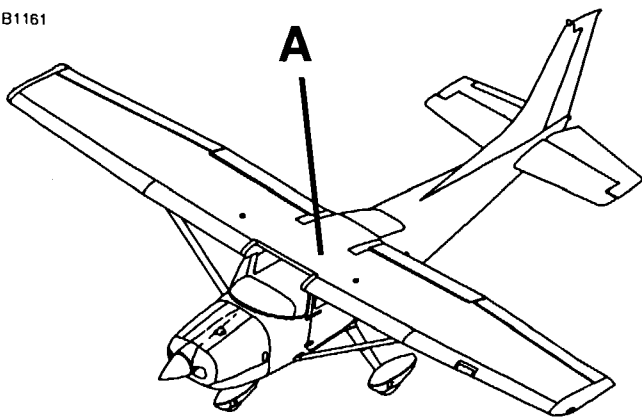
**DETAIL A**

Soundproofing Installation  
Figure 201 (Sheet 1)

0710T1001  
A0719T2001

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**DETAIL A**

Insulation Installation  
Figure 202 (Sheet 1)

0710T1001  
A0719T3003

**CHAPTER**

**26**

**FIRE PROTECTION**

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**FIRE PROTECTION - GENERAL**

**1. Scope and Definition**

- A. This chapter contains a single section which describes the portable fire extinguisher used in the cabin.

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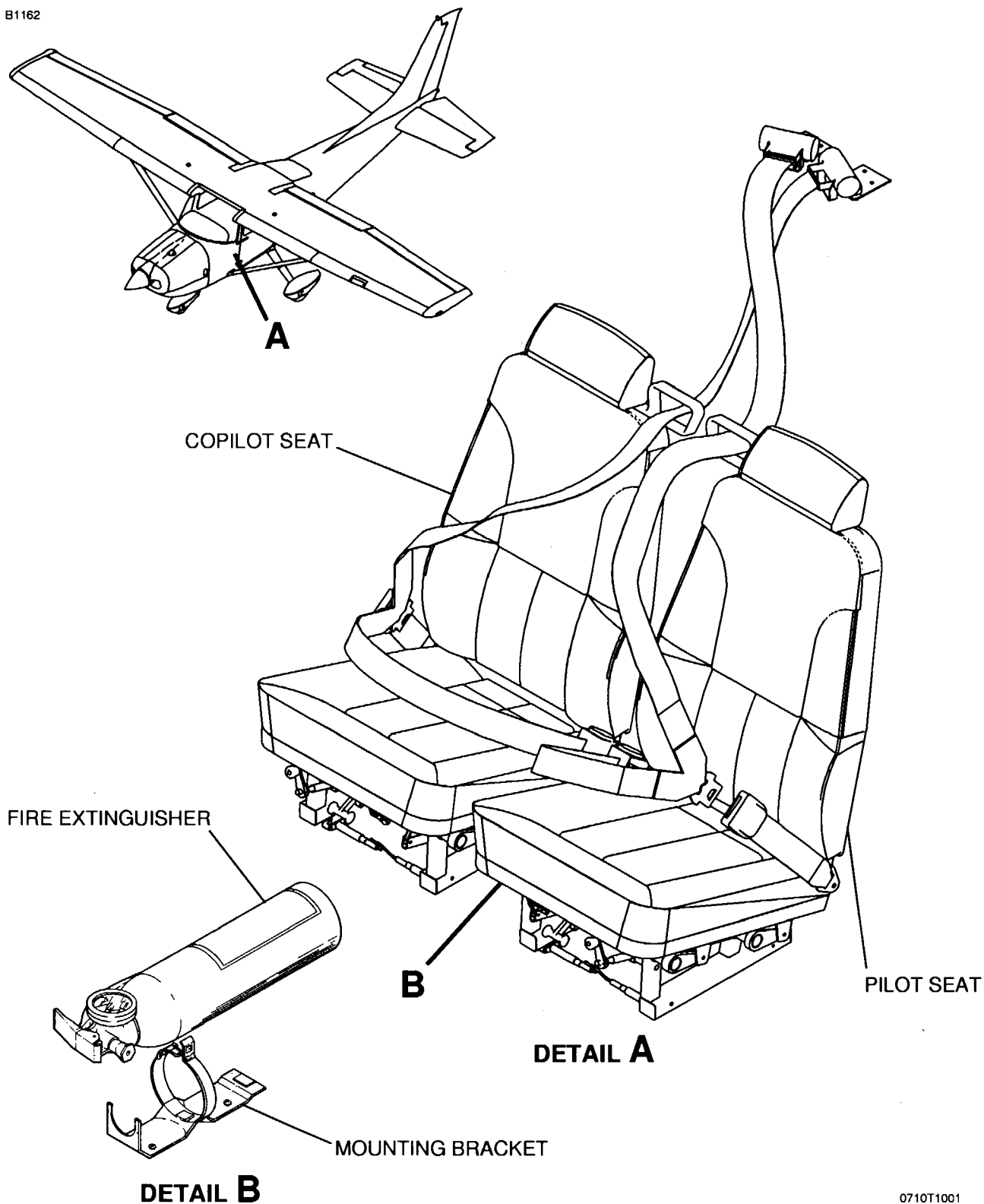
**HAND FIRE EXTINGUISHER - DESCRIPTION AND OPERATION**

**1. Description and Operation**

- A. A portable, hand operated fire extinguisher is mounted on the floor between the pilot and copilot seats for use in the event of a fire. The extinguishing agent is Halon 1211 and may be used on solid combustible, electrical or liquid fires. Servicing of the extinguisher can be handled by most fire equipment dealers. The fire extinguisher is mounted within a quick release, clamp type bracket assembly. (Refer to Figure 1).

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0710T1001  
A0514T1004  
B0578T1001

Fire Extinguisher Installation  
Figure 1 (Sheet 1)

• **CHAPTER**

• **27**

**FLIGHT CONTROLS**

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**FLIGHT CONTROLS - GENERAL**

**1. General**

- A. This chapter provides maintenance of components which furnish a means of manually controlling the flight attitude characteristics of the airplane, including flaps.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Tensiometer	T52002101	Pacific Scientific Electro Kinetics Div. 402 E. Guitierrez St. Santa Barbara, CA 93102	To measure and obtain cable tension.
Inclinometer	SE716	Cessna Aircraft Company Parts Cessna Distribution Department 701, CPD 25800 East Pawnee Road Wichita, KS 67218-5590	To measure control surface travel.
Polyurethane Tape	Y8761	3M 3M Center Minneapolis, MN 55144	To prevent flap chafing.

**3. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. The following is a brief description of each section. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.
- (1) The aileron section provides information on control wheels, cables, linkage and aileron assemblies.
  - (2) The rudder section provides information on rudder pedals, cables, linkage and rudder assembly.
  - (3) The elevator section provides information on control column, cables, linkage and elevator assemblies.
  - (4) The flap section provides information on the flap actuator, cables, linkage, and the flap assemblies.

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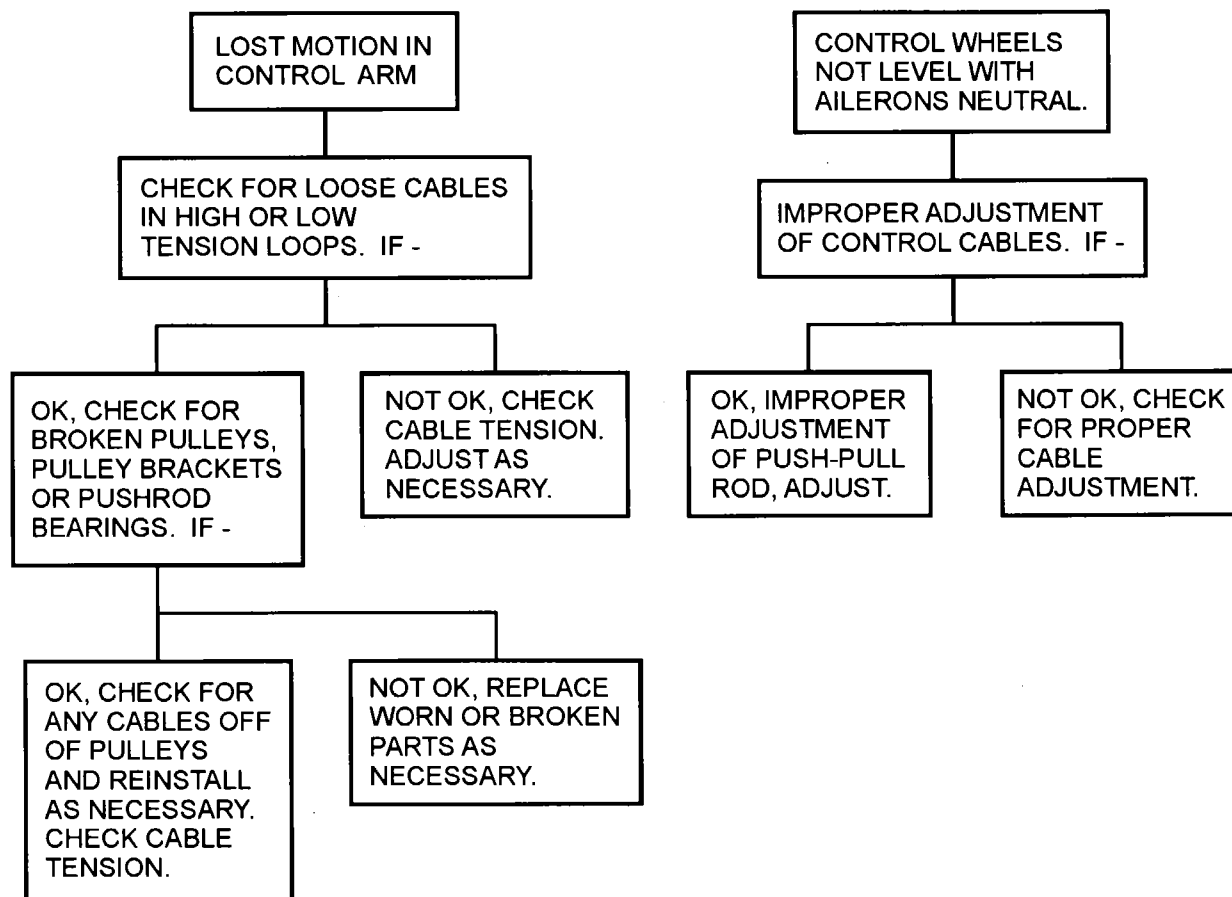
**AILERON CONTROL SYSTEM - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

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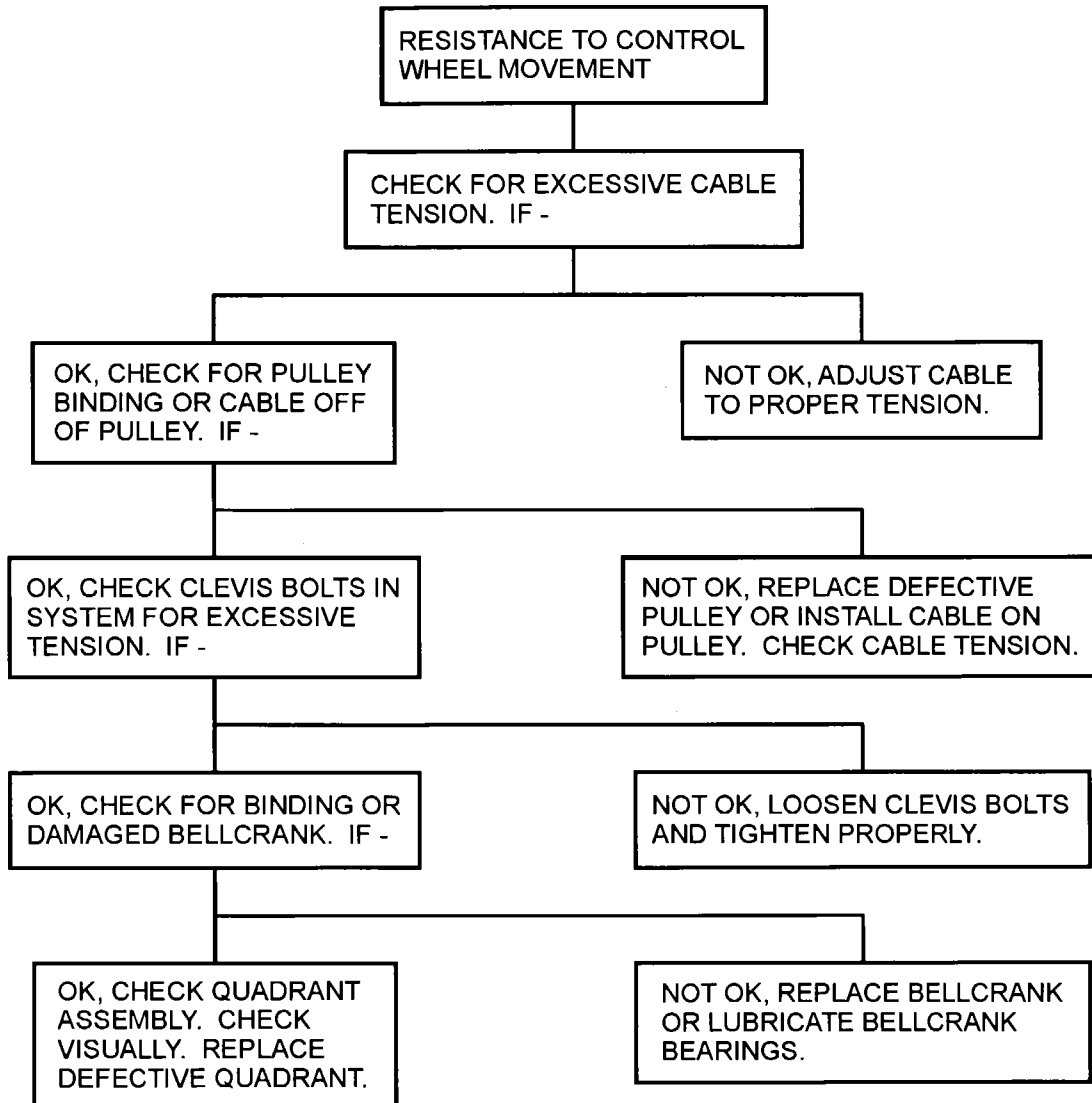
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Aileron System Troubleshooting Chart  
Figure 101 (Sheet 1)

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Aileron System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**AILERON CONTROL SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. The ailerons receive the input from the pilot or copilot control wheel. The torque tubes, bearings, cable quadrants, pulleys, cables, bell cranks, and pushrods help to supply the input to the ailerons.
- B. When you turn the control wheel, the four bearing roller assemblies on the end of the control wheel tube turn. This turns a square control tube assembly inside of and extending from the control wheel tube. Attached to the square tube is a quadrant that operates the aileron system. The aileron system is controlled by the two control wheels. The interconnect cables, turnbuckle, and adjustment terminals give synchronized control to the two control wheels. The forward end of the square control tube is installed in a bearing block on the firewall. It rotates with the control wheel and does not move in a fore-and-aft direction.
- C. As the control wheel moves in a fore-and-aft direction, the four bearing roller assemblies on the end of the control wheel tube decrease the friction. Bearings in the sleeve assembly let the control wheel tube turn. The sleeve assembly is attached to the control wheel tube by a sleeve and a retaining ring. The sleeve moves in a fore-and-aft direction with the control wheel tube. The movement lets the push-pull tube attached to the sleeve assembly operate an elevator arm assembly. One elevator cable is attached to the elevator arm assembly. A torque tube connects one arm assembly to the other arm assembly on the opposite end of the torque tube, where the other elevator cable is attached. The pilot and copilot control wheels are both linked to the aileron and elevator control systems when dual controls are installed.

**2. Control Wheel Removal/Installation**

**NOTE:** The pilot and copilot control wheel removal/installation is typical.

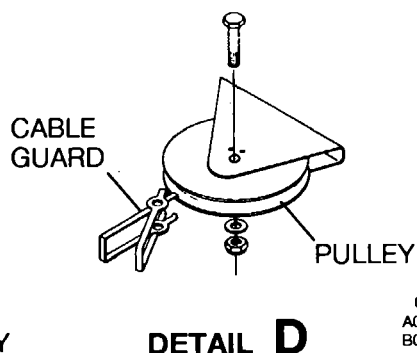
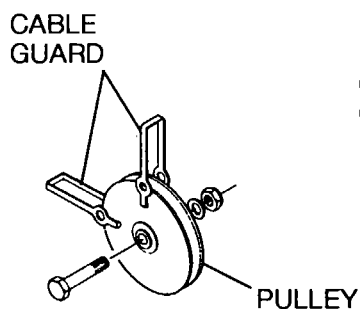
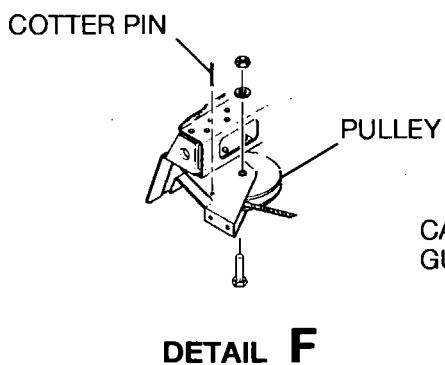
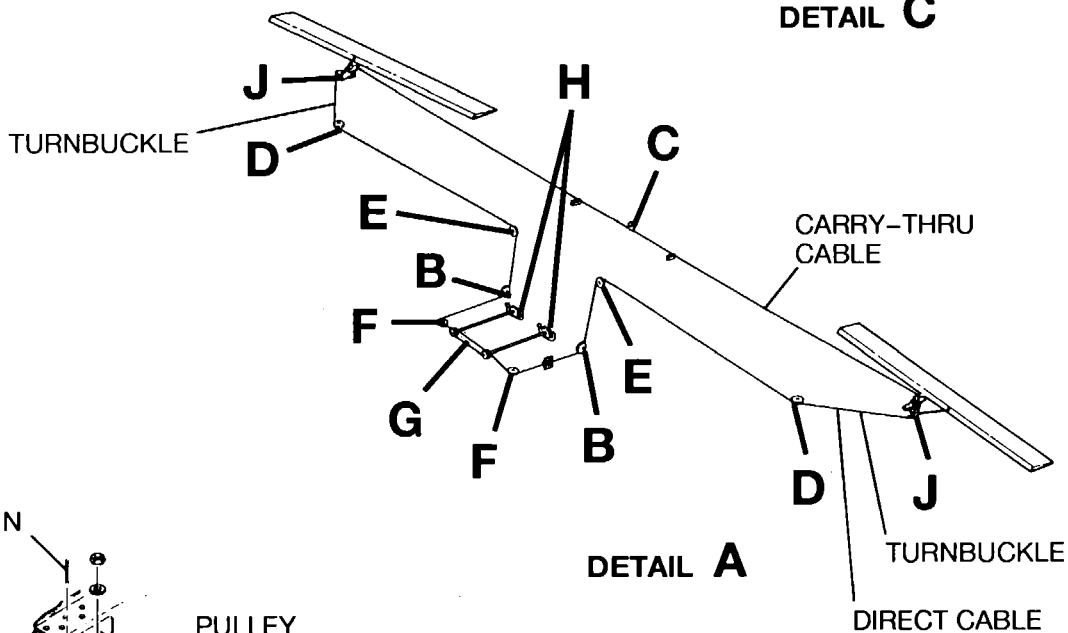
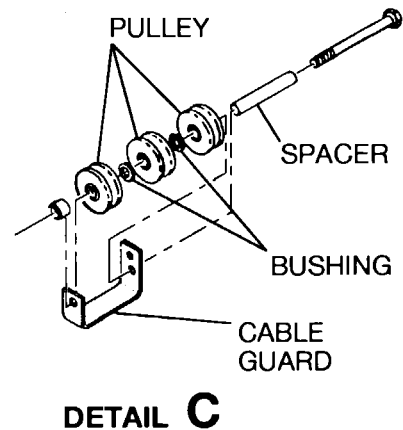
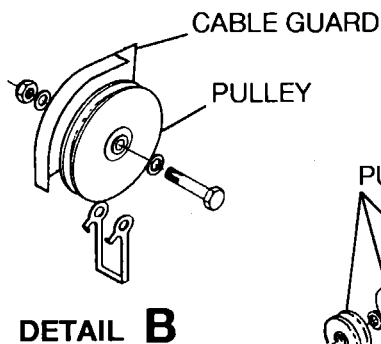
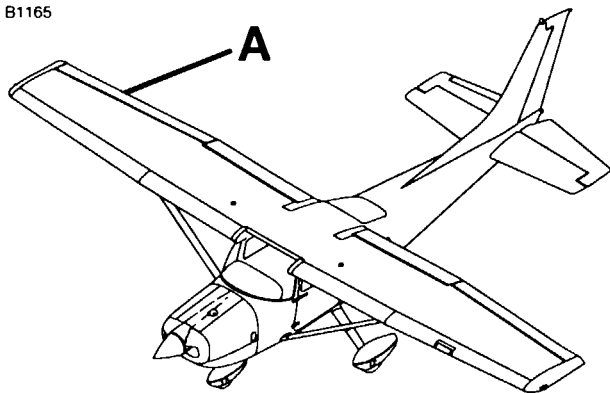
- A. Control Wheel Removal (Refer to Figure 201).
  - (1) Disconnect the electrical connector from the control wheel.
  - (2) Remove the screws that attach the control wheel to the control tube.
  - (3) Remove the control wheel.
- B. Control Wheel Installation (Refer to Figure 201).
  - (1) Attach the control wheel to the control tube with the screws.
  - (2) Connect the electrical connector to the control wheel.

**3. Pilot Control Column Removal/Installation**

- A. Control Column Removal (Refer to Figure 201).
  - (1) Remove the control wheel. Refer to Control Wheel Removal/Installation.
  - (2) Remove the glide plug.
  - (3) Disconnect the push-pull tube at the sleeve assembly.
  - (4) Remove the screws from the collar at the instrument panel.
  - (5) Remove the pilot's center instrument panel. Refer to Chapter 31, Instrument And Control Panels - Maintenance Practices.
  - (6) To help remove the control wheel tube, remove the snap ring from its locking groove to permit more movement of the sleeve assembly.
  - (7) Carefully pull the control wheel tube aft and work it out through the instrument panel.
    - (a) If removal of control tube assembly is necessary, go to step 3.A.(8).
  - (8) Remove the access plates 520AB and 620AB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (9) Remove the safety clips from the turnbuckles at the direct cable, and loosen the tension.
  - (10) Remove and discard the safety wire from the turnbuckle at the interconnect cable, and loosen the tension.
  - (11) Remove and discard the safety wire from the roll pin in the quadrant and the control tube assembly.
  - (12) Remove the roll pin installed in the quadrant and the control tube assembly.

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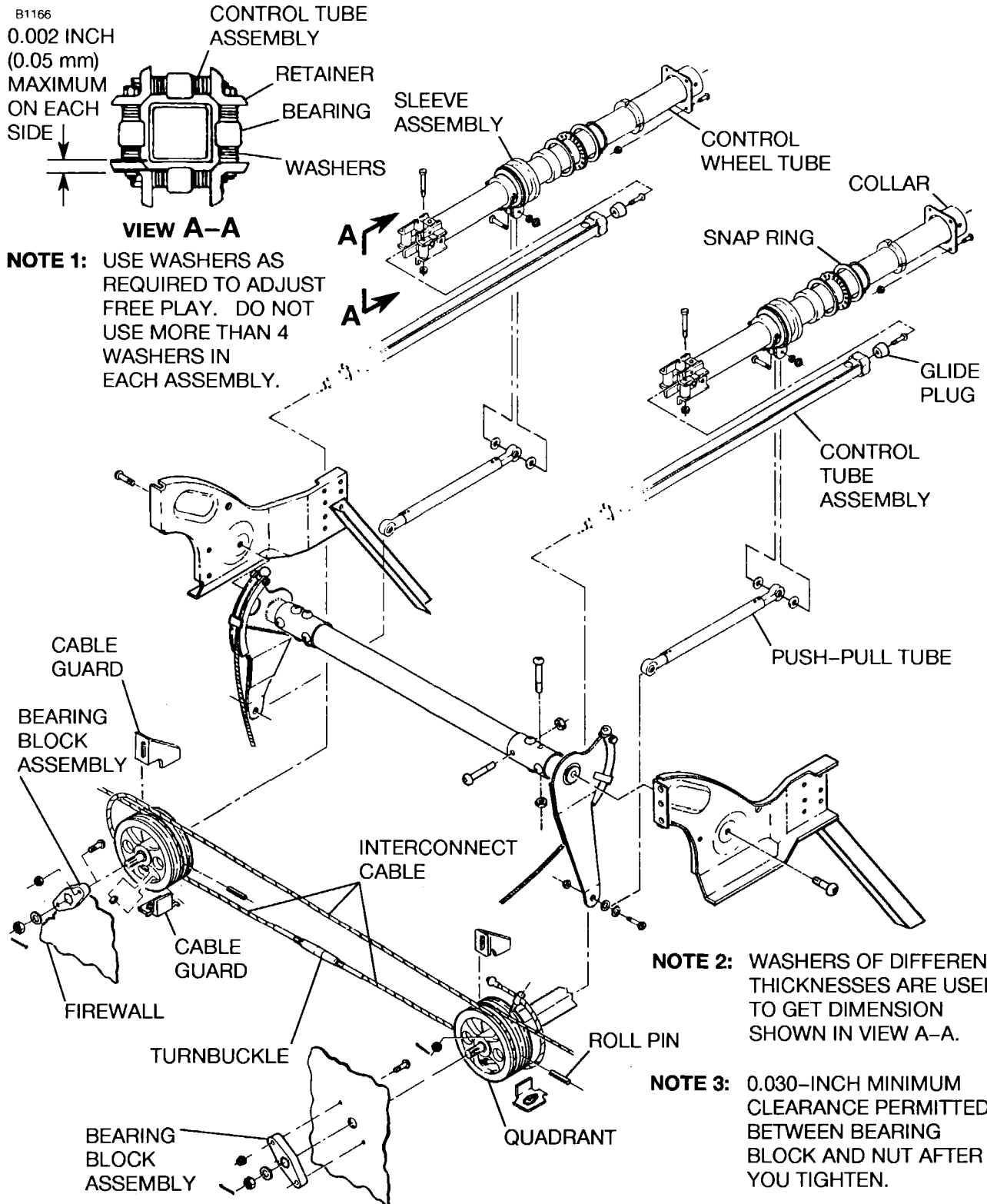
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 A0763R1014  
 B0763R1019  
 C0763R1018  
 D0763R1015  
 E0763R1016

**DETAIL E**  
 Aileron Control System Installation  
 Figure 201 (Sheet 1)

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**DETAIL G**

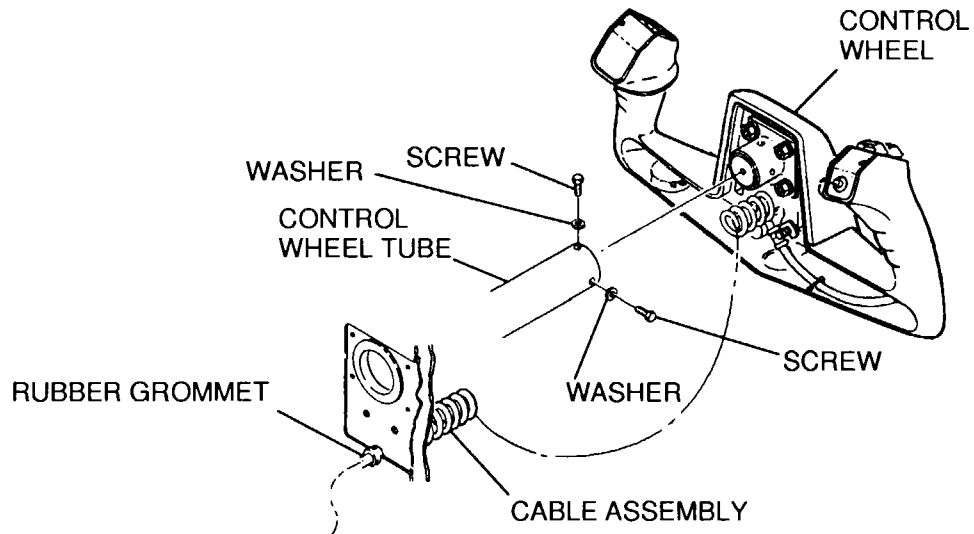
Aileron Control System Installation  
 Figure 201 (Sheet 2)

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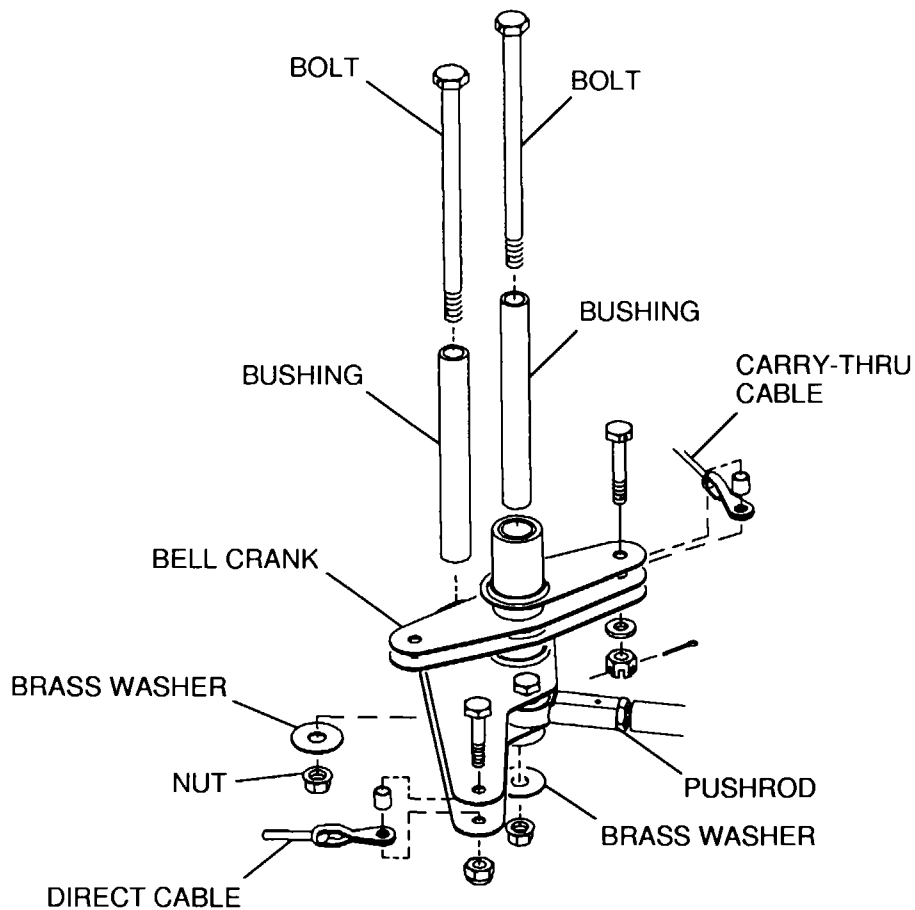


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**DETAIL H**



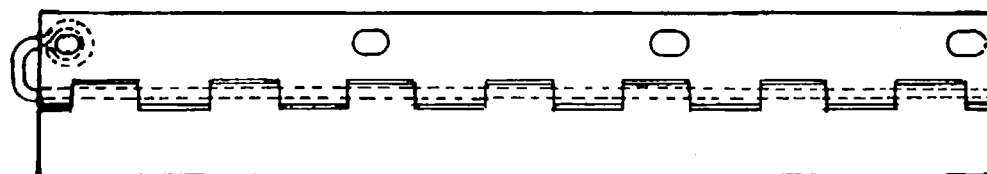
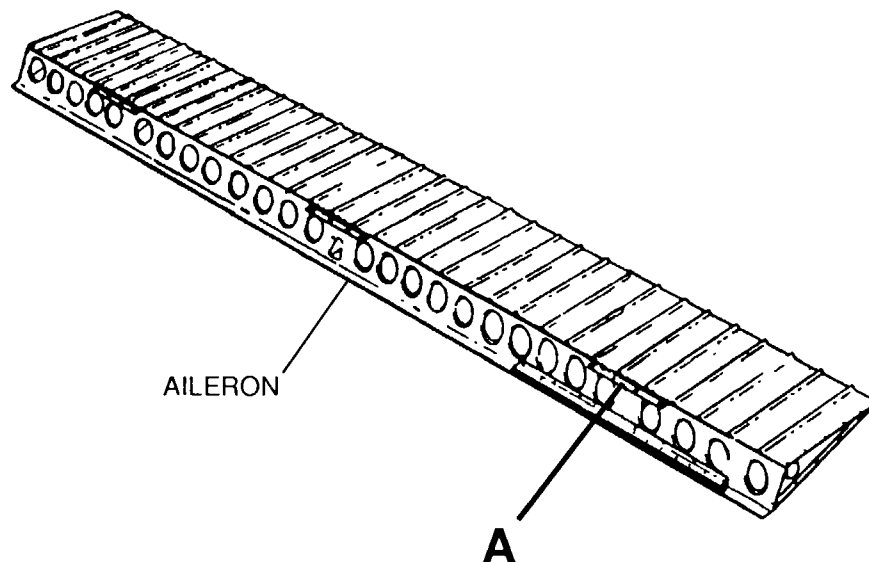
**DETAIL J**

Aileron Control System Installation  
 Figure 201 (Sheet 3)

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**DETAIL A**  
AILERON HINGE

Aileron Control System Installation  
Figure 201 (Sheet 4)

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- (13) Remove the cotter pin, nut, and washer from the center of the bearing block assembly.

**NOTE:** The control tube goes through the center of the bearing block assembly.

- (14) Carefully pull the control tube assembly in the aft direction.  
(15) Remove the quadrant.

B. Control Column Installation (Refer to Figure 201).

**NOTE:** If the control tube assembly was not removed, go to step 3.B.(4).

- (1) Install the control tube assembly through the instrument panel.
- (2) Install the control tube assembly through the quadrant and the firewall.
- (3) Install the roll pin through the quadrant and the control tube assembly.
- (4) Safety the roll pin with wire. Refer to Chapter 20, Safelying - Maintenance Practices.
- (5) Install the washer, locknut, and cotter pin to the control tube assembly that goes through the bearing block on the forward side of the firewall. There must be 0.03- inch minimum clearance between the bearing block and the nut after they are tightened.
- (6) Install the snap ring to the sleeve assembly.
- (7) Attach the push-pull tube to the sleeve assembly.
- (8) Install the center instrument panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
- (9) Install the collar, plug, and glide.
- (10) Adjust the control column for free play.
  - (a) Tighten the screw to remove lateral free play in the control column. Do not tighten the screw too much.

**NOTE:** If the screw is too tight, friction in the fore and aft direction in the full range of the elevator control travel will result.
  - (b) Do not leave the screw loose when you adjust the drag. The adjustment is equal to a typical wheel bearing adjustment. For example, tighten the screw until all free play is removed and you feel drag. Loosen the adjustment screw about 1/8th of a turn for each step until there is minimum free play and no drag is felt.
- (11) Install the control wheel.
- (12) Install the access plates 520AB and 620AB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (13) Rig the aileron control system. Refer to the Adjustment/Test.

#### 4. Copilot's Control Column Removal/Installation

- A. Control Column Removal (Refer to Figure 201).
- (1) Remove the control wheel. Refer to Control Wheel Removal/Installation.
  - (2) Remove the glide plug.
  - (3) Disconnect the push-pull tube at the sleeve assembly.
  - (4) Remove the screws from the attach plate at the instrument panel.
  - (5) Remove the copilot instrument panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (6) To help remove the control wheel tube, remove the snap ring from its locking groove for more movement of the sleeve assembly.
  - (7) Carefully pull the control wheel tube aft and work it out through the instrument panel.
    - (a) If removal of control tube assembly is necessary, go to step 4.A.(8).
  - (8) Remove the access plates 520AB and 620AB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (9) Remove the safety clips from the turnbuckles at the direct cable, and loosen the tension.
  - (10) Remove and discard the safety wire from the turnbuckle at the interconnect cable, and loosen the tension.
  - (11) Remove and discard the safety wire from the roll pin in the quadrant and the control tube assembly.

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- (12) Remove the cotter pin, nut, and washer from the control tube assembly that is attached to the forward side of the firewall.

**NOTE:** The control tube assembly goes through the bearing block assembly on the forward side of the firewall.

- (13) Carefully pull the control tube assembly aft and remove the quadrant.
- (14) Remove the radios and related equipment as necessary to work the control wheel tube assembly out from under the instrument panel.

**B. Control Column Installation (Refer to Figure 201).**

- (1) Install the control tube assembly through the instrument panel.
- (2) Install the control tube assembly through the quadrant and the firewall.
- (3) Install the roll pin through the quadrant and the control tube assembly.
- (4) Safety the roll pin with wire. Refer to Chapter 20, Safetying - Maintenance Practices.
- (5) Install the washer, locknut, and cotter pin to the control tube assembly that comes through the bearing block on the forward side of the firewall. There must be 0.03-inch minimum clearance between the bearing block and the nut after they are tightened.
- (6) Install the snap ring to the sleeve assembly.
- (7) Connect the push-pull tube to the sleeve assembly.
- (8) Install the instrument panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
- (9) Install the collar and the glide plug.
- (10) Adjust the control column for free play.
  - (a) Tighten the screw to eliminate lateral free play in the control column. Do not tighten the screw too much.

**NOTE:** If the screw is too tight, friction in the fore and aft direction in the entire elevator control travel will result.

- (b) Do not leave the screw loose when you adjust the drag. The adjustment is equal to a typical wheel bearing adjustment. For example, tighten the screw until all free play is removed and you feel drag. Loosen the adjustment screw about 1/8th of a turn for each step until there is minimum free play and no drag is felt.
- (11) Install the control wheel.
- (12) Install the radios and related equipment that you removed.
- (13) Install the access plates 520AB and 620AB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (14) Rig the aileron control system. Refer to the Adjustment/Test.

**5. Aileron Removal/Installation**

**A. Aileron Removal (Refer to Figure 201).**

- (1) Disconnect the aileron pushrod at the aileron.
- (2) Disconnect the electrical bonding straps.
- (3) Remove the screws and the nuts that attach the aileron hinges to the trailing edge of the wing.
- (4) Carefully pull the aileron out and down to slide the hinges from under the wing skin and the auxiliary spar reinforcements.

**B. Aileron Installation (Refer to Figure 201).**

- (1) Put the aileron hinges between the skin and the auxiliary spar reinforcements.
- (2) Install the screws and the nuts that attach the hinges to the trailing edge of the wing.
- (3) Connect the electrical bonding straps.
- (4) Attach the aileron pushrod to the aileron.
- (5) Check the aileron travel. Refer to the Adjustment/Test.

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## 6. Aileron Bell Crank Removal/Installation

**NOTE:** The left and the right aileron bell crank removal/installation is typical.

A. Aileron Bell Crank Removal (Refer to Figure 201).

- (1) Remove the access plates 520AB, 520BB, 620AB, and 620BB located inboard of the bell crank on the bottom of each wing. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (2) Remove the safety clip from the turnbuckle at the carry-thru cable.
- (3) Loosen the control cable tension at the turnbuckle.
- (4) Disconnect the control cables from the bell crank.
- (5) Remove the safety clip from the turnbuckle at the direct cable.
- (6) Loosen the control cable tension at the turnbuckle.
- (7) Disconnect the control cables from the bell crank.
- (8) Disconnect the aileron pushrod at the bell crank.
- (9) Remove the nuts, washers, and bolts from the bell crank stop bushing and from the bell crank-to-wing structure.
- (10) Remove the bell crank through the access opening. Make sure that the bearing bushing is not dropped from the bell crank.

**CAUTION:** Use tape on the open ends of the bell crank to prevent dust and dirt from going into the bell crank needle bearings.

- (11) Use brass washers as shims between the lower end of the bell crank and the wing structure. Keep the shims.

B. Aileron Bell Crank Installation (Refer to Figure 201).

- (1) Install the bell crank to the structure. Make sure that the bushings are in the correct position.
- (2) Install the brass washers between the lower end of the bell crank and the wing channel to remove unwanted clearance.
- (3) Install the bell crank pivot bolt.
- (4) Put the bell crank stop-bushing in position and install the bolt.
- (5) Attach the aileron pushrod to the bell crank.
- (6) Attach the control cables to the bell crank. Make sure that the spacers and the bushings are correctly installed.
- (7) Rig the aileron system. Refer to the Adjustment/Test.
- (8) Install the safety clips on the turnbuckles. Refer to Chapter 20, Safetying - Maintenance Practices.
- (9) Install the access plates 520AB, 520BB, 620AB, and 620BB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

## 7. Adjustment/Test

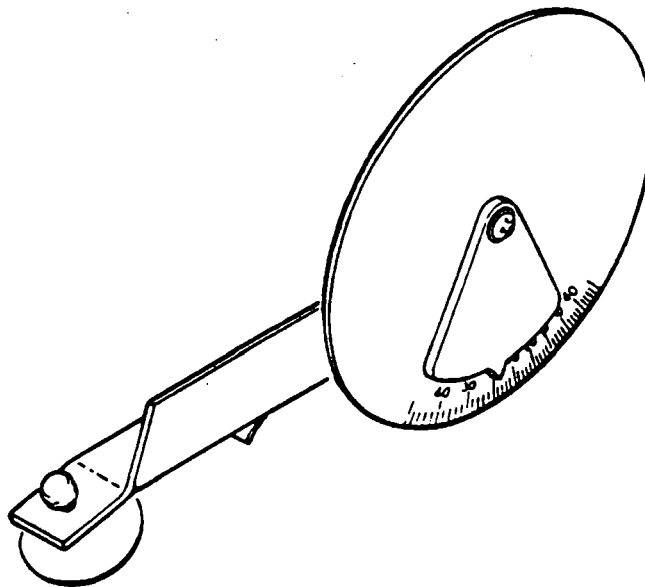
**WARNING:** After the rigging is completed, make sure that the ailerons move in the correct direction when operated by the control wheel.

A. Rig the Aileron Cables (Refer to Figure 201, Figure 202, and Figure 203).

- (1) Remove the safety clips and loosen the tension from the turnbuckles at the direct and the carry-thru cables at the bell cranks in the wings.
- (2) Disconnect the push-pull rods at the bell cranks.
- (3) Remove the safety clip from the turnbuckle at the interconnect cable.
- (4) Adjust tension on the interconnect cable to 40 pounds, +10 or -10 pounds (177.93 N, +44.48 or -44.48 N) at 70 °F (21 °C). Refer to the Charts in Figure 203 for the correct tensions at other temperatures.
- (5) Put the control wheels in a level position and tape a bar across both control wheels to hold them in position.

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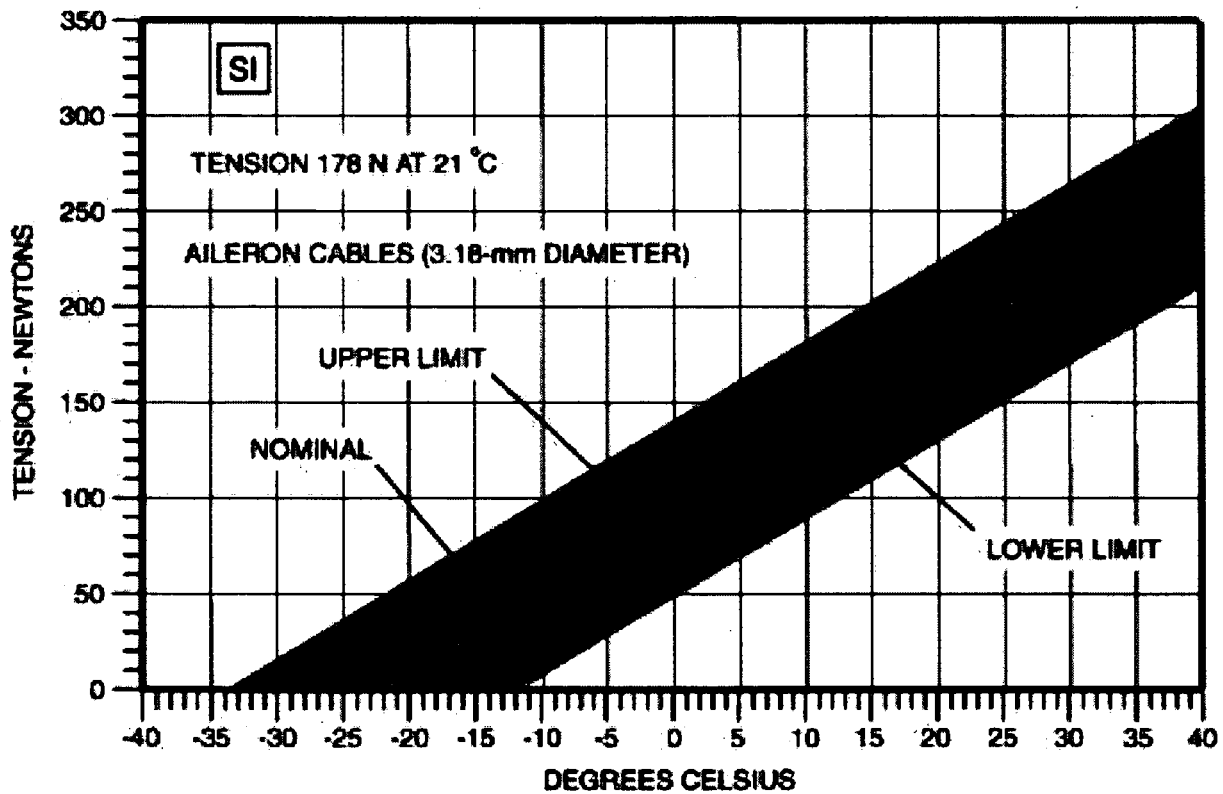
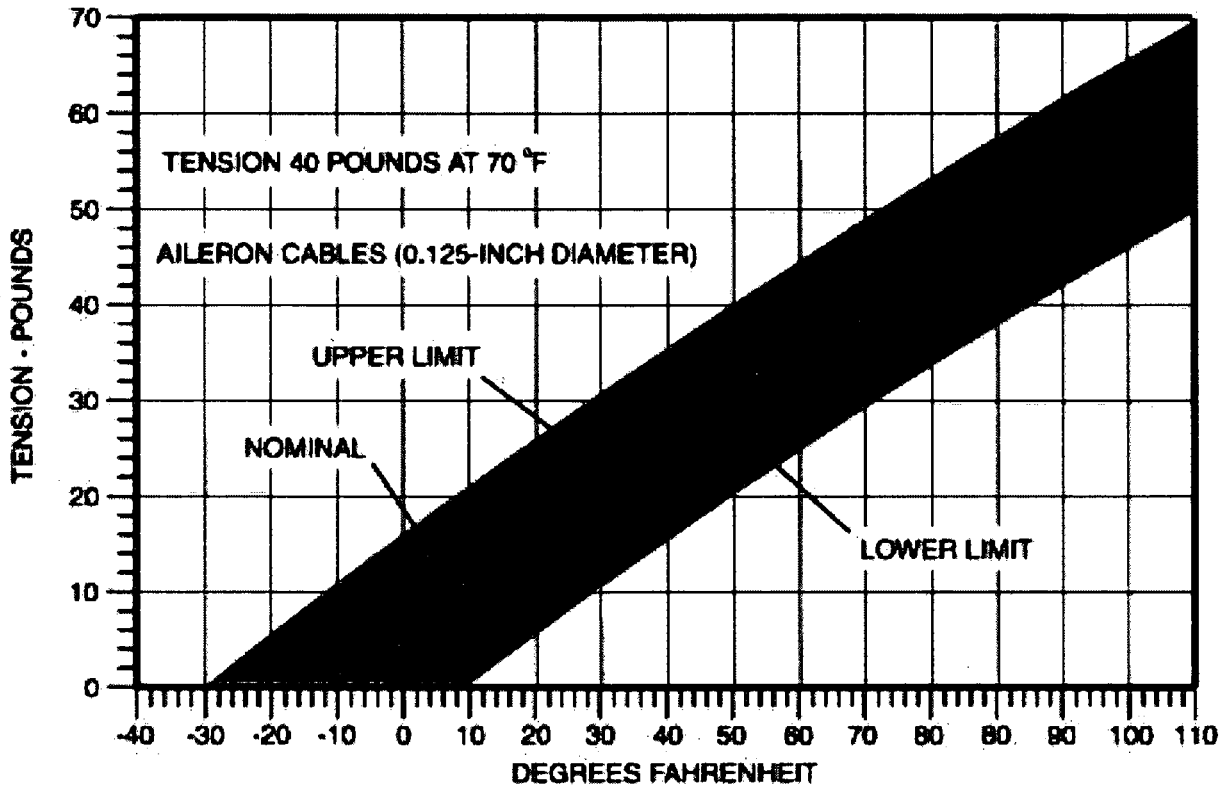
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Inclinometer for Measuring Control Surface Travel  
Figure 202 (Sheet 1)

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Aileron Cable Tension  
 Figure 203 (Sheet 1)

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- (6) Adjust the direct and carry-thru cable turnbuckles to center the position of the bell crank stop bushings in the slots. The tension on the carry-thru cable must be 40 pounds, +10 or -10 pounds (177.93 N, +44.48 or -44.48 N) at 70 °F (21 °C). Refer to the Charts in Figure 203 for the correct tensions at other temperatures. Disregard the tension on the direct cables.
- (7) Adjust the push-pull rods at each aileron until the ailerons are neutral with reference to trailing edge of wing flaps. Make sure that the wing flaps are in the full UP position when you make this adjustment.
- (8) With the ailerons in the neutral position (streamlined), mount an inclinometer on the trailing edge of one aileron and set it to 0 degrees.
- (9) Remove the bar from the control wheels. If travel is not within limits, readjust push-pull rods and cables as necessary.
- (10) Check the aileron travel which must be 20 degrees +2 or -2 degrees up and 15 degrees, +2 or -2 degrees down.
- (11) Make sure that the safety clips are correctly installed in all turnbuckles. Refer to Chapter 20, Safelying - Maintenance Practices.
- (12) Make sure that the cables and the cable guards are correctly installed, all jam nuts are tight, and all items removed for access are installed.



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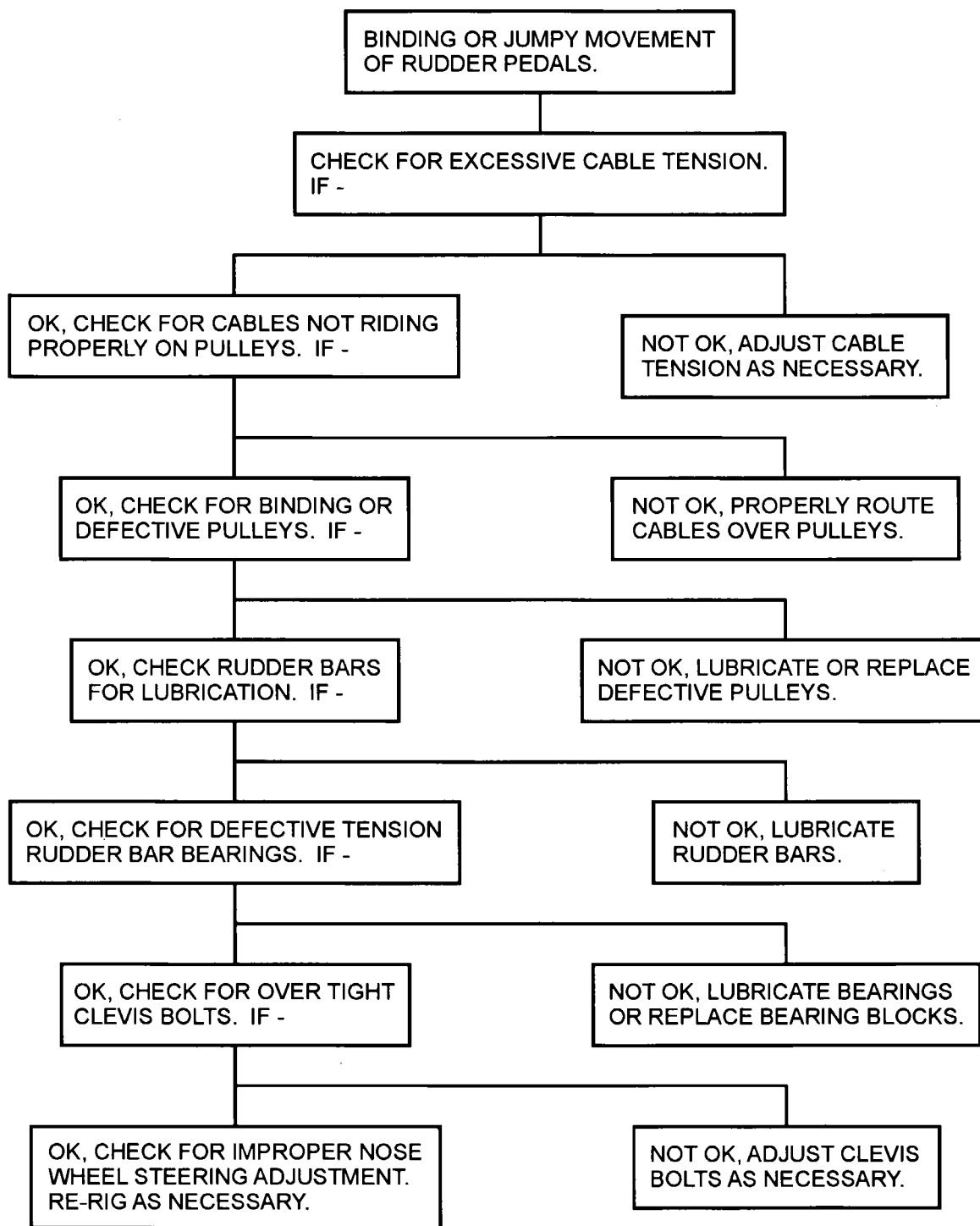
**RUDDER CONTROL SYSTEM - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

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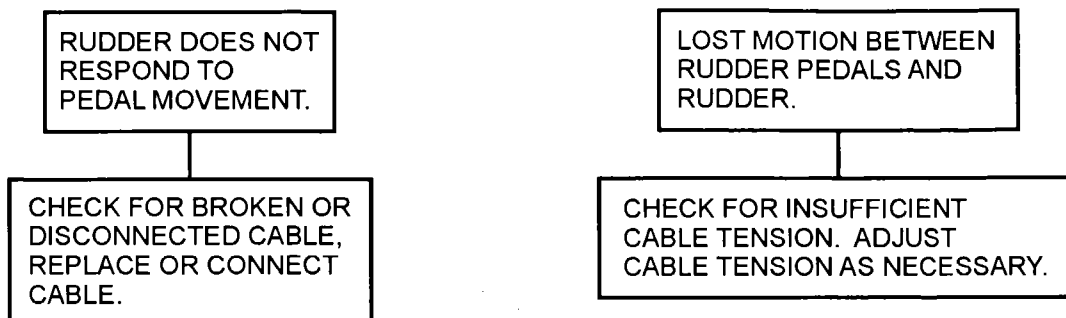
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Rudder System Troubleshooting Chart  
Figure 101 (Sheet 1)

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Rudder System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**RUDDER CONTROL SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. Conventional rudder pedals control the rudder and the nose wheel steering. The rudder control system has rudder pedals, torque tubes, bearings, a centering bungee, bell crank, cables, and pulleys, all of which link the pedals to the rudder and the nose wheel steering.

**2. Rudder Pedal Assembly Removal/Installation**

- A. Rudder Pedal Assembly Removal (Refer to Figure 201).
- (1) Remove the crew seats. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices.
  - (2) Remove the pedestal cover, carpet, and rudder shield assemblies. Refer to Chapter 25, Equipment/Furnishings - General.
  - (3) Disconnect the master cylinders at the pilot rudder pedals.
  - (4) Disconnect the parking brake cables at the master cylinders.
  - (5) Remove the rudder pedals and the brake links.
  - (6) Remove the fairings (340AL and 340AR) for access to the rudder cable turnbuckles. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (7) Remove the safety clips from the turnbuckles and relieve cable tension.
  - (8) Disconnect the right forward and the left forward cables from the rudder bar arms.
  - (9) Disconnect the nose gear steering pushrods from the rudder bar arms.
  - (10) Remove the bolts that attach the bearing blocks and the rudder bars that are found under the instrument panel.
  - (11) Remove the bearing blocks and the rudder bars.

**NOTE:** The two inboard bearing blocks have clearance holes for the rudder bars at one end and a bearing hole at the other. Label these bearing blocks for reference when you install them.

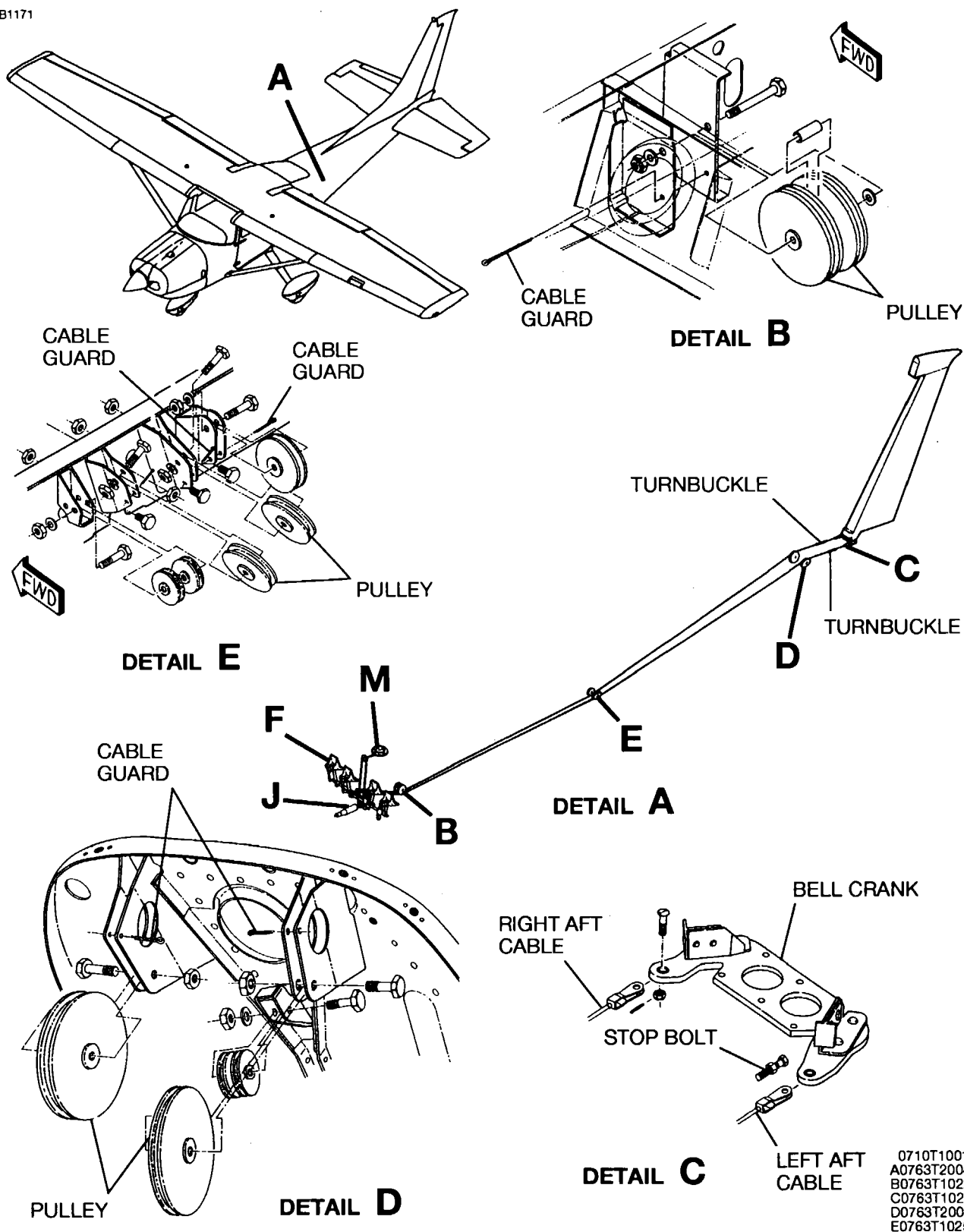
- B. Rudder Pedal Assembly Installation (Refer to Figure 201).
- (1) Lubricate the rudder bar assemblies. Refer to Chapter 12, Flight Controls - Lubrication.
  - (2) Position the rudder bars in the area below the instrument panel and attach the bearing blocks with the bolts.
  - (3) Connect the nose gear steering pushrods to the rudder bar arms.
  - (4) Connect the left forward and the right forward cables to the rudder bar arms.
  - (5) Install the rudder pedals and the brake links.
  - (6) Connect the parking brake cables at the master cylinders.
  - (7) Connect the master cylinders at the pilot rudder pedals.
  - (8) Rig the rudder system. Refer to Rudder Control Adjustment/Test.
  - (9) Install the safety clips.
  - (10) Install the crew seats. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices.
  - (11) Install the pedestal cover, carpet, and rudder shield assemblies. Refer to Chapter 25, Equipment/Furnishings - General.
  - (12) Install the fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**3. Rudder Removal/Installation**

- A. Rudder Removal (Refer to Figure 201).
- (1) Remove the stinger.
  - (2) Disconnect the tail navigation light quick-disconnect (JV001) at the bottom of the rudder.
  - (3) Remove the fairing from the two sides of the vertical fin.
  - (4) Remove the safety wire from the turnbuckles.
  - (5) Loosen the turnbuckles to remove cable tension.
  - (6) Disconnect the cables from the rudder bell crank.
  - (7) With the rudder supported, remove the hinge bolts.
  - (8) Remove the electrical bonding strap.
  - (9) Carefully lift the rudder away from the vertical fin.

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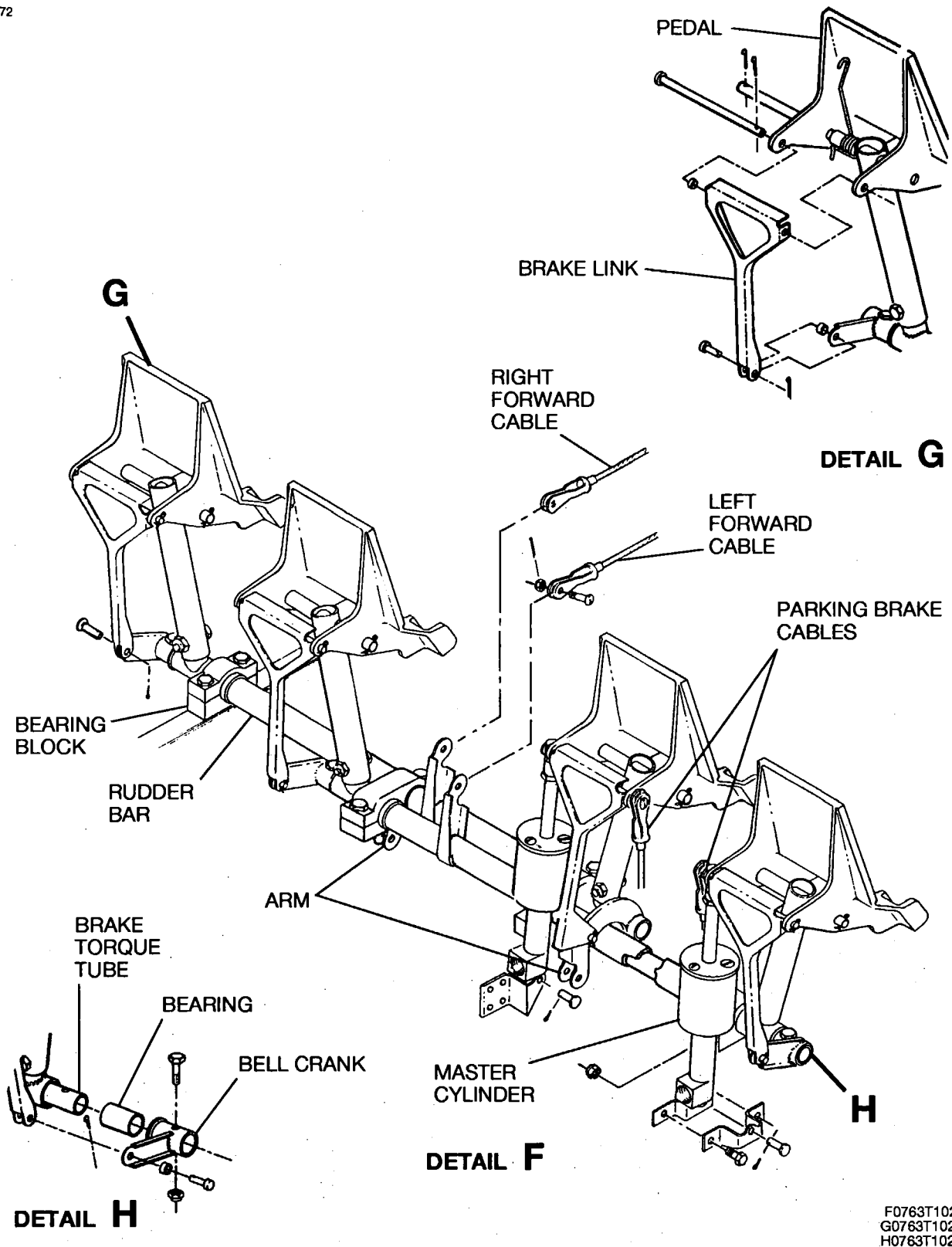


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Rudder Control System Installation  
 Figure 201 (Sheet 1)

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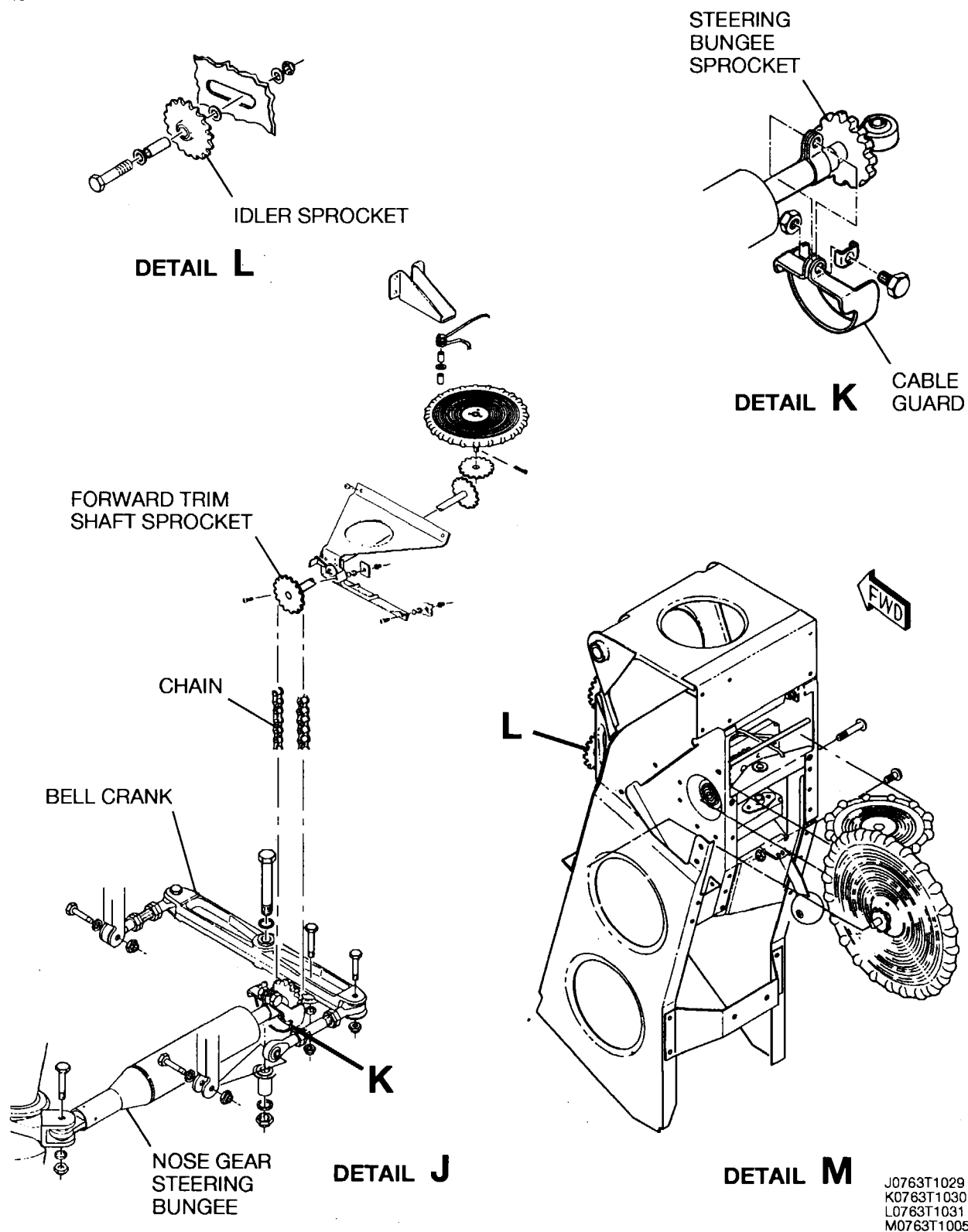


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Rudder Control System Installation  
Figure 201 (Sheet 2)

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Rudder Control System Installation  
 Figure 201 (Sheet 3)

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- B. Rudder Installation (Refer to Figure 201).
- (1) With the rudder supported, install the hinge bolts to attach the rudder to the vertical fin.
  - (2) Install the electrical bonding strap.
  - (3) Torque the nuts to 50 to 70 inch pounds plus free running torque.
  - (4) Connect the cables to the rudder bell crank. Do not tighten too much. Make sure that the terminal (clevis) pivots freely.
  - (5) Rig the rudder system.
  - (6) Safety the turnbuckles with wire.
  - (7) Lubricate the system. Refer to Chapter 12, Flight Controls - Lubrication.
  - (8) Connect the tail navigation light quick-disconnect (JV001) at the bottom of the rudder.
  - (9) Install the stinger.

**4. Rudder Control Cables Removal/Installation**

- A. Rudder Cables Removal (Refer to Figure 201).
- (1) Remove the seats, carpet, and baggage wall. Refer to Chapter 25, Equipment/Furnishings - General.
  - (2) Remove the rudder shield assemblies and the plates (231AB, 231BB, 231DB, 231EB, 231HB, 231JB, and 310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Remove the fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (4) Remove the safety clips from the turnbuckles and relieve cable tension.
  - (5) Disconnect the left and the right rudder cables from the rudder bell crank.
  - (6) Disconnect the left and the right rudder cables from the rudder bar arms.
  - (7) Remove the pulleys and the cable guards as necessary to remove the cables.

**NOTE:** To ease the routing of the cables, you can attach a length of wire to the end of the cable before you remove it from the airplane. Leave the wire in place, routed through the structure. Then attach the cable the wire to install and pull the cable into position.

- (8) Remove the rudder cables.

- B. Rudder Cables Installation (Refer to Figure 201).
- (1) If installed, attach the cables to the wires and pull the cables through the airplane structure.
  - (2) Attach the left and the right rudder cables to the rudder bell crank.
  - (3) Attach the left and the right rudder cables to the rudder bar arms.
  - (4) Install the pulleys and the pulley guards. Make sure that the cables are in the pulley grooves before you install the cable guards.
  - (5) Rig the rudder system. Refer to Rudder Control Adjustment/Test.
  - (6) Install the rudder shield assemblies and the plates (231AB, 231BB, 231DB, 231EB, 231HB, 231JB, and 310AR), that you removed for access. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (7) Install the seats, carpet, and baggage wall. Refer to Chapter 25, Equipment/Furnishings - General.
  - (8) Install the fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**5. Rudder Control Adjustment/Test**

- A. Rig Rudder Controls (Refer to Figure 201, Figure 202, and Figure 203).
- (1) Remove the stinger (310DB) for access to the rudder stop bolts. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) Adjust the rudder stop bolts to get 24 degrees, +0 or -1 degree, measured parallel to the water line, and 27 degrees 13 minutes, +0 or -1 degree, measured perpendicular to the hinge line.
  - (3) Tighten the jam nuts.
  - (4) Remove the crew seats. Refer to Chapter 25, Front Seats and Rails- Maintenance Practices.
  - (5) Remove the pedestal cover, carpet, and rudder shield assemblies. Refer to Chapter 25, Equipment/Furnishings - General.

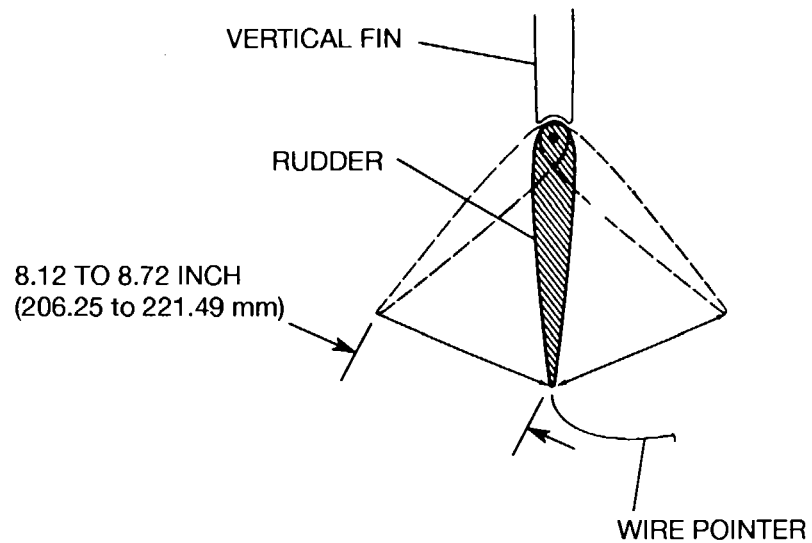
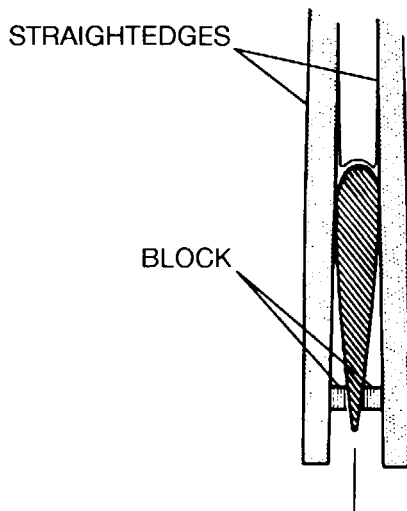


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STEP 1: ESTABLISH NEUTRAL  
POSITION OF RUDDER.

STEP 2: MEASURE  
RUDDER TRAVEL.

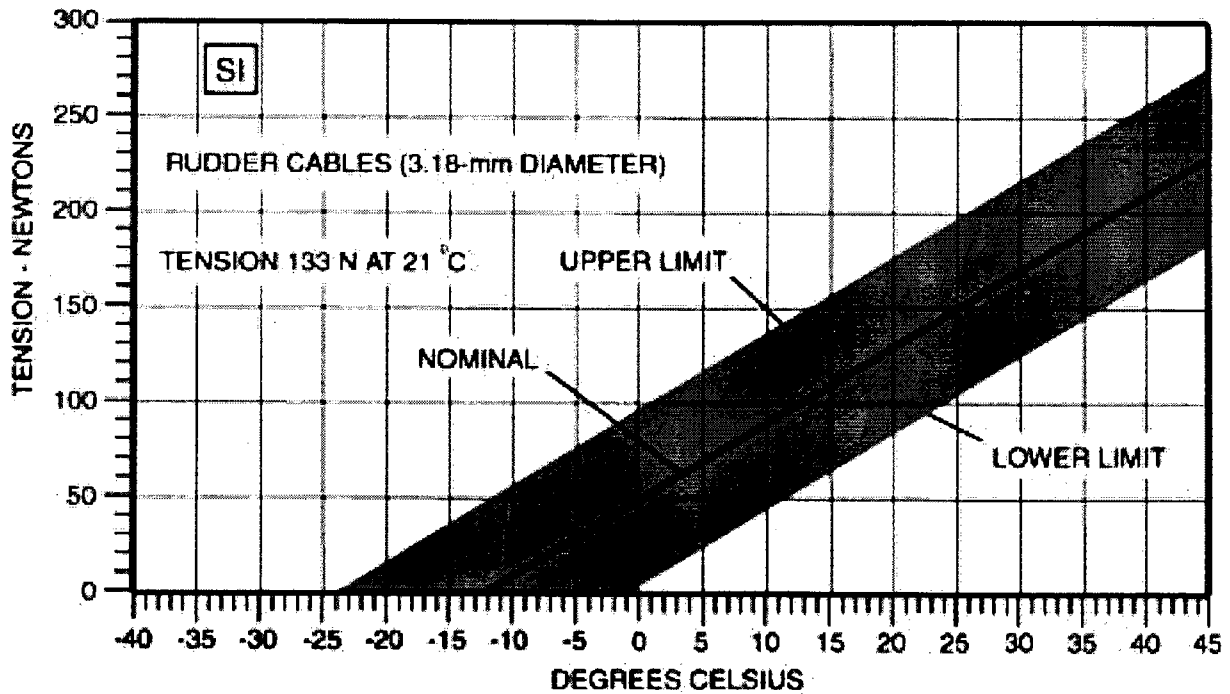
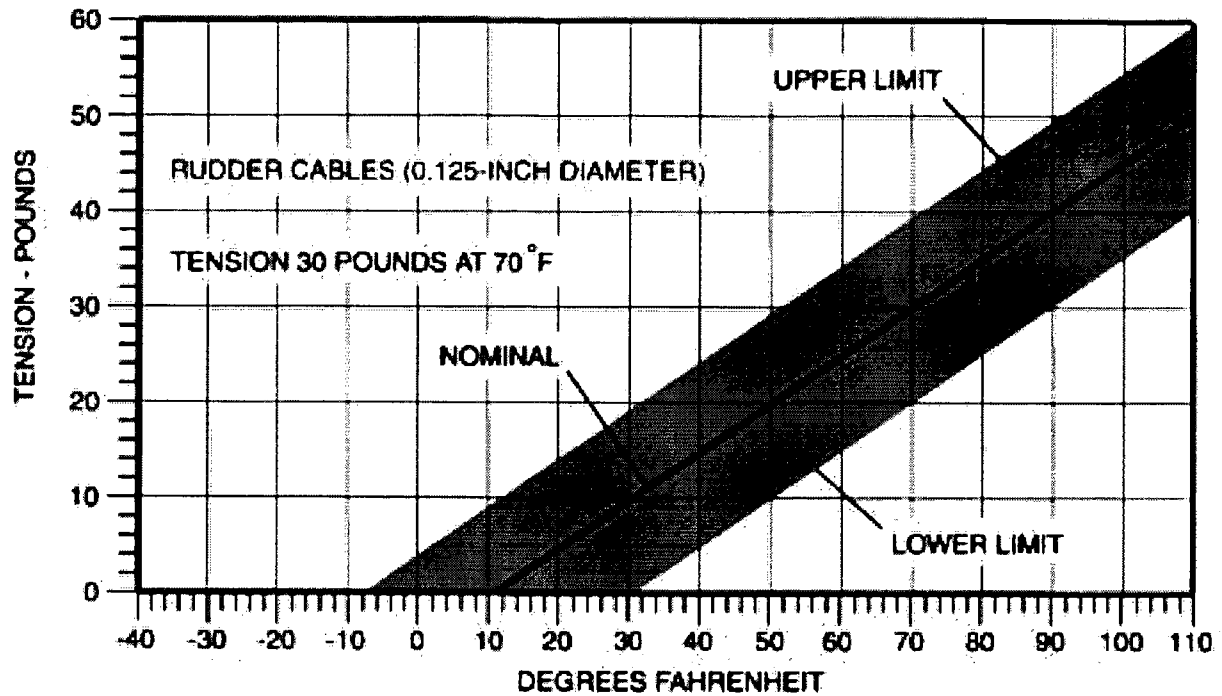


Rudder Travel Adjustment  
Figure 202 (Sheet 1)

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Rudder Cable Tension  
 Figure 203 (Sheet 1)

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- (6) Loosen the idler sprocket and disengage the chain from the forward trim shaft sprocket and the steering bungee sprocket.
- (7) Disconnect the steering bungee adjustable rod end from the bell crank.
- (8) Remove the fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (9) Remove the safety clips from the left and the right rudder cable turnbuckles and relieve cable tension.
- (10) Clamp the rudder pedals in the neutral position and adjust the push-pull rods to center the bell crank.

**NOTE:** The bell crank is centered when the bolts in each end are the same distance from the bulkhead just forward of the bell crank.

- (11) Tighten the jam nuts.
- (12) Keep the rudder pedals in the neutral position and adjust the turnbuckles on the left and the right rudder cables. The correct tension adjustment is 30 pounds, +10 or -10 pounds (133.45 N, +44.48 or -44.48 N) at 70 °F (21 °C) with the rudder offset one degree to the right. Refer to Figure 203 for the correct tensions at other temperatures.

**NOTE:** When the rudder is offset one degree to the right, this is 5/16 inch at the lower trailing edge from the neutral position of the rudder.

- (13) Install the safety clips on the rudder cable turnbuckles.
- (14) Check the rudder travel. (Refer to Figure 202).
  - (a) Find the neutral position of the rudder.
    - 1 Clamp a straightedge on each side of the fin and the rudder.
    - 2 Block the trailing edge of the rudder at half of the distance between the straightedges.
    - 3 Tape a length of soft wire to the stinger to let it bend to index at the lower corner of the rudder trailing edge.
    - 4 With a soft lead pencil, mark the rudder at the at the soft wire indexing point (neutral).
  - (b) Remove the straightedges and the blocks.
  - (c) Hold the rudder against the right and then the left rudder stop.
  - (d) In the two directions of travel, measure the distance from the pointer to the pencil mark on the rudder. The distance should be between 8.12 inches and 8.72 inches (206.25 mm and 221.49 mm).
- (15) Rig rudder trim system. Refer to Rudder Trim Adjustment/Test.

**NOTE:** The rudder control system, rudder trim control system, and nosewheel steering system are connected. Adjustments to one of these systems have an effect on the others. The rudder control system must be correctly rigged before you rig the rudder trim and the nosewheel steering system.

- (16) Install stinger (310DB), fairings (340AL and 340AR), pedestal cover, carpet, rudder shield assemblies, and seats. Refer to Chapter 6, Access/Inspection Plates - Description and Operation, Chapter 25, Front Seats and Rails - Maintenance Practices, and Chapter 25, Rear Seat - Maintenance Practices.

**WARNING: Make sure that the rudder moves in the correct direction when you operate the rudder pedals.**

- (17) Operate the rudder system to check for ease of movement, full travel, and correct operation.

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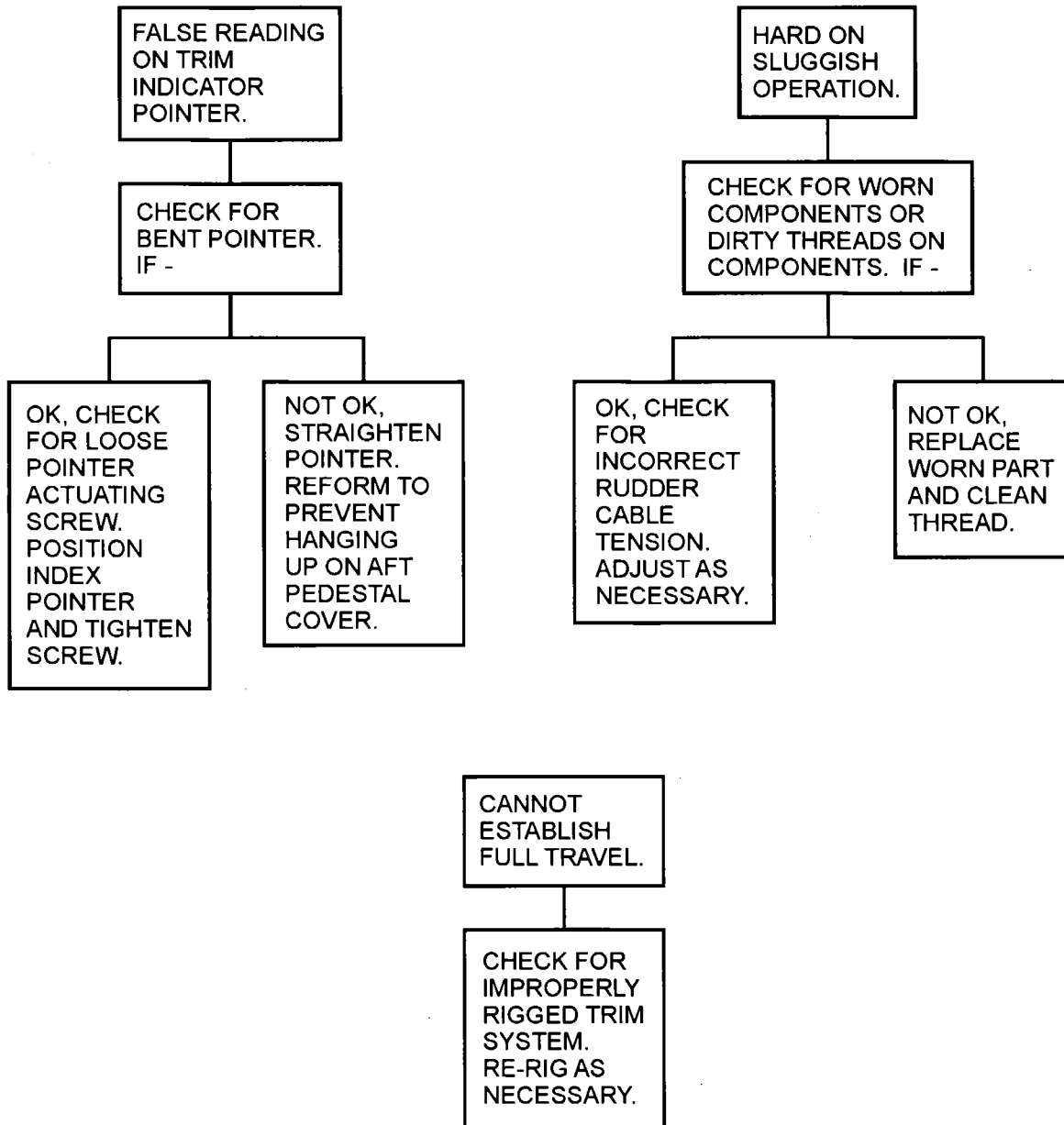
**RUDDER TRIM - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

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Rudder Trim System Troubleshooting Chart  
Figure 101 (Sheet 1)

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**RUDDER TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. Rudder trim system maintenance practices consists of rudder trim system removal/installation and rudder trim system rigging.

**2. Rudder Trim System Removal/Installation**

- A. Remove Rudder Trim System (Refer to Figure 201).
- (1) Remove pilots and copilots seats, pedestal cover, carpet and shield assemblies, Refer to Chapter 25, Front Seats - Maintenance Practices, and Rear Seat - Maintenance Practices.
  - (2) Loosen bolt securing idler sprocket and relieve tension on chain.
  - (3) Remove chain guard from steering bungee sprocket.
  - (4) Disconnect steering bungee from bellcrank.
  - (5) Remove chain from steering bungee sprocket and forward trim shaft sprocket.
- B. Install Rudder Trim System (Refer to Figure 201).
- (1) Install chain on steering bungee sprocket and forward trim shaft sprocket.
  - (2) Connect steering bungee to bellcrank.
  - (3) Position chain on idler sprocket
  - (4) Rig trim system. Refer to Rudder Trim Adjustment/Test.
  - (5) Install chain guard on steering bungee sprocket.
  - (6) Install pedestal cover, carpet and shield assemblies, pilots and copilots seats. Refer to Chapter 25, Front Seats - Maintenance Practices, and Rear Seat - Maintenance Practices.

**3. Rudder Trim Adjustment/Test**

**NOTE:** The rudder control system, rudder trim control system and nosewheel steering system are interconnected. Adjustments to any one of these systems will affect the others. The rudder control system must be correctly rigged prior to rigging the rudder trim and nosewheel steering system.

- A. Rig Rudder Trim System (Refer to Figure 201).

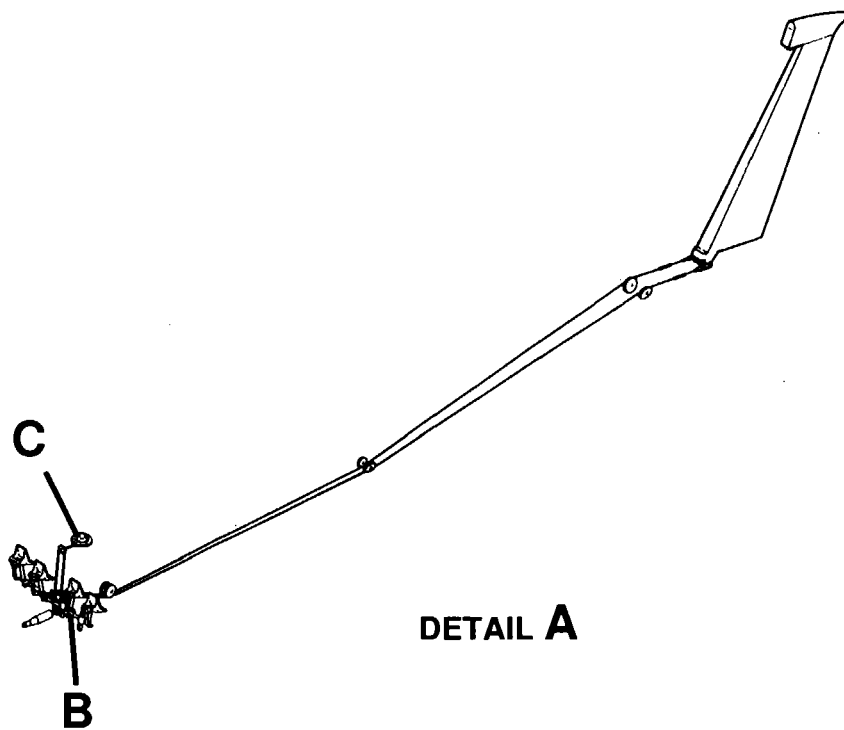
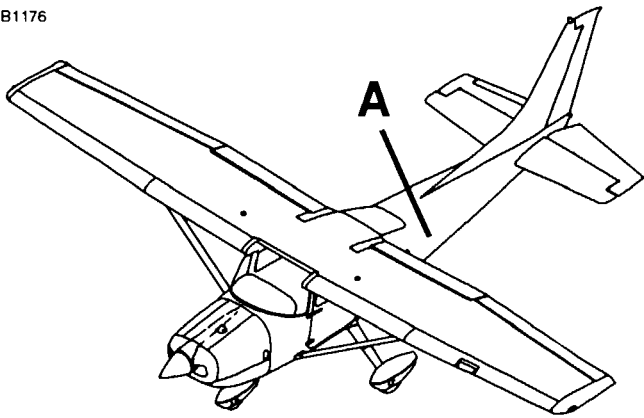
**NOTE:** Rudder control system must be rigged prior to rigging rudder trim system.

- (1) Ensure rudder control system is properly rigged.
- (2) Weight or tie down tail of airplane to raise nose wheel from floor.
- (3) Extend nose gear strut and ensure nose gear is centered against external centering stop.
- (4) Clamp rudder pedals in neutral position.
- (5) Adjust nose wheel steering bungee rod end to 0.81 inch +0.00 or -0.06 inches from sprocket to center of rod end bearing.
- (6) Rotate sprocket in or out as required to align rod end with attaching hole in bellcrank and install bolt, washer, and nut.
- (7) Rotate rudder trim wheel until indicator is centered in pedestal slot (neutral).
- (8) Without moving sprocket, engage chain on steering bungee sprocket, forward trim shaft sprocket and idler sprocket.
- (9) Adjust idler sprocket to allow approximately one-half inch deflection at chain midpoint and tighten sprocket.
- (10) Install cable guard over sprocket.
- (11) Lower nose wheel to ground and remove clamps from rudder pedals.

**WARNING:** Ensure rudder moves in the correct direction when operated by the rudder pedals and trim control wheel.

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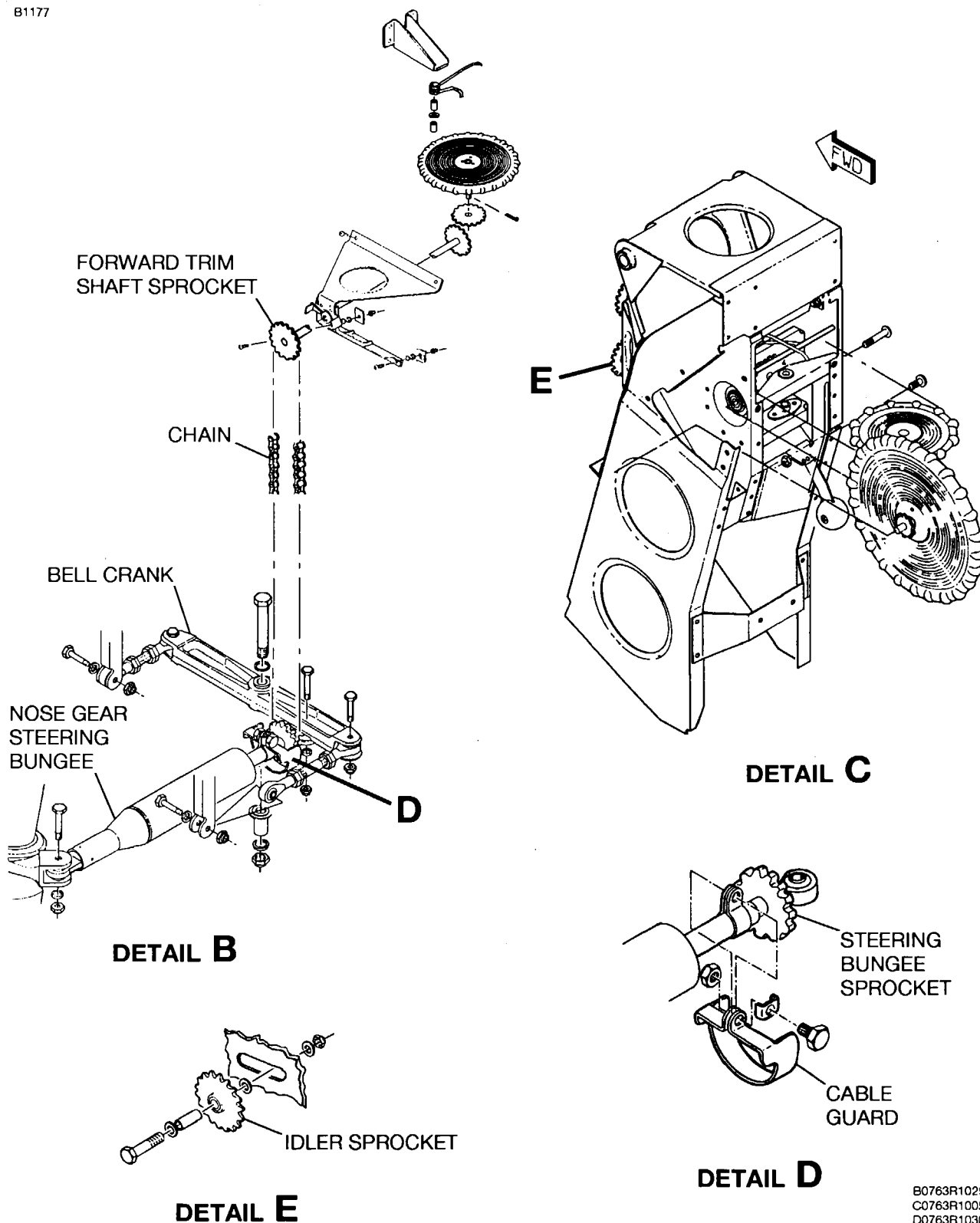


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Rudder Trim Control System Installation  
Figure 201 (Sheet 1)

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Rudder Trim Control System Installation  
 Figure 201 (Sheet 2)



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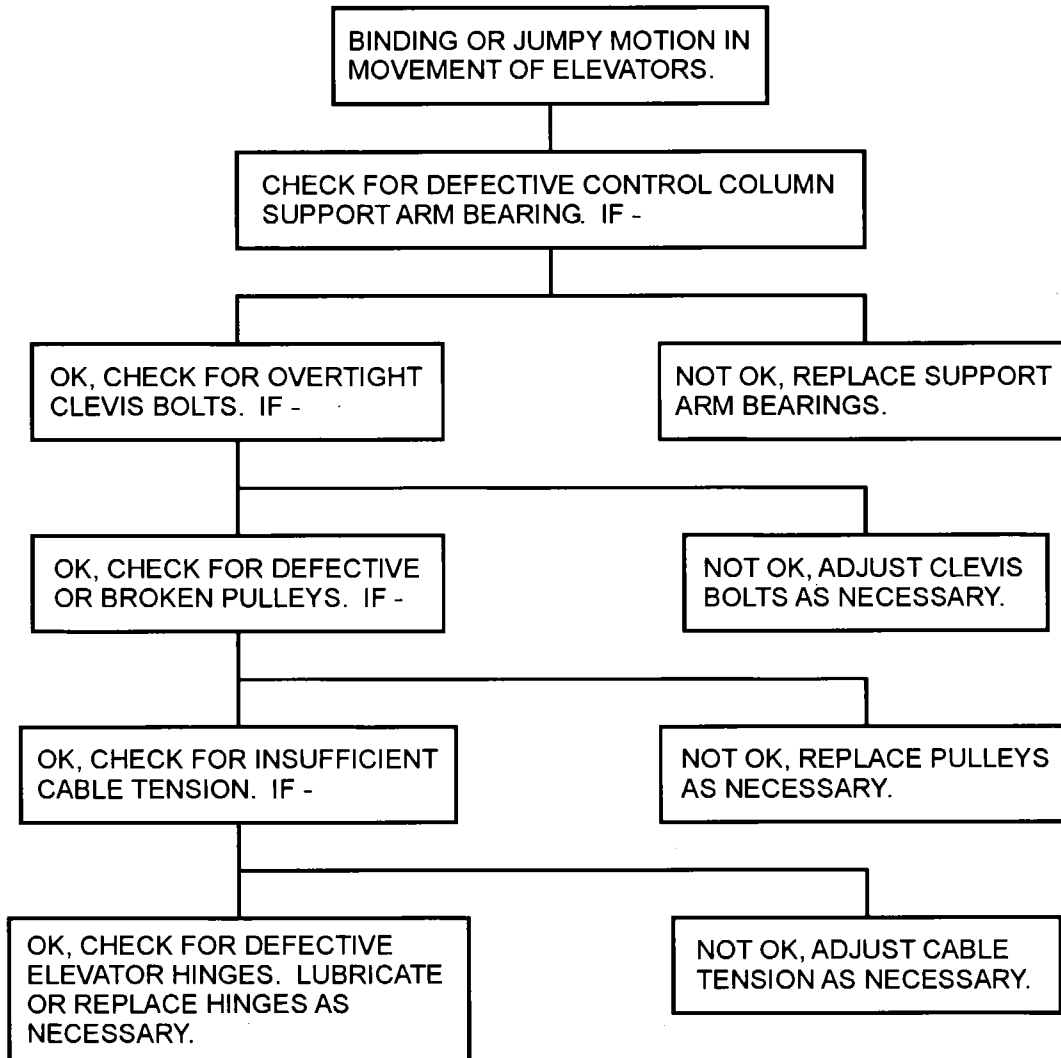
**ELEVATOR SYSTEM - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid maintenance technician in system understanding. Refer to Figure 101.

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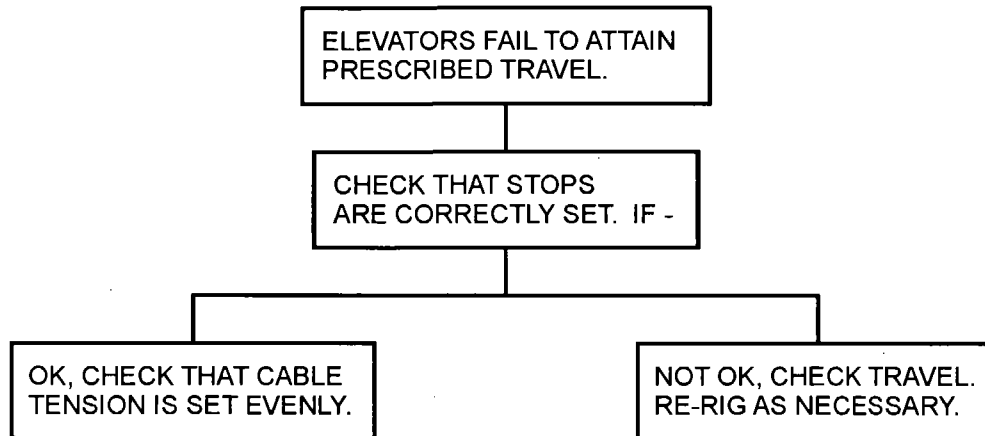
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Elevator System Troubleshooting Chart  
Figure 101 (Sheet 1)

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B1179



Elevator System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**ELEVATOR CONTROL SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. Elevators are operated by forward and aft movement of the control wheels. Movement of the control wheels goes to the elevators through the control yoke and a series of cables, bell cranks, and pushrods.

**2. Forward Elevator Bell Crank Removal/Installation**

- A. Forward Elevator Bell Crank Removal (Refer to Figure 201).
- (1) Remove the seats and the carpet. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Rear Seat - Maintenance Practices.
  - (2) Remove the access plate (310BB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Relieve cable tension at the turnbuckles and disconnect the cables from the forward bell crank.
  - (4) Disconnect the push-pull tube from the forward bell crank.
  - (5) Remove the pivot bolt and remove the forward bell crank.
- B. Forward Elevator Bell Crank Installation (Refer to Figure 201).
- (1) Place the forward bell crank in position and install the pivot bolt.
  - (2) Connect the push-pull tube to the forward bell crank.
  - (3) Install the cables.
  - (4) Adjust the cable tension and safety the turnbuckles. Refer to Elevator Control Adjustment/Test.
  - (5) Install the access plate (310BB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (6) Install the seats and the carpet. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Rear Seat - Maintenance Practices.

**3. Aft Elevator Arm Assembly Removal/Installation**

- A. Aft Elevator Arm Assembly Removal (Refer to Figure 201).
- (1) Remove the stinger (310DB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (2) Relieve cable tension at the turnbuckles and disconnect the cables from the arm assembly.
  - (3) Remove the bolt and the washer that attach the push-pull tube to the arm assembly.
  - (4) Remove the bolts that attach the elevators to the arm assembly.
  - (5) Remove the arm assembly pivot bolt and slide the arm assembly out between the tube assemblies.

**NOTE:** If necessary, you can remove one of the stabilizer attach bolts for clearance when you remove the bell crank pivot bolt.

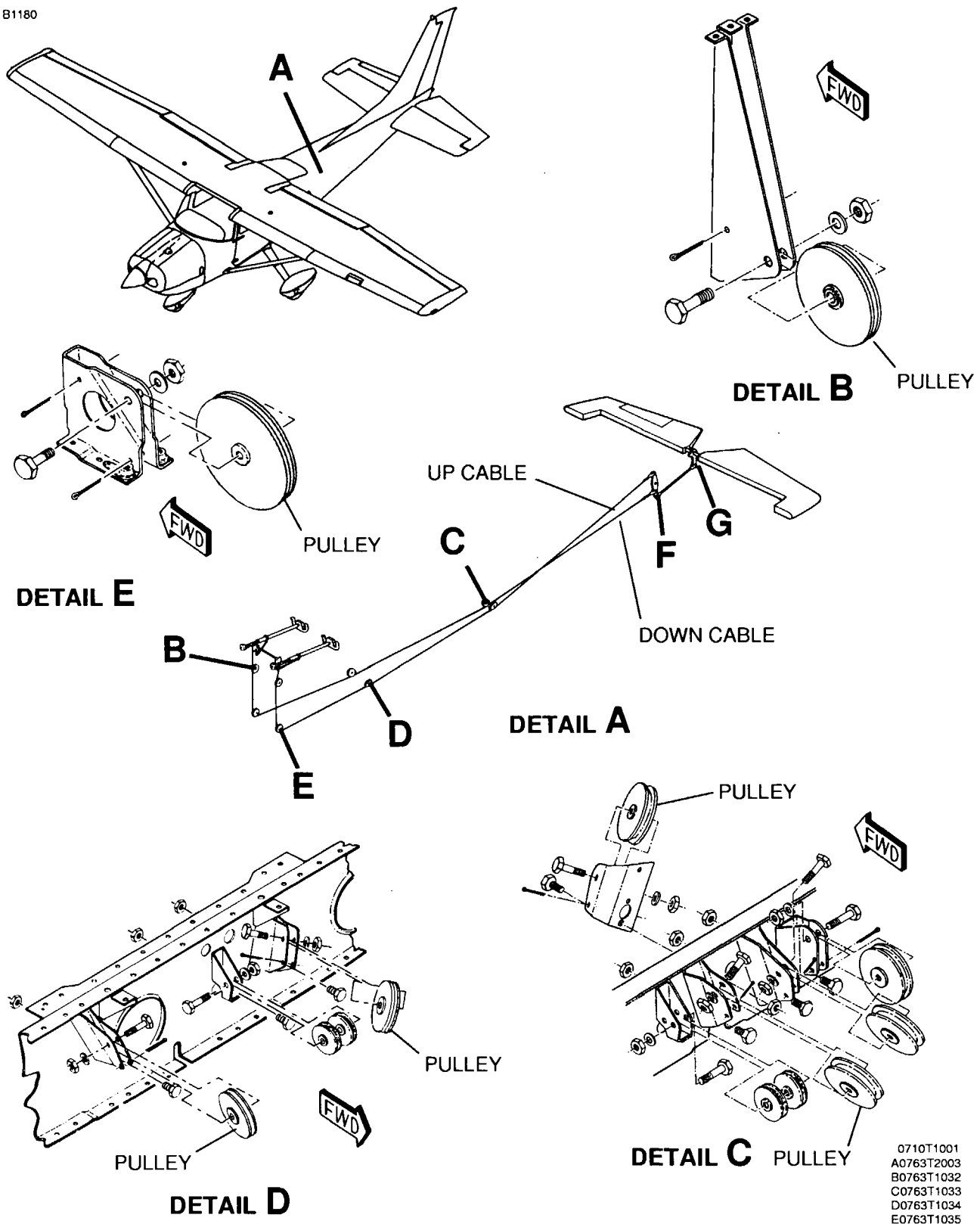
- B. Aft Elevator Arm Assembly Installation (Refer to Figure 201).
- (1) Place the bell crank in position and install the pivot bolt.
  - (2) If necessary, install the components that you removed for clearance when you removed the arm assembly.
  - (3) Install the bolts that attach the elevators to the arm assembly.
  - (4) Attach the push-pull tube to the arm assembly with the bolt and the washer.
  - (5) Install the cables.
  - (6) Adjust the cable tension and safety the turnbuckles. Refer to Elevator Control Adjustment/Test.
  - (7) Install the stinger (310DB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

**4. Elevator Control Adjustment/Test**

- A. Rig Elevator (Refer to Figure 202, Figure 203, and Figure 204).
- (1) Remove the stinger (310DB), fairings (340AL and 340AR), and access plate (310BB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

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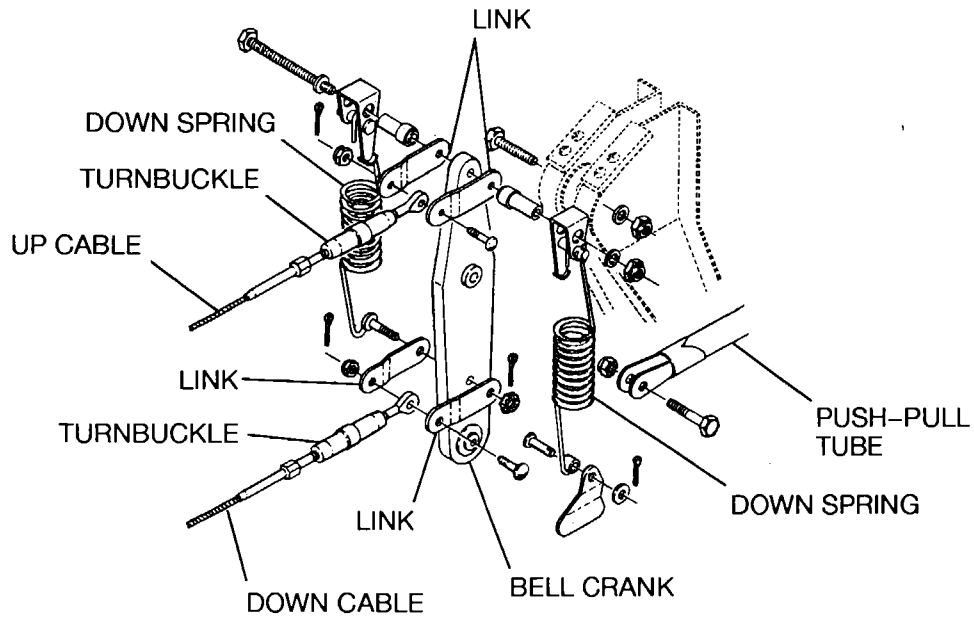
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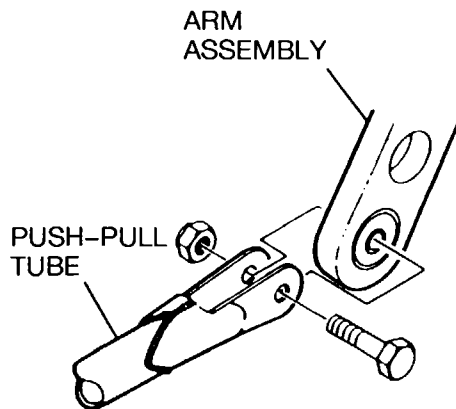
Elevator Control System  
 Figure 201 (Sheet 1)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

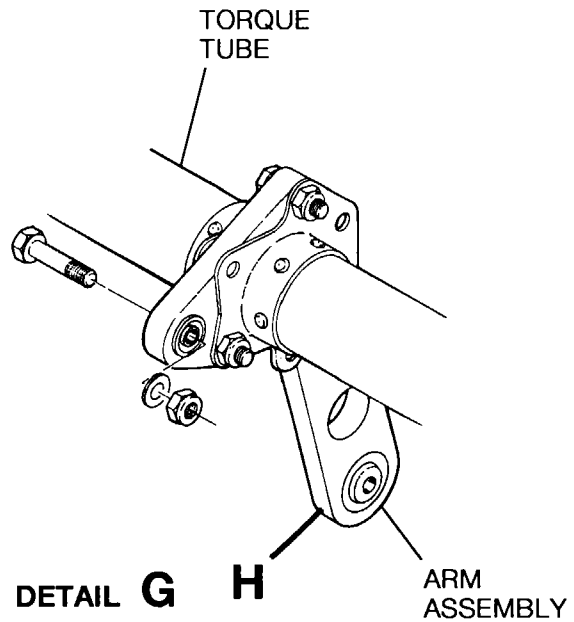
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**DETAIL F**



**DETAIL H**



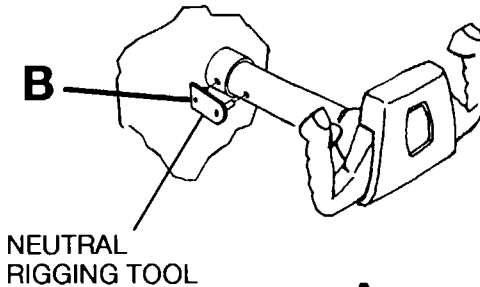
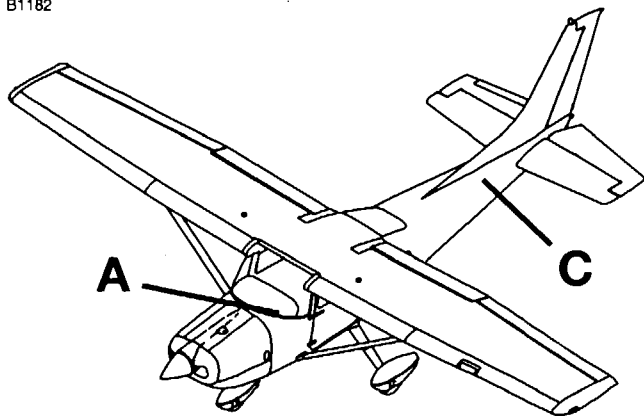
**DETAIL G**

Elevator Control System  
 Figure 201 (Sheet 2)

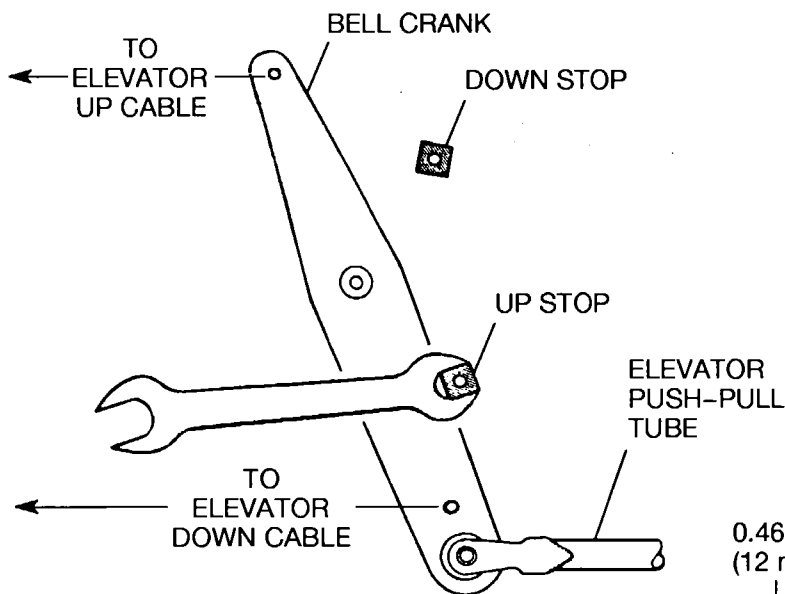
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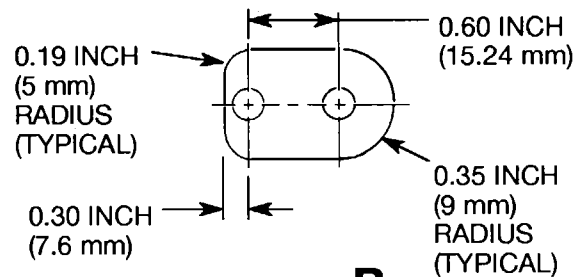
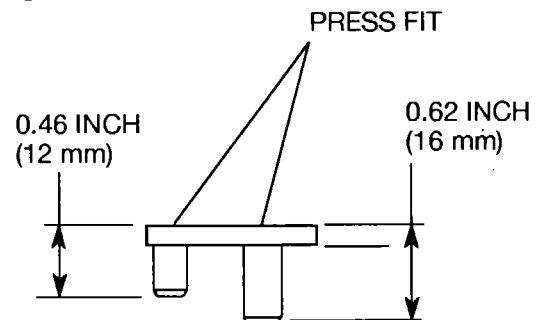
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**DETAIL A**



**DETAIL C**



**DETAIL B**

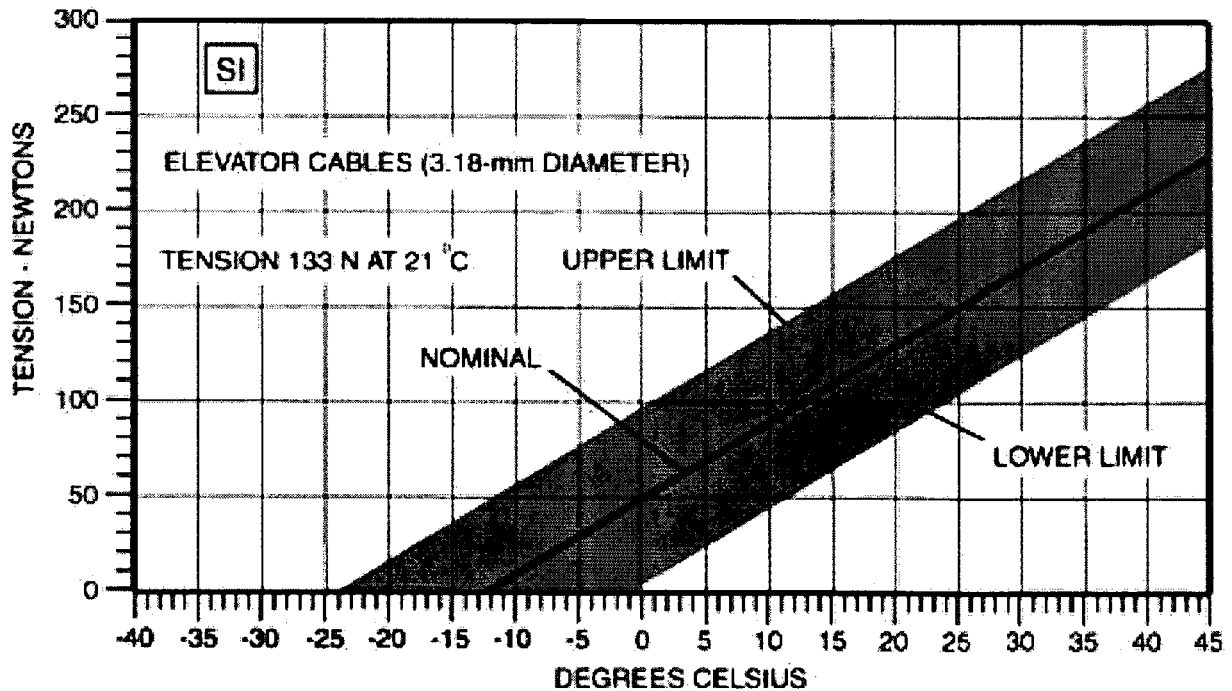
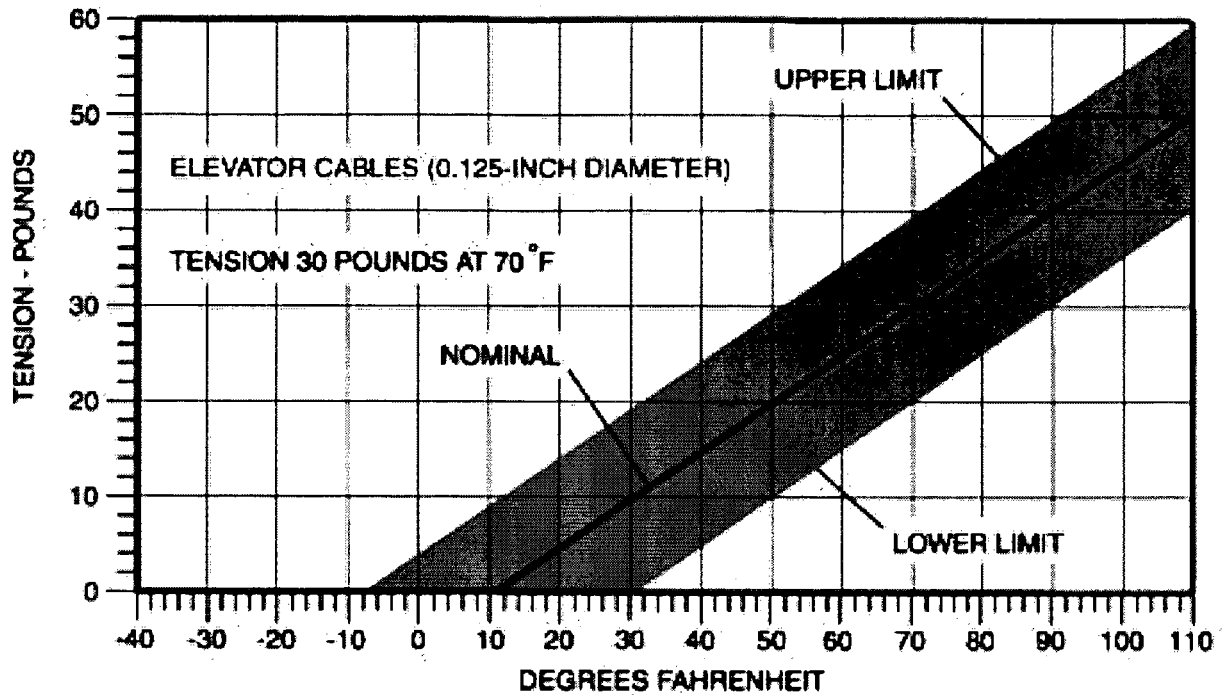
**NOTE:** MAKE FROM 0.125-INCH (3.18 mm) STEEL PLATE, 0.209-INCH DIAMETER DRILL ROD FOR SHORT PIN, AND 0.250-INCH DIAMETER DRILL ROD FOR LONG PIN. REFER TO DIMENSIONS SHOWN.

Elevator Control System Rigging  
 Figure 202 (Sheet 1)

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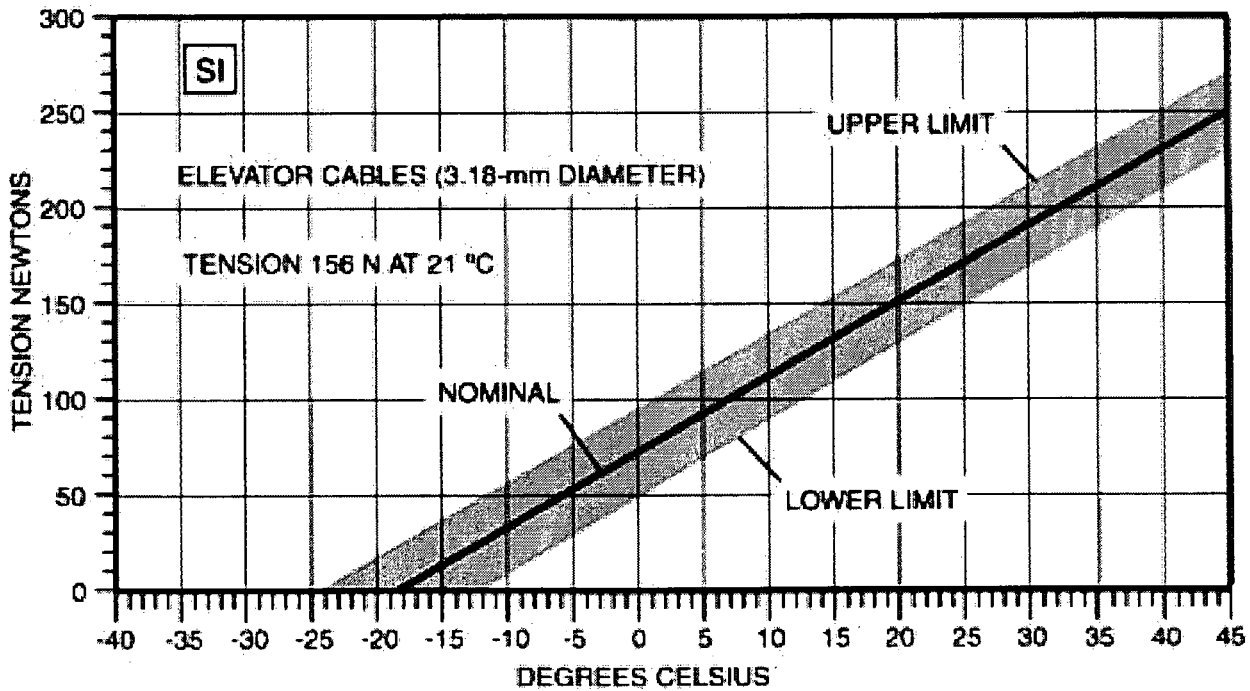
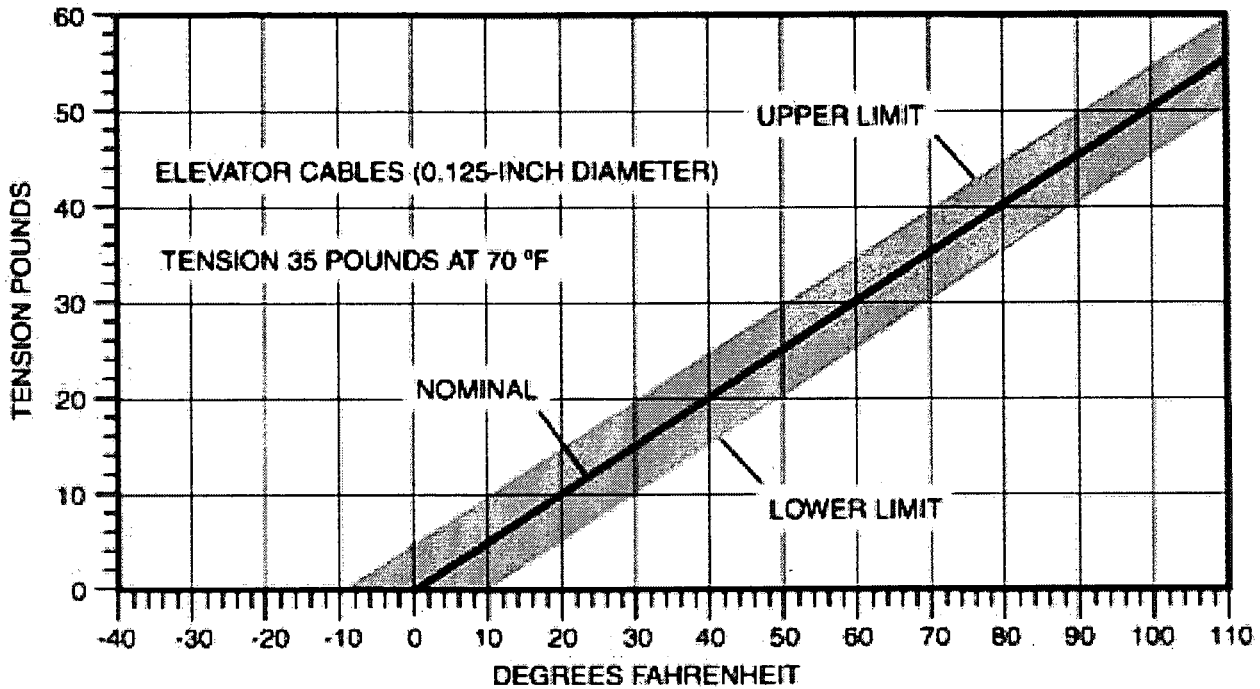


Elevator Cable Tension (without the GFC-700 Autopilot)  
 Figure 203 (Sheet 1)



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Elevator Cable Tension (with the GFC-700 Autopilot)  
 Figure 204 (Sheet 1)

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**CAUTION:** Position a support stand under the tail tiedown to prevent the tailcone from falling while you work inside.

- (2) Lock the elevator control column in the neutral position with the neutral rigging tool (Refer to Figure 202).
- (3) Streamline the elevators to the neutral position with the horizontal stabilizer. Ignore counterweight areas of the elevators when you streamline the elevators.

**NOTE:** Neutral position for the elevators is when they are streamlined with the horizontal stabilizer.

**NOTE:** The counterweight areas have a contour of approximately 3 degrees DOWN at cruising speed.

- (4) While you hold the elevators in the neutral position, adjust the turnbuckles equally to cable tension at 70 °F (21 °C). Refer to Figure 203 for the correct tensions at other temperatures.
  - Without the GFC-700 Autopilot system, 30 pounds, +10 or -10 pounds (133.45 N, +44.48 or -44.48 N)
  - With the GFC-700 Autopilot system, 35 pounds, +5 or -5 pounds (155.69 N, +22.24 or -22.24 N)
- (5) Mount an inclinometer on one elevator.
- (6) While you keep the elevator streamlined with the horizontal stabilizer, set the inclinometer to 0 degrees. Ignore counterweight areas of the elevators when you streamline the elevators.

**NOTE:** Neutral position for the elevators is when they are streamlined with the horizontal stabilizer.

**NOTE:** The counterweight areas have a contour of approximately 3 degrees DOWN at cruising speed.

- (7) Remove the neutral rigging tool.
- (8) Adjust the bell crank up stop to get 28 degrees, +1 or -1 degree, up travel.
- (9) Adjust the bell crank down stop to get 21 degrees, +1 or -1 degree, down travel.

**NOTE:** The bell crank stop blocks (7) are four-sided bushings, drilled off center. They can be turned to four different positions for correct elevator travel. Each 90-degree turn of the stop changes the elevator travel approximately one degree.

- (10) Check the sponge at the control column in both up and down positions and, if necessary, adjust the turnbuckles until the control column cannot touch the instrument panel or the firewall.
- (11) Safety the turnbuckles.
  - (a) Use the single-wrap preferred procedure with the 0.040 inch (1.0 mm) stainless steel or monel safety wire. Refer to Chapter 20, Safetying - Maintenance Practices.
- (12) Install the stinger (310DB), fairings (340AL and 340AR), and access plate (310BB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (13) Remove the support stand.

**WARNING:** Make sure that the elevators move in the correct direction when you move the control column.

- (14) Do a check for the correct operation of the elevators.

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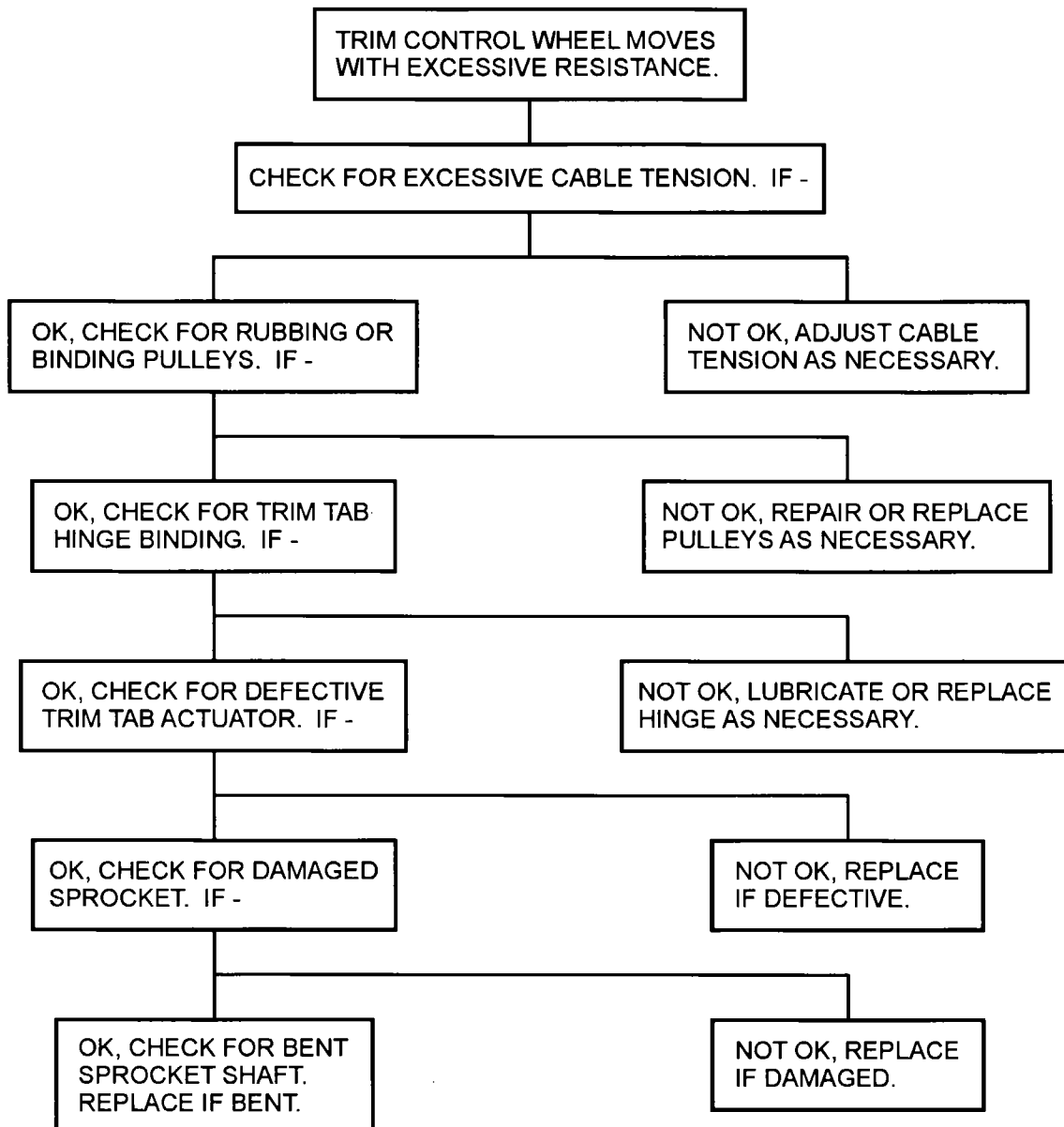
**ELEVATOR TRIM CONTROL - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

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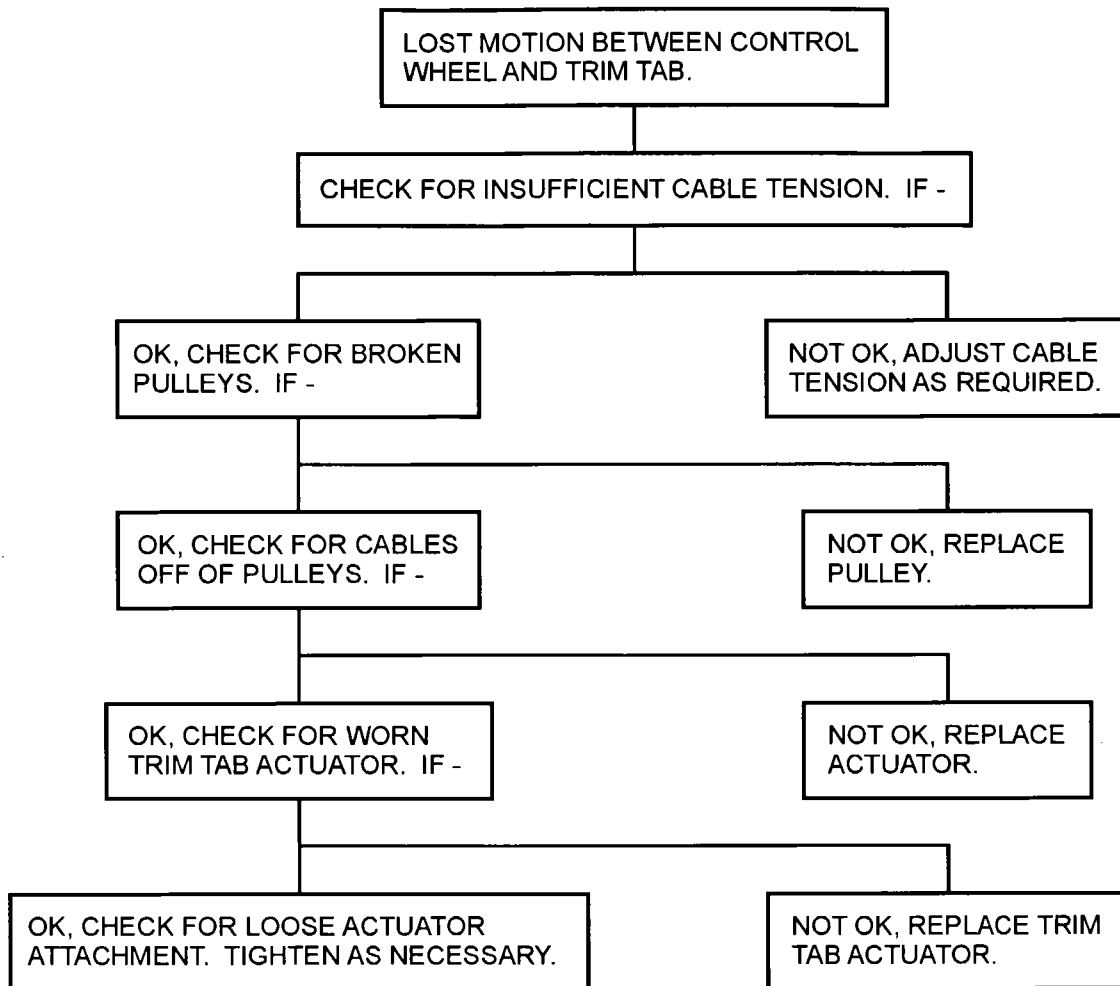
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Elevator Trim System Troubleshooting Chart  
Figure 101 (Sheet 1)

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**MODEL 182/T182**  
MAINTENANCE MANUAL

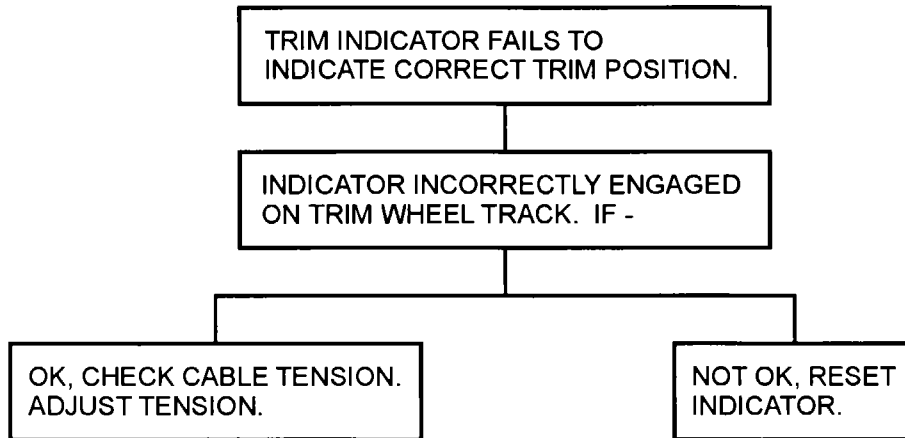
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Elevator Trim System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**MODEL 182/T182**  
MAINTENANCE MANUAL

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Elevator Trim System Troubleshooting Chart  
Figure 101 (Sheet 3)

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**ELEVATOR TRIM CONTROL - MAINTENANCE PRACTICES**

**1. General**

- A. The elevator trim tab is on the right elevator. It is controlled by a trim wheel installed in the pedestal. The power to operate the elevator trim tab comes from the trim control wheel through chains, cables, and an actuator. A mechanical pointer adjacent to the trim wheel shows elevator trim tab position. A nose up setting causes an elevator trim tab down position.

**2. Trim Tab Actuator Removal/Installation**

- A. Trim Tab Actuator Removal (Refer to Figure 201).

**CAUTION:** Put a support stand in position under the tail tiedown ring. The support stand will help to prevent the tailcone from falling while a person works inside.

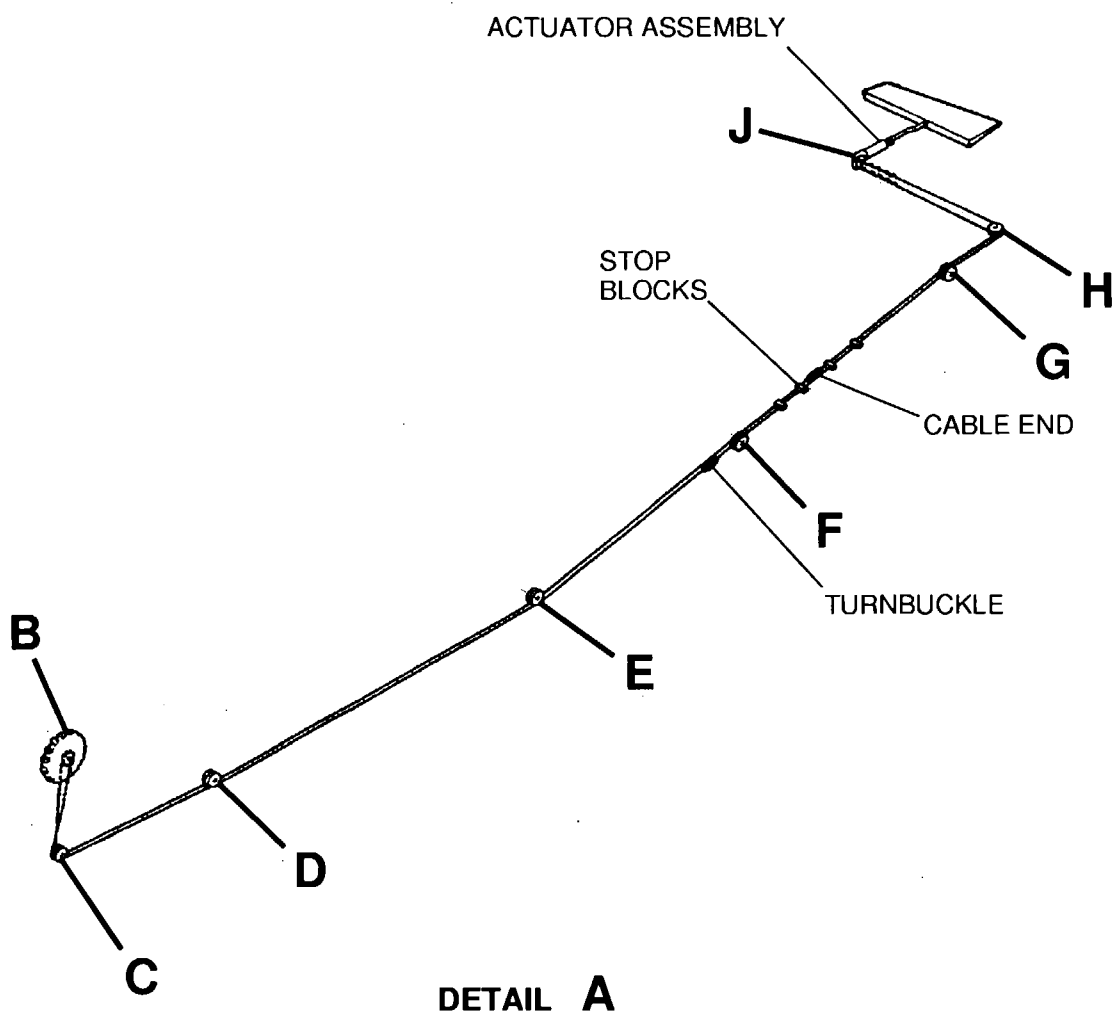
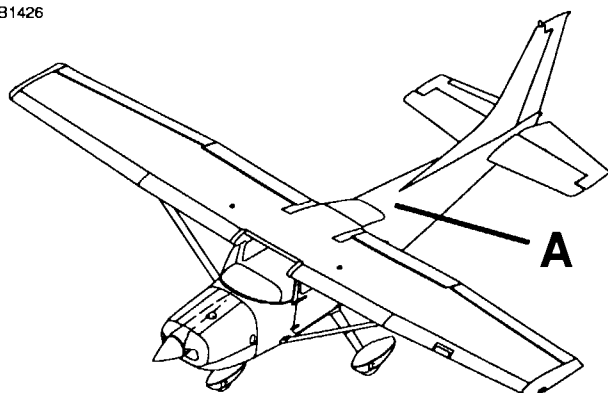
- (1) Remove the panel 310AR to get access to the stop blocks. Refer to Chapter 6, Access/Inspection Plates - Description and Operation (Refer to Figure 201).
  - (2) Remove the safety clip and loosen the tension on the cable at the turnbuckle.
  - (3) Remove the lock nut, bolt, and washers from the push-pull tube and disconnect it from the actuator.
  - (4) Remove the access plate 310CB to get access to the actuator. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (5) Remove the chain guard and the chain from the actuator sprocket.
  - (6) Remove the screws that attach the actuator clamps to the bracket.
  - (7) Carefully remove the actuator from the access opening.
- B. Trim Tab Actuator Installation (Refer to Figure 201).
- (1) Carefully install the actuator through the access opening.
  - (2) Use the screws to attach the actuator clamps to the bracket.
  - (3) Install the chain on the actuator sprocket.
  - (4) Install the chain guard.
  - (5) Install the access plate 310CB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (6) Use the washers, bolt, and lock nut to connect the push-pull tube to the actuator.
  - (7) Set the cable tension at the turnbuckle. Refer to the Trim Tab Control Adjustment/Test.
  - (8) Install the safety clip. Refer to Chapter 20, Safetying - Maintenance Practices.
  - (9) Install the panel 310AR. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (10) Remove the support stand.

**3. Trim Tab Actuator Disassembly/Assembly**

- A. Trim Tab Actuator Disassembly (Refer to Figure 202).
- (1) Remove the trim tab actuator. Refer to Trim Tab Actuator Removal/Installation.
  - (2) Turn the screw assembly to loosen and remove it from the actuator.
- B. Trim Tab Actuator Assembly (Refer to Figure 202).
- (1) If a new bearing is necessary, press it into the boss on the screw assembly. Make sure that the force pushes against the outer race of the bearing.
  - (2) Install the screw assembly into the actuator as follows:
    - (a) Pack the internal housing with MIL-G-21164C grease.
- NOTE:** This supplies the lubrication for the screw assembly.
- (b) Install the screw assembly in the housing.
  - (c) If necessary, clean the unwanted grease from the housing.

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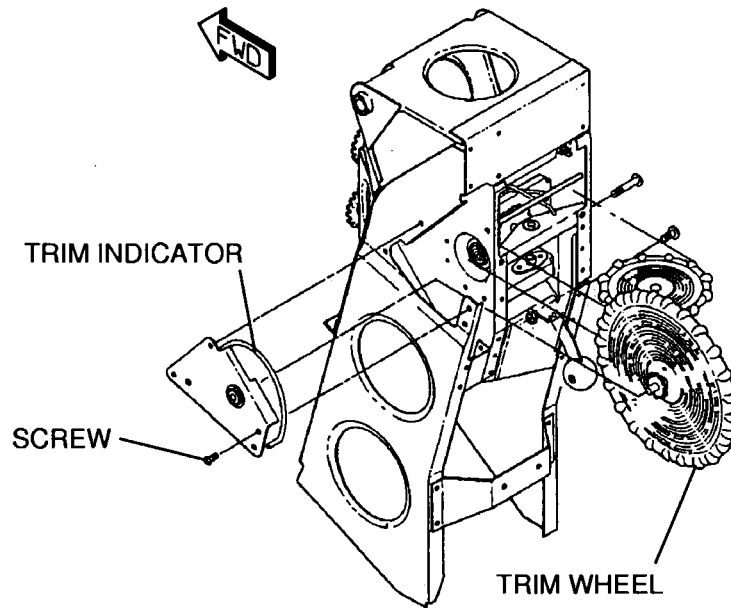
Elevator Trim Tab Control System  
Figure 201 (Sheet 1)

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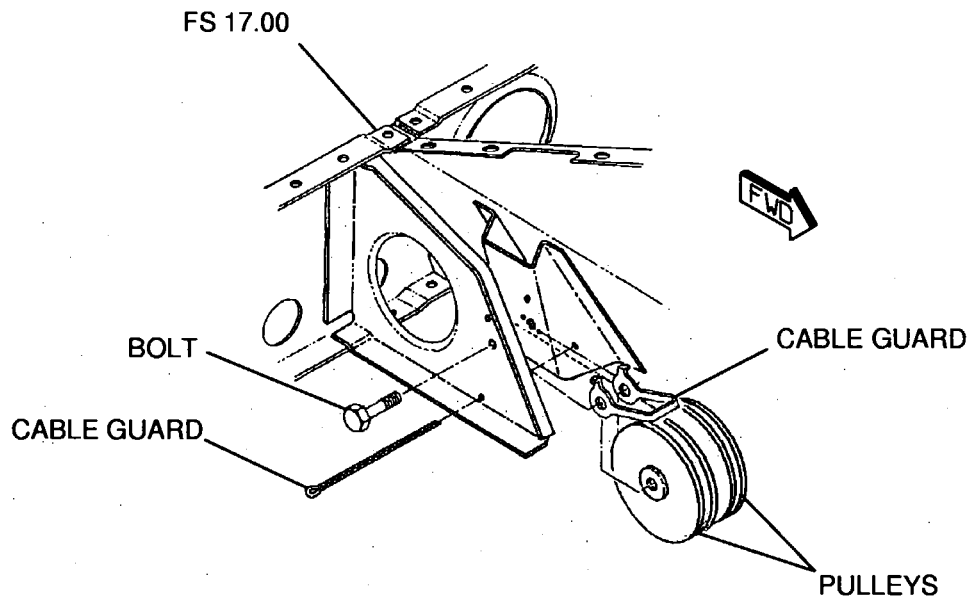


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**MODEL 182/T182**  
MAINTENANCE MANUAL

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**DETAIL B**



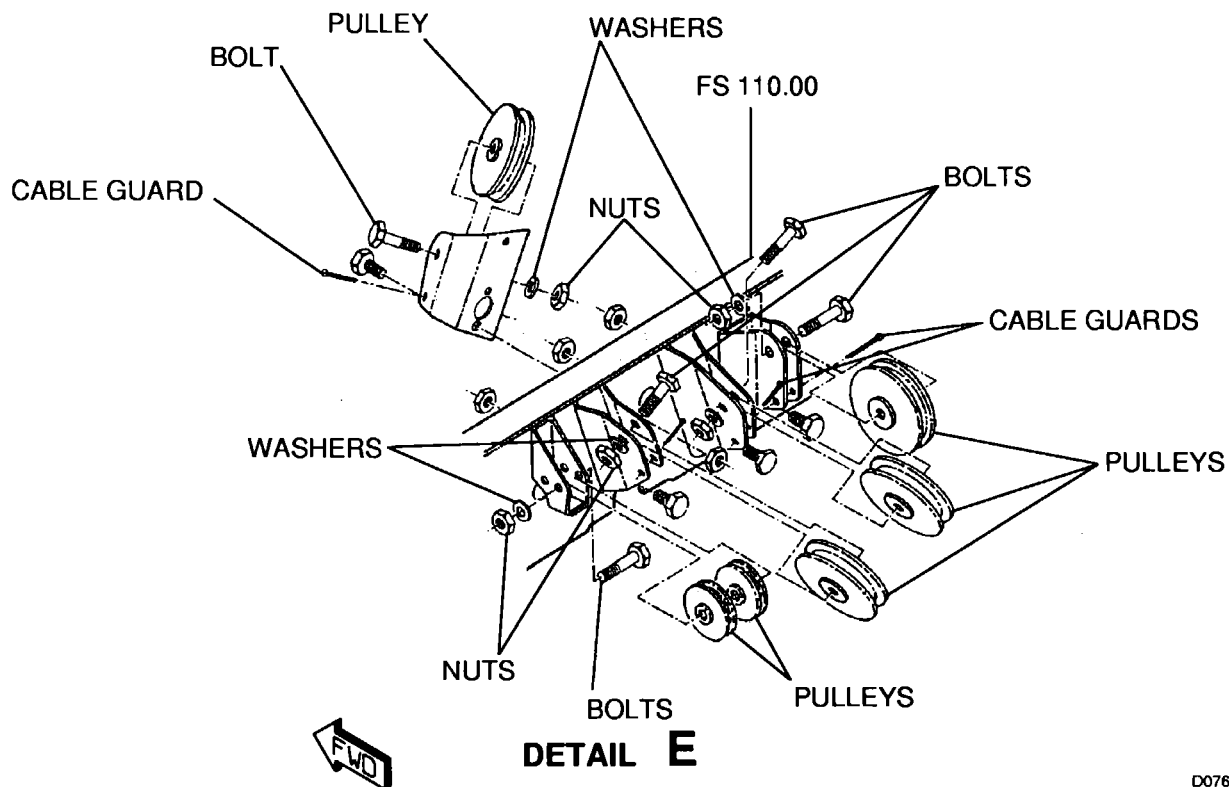
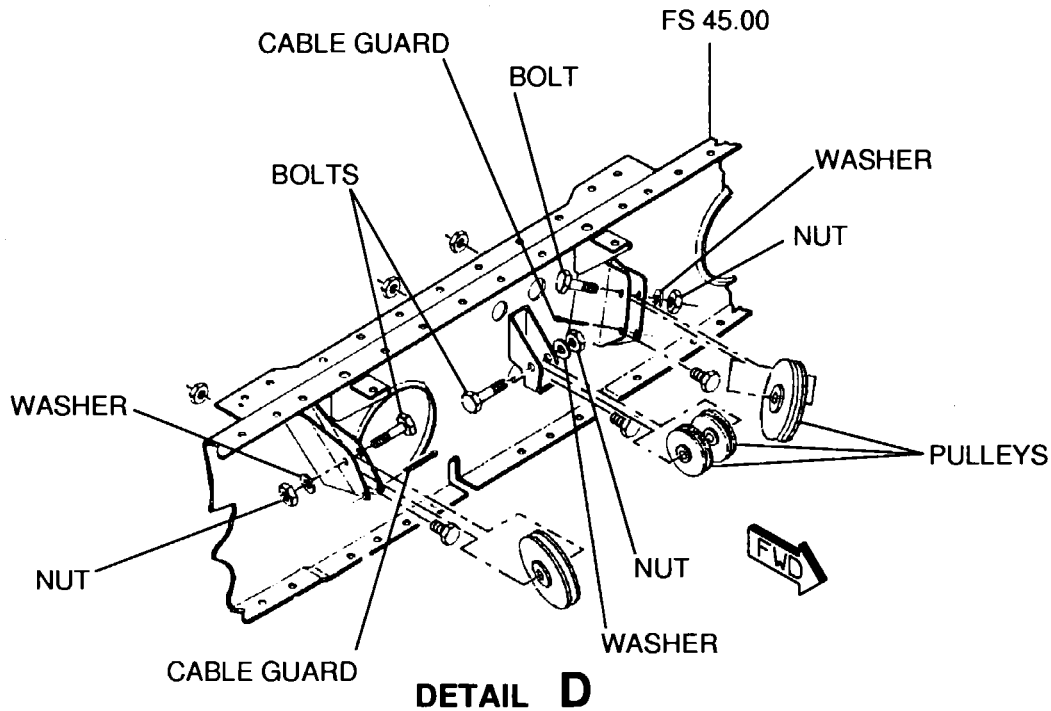
**DETAIL C**

Elevator Trim Tab Control System  
Figure 201 (Sheet 2)

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**MODEL 182/T182**  
 MAINTENANCE MANUAL

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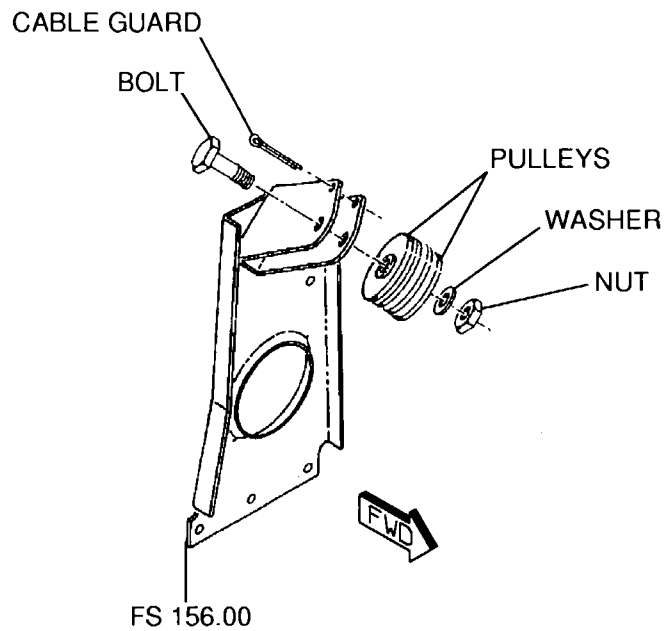


Elevator Trim Tab Control System  
 Figure 201 (Sheet 3)

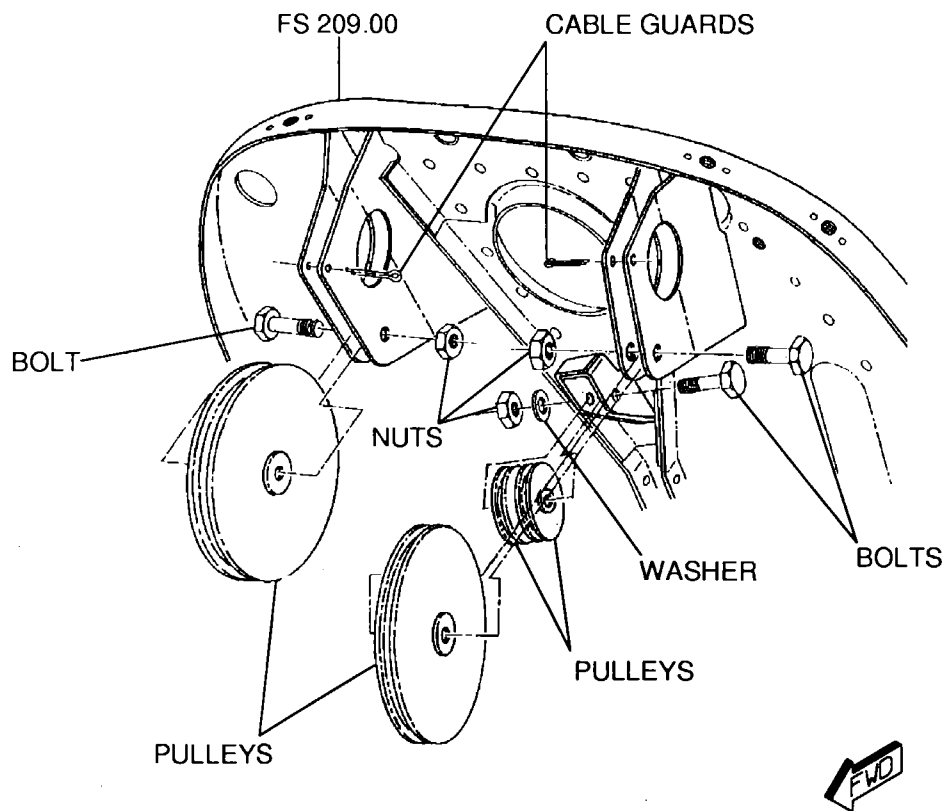
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**MODEL 182/T182**  
 MAINTENANCE MANUAL

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**DETAIL F**



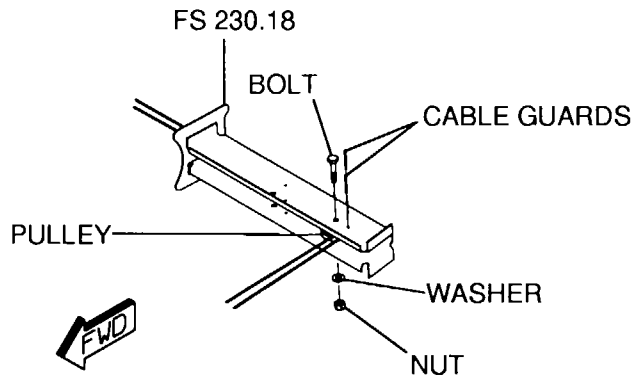
**DETAIL G**

Elevator Trim Tab Control System  
 Figure 201 (Sheet 4)

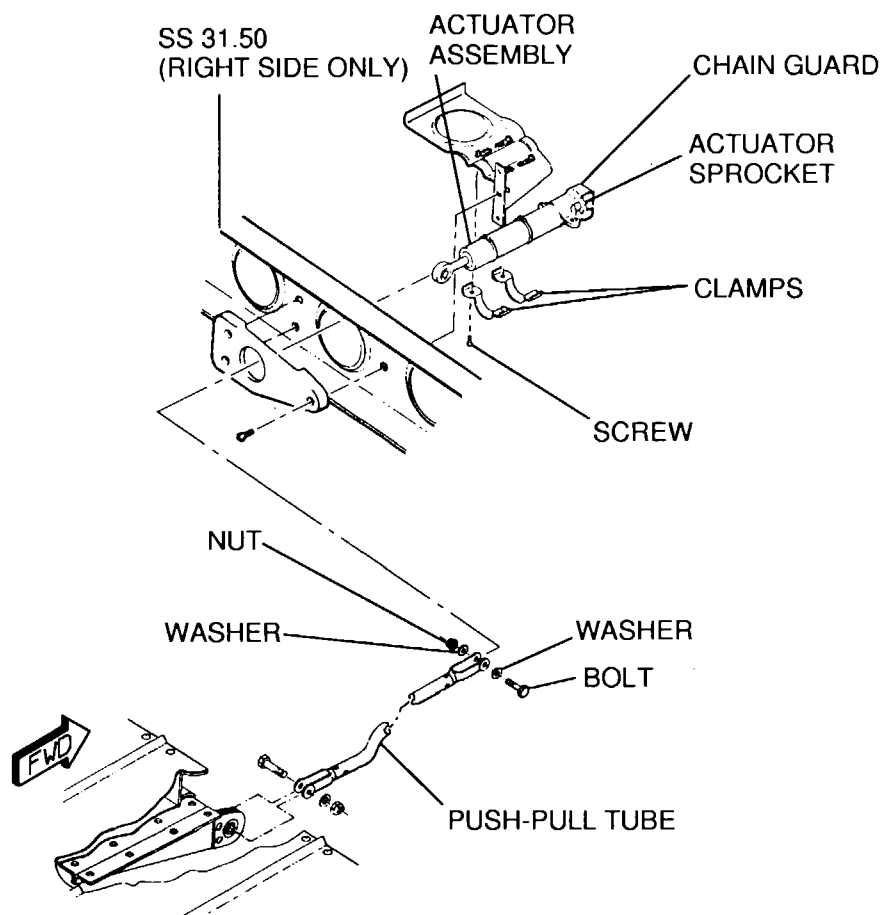
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**MODEL 182/T182**  
 MAINTENANCE MANUAL

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**DETAIL H**



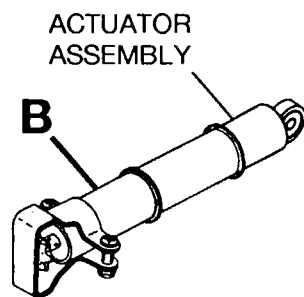
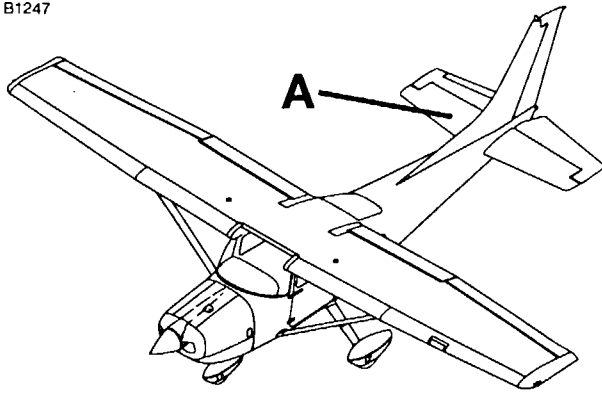
**DETAIL J**

Elevator Trim Tab Control System  
 Figure 201 (Sheet 5)

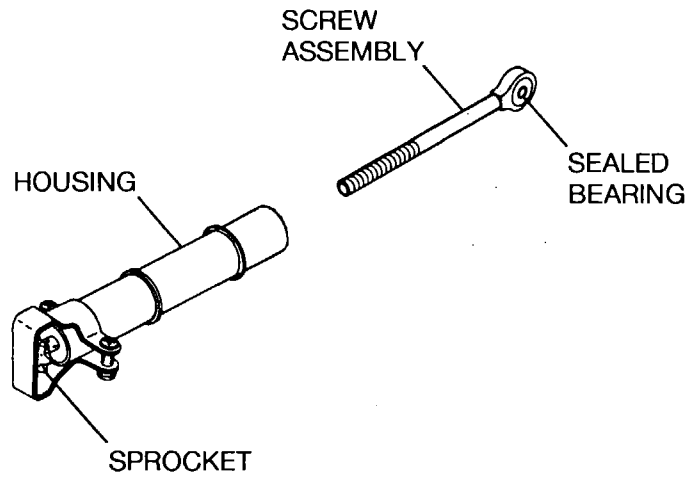
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MAINTENANCE MANUAL

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**DETAIL A**



**DETAIL B**

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B0563T1010

Elevator Trim Tab Actuator Assembly  
Figure 202 (Sheet 1)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

- (3) Hold the screw assembly and turn the sprocket by hand to do a test of the actuator assembly.

**NOTE:** The screw assembly must move smoothly in the actuator.

#### 4. Trim Tab Actuator Cleaning and Inspection

- A. Complete a Trim Tab Actuator Cleaning and Inspection (Refer to Figure 202).
- (1) Remove the screw assembly from the housing. Refer to Trim Tab Actuator Disassembly/Assembly.
    - (a) Do not remove the sealed bearing from the screw assembly unless the bearing replacement is necessary.
  - (2) Wash the screw assembly, except the sealed bearing, in Stoddard solvent or equivalent. Do not clean the sealed bearing.
  - (3) Do a check of the sealed bearing and screw assembly for wear and for parts that have scores. Refer to Table 201 for dimensions.

Table 201. Wear Dimensions

COMPONENT	MAXIMUM DIMENSION	MINIMUM DIMENSION
Aft End Bearing Inside Diameter	0.249 Inch	0.248 Inch
Threaded Rod End Outside Diameter	0.246 Inch (Shank)	0.245 Inch (Shank)

- (4) Examine the screw assembly and the screw for threads that have damage or dirt particles that can cause the assembly to operate incorrectly.
- (5) Examine the screw assembly sealed bearing for smoothness of operation.
- (6) Examine the housing components for stripped threads, cracks, deep nicks, dents, and other signs of damage.
- (7) Examine the sprocket for broken, chipped, and/or worn teeth.
- (8) Examine the linear free play at the sprocket end of the housing.

**NOTE:** The linear free play at the sprocket end must not be more than 0.010 inch maximum.

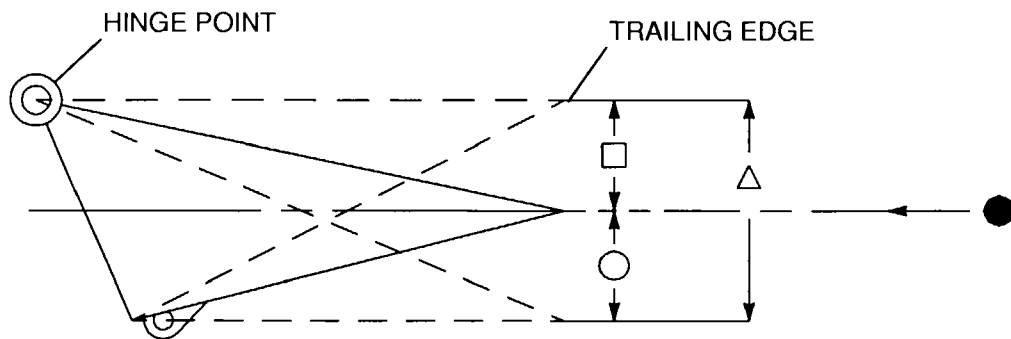
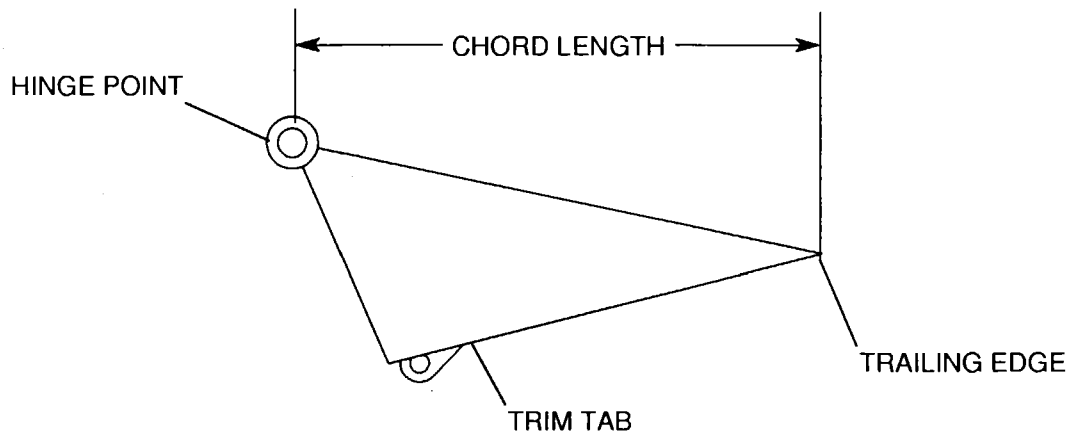
- (a) If the free play is more than the permitted limits, replace the actuator.
- (9) Do not try to repair the actuator assembly parts that have damage or wear.
- (10) Install the screw assembly into the housing. Refer to Trim Tab Actuator Disassembly/Assembly.

#### 5. Trim Tab Free Play Inspection

- A. Trim Tab Free Play Inspection (Figure 203).
- (1) Put the elevator and the trim tab in the neutral position.
  - (2) With the elevator gust lock, make sure that the elevator cannot move.
  - (3) Find the maximum amount of permitted free play.
    - (a) Measure the chord length at the extreme inboard end of the trim tab.
    - (b) Multiply the chord length by 0.025 to get the maximum permitted free play.
    - (c) Measure the free play at the same point on the trim tab where the chord length was measured.
    - (d) The total free play must not be more than the maximum permitted free play.
  - (4) With moderate hand pressure (up and down), measure the free play at the trailing edge of the trim tab.
  - (5) If the trim tab free play is less than the maximum permitted free play, the system is in the approved limits.
  - (6) If the trim tab free play is more than the maximum permitted free play, check the items that follow for looseness while you move the trim tab up and down.
    - (a) The push-pull tube/trim tab horn assembly attachment.
    - (b) The push-pull tube/actuator assembly threaded rod-end attachment.
    - (c) The actuator assembly threaded rod end in the actuator assembly.

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- FREE-PLAY UP
- NEUTRAL POSITION
- FREE-PLAY DOWN
- △ TOTAL FREE-PLAY

Trim Tab Free Play Inspection  
 Figure 203 (Sheet 1)

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- (7) If looseness is apparent while you check the push-pull tube/tab horn assembly, install new parts to repair.
- (8) If looseness is apparent while you check the push-pull tube/actuator assembly threaded rod-end assembly, install new parts to repair.
- (9) If looseness is apparent while you check the push-pull tube threaded rod end in the actuator assembly, the threaded rod end is out of tolerance and you must replace it.

**6. Trim Tab Control Cables and Pulleys Removal/Installation**

**A. Cables and Pulleys Removal (Refer to Figure 201).**

**CAUTION:** Position a support stand under the tail tiedown ring to prevent the tailcone from falling while a person works inside.

- (1) Remove the crew seats and the rear seat. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Rear Seat - Maintenance Practices.
- (2) Remove the pedestal cover.
- (3) Remove the access panel (310AR), access plates (230DB, 230LB, 231LB, 310BB, and 310CB), and fairings (340AL and 340AR) for access. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Remove the stop blocks from the control cables.
- (5) Remove the cable guard from the actuator.
- (6) Remove the safety clip from the turnbuckle and disconnect the cable.
- (7) Disconnect the cables at the cable ends.

**NOTE:** To ease the routing of the cables, a length of wire can be attached to the end of the cable before you remove it from the airplane. You can leave the wire in place, routed through the structure. Then you can attach the new cable and pull it into position.

- (8) Remove the cable guards and the pulleys.
- (9) Disengage the chains from the sprockets and remove the cables from the airplane structure.

**B. Cables and Pulleys Installation (Refer to Figure 201).**

- (1) Attach the cables to the wires that are routed through the airplane structure and pull the cables into position.
- (2) Engage the chains on the sprockets and install the chain guard on the actuator.
- (3) Install the pulleys and the pulley guards.
- (4) Connect the cable ends and install the turnbuckle.
- (5) Rig the system. Refer to Trim Tab Control Adjustment/Test.
- (6) Install the access panel (310AR), access plates (230DB, 230LB, 231LB, 310BB, and 310CB), and fairings (340AL and 340AR) removed to get access. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (7) Install the pedestal cover.
- (8) Install the crew seats and the rear seat. Refer to Chapter 25, Front Seats - Maintenance Practices and Rear Seat - Maintenance Practices.
- (9) Remove the support stand.

**7. Trim Tab Control Wheel Removal/Installation**

**A. Trim Tab Control Wheel Removal (Refer to Figure 201).**

- (1) Relieve cable tension at the turnbuckle.
- (2) Remove the pedestal cover.
- (3) Remove the screws that attach the control wheel retainer.
- (4) Remove the retainer and the pointer. Do not drop the trim control wheel.

**B. Trim Tab Control Wheel Installation (Refer to Figure 201).**

- (1) Install the retainer and the pointer with the screws.
- (2) Install the pedestal cover.
- (3) Set the cable tension at the turnbuckle. Refer to Trim Tab Control Adjustment/Test.



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**8. Trim Tab Control Adjustment/Test**

A. Set Trim Tab Control Cable Tension (Refer to Figure 204 and Figure 205).

**CAUTION:** Position a support stand under the tail tiedown ring to prevent the tailcone from falling while a person works inside.

- (1) Remove the access panel (310AR) and the access plates as necessary. Refer to Access/Inspection Plates - Description and Operation.
- (2) Loosen the travel stop blocks on the cables.
- (3) Disconnect the actuator from the trim tab push-pull tube.
- (4) Adjust the turnbuckle as necessary to get 15 to 20 pounds (66.72 to 88.96 N) of cable tension at 70 °F (21 °C). Refer to the Charts in Figure 205 for the correct tensions at other temperatures.
- (5) If this trim tab adjustment/test is done as part of a chain and/or cable installation, let the actuator screw turn freely, because the chains and the cables are connected.
- (6) Adjust the cable tension and safety the turnbuckle.
- (7) Turn the trim wheel full forward (nose down). Make sure that the pointer does not decrease the trim wheel movement. If necessary, move the pointer to a new position. To move the pointer to a new position, you can pry the trailing leg of the pointer out of the groove with a thin screwdriver if necessary.

**NOTE:** At the full forward (nose down) position of the trim wheel, more forward movement is prevented because the chain or the cable ends contact the sprockets or the pulleys.

- (8) With the elevator and the trim tab both in neutral (streamlined), mount an inclinometer on the tab and set it at 0 degrees. Ignore the counterweight areas of the elevators when you streamline. These areas are contoured so they will be approximately 3 degrees down at cruising speed.

**NOTE:** Neutral positions for the elevators are streamlined with the horizontal stabilizer. Ignore the counterweight areas of the elevators when you streamline. These areas are contoured so they will be approximately 3 degrees DOWN at cruising speed.

**NOTE:** An inclinometer for measuring control surface travel is available from the Cessna Parts Distribution.

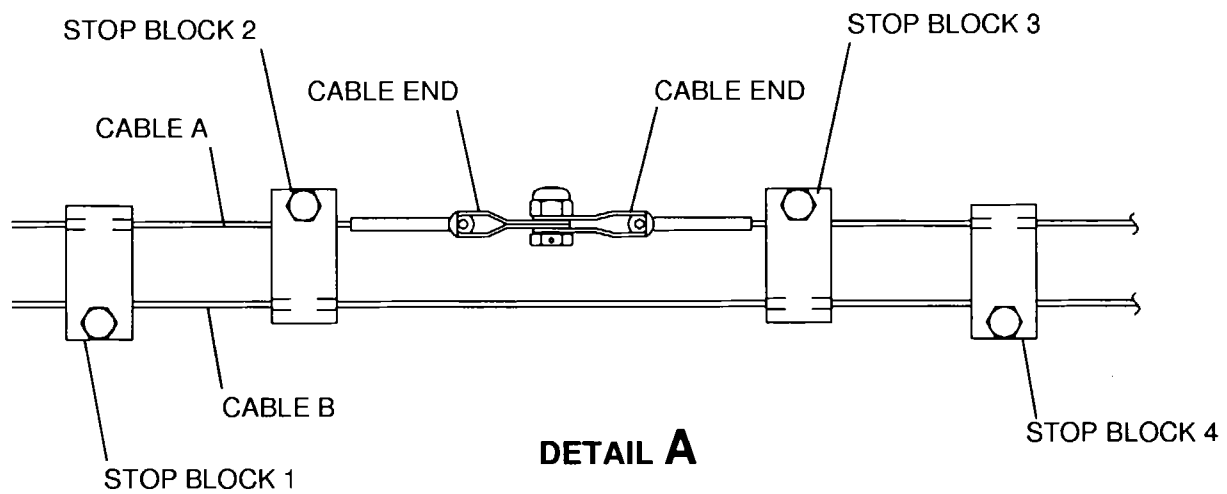
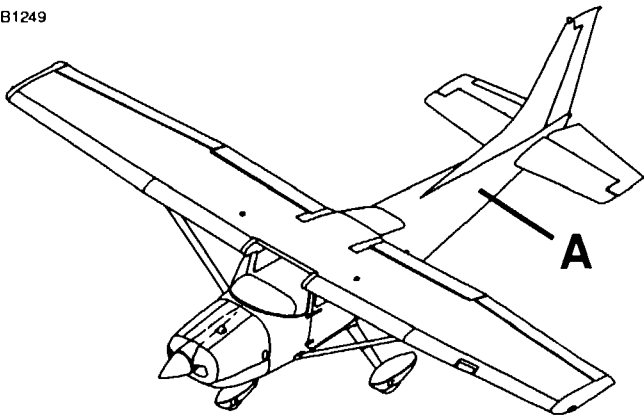
- (9) Turn the trim tab actuator screw in or out as required to place the trim tab up with a maximum of 2 degrees overtravel, with the actuator screw connected to the push-pull tube.
- (10) Turn the trim wheel to position the trim tab up and down, and adjust the actuator screws as required to get correct travel in both directions.
- (11) Put the stop blocks in position. Refer to Figure 204.
  - (a) With the elevators in neutral, set the trim tab to neutral.
  - (b) Position the stop block (2) approximately 0.25 inch (6.35 mm) forward of the turnbuckle.
  - (c) Position the stop block (3) approximately 0.25 inch (6.35 mm) aft of the turnbuckle.
  - (d) Attach the stop blocks (2) and (3) to cable A.
  - (e) Put the inclinometer on the trim tab and lower it to 15 degrees, +1 or -1 degree.
  - (f) Put the stop block (4) against the stop block (3) and attach it to cable B.
  - (g) Run the trim tab up to 24 degrees, +2 or -2 degrees.
  - (h) Place stop block (1) against stop block (2) and attach to cable B.
- (12) Make sure that the trim wheel pointer travels the same distance from the ends of the slot in the cover. Move the trailing leg of the pointer to a new position if necessary.

**WARNING:** Make sure that the elevators travel in the correct direction when you operate the control column.

- (13) Move the control column to make sure that the elevators travel in the correct direction.

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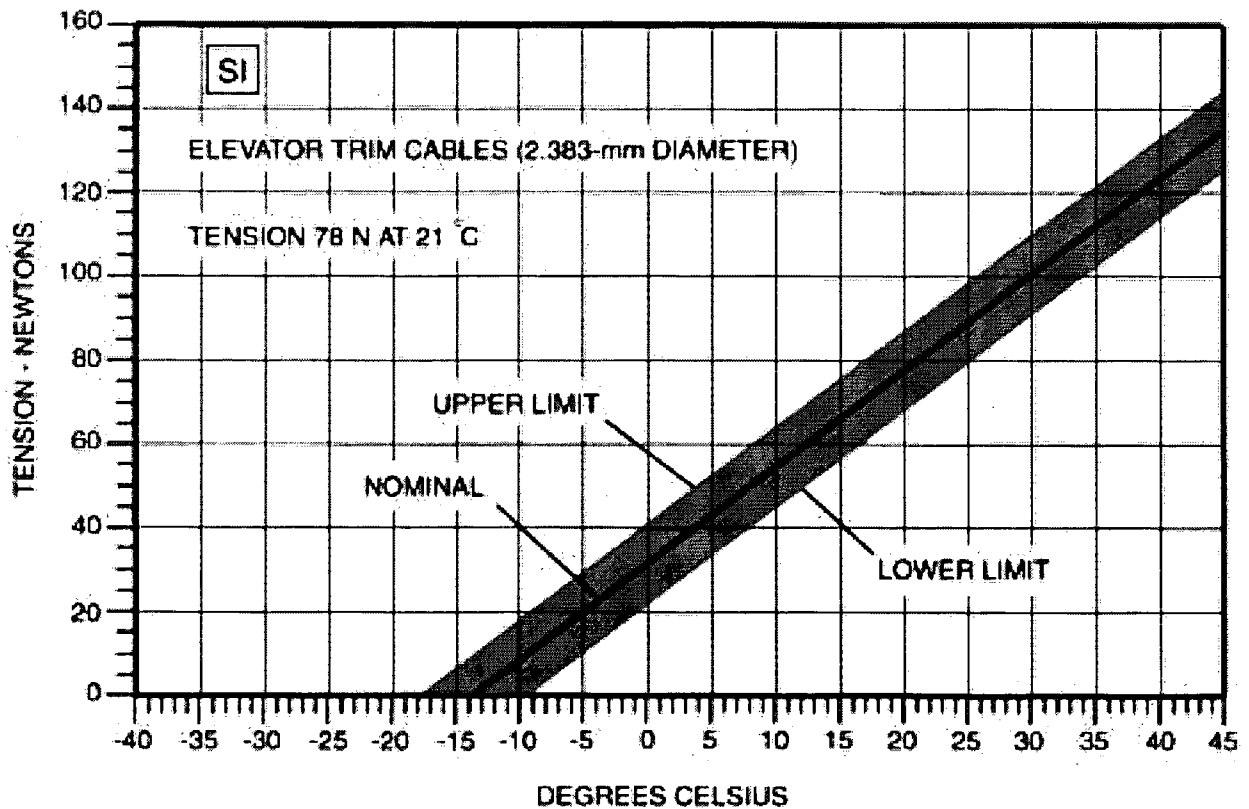
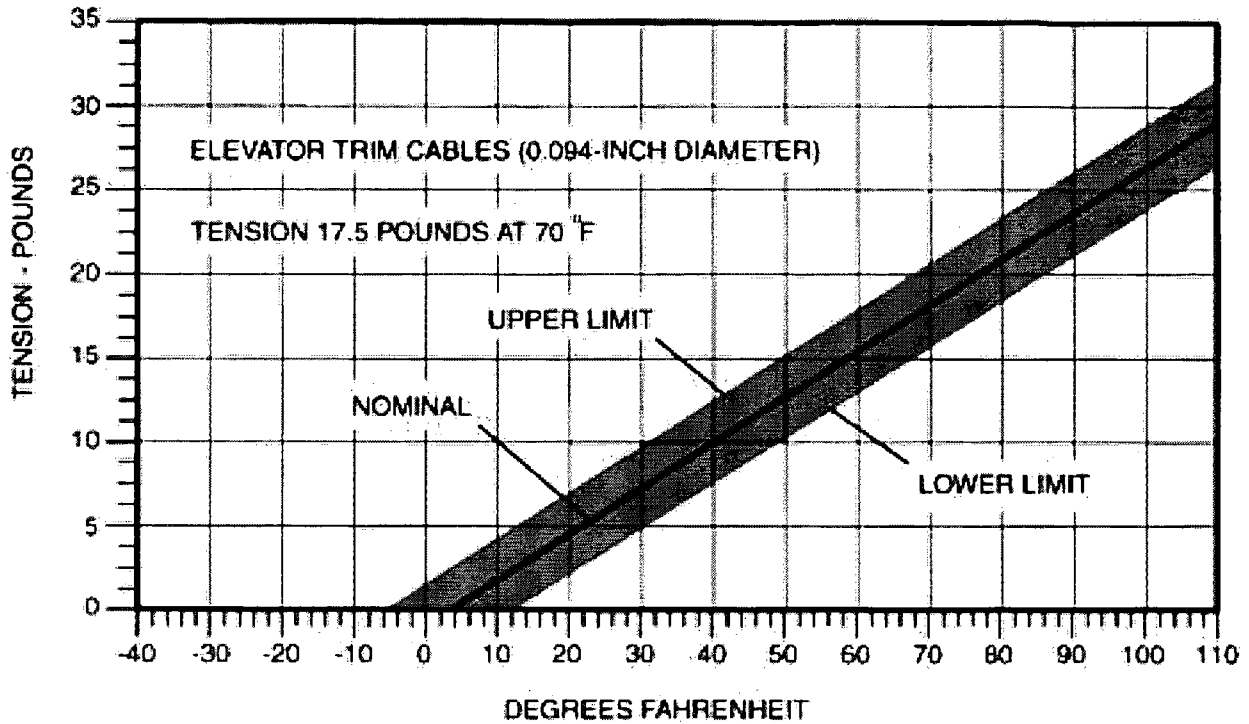
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Elevator Trim Tab Travel Stop Adjustment  
Figure 204 (Sheet 1)

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Elevator Trim Cable Tension  
Figure 205 (Sheet 1)

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- (14) Make sure that the trim tab moves in the correct direction when it is operated by the trim wheel.

**NOTE:** Nose down trim corresponds to the tab UP position.

- (15) Safety the turnbuckle (Refer to Chapter 20, Safelying - Maintenance Practices).  
(16) Install all of the items that you removed to get access to the components.  
(17) Remove the support stand.

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**STALL WARNING SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. The stall warning system includes a stall warning horn and stall detector. The stall warning horn is located inside the cabin behind the headliner, overhead and to the outboard side of the pilot, on the fuselage rib. The (heated) stall detector is mounted on the leading edge of the left wing at WS 91.25. The PITOT HEAT/OFF switch on the circuit panel assembly provides power to the heating element of the stall detector.
- B. The stall detector is actuated by airflow over the surface of the wing. The stall detector internal switch will close as a stall condition is approached, actuating the stall warning horn. The stall detector should actuate the stall warning horn approximately 4.5 to 9.0 knots above airplane stall speed.

**2. Stall Warning Horn Assembly Removal and Installation**

- A. Remove Stall Warning Horn Assembly (Refer to Figure 201).
  - (1) Remove electrical power from airplane. Disengage WARN circuit breaker on circuit panel assembly.
  - (2) Remove headliner to access stall warning horn assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (3) Identify, tag, and disconnect stall warning horn wiring at stall warning horn connector (P1/JC030).
  - (4) Remove nuts and washers securing stall warning horn assembly to adapter plate.
  - (5) Remove stall warning horn assembly from airplane.
- B. Install Stall Warning Horn Assembly (Refer to Figure 201).
  - (1) Position stall warning horn on adapter plate and secure with nuts and washers.
  - (2) Connect stall warning horn wiring at stall warning horn connector (P1/JC030).
  - (3) Install headliner. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (4) Restore electrical power to airplane. Engage WARN circuit breaker on circuit panel assembly.

**3. Stall Detector Removal and Installation**

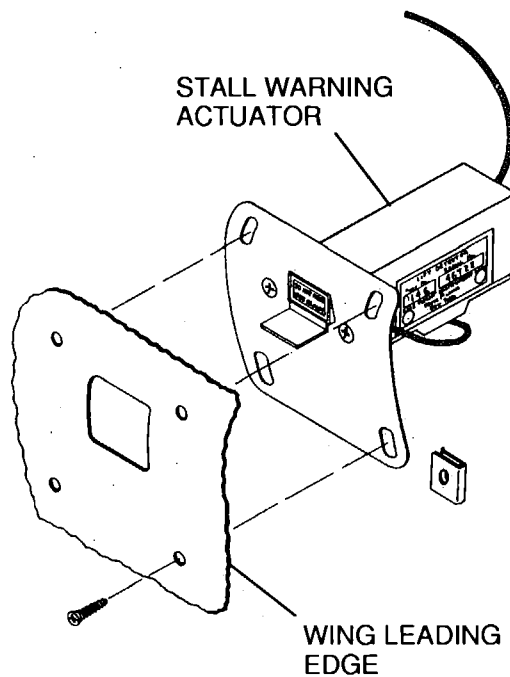
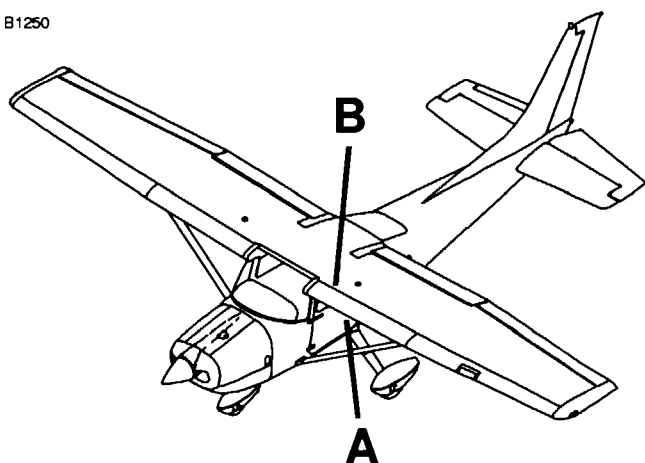
- A. Remove Stall Detector (Refer to Figure 201).
  - (1) Remove electrical power from airplane. Disengage WARN circuit breaker on circuit panel assembly and place PITOT HEAT/OFF switch to OFF.
  - (2) Remove access plate 610JB to access stall detector. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Identify, tag, and disconnect electrical wiring from stall detector and disconnect stall warning connector (JL021/PL021).
  - (4) Remove screws and nuts securing stall detector to wing leading edge.
  - (5) Remove stall detector from airplane.
- B. Install Stall Detector (Refer to Figure 201).
  - (1) Place stall detector at access plate opening and connect electrical wiring to stall detector and connect stall warning connector (JL021/PL021).
  - (2) Position stall detector at wing leading edge and secure with screws and nuts.

**NOTE:** The lip of the stall detector needs to be approximately 0.06 of an inch (1.52 mm) below the centerline of the wing skin cutout.

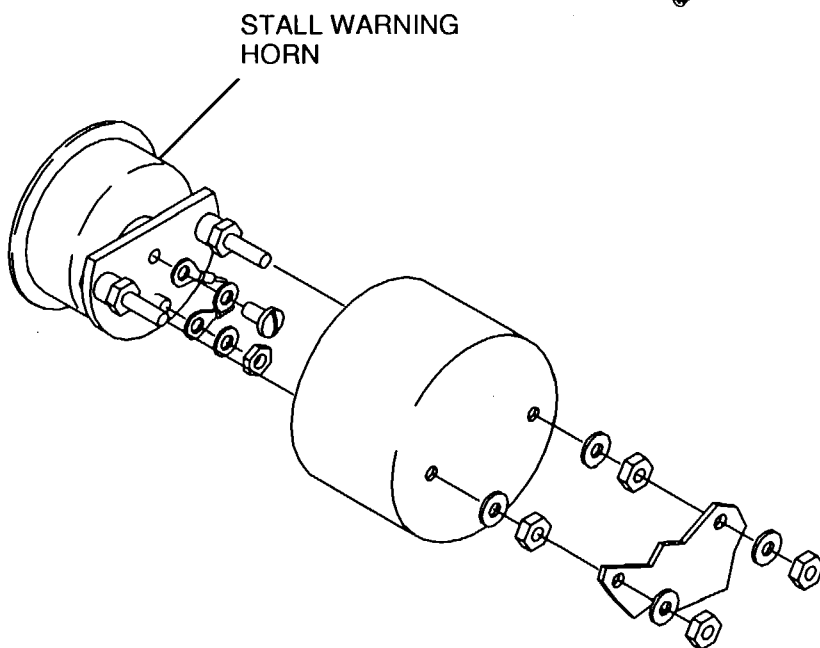
- (3) Install access plate 610JB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Restore electrical power to airplane. Engage WARN circuit breaker on circuit panel assembly.
- (5) Adjust stall detector. Refer to Stall Detector Adjustment.

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**DETAIL A**



**DETAIL B**

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B0718T1021

Stall Warning Horn and Detector Installation  
Figure 201 (Sheet 1)

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**4. Stall Detector Adjustment**

**A. Adjust Stall Detector.**

- (1) It is necessary to test fly the airplane to determine if the stall detector actuates the stall warning horn at the desired speed. Make the following adjustments to stall detector based on results of test flight.
    - (a) If stall warning horn sounds at speeds in excess of 9.0 knots above stall speed, then loosen stall detector mounting screws and move stall detector slightly down. Refer to Stall Detector Removal and Installation.
- WARNING: Do not allow airspeed to drop below airplane stall speed.**
- (b) If stall warning horn does not sound before reaching stall speed plus 4.5 knots (4.5 knots above stall speed), then loosen stall detector mounting screws and move stall detector slightly up. Refer to Stall Warning System - Maintenance Practices, Stall Detector Removal and Installation.
  - (2) A successful test of the stall warning system will cause the stall warning horn to sound at 4.5 to 9.0 knots above airplane stall speed.

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**FLAP CONTROL SYSTEM - TROUBLESHOOTING**

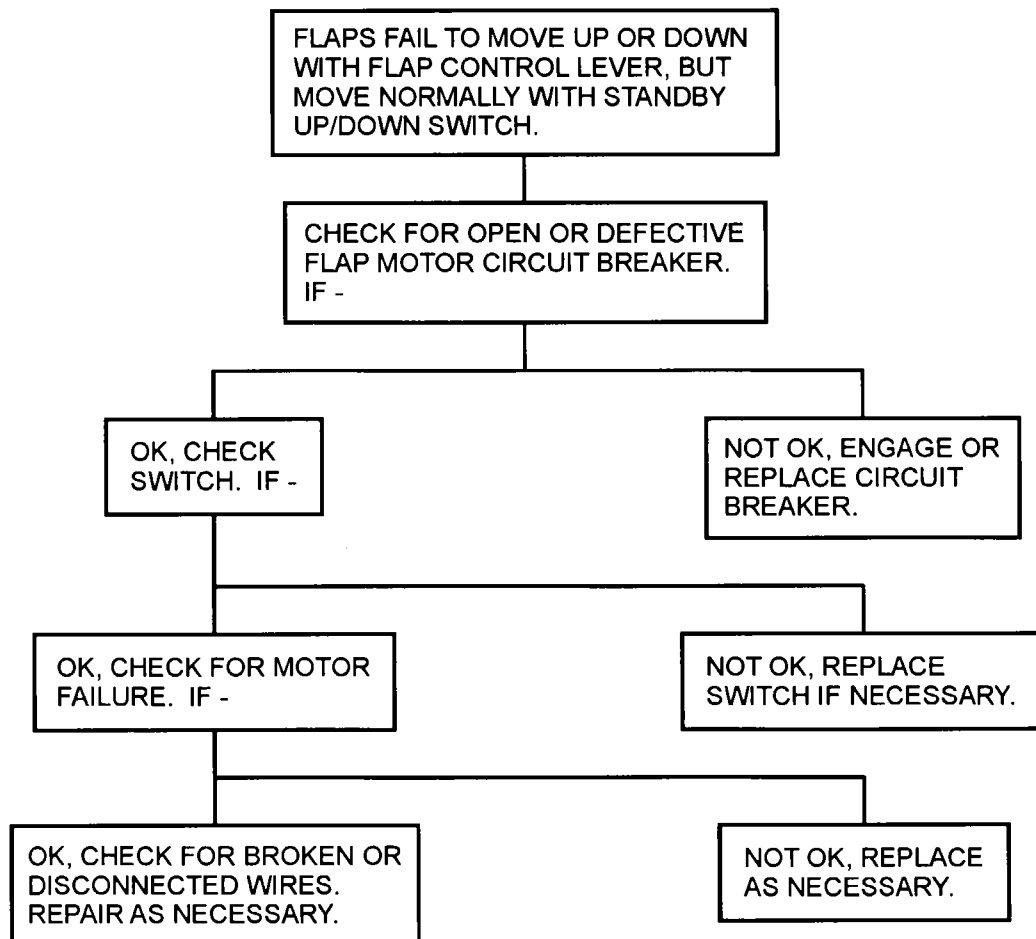
**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.



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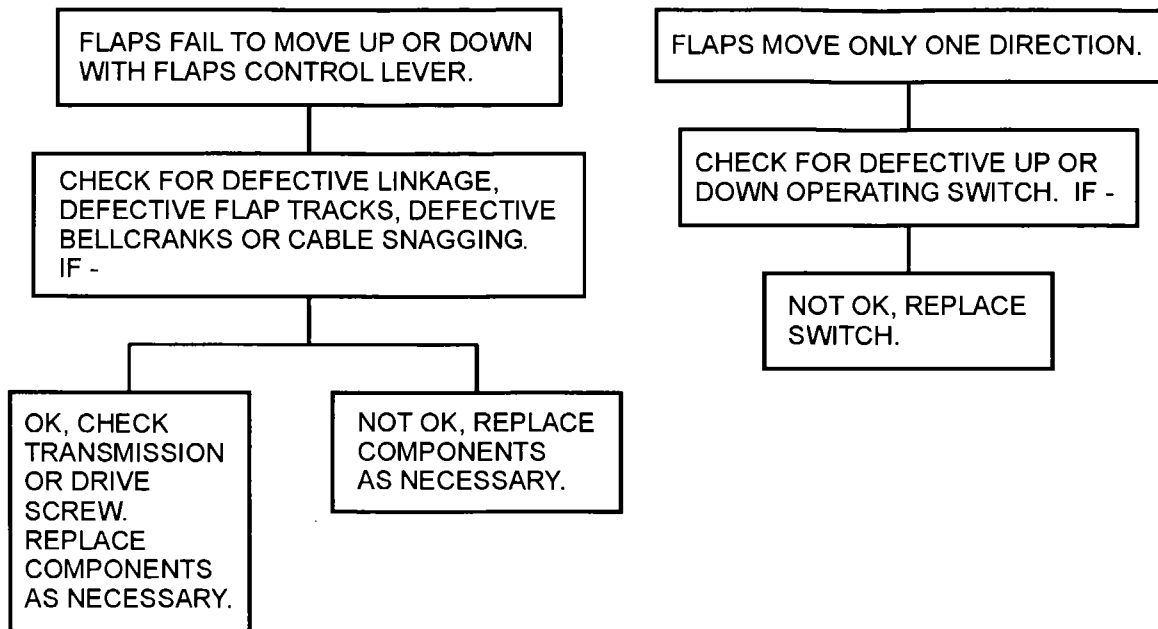
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Flap System Troubleshooting Chart  
Figure 101 (Sheet 1)

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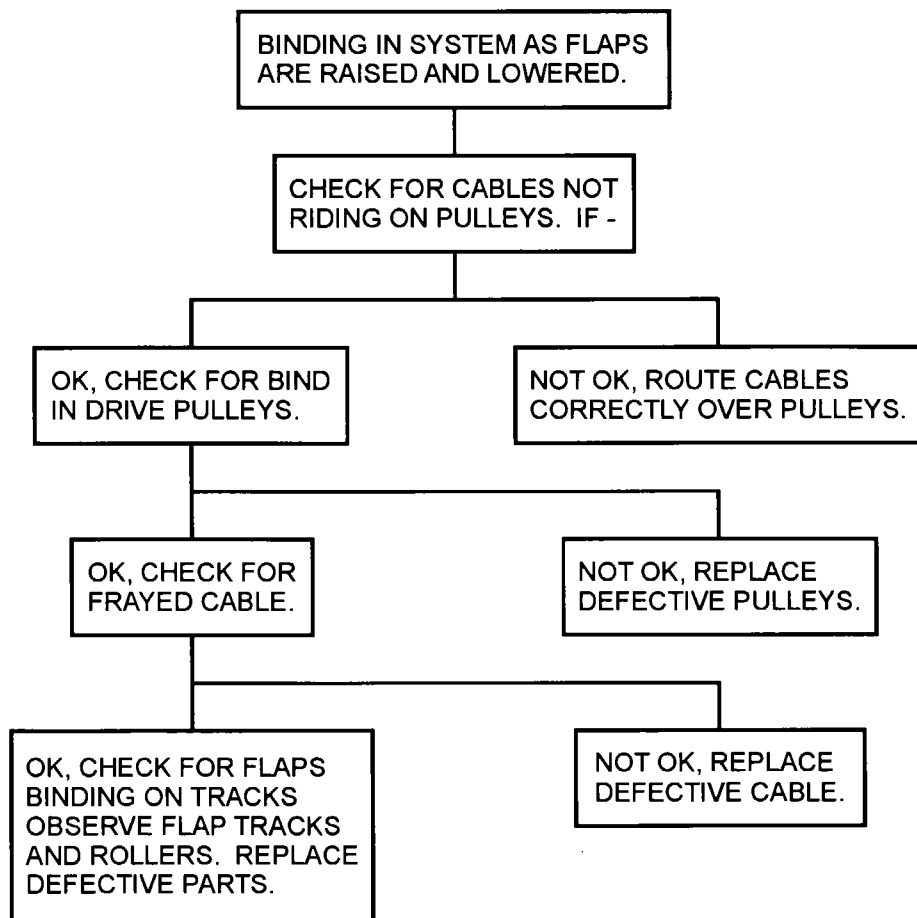
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Flap System Troubleshooting Chart  
Figure 101 (Sheet 2)

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Flap System Troubleshooting Chart  
Figure 101 (Sheet 3)

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**FLAP CONTROL SYSTEM - MAINTENANCE PRACTICES**

**1. General**

A. The wing flap control system contains an electric flap motor, transmission assembly, drive pulleys, push-pull rods, cables, and a follow-up control. Power from the motor and the transmission assembly is transmitted to the flaps by a system of drive pulleys, cables, and push-pull rods. Electric power to the motor is controlled by two microswitches mounted on a floating arm assembly, a cam lever, and a follow-up control. As the flap control lever is moved to the desired flap setting, the attached cam trips one of the microswitches, activating the flap motor. As the flaps move to the position selected, the floating arm is rotated by the follow-up control until the active microswitch clears the cam, breaking the circuit and stopping the motor. To reverse flap direction, the control lever is moved in the opposite direction, causing the cam to trip the second microswitch, which reverses the flap motor. The follow-up control moves the cam until it is clear of the second switch, shutting off the flap motor. Limit switches at the flap actuator assembly control flap travel as the flaps reach the full UP or DOWN positions.

B. For a schematic of the flap system, refer to Figure 201.

**2. Flap Motor and Transmission Assembly Removal/Installation**

A. Flap Motor (MR001) and Transmission Assembly Removal (Refer to Figure 202).

- (1) Lower the flaps fully.
- (2) Set the ALT/BAT MASTER switch to the off position.
- (3) Remove the access panels 610BB and 610CB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Remove the bolt that attaches the actuating tube to the drive pulley.
- (5) Turn the actuating tube in toward the transmission as far as possible by hand.
- (6) Remove the bolt that attaches the flap motor hinge to the wing. Keep the brass washer between the hinge and the wing structure.
- (7) Disconnect the electrical connectors from the flap motor (MR001).
- (8) Disconnect the electrical connectors from the up limit switch (SR001) and the down limit switch (SR002).
- (9) Carefully remove the flap motor and the transmission assembly from the wing through the access opening.

B. Flap Motor and Transmission Assembly Installation (Refer to Figure 202).

- (1) Carefully install the flap motor and the transmission assembly into the wing through the access opening. If the hinge assembly was removed from the transmission, make sure that the short end of the hinge is installed toward the top.
- (2) Connect the electrical connectors to the flap motor (MR001).
- (3) Connect the electrical connectors to the up limit switch (SR001) and the down limit switch (SR002).
- (4) Attach the flap motor hinge to the wing with the bolt and the brass washer.
- (5) Turn the actuating tube out toward the bell crank.
- (6) Install the bolt that attaches the actuating tube to the drive pulley.
- (7) Install the access panels 610BB and 610CB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (8) Set the ALT/BAT MASTER switch to the ON position.
- (9) Make sure that the flaps operate correctly. Refer to Flap System Adjustment/Test for rigging instructions.

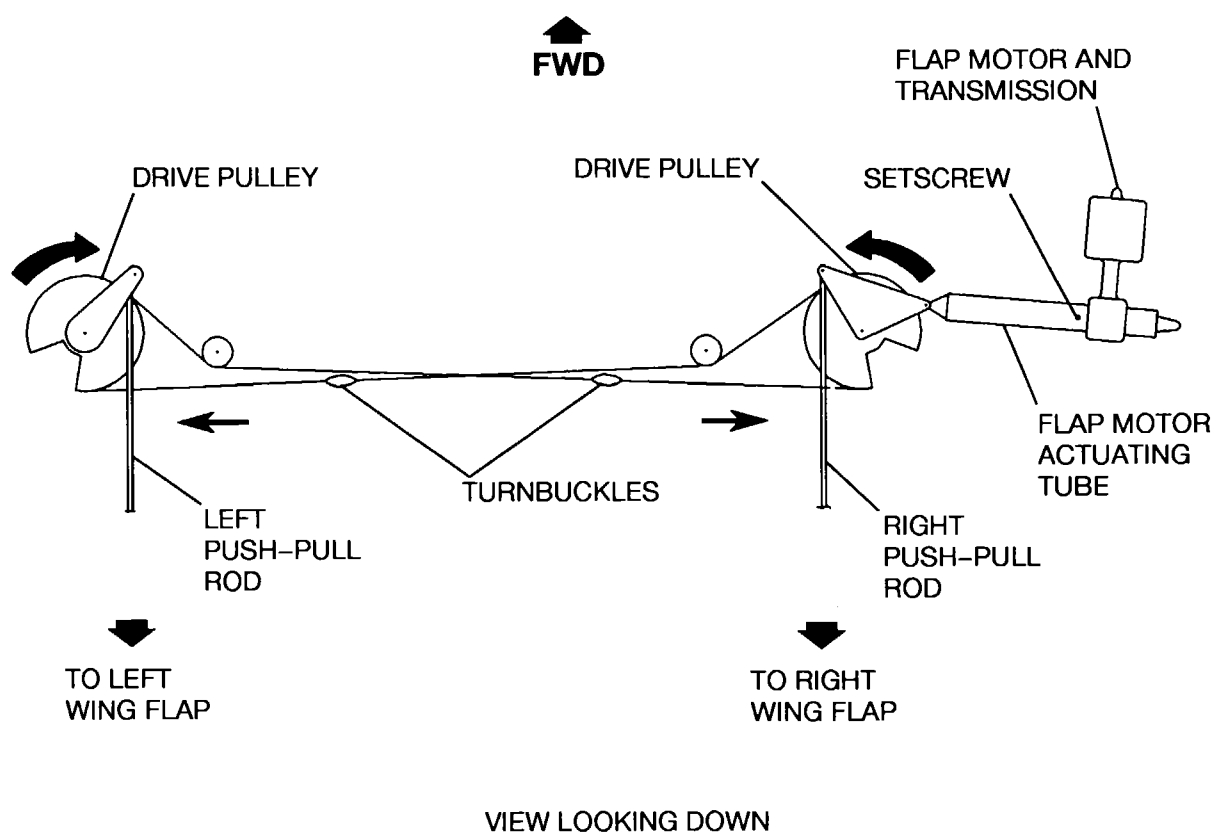
**3. Flap Removal/Installation**

A. Flaps Removal (Refer to Figure 202).

- (1) Lower the flaps fully with the flap selector switch.
- (2) Set the ALT/BAT MASTER switch to the off position.
- (3) Remove access panels 511AT (611AT), 511BT (611BT), 511CT (611CT), and 511DT (611DT) from the leading edge of the flap. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Disconnect the push-pull rod at the flap bracket.

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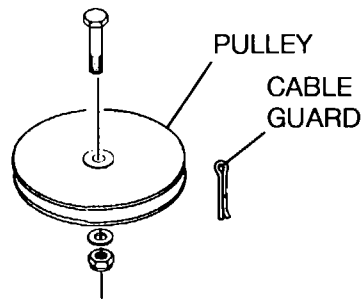
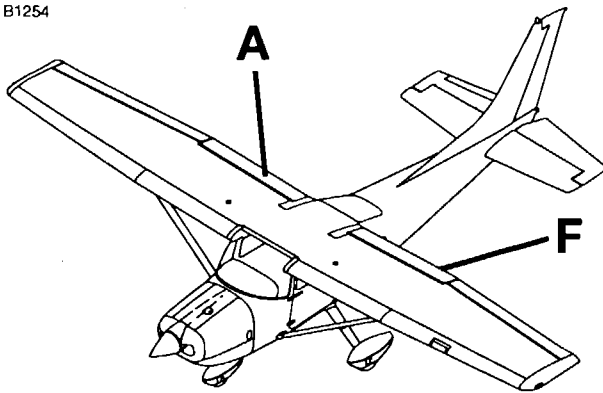


Flap System Schematic  
Figure 201 (Sheet 1)

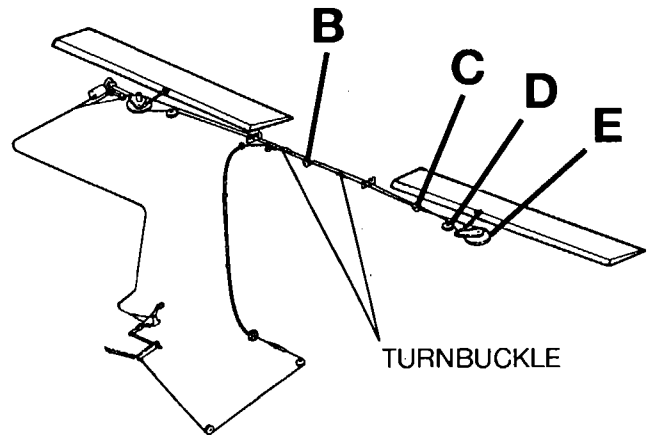
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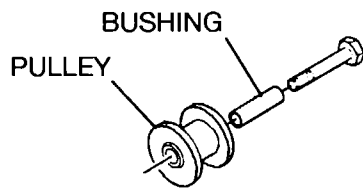
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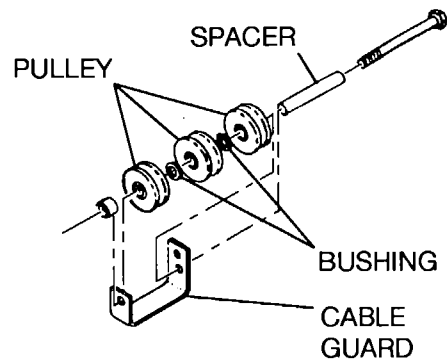
**DETAIL D**



**DETAIL A**



**DETAIL C**



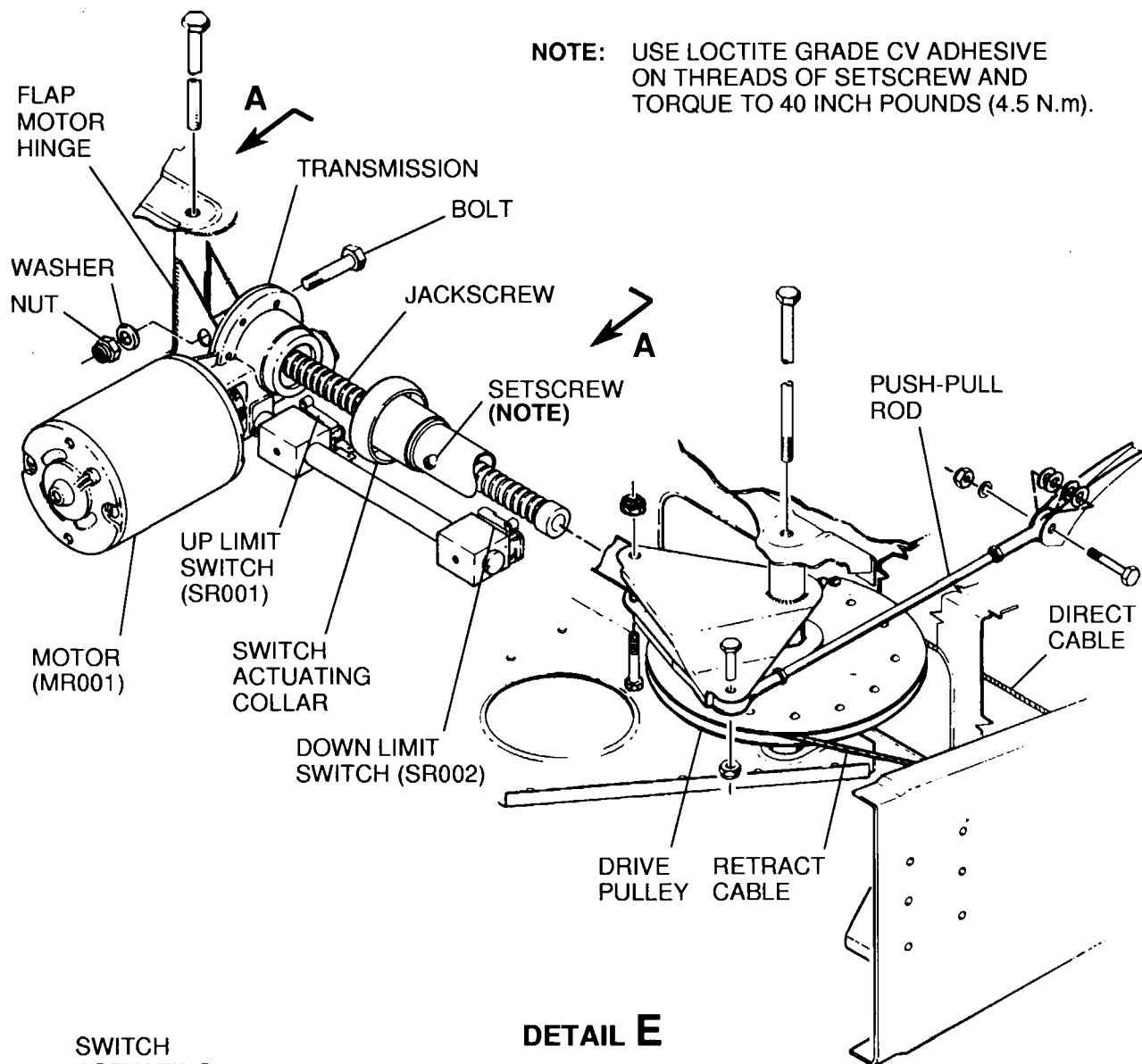
**DETAIL B**

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 A0764R1001  
 B0763R1019  
 C0764R1003  
 D0764R1002

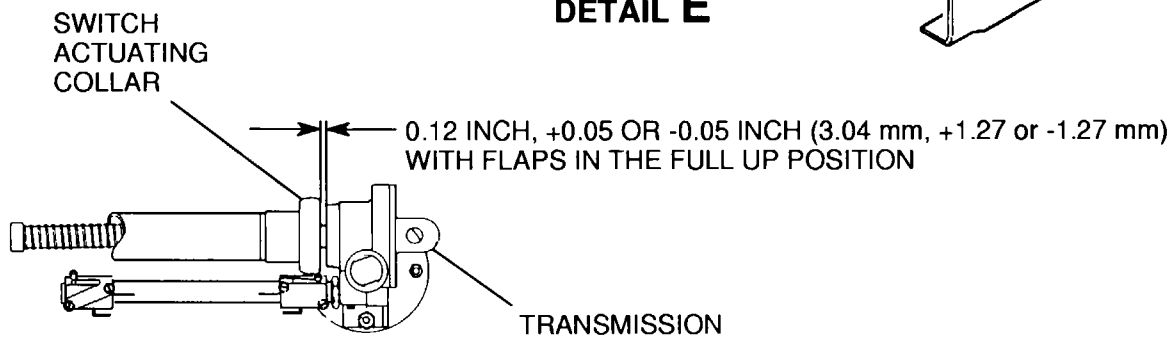
Wing Flap Control System Installation  
 Figure 202 (Sheet 1)

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**DETAIL E**



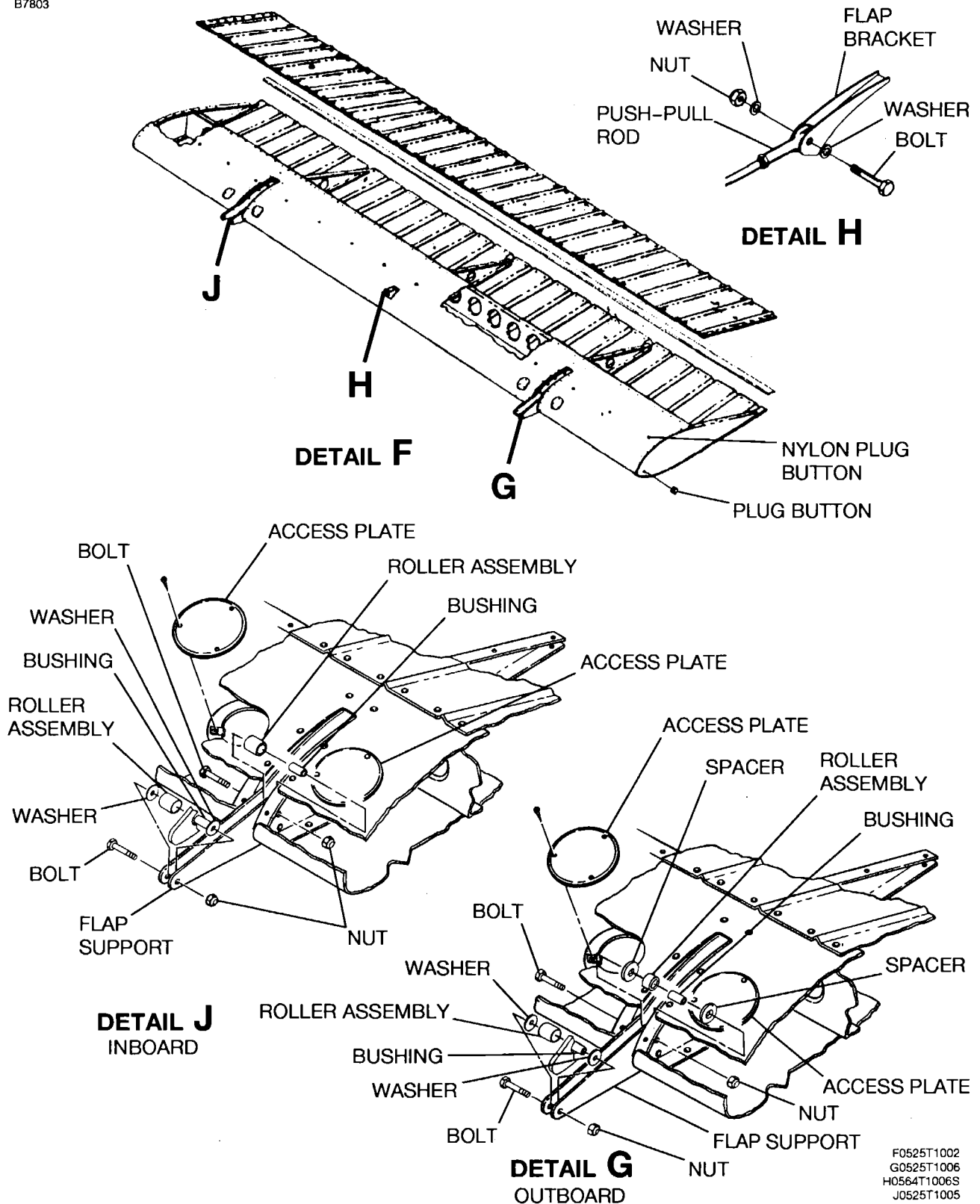
**VIEW A-A**

Wing Flap Control System Installation  
 Figure 202 (Sheet 2)

E0725R1004  
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 H0564T1006S  
 J0525T1005

Wing Flap Control System Installation  
 Figure 202 (Sheet 3)

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- (5) Remove the bolts at each flap track.

**NOTE:** The washers, rollers, and bushings will fall as the flap is removed from the wing. Keep the hardware for installation.

**B. Flaps Installation (Refer to Figure 202).**

**CAUTION:** Make sure that the width of the flap track slot is 0.5735 inch +0.03 or -0.03 inches. The flap track must be replaced if the width is not in the limits.

- (1) Install the flap to the flap tracks.

**NOTE:** It is permitted to apply 3M Y8671 (or equivalent) polyurethane tape on the upper flap skins as required to prevent chafing against the wing trailing edge.

- (2) Connect the push-pull rod to the flap bracket.

**NOTE:** Flap rigging may not be necessary if the push-pull rod adjustment was not disturbed.

- (3) Install access panels 511AT (611AT), 511BT (611BT), 511CT (611CT), and 511DT (611DT) to the leading edge of the flap. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Set the inboard side of the MASTER switch to BAT.
- (5) Raise the flaps to the full position with the flap selector switch.
- (6) Set the BAT side of the MASTER switch to the off position.

**4. Flap Drive Pulley Removal/Installation**

**A. Flap Drive Pulley Removal (Refer to Figure 202).**

- (1) Remove the overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
- (2) Remove the safety clips and loosen the flap adjustment at the turnbuckles.
- (3) Remove the access plates 510BB and 510CB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Remove the bolt that attaches the flap push-pull rod to the drive pulley.
- (5) Carefully lower the right flap.
- (6) Remove the bolt that attaches the actuating tube to the drive pulley.
- (7) Carefully lower the left flap.
- (8) Remove the cable locks that attach the control cables to the drive pulley. Tag the cables for identification.
- (9) Remove the bolt that attaches the drive pulley to the wing.
- (10) Carefully remove the drive pulley through the access opening without dropping the bushing.
- (11) Keep the brass washer from between the drive pulley and the wing structure for installation.

**B. Flap Drive Pulley Installation (Refer to Figure 202).**

- (1) Install the drive pulley and the bushing through the access opening.
- (2) Install the brass washer and attach the drive pulley to the wing structure with the bolt.
- (3) Remove the identification tags and install the cable locks that attach the control cables to the drive pulley.
- (4) Raise the left flap fully and install the bolt that attaches the actuating tube to the drive pulley.
- (5) Raise the right flap fully and install the bolt that attaches the flap push-pull rod to the drive pulley.
- (6) Install the access plates 510BB and 510CB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (7) Adjust the flap drive cables as necessary. Refer to Flap Control Adjustment/Test.
- (8) Install the overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

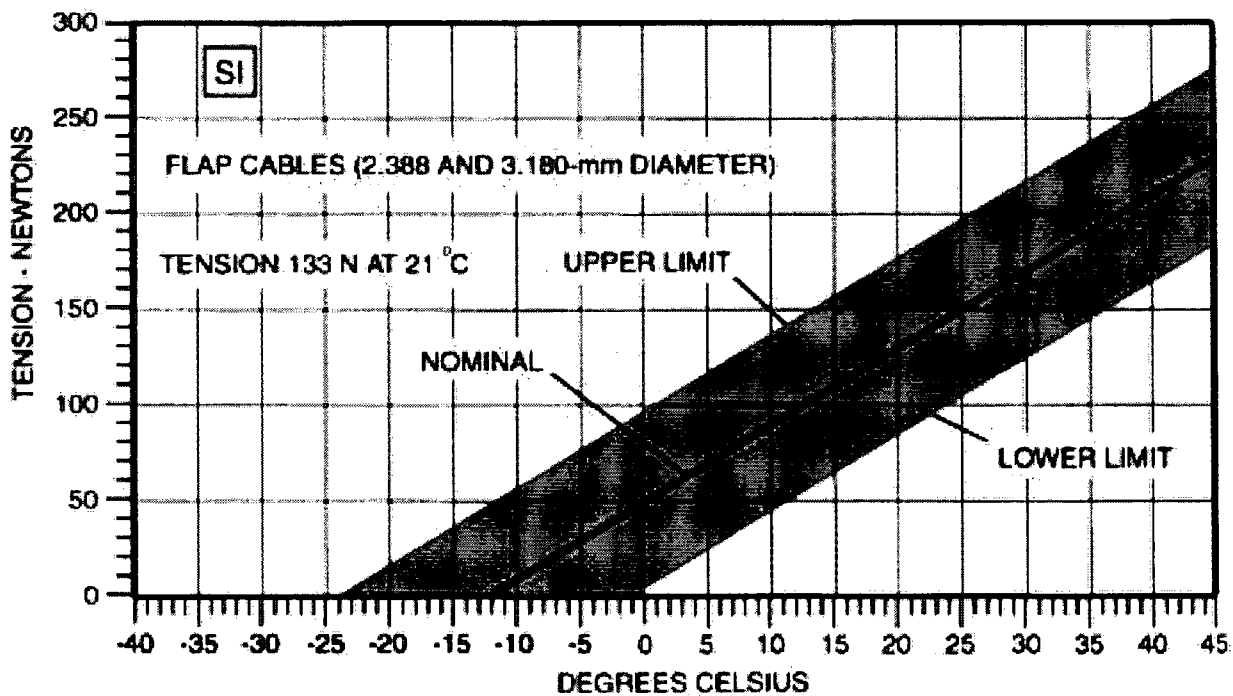
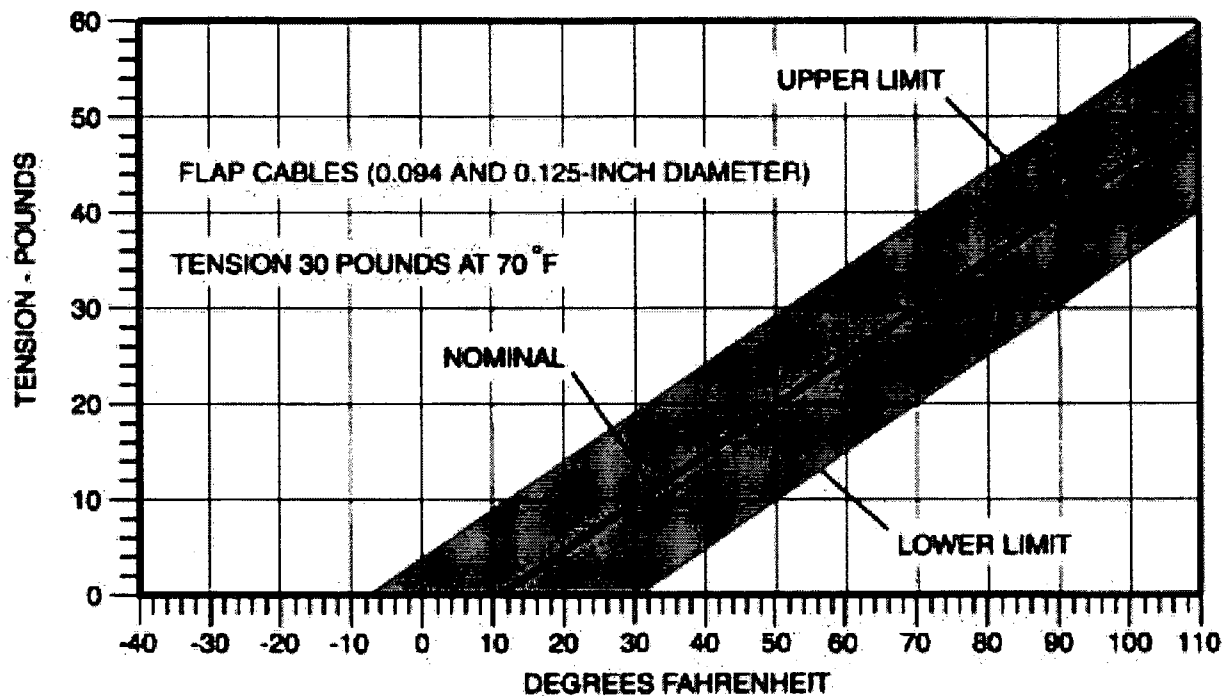
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**5. Flap Control System Adjustment/Test**

- A. Rig the Flap Control System (Refer to Figure 202 and Figure 203).
- (1) Remove the overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the access plates 510BB, 510CB and 610BB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Remove the safety clips, loosen the cable tension, disconnect the turnbuckles, and carefully lower the left flap.
  - (4) Disconnect the push-pull rods at the drive pulleys in both wings and carefully lower the right flap.
  - (5) Disconnect the actuating tube from the drive pulley.
  - (6) Adjust both push-pull rods to 8.83 inches  $\pm 0.12$  inch  $-0.12$  inch between the centers of the rod end bearings, and tighten the locknuts on both ends.
  - (7) Attach the push-pull rods to the flaps and the drive pulleys.
    - (a) If the control cables are not connected to the left and the right drive pulleys, the actuating tube and the push-pull rods must be disconnected before you install the cables.
    - (b) If the drive pulleys are not installed, attach the control cables before you install the drive pulleys in the wings.
  - (8) Turn the actuating tube in toward the transmission by hand 0.12 inch  $+0.05$  or  $-0.05$  inches between the switch actuating collar and the transmission.
  - (9) Temporarily connect the cables at the turnbuckles.
  - (10) Test the flaps by hand to make sure that both flaps extend and retract together. If they do not, the cables are incorrectly attached to the drive pulleys. Make sure that the right drive pulley rotates clockwise when viewed from below as the flaps are extended.
  - (11) Place identification tag on the cables, and disconnect the turnbuckles.
  - (12) Loosen the setscrew that attaches the actuating tube to the switch actuating collar and hold the collar to maintain 0.12 inch  $+0.05$  or  $-0.05$  inches. Hold the right flap up, and adjust the actuating tube in or out as necessary to align with the attachment hole in the drive pulley.
  - (13) Apply Loctite grade CV sealant to the threads of the setscrew and torque to 40 inch pounds.
  - (14) Disconnect the push-pull rod at the drive pulley.
  - (15) Manually hold the right flap in a full up position and readjust the push-pull rod to align with the attachment hole in the drive pulley.
  - (16) Connect the push-pull rod and tighten the locknuts.
  - (17) Set the flaps in the full up position.
  - (18) Shut off the electrical power to the flap motor (MR001) by loosening the setscrew and the idle up limit switch adjustment block on the support to activate the switch.
  - (19) Tighten the setscrew.
  - (20) Manually hold the left flap full up and connect the control cables at the turnbuckles. Remove the identification tags that are installed on the control cables.
  - (21) Adjust the retract cable first. With the flaps up, adjust the turnbuckles to 30 pounds,  $+10$  or  $-10$  pounds (133.45 N,  $+44.48$  or  $-44.48$  N) of tension on the cables at 70 °F (21 °C). Refer to the Charts in Figure 202 for the correct tensions at other temperatures.
  - (22) Disconnect the push-pull rod at the left drive pulley.
  - (23) Turn on the motor (MR001) to extend the flaps approximately 20 degrees.
  - (24) Check the tension on each flap cable.
  - (25) Adjust the turnbuckles as necessary to maintain 30 pounds,  $+10$  or  $-10$  pounds (133.45 N,  $+44.48$  or  $-44.48$  N) of tension on the cables at 70 °F (21 °C). Refer to the Charts in Figure 202 for the correct tensions at other temperatures.
  - (26) Install safety clips on the turnbuckles. Refer to Chapter 20, Safetying - Maintenance Practices.
  - (27) Fully retract the right flap.
  - (28) Manually hold the left flap in the up position and adjust the push-pull rod to align with the attaching hole in the drive pulley.
  - (29) Attach the push-pull rod and tighten the locknuts.
  - (30) Set an inclinometer on the right flap and adjust to zero degrees.
  - (31) Operate the flaps to the full down position. Repeat the check on the left flap.
  - (32) Adjust the down limit switch (SR002) to stop the flap motor (MR001) and flap at the degree of travel.

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Flap Cable Tension  
 Figure 203 (Sheet 1)

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- (33) Check the down limit switch (SR002) through some flap cycles.
- (34) Connect and rig the flap follow-up system. Refer to Flap Follow-Up and Indicating System - Maintenance Practices.
- (35) Complete an operational check.
- (36) Check all items for correct safetying. Refer to Chapter 20, Safetying - Maintenance Practices.
- (37) Install the access plates 510BB, 510CB and 610BB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (38) Install the overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

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**FLAP FOLLOW-UP AND INDICATING SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. The flap follow-up and indicating system consists of a sheathed cable assembly, pointers and microswitches. One end of the cable is attached to the flap operating switch operating arm. The other end is clamped to the flap direct cable, above the headliner in the rear cabin area. Motion of the flap cable is transmitted through the follow-up control to the pointer, attached to the switch mounting arm. Pointer moves along a scale as the flaps are extended or retracted. When the motion of the switch mounting arm with the attached operating switches positions the "active" operating switch to clear the cam on flap lever, flap motor circuit is broken and flaps stop at selected position.

**2. Flap Follow-Up and Indicating System Removal/Installation**

- A. Remove Flap Control Lever. (Refer to Figure 201).
- (1) Remove follow-up control torque tube from switch mounting arm.
  - (2) Remove flap UP SI007 and DOWN SI008 operating switches from switch mounting arm. Do not disconnect electrical wiring at switches.

**NOTE:** Insulators are installed between switches and switch mounting arm.

- (3) Remove knob from control lever.
  - (4) Remove remaining washers, bushings, switch mounting arm, and control lever by removing mounting bolt. Use care not to drop parts into tunnel area.
- B. Install Flap Control Lever. (Refer to Figure 201).
- (1) Install mounting bolt, assembling washers, bushings, switch mounting arm, and control lever.

**NOTE:** Before installing knob on control lever, clean threads on control lever with methyl propyl ketone or equivalent. After threads have thoroughly dried, prime with grade T primer. Allow primer to flash off or dry for three to five minutes. Apply grade CU Loctite (MIL-S-22473), Loctite 271, STA-LOK Catalog No. 800, or equivalent to threads of control lever.

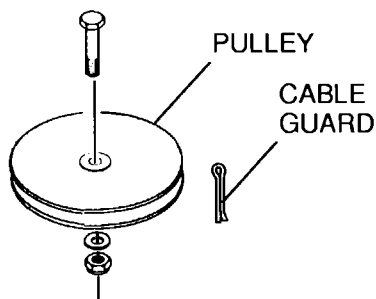
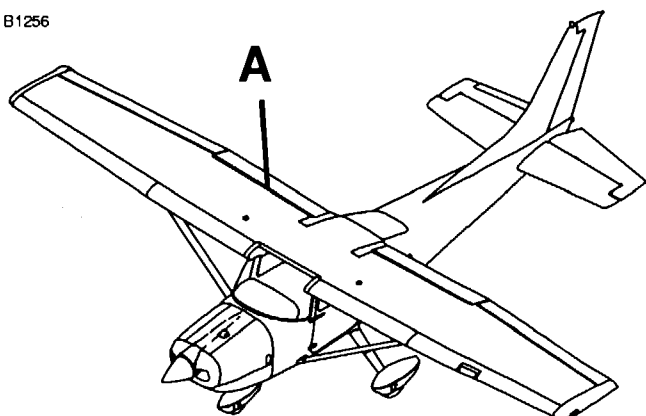
- (2) Install knob and allow Loctite to cure for five to twenty minutes before service.
- (3) Install flap UP SI007 and DOWN SI008 operating switches on switch mounting arm, making sure to install insulators.
- (4) Install follow-up control torque tube to switch mounting arm.
- (5) Rig system. Refer to Flap Follow-Up and Indicating System Adjustment/Test.

**3. Flap Follow-Up and Indicating System Adjustment/Test**

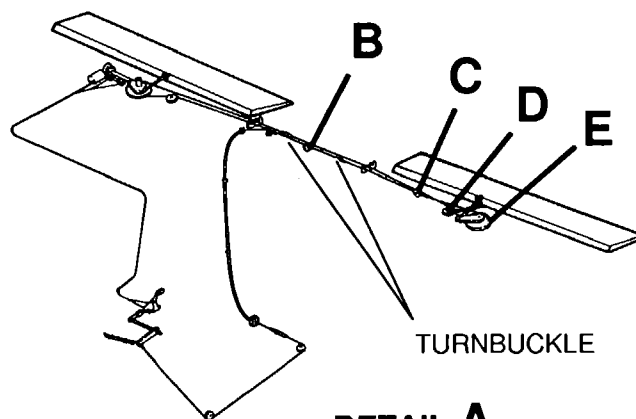
- A. Rig Flap Follow-Up and Indicating System. Refer to Figure 201.
- (1) Run flaps to full up position.
  - (2) Remove overhead center console.
  - (3) Secure follow-up cable to retract cable with clamp assembly.
  - (4) Torque clamp nut to 40 inch-pounds to 50 inch-pounds (4.52 N.m to 5.65 N.m) and lock with a second nut.
  - (5) Pull all slack from follow-up cable, and with position indicator in full UP position connect turnbuckle to follow-up cable.
  - (6) Connect spring to arm assembly.
  - (7) Make minor cable length adjustments using turnbuckle to position indicator at "0" degrees.
  - (8) With control lever in the full UP position adjust Up SI007 operating and Down SI008 operating switch in slotted holes until cam is centered between switch rollers. Ensure control lever is in full UP position during this adjustment.
  - (9) Mount inclinometer on trailing edge of one flap and set to "0" Degrees.
  - (10) Turn master switch SI009 ON and move control lever to "10" degree position.
  - (11) If flaps travel is more than 10 Degrees, +2 or -2 degrees, adjust flap DOWN operating switch away from cam and recycle flaps.

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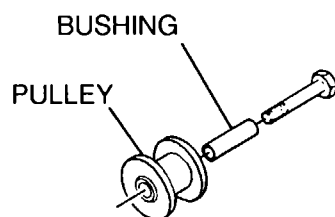
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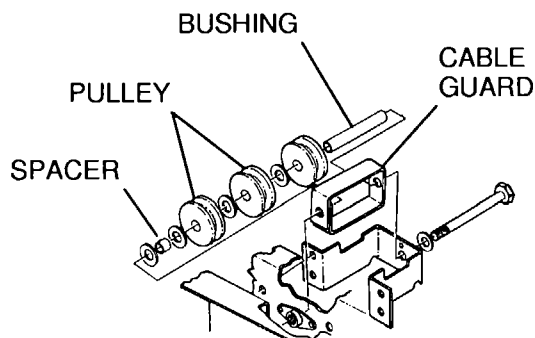
**DETAIL D**



**DETAIL A**



**DETAIL C**

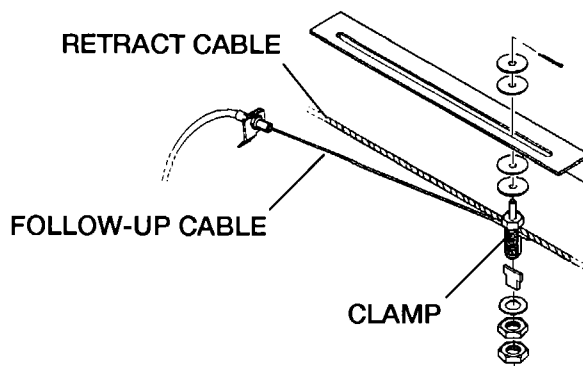


**DETAIL B**

0710T1001  
 A0764T1001  
 B0763T1020  
 C0764T1003  
 D0764T1002

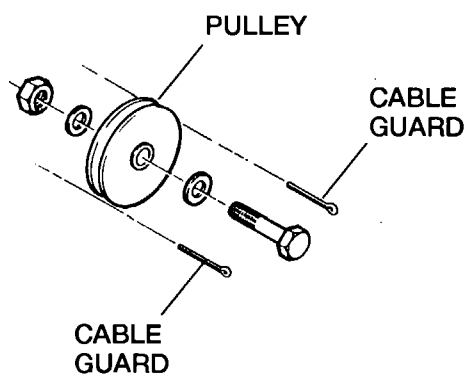
Flap Control Lever and Follow-up Installation  
 Figure 201 (Sheet 1)

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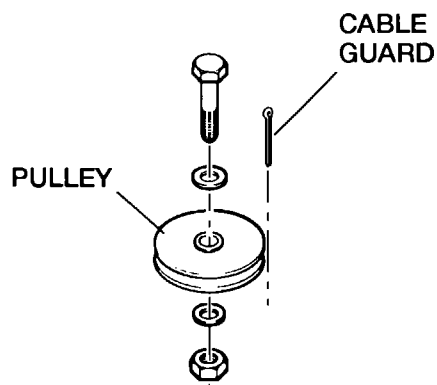


**DETAIL D**

**NOTE:** TORQUE CLAMP NUT TO  
40 TO 50 INCH POUNDS (4.5 TO 5.6 N.m)



**DETAIL F**



**DETAIL E**

Flap Control Lever and Follow-up Installation  
Figure 201 (Sheet 2)

D07641006  
E07641007  
F07641007

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- (12) If flaps travel is less than 10 Degrees, +2 or -2 degrees, adjust flap DOWN operating switch closer to cam and recycle flaps.
- (13) Move control lever to "20" degree position.
- (14) If flaps travel is more than 20 Degrees, +2 or -2 degrees, adjust flap DOWN operating switch away from cam and recycle flaps.
- (15) If flaps travel is less than 20 Degrees, +2 or -2 degrees, adjust flap DOWN operating switch closer to cam and recycle flaps.
- (16) Adjust flaps UP SI007 operating switch in slotted holes for 0.062 inch (1.51 mm) clearance between switch roller and cam when the flaps DOWN SI008 operating switch has just opened in the "10" degree and "20" degree position.

**NOTE:** Flap travel on UP cycle may deviate a maximum of 4 degrees from indicated position.

- (17) Turn master switch SI009 ON and run flaps through several cycles, stopping at various mid-range settings and checking that cable tension is within limits. Retract cable tension may increase to 90 pounds (400 N) when flaps are fully retracted.
- (18) Check all rod ends and clevis ends for sufficient thread engagement, and all jamnuts are tight.
- (19) Install overhead center console.



**CHAPTER**

**28**

**FUEL**

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**LIST OF EFFECTIVE PAGES**

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28-List of Effective Pages		
28-Record of Temporary Revisions		
28-Table of Contents		
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28-20-00	Pages 1-3	April 1/2002
28-20-00	Pages 201-219	Jul 1/2007
28-20-00	Pages 501-506	Jul 1/2007
28-21-00	Pages 201-203	April 1/2002



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**FUEL - GENERAL**

**1. Scope**

- A. This chapter provides information on systems and components associated with fuel storage, fuel distribution, refueling and fuel quantity indicating.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Fuel Quantity Test Box	0580001-1	Cessna Aircraft Company Cessna Parts Distribution Department 701, CPD 25800 East Pawnee Road Wichita, KS 67218-5590	To calibrate fuel quantity system.
Pressure Regulator		Commercially Available	To regulate input pressure.
Thermometer		Commercially Available	To monitor test area temperature.
Leak Detector	Eldorado LD-4	Eldorado Chemical Co. Inc. 14350 Lookout Road P. O. Drawer 34837 San Antonio, TX 78265-4837	To locate source of leak.
Methyl Propyl Ketone		Commercially Available	To clean surfaces prior to sealing.
ScotchBrite Pad	N/A	Commercially Available	To remove loose primer.

**3. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.

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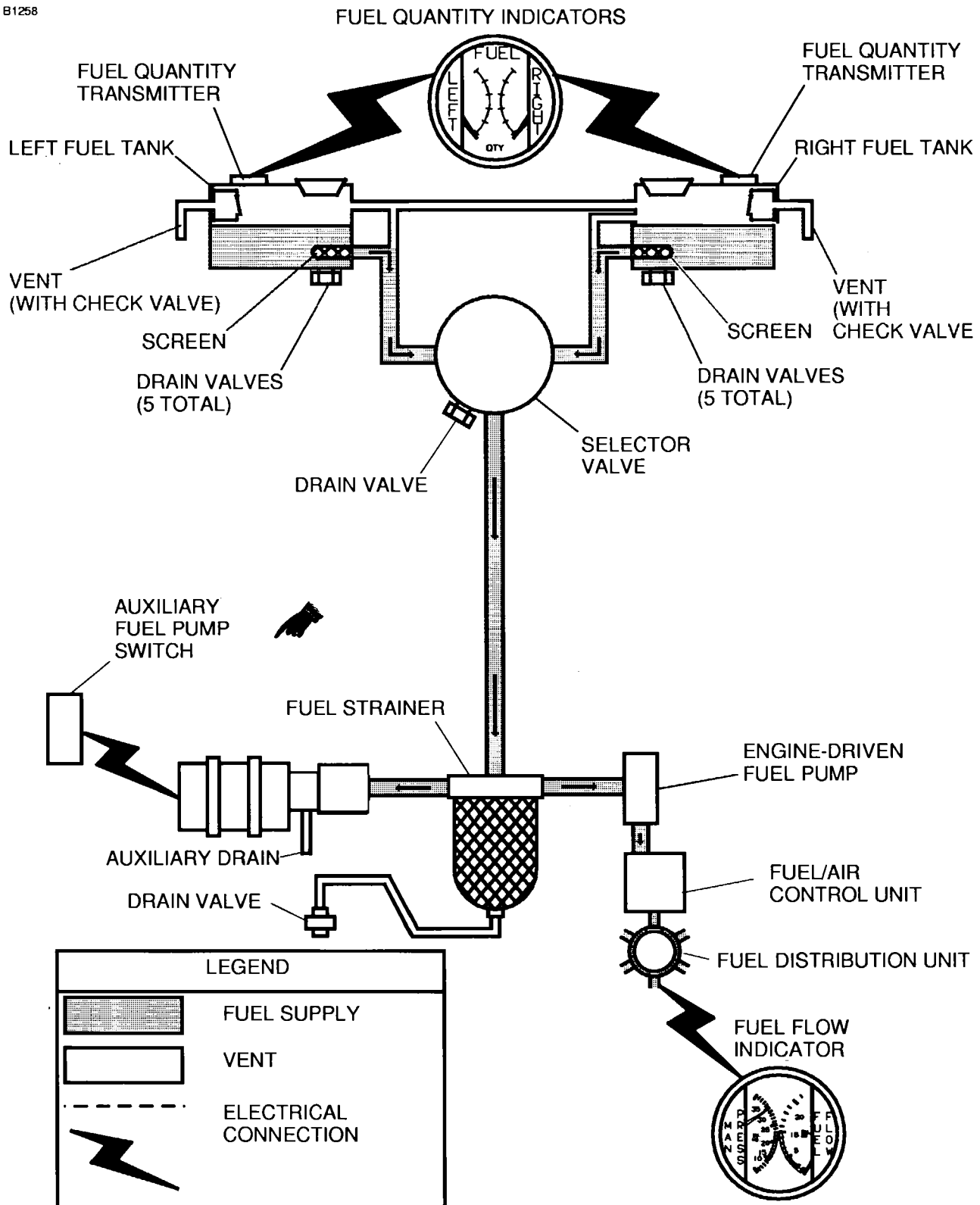
**FUEL STORAGE AND DISTRIBUTION - DESCRIPTION AND OPERATION**

**1. General**

- A. The airplane is equipped with a wet wing fuel storage system. The system consists of two integral fuel tanks (one each wing), a four position selector valve, an electrically driven auxiliary fuel pump, fuel strainer, and a fuel quantity indicating system.
- B. Components beyond the fuel strainer include the engine driven fuel pump, the fuel/air control unit and the fuel distribution valve. These components are considered part of the power plant and are covered in Chapter 73, Fuel Injection System - Description and Operation.
- C. A schematic of the entire fuel system is shown to aid in system understanding. Refer to Figure 1.

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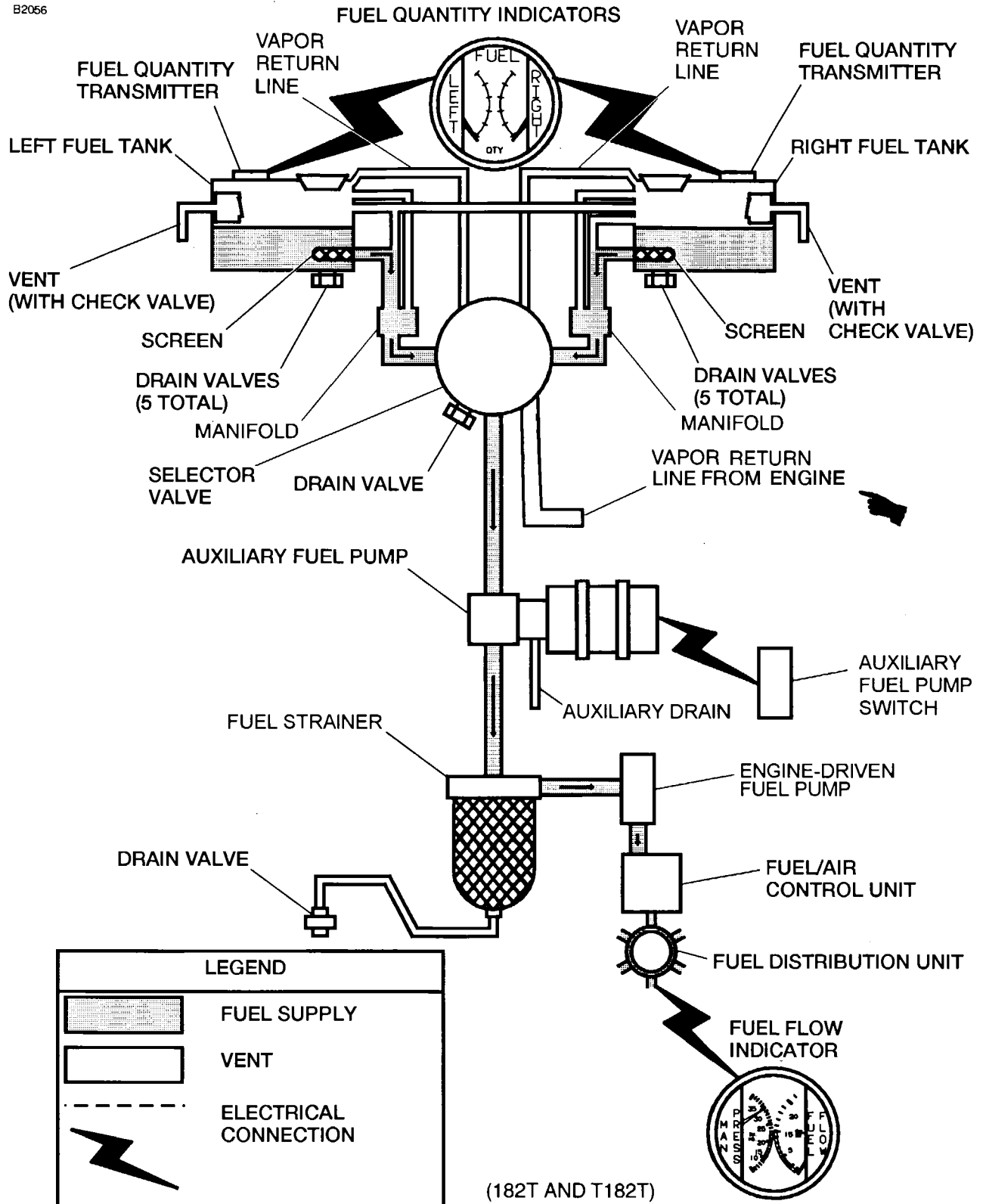


0791CT1001

Fuel System Schematic  
 Figure 1 (Sheet 1)

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0791C1001

Fuel System Schematic  
 Figure 1 (Sheet 2)



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**FUEL STORAGE AND DISTRIBUTION - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives fuel storage and distribution maintenance practices for the fuel tank component removal and installation, and adjustment/test (Refer to Figure 201 and 202).

**2. Precautions**

- A. Obey these general precautions and rules when you refuel, defuel, clean the fuel tank, repair, assemble or disassemble system components, and do electrical system tests and repairs on the airplane fuel system.
- (1) Put covers or caps on all disconnected hoses, lines, and fittings to prevent residual fuel drainage, thread damage, or entry of dirt or unwanted material into the fuel system.
  - (2) When the fuel system is opened, use the fuel boost pump to flush the system with 1/2 gallon of fuel at the inlet of the servo and flow divider.
  - (3) When you work on the fuel injection system, keep all parts clean and free from contamination.

**3. Fuel Drain Valve Removal/Installation**

**NOTE:** The left and right fuel drain valve removal and installation are typical. Five fuel drains are installed in each wing.

- A. Remove the Fuel Drain Valve (Refer to Figure 203).
- (1) Defuel the airplane. Refer to Chapter 12, Fuel - Servicing.
  - (2) With a fuel sampler cup, push each fuel drain valve up to make sure that the fuel tank is fully drained.
  - (3) Remove the safety wire and remove each fuel drain valve from the fuel tank. Chapter 20, Safetying - Maintenance Practices.
- B. Install the Fuel Drain Valve (Refer to Figure 203).
- (1) Install a new O-ring on the fuel drain valve.
  - (2) Install the fuel drain valve in the fuel tank and safety the valve with wire to the clip. Refer to Chapter 20, Safetying - Maintenance Practices.
  - (3) Add a small quantity of fuel to the fuel tank and examine the fuel drain valve for leaks.

**4. Fuel Quantity Sender Removal/Installation**

**NOTE:** The fuel quantity sender removal/installation is typical for left and right fuel tanks.

**NOTE:** Examine the fuel level sender for correct operation before you replace the fuel quantity indicator. The resistance must be 6 ohms +5 or -5 ohms when empty, and 90 ohms +5 or -5 ohms when full.

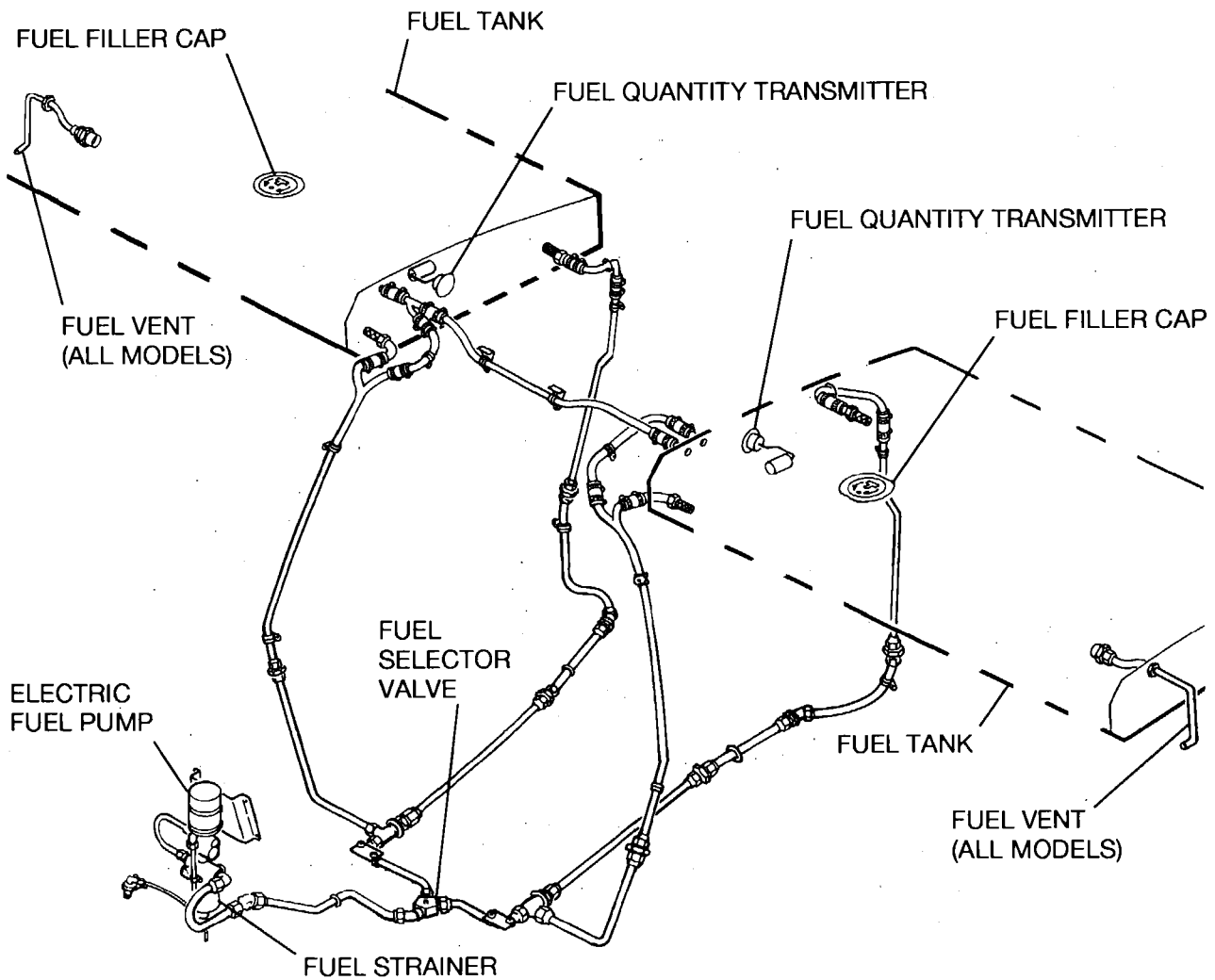
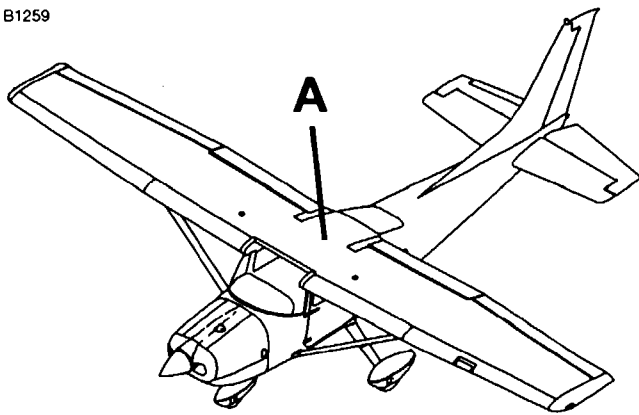
- A. Remove the Left and Right Fuel Quantity Senders (Refer to Figure 204).
- (1) Defuel the airplane. Refer to Chapter 12, Fuel Servicing.
  - (2) Remove the headliner to get access to the wing root. Refer to Chapter 25, Cabin Panels - Removal/Installation.
  - (3) Disconnect the wire ring terminals from the fuel level sender.

**CAUTION:** Do not bend the float arm of the fuel level sender.

- (4) Remove and keep the screws that attach the fuel level sender to the nut ring. Carefully remove the fuel level sender and the gasket from the fuel tank. Keep the gasket for an inspection and for installation.

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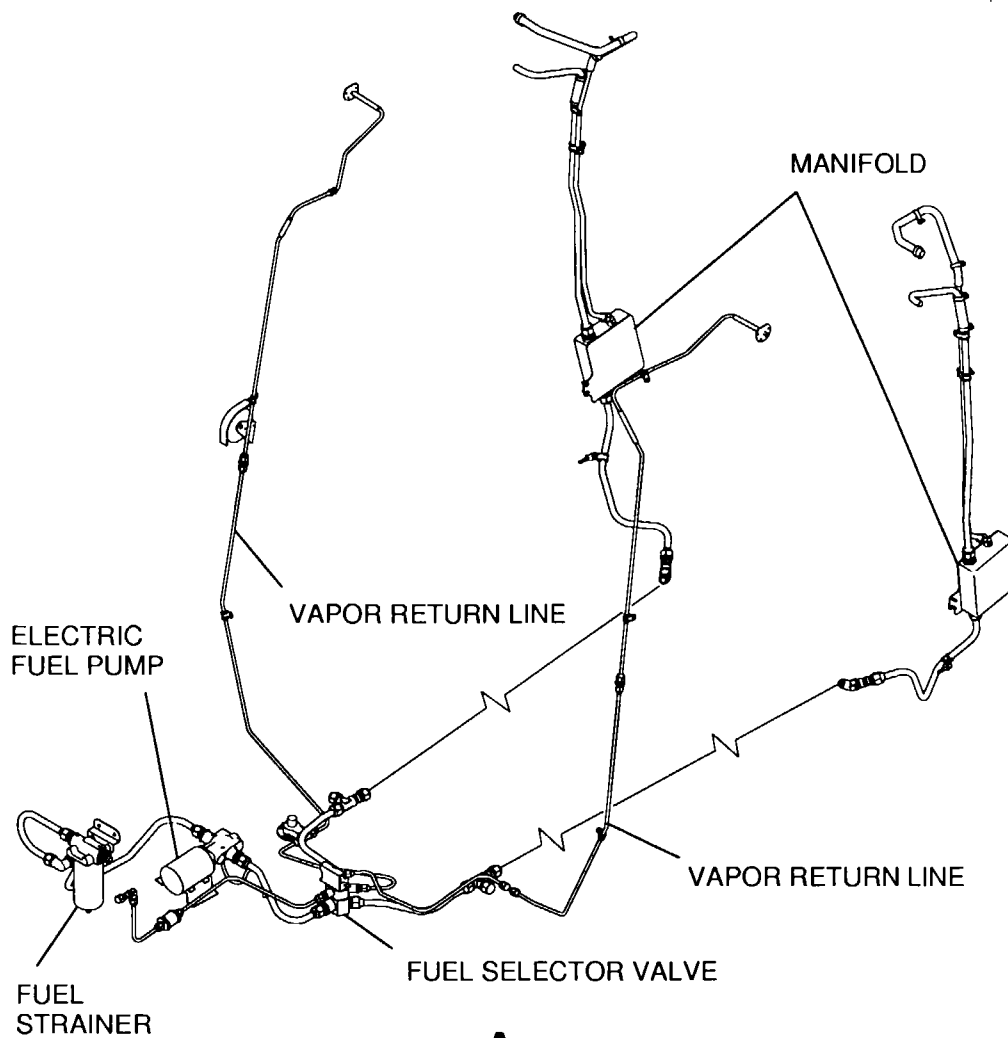
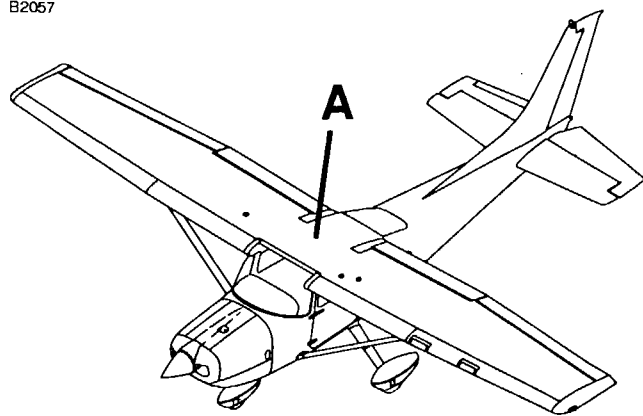
**DETAIL A**  
(182S)

Fuel System  
Figure 201 (Sheet 1)

0710T1001  
A0716T2001

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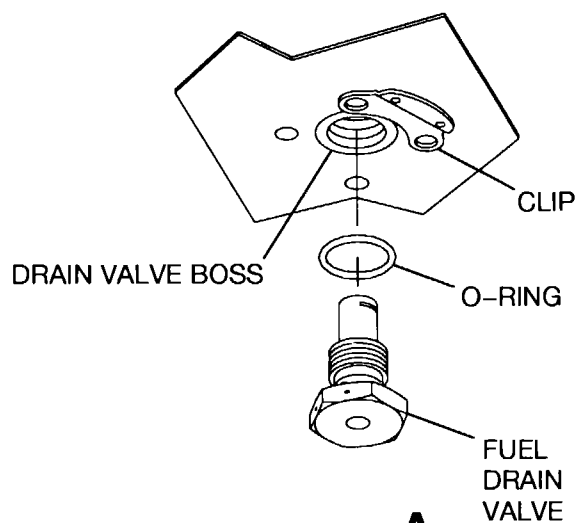
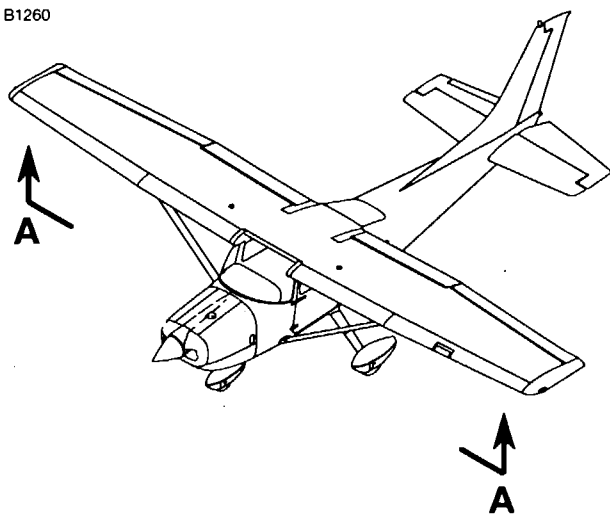
**DETAIL A**  
(182T AND T182T)

0710T1001  
A0716T1015

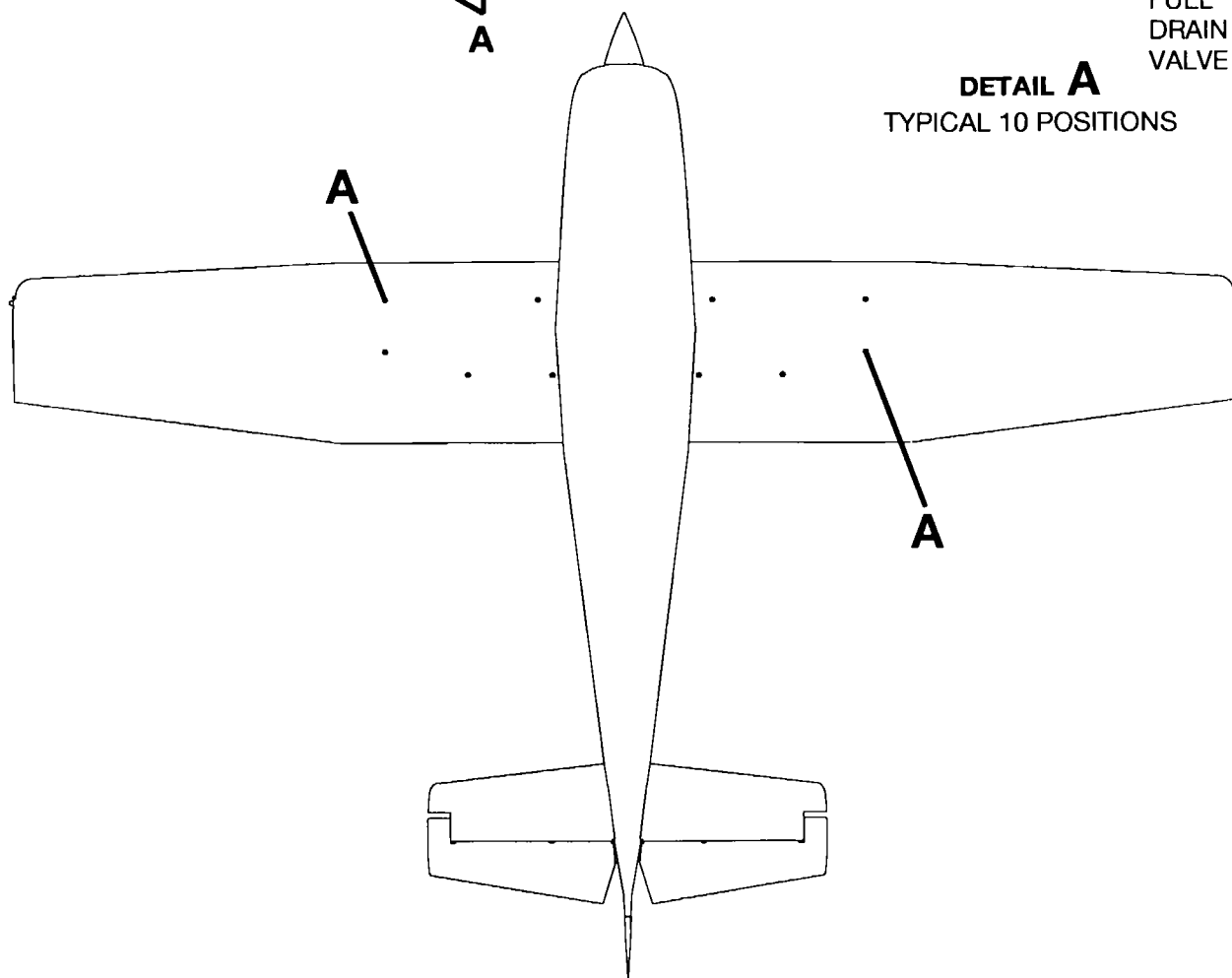
Fuel System  
Figure 202 (Sheet 1)

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**DETAIL A**  
 TYPICAL 10 POSITIONS



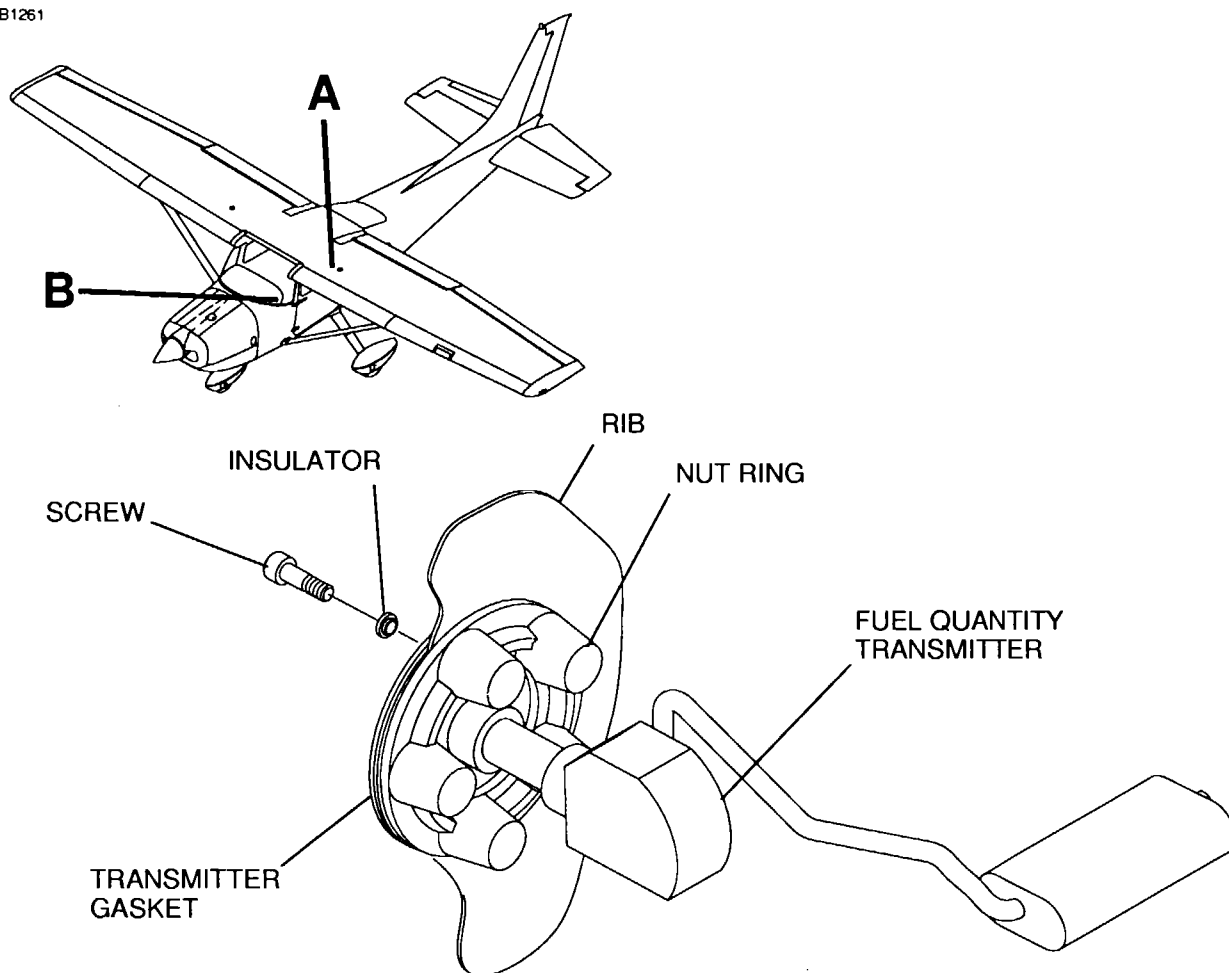
**VIEW A-A**  
 LOOKING UP

Fuel Drain Valve  
 Figure 203 (Sheet 1)

0710T1001  
 A0726T1001  
 AA0726T1002

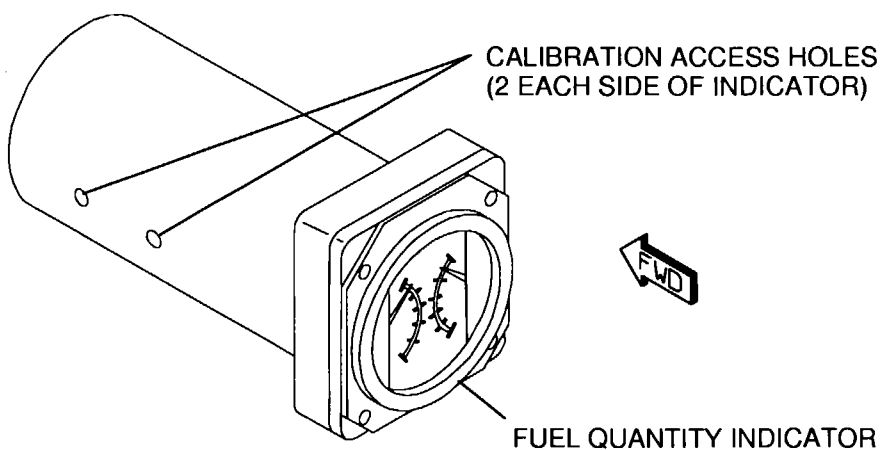
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**DETAIL A**

LEFT SIDE SHOWN  
 (RIGHT SIDE TYPICAL)



**DETAIL B**

FUEL QUANTITY INDICATOR

Fuel Quantity System  
 Figure 204 (Sheet 1)

0710T1001  
 A0714T1027  
 BS3277T-2

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- B. Install the Left and Right Fuel Quantity Senders (Refer to Figure 204).

**NOTE:** Do the fuel quantity calibration only after installation of the fuel level sender.

- (1) Examine the gaskets for cracks or other damage that can prevent the gasket from making a good seal. If the gaskets have damage, or if there are signs of fuel leaks, install new gaskets. Always install new gaskets when you install a new fuel level sender.

**CAUTION:** Do not bend the float arm of the fuel level sender.

- (2) Carefully install the fuel quantity sender into the fuel tank and attach the nut ring with screws.  
(3) Connect the wire ring terminals to the fuel level sender.  
(4) Install the headliner. Refer to Chapter 25, Cabin Panels - Removal/Installation.

**5. Fuel Tank Vents Adjustment/Test**

- A. DESCRIPTION - A vent line is installed in the outboard end of each fuel tank and extends overboard through the lower wing skin near the point where lift struts attach to the underside of the wings.
- B. TEST - Fuel vents may become clogged as shown by field experience, and can cause fuel starvation of the engine. If the bleed hole in the vent valve becomes clogged, over-pressurization can occur due to normal temperature variation. This would usually occur when the airplane engine is not operating. The procedure that follows must be used to make sure that the fuel vent and bleed system operate correctly.
- (1) Attach a rubber tube to the end of the vent line below the wing.

**WARNING: Clogged vent lines and bleed holes can cause either fuel starvation or the pressurization of the fuel tanks by fuel expansion. You must clean any fuel vent found clogged or not operating correctly before the airplane is returned to service.**

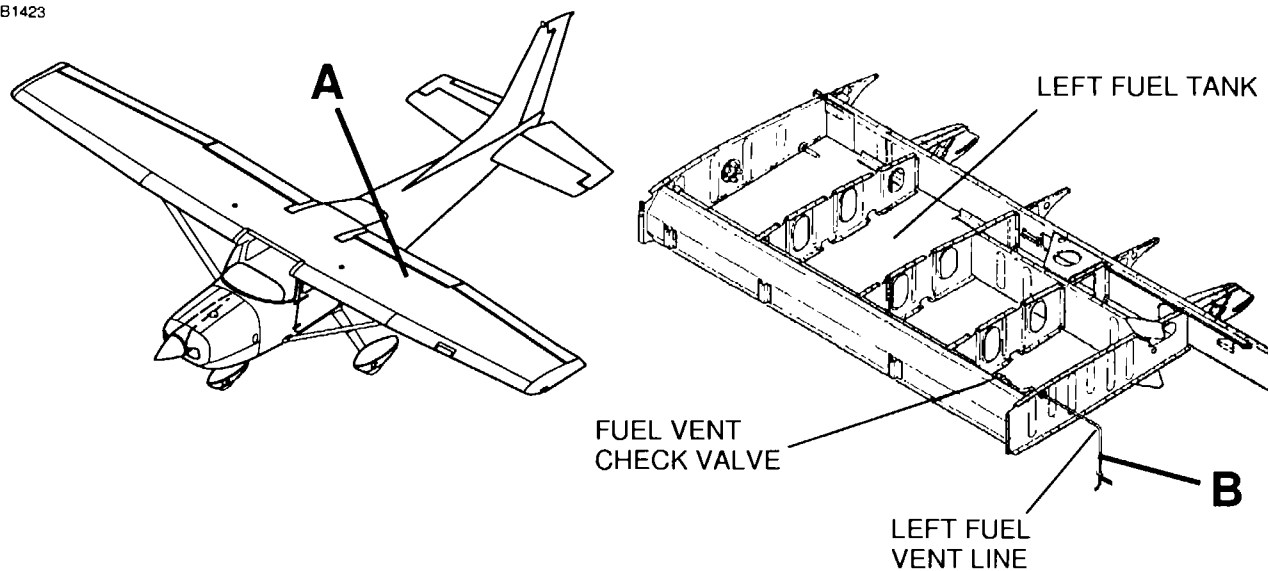
- (2) As you do the test, put a cap on the vent in the opposite wing.  
(3) Blow air into the tube to pressurize the tank. If air can enter the tank, the vent line is open.  
(4) After the tank is pressurized with a small quantity of air, insert the end of the rubber tube into a container of water and look for a continuous stream of bubbles. This shows that the bleed hole in the valve assembly is open, and that the valve assembly releases tank pressure.  
(5) After completing step B.(3), blow air into the tube again to pressurize the tank. Crimp the rubber tube to keep pressure in the tank. Loosen, but do not remove, the filler cap on the opposite wing. If pressure is released through the filler cap, the cell crossover line is open. Remove the rubber tube from the end of the vent line below the wing.  
(6) Do steps B.(1) thru B.(5) again on the opposite wing.

**NOTE:** A serviceable wing fuel vent check valve will release positive pressure through the bypass port from the fuel tank. An unserviceable wing fuel vent check valve will not release positive pressure through the bypass port from the fuel tank.

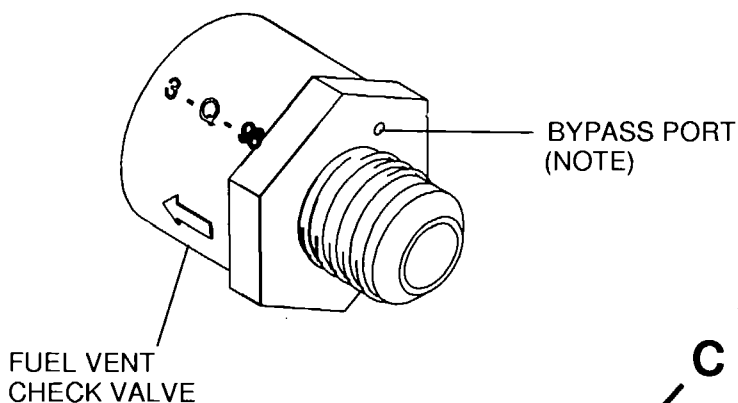
- (7) If the fuel vent check valve is unserviceable, do the procedures that follow (Refer to Figure 205).
- (a) Defuel the airplane. Refer to Chapter 12, Fuel - Servicing.  
(b) Remove the wing access panels (510KB and 610KB) to get access to the wing fuel vent check valve. Refer to Chapter 6, Inspection/Access Plates - Description and Operation.  
(c) Remove the unserviceable wing fuel vent check valve and replace it with a new fuel vent check valve. Make sure that the bypass hole on the valve flap is set at the top of the fuel tank.  
(d) Install and seal the wing fuel tank access plate. Make sure that the access plate is fully sealed. Refer to Chapter 28, Fuel Bay Sealing - Maintenance Practices.  
(e) Do steps B(1) thru B(7) again to make sure that the new fuel vent check valve operates correctly.

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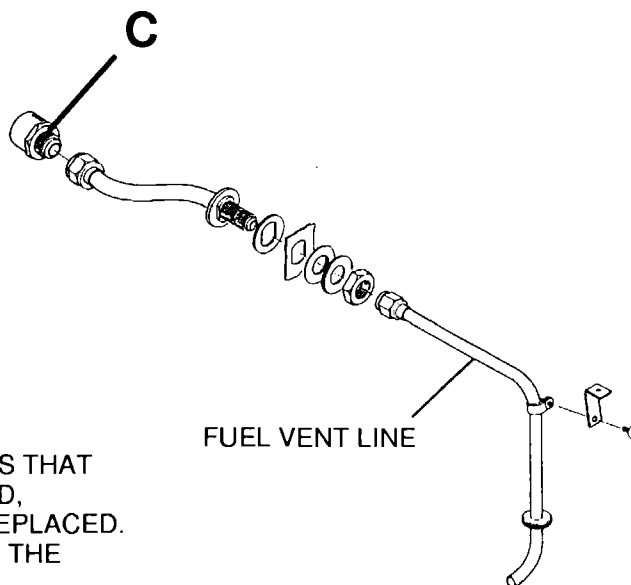
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**DETAIL A**



**DETAIL C**



**DETAIL B**

**NOTE:** IF THE PRESSURE TEST SHOWS THAT THE BYPASS PORT IS CLOGGED, THE CHECK VALVE MUST BE REPLACED. INSTALL THE NEW VALVE WITH THE HINGE/BYPASS PORT ON THE TOP OF THE FUEL TANK.

Fuel Vent Location  
 Figure 205 (Sheet 1)

0710T1001  
 A12261001  
 B12261004  
 CSB99T2806

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**MODEL 182/T182**  
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- (f) Fill the fuel tanks with fuel and examine the tanks for leaks. If leaks are apparent, defuel, disassemble, and seal the tanks again until no leaks are found. Refer to Chapter 28, Fuel Bay Sealing - Maintenance Practices.
- (8) Make sure that the vent line is in the correct position in relationship to the wing struts. Refer to Figure 206 and to Adjustment Procedures below.
  - (a) Put a six-inch scale perpendicular to the wing skin and measure the distance from the wing skin to the end of the fuel vent line.

**WARNING: One of the fuel vent lines must stay set behind the lift strut with the dimensions given in Figure 204. This position will give protection against ice formation in at least one vent tube.**

**NOTE:** It may be necessary to remove the strut cuff to get an accurate measurement using the six-inch scale.

- 1 The distance from the wing skin to the bottom of the fuel vent line must be 3.46 inches, +0.03 or -0.03 inch.
    - (b) Using a six-inch scale, measure the straight line distance from the back of the wing strut to the end of the fuel vent line.
      - 1 The distance from the strut to the end of the fuel vent line must be 1.12 inches, +0.03 or -0.03 inch.
  - (9) If adjustments are necessary for the fuel vent line, do the procedure that follows.
    - (a) Remove and keep the access panels (510KB from the left wing and 610KB from the right wing). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
    - (b) Loosen the clamp on the fuel vent line.
    - (c) Adjust the fuel vent line with your hand to the proper dimensions.
    - (d) Tighten the clamp on the fuel vent line.
    - (e) Install the access/inspection plates.
- C. ADJUSTMENT - In some cases, fuel may flow in different quantities through each nozzle when the fuel selector valve is in the BOTH position. This is caused by different quantities of pressure applied to each of the individual fuel tank vents. Correct this condition with the procedure that follows.

**NOTE:** This procedure must be done during a sequence of routine flight operations. Special flights to measure and adjust the fuel tank feed rates are not recommended.

- (1) Examine the venting system to make sure that the lines are open, all connections are tight, and that the system operates correctly.
- (2) Park the airplane on level ground and set fuel selector switch in the BOTH position. Keep the airplane parked until the tank levels are equal, or until the two tanks are full.
- (3) After takeoff, with the fuel selector in the BOTH position, climb to an altitude where there is no turbulence.
- (4) Adjust the airplane for straight and level flight. Make sure that the airplane is free of yaw by adjusting the rudder to align the ball to the center of the turn coordinator. Fly at maximum cruise power for a minimum of one hour.
- (5) At the end of the hour, and while still in straight and level flight, record the fuel tank levels as shown on the fuel gage.
- (6) If the fuel tank levels are different by more than 5.0 gallons, do the applicable steps that follow after the airplane is on the ground.
  - (a) Find the fuel tank with the most remaining fuel. With your hand, move the fuel vent on the bottom of the wing outboard 0.25 inch.
  - (b) Find the fuel tank with the least remaining fuel. With your hand, move the fuel vent on the bottom of the wing inboard 0.25 inch.

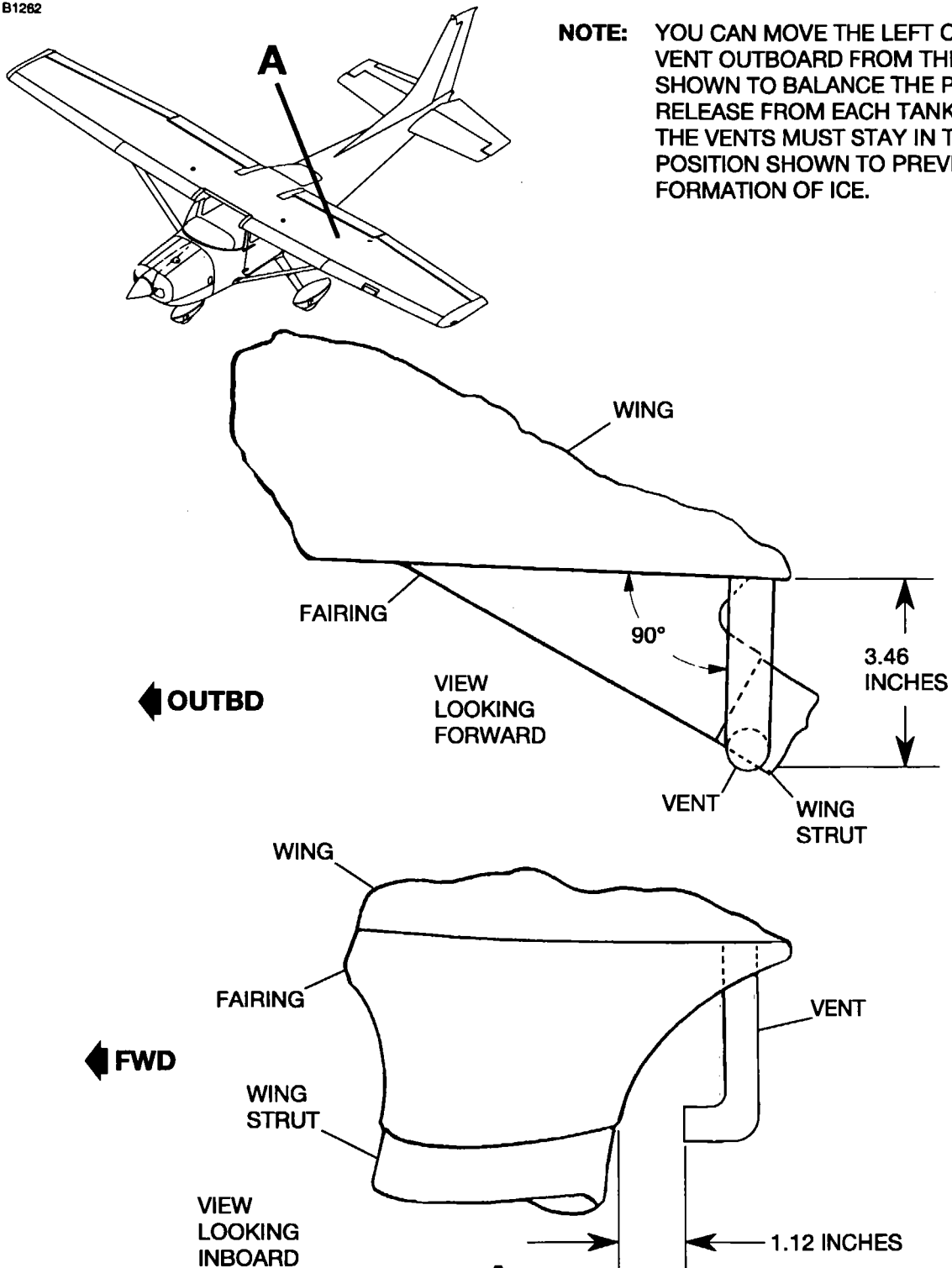
**NOTE:** One of the vents must remain positioned behind the strut as illustrated in Figure 206 for icing protection.



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**NOTE:** YOU CAN MOVE THE LEFT OR RIGHT VENT OUTBOARD FROM THE POSITION SHOWN TO BALANCE THE PRESSURE RELEASE FROM EACH TANK. ONE OF THE VENTS MUST STAY IN THE POSITION SHOWN TO PREVENT THE FORMATION OF ICE.



**DETAIL A**

LEFT SIDE SHOWN  
 (RIGHT SIDE OPPOSITE)

Fuel Vent Location  
 Figure 206 (Sheet 1)

0526TC1008

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**MODEL 182/T182**  
MAINTENANCE MANUAL

- (c) Do steps 5.C.(1) thru 5.C.(6) again and make sure that the fuel flow rates for the tanks are equal,  $\pm 5.0$  gallons/hour.

## 6. Fuel Filler Cap Vent Cleaning/Seal Replacement

### A. Examine, Clean, and Repair the Vented Fuel Filler Cap (Refer to Figure 207).

- (1) Remove the vented fuel filler cap from the adapter assembly, disconnect the safety chain (if installed), and put a cover or cap on the tank opening to keep unwanted material out.
- (2) Examine the condition of the gasket and frictionless washer, and replace if necessary.
- (3) Use cotton swabs and solvent to carefully lift the edges of the rubber umbrella inside the fuel cap and clean the inside of the umbrella to remove all contaminants. Use a second cotton swab to clean the umbrella, and remove all cotton fibers. Repeat these steps until the cotton swabs show no discoloration.
- (4) Replace the umbrella if the vent shows that there is a leak or shows deterioration.

**NOTE:** It can be faster to buy and replace the fuel filler cap assembly, which is an alternative to the removal of the umbrella.

**CAUTION:** Be careful when you remove the umbrella stem. If the umbrella stem breaks when you remove it, make sure you remove all the stem parts from the vent before you install the new umbrella. If the stem parts are left in the vent, the vent will not operate correctly.

- (a) To remove the umbrella, apply lubricant to the umbrella stem with MIL-PRF-5606 hydraulic fluid to prevent damage to the stem.
- (b) When you install the new umbrella, apply lubricant to the stem with MIL-PRF-5606 hydraulic fluid. Use a small blunt tool to install the knob on the umbrella into the check valve body.
- (5) Connect the fuel cap to the safety chain (if installed) and install the cap in the adapter assembly.

## 7. Fuel Selector Valve Removal/Installation

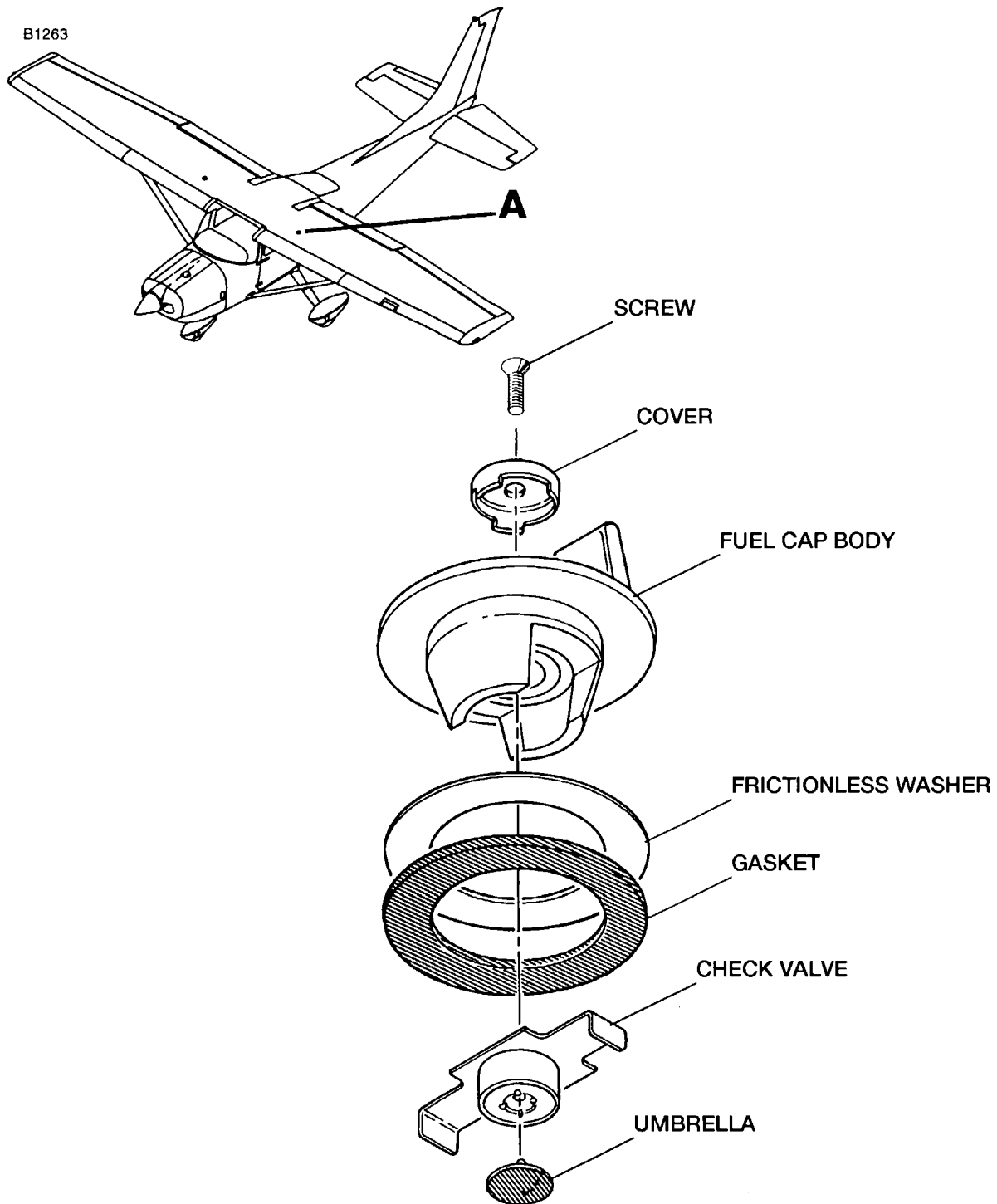
### A. Remove the Fuel Selector Valve (Refer to Figure 208 and Figure 209).

- (1) Drain all of the fuel from the wing fuel tanks. Refer to Chapter 12, Fuel - Servicing.
- (2) Drain all of the fuel from the fuel selector valve and the door post fuel lines by draining the fuel through the fuel selector valve drain.
- (3) Remove the carpet as necessary to get access to the access plate (230DB) and remove the access plate. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (4) Remove the cotter pin and pin from the fitting assembly and disconnect the fitting from the valve.
- (5) Disconnect the inlet and outlet fuel lines from the valve. Put a cover on the valve fittings and seal the lines.
- (6) Remove the safety wire and remove the screws and washers that attach the valve. Remove the valve.

### B. Install the Fuel Selector Valve (Refer to Figure 208 and Figure 209).

- (1) Put the fuel selector valve on the bracket and install the washers and screws. Safety the screws with wire.
- (2) Remove the caps from the fuel selector valve fittings and remove the seals from the fuel lines. Connect the fuel lines to the fuel selector valve.
- (3) Put the fitting on the fuel selector valve and install the pin and cotter pin.
- (4) Refuel the airplane and examine the fuel lines for leaks. Refer to Chapter 12, Fuel - Servicing.
- (5) Install the access plate (230DB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (6) Install the carpet.

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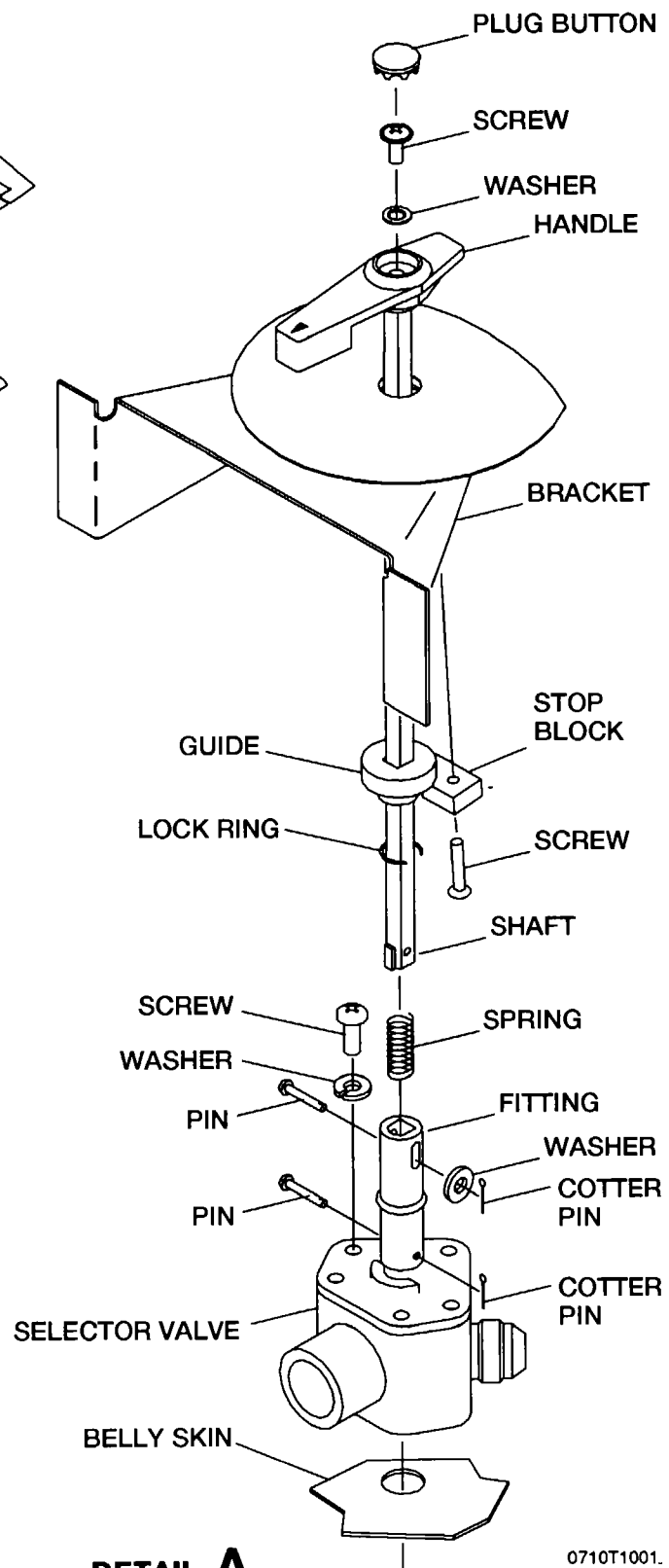
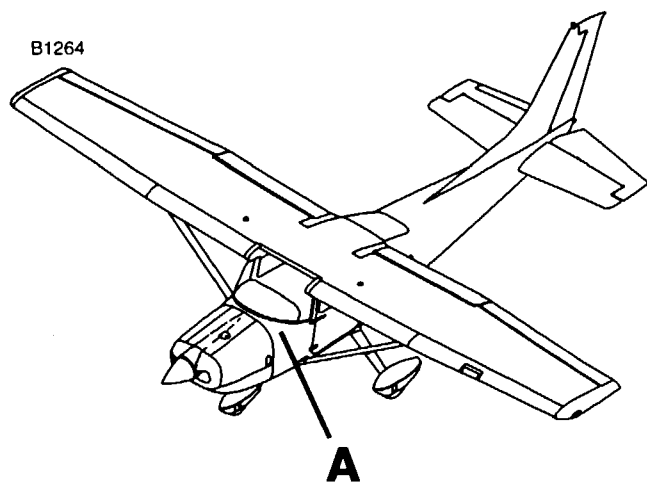


**DETAIL A**  
LEFT SIDE SHOWN  
(RIGHT SIDE TYPICAL)

Vented Fuel Filler Cap  
Figure 207 (Sheet 1)

0710T1001  
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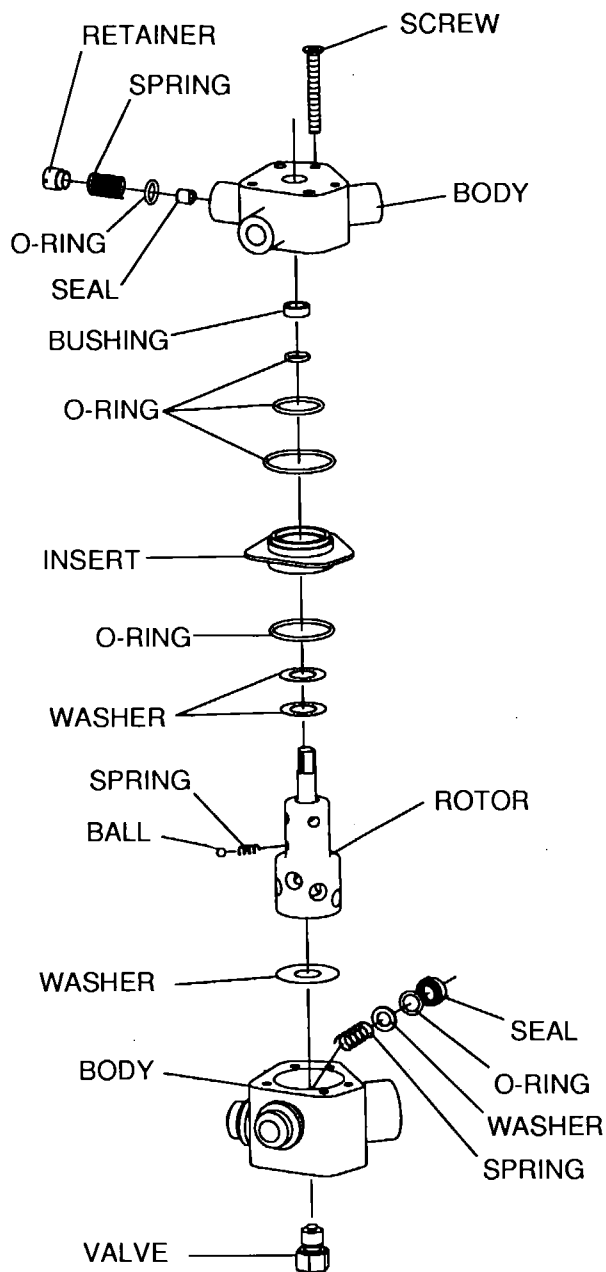
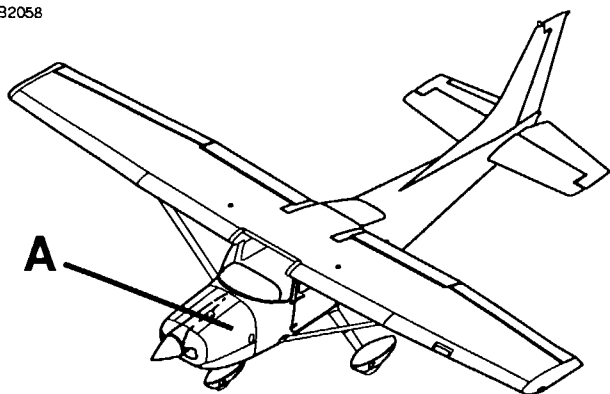
**DETAIL A**

0710T1001.  
 A0716T1002

Fuel Selector Valve  
 Figure 208 (Sheet 1)

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**DETAIL A**  
 (182T AND T182T)

0710T1001  
 A0985T1116

Fuel Selector Valve  
 Figure 209 (Sheet 1)

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**8. Fuel Strainer Disassembly/Cleaning/Assembly**

- A. Disassemble and Clean the Fuel Strainer (Refer to Figure 210).
- (1) Turn the fuel selector valve to the OFF position.
  - (2) Disconnect the strainer drain tube, remove the safety wire, nut, and washer at the bottom of the filter bowl, and remove the bowl.
  - (3) Carefully remove the standpipe.
  - (4) Remove the filter screen and gasket.
  - (5) Clean the filter screen and the bowl in solvent and dry with compressed air.
- B. Assemble the Fuel Strainer (Refer to Figure 210).
- (1) Install the screen and standpipe with a new gasket between the filter screen and the top assembly. Tighten the standpipe with your fingers.
  - (2) Install the bowl with all new O-rings. Torque the nut to between 25 and 30 inch-pounds.

**NOTE:** The step-washer at the bottom of the bowl is installed so that the step is against the O-ring.

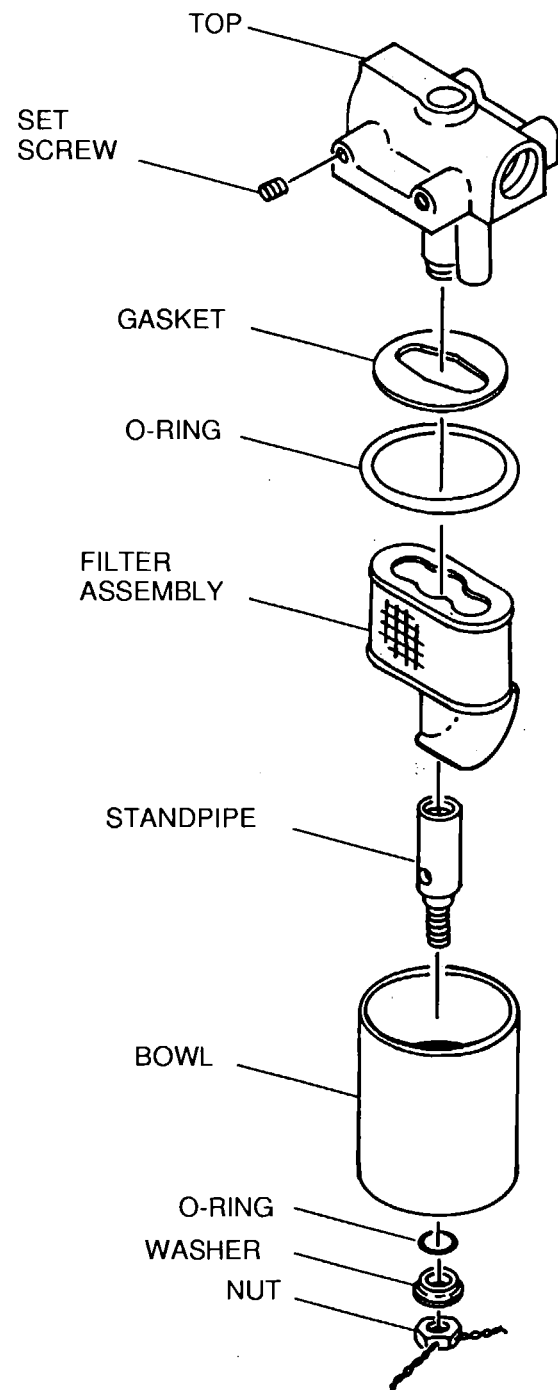
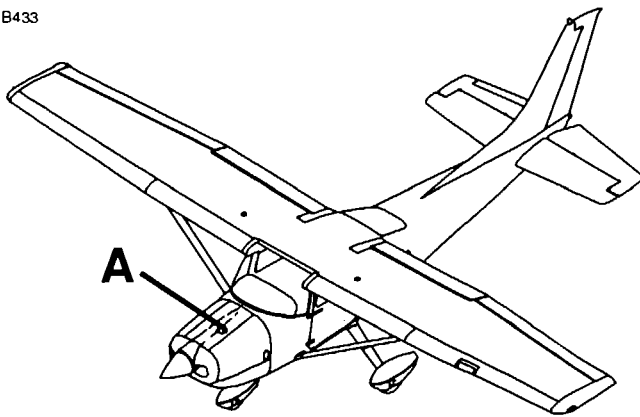
- (3) Connect the strainer to the drain tube.
- (4) Turn the fuel selector valve to the ON position, close the strainer drain, and examine the system for leaks. Make sure that the system operates correctly.
- (5) Loosen the fuel supply hose at the fuel injection servo inlet.
- (6) Set the mixture control to the OFF position.
- (7) Set the throttle control to the IDLE STOP position.
- (8) Set the FUEL PUMP switch to the ON position.
- (9) Operate the electric auxiliary fuel pump until the air is removed from the fuel lines and the pump is full of fuel.
- (10) Set the FUEL PUMP switch to the OFF position.
- (11) Tighten the fuel supply hose at the fuel injection servo inlet. Refer to Chapter 20, Torque Data - Maintenance Practices.
- (12) Install the safety wire from the bottom nut to the top of the assembly. Refer to Chapter 20, Safetying - Maintenance Practices.

**9. Electric Auxiliary Fuel Pump Removal/Installation (Airplanes 18280001 thru 18280944)**

- A. Remove the Electric Auxiliary Fuel Pump (Refer to Figure 211).
- (1) Set the MASTER ALT BAT switch to the OFF position.
  - (2) Turn the fuel selector handle to the OFF position.
  - (3) Disconnect the battery ground cable from the battery.
  - (4) Disconnect the electrical connector (P1) from the electric auxiliary fuel pump (UF005).
  - (5) Disconnect the fuel lines and drain the line from the electric auxiliary fuel pump.
  - (6) Loosen the mounting clamps that attach the electric auxiliary fuel pump and remove the pump from the airplane.
  - (7) Remove all the fuel fittings from the electric auxiliary fuel pump and discard the used O-rings from the inlet and outlet fuel fittings.
- B. Install the Electric Auxiliary Fuel Pump (Refer to Figure 211).
- (1) Put the new O-rings on the inlet and outlet fuel fittings.
  - (2) Install the inlet and outlet fuel fittings into the electric auxiliary fuel pump and tighten the fittings. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (3) Install the fuel drain fitting into the electric auxiliary fuel pump and tighten the fitting. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (4) Put the electric auxiliary fuel pump into mounting clamps.
  - (5) Loosely install the mounting clamps.
  - (6) Connect the fuel drain line to the fuel drain fitting.
  - (7) Connect and tighten the fuel lines to the inlet and outlet fittings.
  - (8) Tighten the mounting clamps. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (9) Tighten the fuel lines onto the fittings. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (10) Connect the electrical connectors to the electric auxiliary fuel pump.

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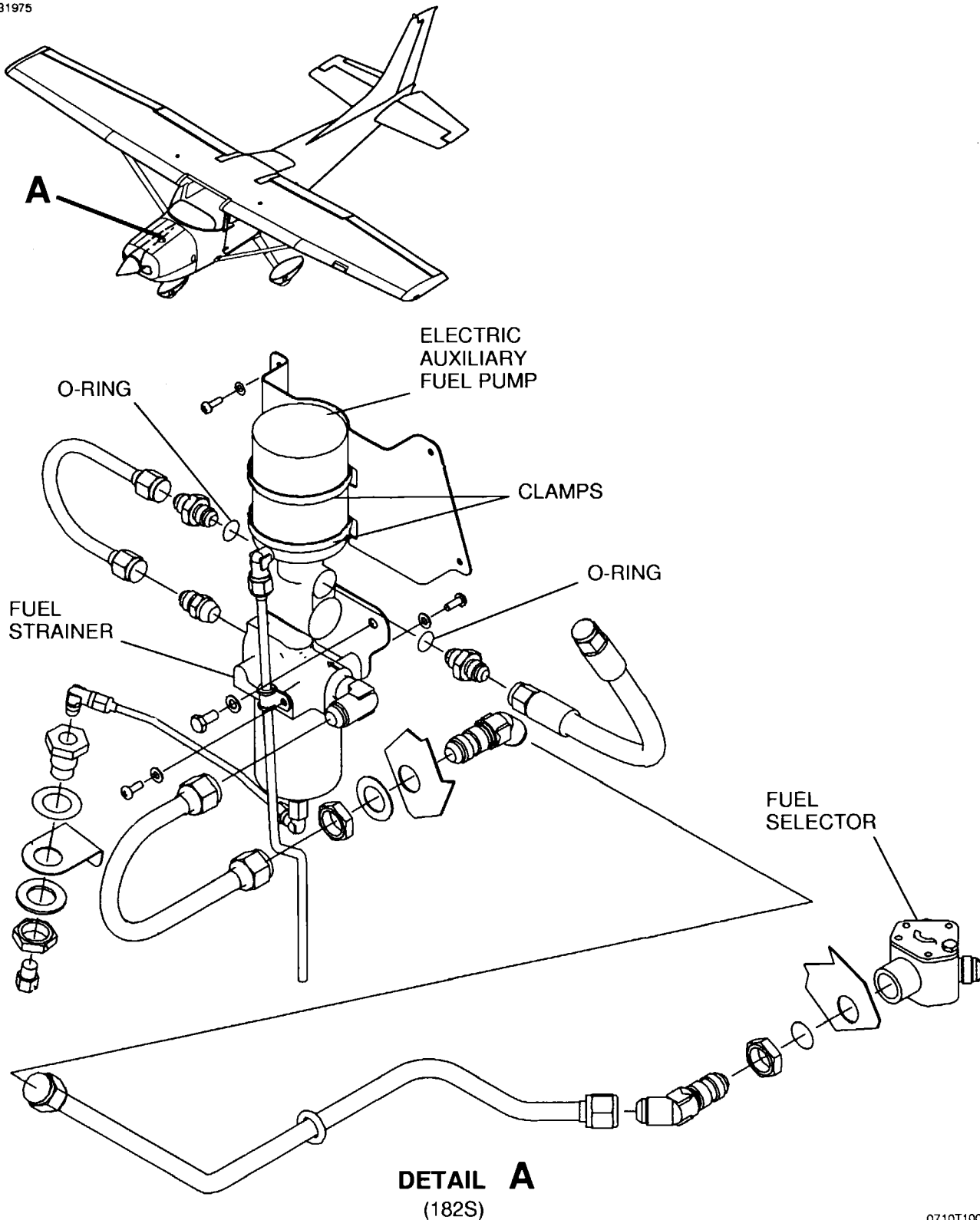
**DETAIL A**

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 A0716T1003

Fuel Strainer Assembly  
 Figure 210 (Sheet 1)

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Electric Auxiliary Fuel Pump  
Figure 211 (Sheet 1)

0710T1001  
A0716T1001



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- (11) Turn the fuel selector handle to the ON position.
- (12) Examine the electric auxiliary fuel pump and fuel fittings for fuel leaks.
- (13) Connect the battery ground cable to the battery.
- (14) Loosen the fuel supply hose at the fuel injection servo inlet.
- (15) Set the mixture control to the OFF position.
- (16) Set the throttle control to the IDLE STOP position.
- (17) Set the MASTER ALT BAT switch to the ON position.
- (18) Set the FUEL PUMP switch to the ON position.
- (19) Operate the electric auxiliary fuel pump until the air is removed from the fuel lines and the pump is full of fuel.
- (20) Set the FUEL PUMP switch to the OFF position.
- (21) Tighten the fuel supply hose at the fuel injection servo inlet. Refer to Chapter 20, Torque Data - Maintenance Practices.
- (22) Set the FUEL PUMP switch to the ON position.
- (23) Operate the electric auxiliary fuel pump and examine all fuel fittings for leaks.
- (24) Set the FUEL PUMP switch to the OFF position.

**10. Electric Auxiliary Fuel Pump Removal/Installation (Airplanes 18280945 and On and Airplanes T18208001 and On)**

- A. Remove the Electric Auxiliary Fuel Pump (Refer to Figure 212).
  - (1) Make sure that the master switch is in the OFF position.
  - (2) Disconnect the battery ground cable.
  - (3) Set the fuel selector to the OFF position.
  - (4) Remove the copilot's seat and carpet. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Chapter 25, Interior Upholstery-Maintenance Practices.
  - (5) Remove the access plate (230AB) to get access to the pump. Refer to Chapter 6, Access/Inspection Plates-Description and Operation.
  - (6) Disconnect the fuel lines, drain line, and electrical connectors from the pump.
  - (7) Loosen the mounting clamps that attach the pump and remove the pump from the airplane.
- B. Install the Electric Auxiliary Fuel Pump (Refer to Figure 212).
  - (1) Put the pump in the mounting clamps and tighten the clamps. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (2) Connect all the fuel lines, drain line, and electrical connectors to the pump.
  - (3) Set the master switch to the ON position and connect the battery ground cable.
  - (4) Turn fuel selector to the ON position.
  - (5) Operate the electric auxiliary fuel pump and examine all the fuel fittings for leaks.
  - (6) Install the access plate (230AB). Refer to Chapter 6, Access/Inspection Plates-Description and Operation.
  - (7) Install the carpet and copilot's seat. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Chapter 25, Interior Upholstery-Maintenance Practices.

**11. Auxiliary Fuel Pump Serviceability Test (Airplanes 18280001 thru 18280944)**

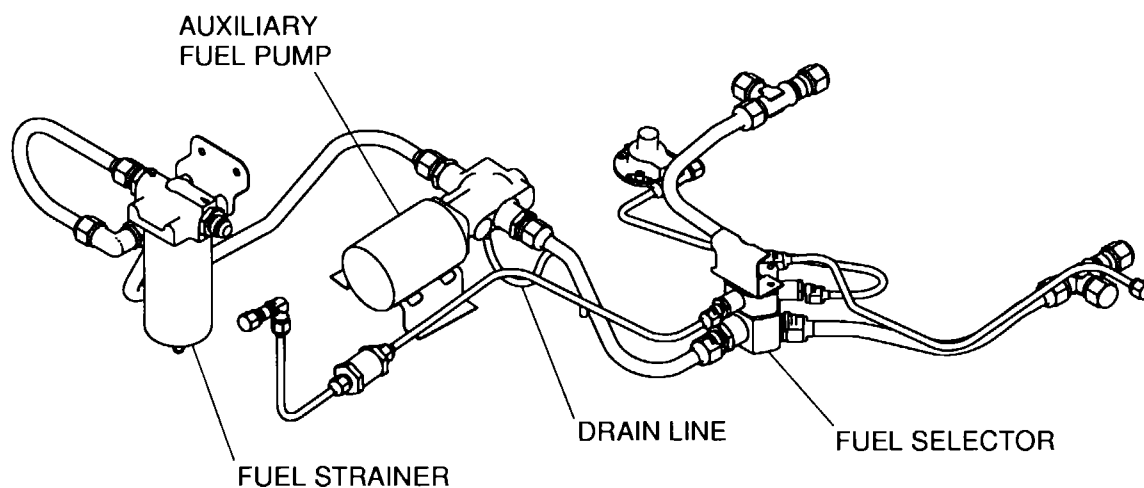
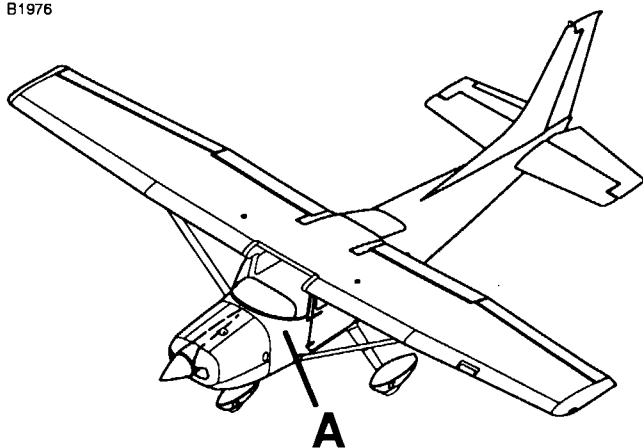
- A. Auxiliary Fuel Pump Test (Refer to Table 201).

**WARNING: Obey all fuel system fire and safety procedures. Remove all flammable materials from the airplane and from all areas where the fumes are dangerous.**

- (1) Remove the fuel supply hose from the inlet fitting of the engine-driven fuel pump.
- (2) Install a tee fitting on the fuel supply hose.
- (3) Connect a calibrated fuel pressure test gage and locally-purchased fuel shutoff valve to the tee fitting.
- (4) Set the fuel shutoff valve so that the fuel drains into a container.

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**DETAIL A**  
(182T AND T182T)

0710T1001  
A0716T158

Electric Auxiliary Fuel Pump  
Figure 212 (Sheet 1)

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- (5) Use a controlled electric power source to supply the 24 VDC electric power to the airplane and a multimeter to measure the electric current.
- (a) Operate the auxiliary fuel pump and adjust the fuel shutoff valve to get a pressure value as shown in Table 201. Make sure that the test is for the applicable part number.
- (b) Monitor the current draw of the auxiliary fuel pump electric motor.
- (c) Measure the fuel pump current draw and output. The output will be 1 gallon in 2.5 minutes.

**NOTE:** The Dukes Model 5100-00-1 auxiliary fuel pumps that are capable of giving a minimum flow rate of 23.5 GPH at 23 PSI and have a maximum current of 3.0 amps at 24 volts DC are considered serviceable. Dukes Models 5100-00-3 and 5100-00-4 auxiliary fuel pumps that are capable of giving a minimum flow rate of 23.5 GPH at 14 PSI and have a maximum current draw of 3.0 amps at 24 volts DC are considered serviceable.

- (6) If the fuel pump does not meet the requirements, replace it with a pump that does meet the requirements.
- (7) If the fuel pump meets the requirements, it must be considered serviceable.

Table 201. Dukes Model 5100 Serviceability Requirements

PUMP PART NUMBER	FUEL FLOW VOLUME (MINIMUM)	FUEL FLOW PRESSURE	SUPPLIED VOLTAGE	MAXIMUM FUEL PUMP CURRENT
5100-00-1 (or -1RX)	23.5 GPH	23 PSI	24 Volts DC	3.0 Amps
5100-00-3 (or -3RX)	23.5 GPH	14 PSI	24 Volts DC	3.0 Amps
5100-00-4 (or -4RX)	23.5 GPH	14 PSI	24 Volts DC	3.0 Amps

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- (20) Set the FUEL PUMP switch to the OFF position.
- (21) Tighten the fuel supply hose at the fuel injection servo inlet. Refer to Chapter 20, Torque Data - Maintenance Practices.
- (22) Set the FUEL PUMP switch to the ON position.
- (23) Operate the electric auxiliary fuel pump and examine all fuel fittings for leaks.
- (24) Set the FUEL PUMP switch to the OFF position.

**12. Electric Auxiliary Fuel Pump Removal/Installation (Airplanes 18280945 and On and Airplanes T18208001 and On)**

- A. Remove the Electric Auxiliary Fuel Pump (Refer to Figure 212).
  - (1) Make sure that the master switch is in the OFF position.
  - (2) Disconnect the battery ground cable.
  - (3) Set the fuel selector to the OFF position.
  - (4) Remove the copilot's seat and carpet. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Chapter 25, Interior Upholstery-Maintenance Practices.
  - (5) Remove the access plate (230AB) to get access to the pump. Refer to Chapter 6, Access/Inspection Plates-Description and Operation.
  - (6) Disconnect the fuel lines, drain line, and electrical connectors from the pump.
  - (7) Loosen the mounting clamps that attach the pump and remove the pump from the airplane.
- B. Install the Electric Auxiliary Fuel Pump (Refer to Figure 212).
  - (1) Put the pump in the mounting clamps and tighten the clamps. Refer to Chapter 20, Torque Data - Maintenance Practices.
  - (2) Connect all the fuel lines, drain line, and electrical connectors to the pump.
  - (3) Set the master switch to the ON position and connect the battery ground cable.
  - (4) Turn fuel selector to the ON position.
  - (5) Operate the electric auxiliary fuel pump and examine all the fuel fittings for leaks.
  - (6) Install the access plate. Refer to Chapter 6, Access/Inspection Plates-Description and Operation.
  - (7) Install the carpet and copilot's seat. Refer to Chapter 25, Front Seats and Rails - Maintenance Practices and Chapter 25, Interior Upholstery-Maintenance Practices.

**13. Auxiliary Fuel Pump Serviceability Test (Airplanes 18280001 thru 18280944)**

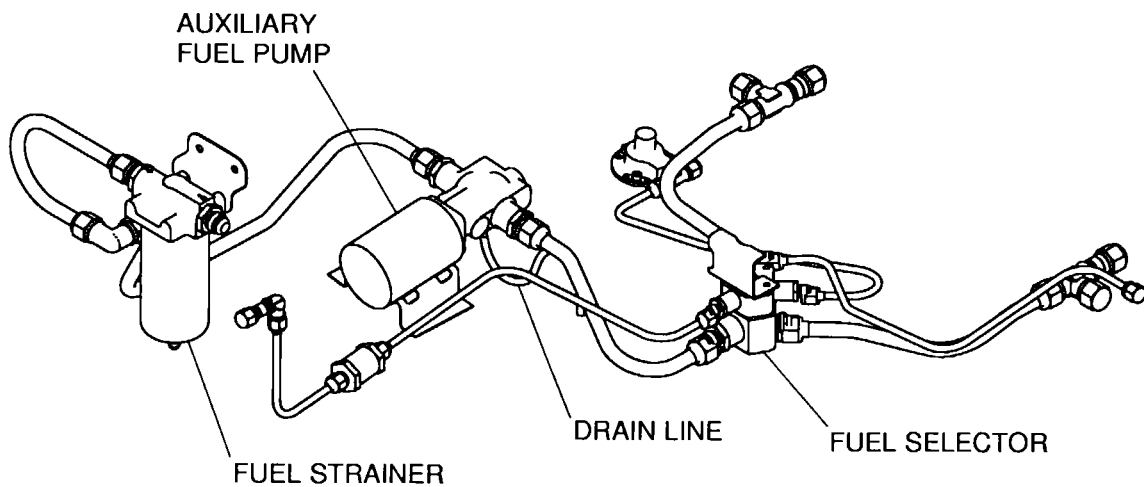
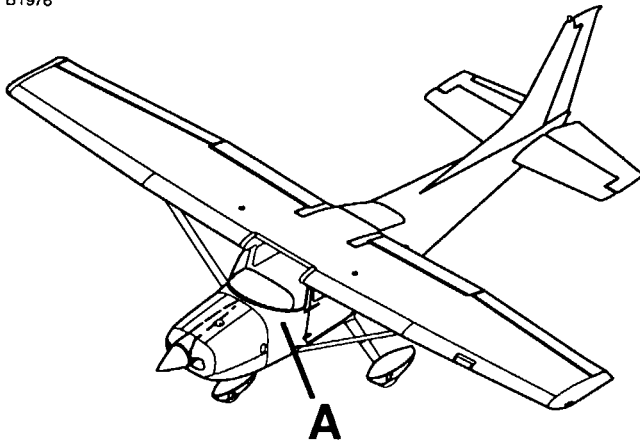
- A. Auxiliary Fuel Pump Test (Refer to Table 201).

**WARNING: Obey all fuel system fire and safety procedures. Remove all flammable materials from the airplane and from all areas where the fumes are dangerous.**

- (1) Remove the fuel supply hose from the inlet fitting of the engine-driven fuel pump.
- (2) Install a tee fitting on the fuel supply hose.
- (3) Connect a calibrated fuel pressure test gage and locally-purchased fuel shutoff valve to the tee fitting.
- (4) Set the fuel shutoff valve so that the fuel drains into a container.
- (5) Use a controlled electric power source to supply the 24 VDC electric power to the airplane and a multimeter to measure the electric current.
  - (a) Operate the auxiliary fuel pump and adjust the fuel shutoff valve to get a pressure value as shown in Table 201. Make sure that the test is for the applicable part number.
  - (b) Monitor the current draw of the auxiliary fuel pump electric motor.

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**DETAIL A**  
(182T AND T182T)

0710T1001  
A0716T158

Electric Auxiliary Fuel Pump  
Figure 212 (Sheet 1)

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- (c) Measure the fuel pump current draw and output. The output will be 1 gallon in 2.5 minutes.

**NOTE:** The Dukes Model 5100-00-1 auxiliary fuel pumps that are capable of giving a minimum flow rate of 23.5 GPH at 23 PSI and have a maximum current of 3.0 amps at 24 volts DC are considered serviceable. Dukes Models 5100-00-3 and 5100-00-4 auxiliary fuel pumps that are capable of giving a minimum flow rate of 23.5 GPH at 14 PSI and have a maximum current draw of 3.0 amps at 24 volts DC are considered serviceable.

- (6) If the fuel pump does not meet the requirements, replace it with a pump that does meet the requirements.  
(7) If the fuel pump meets the requirements, it must be considered serviceable.

Table 201. Dukes Model 5100 Serviceability Requirements

PUMP PART NUMBER	FUEL FLOW VOLUME (MINIMUM)	FUEL FLOW PRESSURE	SUPPLIED VOLTAGE	MAXIMUM FUEL PUMP CURRENT
5100-00-1 (or -1RX)	23.5 GPH	23 PSI	24 Volts DC	3.0 Amps
5100-00-3 (or -3RX)	23.5 GPH	14 PSI	24 Volts DC	3.0 Amps
5100-00-4 (or -4RX)	23.5 GPH	14 PSI	24 Volts DC	3.0 Amps

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**FUEL STORAGE AND DISTRIBUTION - ADJUSTMENT/TEST**

**1. General**

A. This section gives the adjustment/test procedures for the fuel storage and distribution system.

**2. Fuel Quantity Calibration And Check (Airplanes without Garmin G1000)**

A. Fuel Indicator Calibration

- (1) Put the fuel selector valve in the BOTH position.
- (2) Defuel the airplane. Refer to Chapter 12, Fuel - Servicing.
  - (a) Open all the wing drain valves and drain the fuel bays until both are empty.
  - (b) Drain the fuel selector valve until empty.
- (3) Put the fuel selector valve in the OFF position.
- (4) Remove the fuel quantity indicator from the instrument panel.
- (5) Install a 0580001-1 test box between the wire harness connector and the fuel quantity indicator connector.

**NOTE:** The internal light for the fuel quantity indicator will not work when the test box is connected.

- (6) Make the airplane level.
  - (a) Make the wings level to 0.00 degree, +0.25 degree or -0.25 degree. Use blocks under the wheels or adjust the tire pressure to make the wings level. Refer to Chapter 8, Leveling - Maintenance Practices.
  - (b) Make the airplane level to 2.00 degrees, +0.25 or -0.25 degrees nose up position. Refer to Chapter 8, Leveling - Maintenance Practices.
- (7) Use an external power source to apply 28 VDC, +0.5 or -0.5 VDC, to the airplane, and put the master switch in the ON position. Put both switches on the test box to the NORM position.
- (8) Add unusable fuel to each fuel bay. Refer to Pilots' Operating Handbook for the amount of usable fuel unusable fuel.
- (9) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (10) Let the airplane become stable for approximately 30 seconds.
- (11) Make sure that the airplane is still at 2 degrees nose up and the wings are still level.
- (12) Adjust the "EMPTY" potentiometer, on the fuel quantity indicator, for the left and right gages until the indicator pointer is in the middle of the red radial line.

**NOTE:** A nonmagnetic screwdriver must be used when you adjust the potentiometers on the fuel quantity indicator.

- (13) Make sure that the low-fuel warning-lamps come on.
- (14) Fill both fuel bays.
- (15) Adjust the "FULL" potentiometer for the left and right gages until the pointer is in the middle of the white radial line at the full indication.
- (16) Make sure the low-fuel warning-lamps go off.
- (17) Proceed to the Fuel Warning System Check.

B. Fuel Warning System Check.

- (1) Configure the airplane for the Fuel Warning System Check.
  - (a) Apply 28 VDC to the airplane.
  - (b) Set the master switch to ON.
  - (c) Move the test box switches to NORM.
  - (d) Make sure the fuel gages read FULL.
  - (e) Make sure the low-fuel annunciator is OFF.

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- (2) Turn the NORM/OPEN switch on the test box to the OPEN position and start the timer.

**NOTE:** The airplane's digital clock can be used in the timer mode to measure the time of the annunciators. The interval for this test is from switch operation until the annunciator begins to flash. The annunciators will flash for approximately 10 seconds before they come continuously on without a flash.

- (3) Monitor the fuel quantity indicator.  
(a) Make sure the pointer goes to the power off position below the first graduation.  
(b) The annunciators must come on within 75 seconds.
- (4) Put the NORM/OPEN switch to the NORM position.  
(a) The indicators must read full and the annunciators must go off.  
(b) Set the timer again.
- (5) Turn the SHORT/NORM/100+ OHM switch to the 100+ OHM position. Start the timer.
- (6) Monitor the fuel quantity indicator.  
(a) Make sure the pointer goes to the power off position below the first graduation.  
(b) The annunciators must come on within 75 seconds.
- (7) Turn the SHORT/NORM/100+ OHM switch to the NORM position.  
(a) The indicators must read full and the annunciators must go off.  
(b) Set the timer again.
- (8) Turn the SHORT/NORM/100+ OHM switch to the SHORT position. Start the timer.
- (9) Monitor the fuel quantity indicator.  
(a) Make sure the pointer goes to the power off position below the first graduation.  
(b) The annunciators must come on within 75 seconds.
- (10) Turn the SHORT/NORM/100+ OHM switch to the NORM position.  
(a) The indicators must read full and the annunciators must go off.
- (11) Set the airplane digital clock back to the clock mode.
- (12) Set the master switch to OFF.
- (13) Remove the test box.
- (14) Install the fuel quantity indicator in the instrument panel.
- (15) Set the master switch to ON.
- (16) Make sure the fuel quantity indicators show FULL and the annunciators are off.
- (17) Set the master switch to OFF.

**3. Fuel Quantity Calibration and Fuel Flow Test (Airplanes with Garmin G1000 with software version 563.01 or earlier)**

**NOTE:** The software version is shown on the upper right corner of the MFD on the first page displayed after power is applied the MFD in normal operation.

**NOTE:** If the fuel quantity indicator on the Garmin G1000 system has a red X on it during normal operation, examine the sender and wiring and refer to the Garmin G1000 Line Maintenance Manual for more Garmin system troubleshooting. If the values given on the Primary Flight Display (PFD) are not the same as the values given in the calibration procedure, refer to the Garmin G1000 Line Maintenance Manual for troubleshooting.

**A. Do a Fuel Quantity Calibration and Fuel Flow Test.**

- (1) Put the selector valve in the BOTH position.
- (2) Defuel the airplane. Refer to Chapter 12, Fuel - Servicing.  
(a) Drain the fuel tanks with all wing drain valves until the two tanks are empty.  
(b) Drain the fuel-selector drain valve until it is empty.
- (3) Put the fuel selector valve in the OFF position.
- (4) Make the airplane level.  
(a) Make the wings level to 0.0 degrees, +0.25 or -0.25 degree. Use blocks under the wheels or adjust the tire pressure to make the wings level. Refer to Chapter 8, Leveling - Maintenance Practices.  
(b) Make the airplane level to 2.00 degrees, +0.25 or -0.25 degree, in the nose up position. Refer to Chapter 8, Leveling - Maintenance Practices.



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- (5) Add unusable fuel to each fuel tank. Refer to the Pilot's Operating Handbook for the amount of usable fuel.
- (6) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (7) Let the airplane become stable for approximately 30 seconds.
- (8) Put the BAT MASTER switch to the ON position while you push the ENT button on the PFD.
- (9) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.

**NOTE:** The PFD is now in the configuration mode.

- (10) Use the Flight Management System (FMS) outer knob to go to the CAL page group.
- (11) Use the FMS inner knob to go to the FUEL CALIBRATION page.
- (12) Put the AVIONICS master switch in the ON position while you hold down the ENT button on the MFD.
- (13) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.

**CAUTION:** Before you do the calibration procedure, you must turn on the G1000 system and let it become stable for a minimum of three minutes.

**NOTE:** The MFD is now in the configuration mode.

- (14) Push the softkeys on the FUEL CALIBRATION page of the PFD, in the sequence that follows, to enter the password.
  - (a) Push Softkey 12 (far right softkey).
  - (b) Push Softkey 11.
  - (c) Push Softkey 10.
  - (d) Push Softkey 9.
- (15) Make sure that the FUEL FLOW ENG 1 SCALE value is 1.00000.
  - (a) If the FUEL FLOW ENG 1 SCALE value is not 1.00000, use the FMS knobs to make it 1.00000. Push in the inner FMS knob to activate the cursor. Use the outer FMS knob to select FUEL FLOW ENG 1 SCALE. Use the inner FMS knob to change the value.
- (16) Push the L RESET softkey to set the left calibration parameters to the default values.

**NOTE:** When L RESET is pushed, the system shows the warning message "WARNING! Pressing 'OK' will cause the calibration to revert to the default settings."

- (17) Push ENT to make the OK selection.
- (18) Make sure that the airplane is level at 2.0 degrees nose up position and 0.0 degrees wings level attitude.
- (19) Make sure that the CAL VAL value shown for the LEFT 1 SUB-TANK is stable.
- (20) Push the L EMPTY softkey.
- (21) Push the R RESET softkey to set the right calibration parameters to the default values.

**NOTE:** When R RESET is pushed, the system shows the warning message "WARNING! Pressing 'OK' will cause calibration to revert to default settings."

- (22) Push ENT to make the OK selection.
- (23) Make sure that the CAL VAL value shown for the RIGHT 1 SUB-TANK is stable.
- (24) Push the R EMPTY softkey.
- (25) Make sure that the CAL VAL values are between -0.10 and +0.10 gallon ( -0.38 and +0.38l) for the LEFT 1 SUB-TANK.
- (26) Make sure that the CAL VAL values are between -0.10 and +0.10 gallon ( -0.38 and +0.38l) for the RIGHT 1 SUB-TANK.
- (27) Put the AVIONICS master switch in the OFF position.
- (28) Put the BAT MASTER switch in the OFF position.
- (29) After a minimum of 10 seconds, put the BAT MASTER switch in the ON position.
- (30) Make sure that the left, L, and right, R, fuel quantity pointers are on the red line.

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- (31) Put the BAT MASTER switch in the OFF position.
- (32) Put the BAT MASTER switch to the ON position while the ENT button on the PFD is held down.
- (33) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
- (34) Use the FMS outer knob to go to the CAL page group.
- (35) Use the FMS inner knob to go to the FUEL CALIBRATION page.
- (36) Put the AVIONICS master switch to the ON position while the ENT button on the MFD is held down.
- (37) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.

**CAUTION:** Before you do the calibration procedure, you must turn on the G1000 system and let it become stable for a minimum of three minutes.

- (38) Add 5 gallons of fuel (low fuel level) to the left fuel tank. Refer to Chapter 12, Fuel - Servicing.
- (39) Make sure the fuel is sensed in the LEFT 1 SUB-TANK.
- (40) Add 5 gallons of fuel (low fuel level) to the right fuel tank. Refer to Chapter 12, Fuel - Servicing.
- (41) Make sure the fuel is sensed in the RIGHT 1 SUB-TANK.
- (42) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (43) Let the airplane become stable for approximately 30 seconds.
- (44) Make sure that the airplane is level at 2.0 degrees nose up position and 0.0 degrees wings level attitude.
- (45) Make sure the CAL VAL values are stable for the LEFT 1 SUB-TANK and RIGHT 1 SUB-TANK on the PFD.
- (46) Make sure the CAL VAL value for the LEFT 1 SUB-TANK is between 6.5 to 9 gallons.
- (47) Make sure the CAL VAL value for the RIGHT 1 SUB-TANK is between 6.5 to 9 gallons.
- (48) If the values are in the tolerance range, the procedure is complete.
- (49) If the CAL VAL values are not in tolerance:
  - (a) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
  - (b) Let the airplane become stable for approximately 30 seconds.
  - (c) Make sure that the airplane is level at 2.0 degrees nose up position and 0.0 degrees wings level attitude.
  - (d) Make sure the CAL VAL values are stable for the LEFT 1 SUB-TANK and RIGHT 1 SUB-TANK on the PFD.
  - (e) Make sure the CAL VAL value for the LEFT 1 SUB-TANK is between 6.5 to 9 gallons.
    - 1 If the CAL VAL is still not in the tolerance range, drain the fuel from the tanks and do the fuel calibration procedure again.
  - (f) Make sure the CAL VAL value for the RIGHT 1 SUB-TANK is between 6.5 to 9 gallons.
    - 1 If the CAL VAL is still not in the tolerance range, drain the fuel from the tanks and do the fuel calibration procedure again.
- (50) Inflate the tire to the correct pressure.
- (51) Put the AVIONICS switch to the OFF position.
- (52) Put the BAT MASTER switch to the OFF position.

**4. Fuel Quantity Calibration and Fuel Flow Test (Airplanes with Garmin G1000 with software version 563.02 or later)**

**NOTE:** The software version is shown on the upper right corner of the MFD on the first page displayed after the MFD is powered on in normal operation.

**NOTE:** If the fuel quantity indicator on the Garmin G1000 system has a red X on it during normal operation, examine the fuel quantity sender and wiring and refer to the Garmin G1000 Line Maintenance Manual for more Garmin system troubleshooting. If the values given on the PFD are not the same as the values given in the calibration procedure, refer to the Garmin G1000 Line Maintenance Manual for troubleshooting.

- A. Do a Fuel Quantity Calibration and Fuel Flow Test.
- (1) Put the selector valve in the BOTH position

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- (2) Defuel the airplane. Refer to Chapter 12, Fuel - Servicing.
  - (a) Drain the fuel tanks with all wing drain valves until the two tanks are empty.
  - (b) Drain the fuel-selector drain valve until it is empty.
- (3) Put the fuel selector valve in the OFF position.
- (4) Make the airplane level.
  - (a) Make the wings level to 0.0 degrees, +0.25 or -0.25 degree. Use blocks under the wheels or adjust tire pressure to make the wings level. Refer to Chapter 8, Leveling - Maintenance Practices.
  - (b) Make the airplane level to 2.00 degrees, +0.25 or -0.25 degrees nose up position. Refer to Chapter 8, Leveling - Maintenance Practices.
- (5) Add unusable fuel to each fuel tank. Refer to the Pilot's Operating Handbook for the unusable fuel quantity.
- (6) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (7) Let the airplane become stable for approximately 30 seconds.
- (8) Put the BAT MASTER switch to the ON position while you push the ENT button on the PFD.
- (9) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.

**NOTE:** The PFD is now in the configuration mode.

- (10) Use the Flight Management System (FMS) outer knob to go to the CAL page group.
- (11) Use the FMS inner knob to go to the FUEL CALIBRATION page.
- (12) Put the AVIONICS master switch in the ON position while you hold down the ENT button on the Multi-Function Display (MFD).
- (13) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.

**CAUTION:** Before you do the calibration procedure, you must turn on the G1000 system and let it become stable for a minimum of three minutes.

**NOTE:** The MFD is now in the configuration mode.

- (14) Use the FMS outer knob to go to the GRS page group on the MFD.
- (15) Use the FMS inner knob to go to the GRS/GMU CALIBRATION page on the MFD.
- (16) Push the softkeys on the FUEL CALIBRATION page of the PFD, in the sequence that follows, to enter the password.
  - (a) Push Softkey 12 (far right softkey).
  - (b) Push Softkey 11.
  - (c) Push Softkey 10.
  - (d) Push Softkey 9.
- (17) Make sure that the FUEL FLOW ENG 1 SCALE value is 1.00000.
  - (a) If the FUEL FLOW ENG 1 SCALE value is not 1.00000, use the FMS knobs to make it 1.00000. Push in the inner FMS knob to activate the cursor. Use the outer FMS knob to select FUEL FLOW ENG 1 SCALE. Use the inner FMS knob to change the value.
- (18) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (19) Turn the inner FMS knob to select LEFT.
- (20) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
- (21) Make sure that the CALIBRATED TOTAL value shown for the LEFT TANK is stable.
- (22) Push the EMPTY softkey and press the enter (ENT) button to add the calibration point to the CALIBRATION TABLE.
- (23) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon ( -0.38 and +0.38l) for the LEFT TANK.
- (24) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (25) Turn the inner FMS knob to select RIGHT.
- (26) Make sure that the CALIBRATED TOTAL value shown for the RIGHT TANK is stable.
- (27) Push the EMPTY softkey and press the ENT button to add the calibration point to the CALIBRATION TABLE.

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- (28) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon ( -0.38 and +0.38l) for the RIGHT TANK.
- (29) Make sure there is only one calibration point in the CALIBRATION TABLE. Under ACTUAL QUANTITY you must have "0.00 GL" and you must have one number under CALIBRATED VALUE. If you have more points in the CALIBRATION TABLE highlight them and push the DELETE softkey.
- (30) Make sure that the left, L, and right, R, fuel quantity pointers are on the red line on the MFD on the GRS group GRS/GMU CALIBRATION page.
- (31) Add 5 gallons of fuel (low fuel level) to the left fuel tank. Refer to Chapter 12, Fuel - Servicing.
- (32) Make sure fuel is sensed in the LEFT TANK.
- (33) Add 5 gallons of fuel (low fuel level) to the right fuel tank. Refer to Chapter 12, Fuel - Servicing.
- (34) Make sure fuel is sensed in the RIGHT TANK.
- (35) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (36) Let the airplane become stable for approximately 30 seconds.
- (37) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude..
- (38) Make sure the CALIBRATED TOTAL value for the LEFT TANK is stable and between 6.5 to 9 gallons.
- (39) Make sure the CALIBRATED TOTAL value for the RIGHT TANK is stable and between 6.5 to 9 gallons.
- (40) If the values are in tolerance, the procedure is complete.
- (41) If the CALIBRATED TOTAL values are not in the range:
  - (a) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
  - (b) Let the airplane become stable for approximately 30 seconds.
  - (c) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
  - (d) Make sure the CALIBRATED TOTAL value for the LEFT TANK is stable and between 6.5 to 9 gallons.
    - 1 If the CALIBRATED TOTAL is still not in the tolerance range, drain the fuel from the tanks and do the fuel calibration procedure again.
  - (e) Make sure the CALIBRATED TOTAL value for the RIGHT TANK is stable and between 6.5 to 9 gallons.
    - 1 If the CALIBRATED TOTAL is still not in the tolerance range, drain the fuel from the tanks and do the fuel calibration procedure again.
- (42) Inflate the tire to the correct pressure.
- (43) Put the AVIONICS switch to the OFF position.
- (44) Put the BAT MASTER switch to the OFF position.

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**FUEL BAY SEALING - MAINTENANCE PRACTICES**

**1. General**

- A. The fuel bays may need to be resealed if a leak has developed or if the wing has been repaired. This procedure provides instructions for sealing fuel bays, classifying fuel leaks and testing fuel bays after repair.

**2. Tools and Equipment**

- A. Refer to Fuel - General, for Tools and Equipment.

**3. Classification of Fuel Leaks**

- A. Fuel leaks are classified in to one of four categories based on the observed size of the leaks. Dependent on where the leak is located, immediate corrective action may be required prior to flight. Leaks may be classified as follows and are illustrated in Figure 201:
- (1) Stains - An area of 0.75 inch (19.05 mm) or less in diameter.
  - (2) Seep - An area from 0.75 inch to 1.50 inch (19.05 mm to 38.1 mm) in diameter.
  - (3) Heavy Seep - An area from 1.50 inch to 4.00 inch (38.1 mm to 101.6 mm) in diameter.
  - (4) Running Leak - Size varies with location and intensity of leak.
- B. The following leaks require corrective action before further flight:
- (1) Running leaks in any area.
  - (2) Stains, seeps or heavy seeps in an enclosed area.

**NOTE:** An enclosed area is defined as the wing leading edge and the section of wing inboard or outboard of the fuel bays.

- C. The following leaks require correction when the airplane is grounded for other maintenance:
- (1) Stains, seeps or heavy seeps not in an enclosed area.

**4. Sealing Fuel Leaks**

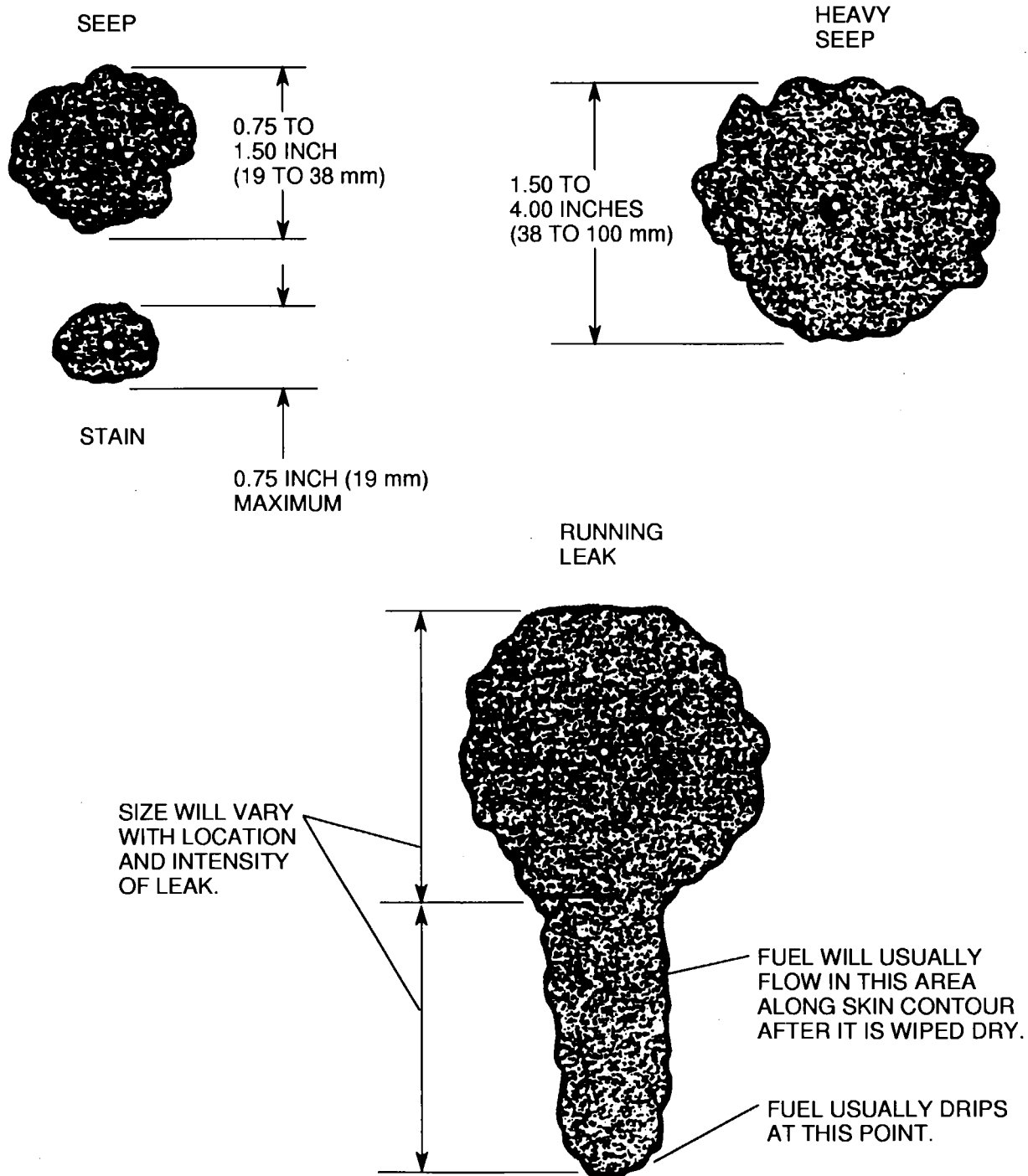
- A. Determine Source of Leak.
- (1) Fuel can flow along a seam or structure of the wing for several inches, making the leak source difficult to find. A stained area is an indication of the leak source.
  - (2) Fuel leaks can be found by testing the complete bay as described in Testing Integral Fuel Bay.
  - (3) Another method of detecting the source of a fuel leak is to remove access doors and blow with an air nozzle from the inside of the bay in the area of the leak while soap bubble solution is applied to the outside wing skin.
- B. Repair Leak.
- (1) Remove existing sealant in the area of the leak.
  - (2) Clean the area and apply a fillet seal. Press sealant into leaking area with a small paddle, working out all air bubbles.
  - (3) If leakage occurs around a rivet or bolt, replace the rivet or loosen bolt, retorqued and reseal around nutplate.
  - (4) Apply Type VIII sealant to access doors, fuel quantity transmitter, etc., as required and reinstall to structure. Refer to Chapter 20, Fuel, Weather and High-Temperature Sealing - Maintenance Practices.
  - (5) Allow sealant to cure completely.
  - (6) Test fuel bay for leakage. Refer to Testing Integral Fuel Bay.

**5. Testing Integral Fuel Bay**

- A. The fuel system consists of two vented, integral fuel tanks (one in each wing). The following procedure should be used only after sealant has fully cured.
- (1) Remove vent line from vent fitting and cap fitting.
  - (2) Disconnect fuel lines from bay.

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Classification of Fuel Leaks  
Figure 201 (Sheet 1)

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- (3) To one of the bay fittings, attach a water manometer capable of measuring 20 inches (.508 m) of water.
- (4) To the other bay fitting, connect a well regulated supply of air (0.5 PSI (415 Pa) maximum, or 13.8 (0.351 m) inches of water). Nitrogen may be used where the bay might be exposed to temperature changes while testing.
- (5) Make sure filler cap is installed and sealed.
- (6) Apply pressure slowly until 0.5 PSI (415 Pa) is obtained.
- (7) Apply a soap solution as required.
- (8) Allow 15 to 30 minutes for pressure to stabilize.
- (9) If bay holds for 15 minutes without pressure loss, seal is acceptable.
- (10) Reseal and retest if any leaks are found.

**CHAPTER**

**30**

**ICE AND RAIN  
PROTECTION**



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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
30-Title		
30-List of Effective Pages		
30-Record of Temporary Revisions		
30-Table of Contents		
30-00-00	Page 1	April 1/2002
30-20-00	Pages 201-202	April 1/2002
30-60-00	Page 1	Jan 2/2006
30-60-00	Pages 101-110	Jan 1/2007
30-60-00	Pages 201-203	April 1/2002



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**ICE AND RAIN PROTECTION - GENERAL**

**1. Scope**

- A. This chapter describes the procedures and components used to prevent or dispose of the formation of ice and rain on various parts of the aircraft.

**2. Definition**

- A. This chapter is divided into sections and subsections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows.
  - (1) The section on winterization provides procedures and techniques for the installation of the winterization kit.
  - (2) The section on propeller heat provides procedures and techniques for the maintenance of the propeller heat system.

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**WINTERIZATION KIT - MAINTENANCE PRACTICES**

**1. General**

- A. The winterization kit consists of two coverplates (with placards) which attach to the air intakes in the cowlings, a placard silk-screened on the instrument panel, and insulation for the engine crankcase breather line. This equipment should be installed for operations in temperatures consistently below 20 degrees F (-7 degrees C). Once installed, the engine crankcase breather insulation is approved for permanent use in both hot and cold weather.
- B. The winterization kit may be installed on 182S and 182T airplanes when temperatures are consistently below 20 degrees F (-7 degrees C). This procedure provides instructions for the installation and removal of the winterization kit and installation of the breather line insulation.

**2. Winterization Kit Installation**

- A. Winterization Cover Installation (Refer to Figure 201).
  - (1) Position Nose Covers in the air intake openings of the nose cap and mark the positions of the holes.

**NOTE:** Be sure existing holes on nose covers align with existing holes in nose cap.

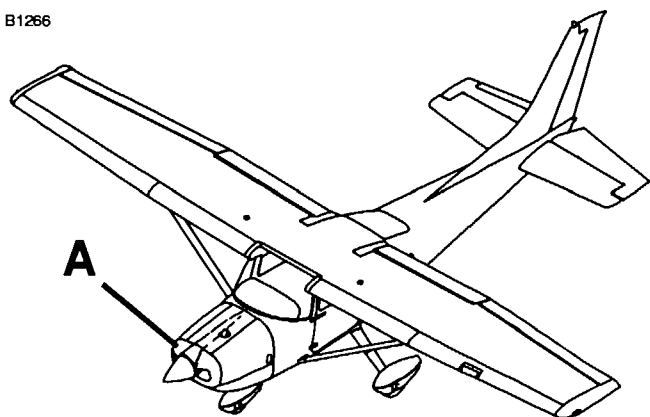
  - (2) Using the newly made marks, drill holes through the nose cap.
  - (3) Remove engine cowlings and upper and lower nose caps from the aircraft.
  - (4) Using the nutplates as a template, mark and drill holes. Countersink holes on the forward side of the nose cap.
  - (5) Install and secure nutplates on the aft side of the nose cap with rivets.
  - (6) Install covers, secure with screws.
- B. Breather Line Insulation Installation. (Refer to Figure 201).
  - (1) Remove clamps from the breather line.
  - (2) Slip insulation tubes over breather line.
  - (3) Secure tube with a small amount of EC1300 cement (3M Corporation) or equivalent in accordance to dimensions shown.

**NOTE:** Ensure vent holes are not covered. If necessary, it is acceptable to trim the insulation.

- (4) Reconnect clamps.

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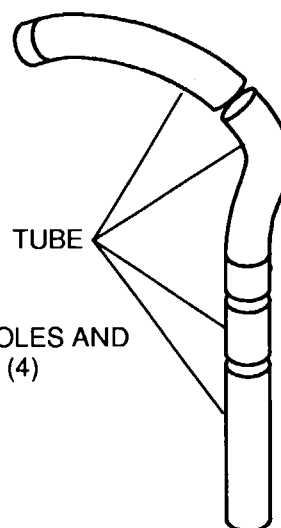
NOSE  
COVER  
(RH)

NOSE  
COVER  
(LH)

PLACARD

SCREW (9)

EXISTING HOLES AND  
NUTPLATES (4)



**DETAIL A**

Winterization Equipment  
Figure 201 (Sheet 1)

0710T1001  
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**PROPELLER HEAT (T182 ONLY) - DESCRIPTION AND OPERATION**

**1. General**

- A. A propeller electrical heated boot system is standard equipment.

**2. Description and Operation**

- A. The system is of an electrothermal type. It has electrically heated boots bonded to each propeller blade. There is a slip ring assembly for power distribution to the propeller boots and a brush block assembly to transfer electrical power to the rotating slip ring. A propeller heat timer/monitor cycles electrical power to the boots in the correct sequence and monitors the boot's heater current. There is propeller heat indication for either correct or failed system operation. A toggle switch labeled PROP HEAT controls the engine propeller heat system.

The propeller heat system also includes a larger alternator for additional current capacity. It has a higher Amp/Hour Battery to support the additional current load required by the propeller heat system.

The propeller heat system applies heat to the surfaces of the propeller blades where ice would normally adhere. This heat, plus centrifugal force and the blast from the airstream, removes accumulated ice.

When the PROP HEAT switch is placed in the ON position, the timer controls electrical power through the brush block and slip ring to the three propeller heat boots in intervals of 90 seconds on and 90 seconds off. The propeller heat system is off when the switch is placed in the OFF position. Operation of the propeller heat system can be checked through the propeller heat annunciation. If the correct amount of current does not flow to all three elements, the timer/monitor recognizes the condition, removes current flow to all heating boots, and turns on the amber PROP HEAT annunciation. The green PROP HEAT annunciation is on during the correct operation of the propeller heat system.

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**PROPELLER HEAT - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101 for airplanes without Garmin G1000 and Figure 102 for airplanes with Garmin G1000.
- B. The propeller heat timer has a 90-second ON cycle and a 90-second OFF cycle. The timer measures the 90-second cycle interval of the de-icing boots and the correct electrical current (12.5 to 19 amps) delivered to the de-icing boots. If the 90-second cycle interval or the electrical current delivered to the de-icing boots is not in permitted limits, the timer causes these to show as faults.

The timer also monitors pin 6 and pin 8 for electrical grounds. If a ground is not applied to pin 6, the timer causes this to show as a fault. If a ground is applied to pin 8, as occurs when one of the crew sets the PROP HEAT switch to TEST, the timer causes this to show as a fault and also resets.

When there are faults, the timer disconnects the power that is supplied to the de-icing boots on pin 1, supplies a ground on pin 3 to start the amber alert, and removes a ground from pin 2 to stop the green alert.

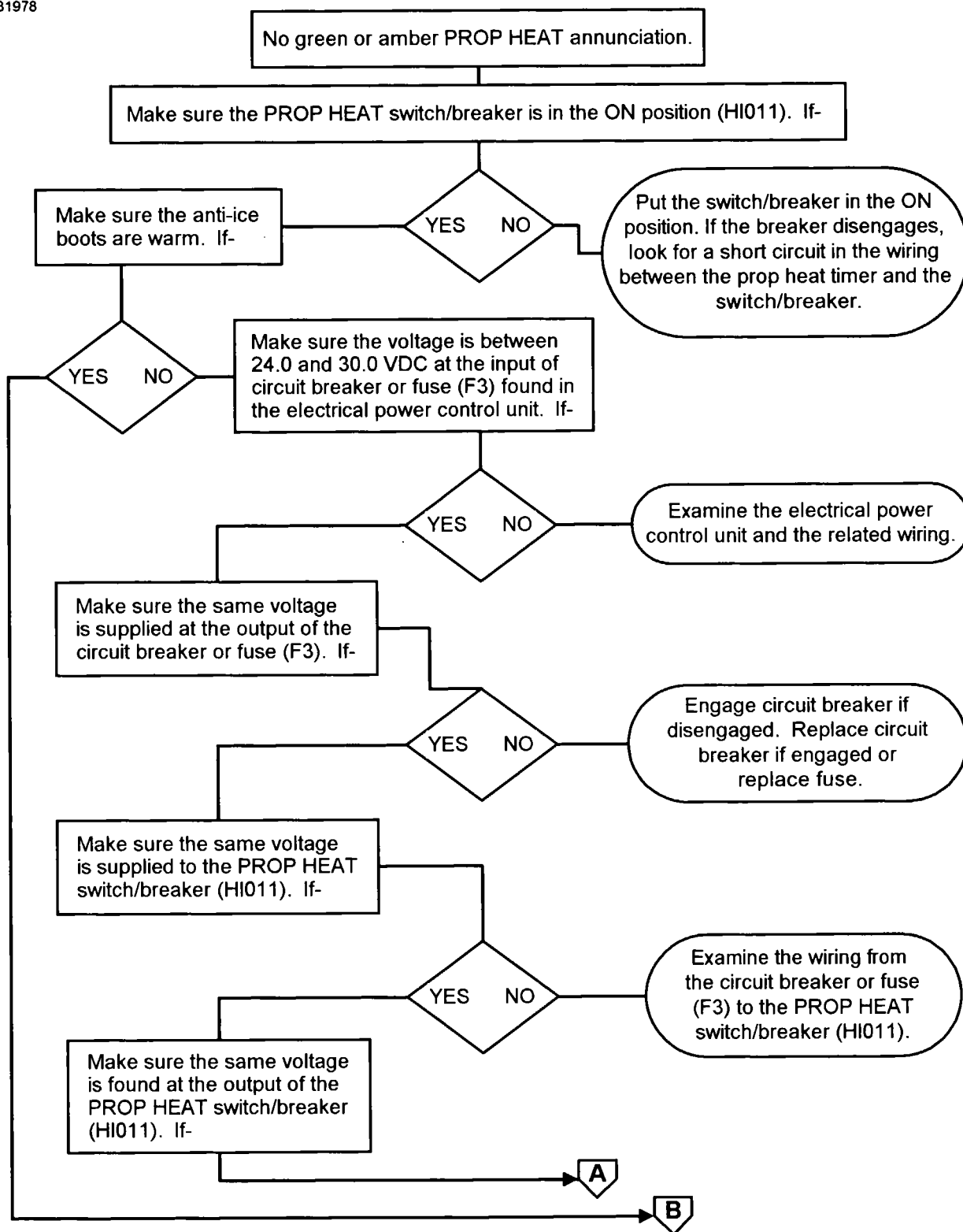
**NOTE:** Operation of the propeller heat system for longer than 60 seconds without the propeller rotation can cause damage to the de-icing boots.

**NOTE:** Operation of the propeller heat system at below 24 volts can result in less than sufficient power for normal operation.



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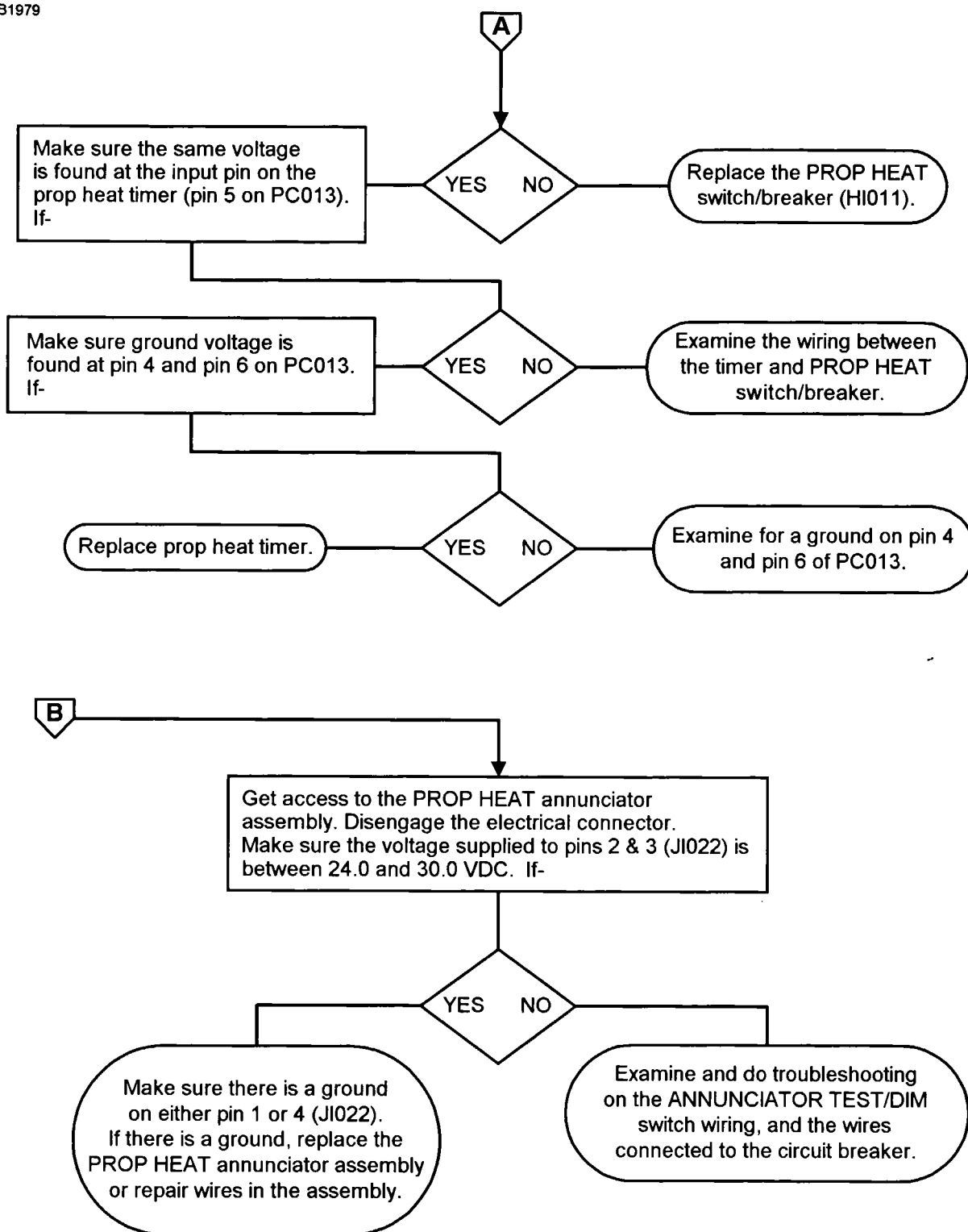
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Propeller Heat Troubleshooting for Airplanes without Garmin G1000  
 Figure 101 (Sheet 1)

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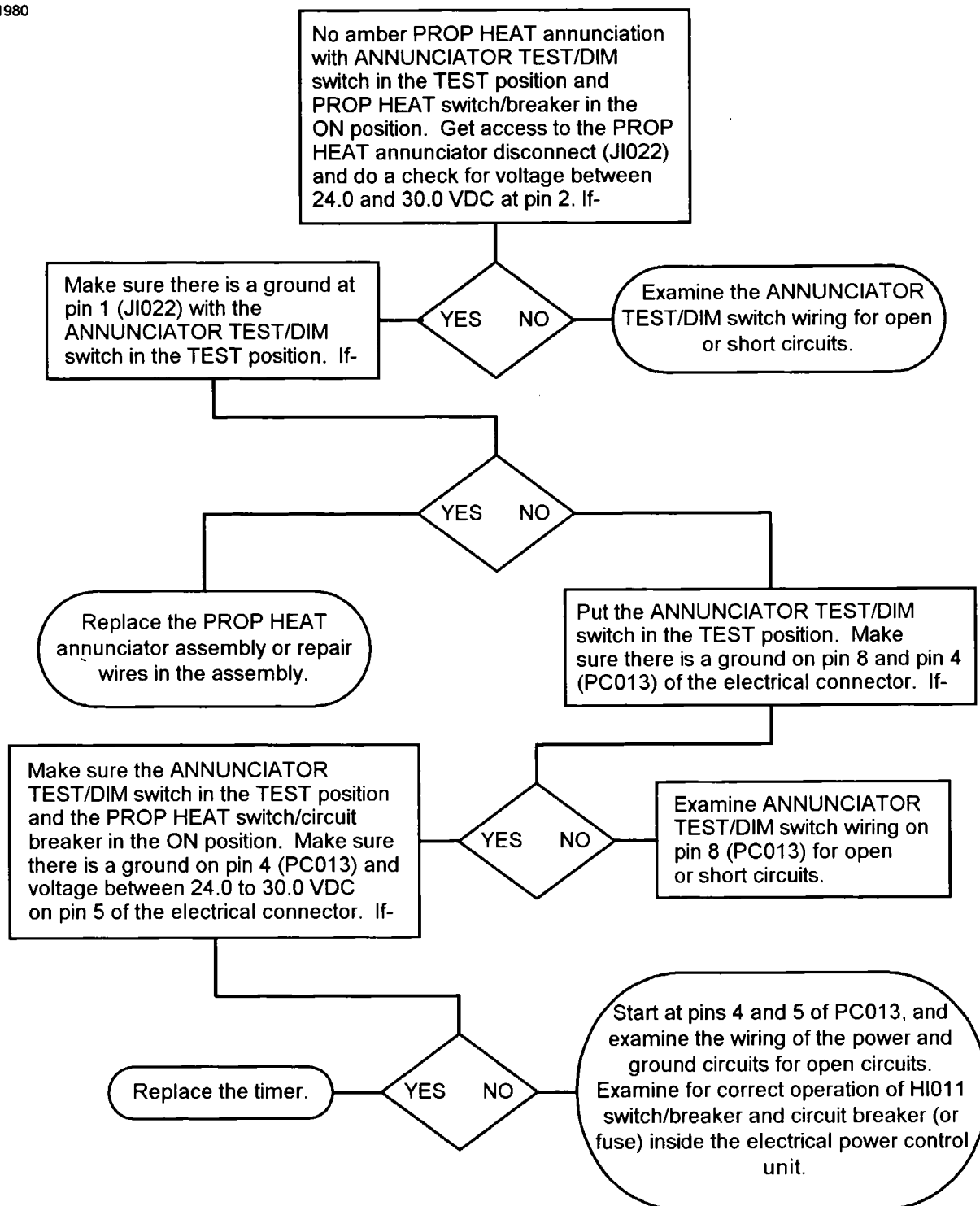
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Propeller Heat Troubleshooting for Airplanes without Garmin G1000  
 Figure 101 (Sheet 2)

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B1980



Propeller Heat Troubleshooting for Airplanes without Garmin G1000  
 Figure 101 (Sheet 3)

**B4208**

Get access to the prop heat timer electrical connector (PC013) and make sure there is bus voltage between 27 and 29 VDC at pin 5 with the PROP HEAT switch/breaker in the ON position and external power supplied. If-

YES NO

Disconnect the deicing boot wires from the terminal blocks and measure the resistance of the individual boots. Do not bend the deicing boot leads a small amount and look for intermittent open circuits. Measure the resistance. Push lightly on the deicing boot heating element surface on the leads. The resistance must not change. Repair the wiring or replace the defective boots if the resistance is not 4.8 ohms, +0.3 or -0.3 ohms.

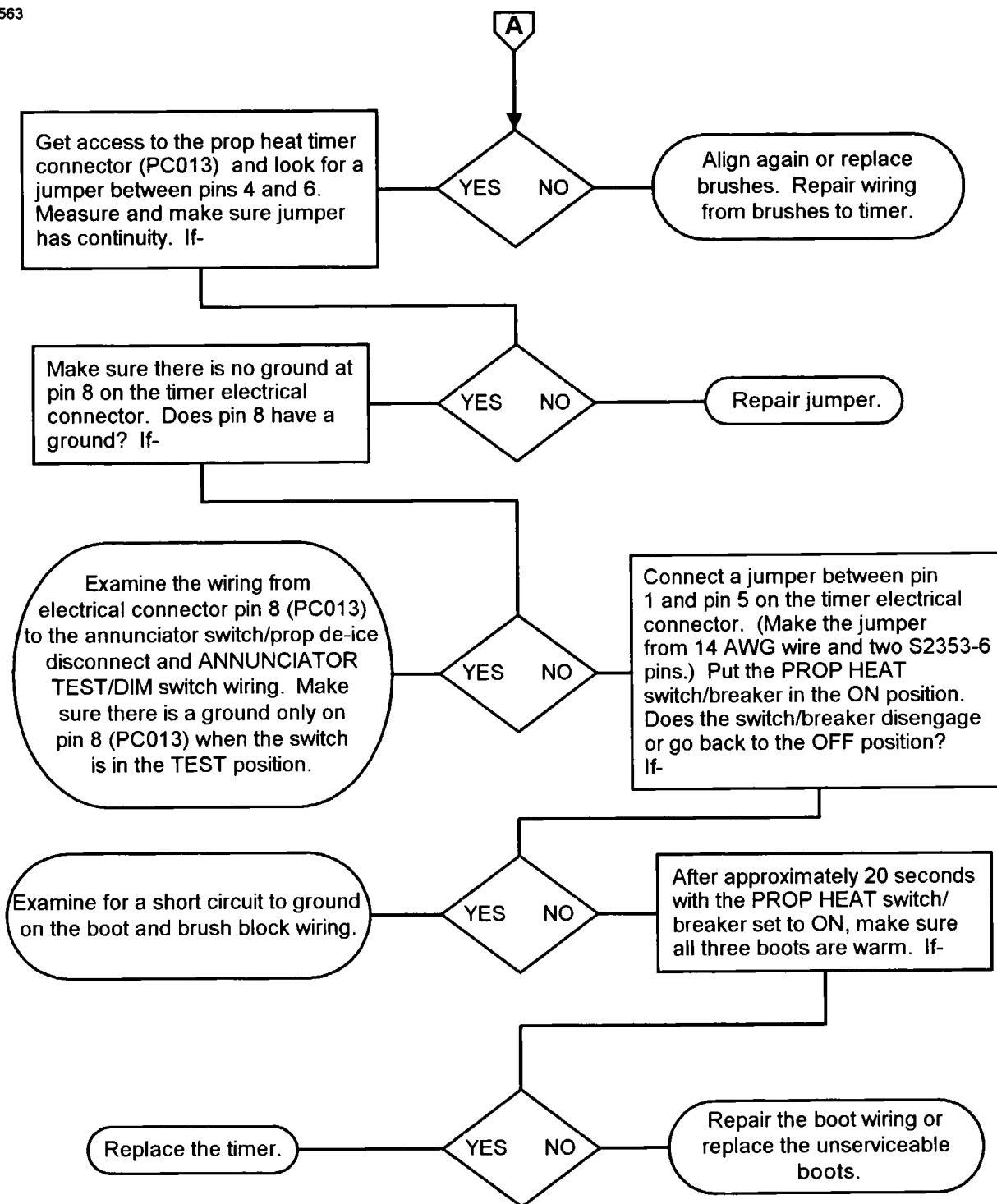
YES NO



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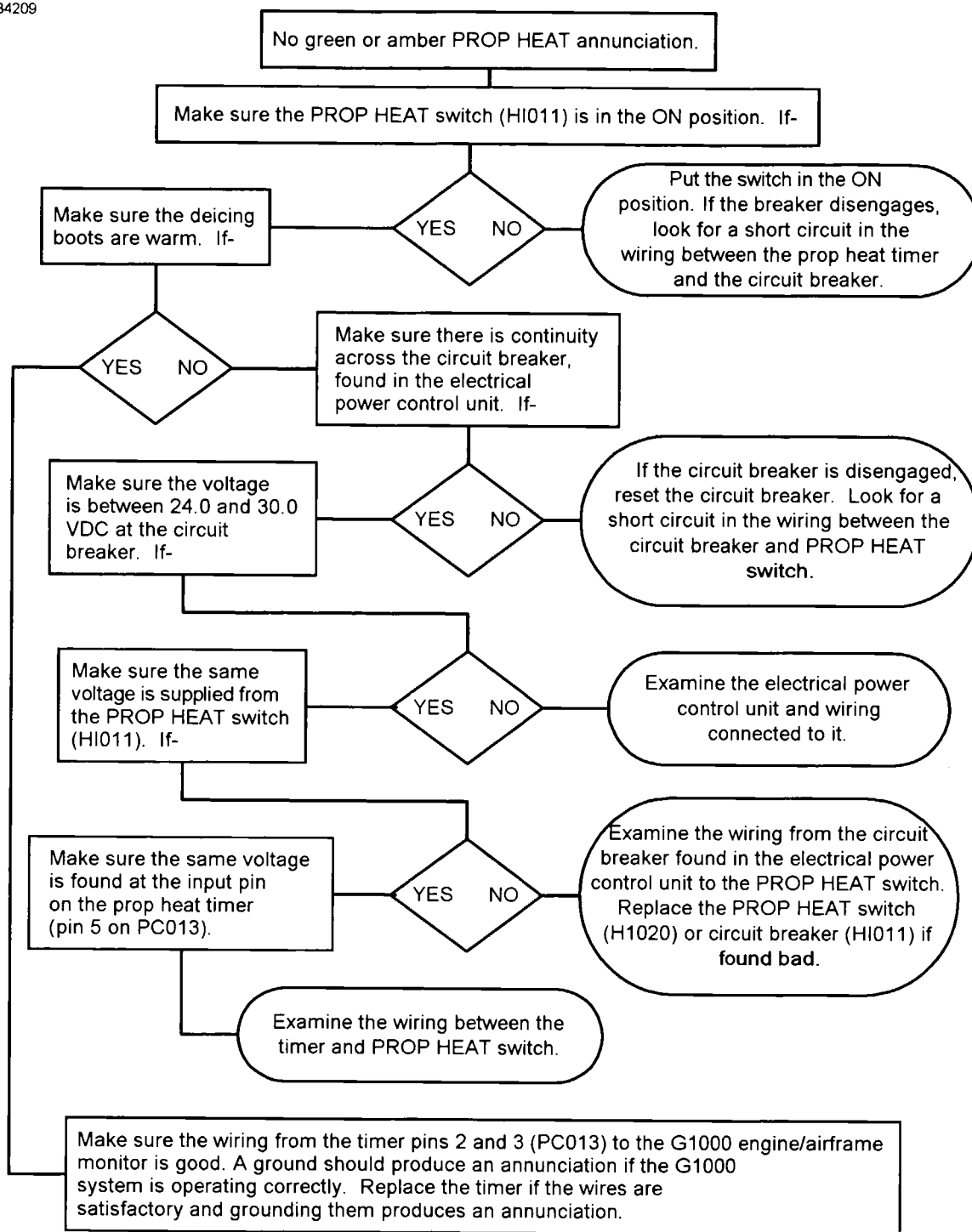
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Propeller Heat Troubleshooting for Airplanes without Garmin G1000  
 Figure 101 (Sheet 5)

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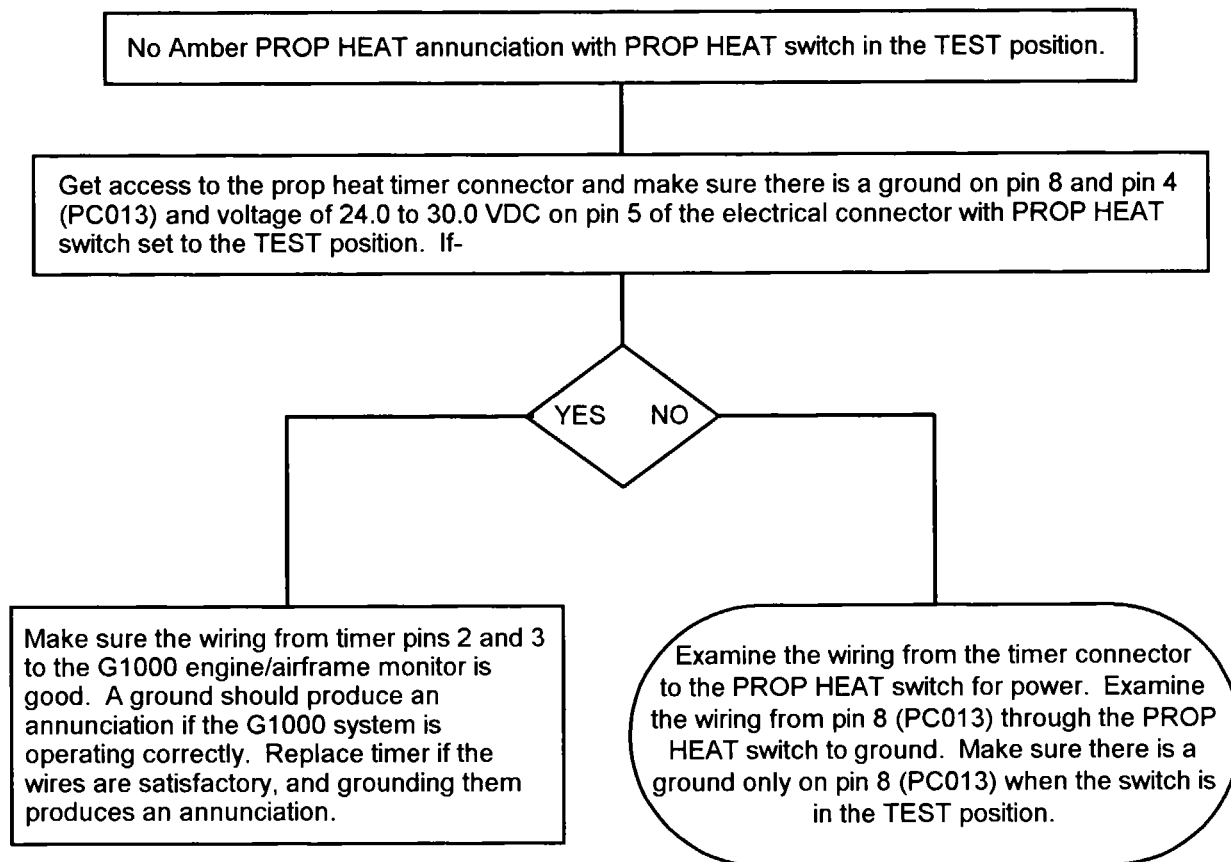
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Propeller Heat Troubleshooting for Airplanes with Garmin G1000  
 Figure 102 (Sheet 1)

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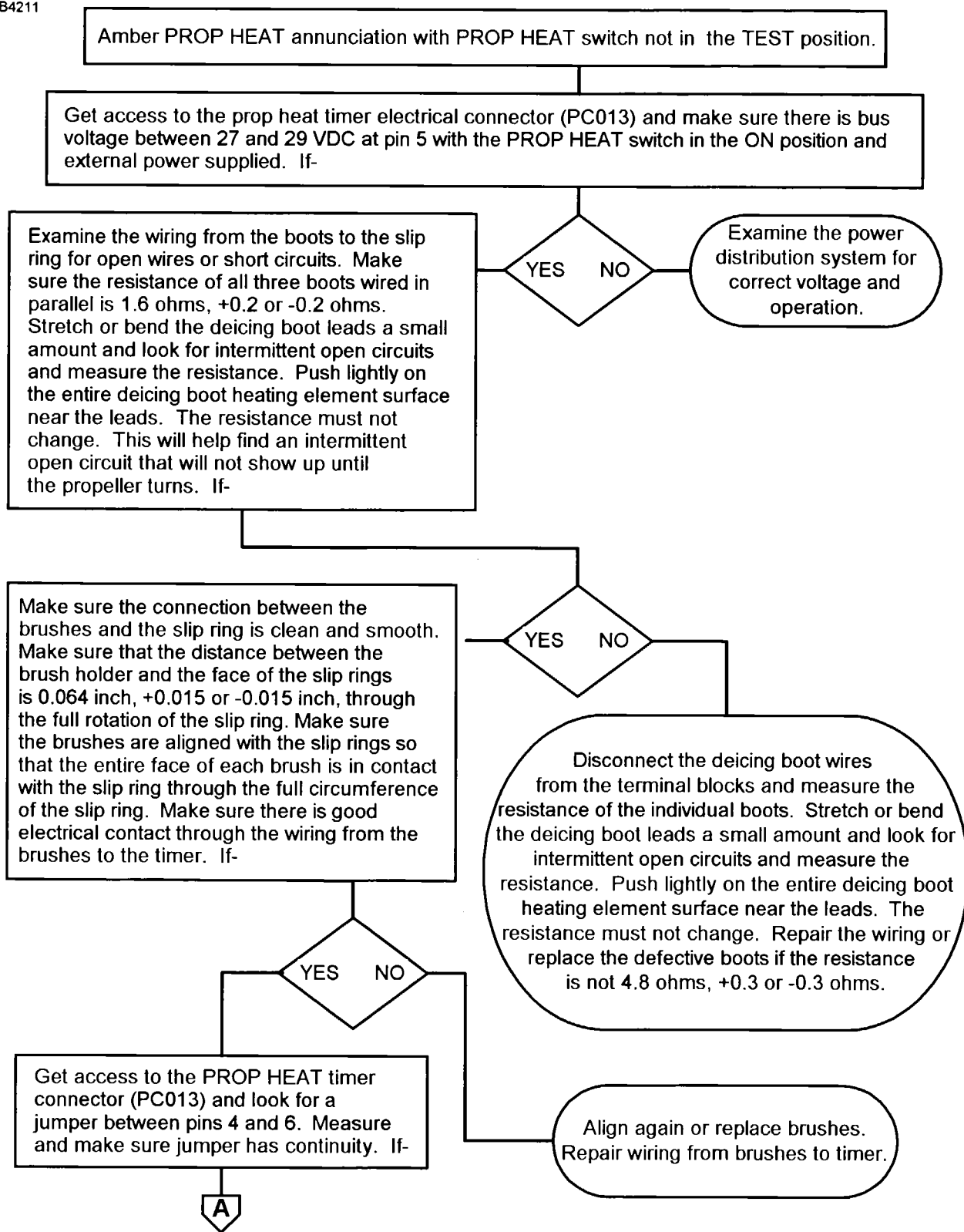
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Propeller Heat Troubleshooting for Airplanes with Garmin G1000  
Figure 102 (Sheet 2)

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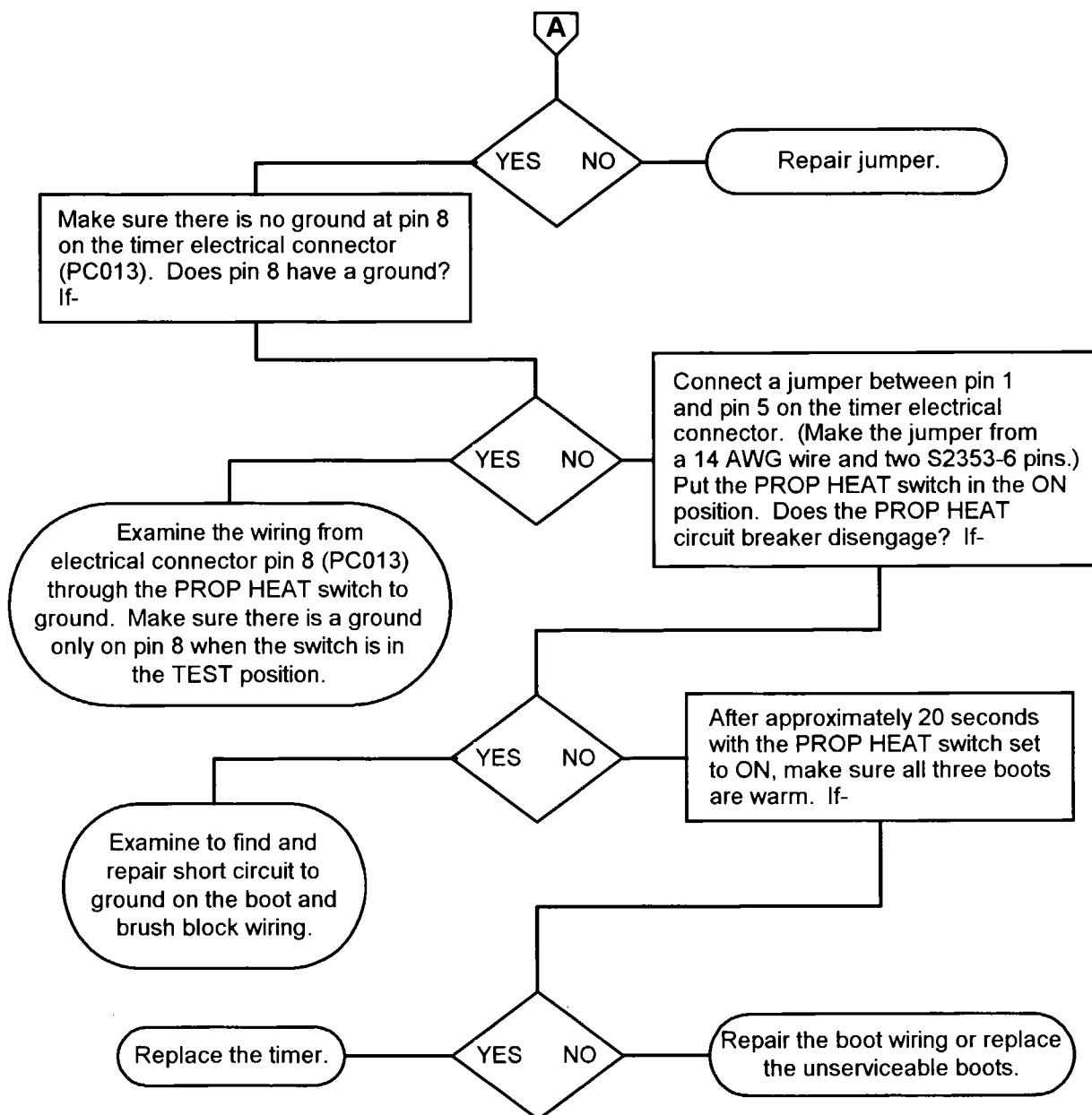


Propeller Heat Troubleshooting for Airplanes with Garmin G1000  
Figure 102 (Sheet 3)



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Propeller Heat Troubleshooting for Airplanes with Garmin G1000  
 Figure 102 (Sheet 4)

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**PROPELLER HEAT - MAINTENANCE PRACTICES**

**1. General**

- A. The following procedures contain the propeller de-ice timer removal/installation and the propeller heat annunciator removal/installation.

**2. Propeller Heat Timer/Monitor Removal/Installation**

- A. Propeller Heat Timer Removal (Refer to Figure 201).  
(1) Set the ALT/BAT MASTER switch to the off position.  
(2) Disconnect the electrical plug (PC013) from the propeller heat timer/monitor.  
(3) Remove the screws attaching the propeller heat timer/monitor to the Pedestal.
- B. Propeller Heat Timer Installation (Refer to Figure 201).  
(1) Set the ALT/BAT MASTER switch to the off position.  
(2) Install the propeller heat timer/monitor to the pedestal.  
(3) Connect the electrical plug (PC013) to the propeller heat timer/monitor.  
(4) Set the ALT/BAT MASTER switch to the ON position.

**3. Propeller Heat Annunciator Removal/Installation**

- A. Propeller Heat Annunciator Removal (Refer to Figure 202).  
(1) Set the ALT/BAT MASTER switch to the off position.  
(2) Remove the screws attaching the annunciator panel to the glareshield.  
(3) Carefully pull the annunciator panel forward.  
(4) Disconnect the electrical plug from the propeller heat annunciator.  
(5) Remove the screws from the attach clip to propeller heat annunciator.  
(6) Remove the clip from the heat annunciator.  
(7) Pull the propeller heat annunciator from the annunciator panel.
- B. Propeller Heat Annunciator Installation  
(1) Press the ALT/BAT MASTER switch to the off position.  
(2) Slide the propeller heat annunciator into annunciator panel.  
(3) Install mounting clip to the propeller heat annunciator using screws.  
(4) Connect electrical plug to the propeller heat annunciator.  
(5) Install the annunciator panel to glareshield using screws.  
(6) Press the ALT/BAT MASTER switch to the ON position.

**4. Deice Boots Removal/Installation**

- A. Refer to the List of Manufacturers Technical Publications, McCauley Electrothermal De-Ice Systems, Service, Parts and Installation Manual.

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**A**

PROPELLER HEAT  
TIMER/MONITOR  
(UC001)

ELECTRICAL  
CONNECTOR  
(PC013)

ELEVATOR TRIM WHEEL

SCREWS

PEDESTAL

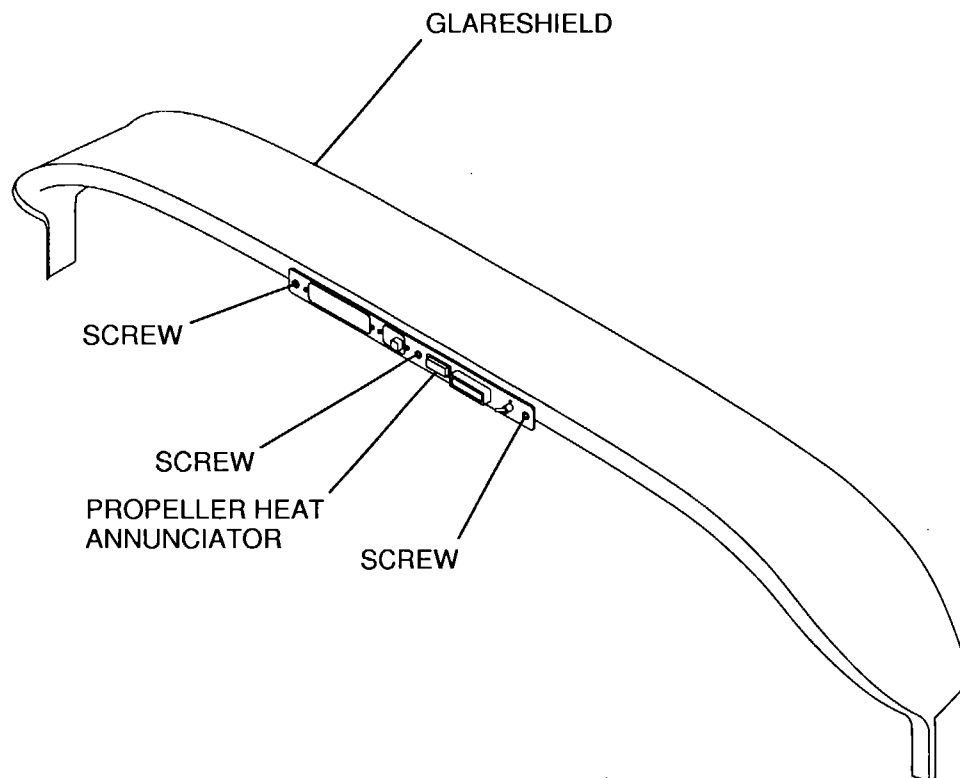
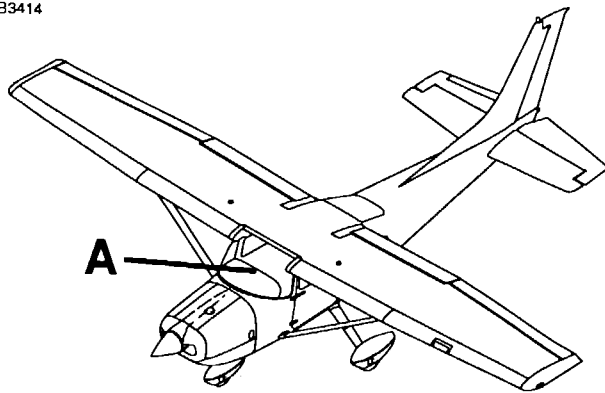
**DETAIL A**

0710T1001  
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Propeller Heat Timer/Monitor  
Figure 201 (Sheet 1)

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**DETAIL A**  
AIRPLANES 18280945 AND ON AND  
AIRPLANES T18208001 AND ON



0710T1001  
A0718T1040

Propeller Heat Annunciator  
Figure 202 (Sheet 1)

**CHAPTER**

# **31**

**INDICATING/  
RECORDING  
SYSTEMS**

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**LIST OF EFFECTIVE PAGES**

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31-List of Effective Pages		
31-Record of Temporary Revisions		
31-Table of Contents		
31-00-00	Page 1	April 1/2002
31-10-00	Pages 201-203	Mar 1/2004
31-10-10	Pages 201-203	Jan 2/2006
31-20-00	Pages 201-202	April 1/2002
31-30-00	Pages 201-202	April 1/2002
31-50-00	Pages 201-203	Jan 2/2006



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**INDICATING/RECORDING SYSTEMS - GENERAL**

**1. Scope**

- A. This chapter contains information on those systems and components used to indicate and/or record various parameters of the engine, airframe or related flight operations. Also included in this chapter is information on the instrument panels that house the indicating/recording systems.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on instrument and control panels provides general removal and installation instructions for the various panels used in the cockpit.
  - (2) The section on indicating provides information on the digital clock.
  - (3) The section on recording provides information on the hour meter.
  - (4) The section on annunciation provides information on the multi-system panel annunciator.

## INSTRUMENT AND CONTROL PANELS - MAINTENANCE PRACTICES

### 1. General

- A. This section gives the removal and installation of different panels of the instrument panel

### 2. Pilot's Center Panel Removal/Installation

- A. Remove the Pilot's Center Panel (Refer to Figure 201).
- (1) Disconnect the negative cable from airplane battery. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Remove the screws that attach the control column collar.
  - (3) Remove the screws that attach the center panel to the pilot's outboard and inboard panels.
  - (4) Put labels on all applicable electrical connections.
  - (5) Disconnect the electrical connections from the applicable instruments.
  - (6) Disconnect all of the pneumatic lines from the instruments.
  - (7) Install caps and plugs on all open pneumatic lines to prevent foreign object debris.
  - (8) Put caps and plugs on all open instrument ports to prevent foreign object debris.
  - (9) Remove pilot's center panel assembly.
- B. Install the Pilot's Center Panel (Refer to Figure 201).
- (1) Remove the caps and plugs from the pneumatic lines and the instrument ports.
  - (2) Connect the applicable pneumatic lines to the instruments.
  - (3) Connect all electrical connections.
  - (4) Remove the labels from the electrical connections.
  - (5) Install the center panel with screws.
  - (6) Install the screws that attach the control column collar.
  - (7) Connect the negative battery cable. Refer to Chapter 24, Battery - Maintenance Practices.

### 3. Pilot's Inboard/Outboard Panel Removal/Installation

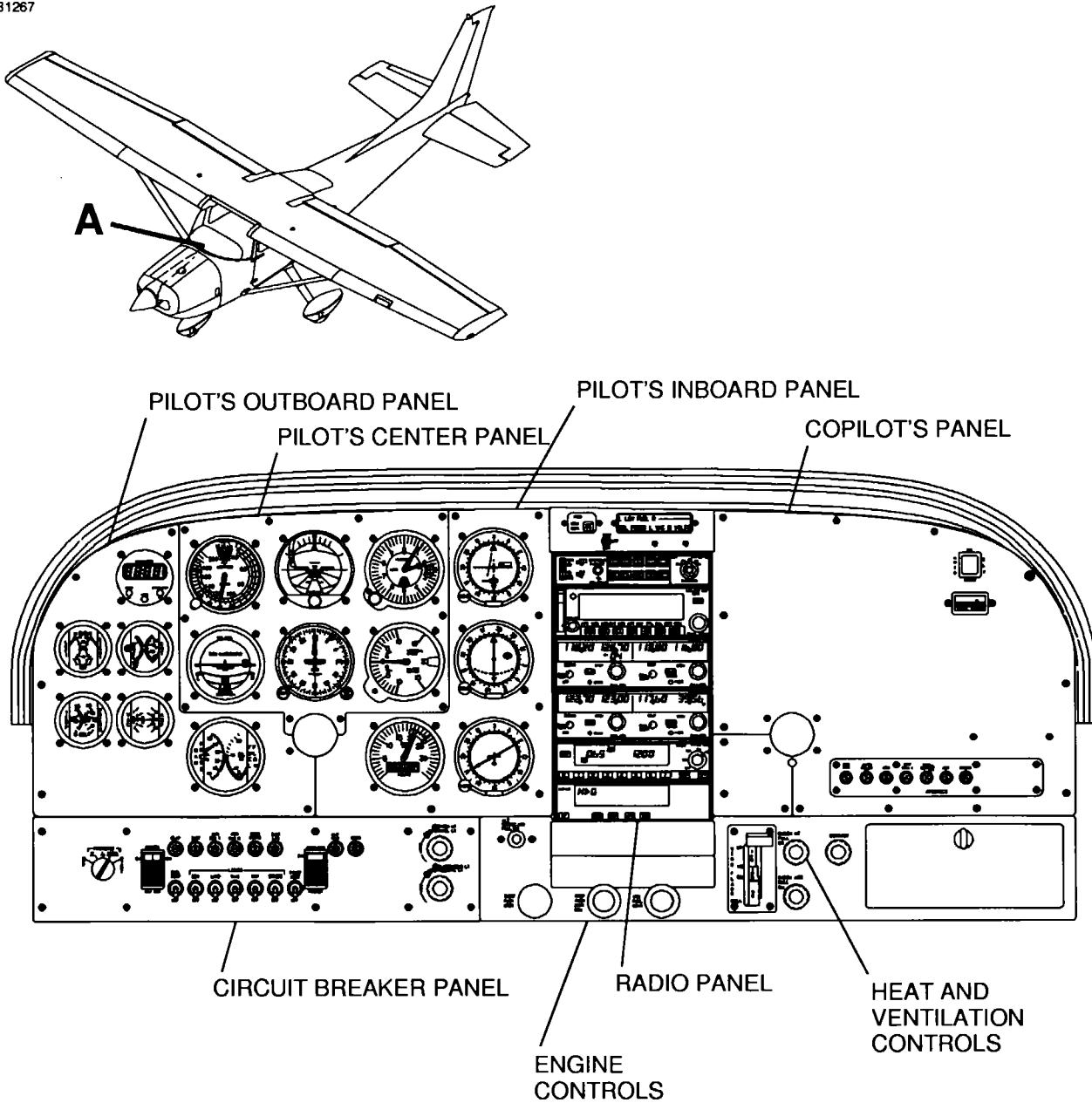
- A. Remove the Pilot's Inboard/Outboard Panel (Refer to Figure 201).
- (1) Disconnect the negative cable from the airplane battery. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Remove the screws that attach the control column collar.
  - (3) Remove the screws that attach the inboard/outboard panel to the pilot's inboard and outboard panels.
  - (4) Put labels on all applicable electrical connections.
  - (5) Disconnect the applicable electrical connections.
  - (6) Remove the panel assembly.
- B. Install the Pilot's Inboard/Outboard Panel (Refer to Figure 201 ).
- (1) Connect all electrical connections.
  - (2) Remove the labels from the electrical connections.
  - (3) Install the inboard/outboard panel with screws.
  - (4) Install the screws that attach the control column collar.
  - (5) Connect the negative battery cable. Refer to Chapter 24, Battery - Maintenance Practices.

### 4. Copilot's Panel Removal/Installation

- A. Remove the Copilot's Panel (Refer to Figure 201).
- (1) Disconnect the negative cable from the airplane battery. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Remove the screws that attach the control column collar.
  - (3) Remove the screws that attach the panel.
  - (4) Put labels on all applicable electrical connections.
  - (5) Disconnect the electrical connections.
  - (6) Remove the panel assembly.
- B. Install the Copilot's Panel (Refer to Figure 201).
- (1) Connect all electrical connections.

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**DETAIL A**  
 AIRPLANES WITH STANDARD AVIONICS

Instrument Panels  
 Figure 201 (Sheet 1)

0710T1001  
 A0718T1001

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- (2) Remove the labels from the electrical connections.
- (3) Install the copilot's panel with screws.
- (4) Install the screws that attach the control column collar.
- (5) Connect the negative battery cable. Refer to Chapter 24, Battery - Maintenance Practices.

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**INSTRUMENT AND CONTROL PANELS - MAINTENANCE PRACTICES**  
**Airplanes with Garmin G1000**

**1. General**

- A. This section covers the removal and installation for the center panel, switch panel, throttle/flap panel, and instrument panel.

**2. Center Panel Removal/Installation**

- A. Remove the Center Panel (Refer to Figure 201).
- (1) Make sure the MASTER ALT/BAT and AVIONICS switches are in the off position.
  - (2) Disengage the STDBY IND-LTS circuit breaker.
  - (3) Remove the screws that attach the center panel to the instrument panel.
  - (4) Carefully pull out the center panel as necessary to get access behind the panel.
  - (5) Install tags for identification on the electrical connectors and hoses and disconnect them from the instruments.
- B. Install the Center Panel (Refer to Figure 201).
- (1) Connect the electrical connectors and hoses to the applicable instruments.
  - (2) Remove the tags from the electrical connectors and hoses.
  - (3) Carefully put the center panel in the instrument panel.
  - (4) Install the screws that attach the center panel.
  - (5) Engage the STDBY IND LTS circuit breaker.

**3. Switch Panel Removal/Installation**

- A. Remove the Switch Panel (Refer to Figure 201).
- (1) Make sure the MASTER ALT/BAT and AVIONICS switches are in the off position.
  - (2) Remove the screws that attach the switch panel to the instrument panel.
  - (3) Carefully pull the switch panel out from the instrument panel to get access behind the panel.
  - (4) Disconnect the switches from the electrical connections.
- B. Install the Switch Panel (Refer to Figure 201).
- (1) Connect the electrical connections to the switches.
  - (2) Put the switch panel in the instrument panel.
  - (3) Attach the switch panel with the screws.

**4. Throttle/Flap Panel**

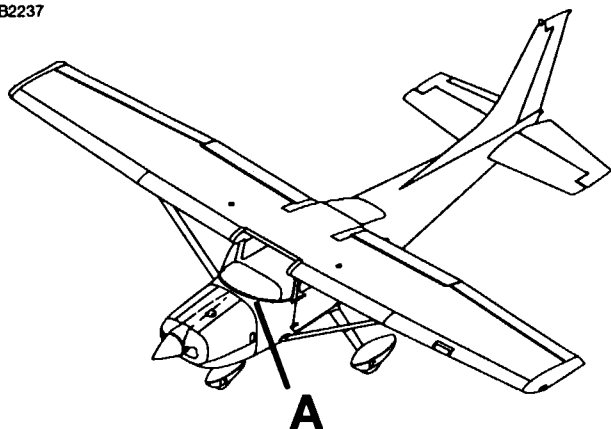
- A. Throttle/Flap Panel Removal (Refer to Figure 201).
- (1) Disconnect the negative cable from airplane battery. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Make sure the MASTER ALT/BAT and AVIONICS switches are in the off position.
  - (3) Remove the screws that attach the throttle/flap panel to the instrument panel.
  - (4) Carefully pull the throttle/flap panel out from the instrument panel to get access behind the panel.
  - (5) Disconnect the switches from the electrical connections.
- B. Throttle/Flap Panel Installation (Refer to Figure 201).
- (1) Connect the electrical connections to the switches.
  - (2) Put the throttle/flap panel in the instrument panel.
  - (3) Attach the throttle/flap panel with the screws.
  - (4) Connect the negative battery cable. Refer to Chapter 24, Battery - Maintenance Practices.

**5. Instrument Panel Removal/Installation**

- A. Remove the Instrument Panel (Refer to Figure 201).
- (1) Disconnect electrical power to the airplane.
    - (a) Make sure the AVIONICS switch is in the off position.
    - (b) Disengage the two PFD circuit breakers, the MFD, STDBY BATT, STDBY IND-LTS AUDIO circuit breakers.

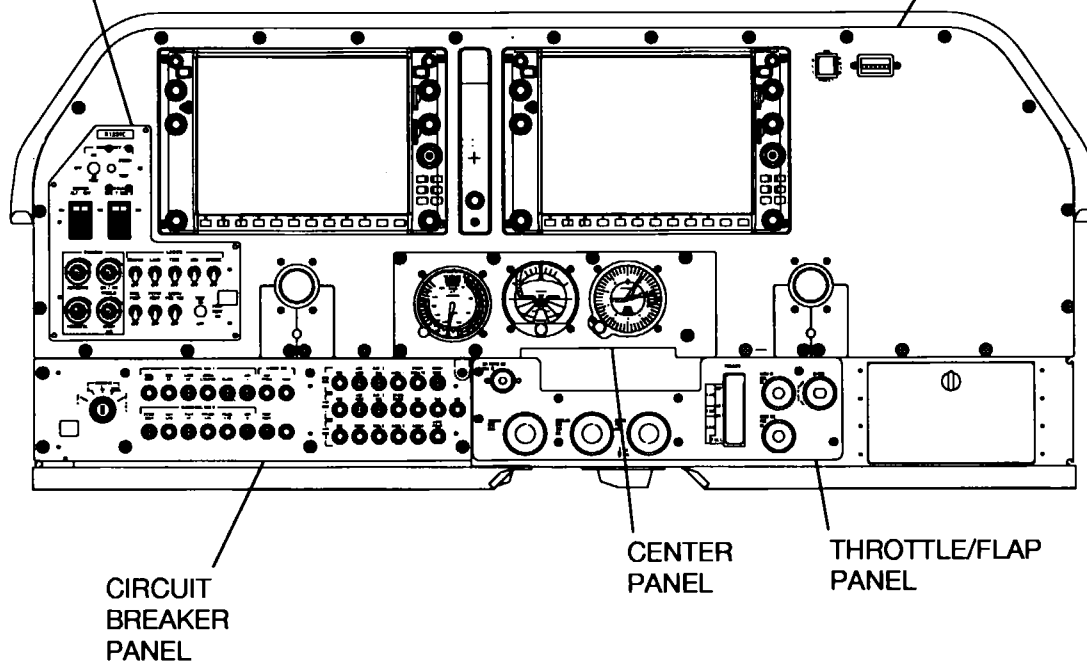
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SWITCH  
PANEL

INSTRUMENT  
PANEL



**DETAIL A**  
AIRPLANES WITH GARMIN G1000

Instrument and Control Panel Installation  
Figure 201 (Sheet 1)

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- (2) Remove the center panel. Refer to Center Panel - Removal/Installation.
- (3) Remove the switch panel. Refer to Switch Panel - Removal/Installation.
- (4) Remove the throttle/flap panel. Refer to Throttle/Flap Panel - Removal/Installation.
- (5) Remove the Audio Panel. Refer to Audio Panel - Maintenance Practices.
- (6) Remove the screws that attach the control column collars to the instrument panel.
- (7) Remove the hourmeter to the instrument panel.
  - (a) Remove the screws for the hourmeter.
  - (b) Pull the hourmeter out and disconnect the connector.
- (8) Remove the Control Display Units (CDU).
  - (a) Disengage the quick release fasteners.
  - (b) Carefully pull the CDU away from the instrument panel and disconnect the electrical connector.
- (9) Remove the screws from the instrument panel.

**NOTE:** The ELT switch can only be removed from the back of the instrument panel.

- (10) Disconnect and remove the ELT switch from the instrument panel.
  - (11) Remove the instrument panel.
- B. Install the Instrument Panel (Refer to Figure 201).
- (1) Set the instrument panel in position.
  - (2) Install the ELT switch and connect the electrical connector.
  - (3) Install the instrument panel screws.
    - (a) Make sure to put the electrical connector for the hourmeter through the panel hole for the hourmeter installation.
  - (4) Connect the electrical connector to the hourmeter.
  - (5) Install the hourmeter.
  - (6) Attach the collar for the control column to the instrument panel.
  - (7) Set the throttle/flap panel in position and connect the electrical connections to the switches.
  - (8) Install the throttle/flap panel to the instrument panel with the screws.
  - (9) Set the switch panel in position and connect the electrical connections to the switches.
  - (10) Install the switch panel to the instrument panel with the screws.
  - (11) Set the center panel in position and connect the electrical connectors and vacuum hoses to the instruments.
  - (12) Install the center panel to the instrument panel with the screws.
  - (13) Set the Control Unit Displays (CDU's) in position and connect the electrical connector.
  - (14) Install the CDU's with the quick release fasteners to the instrument panel.
  - (15) Engage the two PFD circuit breakers, the MFD, STDBY BATT, STDBY IND-LTS AUDIO circuit breakers.

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**DIGITAL CLOCK - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The digital clock is located in the upper left side of the instrument panel. The unit also gives an indication of the temperature and voltage.

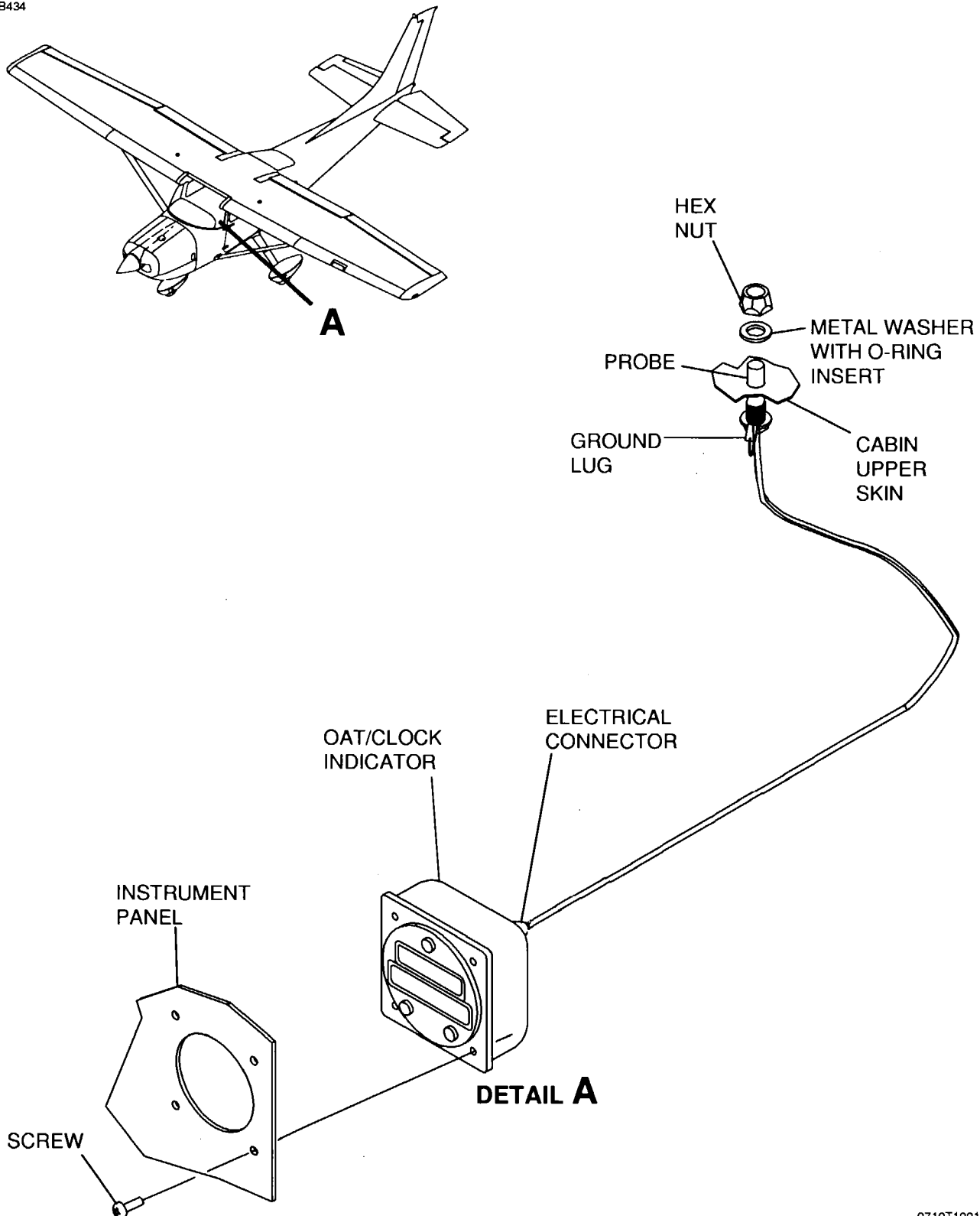
**2. Digital Clock Removal/Installation**

- A. Remove the Digital Clock (Refer to Figure 201).
  - (1) Press the ALT/BAT MASTER switch to the off position.
  - (2) Remove the screws that attach the digital clock to the instrument panel.
  - (3) Carefully pull the digital clock out from the instrument panel and disconnect the electrical connector.
- B. Install Digital Clock (Refer to Figure 201).
  - (1) Connect the electrical connector to the digital clock.
  - (2) Set in position the digital clock in the instrument panel and attach with the screws.
  - (3) Press the ALT/BAT MASTER switch to the ON position.



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Digital Clock Installation  
Figure 201 (Sheet 1)

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**HOURLY METER - MAINTENANCE PRACTICES**

**1. Description and Operation**

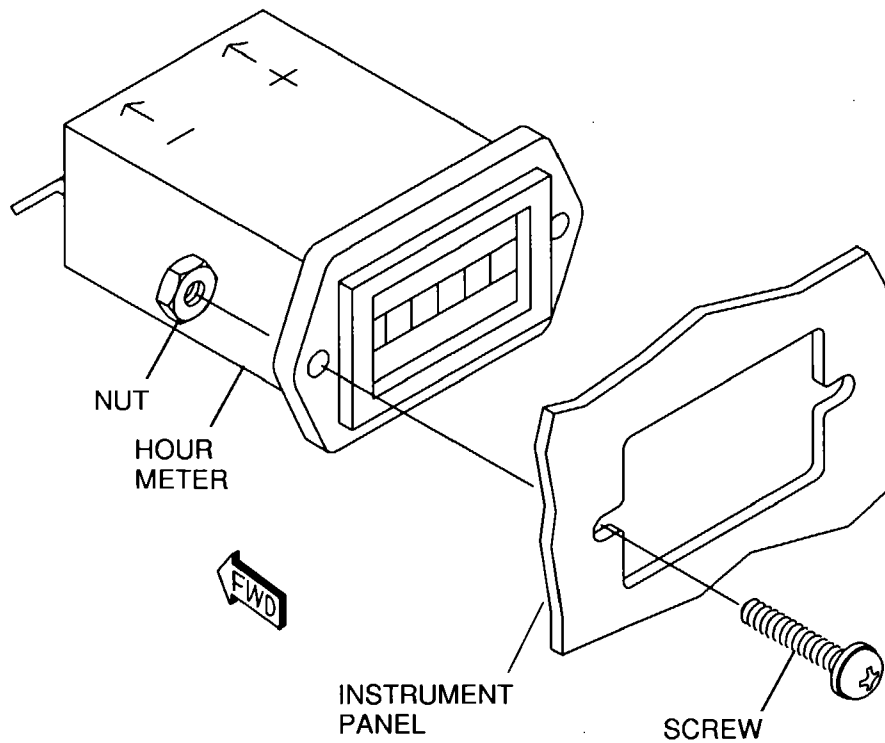
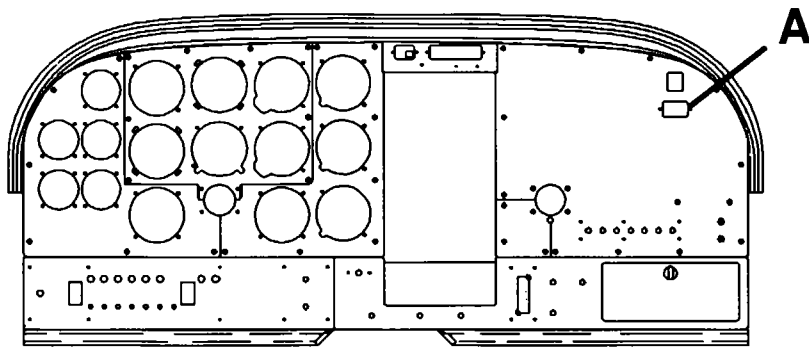
- A. The hour (Hobbs) meter is located in the upper right corner of the instrument panel and provides indication of flight hours based on engine operation.
- B. The hour meter (EI003) receives power through the WARN circuit breaker (HI022) located on the lower instrument panel. The hour meter is grounded through the Oil Pressure Switch (SN001), and anytime oil pressure exceeds 20 PSI a ground is sent from the switch to the hour meter, completing a circuit and activating the hour meter.

**2. Hour Meter Removal/Installation**

- A. Remove Hour Meter (Refer to Figure 201).
  - (1) Gain access to backside of instrument panel and hold nuts while loosening screws.
  - (2) Disconnect electrical connectors leading into hour meter.
- B. Install Hour Meter (Refer to Figure 201).
  - (1) Connect electrical connectors to hour meter.
  - (2) Install hour meter to panel and secure using screws and nuts.

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**DETAIL A**

0718T1002  
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Hour Meter Installation  
 Figure 201 (Sheet 1)

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**ANNUNCIATOR PANEL - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The annunciator panel is a multi-system display that gives visual warning and caution information for some systems and fuel levels for the airplane. The annunciator shows this visual information in amber (caution) or red (warning) messages. Refer to Table 201 for a breakdown of the messages and sources.
- B. Table 201 gives a general description of the annunciator system and its inputs. Use this table with the Wiring Diagram Manual to help with system troubleshooting.

Table 201. Annunciator Panel Messages and Inputs

MESSAGE	COLOR	MEANING	SOURCE OF SIGNAL
L LOW FUEL	Amber	Low fuel condition found in the left tank.	Left fuel quantity system.
LOW FUEL R	Amber	Low fuel condition found in the right tank.	Right fuel quantity system.
L LOW FUEL R	Amber	Low fuel condition found in the left and the right fuel tanks.	Left and right fuel quantity systems.
L LOW FUEL and left fuel gauge needle stays below 0	Amber	Short, open or increasing resistance over time.	Left fuel transmitter or electrical line between transmitter and fuel gauge.
LOW FUEL R and right fuel gauge needle stays below 0	Amber	Short, open or increasing resistance over time.	Right fuel transmitter or electrical line between transmitter and fuel gauge.
L LOW FUEL R and both fuel gauge needles stay below 0	Amber	Short, open or increasing resistance over time.	Left and right transmitters or electrical lines between transmitters and fuel gauge.
OIL PRESS	Red	Oil pressure less than 20 PSI.	Oil pressure switch supplies ground to annunciator.
L VAC	Amber	Vacuum less than 3.0 In. Hg.	Left vacuum switch supplies ground to annunciator.
VAC R	Amber	Vacuum less than 3.0 In. Hg.	Right vacuum switch supplies ground to annunciator.
L VAC R	Amber	Vacuum less than 3.0 In. Hg.	Right vacuum switch and left vacuum switch supply ground to annunciator.

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Table 201. Annunciator Panel Messages and Inputs (continued)

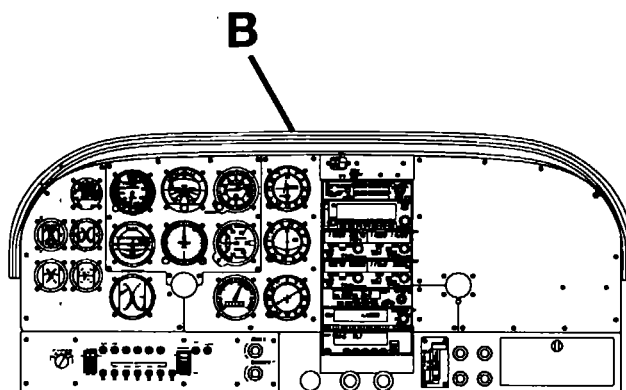
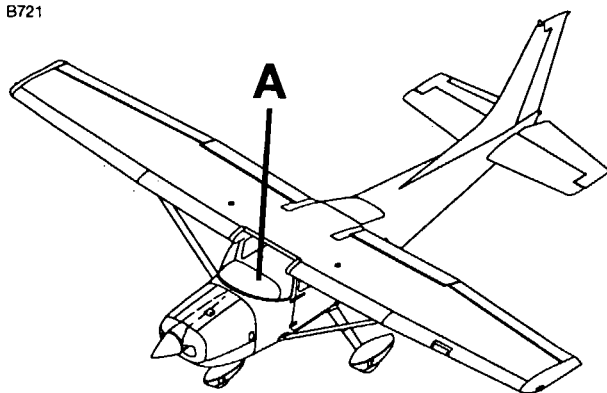
MESSAGE	COLOR	MEANING	SOURCE OF SIGNAL
VOLTS	Red	Voltage less than 24.5 VDC, $\pm 0.35$ VDC.	Ground from the alternator control unit to the annunciator panel.
PITCH TRIM	Red	Autopilot pitch trim failure.	Autopilot flight computer.
TERR N/A	Amber	Ground proximity warning.	KAC 502 EGPWS module installed in the KMD-540 multi-function display.

**2. Annunciator Panel Removal/Installation**

- A. Annunciator Panel Removal (Refer to Figure 201).
- (1) Remove electrical power from the airplane.
  - (2) Get access to back side of annunciator panel and disconnect electrical connectors.
  - (3) Remove screws that attach annunciator panel to instrument panel.
  - (4) Carefully remove the annunciator panel from the airplane.
- B. Annunciator Panel Installation (Refer to Figure 201).
- (1) Connect electrical connectors to annunciator panel.
  - (2) Put the annunciator panel in position on the instrument panel and attach it with the screws.
  - (3) Connect electrical power to the airplane.
  - (4) Do a check of the annunciator panel for correct operation.

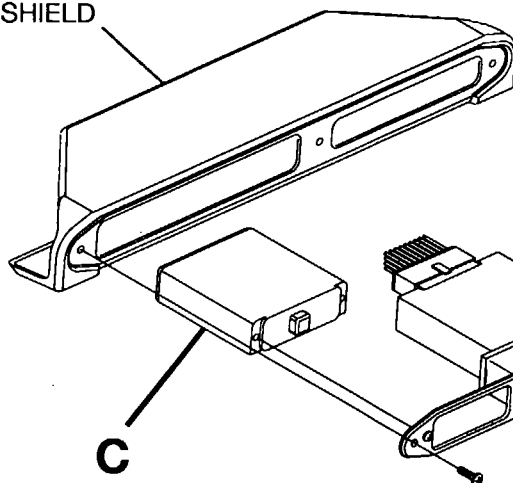
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**DETAIL A**

INSTRUMENT PANEL  
GLARESHIELD



**D**

BEZEL

SWITCH

**DETAIL B**

ELECTRICAL  
CONNECTOR

BEZEL

BEZEL  
SCREW

**DETAIL D**

ANNUNCIATOR  
UNIT

LENS

BEZEL

BEZEL  
SCREW

**DETAIL C**

**NOTE 1:** ANNUNCIATOR PANEL CONFIGURATION  
CAN BE DIFFERENT THAN SHOWN.

0710T1001  
 A1218T1001  
 B1218T1068  
 C1218T1068  
 D1218T1068

Annunciator Panel Installation  
 Figure 201 (Sheet 1)

**CHAPTER**

**32**

**LANDING GEAR**

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**LIST OF EFFECTIVE PAGES**

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32-List of Effective Pages		
32-Record of Temporary Revisions		
32-Table of Contents		
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32-10-00	Pages 101-103	April 1/2002
32-10-00	Pages 201-212	Jul 3/2006
32-20-00	Pages 101-104	April 1/2002
32-20-00	Pages 201-212	Jul 3/2006
32-40-00	Pages 201-205	Mar 1/2004
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**LANDING GEAR - GENERAL**

**1. Scope**

- A. This chapter contains maintenance information concerning the landing gear and associated components which provide means of supporting, braking, and steering the airplane.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on main landing gear provides troubleshooting, maintenance practices and adjustment instructions for the main landing gear.
  - (2) The section on nose landing gear provides troubleshooting, maintenance practices and inspection/checks for the nose landing gear.
  - (3) The section on wheels and brakes provides troubleshooting, maintenance practices and adjustment/test instructions for the main gear brake system.
  - (4) The section on main landing gear wheel and axle provides maintenance practices and inspection/checks.
  - (5) The section on nose landing gear wheel provides maintenance practices and inspection/checks.
  - (6) The section on the brake system provides troubleshooting, maintenance practices and inspection/checks.

**3. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Adhesive	EA9309.3NA	Hysol Div. Dexter Corp. 15051 E. Don Julian Rd. Industry, CA	To bond main landing gear step bracket.
Tape	P840306	Commercially Available	To cover main gear strut at upper end where strut fairing could cause chafing.
Lubricant	Universal Dynaplex 21C Regular	Commercially Available	To apply to upper unpainted end of main gear strut before installation.
Rivet Setting Kit	199-1	Cessna Aircraft Company Cessna Parts Distribution Department 701, CPD2 5800 East Pawnee Road Wichita, Kansas 67218-5590	To rivet brake linings to back plate.

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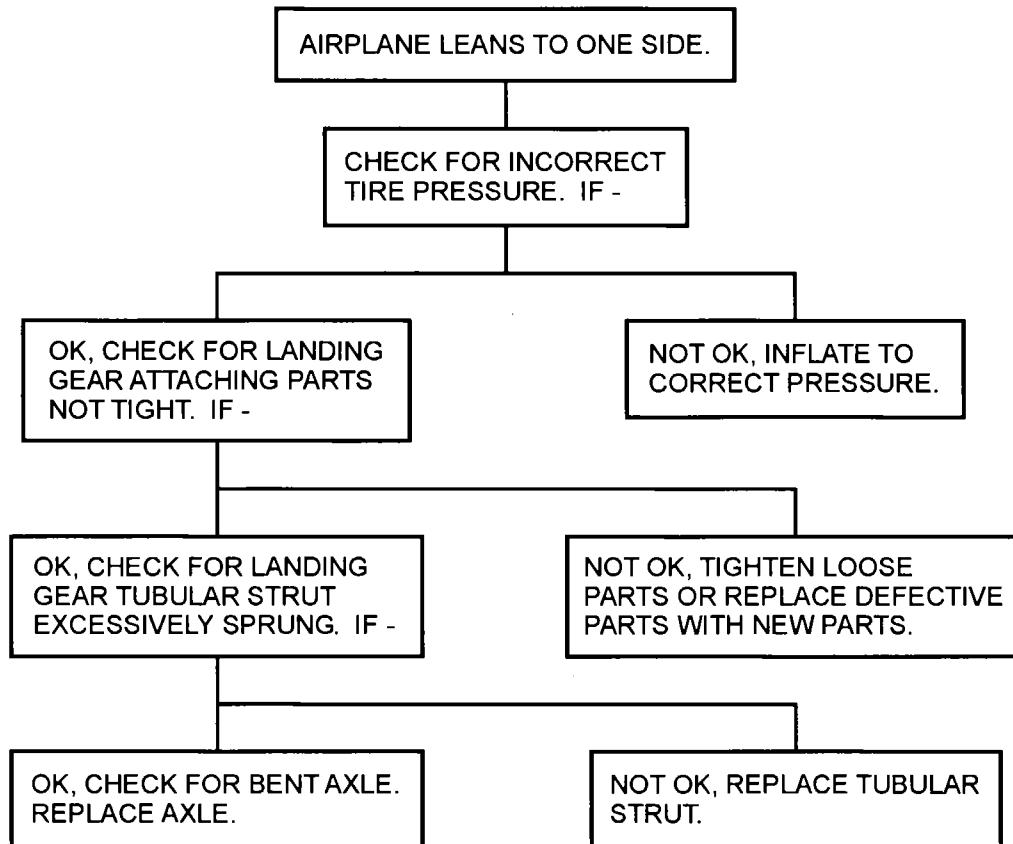
**MAIN LANDING GEAR - TROUBLESHOOTING**

**1. Troubleshooting**

- A. A troubleshooting chart has been developed to aid the maintenance technicians in system understanding. Refer to Figure 101.

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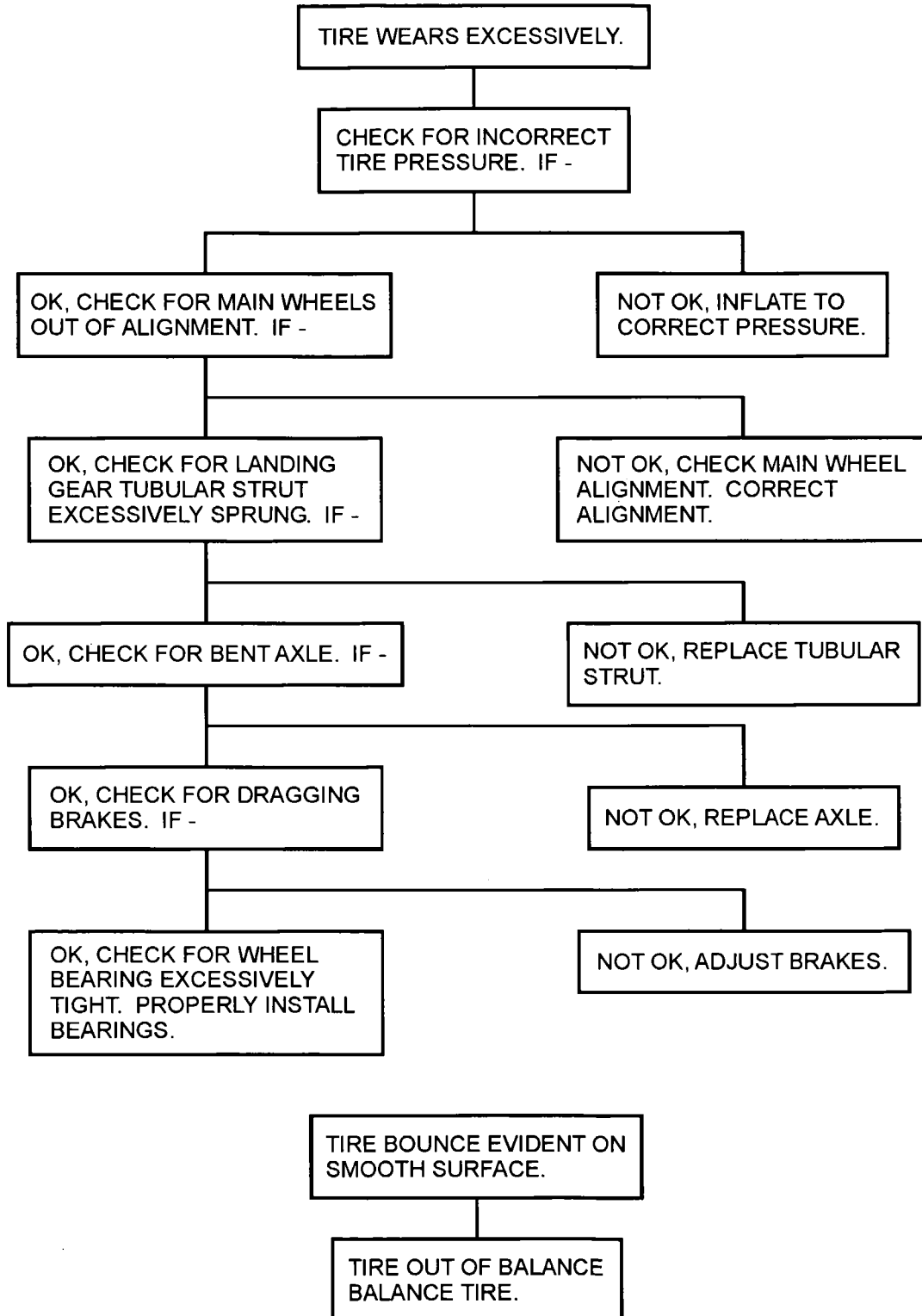
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Main Landing Gear Troubleshooting Chart  
Figure 101 (Sheet 1)

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Main Landing Gear Troubleshooting Chart  
Figure 101 (Sheet 2)

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**MAIN LANDING GEAR - MAINTENANCE PRACTICES**

**1. General**

- A. The main landing gear maintenance practices give removal/installation instructions for the left main landing gear. Removal/installation for the right main landing gear is typical unless noted.
- B. The tubular, spring-steel main landing gear struts are attached to the aircraft at inboard and outboard forgings in the belly of the aircraft. A bracket is bonded to each strut for attachment of a step. Hydraulic brake lines go down the main gear struts. The axles, main wheels, and brake assemblies are installed at the lower end of each strut.
- C. The aircraft has fuselage fairings, attached to the fuselage and the tubular strut fairings with screws. The tubular strut fairings cover the tubular landing gear struts, and attach to the fuselage fairings at the upper end and to cover plates at the lower end. The cover plates attach to the tubular strut fairings at the upper end and are clamped to the tubular struts at the lower end. Brake fairings are installed at the lower end of the tubular strut fairings and are attached to the wheel speed fairings by screws around their outer perimeters. The speed fairings are installed over the wheels and are attached to mounting plates attached to the axles. The wheel fairings have adjustable scrapers installed in the lower aft part of the fairings directly behind the wheels.

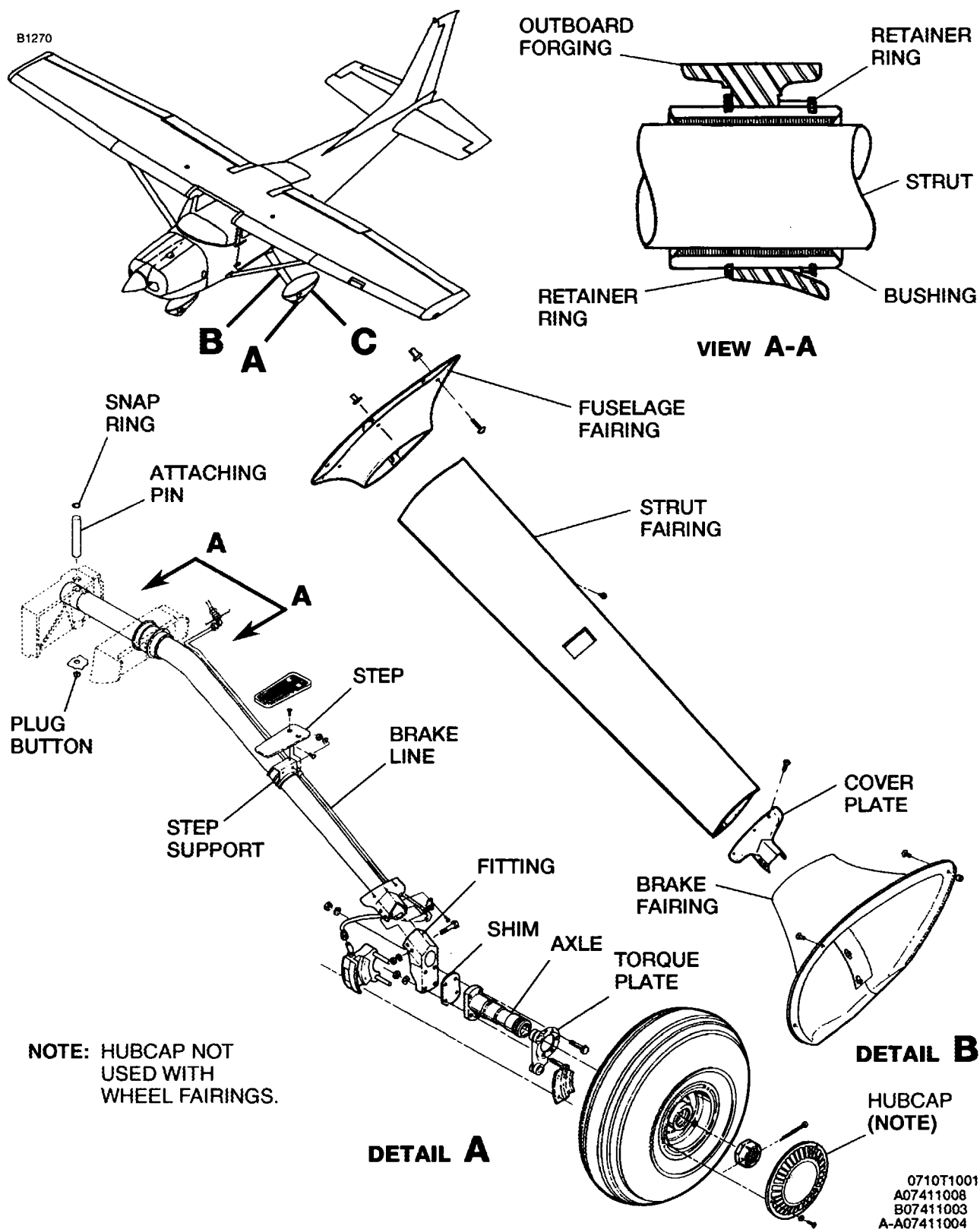
**2. Main Landing Gear Fairings Removal/Installation**

- A. Brake Fairing Removal (Refer to Figure 201).
  - (1) Remove the screws from the lower side of the brake fairing.
  - (2) Remove the brake fairing from the landing gear.
- B. Brake Fairing Installation (Refer to Figure 201).
  - (1) Put the brake fairing over the landing gear.
  - (2) Install the screws to the lower side of the brake fairing.
- C. Main Wheel Speed Fairing Removal (Refer to Figure 201).
  - (1) Remove and keep the screws that attach the brake fairing to the main wheel speed fairing.
  - (2) Remove the screws that attach the main wheel speed fairing to the mounting plate.
  - (3) Remove the bolt that attaches the outboard side of the main wheel speed fairing to the axle nut.
  - (4) Loosen the scraper, if necessary, and remove the main wheel speed fairing from the wheel.
- D. Main Wheel Speed Fairing Installation (Refer to Figure 201).
  - (1) Put the speed fairing over the wheel. Adjust the scraper if necessary.
  - (2) Install the bolt that attaches the outboard side of the main wheel speed fairing to the axle nut.
  - (3) Install the screws that attach the main wheel speed fairing to the attach plate, which is bolted to the axle.
  - (4) Install the screws that attach the brake fairing to the main-wheel speed fairing.

**CAUTION:** You must keep the scraper clean for the tire to turn correctly. Make sure you complete a check of the clearance every time the scraper has been disturbed, the tire changed, and when you install the speed fairings. You can cause damage to the equipment if the correct clearance is not set between the tire and the scraper. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct movement.

- (5) Do a check of the clearance between the tire and the scraper.
  - (a) Clean off any dirt or ice that has collected on the scraper.
  - (b) Adjust the clearance as necessary to have a minimum of 0.55 inch (14 mm) to a maximum of 0.80 inch (20 mm).
- (6) Remove any fuel and oil from the speed fairings to prevent stains and deterioration.

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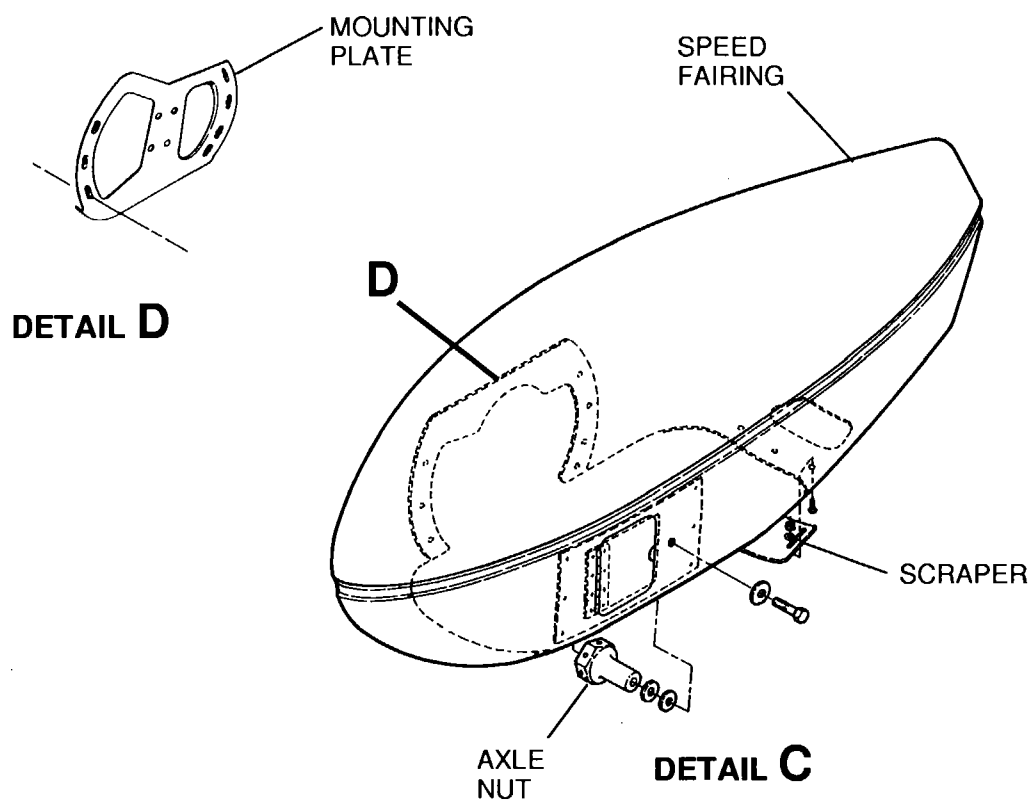


Main Landing Gear Installation  
 Figure 201 (Sheet 1)



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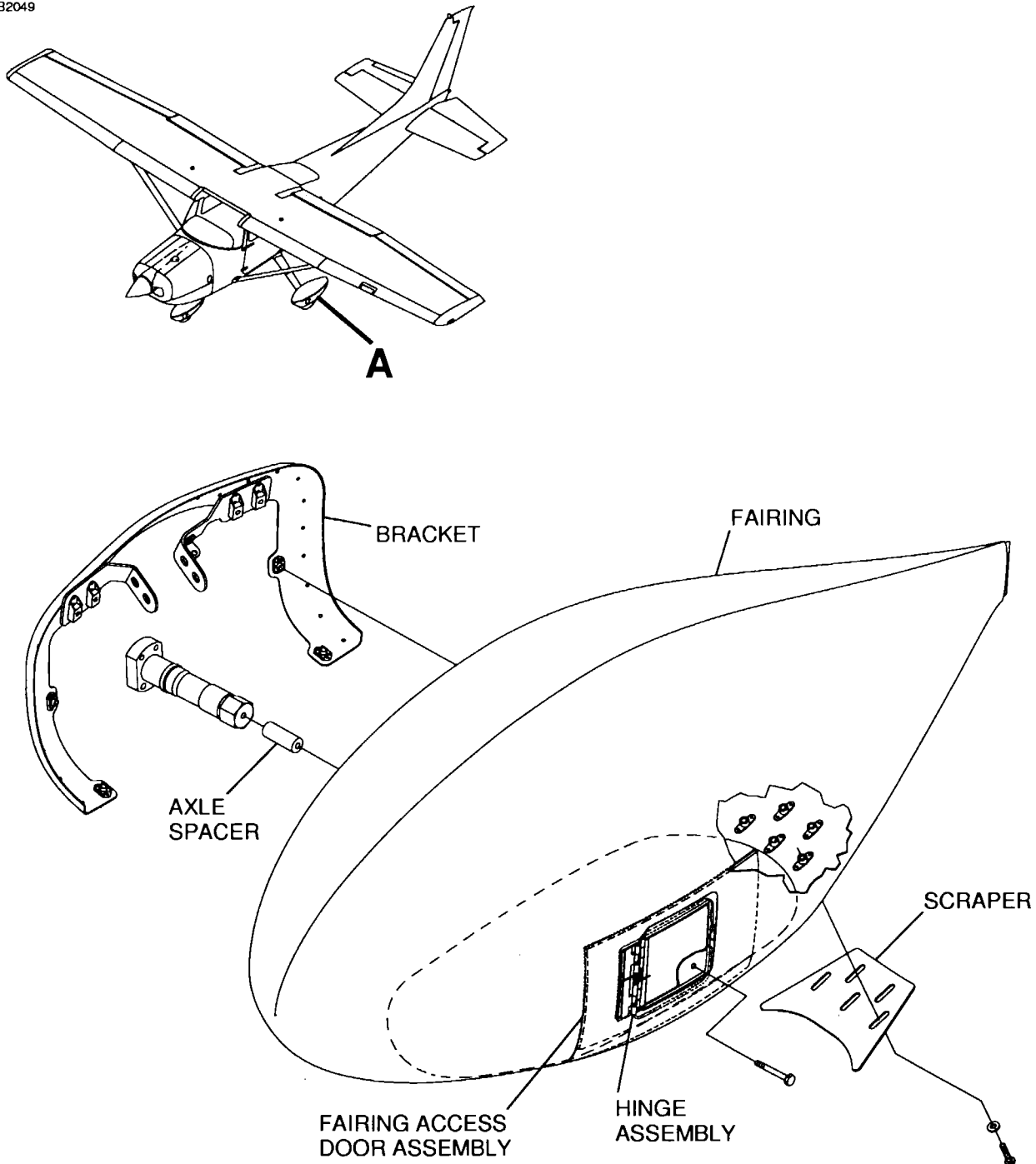


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D0741T1007

Main Landing Gear Installation  
Figure 201 (Sheet 2)

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**DETAIL A**  
(182T AND T182T)

0710T1001  
A0741T1016

Main Landing Gear Installation  
Figure 201 (Sheet 3)

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**CAUTION:** Make sure the tire pressure is correct. Incorrect tire pressure can cause damage to the fairing.

- (7) Do a check of the tire pressure and adjust the pressure as necessary. Refer to Chapter 12, Tires - Servicing.
- E. Cover Plate Removal (Refer to Figure 201).
  - (1) Remove the screws and clamp that attach the cover plate to the tubular strut fairing.
  - (2) Remove the cap fairing.
- F. Cover Plate Installation (Refer to Figure 201).
  - (1) Put the cover plate and the clamp over the tubular strut. Attach them with the screws.
  - (2) Install the cap fairing.
- G. Main Gear Strut Fairing Removal (Refer to Figure 201).
  - (1) Remove the screws that attach the step-to-the step support.
  - (2) Remove the screws from the lower side of the strut fairing.
  - (3) Remove the cover plate.
  - (4) Carefully separate the main gear strut fairing along the aft edge and remove it over the step support.
  - (5) Pull the strut fairing out of the fuselage fairing and remove it from the tubular strut.
- H. Main Gear Strut Fairing Installation (Refer to Figure 201).
  - (1) Put the main gear strut fairing over the strut and put the fairing in position over the step support and into the fuselage fairing. Attach it with screws.
  - (2) Install the step-on-the step support.
  - (3) Install the cover plate.
- I. Fuselage Fairing Removal (Refer to Figure 201).
  - (1) Remove the main landing gear wheel. Refer to Main Landing Gear Wheel and Axle - Maintenance Practices.
  - (2) Remove the mounting plate for the main-wheel speed fairing.
  - (3) Remove the brake torque plate.
  - (4) Remove the screws that attach the fuselage fairing to the fuselage.
  - (5) Slide the fuselage fairing down the tubular strut and over the main landing gear axle.
- J. Fuselage Fairing Installation (Refer to Figure 201).
  - (1) Move the fuselage fairing over the main landing gear axle and slide it up to the fuselage. Attach it with the screws.
  - (2) Install the brake torque plate.
  - (3) Install the mounting plate for the main-wheel speed fairing.
  - (4) Install the main landing gear wheel. Refer to Main Landing Gear Wheel and Axle - Maintenance Practices.

### 3. Main Landing Gear Removal/Installation

- A. Main Landing Gear Removal (Refer to Figure 201).

**NOTE:** This procedure removes the landing gear as a complete assembly.

- (1) Remove the pilot's and the copilot's seats. Refer to Chapter 25, Front Seats - Maintenance Practices.
- (2) Remove the access plate 230NB or 230QB. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (3) Jack the airplane. Refer to Chapter 7, Jacking - Maintenance Practices.
- (4) Remove the screws that attach the fuselage fairing to the fuselage. Remove the screws at the splice in the fuselage fairing and remove from the strut fairing.
- (5) Remove the brake bleeder screw and drain the hydraulic fluid from the brake line on the strut.
- (6) Disconnect the hydraulic brake line at the fitting where the brake line emerges from the fuselage skin. Cap or plug the disconnected fittings.
- (7) Remove the snap ring from strut attaching pin.

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- (8) Remove the plug button from the belly of the airplane below the gear forging.
- (9) With a punch, push the attaching pin upward out of the inboard forging.

**WARNING: Use caution when the forging and pin are removed.**

- (10) Pull the tubular strut from the forgings. Use care when you remove the strut to prevent damage to the hydraulic brake line.

**NOTE:** To replace the bushing from the outboard forging, remove the retaining ring at the inboard end and slide the bushing outboard from the forging.

- B. Main Landing Gear Installation (Refer to Figure 201).
  - (1) Install all parts removed from the strut.
  - (2) Clean the inboard end of the strut. Refer to Chapter 20, General Solvents/Cleaners - Maintenance Practices.
  - (3) Apply A840014 aluminum foil tape to the inboard end of each strut to seal the strut end.
  - (4) Apply U000992 grease to the unpainted area on the upper end of the strut. For the grease supplier, refer to Chapter 12, Lubricants.
  - (5) Slide the strut through the bushing into the inboard forging and align the attaching pin holes.
  - (6) Install the attaching pin and the snap ring.
  - (7) Install the access plate 230NB or 230QB and the plug button. Refer to Chapter 6, Access/ Inspection Plates - Description and Operation.
  - (8) Remove the caps and connect the hydraulic brake line to the fitting. Fill and bleed the brake system. Refer to Brake System - Maintenance Practices.
  - (9) Install the fuselage fairing.
  - (10) Remove the airplane from the jacks.
  - (11) Install the pilot's and copilot's seats. Refer to Chapter 25, Front Seats - Maintenance Practices.
  - (12) Do a check of the wheel alignment. Refer to Main Wheel Alignment.

#### 4. Step Support Removal/Installation

- A. Step Support Removal (Refer to Figure 202).
  - (1) Remove the main landing gear fairings. Refer to Main Landing Gear Fairings Removal/ Installation.
  - (2) Remove the step support.
    - (a) With long-handled pliers or a similar tool, apply upward force to the step support.

**CAUTION:** Do not continue to heat the tubular strut to the point where the paint or the epoxy blisters.

- (b) Apply heat to the epoxy with a heat gun, until the epoxy softens and an upward force of pliers breaks the step support away from the landing gear strut. Quickly remove heat.

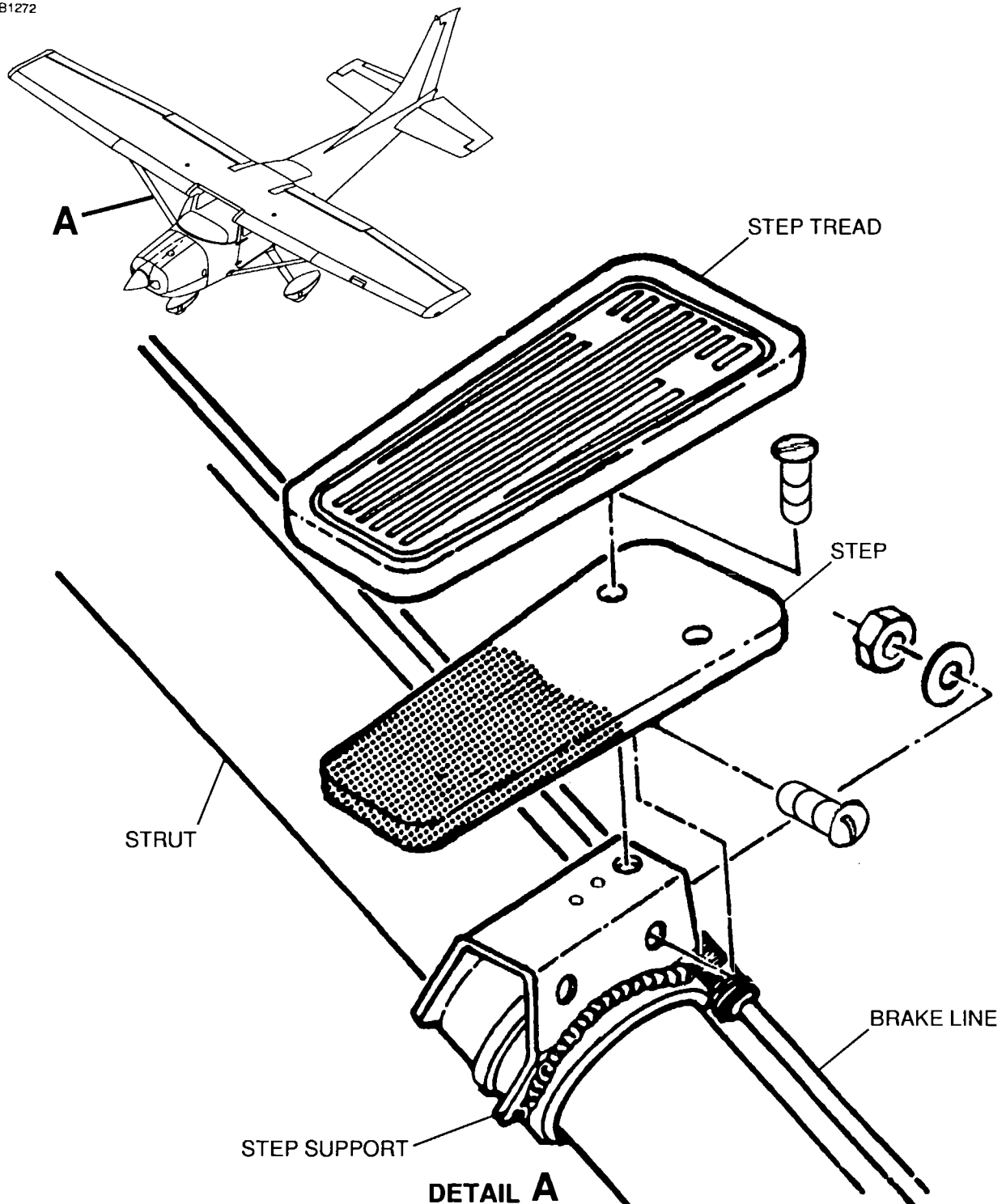
- B. Step Support Installation (Refer to Figure 202).

**NOTE:** The step support is attached to the tubular gear strut with EA9309.3NA, EC2216, EC2214, EC3445 or an equivalent epoxy base adhesive.

- (1) Mark the position of the step support to make sure that the new step support will be installed in the same position on the strut.
  - (2) Remove all traces of the original step support adhesive, as well as rust, paint, or scale, with a wire brush and coarse sandpaper.
  - (3) Leave surfaces slightly roughened or abraded, but remove deep scratches or nicks.
  - (4) Thoroughly clean the surfaces to be bonded together. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important that the bonding surfaces be clean and dry.
  - (5) Check the fit of the step support on the tubular strut. A small gap is permitted between the support and the tubular strut.
  - (6) Mix the adhesive in accordance with the manufacturer's directions.

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**DETAIL A**

AIRPLANES 18280945 THRU 18281297 AND  
AIRPLANES T18208001 THRU T18208224

RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE

Step Installation  
Figure 202 (Sheet 1)

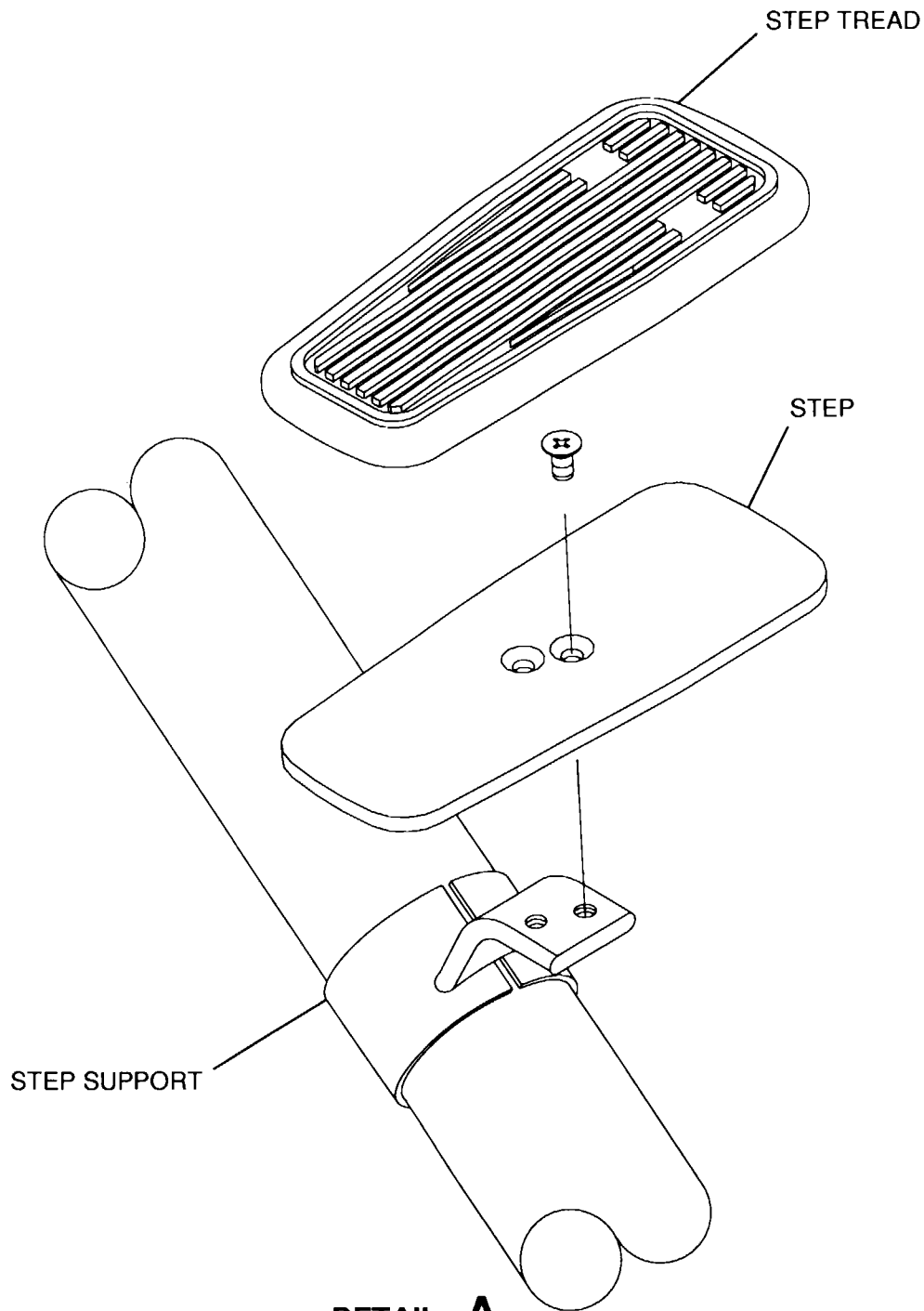
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**DETAIL A**

AIRPLANES 18281298 AND ON AND  
AIRPLANES T18208225 AND ON  
RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE

Step Installation  
Figure 202 (Sheet 2)

0714T1045

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- (7) Spread a coat of adhesive on both bonding surfaces, and put the step support in position on the tubular strut. Clamp the step support to the strut to make sure that there is a good, tight fit.
- (8) Make a small fillet of the adhesive at all edges of the bonded surfaces. Remove excess adhesive with lacquer thinner. Do not dilute the adhesive in the step/gear interface.
- (9) Allow adhesive to cure thoroughly in accordance with the manufacturer's recommendations before the tubular gear strut is flexed or loads are applied to the strut.
- (10) Paint the tubular strut and the step support after the adhesive is fully cured.
- (11) Install the main landing gear fairings. Refer to Main Landing Gear Fairings Removal/Installation.

**5. Main Wheel Alignment Check**

- A. Use tapered shims between the flange of the axle and the main axle fitting to align the main wheels. Refer to Table 201, Table 202, and Figure 203.

Table 201. Camber Adjustment

SHIM PART NUMBER	POSITION OF THICKEST CORNER OR EDGE OF SHIM	TOE-IN	TOE-OUT	POSITIVE CAMBER	NEGATIVE CAMBER
0541157-1	Aft	0.063 Inch	---	0°4'	---
	Forward	---	0.063 Inch	---	0°4'
0541157-2	Up	---	0.008 Inch	0°28'	---
	Down	0.008 Inch	---	---	0°28'
1241061-1	Up and Forward	---	0.006 Inch	2°44'	---
	Up and Aft	0.028 Inch	---	2°46'	---
	Down and Forward	---	0.028 Inch	---	2°46'
	Down and Aft	0.006 Inch	---	---	2°44'
0441139-5	Up and Forward	---	0.125 Inch	0°10'	---
	Up and Aft	0.117 Inch	---	0°25'	---
	Down and Forward	---	0.117 Inch	---	0°25'
	Down and Aft	0.125 Inch	---	---	0°10'
0441139-6	Up and Forward	---	0.253 Inch	0°21'	---
	Up and Aft	0.235 Inch	---	0°51'	---
	Down and Forward	---	0.235 Inch	---	0°51'
	Down and Aft	0.253 Inch	---	---	0°21'
0541157-3	Aft	0.12 Inch	---	---	0°7'
	Forward	---	0.12 Inch	0°7'	---

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Table 202. Shim Chart

SHIM PART NUMBER	CORRESPONDING AND TOTAL ALLOWABLE SHIM					
	1241061-1	0441139-6	0441139-5	0541157-2	0541157-1	0541157-3
1241061-1	0	0	0	0	0	0
0441139-6	0	0	0	1	1	0
0441139-5	0	0	1	1	2	0
0541157-2	0	1	1	2	2	0
0541157-1	0	1	1	2	2	0
0541157-3	0	0	1	2	1	0

**NOTE:** The best alignment setting is zero toe-in and zero camber at normal operating weight. Standard empty weight is 1910 pounds. Maximum useful load is 1200 pounds. Maximum gross weight is 3110 pounds.

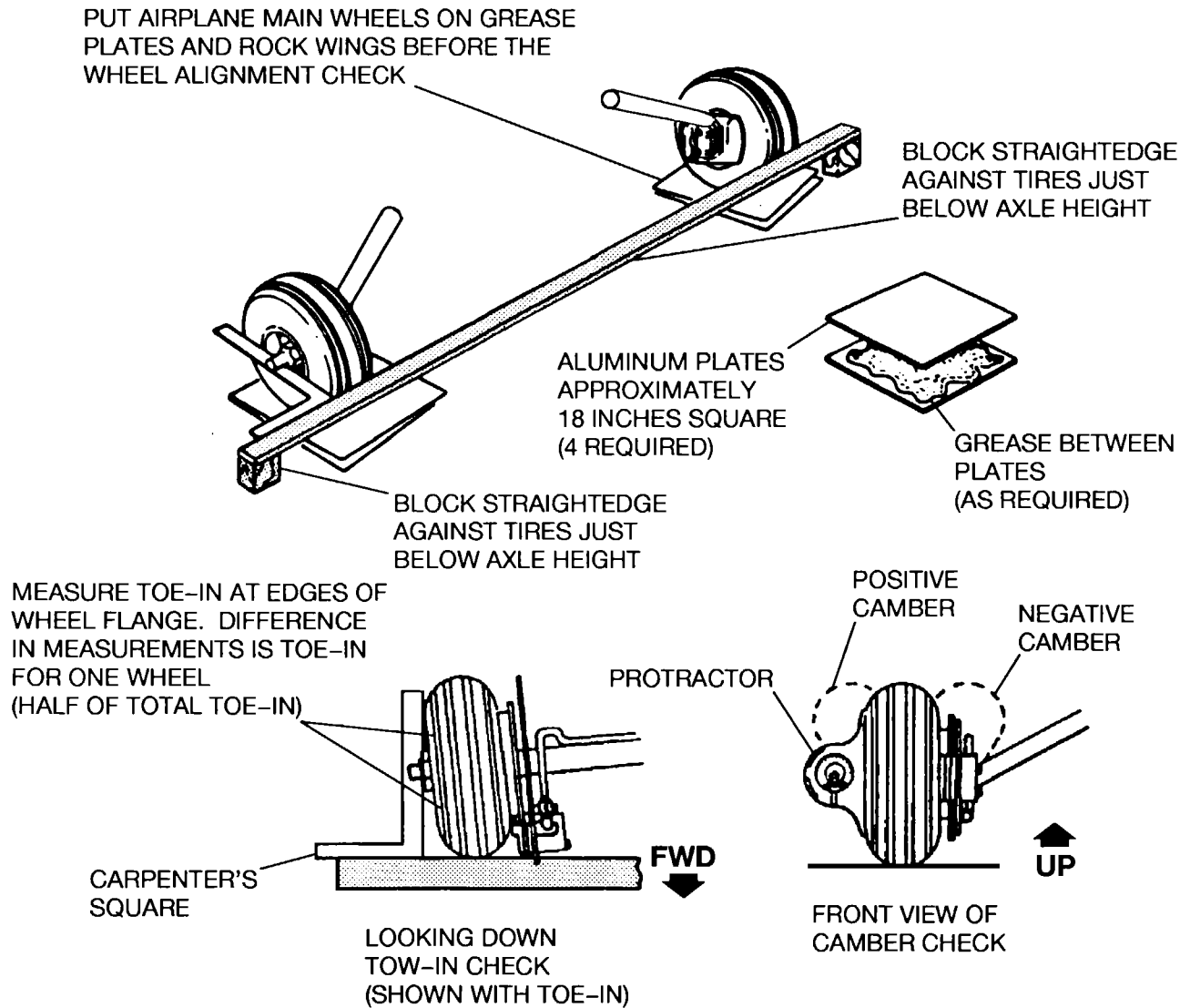
- (1) Make sure that the floor is level where you do the work on the airplane.
- (2) Ballast the aircraft to the normal operating weight. Put the ballast as close to the aft door frame fuselage station as possible.
- (3) Use tapered shims between the flange of the axle and main axle fitting to do the main wheel alignment. Always use the minimum number of shims possible to get the necessary result. Follow the illustration for the alignment procedure.

**NOTE:** If you remove or loosen a self-locking nut beyond the locking area of the nut, you can use it again unless the nut can be run up finger tight. When fiber-type self locking nuts are used again, check the fiber carefully to make sure that it has not lost locking function or become brittle.



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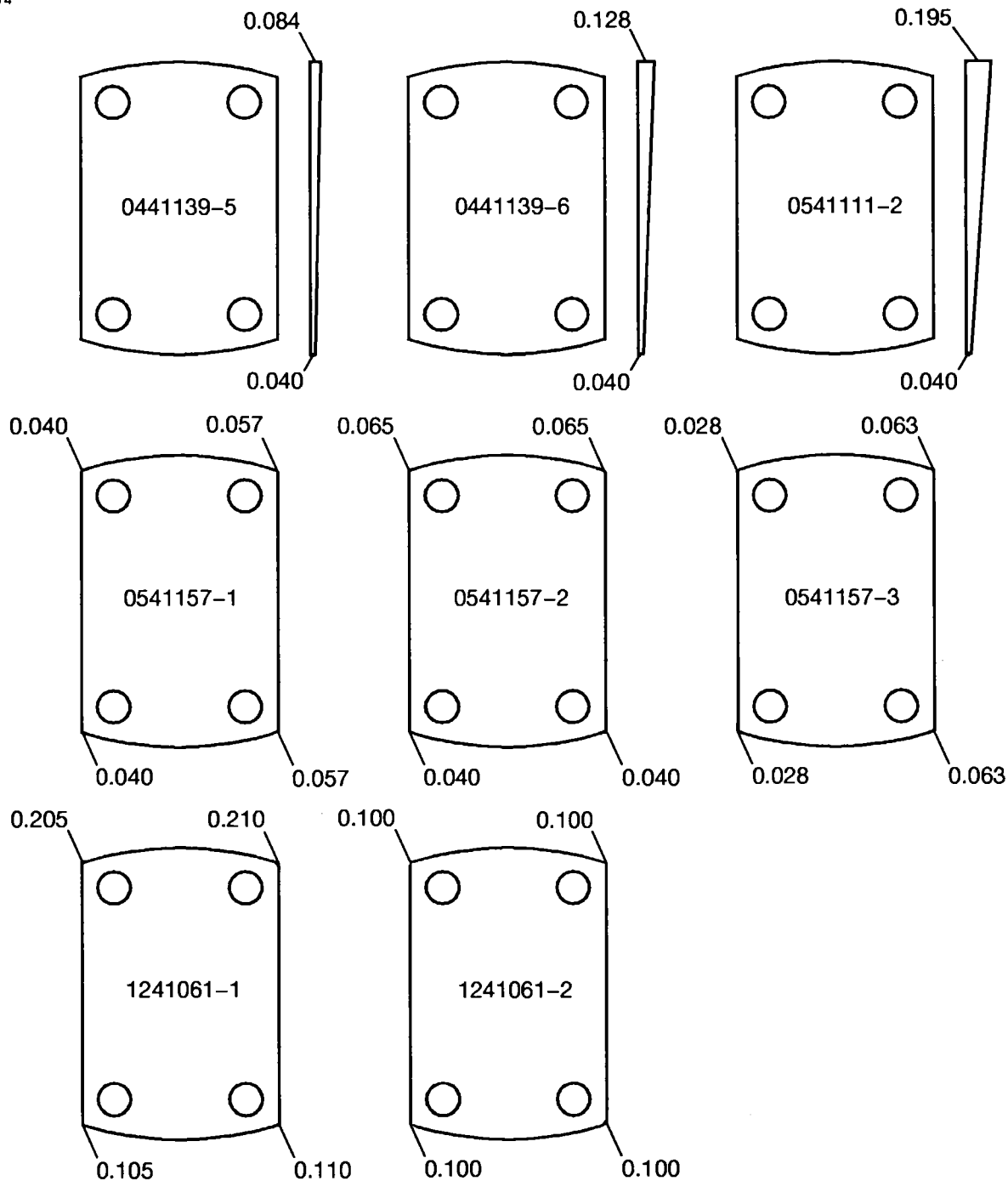


SB9832T03

Main Wheel Alignment Check  
 Figure 203 (Sheet 1)

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**NOTE:** Maximum shim thickness is 0.375 inches (with fairing support plate, if installed between gear and axle). Maximum difference in shim thickness in camber plane is 0.108 inches. Maximum difference in shim thickness in toe plane is 0.100 inches. All dimensions taken at shim corners.

SB9832R03

Main Wheel Alignment Check  
 Figure 203 (Sheet 2)

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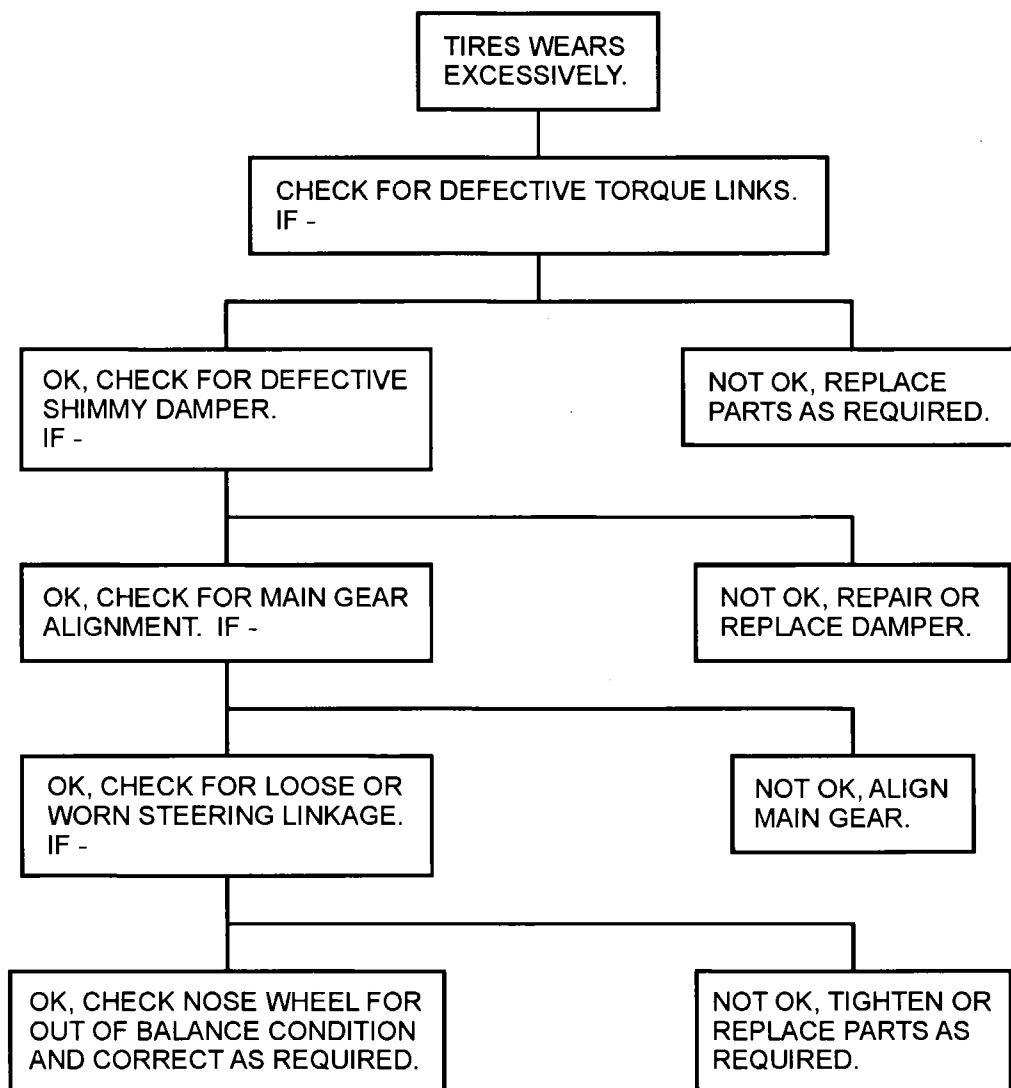
**NOSE LANDING GEAR - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been provided to aid maintenance technician in system troubleshooting. Refer to Figure 101.

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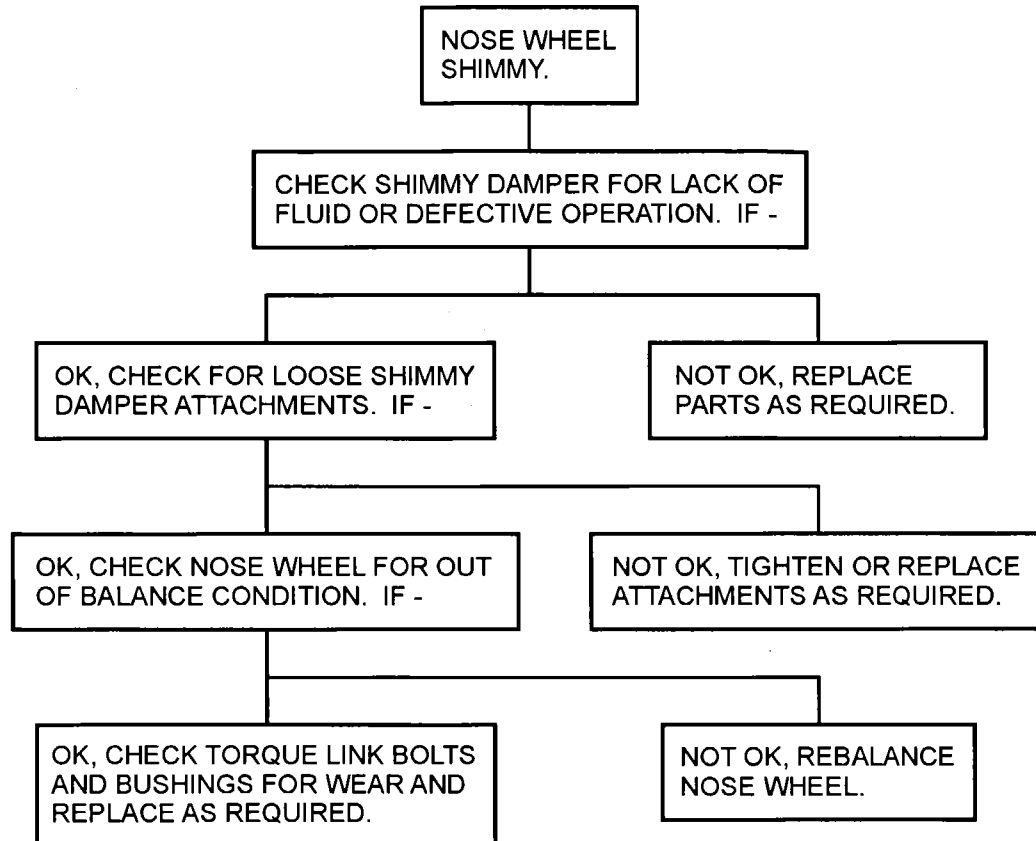
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Nose Landing Gear Troubleshooting Chart  
Figure 101 (Sheet 1)

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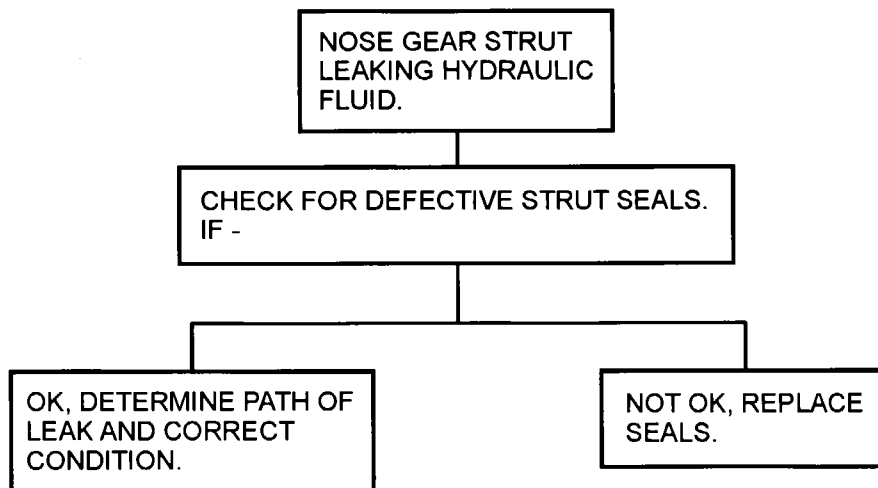
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Nose Landing Gear Troubleshooting Chart  
Figure 101 (Sheet 2)

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Nose Landing Gear Troubleshooting Chart  
Figure 101 (Sheet 3)

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**NOSE LANDING GEAR - MAINTENANCE PRACTICES**

**1. General**

- A. The nose gear has a steering nosewheel, mounted in a fork, attached to an air/oil oleo shock strut. The shock strut is attached to the firewall with upper and lower strut fittings.
- B. Nose wheel steering is accomplished through the use of the rudder pedals. A steering bungee links the nose gear to a whiffletree (bell crank) which is operated by push-pull rods connected to the rudder bars. Steering is afforded up to approximately 10 degrees each side of center, after which brakes may be used to gain a maximum deflection of 30 degrees right or left of center. A flexible boot is used to seal the fuselage entrance of the steering bungee. A sprocket operated screw mechanism to provide rudder trim is incorporated at the aft end of the bungee. The trim system is operated by a trim control wheel mounted in the pedestal.
- C. The steering bungee assembly is spring loaded, and should not be disassembled internally. The steering bungee assembly is connected to the steering torque arm on the nose gear strut by a bearing end assembly, and to the whiffletree (bell crank) by a rod assembly.
- D. Torque links keep the lower strut aligned with the nose gear steering system, but permit shock strut action.
- E. Shimmy Damper (For airplanes that do not have the Lord Shimmy Damper) - The shimmy damper gives resistance to shimmy when it moves hydraulic fluid through small orifices in a piston. The damper piston shaft is attached to a stationary part, and housing is attached to the nosewheel steering torque arm assembly, which moves as the nosewheel turns, causing relative motion between the damper shaft and the housing.
- F. Shimmy Damper (For airplanes with the Lord Shimmy Damper) - The shimmy damper uses rubber with a lubricant to absorb nosewheel vibration. The damper piston shaft is attached to a stationary part, and housing is attached to the nosewheel steering torque arm assembly, which moves as the nosewheel turns. This movement causes relative motion between the damper shaft and the housing.

**2. Nosewheel Speed Fairing Removal/Installation**

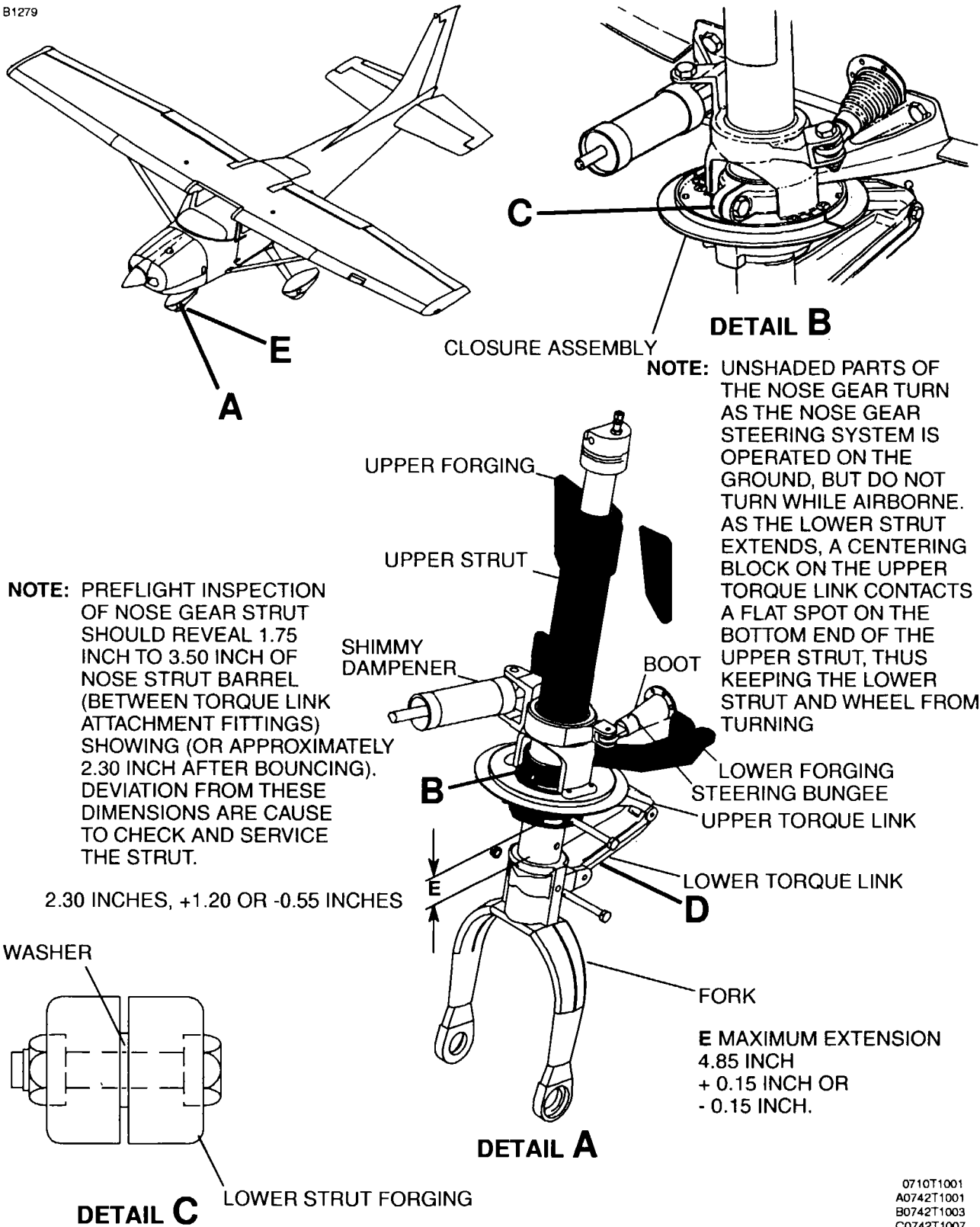
- A. Nosewheel Speed Fairing Removal (Refer to Figure 201).
  - (1) Deflate nose gear strut.
  - (2) Weight or tie down tail of airplane to raise nose wheel from floor.
  - (3) Remove nose wheel axle stud.
  - (4) Remove bolt securing speed fairing, cover plate and tow bar spacers at top of strut.
  - (5) Slide speed fairing up and remove nose wheel. Loosen scraper as necessary.
  - (6) Rotate speed fairing 90 degrees to centerline of airplane and work fairing down over the nose gear fork to remove.
- B. Install Nose Wheel Speed Fairing (Refer to Figure 201).
  - (1) With speed fairing 90 degrees to center line of airplane, work fairing up over nose gear fork.
  - (2) Slide fairing up and install nose wheel in fork. Install axle stud.
  - (3) Position speed fairing over nose wheel and tighten axle stud nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to the nearest castellated and install cotter pin.
  - (4) Install bolt, tow bar spacers, washers and nut attaching fairing and cover plate to strut.

**CAUTION:** You must clean the scraper for the tire to turn correctly. Make sure you complete a check of the clearance every time the scraper has been disturbed, the tire changed and when you install the speed fairings. Damage will result if the correct clearance is not set between the tire and the scraper. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct movement.

- (5) Do a check of the clearance between the tire and the scraper.
  - (a) Clean off any dirt or ice that has collected on the scraper.

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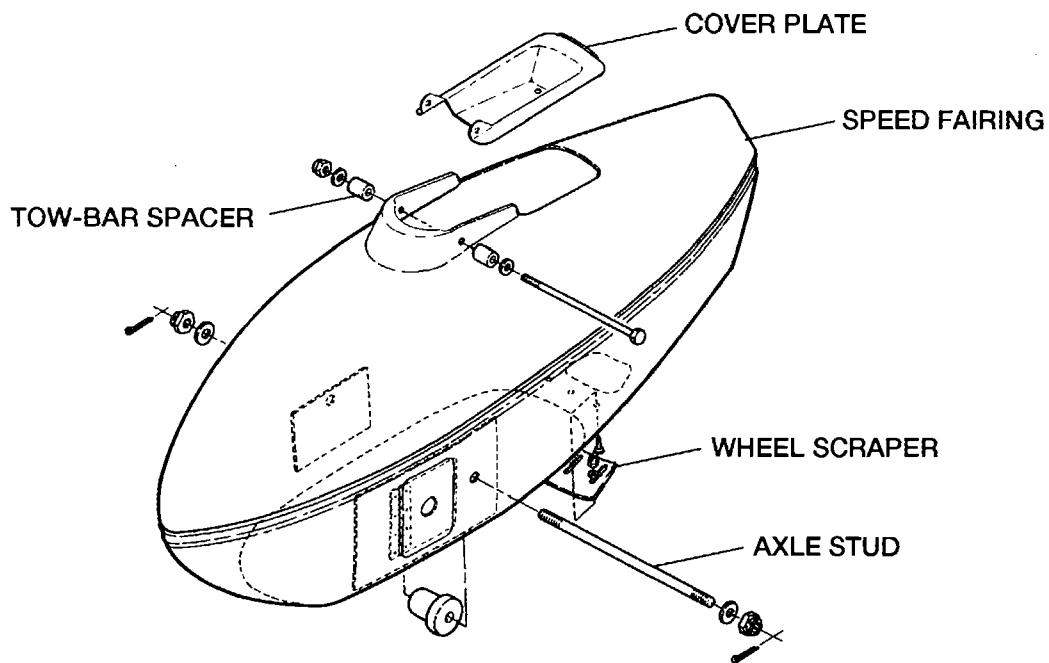
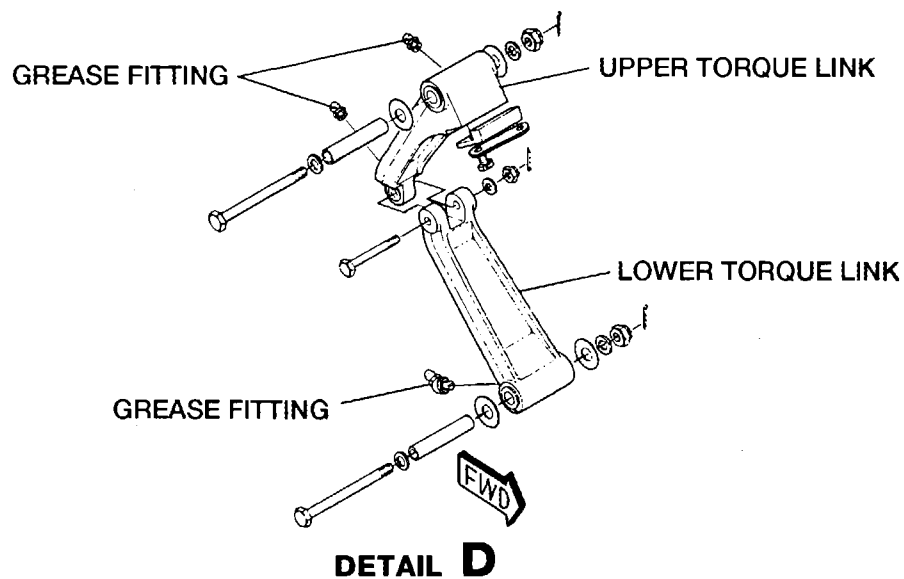
Nose Landing Gear Installation  
 Figure 201 (Sheet 1)

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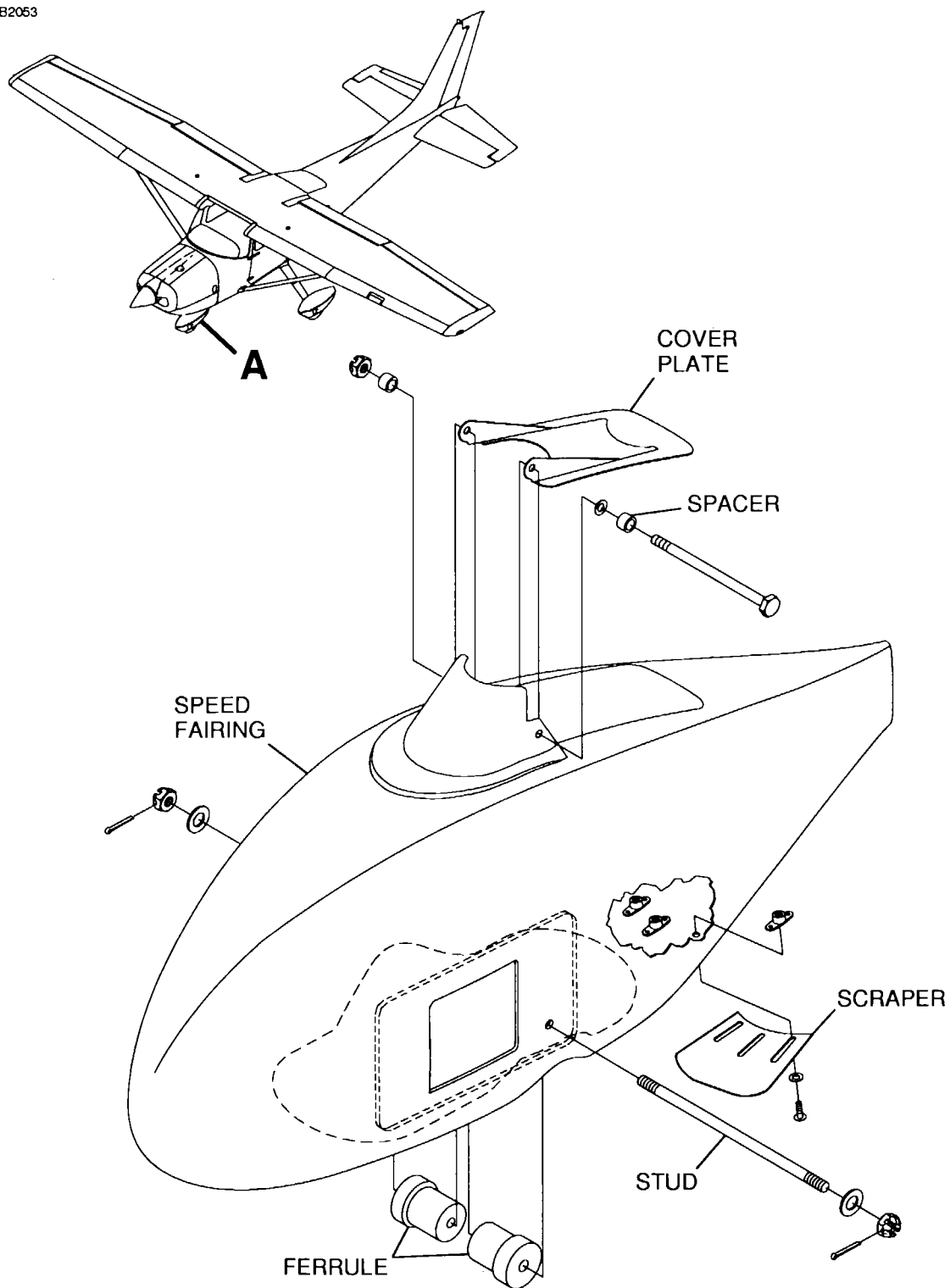
**DETAIL E**

Nose Landing Gear Installation  
Figure 201 (Sheet 2)

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**DETAIL A**  
(182T AND T182T)

Nose Landing Gear Installation  
Figure 201 (Sheet 3)

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- (b) Adjust the clearance as necessary to have a minimum of 0.55 inch (14 mm) to a maximum of 0.80 inch (20 mm).
- (6) Lower nose of airplane to floor.
- (7) Inflate nose gear strut. Refer to Chapter 12, Nose Landing Gear Shock Strut - Servicing.

**CAUTION:** Make sure the tire pressure is correct. Damage to the fairing can result if the tire pressure is incorrect.

- (8) Do a check of the tire pressure and adjust the pressure as necessary. Refer to Chapter 12, Tires - Servicing.

### 3. Nose Landing Gear Removal/Installation

- A. Remove Nose Landing Gear (Refer to Figure 201).
  - (1) Remove cowling. Refer to Chapter 71, Cowling - Removal/Installation.
  - (2) Weight or tie down tail of airplane to raise nose wheel from floor.
  - (3) Disconnect nose wheel steering bungee and shimmy dampener from nose gear.

**CAUTION:** Ensure strut is completely deflated prior to removing bolt or roll pin at top of strut.

- (4) Deflate strut completely and telescope strut to its shortest length.
    - (5) Remove bolt from upper forging and strut.
    - (6) Remove the screws securing the steering torque arm and closure assembly to the steering collar.
    - (7) Remove lower forging attach bolt.
    - (8) Pull the strut assembly down from upper attach forging through the steering torque arm and lower forging.
  - B. Install Nose Landing Gear (Refer to Figure 201).
    - (1) Insert strut up through lower forging and install steering torque arm over strut.
    - (2) Position upper end of strut in upper forging, align bolt hole in forging and strut and install bolt.
    - (3) Install lower forging mount bolt and washer. Torque bolt 100 to 140 inch pounds.
    - (4) Install screws securing steering torque arm and closure assembly to steering collar.
    - (5) Connect steering bungee to steering torque arm.
    - (6) Connect shimmy dampener.
    - (7) Inflate and service shock strut. Refer to Chapter 12, Nose Landing Gear Shock Strut - Servicing.
    - (8) Rig nose wheel steering tubes. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
    - (9) Remove weights or tie down from tail, and lower nose wheel to floor.
    - (10) Install cowling. Refer to Chapter 71, Cowling - Removal/Installation.

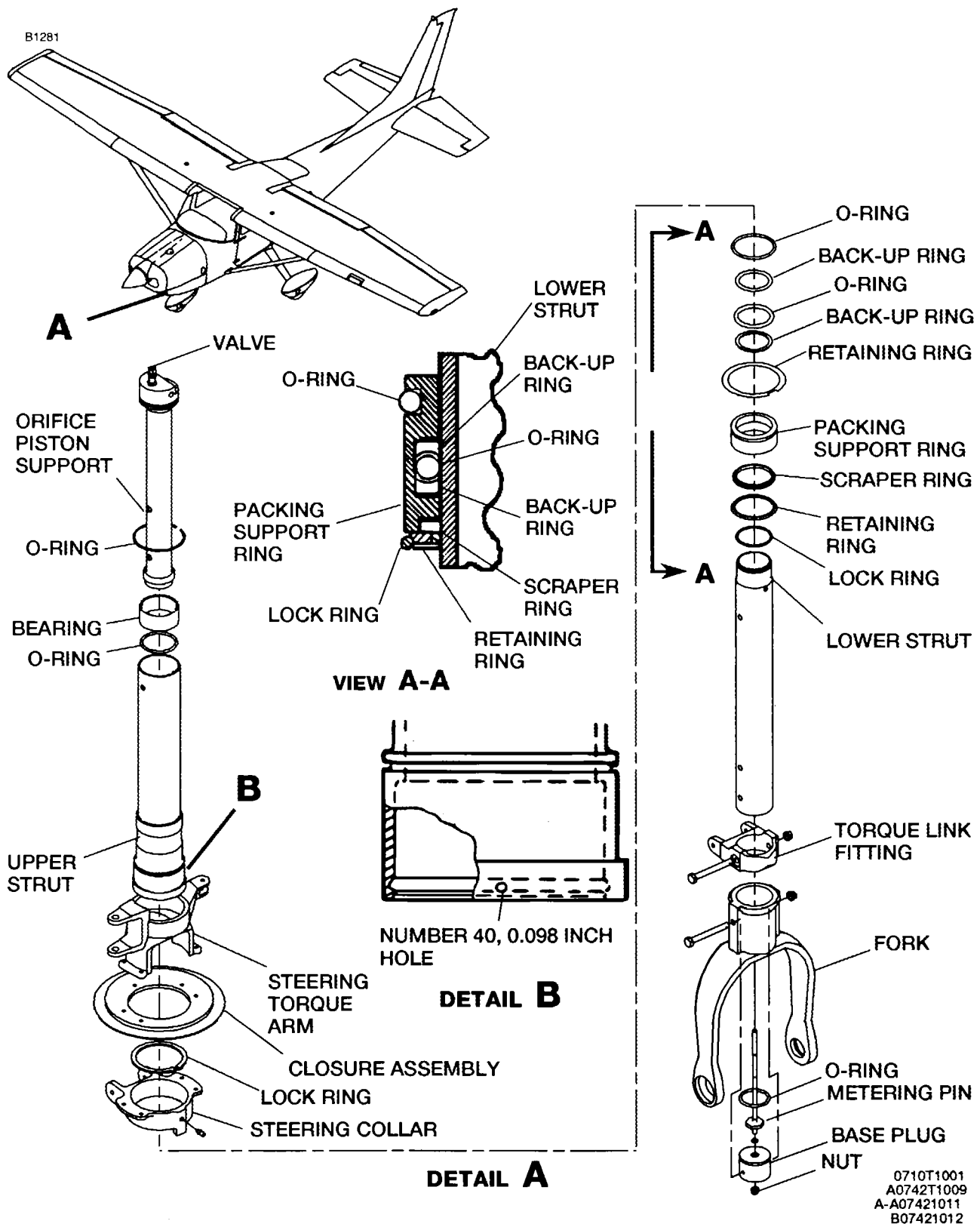
### 4. Nose Gear Shock Strut Disassembly/Assembly

- A. Disassemble Nose Gear Shock Strut (Refer to Figure 202).
  - (1) Remove speed fairing and nose gear. Refer to Nose Wheel Speed Fairing Removal/Installation, and Nose Landing Gear Removal/Installation.
  - (2) Ensure strut is completely deflated.
  - (3) Remove torque links. (Note position of washers, shims, and spacers).
  - (4) Remove lock ring from groove inside lower end of upper strut. A small hole is provided at the lock ring groove to facilitate removal of the lock ring.

**NOTE:** Hydraulic fluid will drain from strut as lower strut is pulled from upper strut.

- (5) Use a straight, sharp pull to separate upper and lower struts. Invert lower strut and drain remaining hydraulic fluid.
    - (6) Remove lock ring and bearing at top of lower strut.
    - (7) Slide packing support ring, scraper ring, retaining ring, and lock ring from lower strut, noting relative position and top side of each ring, wire together if desired.

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Nose Gear Shock Strut Breakdown  
 Figure 202 (Sheet 1)

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- (8) Remove O-rings and backup rings from packing support ring.
- (9) Remove bolt securing torque link fitting and remove torque link fitting from lower strut.

**NOTE:** Bolt attaching torque link fitting also holds metering pin base plug in place.

- (10) Push metering pin and base plug assembly from lower strut. Remove O-rings and metering pin from base plug.

**NOTE:** Lower strut and fork are press fit, drilled on assembly. Separation of these parts is not recommended, except for installation of new parts.

- (11) Remove retaining ring securing steering arm assembly on upper strut. Remove steering arm, shims, and washers.
- (12) Push orifice support from upper strut and remove O-ring.

**B. Assemble Nose Gear Shock Strut (Refer to Figure 202).**

- (1) Make sure all parts are clean and examined for damage before you assemble the nose gear shock strut. Refer to Nose Gear Shock Strut Inspection/Repair.
- (2) Apply lubricant and assemble the parts that follow with a film of Petrolatum VV-P-236, hydraulic fluid MIL-PRF-5606 or Dow Corning DC-7.
- (3) Install washer and shim(s) under steering collar if installed.
- (4) Lubricate needle bearings in steering collar. Refer to Chapter 12, Landing Gear and Parking Brake - Lubrication.
- (5) Install steering collar and retaining ring.
- (6) Check steering collar for snug fit against washer. Shims of variable thickness are available from Cessna Aircraft Company, Cessna Parts Distribution, Department 701, CPD 2 5800 East Pawnee Road Wichita KS 67218-5590.
- (7) If shims are required, remove retaining ring and steering collar and add shims as necessary to provide a snug fit with steering collar retaining ring in place. Table 201 lists part number and thickness of available shims:

PART NUMBER	THICKNESS
1243030-5	0.006 INCH
1243030-6	0.012 INCH
1243030-7	0.020 INCH

- (8) Install O-ring and filler valve in orifice piston support, and install orifice piston support in upper strut.
- (9) Install O-ring and metering pin O-ring in base plug. Secure with nut.

**NOTE:** If base plug is to be replaced, new part will need to be line drilled to accept NAS5 bolt.

- (10) Install base plug assembly in lower strut fork assembly.
- (11) Install bolt through upper hole in lower strut, through base plug and secure with nut.
- (12) Install lock ring, retaining ring and scraper ring, making sure they are installed in the same positions as they were removed.
- (13) Install O-rings and backup rings in packing support ring; slide packing support ring over lower strut.
- (14) Install bearing and lock ring at upper end of lower strut assembly. Note top side of bearing.
- (15) Install upper strut assembly over lower strut assembly.
- (16) Install lock ring in groove in lower end of upper strut. Position lock ring so that one end covers the small access hole in the lock ring groove.
- (17) Install closure assembly over upper strut.
- (18) Install steering torque arm over upper strut.
- (19) Line up holes in steering torque arm and closure assembly with holes in steering collar and screws, washers, and nuts.
- (20) Install torque links, positioning washers, shims, and spacers exactly in positions as removed.

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- (21) Install strut. Refer to Nose Landing Gear Removal/Installation and Nose Wheel Speed Fairing Removal/Installation.

**5. Nose Gear Shock Strut Inspection/Repair**

- A. Inspect and Repair Nose Gear Shock Strut. (Refer to Figure 202).
- (1) Thoroughly clean all parts in cleaning solvent and inspect carefully.
  - (2) All worn or defective parts and all O-rings and backup rings must be replaced with new parts.
  - (3) Sharp metal edges should be smoothed with No. 40 emery paper, then cleaned with solvent.

**6. Shimmy Damper Removal/Installation**

- A. Shimmy Damper Removal (Refer to Figure 201).
- (1) Remove the cotter pin and remove the nut, bolt, and washers from the damper piston rod end.
  - (2) Remove the bolts and the washers that attach the barrel to the nosewheel steering torque arm.
  - (3) Remove the shimmy damper. For airplanes with the Lord Shimmy Damper installed, discard the Lord Shimmy Damper.
- B. Shimmy Damper Installation (Refer to Figure 201).
- (1) Before you install the shimmy damper, do the maintenance that follows.
    - (a) If a Lord Shimmy Damper has been in storage for a long period, make sure that the shaft moves freely before you install it. Refer to Chapter 12, Nose Landing Gear Shimmy Damper - Servicing.
    - (b) Make sure that the tire is in good condition, is balanced, and has no tears or foreign objects in it.
    - (c) Examine the interface between the bottom of the steering collar and the top of the nose gear fork. If there is looseness here, replace or add more shims under the collar.
    - (d) Examine the assembly hardware for wear and replace as necessary.
    - (e) Examine the shimmy damper arm attach points on the landing gear and the structure for wear and replace as necessary.
  - (2) Install the shimmy damper on the steering torque arm with the washers and the bolts.
  - (3) Connect the shimmy damper rod with the bolt, washers, and nut.
  - (4) Install the cotter pin through the nut and the bolt.
  - (5) For cleaning and servicing of the shimmy damper, refer to Chapter 12, Nose Landing Gear Shimmy Damper - Servicing.

**7. Shimmy Damper Disassembly/Assembly (For airplanes that do not have the Lord Shimmy Damper)**

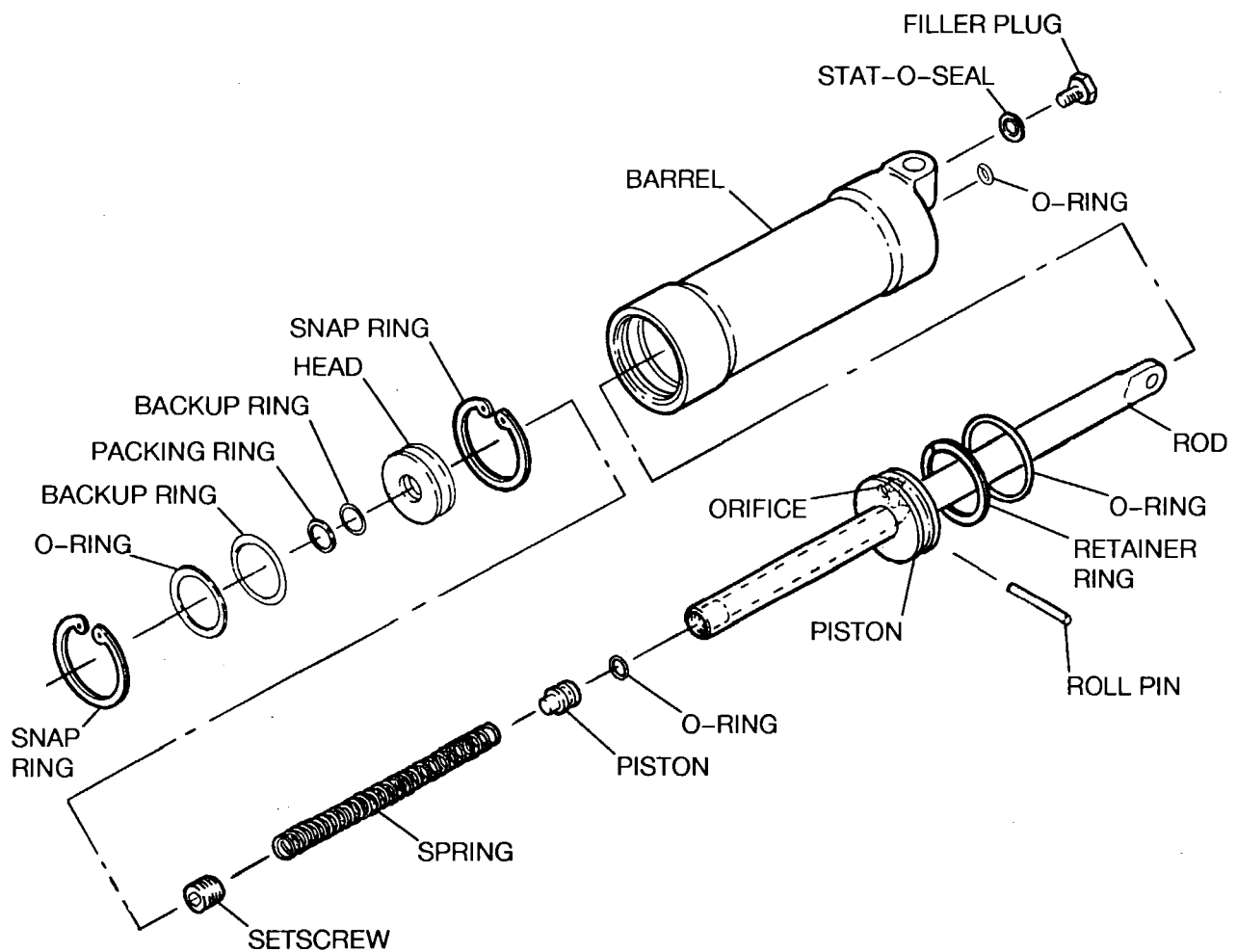
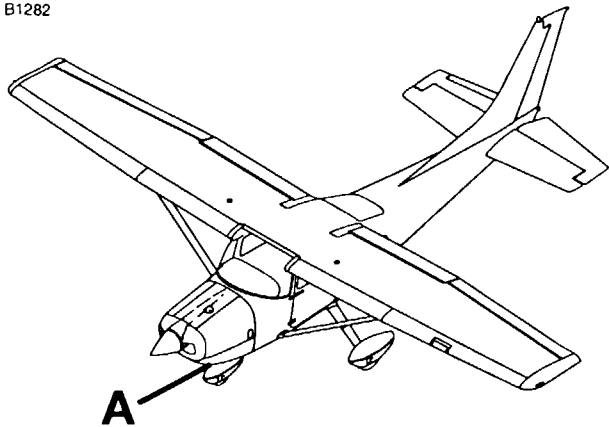
- A. Disassemble Shimmy Damper (Refer to Figure 203).

**NOTE:** There are no inspection or overhaul requirements for the Lord Shimmy Damper.

- (1) Remove the filler plug and drain the hydraulic fluid from the shimmy damper.
  - (2) Remove the setscrew, spring, and floating piston from the rod assembly.
  - (3) Remove the snap ring, head, and second snap ring from the barrel.
  - (4) Pull the rod assembly from the barrel.
  - (5) Examine all of the O-rings and the packing ring for serviceability.
  - (6) Examine the piston, rod, and floating piston for serviceability.
  - (7) Examine the inside surface of the barrel.
  - (8) Examine the backup ring and the retainer ring for serviceability.
  - (9) Replace all damaged parts.
- B. Assemble Shimmy Damper (Refer to Figure 203).
- (1) Before you assemble the shimmy damper, make sure there are no sharp edges on the parts that can result in damage of the O-rings or packing ring when assembled. Put lubricant on all internal parts with MIL-PRF-5606 hydraulic fluid before you assemble them.
  - (2) If removed, install the O-ring in the end of the barrel.
  - (3) If removed, install the O-ring and the retainer ring on the piston.
  - (4) Install the O-ring on the floating piston. Then install the floating piston, spring, and setscrew in the rod.

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**DETAIL A**

Shimmy Damper  
 Figure 203 (Sheet 1)

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- (5) Install the rod assembly in the barrel.
- (6) If removed, install the packing and the backup ring in the head.
- (7) If removed, install the O-ring on the head.
- (8) Install the snap ring in the barrel.
- (9) Install the head assembly and the outer snap ring.
- (10) Service the shimmy damper. Refer to Chapter 12, Nose Landing Gear Shimmy Damper - Servicing.
- (11) Install the shimmy damper on the nose landing gear. Refer to Shimmy Damper Removal/Installation.

## 8. Nose Wheel Steering Removal/Installation

- A. Remove Nose Wheel Steering (Refer to Figure 204).
- (1) Remove cowling. Refer to Chapter 71, Cowling - Removal/Installation.
  - (2) Remove pilot's and copilot's seats. Refer to Chapter 25, Front Seats - Maintenance Practices.
  - (3) Remove carpet and shield assemblies.
  - (4) Remove pedestal cover.
  - (5) Loosen rudder trim chain idler sprocket on forward side of pedestal.
  - (6) Remove cable guard from steering bungee sprocket.
  - (7) Remove nut, washer, and bolt securing steering bungee to bell crank.
  - (8) Remove chain from steering bungee sprocket.
  - (9) Remove clamp securing boot to steering bungee.
  - (10) Remove nut, washer, and bolt securing bungee to nose gear steering torque arm and remove bungee.
- B. Install Nose Gear Steering (Refer to Figure 204).
- (1) Place steering bungee through boot on firewall.
  - (2) Connect steering bungee to nose gear steering torque arm with bolt, washer and nut.
  - (3) Place chain over steering bungee sprocket and connect steering bungee to bell crank with bolt, do not install washer and nut at this time.
  - (4) Rig nose gear steering. Refer to Rigging Nose Wheel Steering.
  - (5) Install clamp on nose wheel steering bungee boot.
  - (6) Install cowling. Refer to Chapter 71, Cowling - Removal/Installation.
  - (7) Install carpet and shield assemblies.
  - (8) Install pedestal cover.
  - (9) Install pilots and copilots seats. Refer to Chapter 25, Front Seats - Maintenance Practices.

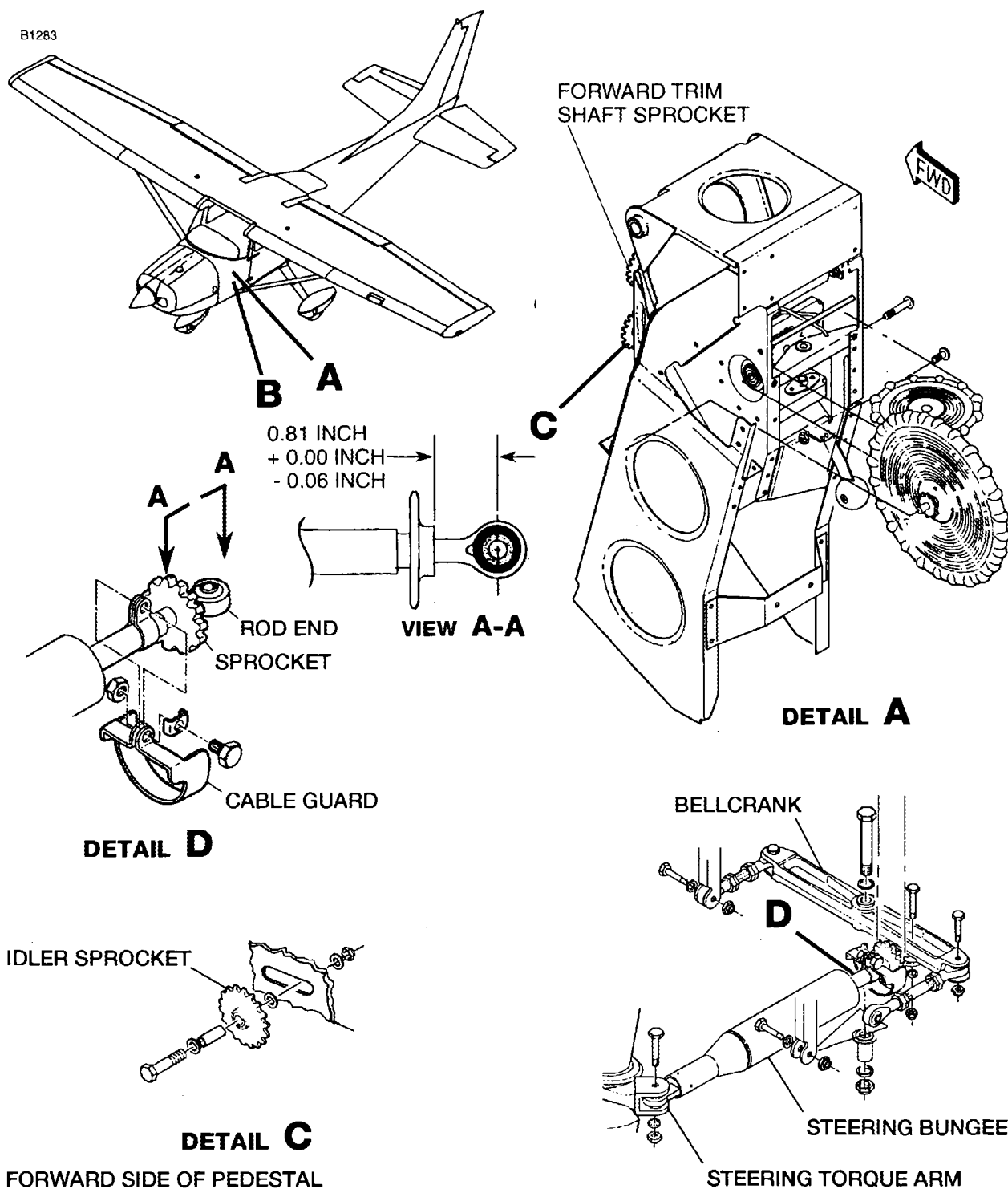
## 9. Rigging Nose Wheel Steering.

**NOTE:** The rudder control system, rudder trim control system and nosewheel steering system are interconnected. Adjustments to any one of these systems will affect the others. The rudder control system must be correctly rigged prior to rigging the rudder trim and nosewheel steering system.

- A. Rig Nose Wheel Steering. (Refer to Figure 204).
- (1) Ensure rudder control system is properly rigged.
  - (2) Weight or tie down tail of airplane to raise nose wheel from floor.
  - (3) Extend nose gear strut and ensure nose gear is centered against external centering stop.
  - (4) Clamp rudder pedals in neutral position.
  - (5) Adjust nose wheel steering bungee rod end to 0.81 inch +0.00 or -0.06 inches from sprocket to center of rod end bearing.
  - (6) Rotate sprocket in or out as required to align rod end with attaching hole in bell crank and install bolt, washer, and nut.
  - (7) Rotate rudder trim wheel until indicator is centered in pedestal slot (neutral).
  - (8) Without moving sprocket, engage chain on steering bungee sprocket, forward trim shaft sprocket and idler sprocket.
  - (9) Adjust idler sprocket to allow approximately one-half inch deflection at chain midpoint and tighten sprocket.
  - (10) Install cable guard over sprocket.



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Nose Wheel Steering Installation  
 Figure 204 (Sheet 1)

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(11) Lower nose wheel to ground and remove clamps from rudder pedals.

**WARNING: Ensure rudder moves in the correct direction when operated by the rudder pedals and trim control wheel.**

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**MAIN LANDING GEAR WHEEL AND AXLE - MAINTENANCE PRACTICES**

**1. General**

- A. Main landing gear wheel maintenance practices provide removal/installation instructions for left main wheel. Removal/installation for right main wheel is typical unless otherwise noted.

**2. Main Wheel Removal/Installation**

**NOTE:** Wheel removal is not necessary to reline brakes or to remove brake parts, other than the brake disc on the torque plate.

- A. Remove Main Wheel (Refer to Figure 201).
- (1) Jack airplane. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (2) Remove speed fairing or hub cap, if installed. Refer to Main Landing Gear - Maintenance Practices.
  - (3) Remove cotter pin and axle nut.
  - (4) Remove bolts securing brake back plate to brake cylinder. Remove back plate.
  - (5) Pull wheel from axle.
- B. Install Main Wheel (Refer to Figure 201).
- (1) Place wheel assembly on axle.
  - (2) Install axle nut and tighten axle nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellated and install cotter pin.
  - (3) Place brake back plate in position and secure with bolts.
  - (4) Install speed fairing or hub cap. Refer to Main Landing Gear - Maintenance Practices.
  - (5) Remove airplane from jacks. Refer to Chapter 7, Jacking - Maintenance Practices.

**3. Main Wheel Axle Removal/Installation**

- A. Remove Main Wheel Axle (Refer to Figure 201).
- (1) Jack airplane. Refer to Chapter 7, Jacking - Maintenance Practices.
  - (2) Remove main wheel brake fairing, speed fairing, and cap fairing cover plate. Refer to Main Landing Gear - Maintenance Practices.
  - (3) Remove main landing gear wheel. Refer to Main Wheel Removal/Installation.
  - (4) Disconnect, drain and cap or plug hydraulic brake line at the wheel brake cylinder.

**NOTE:** When removing axle from strut fitting, note number and position of wheel alignment shims between axle and fitting. Mark shims or tape together carefully so they can be installed in exactly the same position to ensure wheel alignment is not disturbed.

- (5) Remove nuts, washers, and bolts securing shims, axle, brake components, and speed fairing mounting plate from strut fitting.
- B. Install Main Wheel Axle (Refer to Figure 201).

**NOTE:** Ensure wheel alignment shims are installed in the same order and position as when removed.

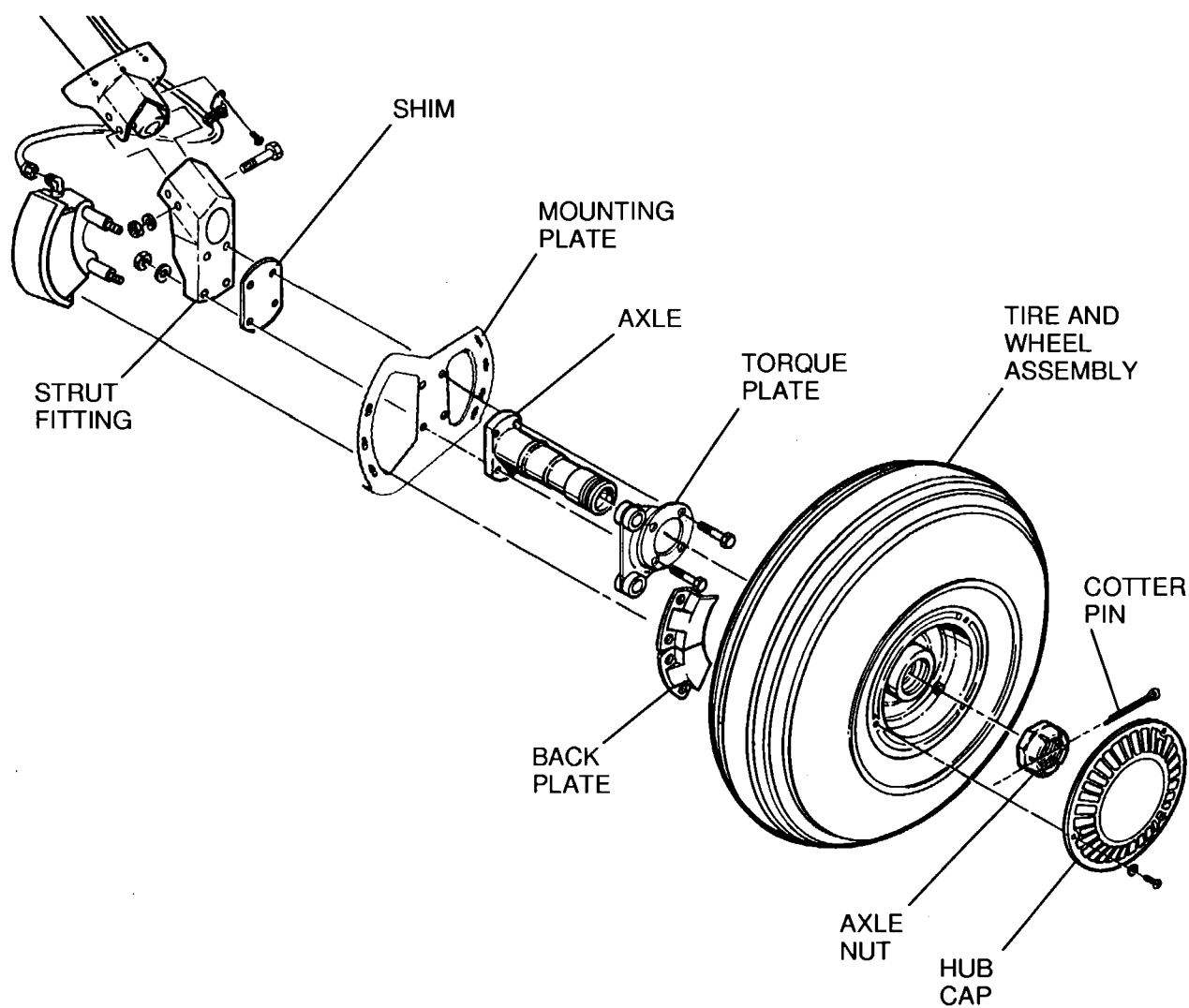
- (1) Secure shims, axle, brake components, and speed fairing mounting plate to strut fitting.
- (2) Install wheel on axle. Refer to Main Wheel Removal/Installation.
- (3) Connect hydraulic brake line to wheel brake cylinder.
- (4) Fill and bleed hydraulic brake system. Refer to Brake System - Maintenance Practices.
- (5) Install main wheel speed fairing. Refer to Main Landing Gear - Maintenance Practices.
- (6) Remove airplane from jacks. Refer to Chapter 7, Jacking - Maintenance Practices.

**4. Main Wheel Disassembly/Assembly**

- A. Disassemble Main Wheel (Refer to Figure 202).

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Main Landing Gear Wheel and Axle Installation  
Figure 201 (Sheet 1)

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**WARNING: Serious injury can result from attempting to separate wheel halves with tire and tube inflated.**

- (1) Completely deflate tire and tube and break loose tire bead. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.
- (2) Remove thru-bolts holding wheel halves together.
- (3) Separate and remove wheel halves from tire and tube. Mark tube and tire relationship.
- (4) From each wheel half, remove retaining rings, grease seal retainers, grease seal felts, grease seal ring and bearing cones.

**NOTE:** Bearing cups (races) are a press fit in wheel halves, and should not be removed unless a new part is to be installed.

- (5) To remove bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven, not to exceed 250°F. Using an arbor press, if available, press out bearing cup and press in a new bearing cup while wheel half is still hot.

**B. Assemble Main Wheel (Refer to Figure 202).**

- (1) Apply a small quantity of SAE 10 oil for lubrication on the felt grease seal.
- (2) Install bearing cone, grease seal ring, grease seal felt, grease seal retainer and retaining ring into each wheel half.
- (3) Insert tube in tire, aligning index marks on tire and tube.
- (4) Place wheel half into tire and tube (side opposite valve stem). With washer under head of thru-bolt, insert bolt through wheel half.
- (5) Place other wheel half into other side of tire and tube, aligning valve stem in valve slot.
  - (a) Ensure tube is not pinched between wheel halves before torquing nuts.

**CAUTION:** Uneven or improper torque of the nuts can cause failure of the bolts with resultant wheel failure.

**CAUTION:** Do not use impact wrenches on thru-bolts or nuts.

- (6) Insert washers and nuts on thru-bolts, and dry torque alternately to 90 inch-pounds, +2 or -2 inch-pounds.
- (7) Inflate tire to seat tire beads, deflate and inflate to 42 PSI air pressure.

**5. Main Wheel Inspection/Check**

**A. Inspect Main Wheel (Refer to Figure 202).**

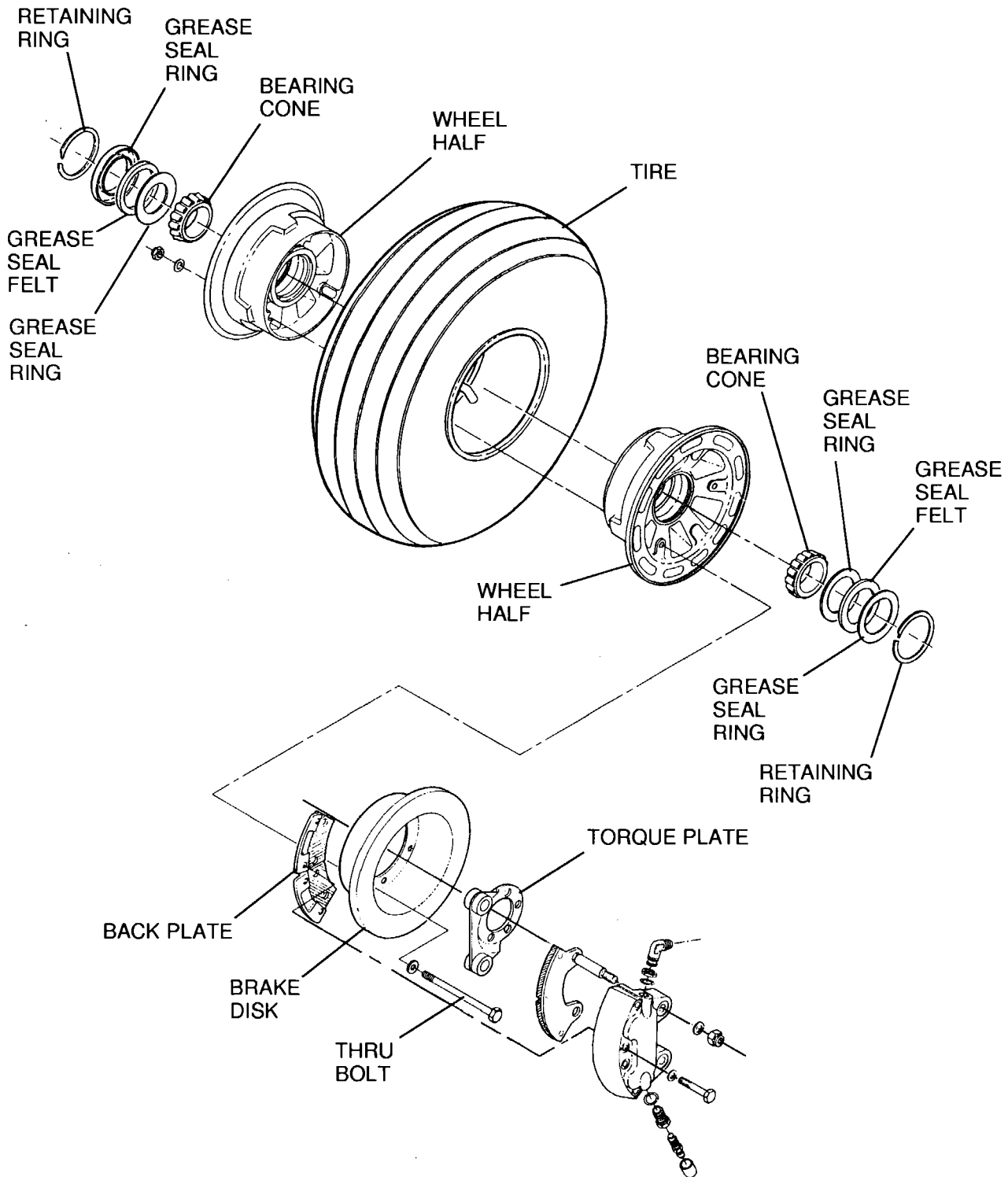
- (1) Clean all metal parts and grease seal felts in solvent, and dry thoroughly.

**NOTE:** A soft bristle brush may be used to remove hardened grease, dust or dirt.

- (2) Inspect wheel halves for cracks or damage.
- (3) Inspect bearing cones, cups, retaining rings, grease seal retainers, grease seal felts and grease seal rings for wear or damage.
- (4) Inspect thru-bolts for cracks in bolt head.
- (5) Replace cracked or damaged wheel half.
- (6) Replace damaged retainer rings and seals.
- (7) Replace worn or damaged bearing cups and cones.
- (8) Replace any worn or damaged thru-bolts.
- (9) Remove any corrosion or small nicks.
- (10) Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.
- (11) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt
- (12) Pack the bearings with MIL-PRF-81322 wheel bearing grease.
- (13) Inspect Brakes. Refer to Chapter 5, Inspection Time Limits.

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Main Wheel Assembly  
Figure 202 (Sheet 1)

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**6. Wheel Balancing**

- A. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerance permits a specified amount of static unbalance. The light weight point of this tire is marked with a red dot on the tire sidewall and the heavy weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel shows evidence of unbalance during service, it may be statically balanced but not dynamically balanced.

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**NOSE LANDING GEAR WHEEL - MAINTENANCE PRACTICES**

**1. General**

- A. Nose landing gear wheel maintenance practices consist of nose wheel removal/installation, nose wheel disassembly/assembly and nose landing gear wheel inspection/check.

**2. Nose Landing Gear Wheel Removal/Installation**

- A. Remove Nose Landing Gear Wheel (Refer to Figure 201).
- (1) Weight or tie down tail of airplane to raise nose wheel from floor.
  - (2) Remove nose wheel axle stud.
  - (3) Pull nose wheel assembly from fork and remove axle tube from nose wheel. Airplanes equipped with speed fairing, loosen wheel scraper as necessary.
- B. Install Nose Landing Gear Wheel (Refer to Figure 201).
- (1) Install axle tube in nose wheel.
  - (2) Install nose wheel assembly in fork and install nose wheel axle stud.
  - (3) Tighten axle stud until a slight bearing drag is obvious when wheel is rotated. Back the nut off to the nearest castellation and insert cotter pins.
  - (4) Airplanes equipped with speed fairings, check scraper clearance. Refer to Nose Landing Gear - Maintenance Practices.

**3. Nose Landing Gear Wheel Disassembly/Assembly**

- A. Disassemble Nose Landing Gear Wheel (Refer to Figure 201).
- (1) Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.

**WARNING: Serious injury can result from attempting to separate wheel halves with tire and tube inflated.**

- (2) Remove thru-bolts and washers.
- (3) Separate and remove wheel halves from tire and tube.
- (4) Remove retaining rings, grease seal retainer, felt grease seal, grease seal retainer and bearing cone from each wheel half.

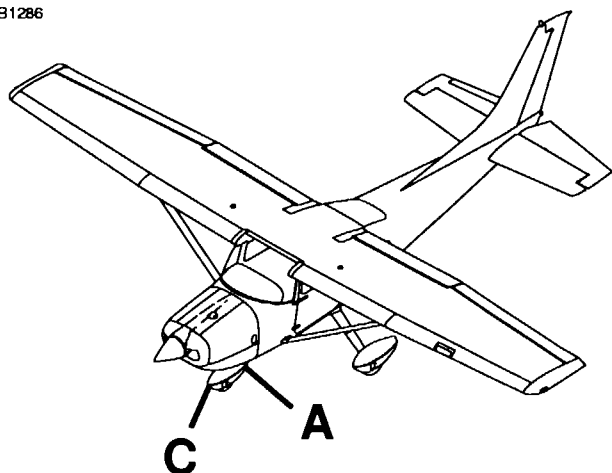
**NOTE:** Bearing cups are a press fit in wheel half and should not be removed unless a new part is to be installed.

- (5) To remove bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven, not to exceed 250°F (120°C). Using an arbor press, press out bearing cup and press in new bearing cup while wheel half is still hot.
- B. Assemble Nose Landing Gear Wheel (Refer to Figure 201).
- (1) Assemble bearing cone, grease seal retainer, felt grease seal, grease seal retainer and retaining ring into both wheel halves.
    - (a) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt.
  - (2) Insert tube in tire, aligning index marks on tire and tube.
  - (3) Place wheel half into tire and tube. With washer under head of thru bolt, insert bolt through wheel half.
  - (4) Place wheel half into other side of tire and tube, aligning valve stem in valve slot.
    - (a) Ensure tube is not pinched between wheel halves before torquing nuts.

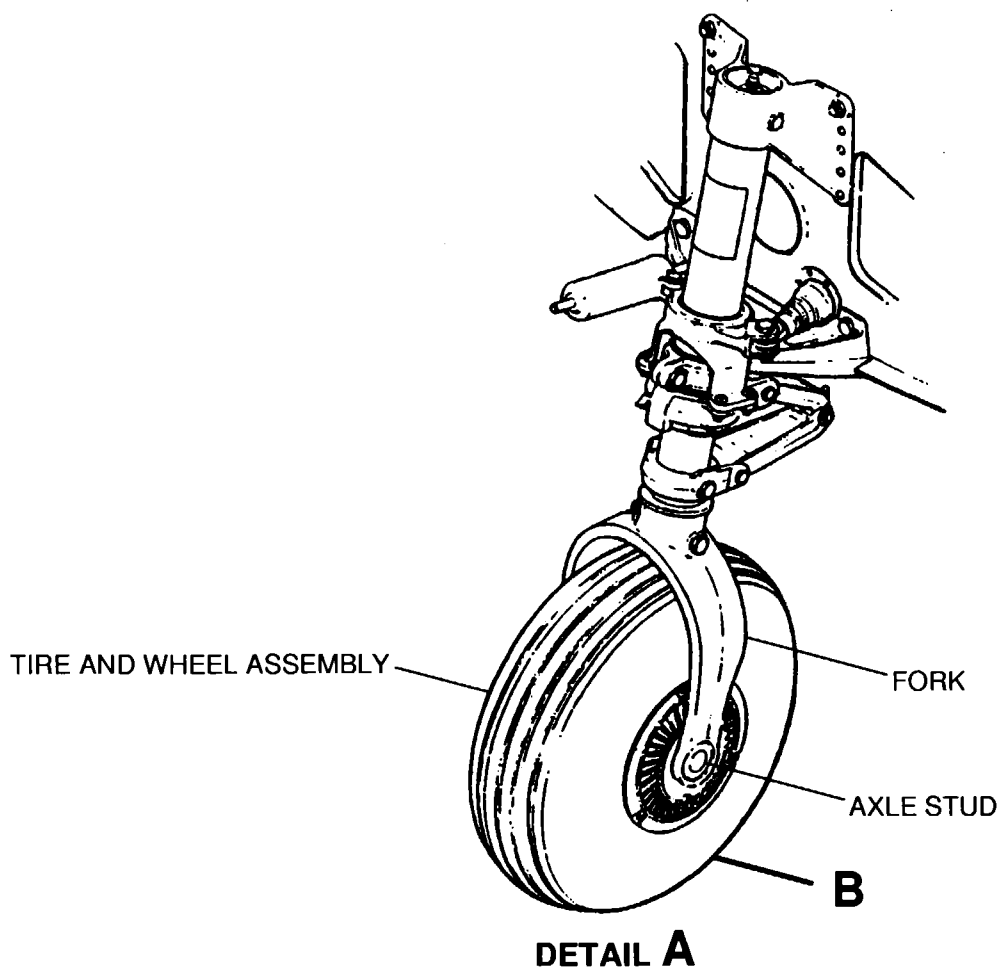


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**NOTE:** THE SPEED FAIRING IS REMOVED TO HELP CLEARLY IDENTIFY COMPONENTS.

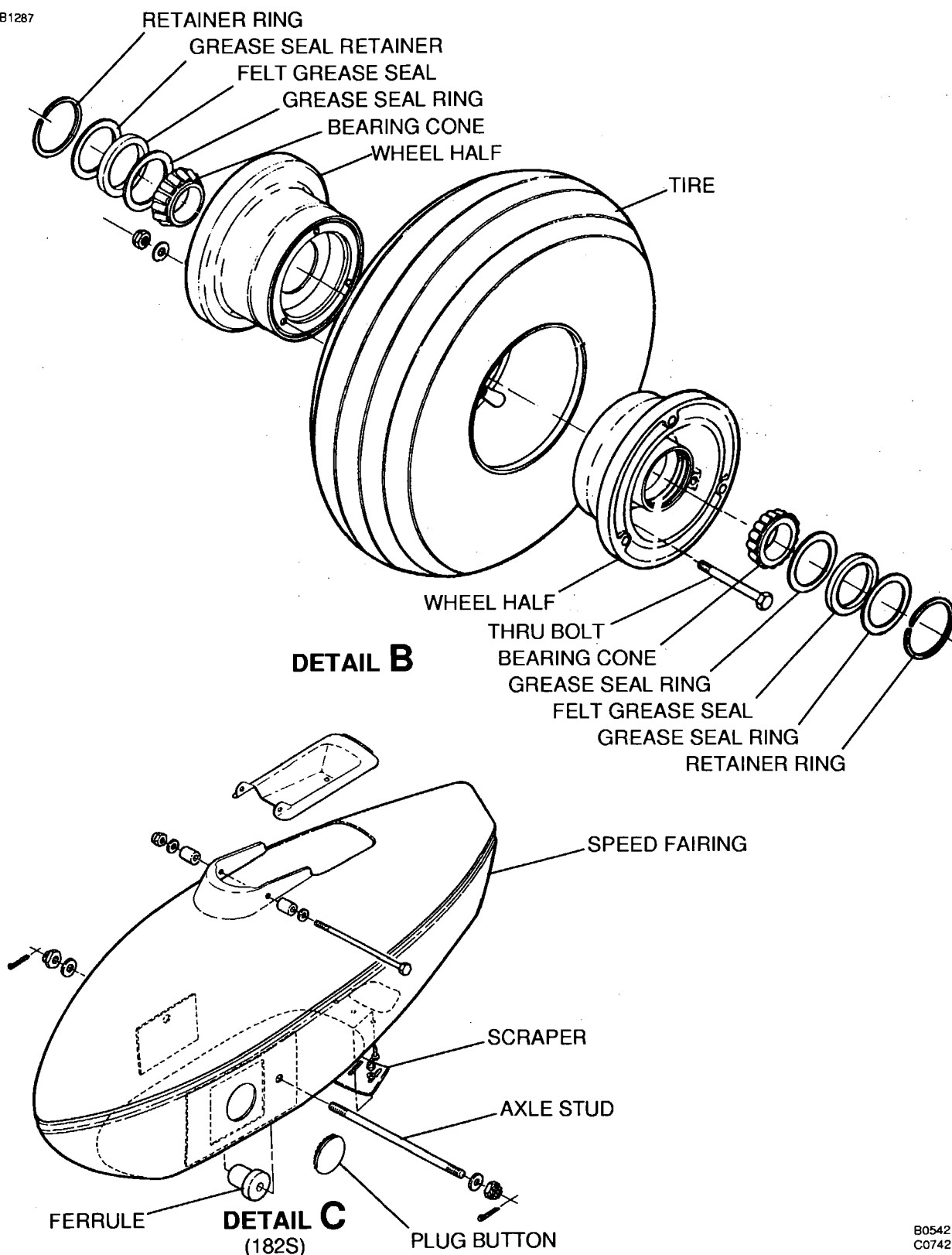


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Nose Landing Gear Wheel Installation  
Figure 201 (Sheet 1)

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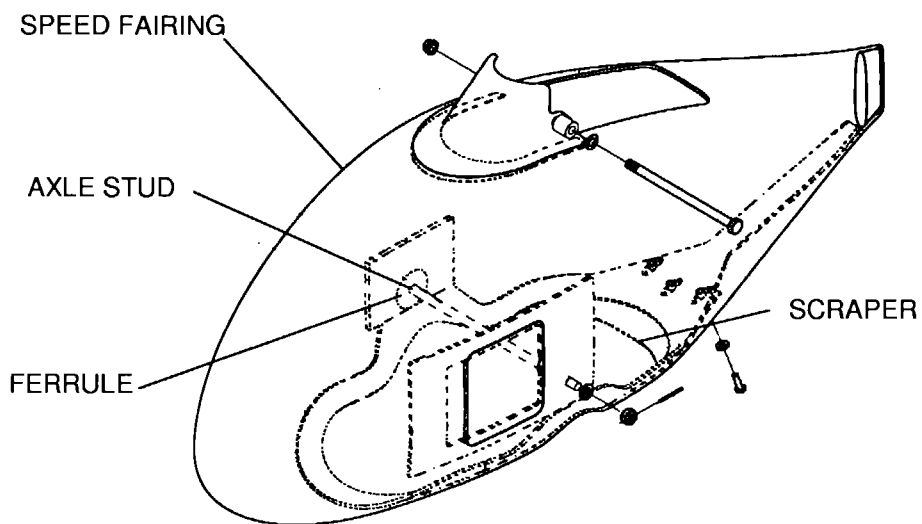


Nose Landing Gear Wheel Installation  
 Figure 201 (Sheet 2)

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**DETAIL C**  
(182T AND T182T)

Nose Landing Gear Wheel Installation  
Figure 201 (Sheet 3)

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**CAUTION:** Uneven or improper torque of the nuts can cause failure of the bolts with resultant wheel failure.

**CAUTION:** Do not use impact wrenches on thru-bolts or nuts.

- (5) Insert washers and nuts on thru-bolts, and dry torque alternately to 90 inch-pounds, +2 or -2 inch-pounds (10.2 N.m., +0.2 or -0.2 N.m.).
- (6) Inflate tire to seat tire beads, deflate and inflate to 49 PSI (338 kPa) air pressure.

**4. Nose Landing Gear Wheel Inspection/Check**

- A. Inspect Nose Landing Gear Wheel (Refer to Figure 201).
  - (1) Clean all metal parts and felt grease seals in Stoddard solvent or equivalent, and dry thoroughly.
  - (2) Inspect wheel halves for cracks or damage.
  - (3) Inspect bearing cones, cups, retaining rings, and seals for wear or damage.
  - (4) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt.
  - (5) Inspect thru-bolts and nuts for cracks in threads or radius of bolt heads.
  - (6) Replace cracked or damaged wheel half.
  - (7) Replace damaged retaining rings and seals.
  - (8) Replace any worn or cracked thru-bolts or nuts.
  - (9) Replace worn or damaged bearing cups or cones.
  - (10) Remove any corrosion or small nicks.
  - (11) Repair reworked areas of wheel by cleaning thoroughly, then apply one coat of clear lacquer paint.

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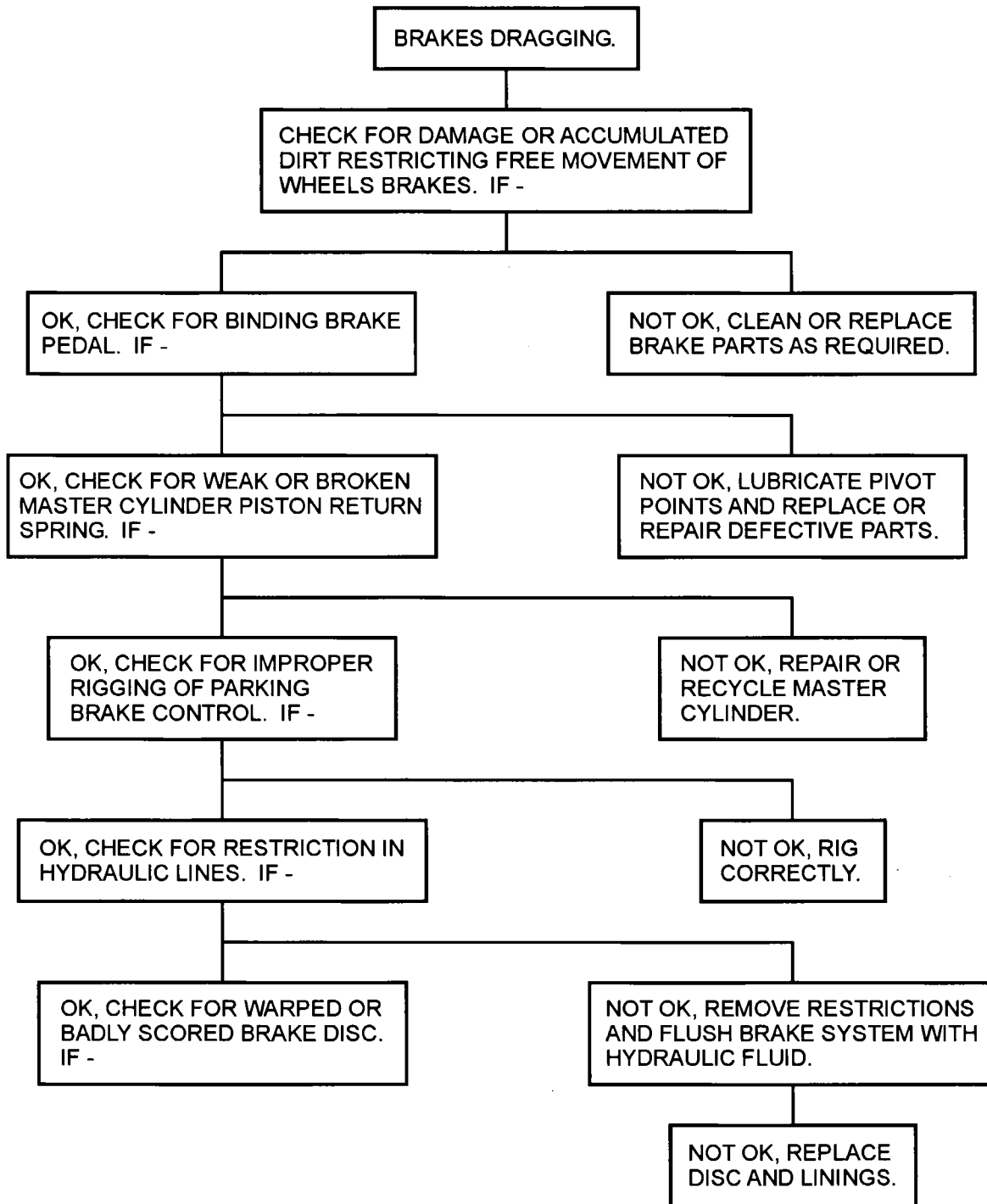
**BRAKE SYSTEM - TROUBLESHOOTING**

**1. Troubleshooting**

- A. A troubleshooting chart has been provided to aid the maintenance technician in system troubleshooting. Refer to Figure 101.

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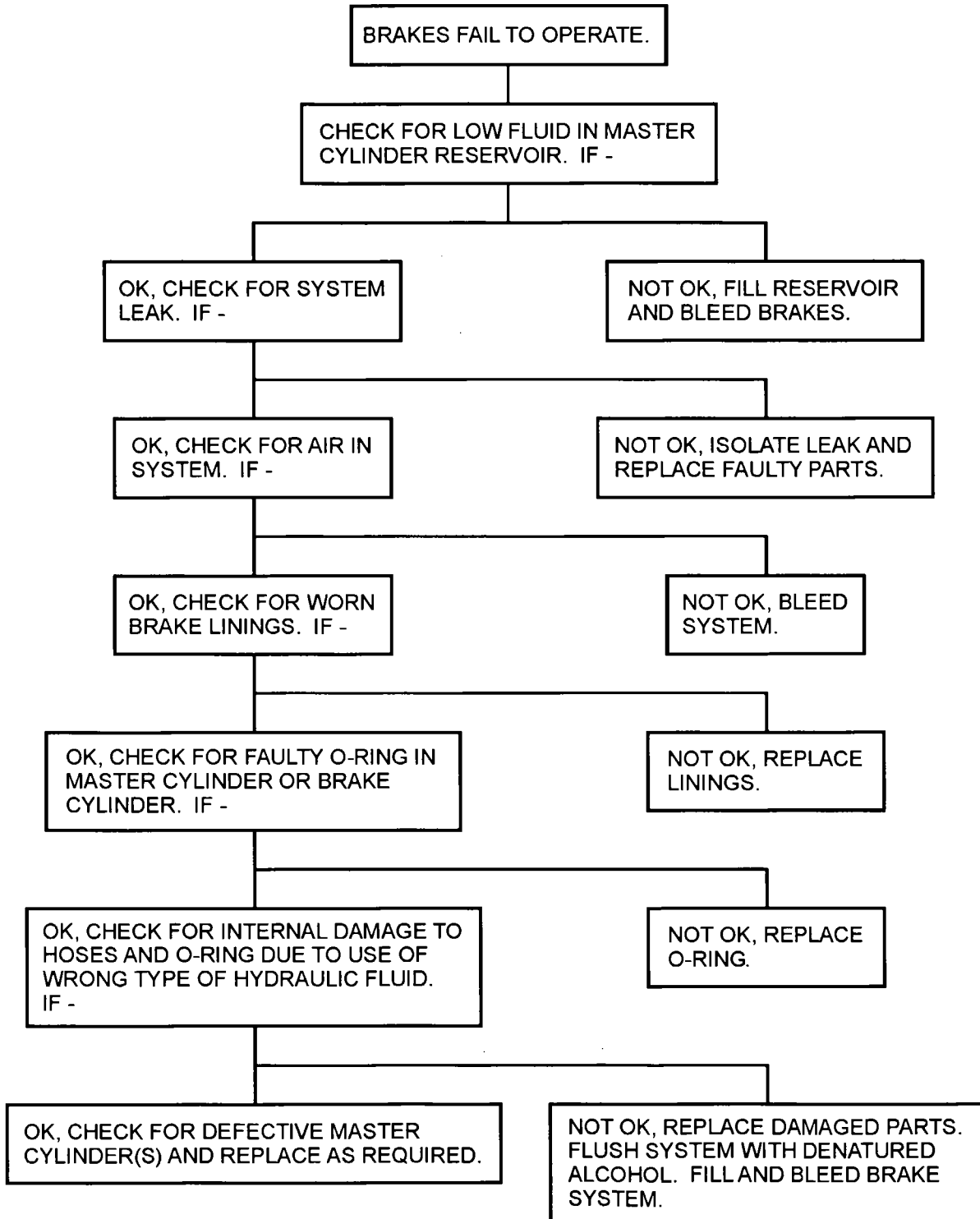
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Brake System Troubleshooting Chart  
Figure 101 (Sheet 1)

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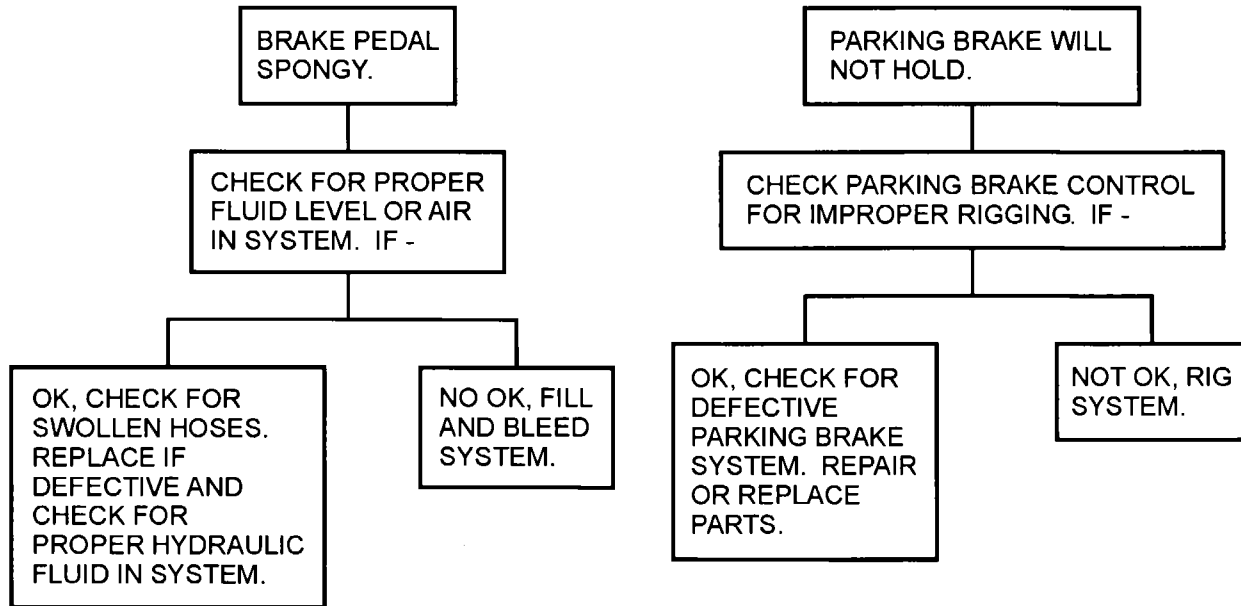
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Brake System Troubleshooting Chart  
Figure 101 (Sheet 2)

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Brake System Troubleshooting Chart  
Figure 101 (Sheet 3)



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**BRAKE SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. Brake system maintenance practices provide removal/installation and inspection/repair of the brake master cylinders; removal/installation, inspection/repair, and rigging of the parking brake system.
- B. The hydraulic brake system is comprised of two master brake cylinders, located immediately forward of the rudder pedals, brake lines connecting each master cylinder to its wheel brake cylinder, and the single-disc, floating cylinder-type brake assembly, located at each main landing gear wheel.
- C. The brake master cylinders, located immediately forward of the pilot's rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder for the fluid supply. Mechanical linkage permits the copilot pedals to operate the master cylinders.
- D. The wheel brake assemblies employ a floating brake assembly and a disc which is attached to the main wheel.
- E. The brake lines are of rigid tubing, except for flexible hose used at the brake master cylinders. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.
- F. The parking brake system consists of a handle and ratchet mechanism, connected by a cable to linkage at the brake master cylinders. Pulling out on the handle depresses both brake master cylinder piston rods and the handle ratchet locks the handle in this position until the handle is turned and released.

**2. Brake Master Cylinders Removal/Installation**

- A. Remove Brake Master Cylinders (Refer to Figure 201).
  - (1) Remove brake fairings for access to brake bleeder screws.
  - (2) Drain hydraulic fluid from brake master cylinders.
  - (3) Remove pilots seat. Refer to Chapter 25, Front Seats - Maintenance Practices.
  - (4) Remove shield assembly from pilots rudder pedals.
  - (5) Disconnect hoses from master cylinders and cap or plug hoses.
  - (6) Disconnect master cylinders at pilot rudder pedals.
  - (7) Remove cotter pins and pins securing lower end of brake master cylinders and remove brake master cylinders.
- B. Install Brake Master Cylinders (Refer to Figure 201).
  - (1) Secure lower end of brake master cylinders using pins and new cotter pins.
  - (2) Secure upper end of brake master cylinders to rudder pedals. Use new cotter pins.
  - (3) Remove plugs or caps from hoses and connect hoses to brake master cylinders.
  - (4) Remove filler plug and fill brake master cylinders with MIL-PRF-5606 hydraulic fluid.
  - (5) Bleed brake system. Refer to Brake System Bleeding.
  - (6) Install brake fairings.
  - (7) Install shield assembly on pilots rudder pedals.
  - (8) Install pilots seat. Refer to Chapter 25, Front Seats - Maintenance Practices.

**3. Brake Master Cylinder Disassembly/Assembly**

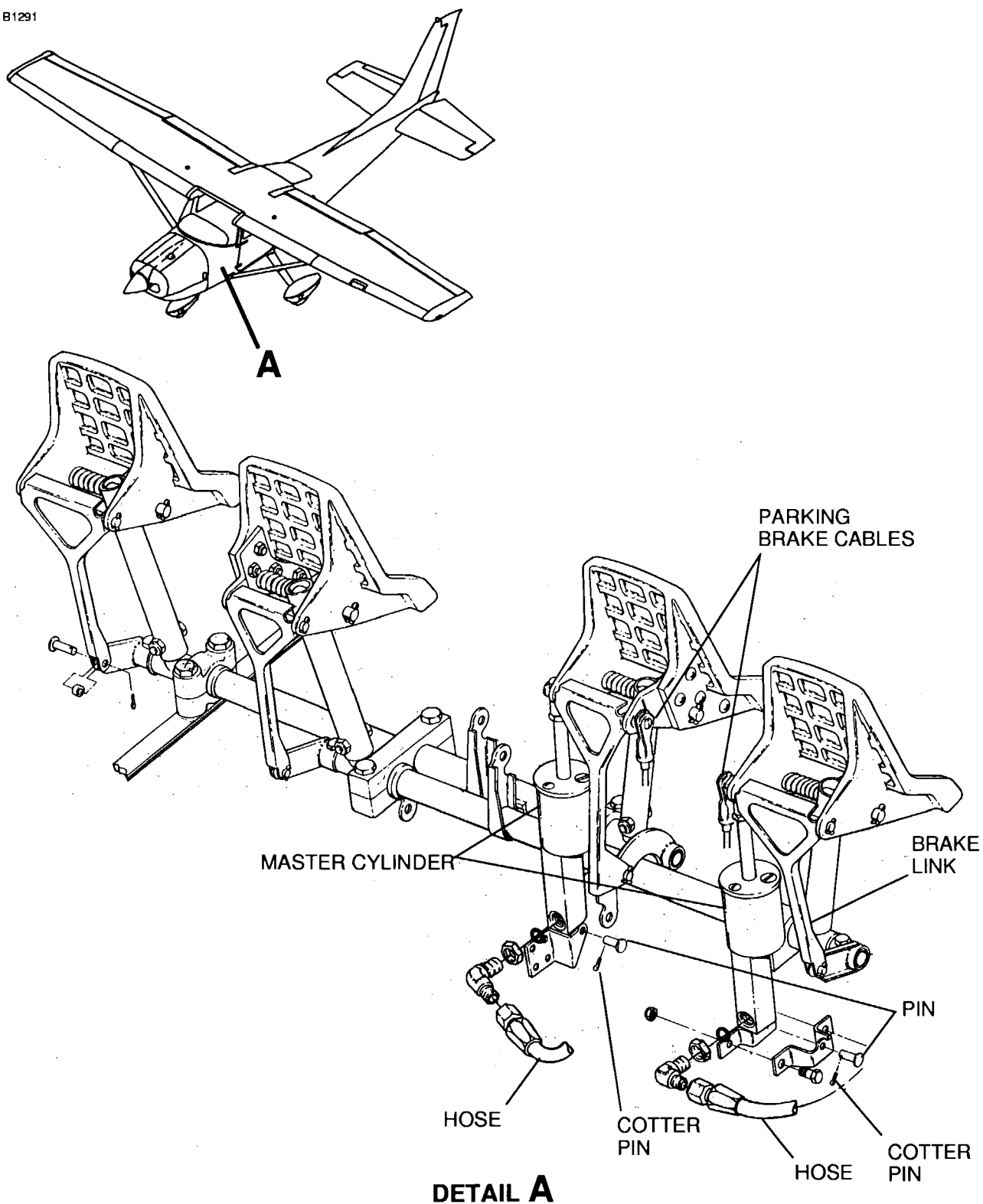
- A. Disassemble Brake Master Cylinder (Refer to Figure 202).
  - (1) Remove brake master cylinder. Refer to Brake Master Cylinder Removal/Installation.
  - (2) Remove clevis and jamnut from piston rod.
  - (3) Remove filler plug.

**NOTE:** A special tool, brake master cylinder wrench Proto Stanley Par No. C418 to remove brake master cylinder cover.

- (4) Unscrew cover and remove up over piston rod.
- (5) Remove piston rod and spring.
- (6) Remove packing and backup ring from piston.

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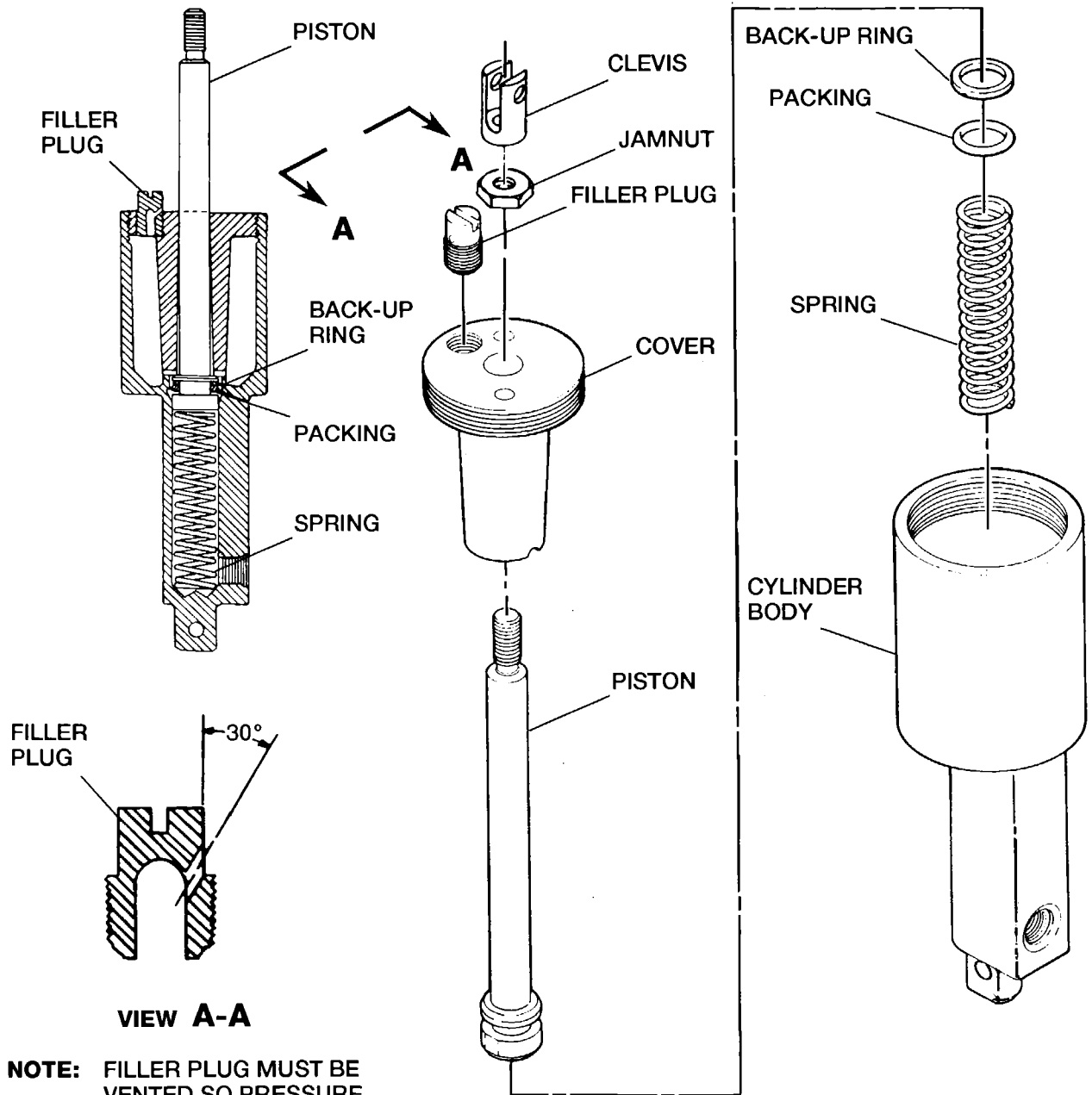


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Brake Master Cylinder Installation  
Figure 201 (Sheet 1)

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**VIEW A-A**

**NOTE:** FILLER PLUG MUST BE VENTED SO PRESSURE CANNOT BUILD UP IN THE RESERVOIR DURING BRAKE OPERATION.

Brake Master Cylinder Assembly  
 Figure 202 (Sheet 1)

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 12171003  
 A-A12171002

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- B. Assemble Brake Master Cylinder (Refer to Figure 202).
- (1) Apply lubrication to all internal parts with MIL-PRF-5606 hydraulic fluid.
  - (2) Install spring in cylinder body.
  - (3) Install backup ring and packing in groove of piston.
  - (4) Install piston in cylinder body.
  - (5) Install cover over piston and screw cover into cylinder body.
  - (6) Install jamnut and clevis on piston rod.
  - (7) Install filler plug making sure vent hole is open.
  - (8) Install brake master cylinder. Refer to Brake Master Cylinder Removal/Installation.

**4. Brake Master Cylinders Inspection/Repair**

- A. Check all parts for damage or wear. Repair is limited to replacement of worn or damaged parts.

**5. Brake Lining Wear Check**

- A. Check Brake Lining.
- (1) A new brake lining should be installed when existing lining has worn to a thickness of 3/32-inch. A 3/32-inch thick strip of material, held adjacent to each lining, can be used to determine amount of wear. The shank end of a drill bit, of the correct size, can also be used to determine wear of the brake linings.

**6. Brake Lining Replacement**

- A. Remove Brake Lining.
- (1) Remove brake fairing and speed fairing. Refer to Main Landing Gear - Maintenance Practices.
  - (2) Remove bolts securing back plate and remove back plate.
  - (3) Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.
  - (4) Place back plate on a table with lining side down flat.
  - (5) Center a 9/64-inch (or slightly smaller) punch in the rolled rivet and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate and pressure plate in the same manner.
- B. Install Brake Lining.

**NOTE:** A rivet setting kit is available from Cessna Aircraft Company.

- (1) Clamp the flat side of the anvil in a vise.
- (2) Align new lining on back plate and place brake rivet in hole with rivet head in the lining. Place the head against the anvil.
- (3) Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with a hammer to set the rivet. Repeat blows on punch until lining is firmly against back plate.
- (4) Realign the lining on the back plate and install rivets in the remaining holes.
- (5) Install a new lining on pressure plate in the same manner.
- (6) Position pressure plate on anchor bolts and place cylinder in position so that anchor bolts slide into torque plate.
- (7) Install back plate with bolts and washers. Torque bolts to 90-inch pounds.
- (8) Install brake fairing and speed fairing. Refer to Main Landing Gear - Maintenance Practices.
- (9) Perform brake lining burn-in. Refer to Brake Lining Burn-In.

**7. Brake System Bleeding**

- A. Bleed Brake System.
- (1) Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into filler hole.
  - (2) Immerse opposite end of flexible hose into a container with enough hydraulic fluid to cover end of hose.
  - (3) Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit to the bleeder valve on the wheel brake cylinder.

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- (4) As fluid is pumped into the system, observe the immersed end of the hose from the master brake cylinder for evidence of air bubbles being forced from the brake system. When bubbling has ceased, remove bleeder source from wheel brake cylinder and tighten bleeder valve.
- (5) Remove hose from master cylinder and install filler plug.

**8. Brake Lining Conditioning**

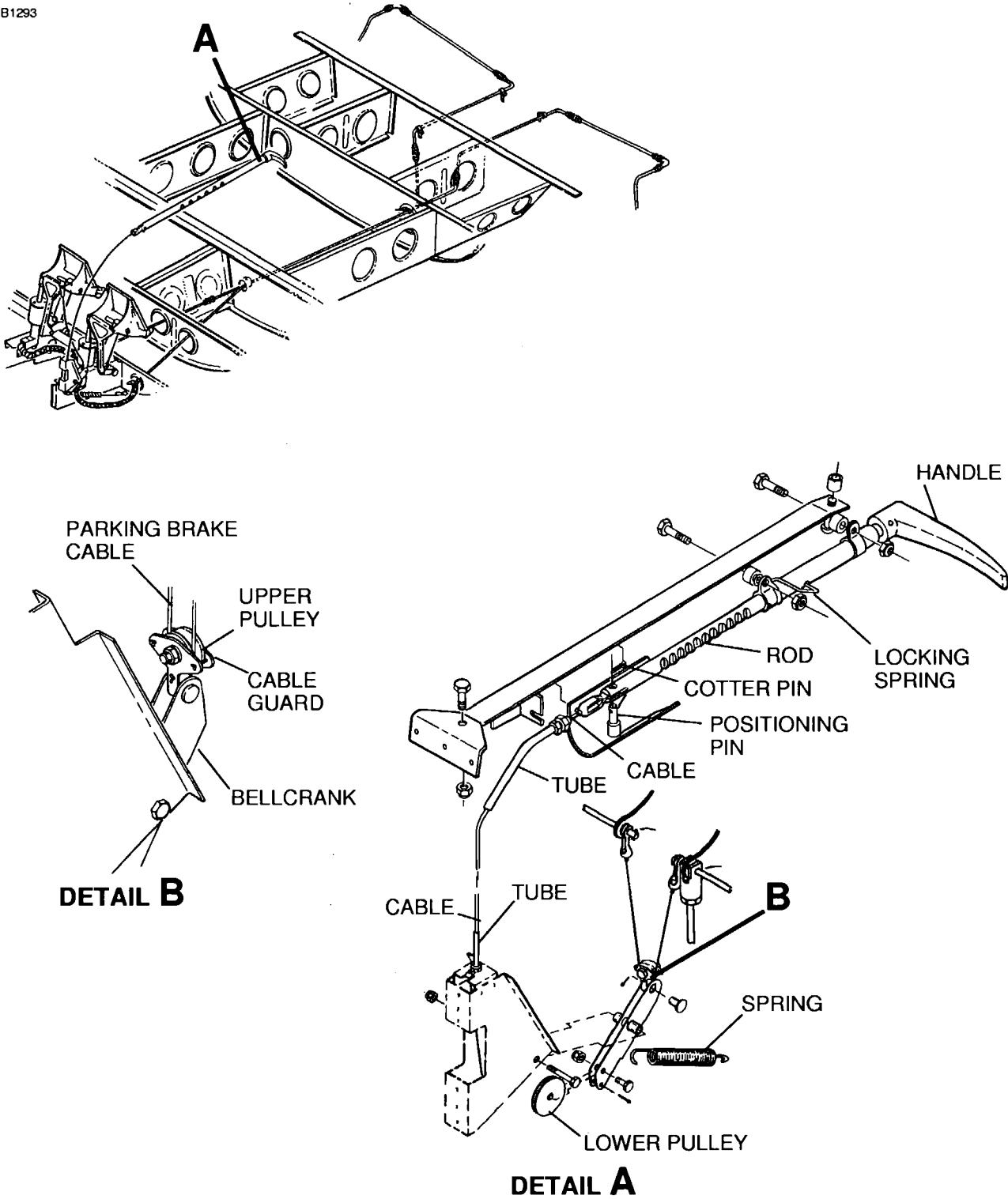
- A. Condition new brake linings.
  - (1) Taxi aircraft for 1500 feet with engine at 1700 rpm applying brake pedal force as needed to develop a 5-10 mph taxi speed.
  - (2) Allow the brakes to cool for 10 to 15 minutes.
  - (3) Apply brakes and check for restraint at full throttle. If brakes hold, conditioning is complete.
  - (4) If brakes cannot hold aircraft during static run up, allow brakes to completely cool, and repeat steps (1) through (3).

**9. Parking Brake System**

- A. Remove parking Brake System. (Refer to Figure 203).
  - (1) Remove pilots seat. Refer to Chapter 25, Front Seats - Maintenance Practices.
  - (2) Remove shield assembly from pilots rudder pedals.
  - (3) Disconnect spring from bell crank.
  - (4) Remove cotter pin from positioning pin and remove pin and cable from rod.
  - (5) Remove nut, bolt, and pulley from lower end of bell crank.
  - (6) Remove nuts from both ends of tube and remove tube and cable assembly.
  - (7) Remove cotter pins and disconnect park brake cable from rudder pedals.
  - (8) Remove nut, washer, and bolt and remove pulley and brake cable from upper end of bell crank.
- B. Install parking Brake System. (Refer to Figure 203).
  - (1) Connect brake cable to rudder pedals using new cotter pins.
  - (2) Position brake cable around upper pulley and install pulley, bolt, washer, and nut.
  - (3) Install tube and cable assembly upper end.
  - (4) Connect upper end of cable to rod using positioning pin and new cotter pin.
  - (5) Position cable around lower pulley and install pulley, bolt, and nut.
  - (6) Connect Cable and tube to bracket.
  - (7) Install spring.
  - (8) Ensure that cables are in grooves of pulleys and all cable guards are installed.
  - (9) Install shield assembly on pilots rudder pedals.
  - (10) Install pilots seat. Refer to Chapter 25, Front Seats - Maintenance Practices.
  - (11) Check parking brake operation.

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Parking Brake Installation  
 Figure 203 (Sheet 1)

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 A0514T3003  
 B0741T1011

**CHAPTER**

**33**

**LIGHTS**

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**LIGHTING - GENERAL**

**1. Scope**

- A. This chapter describes those units and components which provide for external and internal illumination such as landing lights, taxi lights, position lights, dome lights, etc. This chapter does not include warning lights for individual systems or self-illuminating signs.
- B. It is intended to use the information in this chapter in conjunction with wiring diagrams to provide data required to maintain the lighting systems that illuminate the interior and exterior of the airplane. An understanding of the function of the components, electrical circuits, electrical wiring, and switches is necessary to perform effective troubleshooting beyond lamp replacement. See the Model 182 Wiring Diagram Manual for electrical diagrams of specific systems.
- C. This chapter is divided into sections to aid maintenance personnel to find information. The sections provide maintenance procedures for individual exterior and interior lighting systems of the airplane.
  - (1) Exterior lighting.
    - (a) Flashing beacon light assembly located on the vertical fin tip assembly.
    - (b) Tail navigation light.
    - (c) Underwing courtesy lights.
    - (d) Wing tip strobe lights.
    - (e) Landing and taxi lights located on the left wing.
    - (f) Left (red) and right (green) navigation lights.
  - (2) Interior lighting.
    - (a) Dome lights provide cabin flood lighting.
    - (b) Map light is located on the pilot control wheel.
    - (c) Pedestal (console) lighting is provided by an upper, and lower pedestal light.
    - (d) Instrument and a glareshield lights provide lighting for flight instruments. Control of light brightness is provided through dimming circuitry.
    - (e) A center light is included in the 182T and T182T models.

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**MODEL 182/T182**  
MAINTENANCE MANUAL

**FLOOD LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. Cabin floodlights are mounted in the aft and the forward parts of the overhead console. Each floodlight has a switch. The forward and the aft lights are reading lights. On airplanes with Garmin G1000 that are equipped with oxygen, there is a light mounted on the oxygen panel. Dimming of the oxygen panel light is controlled by the STBY IND dimmer switch located on the switch panel on the pilot instrument panel.

**WARNING:** Obey all oxygen safety precautions on airplanes that have the oxygen panel installed in the overhead console. Refer to the oxygen maintenance practices for correct procedures to use when you must do maintenance on or near to the oxygen lines.

**2. Floodlight Bulb Removal/Installation**

**CAUTION:** Be careful when you remove and install the floodlight bulb. The floodlight bulb can break if too much pressure is applied when you remove and install it.

**NOTE:** Removal/Installation is typical for all floodlight bulbs.

- A. Floodlight Bulb Removal (Refer to Figure 201).  
(1) Press the lens holder up and turn it counterclockwise.  
(2) Remove the lens holder.  
(3) Carefully push the bulb up and turn it counterclockwise.  
(4) Remove the bulb.
- B. Floodlight Bulb Installation (Refer to Figure 201).  
(1) Put the bulb in position.  
(2) Carefully push the bulb up and turn it clockwise.  
(3) Put the lens in position.  
(4) Push the lens holder up and turn it clockwise.

**3. Light Assembly Removal/Installation**

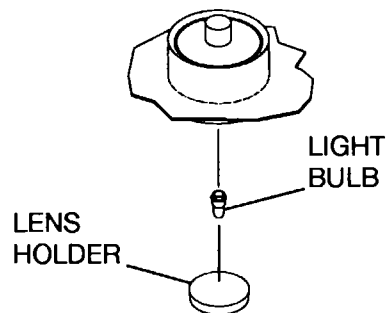
**NOTE:** Removal/installation is typical for the overhead dome light assemblies.

- A. Light Assembly Removal (Refer to Figure 201).  
(1) Put the ALT/BAT MASTER switch in the off position.

**CAUTION:** Support the overhead console when you remove the screws to prevent damage to the electrical wiring in the overhead console.

- (2) Remove the screws that attach the overhead console to the attach brackets.  
(3) Identify, tag, and disconnect the electrical wires from the light assembly.  
(4) Remove the light assembly from the overhead console.
- B. Light Assembly Installation (Refer to Figure 201).  
(1) Put the light assembly in position.  
(2) Attach the light assembly to the overhead console.  
(3) Connect the electrical wires to the light assembly.  
(4) Attach the overhead console to the attach brackets with the screws.  
(5) Put the ALT/BAT MASTER switch in the ON position.

**B1294**



OVERHEAD CONSOLE

LIGHT ASSEMBLY

SWITCH

DOME LIGHT ASSEMBLY

ATTACH BRACKET

B

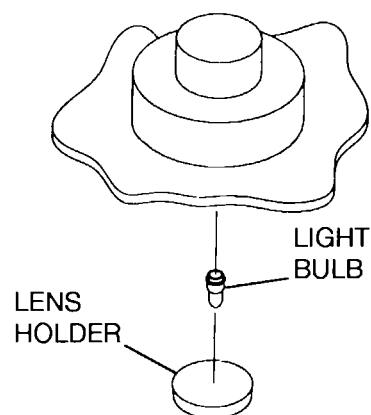
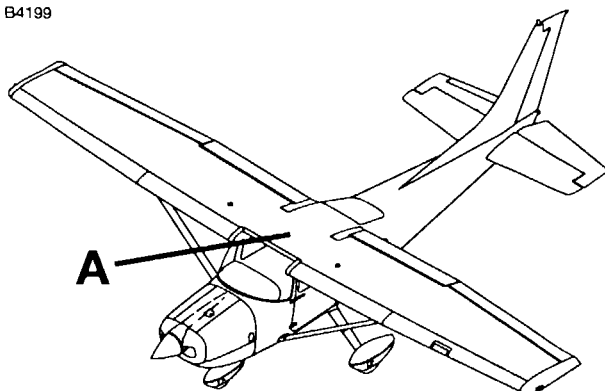
DETAIL A

0710T1001  
A0519T1050  
B0519T1058

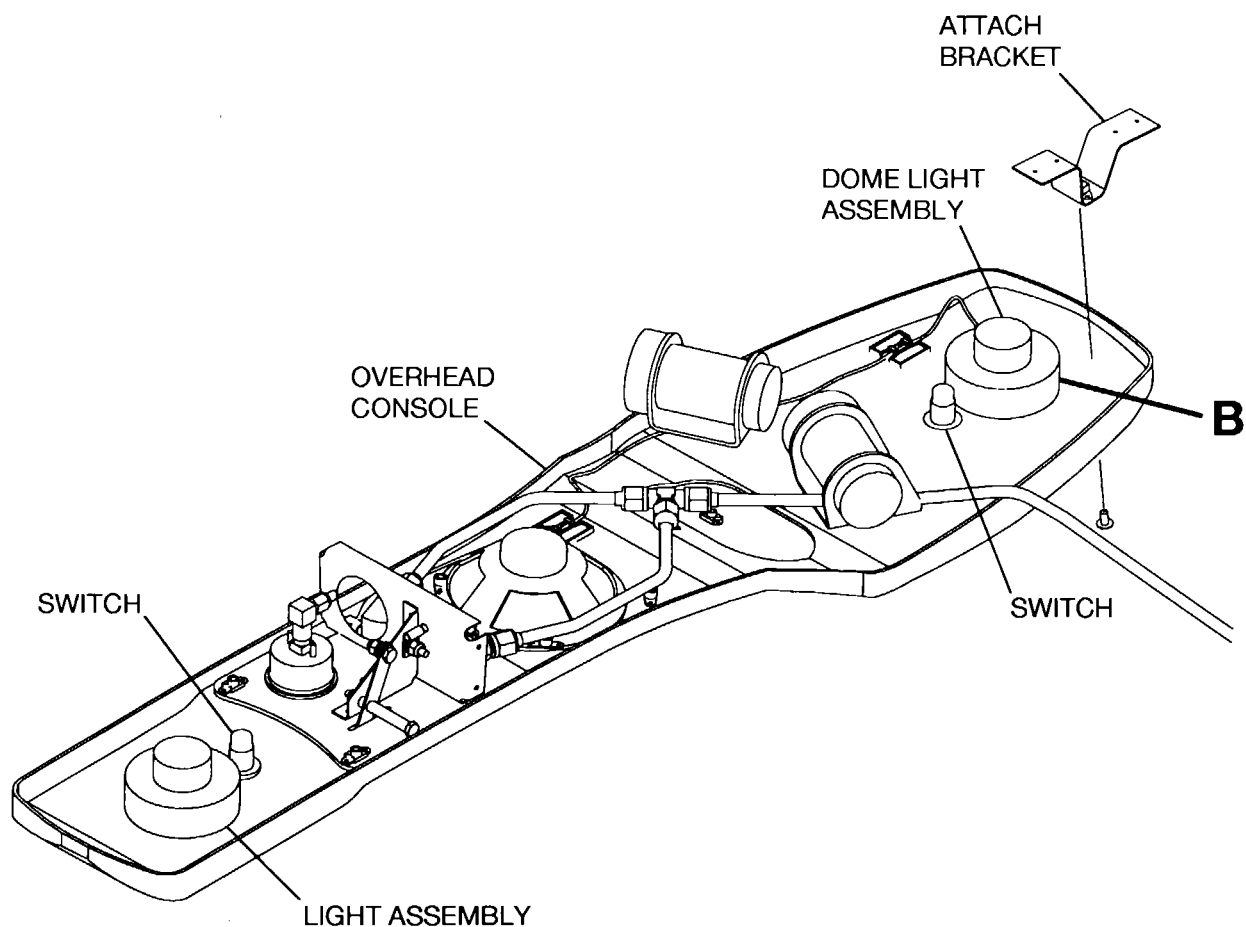
**33-10-00** Page 202  
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**DETAIL B**



**DETAIL A**

182T AND T182T AIRPLANES WITHOUT GARMIN G1000

Floodlight Installation  
Figure 201 (Sheet 2)

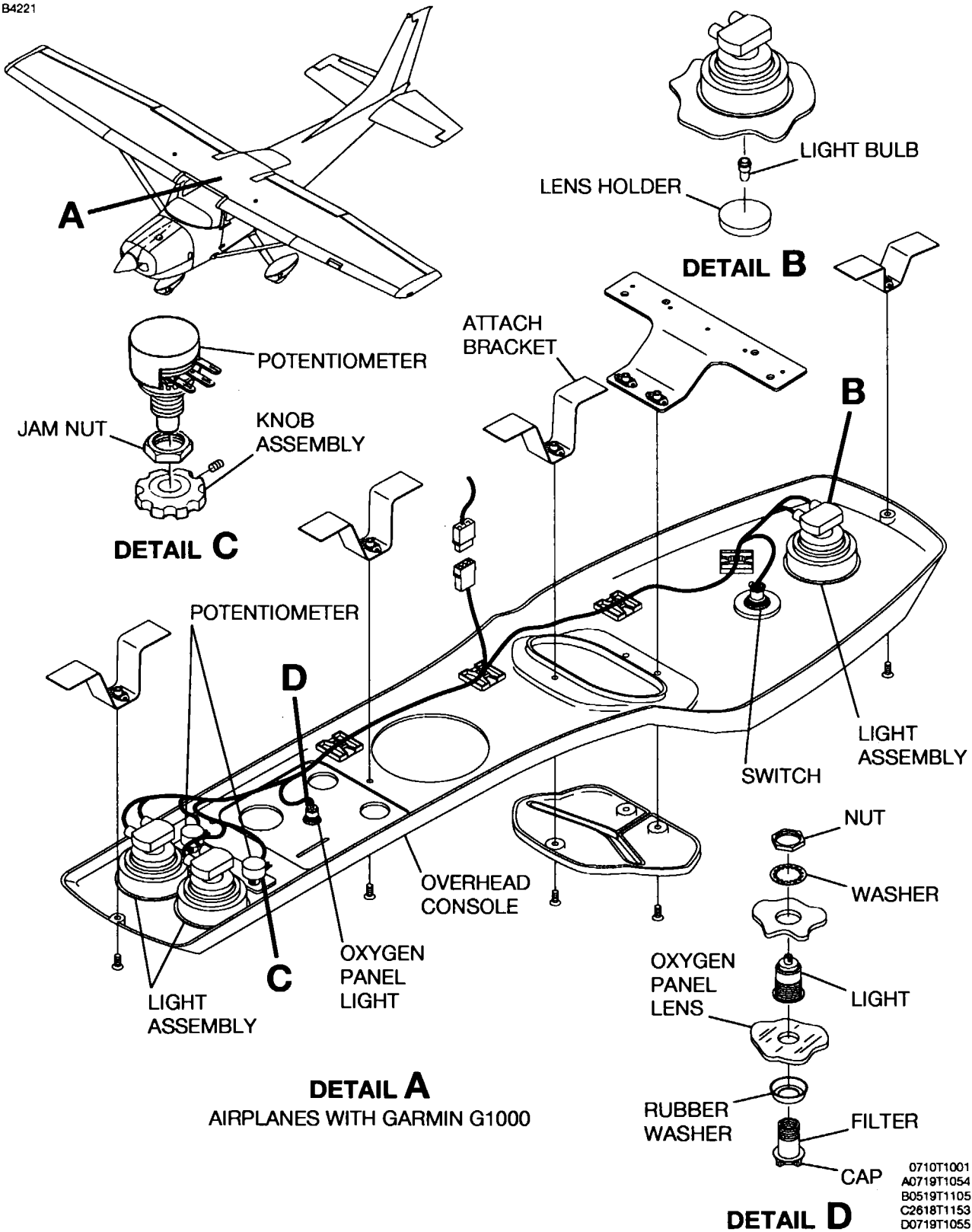
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Floodlight Installation  
 Figure 201 (Sheet 3)



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**4. Light Assembly Switch Removal/Installation**

- A. Light Assembly Switch Removal (Refer to Figure 201).  
(1) Put the ALT/BAT MASTER switch in the off position.

**CAUTION:** Support the overhead console when you remove the screws to prevent damage to the electrical wiring in the overhead console.

- (2) Remove the overhead console from the attach brackets.  
(3) Identify, tag, and disconnect the wires from the switch.  
(4) Remove the switch from the overhead console.
- B. Light Assembly Switch Installation (Refer to Figure 201).  
(1) Install the switch in the overhead console.  
(2) Connect the electrical wires to the switch.  
(3) Attach the overhead console to the attach brackets with the screws.  
(4) Put the ALT/BAT MASTER switch in the ON position.

**5. Potentiometer Removal/Installation**

- A. Potentiometer Removal (Refer to Figure 201).  
(1) Put the ALT/BAT MASTER switch in the off position.

**CAUTION:** Support the overhead console when you remove the screws to prevent damage to the electrical wiring in the overhead console.

- (2) Remove the overhead console from the attach brackets.  
(3) Identify, tag, and disconnect the wires from the switch.  
(4) Remove the knob assembly and the jam nut from the potentiometer.  
(5) Remove the potentiometer from the overhead console.
- B. Potentiometer Installation (Refer to Figure 201).  
(1) Install the jam nut and the knob assembly.  
(2) Connect the electrical wires to the potentiometer.  
(3) Attach the overhead console to the attach brackets with the screws.  
(4) Put the ALT/BAT MASTER switch in the ON position.

**6. Oxygen Panel Light Bulb Removal/Installation (Airplanes with Garmin G1000)**

**CAUTION:** Be careful when you remove and install the oxygen panel light bulb. The oxygen panel light bulb can break if too much pressure is applied when you remove and install it.

- A. Oxygen Panel Light Bulb Removal (Refer to Figure 201).  
(1) Put the ALT/BAT MASTER switch in the off position.  
(2) Remove the oxygen panel light assembly.  
(3) Carefully turn the bulb counterclockwise.  
(4) Remove the bulb from the light assembly.
- B. Oxygen Panel Light Bulb Installation (Refer to Figure 201).  
(1) Put the bulb in position.  
(2) Carefully turn the bulb clockwise.  
(3) Install the oxygen panel light assembly.  
(4) Put the ALT/BAT MASTER switch in the ON position.

**7. Oxygen Panel Light Assembly Removal/Installation (Airplanes with Garmin G1000)**

- A. Oxygen Panel Light Assembly Removal (Refer to Figure 201).  
(1) Put the ALT/BAT MASTER switch in the off position.

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- (2) Turn the cap on the oxygen panel light assembly counterclockwise.
  - (3) Remove the cap, washer, and light assembly from the oxygen panel.
- B. Oxygen Panel Light Assembly Installation (Refer to Figure 201.)
- (1) Put the washer and light assembly in position on the oxygen panel.
  - (2) Put the cap in position on the light assembly.
  - (3) Turn the cap clockwise to tighten.
  - (4) Put the ALT/BAT MASTER switch in the ON position.

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**GLARESHIELD LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. The glareshield light provides overall lighting for the instrument panel and is located under the glareshield. Model 182S aircraft have a single neon tube light and is powered by a variable AC current lighting inverter. The inverter is located behind the copilot instrument panel assembly. Model 182T and T182T aircraft have a light strip with multiple Light Emitting Diodes (LED) which are powered by variable DC current. A glareshield lighting dimming control is mounted on the right side of the circuit panel assembly.

**2. Glareshield Lamp Removal/Installation (182S)**

- A. Remove Glareshield Lamp (Refer to Figure 201).
- (1) Remove electrical power from airplane and turn off the ALT/BAT Master Switch.
  - (2) Remove screws securing copilot instrument panel assembly to bulkhead to gain access to glareshield light connector. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

**NOTE:** Note location of two spacers installed between the panel and bulkhead for installation of copilot instrument panel assembly.

- (3) Disconnect glareshield light connector.
- (4) Remove screws securing lens to glareshield assembly.

**NOTE:** Velcro strips are located on the edge of the lens to prevent light leakage around lens.

- (5) Remove lamp from light clips.

- B. Install Glareshield Lamp (Refer to Figure 201).

- (1) Position lamp at glareshield assembly with electrical wire and connector toward the right side of the airplane. Secure lamp in light clips.
- (2) Secure glareshield light lens to glareshield assembly with screws.

**NOTE:** Apply Velcro strips to the edge of the lens as required to prevent light leakage around lens.

- (3) Connect glareshield light connector.
- (4) Secure copilot instrument panel assembly to bulkhead with screws. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

**NOTE:** Two spacers are installed between the panel and bulkhead using the two screws securing the right side of the panel.

- (5) Restore electrical power to airplane as required and turn on the ALT/BAT Master Switch.

**3. Glareshield Light Removal/Installation (T182 and T182T)**

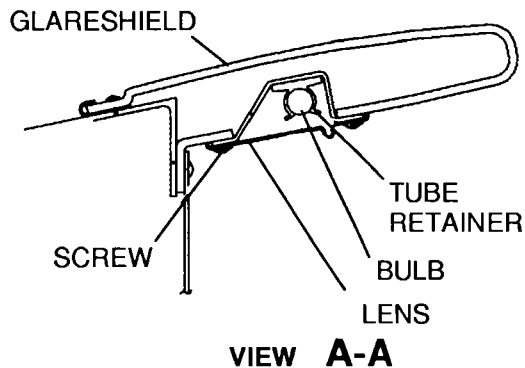
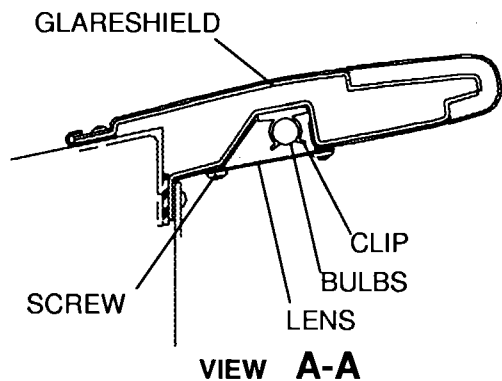
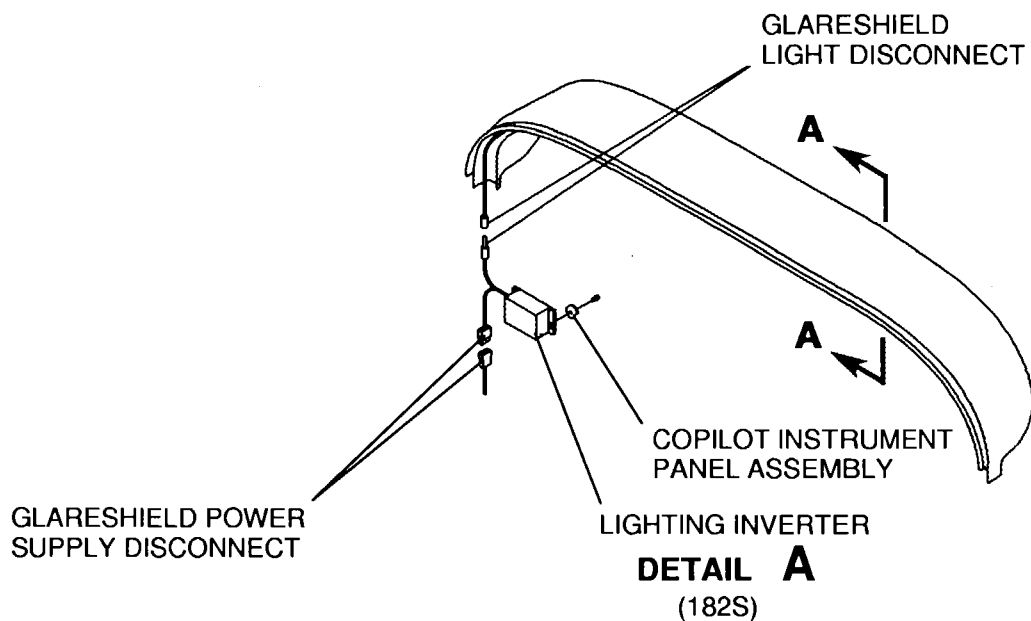
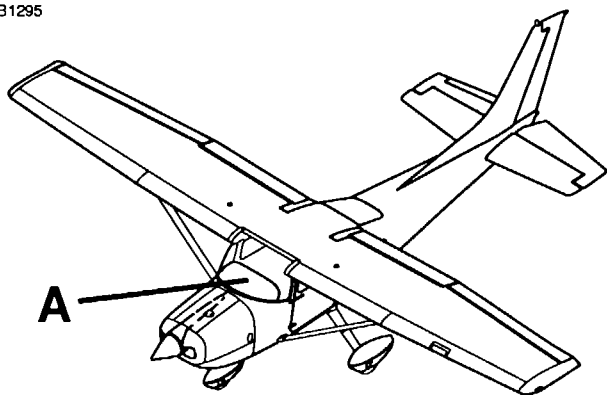
- A. Remove Glareshield Light Strip (Refer to Figure 202).
- (1) Remove electrical power from airplane and turn off the ALT/BAT Master Switch.
  - (2) Remove screws securing the left and right glareshield light enclosure plates and remove enclosure plate.

**CAUTION:** LED light strip is fragile when not supported in glareshield. Overbending of strip could cause failure of strip.

- (3) Remove screws securing light strip and gently remove light strip.
- (4) Disconnect glareshield light connector.

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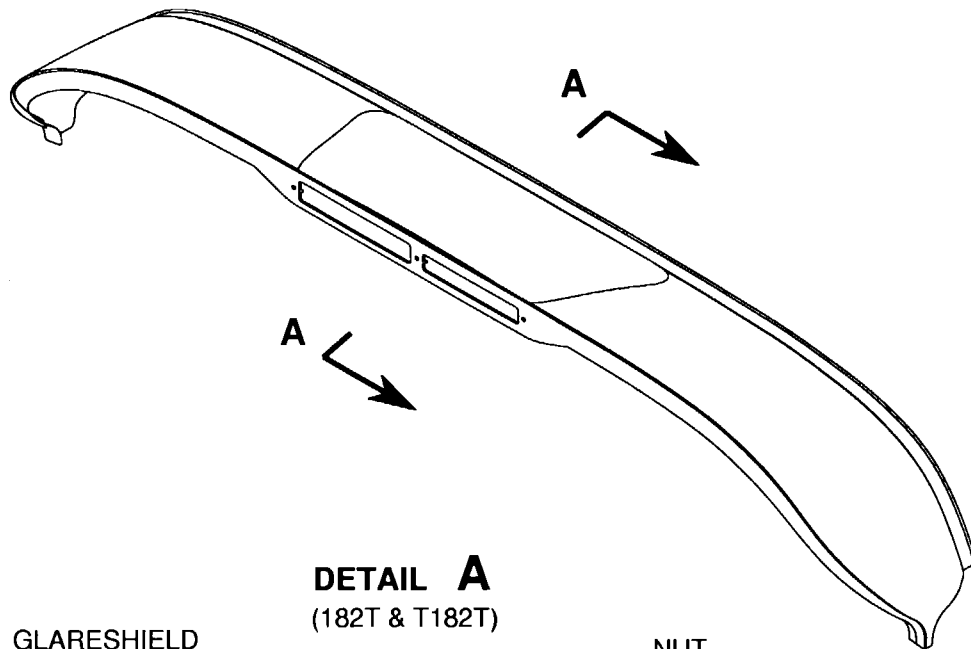
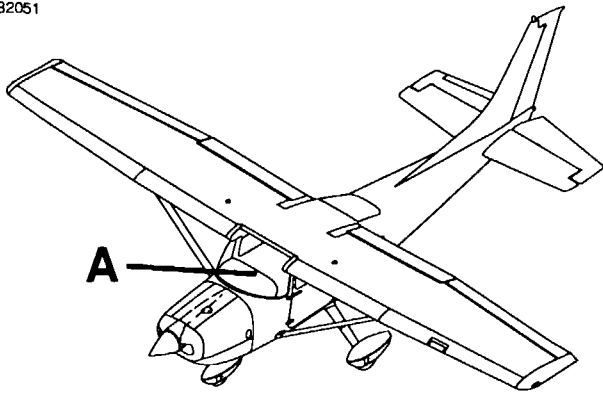


Glareshield Lighting Installation  
 Figure 201 (Sheet 1)

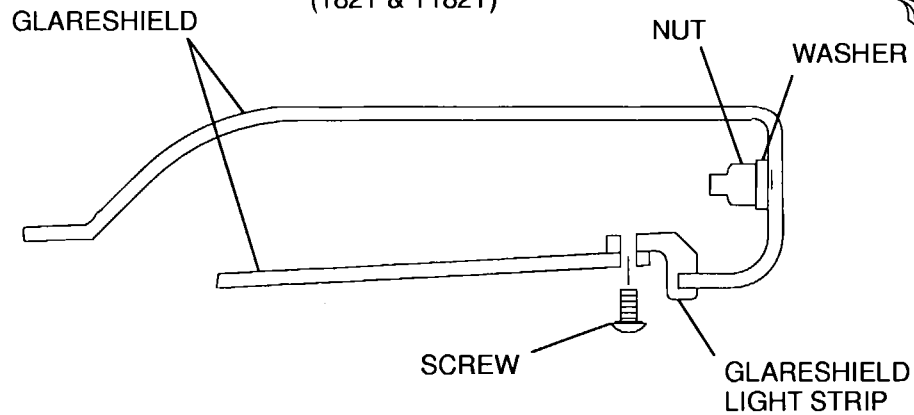
0710T1001  
 A0519T1051  
 AA0718T1014

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**DETAIL A**  
(182T & T182T)



**VIEW A-A**

Glareshield Lighting  
Figure 202 (Sheet 1)

0710T1001  
A1214T1033  
B1214T1034

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B. Install Glareshield Light Strip (Refer to Figure 202).

- (1) Connect glareshield light connector.

**CAUTION:** LED light strip is fragile when not supported in glareshield.  
Overbending of strip could cause failure of strip.

- (2) Gently install light strip into glareshield.
- (3) Secure light strip, then left and right enclosure plates with screws.
- (4) Restore electrical power to airplane as required and turn on the ALT/BAT Master Switch.

**4. Lighting Inverter Removal/Installation**

A. Remove Lighting Inverter (Refer to Figure 201).

- (1) Remove electrical power from airplane and turn off the ALT/BAT Master Switch.
- (2) Remove screws securing copilot instrument panel assembly to bulkhead to gain access to lighting inverter wiring connectors. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

**NOTE:** Note location of two spacers installed between the panel and bulkhead for installation of copilot instrument panel assembly.

- (3) Disconnect glareshield light connector and glareshield power supply connector.
- (4) Remove screws securing lighting inverter to back of instrument panel assembly.
- (5) Remove lighting inverter from airplane.

B. Install Lighting Inverter (Refer to Figure 201).

- (1) Secure lighting inverter to back of instrument panel assembly with screws.
- (2) Connect glareshield light connector and glareshield power supply connector.
- (3) Secure copilot instrument panel assembly to bulkhead with screws. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

**NOTE:** Two spacers are installed between the panel and bulkhead using the two screws securing the right side of the panel.

- (4) Restore electrical power to airplane as required and turn on the ALT/BAT Master Switch.

**5. Glareshield Lighting and Dimming Control Removal/Installation**

- A. For the Glareshield Lighting and Dimming Control Removal/Installation, refer to Radio Lighting - Maintenance Practices.

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**PEDESTAL LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. Two single bulb-type lights are installed on the console cover assembly, one an upper pedestal light and the second a lower pedestal light. The upper pedestal light is located on the upper left corner of the console protected by a light cover. The lower pedestal light is centered in the recessed portion of the lower console cover assembly in front of the horizontal support. A pedestal lighting dimming control (PEDESTAL LT) is mounted on the right side of the circuit panel assembly.
- B. General maintenance is limited to lamp replacement. See Model 182 Wiring Diagram Manual for troubleshooting associated electrical wiring and lamp holders. The upper and lower pedestal light disconnects are located in the console assembly behind the console cover assembly.

**2. Pedestal Light Lamp Replacement**

- A. Replace Upper Pedestal Light Lamp (Refer to Figure 201).
  - (1) Remove electrical power from airplane. Disengage INST LTS circuit breaker on the circuit panel assembly.
  - (2) Remove screws securing light cover to console cover assembly.
  - (3) Rotate lamp to free lamp from lamp holder. Remove lamp from lamp holder.
  - (4) Install new lamp in lamp holder.

**CAUTION:** For proper heat dissipation, attaching tab of reflector must be sandwiched between console assembly and console cover assembly.

- (5) Ensure reflector is properly positioned and secure light cover to console cover assembly with screws.
  - (6) Restore electrical power to airplane. Engage INST LTS circuit breaker.
- B. Replace Lower Pedestal Light Lamp (Refer to Figure 201).
  - (1) Remove electrical power from airplane. Disengage INST LTS circuit breaker on the circuit panel assembly.
  - (2) Rotate lamp to free lamp from lamp holder. Remove lamp from lamp holder.

**NOTE:** Lamp is directly accessible from the lower front, recessed portion of the console cover assembly.

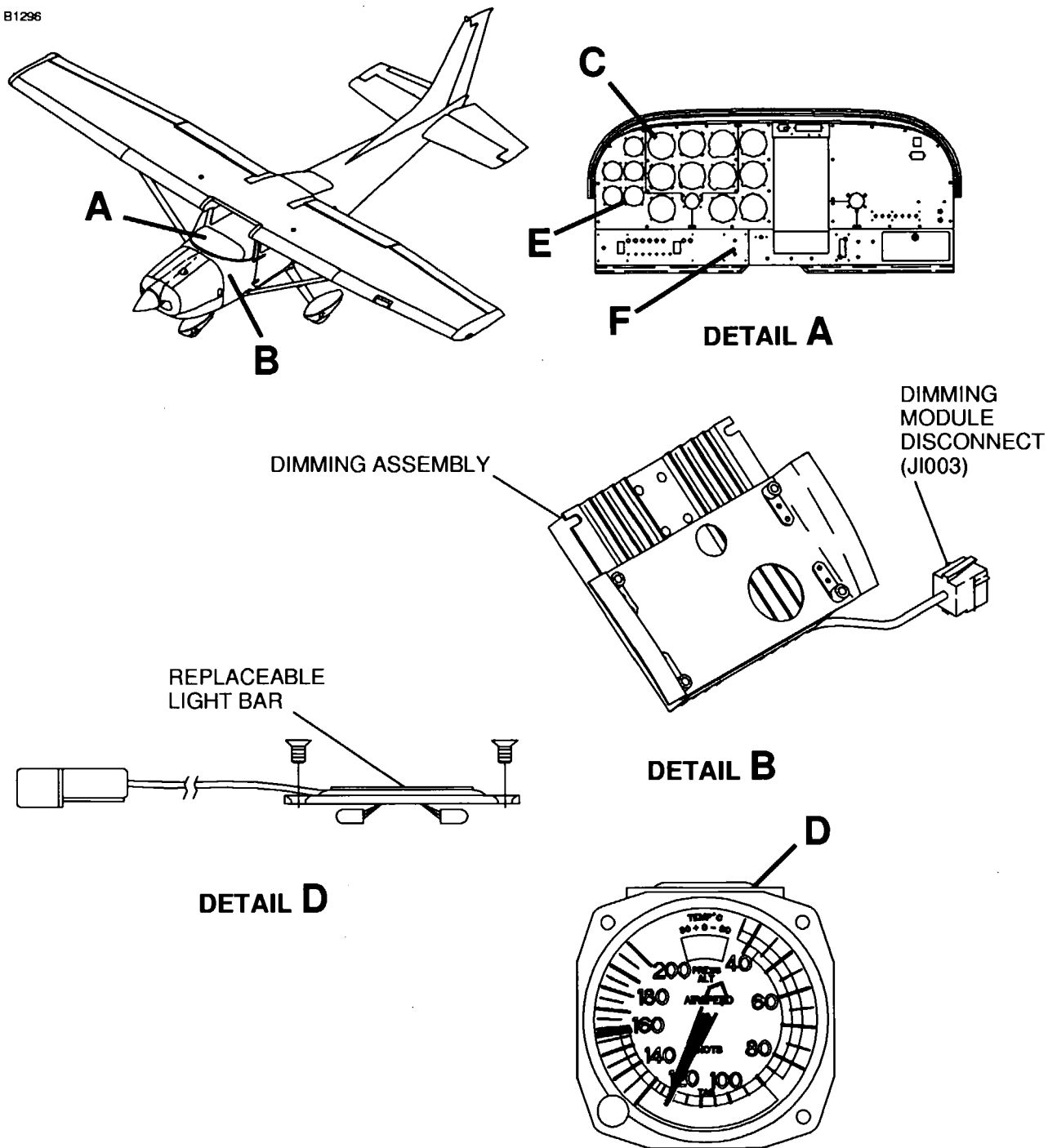
- (3) Install new lamp in lamp holder.
  - (4) Restore electrical power to airplane. Engage INST LTS circuit breaker.

**3. Pedestal Lighting Dimming Control Removal and Installation**

- A. For Pedestal Lighting Dimming Control Removal and Installation, refer to Radio Lighting - Maintenance Practices, Radio Lighting Dimming Control Removal and Installation.

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**DETAIL C**  
 TYPICAL FLIGHT INSTRUMENT LIGHTING

0710T1001  
 A0718T1001  
 B0718T1007  
 C0518T1036  
 D0518T1036

Pedestal Lighting Installation  
 Figure 201 (Sheet 1)



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**INSTRUMENT LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. Flight instruments are individually lighted by a replaceable light bar installed at the top of the instrument. Engine instruments are individually lighted by replaceable light bulbs. Both flight and engine instruments are connected to a dimming assembly and an instrument lighting dimming control. The dimming assembly is located behind (forward of) the copilot instrument panel assembly at RBL 18.00 and WL 15.00. The instrument lighting dimming control (PANEL LT) is mounted on the right side of the circuit panel assembly.

**2. Description and Operation**

- A. Panel illumination is operated with independent lights installed in each instrument and gage. The lights are wired parallel and are controlled by the PANEL LT dimmer, found below the navigation indicators. Instrument illumination for the RH navigation indicators in the pilot's instrument panel, is controlled by the TST (test) - BRT (bright) - DIM (night) switch. When the switch is in the BRT position, the instrument lights will be off regardless of the RADIO LT dimmer position.

**3. Flight Instrument Light Bar Replacement**

- A. Replace Flight Instrument Light Bar (Refer to Figure 201).
- (1) Disconnect the electrical power from the airplane.
  - (2) Make sure the ALT/BAT MASTER switch is in the off position.
  - (3) Remove necessary instrument panel assemblies to gain access to flight instrument. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Remove flight instrument.
  - (5) Remove screws securing light bar to flight instrument.
  - (6) Replace light bar and secure with screws.
  - (7) Install flight instrument.
  - (8) Install instrument panel assemblies previously removed. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (9) Connect the electrical power to the airplane.
  - (10) Press the ALT/BAT MASTER switch to ON to do a check of the light bar.

**4. Engine Instrument Light Bulb Replacement**

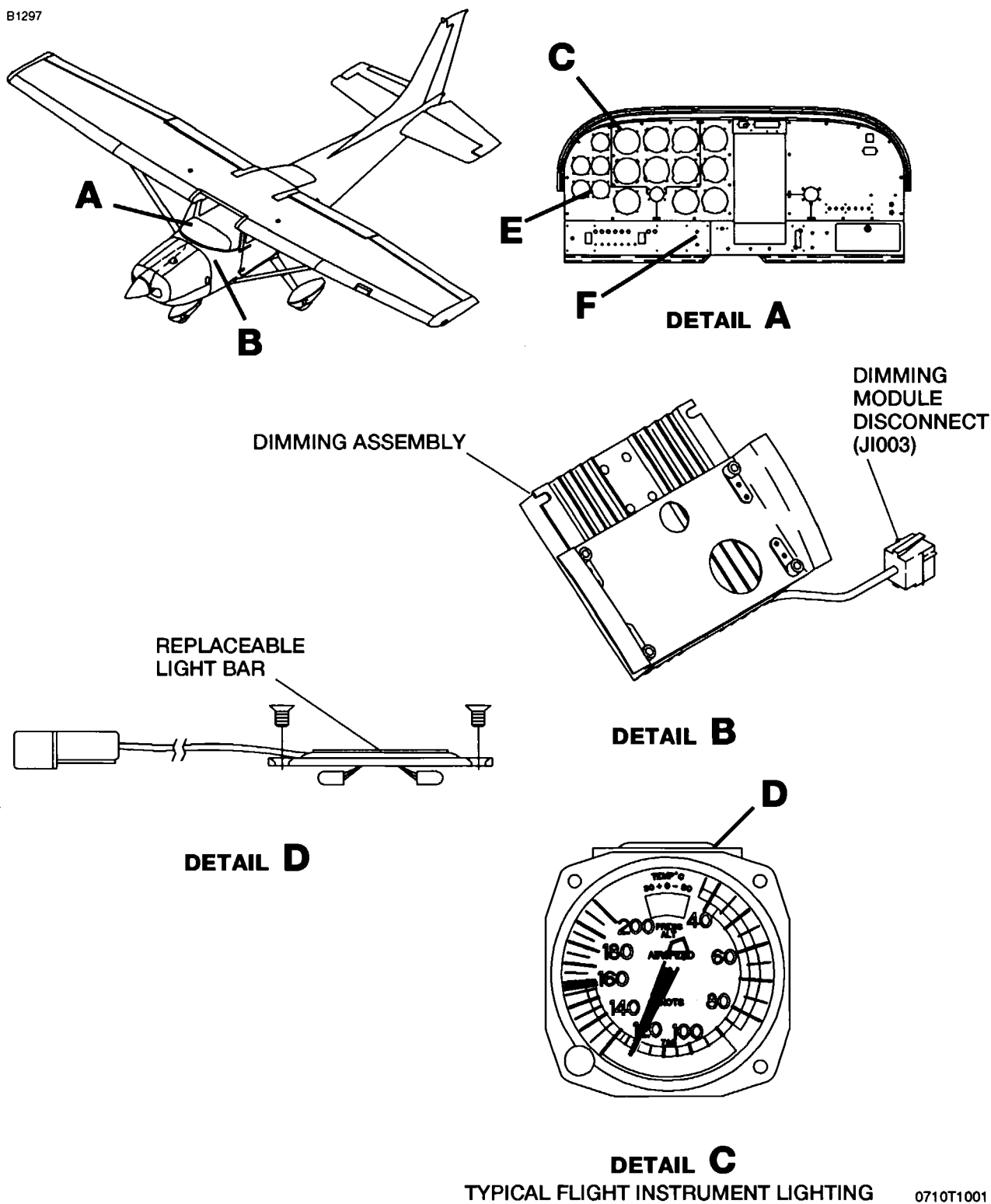
- A. Replace Engine Instrument Light Bulbs (Refer to Figure 201).
- (1) Disconnect the electrical power from the airplane.
  - (2) Make sure the ALT/BAT MASTER switch is in the off position.
  - (3) Remove necessary instrument panel assemblies to gain access to engine instrument. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Remove engine instrument.
  - (5) Remove screws securing light cover plate to bottom of instrument.
  - (6) Replace light bulbs.
  - (7) Secure light cover plate to bottom of instrument with screws.
  - (8) Install engine instrument.
  - (9) Install instrument panel assemblies previously removed. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (10) Connect the electrical power to the airplane.
  - (11) Press the ALT/BAT MASTER switch to ON to do a check of the instrument light bulb.

**5. Dimming Assembly Removal and Installation**

- A. Remove Dimming Assembly (Refer to Figure 201).
- (1) Disconnect the electrical power from the airplane.
  - (2) Make sure the ALT/BAT MASTER switch is in the off position.
  - (3) Remove copilot instrument panel assembly to gain access to dimming assembly. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Disconnect dimming module connector (J1003/J1).

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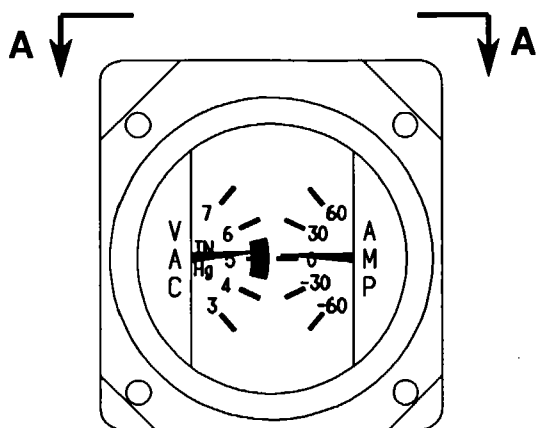
**DETAIL C**  
 TYPICAL FLIGHT INSTRUMENT LIGHTING

0710T1001  
 A0718C1001  
 B0718C1007  
 C0518C1036  
 D0518C1036

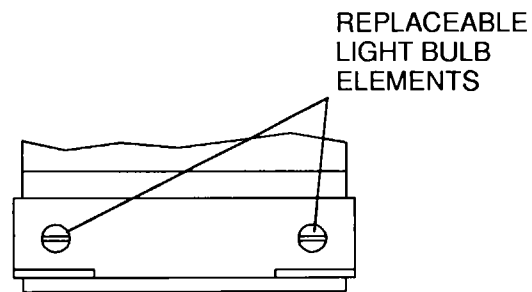
Instrument Lighting Installation  
 Figure 201 (Sheet 1)

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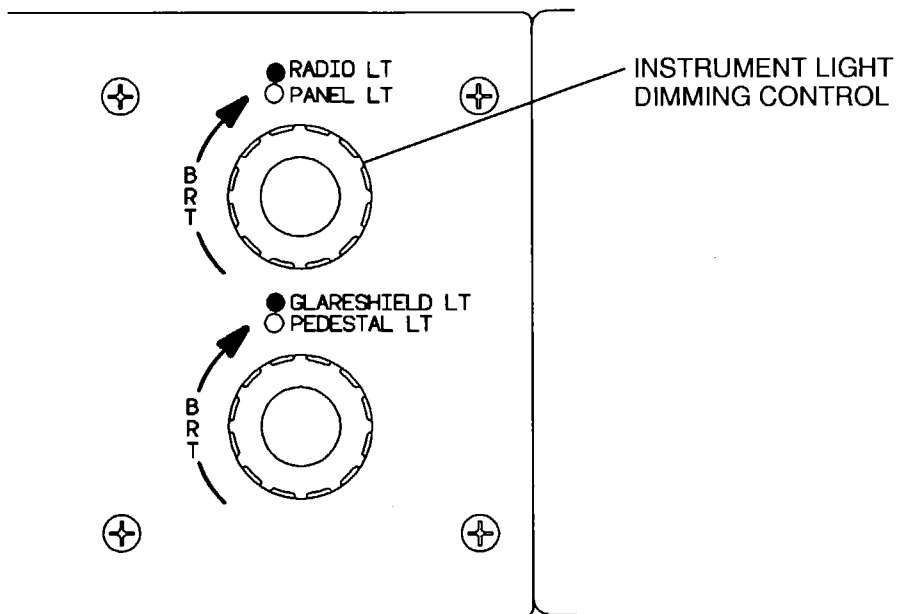
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**DETAIL E**  
 TYPICAL ENGINE  
 INSTRUMENT LIGHTING



**VIEW A-A**



**DETAIL F**

E0518T1037  
 AA0518T1037  
 F0718T1001

Instrument Lighting Installation  
 Figure 201 (Sheet 2)

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- (5) Remove screws securing dimming assembly to heat sink support assembly.
- (6) Remove dimming assembly from airplane.

B. Install Dimming Assembly (Refer to Figure 201).

- (1) Position dimming assembly and secure to heat sink support assembly with screws.
- (2) Connect dimming module connector (J1003/J1).
- (3) Install copilot instrument panel assembly. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
- (4) Connect the electrical power to the airplane.
- (5) Press the ALT/BAT MASTER switch to ON to do a check of the dimming assembly.

**6. Instrument Lighting Dimming Control Removal and Installation**

- A. For Instrument Lighting Dimming Control Removal and Installation, refer to Radio Lighting - Maintenance Practices, Radio Lighting Dimming Control Removal and Installation.

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**RADIO LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. Radio lighting consists of internally lighted radios, a dimming assembly, and a radio lighting (RADIO LT) dimming control. Maintenance practices consist of removal and installation for the dimming assembly and radio lighting dimming control.

**2. Description and Operation**

- A. Panel illumination is operated with independent lights installed in each instrument and gage. The lights are wired parallel and are controlled by the PANEL LT dimmer, found below the navigation indicators. Illumination intensity for the radios is controlled by the TST (test) - BRT (bright) - DIM (night) switch. When the switch is in the BRT position, the radio illumination will be off regardless of the RADIO LT dimmer position.

**3. Dimming Assembly Removal and Installation**

- A. For Dimming Assembly Removal and Installation, refer to Instrument Lighting - Maintenance Practices, Dimming Assembly Removal and Installation.

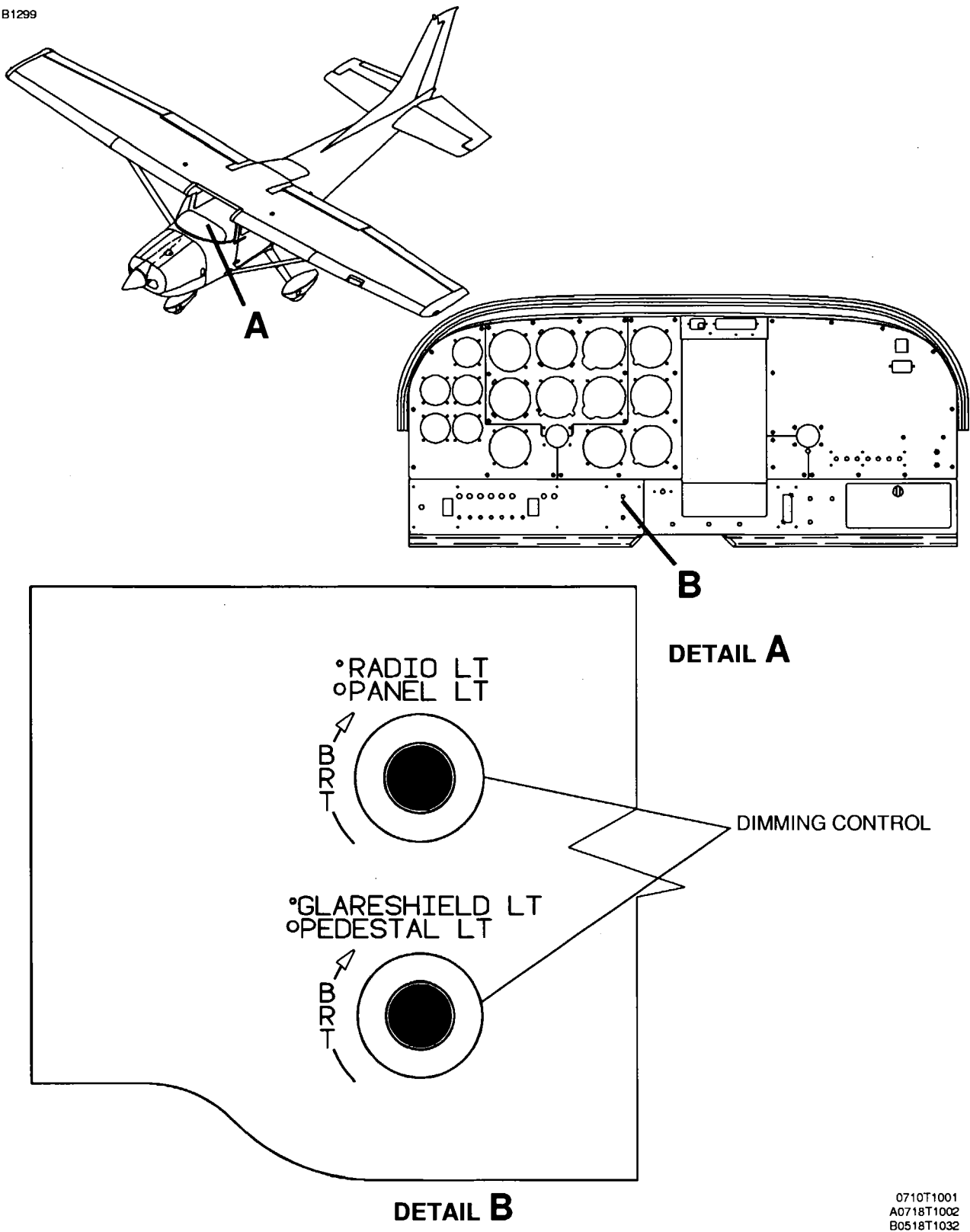
**4. Radio Lighting Dimming Control Removal and Installation**

**NOTE:** Two dimming control potentiometers are located on the circuit panel assembly. One dimming control serves as the radio lighting (RADIO LT) and instrument lighting (PANEL LT) dimming control, the second dimming control serves as the glareshield lighting (GLARESHIELD LT) and pedestal lighting (PEDESTAL LT) dimming control. Removal and installation for both dimming controls are typical.

- A. Remove Dimming Control (Refer to Figure 201).
- (1) Disconnect the electrical power from the airplane.
  - (2) Make sure the ALT/BAT MASTER switch is in the off position.
  - (3) Remove circuit panel assembly. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Loosen setscrew on knob and remove knob to access nut securing dimming control to circuit panel assembly.
  - (5) Remove nut securing dimmer control to circuit panel assembly.
  - (6) Identify, tag and disconnect the wires from the dimming control.
  - (7) Remove dimming control from airplane.
- B. Install Dimming Control (Refer to Figure 201).
- (1) Position dimming control and solder labeled wires to proper pins. See Model 182 Wiring Diagram Manual.
  - (2) Place dimming control through circuit panel assembly and secure with nut.
  - (3) Position knob on dimming control and set with setscrew.
  - (4) Install circuit panel assembly. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (5) Connect the electrical power to the airplane.
  - (6) Press the ALT/BAT MASTER switch to ON to do a check of the dimming control.

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Dimming Control Installation  
Figure 201 (Sheet 1)

0710T1001  
A0718T1002  
B0518T1032

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**PILOT CONTROL WHEEL LIGHTING - MAINTENANCE PRACTICES**

**1. General**

- A. A map light is installed in the bottom center surface of the pilot's control wheel. Light brilliance is controlled by a potentiometer located in the bottom right side of the pilot's control wheel. A knob is attached to the potentiometer and accessible on the bottom of the control wheel for map light adjustment.

**2. Map Light Assembly Removal and Installation**

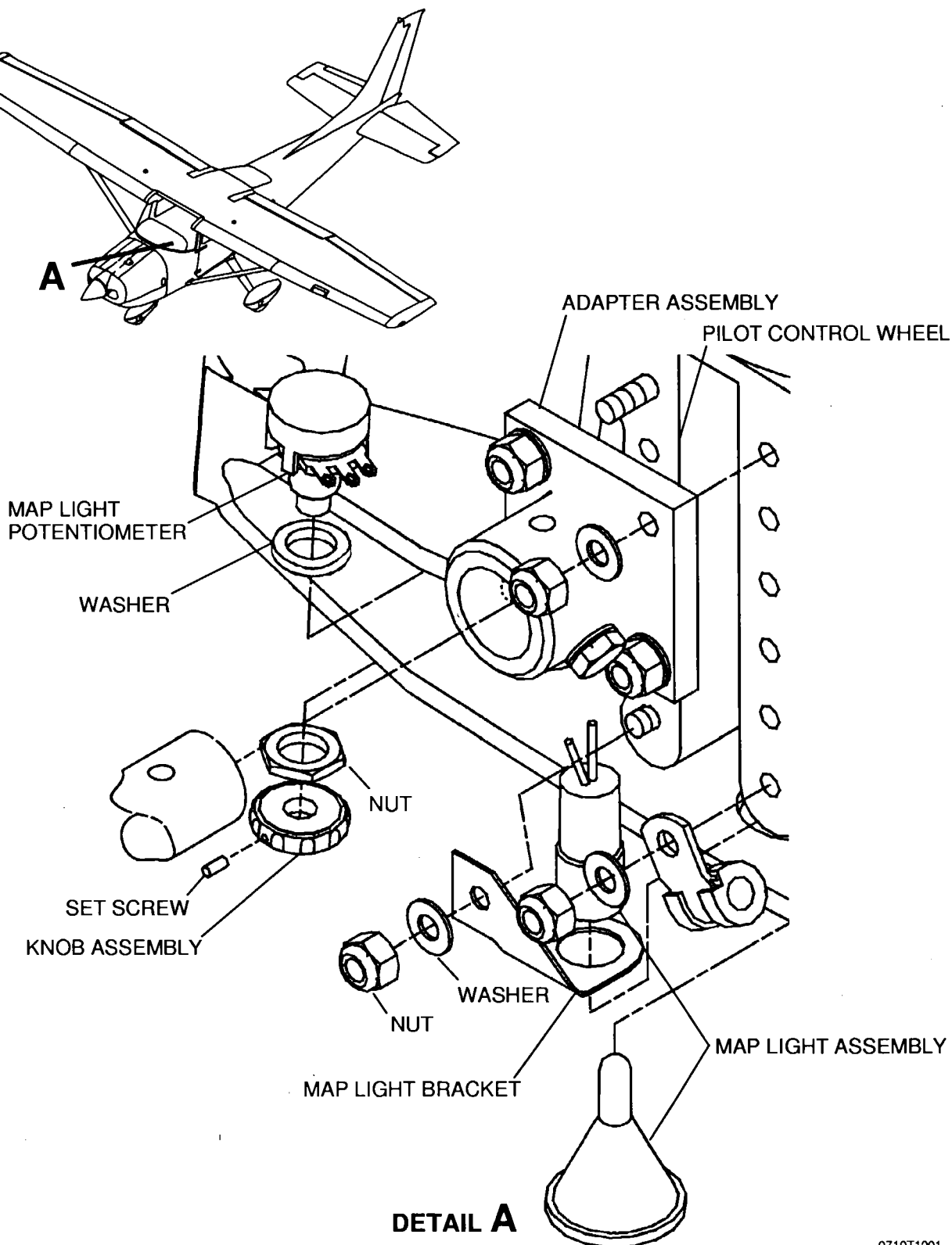
- A. Remove Map Light Assembly (Refer to Figure 201).
- (1) Remove electrical power from airplane. Position the LIGHTS NAV switch to the OFF position.
  - (2) Remove nut, washer, and bolt securing map light bracket to control wheel.
  - (3) Remove map light assembly from control wheel.
  - (4) Identify, tag, and disconnect map light assembly wiring.
  - (5) Remove map light assembly from airplane.
- B. Install Map Light Assembly (Refer to Figure 201).
- (1) Position map light assembly to pilot control wheel and connect map light assembly wiring.
  - (2) Place bracket and map light assembly in control wheel and secure with bolt, washer, and nut.
  - (3) Restore electrical power to airplane. Position LIGHTS NAV switch to desired position.

**3. Map Light Potentiometer Removal and Installation**

- A. Remove Map Light Potentiometer (Refer to Figure 201).
- (1) Remove electrical power from airplane. Position the LIGHTS NAV switch to the OFF position.
  - (2) Loosen setscrew securing knob assembly to map light potentiometer. Remove knob assembly.
  - (3) Remove nut and washer securing map light potentiometer to control wheel.
  - (4) Pull map light potentiometer out of control wheel to access electrical wires.
  - (5) Identify, tag, and disconnect wires from map light potentiometer.
  - (6) Remove map light potentiometer from airplane.
- B. Install Map Light Potentiometer (Refer to Figure 201).
- (1) Position map light potentiometer at pilot control wheel and connect electrical wires to map light potentiometer.
  - (2) Place map light potentiometer in control wheel and secure with washer and nut.
  - (3) Position knob assembly on map light potentiometer and secure with set screw.
  - (4) Restore electrical power to airplane. Position LIGHTS NAV switch to desired position.

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Map Light Assembly and Potentiometer Installation  
Figure 201 (Sheet 1)



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**NAVIGATION AND STROBE LIGHTS - MAINTENANCE PRACTICES**

**1. General**

- A. The airplane is equipped with both fixed intensity navigation lights and pulsing strobe lights.
- (1) Navigation lights are located on the left wing tip, right wing tip, and tailcone. The navigation lights in the wing tips are co-located with the strobe lights, and the navigation light in the tailcone is located in its own housing.
    - (a) Bulbs for all three navigation lights are clear. The lens assembly on the right wing tip is colored green, the lens assembly on the left wing tip is colored red, and the lens assembly on the tailcone is clear.
    - (b) The navigation lights are activated by placing the LIGHTS NAV/OFF switch on the circuit panel assembly to the NAV position. This position supplies power concurrently to all three lights.
  - (2) Strobe lights are co-located with navigation lights in the wing tip housing.
    - (a) The strobe tube (light) and lens are both clear. The strobe lights are activated by placing the LIGHTS STROBE/OFF switch to the STROBE position. This position supplies power to the right and left strobe power supplies located in the wing tips, providing pulsed energy to the strobe tube assemblies.
  - (3) General maintenance is limited to lamp/tube replacement and removal and installation of the strobe light power supplies. See the Model 182 Wiring Diagram Manual for troubleshooting light assemblies and associated electrical wiring.

**2. Navigation Light Lamp Removal and Installation**

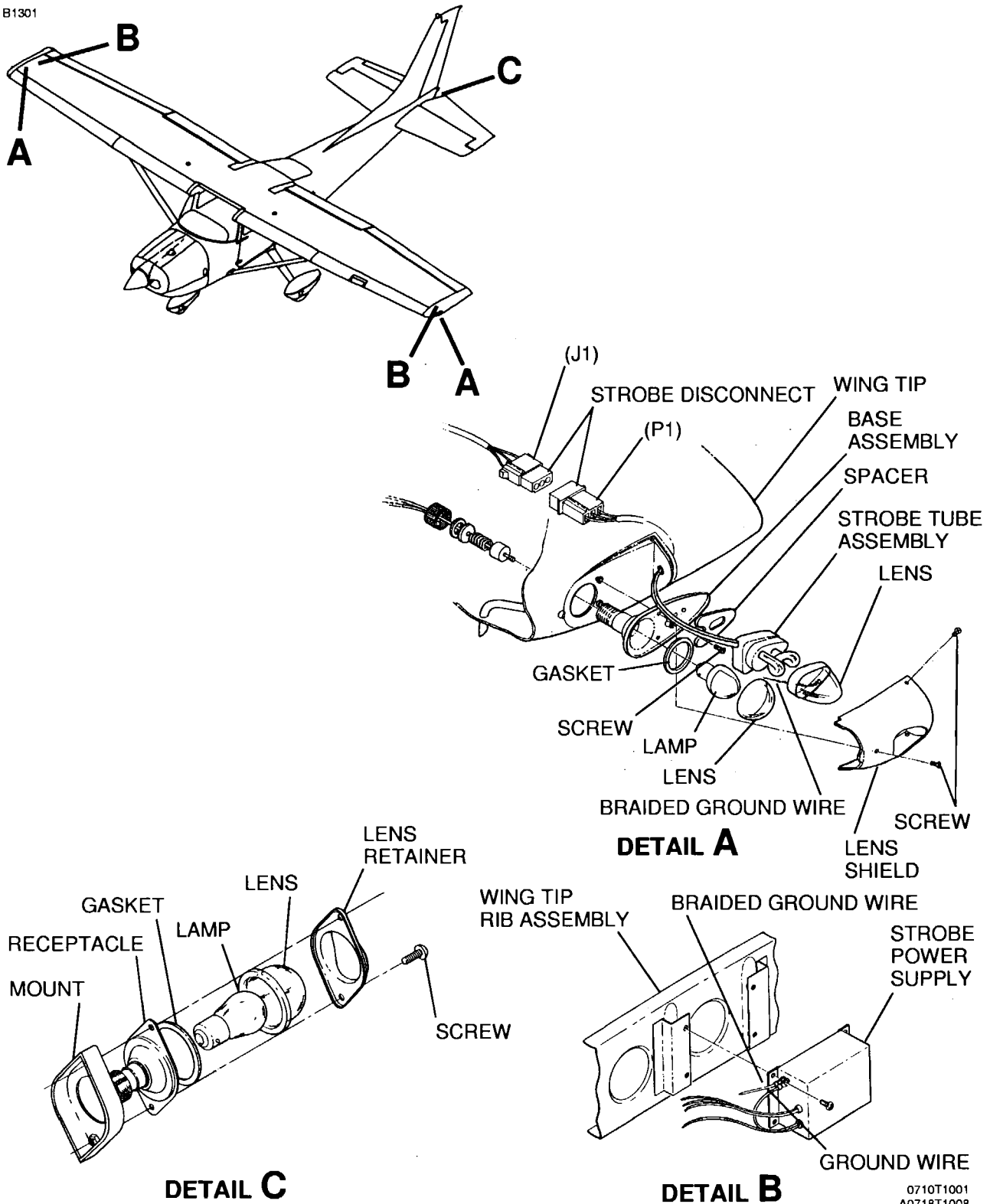
- A. Wing Tip Navigation Light Lamp Removal and Installation.

**NOTE:** Removal and installation is typical for the left and right wing tip navigation light lamps.

- (1) Remove Wing Tip Navigation Light Lamp (Refer to Figure 201).
    - (a) Remove electrical power from airplane. Position LIGHTS NAV/OFF switch on circuit panel assembly to OFF.
    - (b) Remove screws securing lens shield to wing tip.
    - (c) Remove lens from navigation light assembly.
    - (d) Grasp lamp, depress slightly and turn counterclockwise to release and remove lamp from bayonet mount.
  - (2) Install Wing Tip Navigation Light Lamp (Refer to Figure 201).
    - (a) Place lamp in bayonet socket, depress, and gently turn clockwise until lamp seats in socket.
    - (b) Position lens and gasket in place.
    - (c) Secure lens by installing lens shield to wing tip with screws.
    - (d) Restore electrical power to airplane. Position LIGHTS NAV/OFF switch to NAV.
- B. Tail Navigation Light Lamp Removal and Installation.
- (1) Remove Tail Navigation Light Lamp (Refer to Figure 201).
    - (a) Remove electrical power from airplane. Position LIGHTS NAV/OFF switch on circuit panel assembly to OFF.
    - (b) Remove screws securing lens retainer to mount.
    - (c) Remove lens to gain access to lamp.
    - (d) Grasp lamp, depress slightly and turn counterclockwise to release and remove lamp from bayonet mount.
  - (2) Install Tail Navigation Light Lamp (Refer to Figure 201).
    - (a) Place Lamp in bayonet socket, depress, and gently turn clockwise until lamp seats in socket.
    - (b) Position lens and gasket over lamp.
    - (c) Secure lens by installing lens retainer with screws.
    - (d) Restore electrical power to airplane. Position LIGHTS NAV/OFF switch to NAV.

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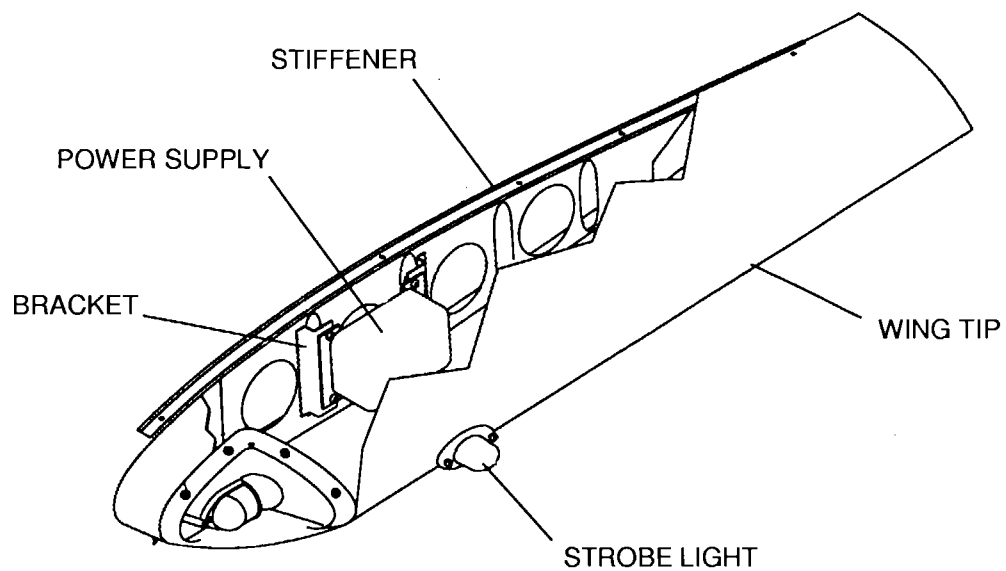
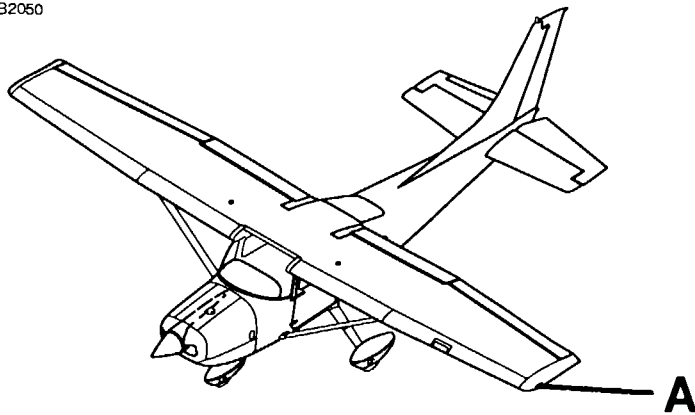


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Navigation and Strobe Light Installation  
 Figure 201 (Sheet 1)

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**DETAIL A**  
(182T & T182T)



Navigation and Strobe Light Installation  
Figure 201 (Sheet 2)

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**3. Strobe Tube Assembly Removal and Installation**

**NOTE:** Removal and installation is typical for both the right and left strobe tube assemblies.

**A. Remove Strobe Tube Assembly (Refer to Figure 201).**

- (1) Remove electrical power from airplane. Position LIGHTS STROBE/OFF switch on circuit panel assembly to OFF.
- (2) Remove screws securing lens shield to wing tip.

**NOTE:** Following removal of lens shield and prior to removing the strobe light lens, note the placement of the braided ground wire positioned on the inside of the lens between the lens and strobe tube assembly.

- (3) Remove lens from front of strobe tube assembly.

**CAUTION:** If strobe tube assembly is being removed to facilitate other maintenance and not being replaced with new strobe tube assembly, then use protective gloves or cotton wrap to ensure fingertip oil does not come in contact with strobe tube assembly.

- (4) Carefully pull the strobe light assembly wiring to retrieve the strobe connector (J1/P1) from inside the wing tip. Disconnect strobe connector.

**NOTE:** If the strobe connector cannot be retrieved from inside of wing tip, it will be necessary to remove wing tip to gain access to strobe connector.

- (5) Remove strobe tube assembly from base assembly and remove from wing tip.

**B. Install Strobe Tube Assembly (Refer to Figure 201).**

**CAUTION:** Use protective gloves or cotton wrap to ensure fingertip oil does not come in contact with strobe tube assembly.

- (1) Position strobe tube assembly and connect strobe connector.
  - (a) If access to the strobe connector required removal of the wing tip, then perform the following:

**CAUTION:** Use protective gloves or cotton wrap to ensure fingertip oil does not come in contact with strobe tube assembly.

- 1 Position wing tip and strobe tube assembly at wing.
    - 2 Feed strobe connector (P1) and strobe light assembly wiring through wing tip and connect to strobe connector (J1).
    - 3 Install wing tip.
- (2) Feed strobe connector and access strobe light assembly wiring into wing tip.

**NOTE:** If wing tip was removed to access strobe connector, then strobe connector will already be positioned in the wing tip.

**CAUTION:** Use protective gloves or cotton wrap to ensure fingertip oil does not come in contact with strobe tube assembly.

- (3) Position spacer and install strobe tube assembly to base assembly.
- (4) Position lens at strobe tube assembly and place braided ground wire inside of lens.

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**CAUTION:** Following placing lens onto strobe tube assembly, verify that braided ground wire is properly positioned inside of lens and between the lens and strobe tube assembly.

- (5) Place lens on strobe tube assembly.
- (6) Secure lens by installing lens shield with screws.
- (7) Restore electrical power to airplane. Position LIGHTS STROBE/OFF switch to STROBE position.

#### 4. Strobe Power Supply Removal and Installation

**NOTE:** Removal and installation is typical for both the left and right strobe power supplies.

A. Remove Strobe Power Supply (Refer to Figure 201).

- (1) Remove electrical power from airplane. Position LIGHTS STROBE/OFF switch on circuit panel assembly to OFF.
- (2) Remove wing tip to access strobe power supply.
- (3) Disconnect the strobe connector (J1/P1) and strobe power supply connector (JL005/PL005 for left strobe power supply and JR004/PR004 for right strobe power supply).
- (4) Remove screws securing strobe power supply to wing tip rib assembly.

**NOTE:** Note the screw location used for installation of the strobe power supply ground wire and the braided ground wire from the lens for the strobe tube assembly.

- (5) Remove strobe power supply from airplane.

B. Install Strobe Power Supply (Refer to Figure 201).

- (1) Position strobe power supply to wing tip rib assembly.
  - (a) Secure by using all required screws, except for the screw used for the two ground wires.
  - (b) Position ground wire and braided ground wire and secure with remaining screw used to secure strobe power supply.
- (2) Connect strobe connector (J1/P1) and strobe power supply connector (JL005/PL005 for left strobe power supply and JR004/PR004 for right strobe power supply).
- (3) Install wing tip.
- (4) Restore electrical power to airplane. Position LIGHTS STROBE/OFF switch on circuit panel assembly to STROBE.
- (5) Check strobe for proper operation.

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**VERTICAL FIN FLASHING BEACON - MAINTENANCE PRACTICES**

**1. General**

- A. The vertical fin flashing beacon is on top of the vertical fin tip assembly. It is a recognition light that flashes red.
- B. Put the LIGHTS BCN/OFF switch to the BCN position to start the flashing beacon. This position supplies power to the light. Internal circuitry makes the light flash on and off at approximately 50 cycles per minute.

**2. Flashing Beacon Lamp Removal/Installation**

- A. Flashing Beacon Lamp Removal (Refer to Figure 201).
  - (1) Remove electrical power from the airplane.
  - (2) Put the LIGHTS BCN/OFF switch in the OFF position.
  - (3) Loosen the screw on the clamp around the flashing beacon light assembly and remove the clamp.
  - (4) Remove the lens from the flasher base assembly.

**CAUTION:** Use protective gloves or cotton wrap to make sure that fingertip oil does not come in contact with the lamp assembly.

- (5) Remove the lamp assembly from the flasher base assembly.
- B. Flashing Beacon Lamp Installation (Refer to Figure 201).

**CAUTION:** Use protective gloves or cotton wrap to make sure fingertip oil does not come in contact with the lamp assembly.

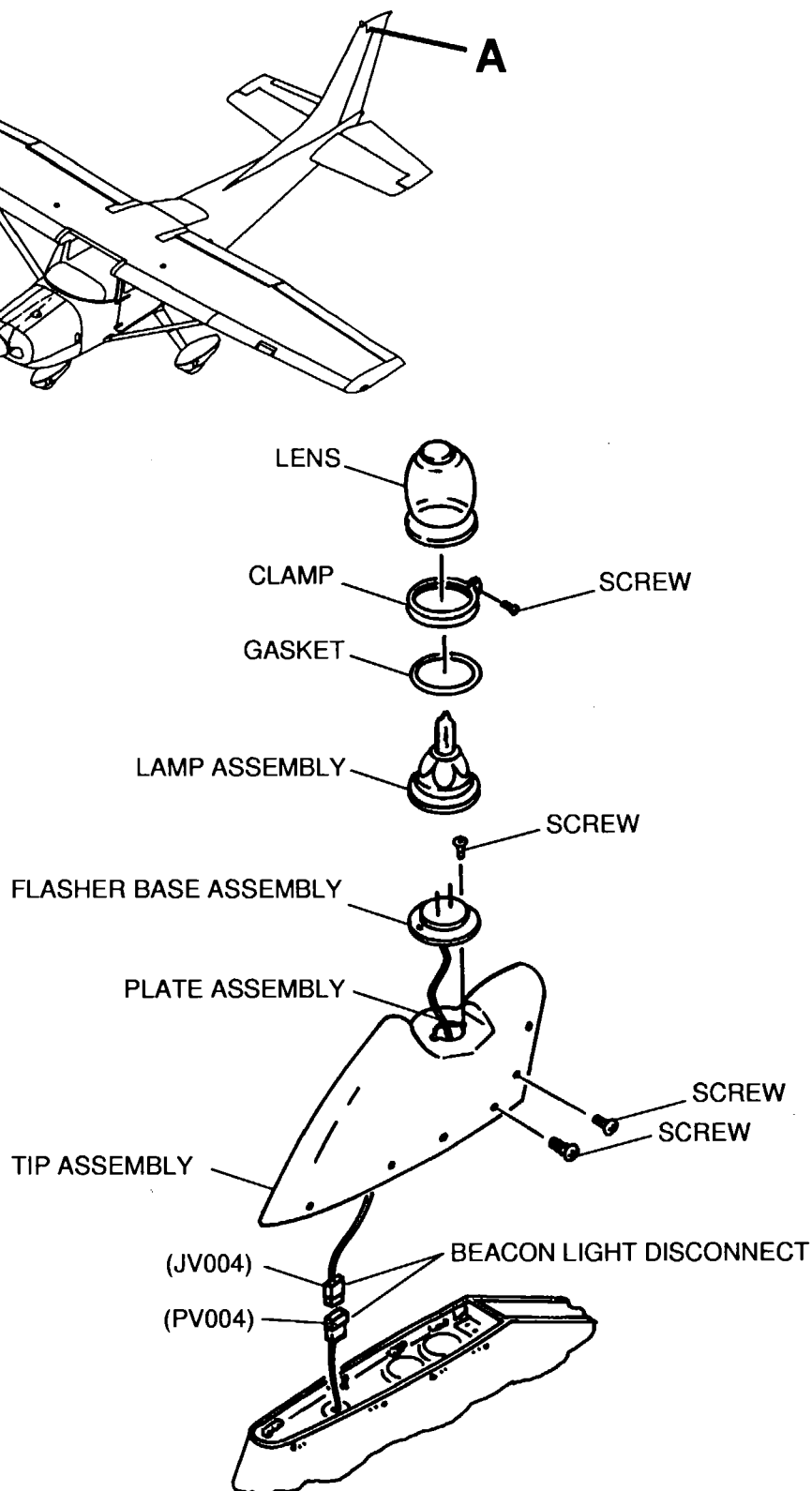
- (1) Align the lamp assembly with the flasher base assembly electrical pins and slide the lamp assembly into the flasher base assembly.
  - (2) Make sure that the gasket is placed on the flasher base assembly and place the lens on the flasher base assembly.
  - (3) Place the lens with the black masking forward on the inside of the lens.
  - (4) Put the clamp around the lens and attach the lens with the screw that tightens the clamp.
  - (5) Connect electrical power to the airplane.
  - (6) Put the LIGHTS BCN/OFF switch in the BCN position.
  - (7) Make sure that the flashing beacon operates correctly.

**3. Flashing Beacon Light Assembly Removal/Installation**

- A. Flashing Beacon Light Assembly Removal (Refer to Figure 201).
  - (1) Remove the lens and the lamp assembly for access to the screws that attach the flasher base assembly to the plate assembly. Refer to Vertical Fin Flashing Beacon - Maintenance Practices, and Flashing Beacon Lamp Removal/Installation.
  - (2) Remove the screws that attach the flasher base assembly to the plate assembly.
  - (3) Lift the flasher base assembly for access to the flashing beacon electrical wiring.
  - (4) Carefully pull the electrical wiring until you get access to the beacon light connector (JV004/PV004).
  - (5) With a tie strap or a string, safety the electrical wiring to make sure that the beacon light connector (PV004) does not fall into the fin tip assembly after you connect the beacon light connector.
  - (6) Disconnect the beacon light connector (JV004/PV004).
  - (7) Remove the flasher base assembly from the airplane.
- B. Flashing Beacon Light Assembly Installation (Refer to Figure 201).
  - (1) Position the flasher base assembly at the fin tip assembly and connect the beacon light connector (JV004/PV004).
  - (2) Remove the tie strap or the string that kept the beacon light connector (PV004) away from the fin tip assembly.

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Flashing Beacon Light Installation  
Figure 201 (Sheet 1)

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- (3) Attach the flasher base assembly to the plate assembly with the screws.
- (4) Install the lamp assembly and the lens. Refer to Vertical Fin Flashing Beacon - Maintenance Practices, Flashing Beacon Lamp Removal and Installation.



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**LANDING/TAXI LIGHTS - TROUBLESHOOTING**

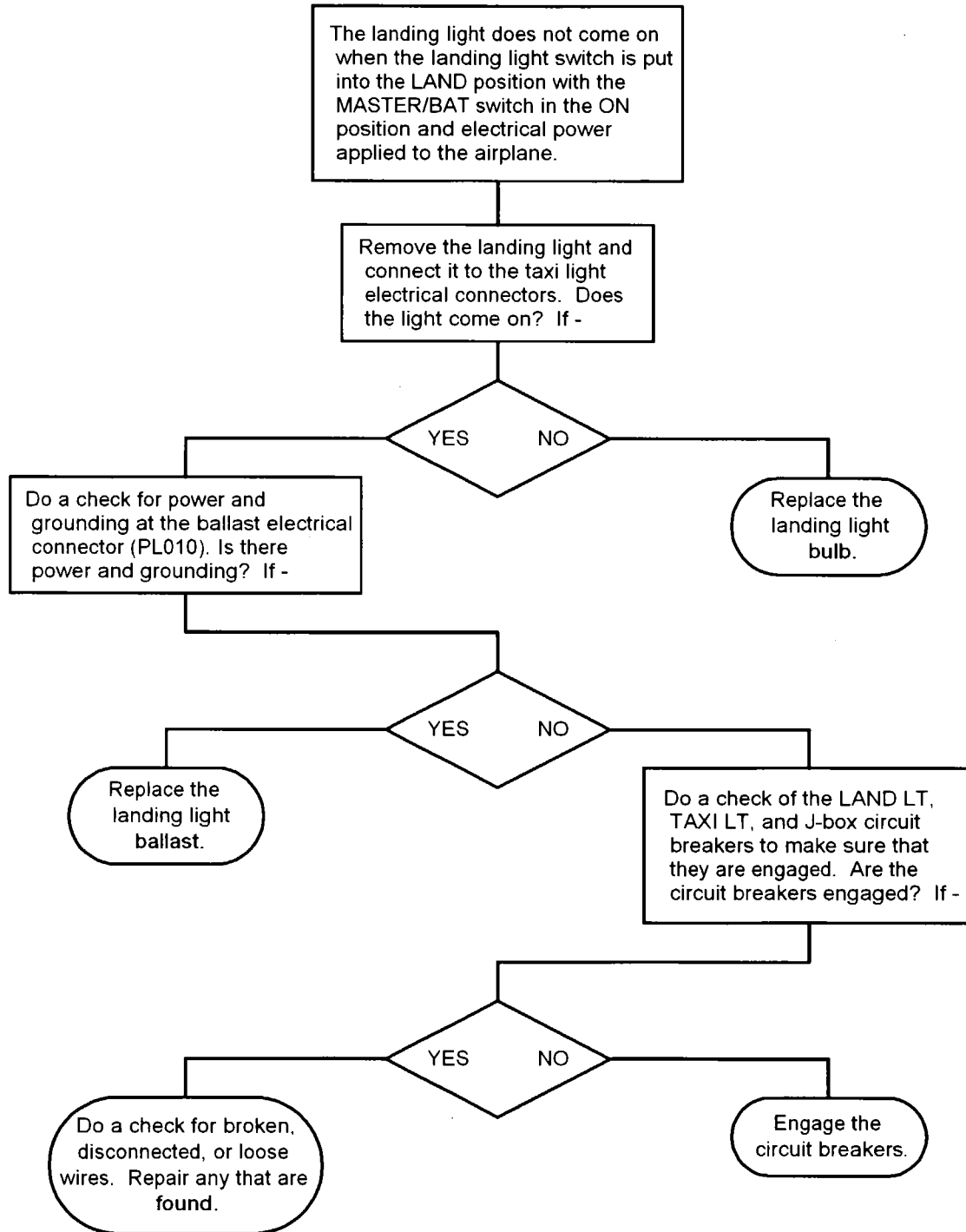
**1. High-Intensity Discharge (HID) Landing and Taxi Lights Troubleshooting**

- A. The troubleshooting flow chart that follows is for Airplanes 18281504 and On and T18208358 and On, and Airplanes 18280001 thru 18281503 and Airplanes T18208001 thru T18208357 incorporating MK206-33-01 that have high-intensity discharge (HID) lighting installed.

**NOTE:** The troubleshooting procedure is typical for the landing light and the taxi light.

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Landing/Taxi Light Troubleshooting  
Figure 101 (Sheet 1)

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**LANDING/TAXI LIGHTS - MAINTENANCE PRACTICES**

**1. General**

- A. Airplanes 18280001 thru 18281503 and Airplanes T18208001 thru T18208357 not incorporating MK206-33-01 have an incandescent landing and taxi light installed. The landing and taxi lights are installed on the left wing leading edge between WS 136.00 and WS 154.00. The landing and taxi lights are controlled by two switches on the circuit panel assembly. The landing light is operated by the landing light switch and the taxi light is operated by the taxi light switch.
- B. Airplanes 18281504 and On and Airplanes T18208358 and On, and Airplanes 18280001 thru 18281503 and Airplanes T18208001 thru T18208357 incorporating MK206-33-01 have high-intensity discharge (HID) landing and taxi lighting installed. The landing and taxi lights have an igniter installed on the back side of each light. A ballast is necessary for the operation of the HID bulbs. The ballast for the landing light HID bulb (inboard bulb) is installed on a bracket that is attached to a wing leading-edge rib inboard of the bulb. The ballast for the taxi light HID bulb (outboard bulb) is installed on a bracket that is attached to a wing leading-edge rib outboard of the bulb. The wiring is almost the same as the incandescent bulb installation, but there is one more cable necessary to connect the ballast to the HID bulbs. The landing and taxi light switches, and the landing and taxi light circuit breakers for the HID lighting system are the same as those for the incandescent lighting system.

**2. Troubleshooting**

- A. For troubleshooting of the HID landing and taxi light installation, refer to Chapter 33, Landing/Taxi Lights - Troubleshooting.

**3. Light Adjustment**

- A. The landing and taxi lights are set to specified positions, but you can adjust them as necessary. The procedures that follow give information on the correct landing and taxi light adjustment procedure. The procedures that follow are typical for incandescent and HID lights.
  - (1) Park the airplane on a flat, level surface with the landing and taxi lights in front of a light-reflecting object. Make sure that the waterline of the airplane is level and that the wings are level. Refer to Chapter 8, Leveling - Maintenance Practices.
  - (2) Park the airplane so that the distance from the light-reflecting object to the rivet line on the bottom of the front spar is approximately 3 feet.
  - (3) Set the landing light switch to the LAND position.
  - (4) Measure the distance from the floor to the center of the beam that shines on the light-reflecting object. The correct distance is 74.41 inches.
  - (5) Set the landing light switch to the OFF position.
  - (6) Set the taxi light switch to the TAXI position.
  - (7) Measure the distance from the floor to the center of the beam that shines on the light-reflecting object. The correct distance is 73.29 inches.
  - (8) Set the taxi light switch to the OFF position.
  - (9) To adjust the beam to the correct position, add or remove washers between the spacers and the plate.

**4. Light Removal/Installation**

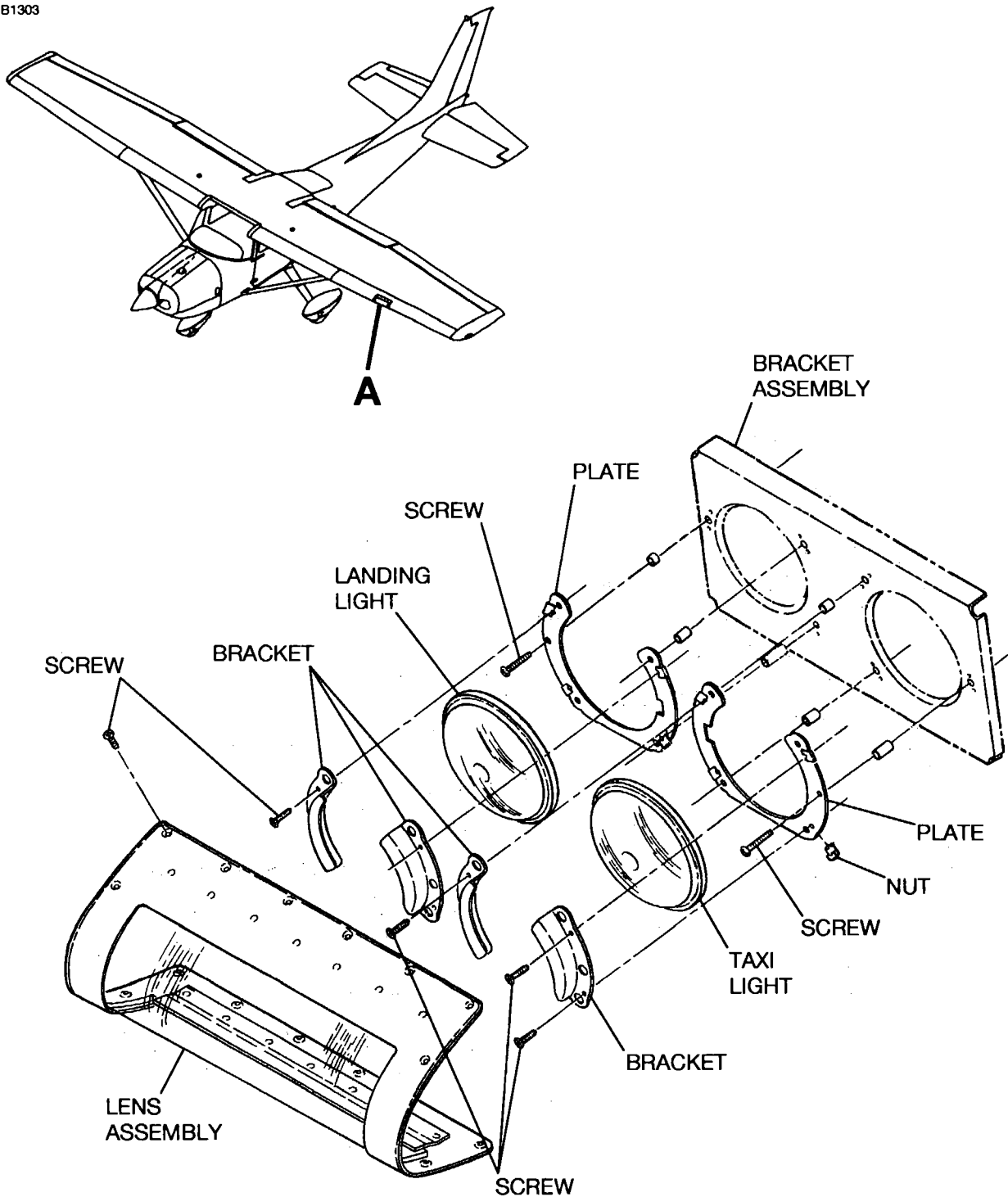
**NOTE:** Removal/installation is typical for incandescent and HID landing and taxi lights.

- A. Light Removal (Refer to Figure 201).
  - (1) Disconnect the main battery from the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Set the landing light and the taxi light switches to OFF.
  - (3) Remove the screws that attach the lens assembly to the leading edge of the wing.
  - (4) Remove the screws, brackets, and nuts that hold the light in position against the plate.

**NOTE:** Some airplanes that have the HID landing and taxi lights have an aluminum ring installed between the HID landing and taxi lights and the bracket.

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**DETAIL A**

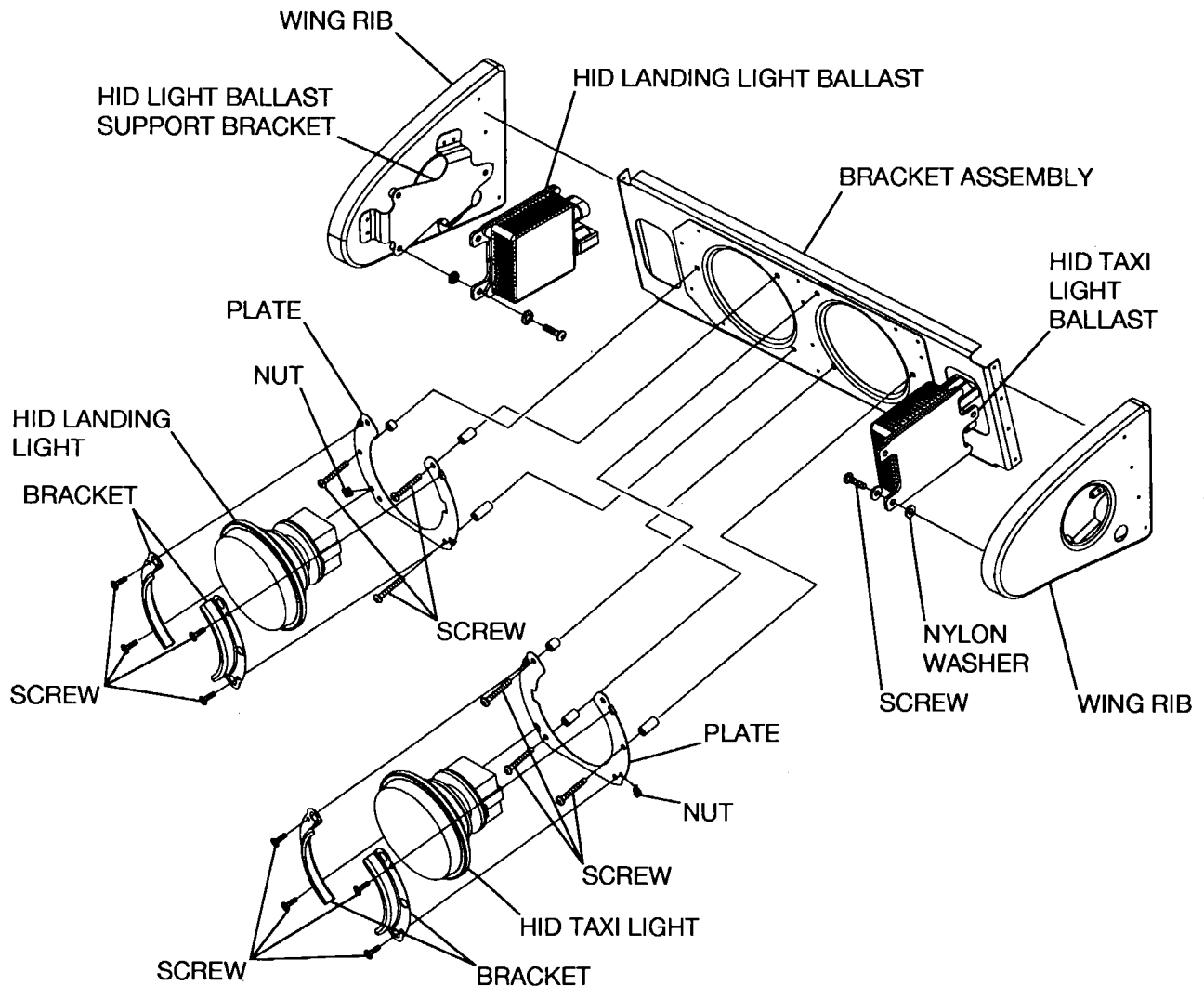
AIRPLANES 18280001 THRU 18281503 AND  
AIRPLANES T18208001 THRU T18208357  
NOT INCORPORATING MK206-33-01

Landing and Taxi Light Installation  
Figure 201 (Sheet 1)

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**DETAIL A**

AIRPLANES 18281504 AND ON AND  
 AIRPLANES T18208358 AND ON AND  
 AIRPLANES 18280001 THRU 18281503 AND  
 AIRPLANES T18208001 THRU T18208357  
 INCORPORATING MK206-33-01

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Landing and Taxi Light Installation  
 Figure 201 (Sheet 2)

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- (5) Disconnect the electrical wires from the back side of the light and remove the light from the airplane.

**B. Light Installation (Refer to Figure 201).**

- (1) Put the light at the correct wing location (between WS 136.00 and WS 154.00) and connect the electrical wires to the light.
- (2) With screws and nuts, attach the light to the bracket so the light is attached tightly against the plate.

**NOTE:** The tops of the nuts are not flush with the lip of the plate. The remaining parts of the nuts are behind the plate at the screw opening.

**NOTE:** Some airplanes that have the HID landing and taxi lights will have an aluminum ring installed between the HID landing and taxi lights and the bracket.

- (3) Install the lens assembly to the leading edge of the wing.
- (4) Connect the main battery to the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
- (5) Set the landing light switch to LAND and the taxi light switch to TAXI.
- (6) Do a check of the operation of the landing and taxi lights.

**5. High-Intensity Discharge (HID) Ballast Removal/Installation**

**NOTE:** The procedures that follow are for airplanes that have the HID landing and taxi light installation.

**A. HID Ballast Removal (Refer to Figure 201).**

**NOTE:** Removal/installation procedures are typical for the HID landing and taxi lights.

- (1) Disconnect the main battery from the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
- (2) Put the landing and taxi light switches in the OFF position.
- (3) Remove the HID landing and taxi lights. Refer to Light Removal and Installation.
- (4) Remove the screws and the nylon washers that attach the HID ballast to the support bracket on the wing leading-edge rib.
- (5) Disconnect the electrical connectors from the HID ballast.
  - (a) Landing light connectors: PL010 and UL005.
  - (b) Taxi light connectors: PL011 and UL006.
- (6) Remove the HID ballast from the airplane.

**B. HID Ballast Installation (Refer to Figure 201).**

- (1) Disconnect the main battery from the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
- (2) Put the landing and taxi light switches in the OFF position.
- (3) Put the ballast at the correct wing location.
  - (a) Landing light: outboard side of the wing rib found at WS 136.00.
  - (b) Taxi light: inboard side of the wing rib found at WS 154.00.
- (4) Connect the electrical connectors to the HID ballast.
  - (a) Landing light connectors: PL010 and UL005.
  - (b) Taxi light connectors: PL011 and UL006.

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**CAUTION:** Do not install the HID ballast to the support bracket without the nylon shoulder washers between the HID ballast and the support bracket and the nylon washers between the HID ballast and the screw head. If the HID ballast is installed without the nylon washers, an electromagnetic field in the wing structure can cause incorrect operation of the magnetometer.

- (5) Install the screws and the nylon washers that attach the HID ballast to the support bracket on the wing leading-edge rib.
- (6) Install the HID landing and taxi lights. Refer to Light Removal and Installation.
- (7) Connect the battery to the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
- (8) Set the landing light switch to LAND and the taxi light switch to TAXI.
- (9) Do a check of the operation of the landing and taxi lights.

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**COURTESY LIGHTS - MAINTENANCE PRACTICES**

**1. General**

- A. Each wing is equipped with an under wing courtesy light located near the strut/wing intersection. The left wing courtesy light (FL004), the right wing courtesy light (FR002), and the rear dome light assembly (FC005) are connected in parallel on a single circuit. Pressing the overhead light assembly switch (SC004) supplies power to all three lights. Pressing the overhead light assembly switch again removes power from all three lights.
- B. See Model 182 Wiring Diagram Manual for diagrams for use in troubleshooting the courtesy light lamp socket under the wing and necessary electrical wiring.

**2. Courtesy Light Lamp Removal and Installation**

- A. Remove Courtesy Light Lamp (Refer to Figure 201).

**NOTE:** Removal and Installation is typical for the left and right wing courtesy light lamps.

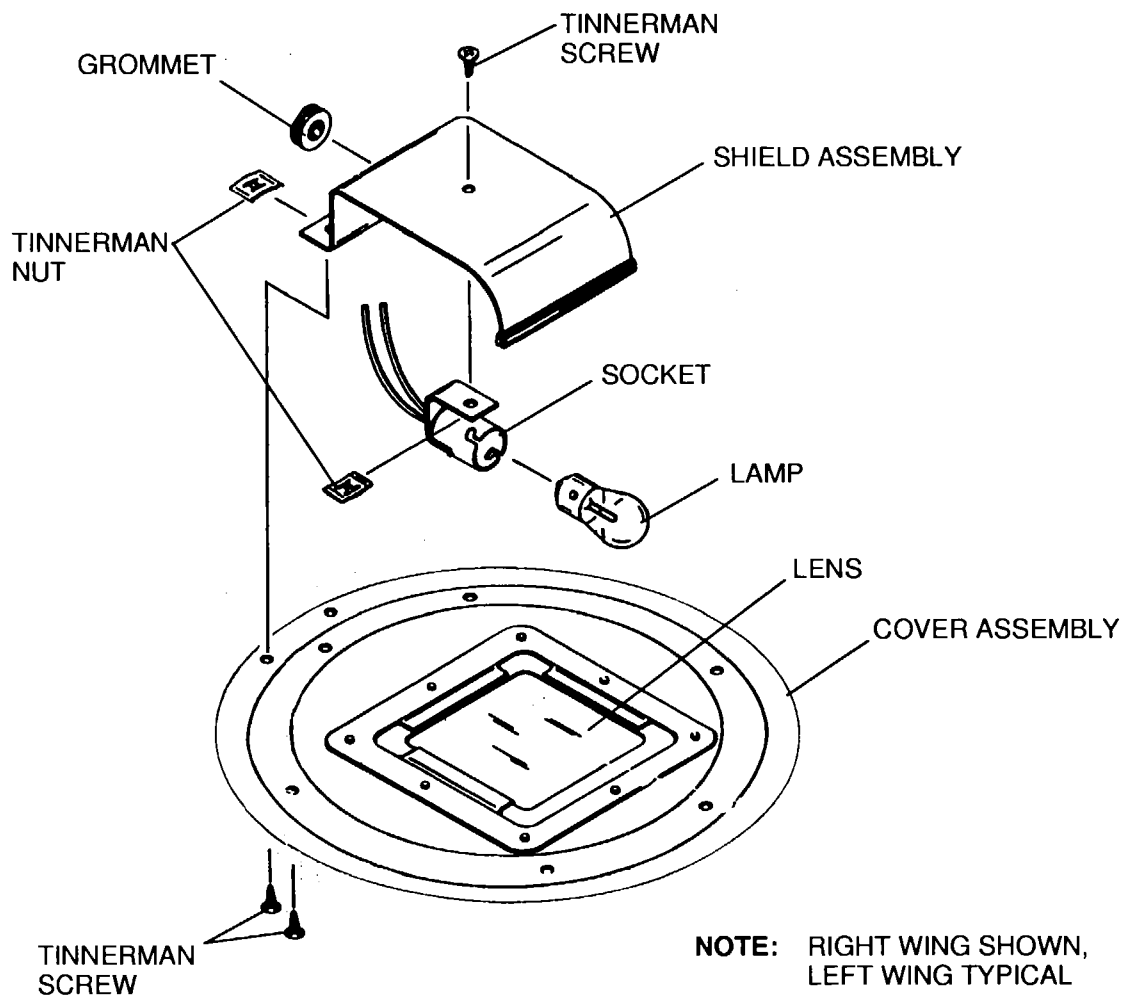
- (1) Disconnect the electrical power from airplane.
  - (2) Press the ALT/BAT MASTER switch to the off position.
  - (3) Remove screws securing cover assembly to underside of wing.
  - (4) Push in on lamp, rotate counterclockwise and remove lamp from bayonet socket.
- B. Install Courtesy Light Lamp (Refer to Figure 201).
  - (1) Insert lamp into bayonet socket. Turn clockwise until lamp seats in socket.
  - (2) Reinstall cover assembly to underside of wing and secure with screws.
  - (3) Connect the electrical power to the airplane.
  - (4) Press the ALT/BAT MASTER switch to the ON position to do a check of the courtesy lights.



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**A**



**DETAIL A**

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Courtesy Light Installation  
Figure 201 (Sheet 1)

**CHAPTER**

**34**

**NAVIGATION**

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34-Record of Temporary Revisions		
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**NAVIGATION - GENERAL**

**1. Scope**

- A. This chapter describes the navigation systems, units, and components which provide airplane navigational information. Included are pitot and static systems, air temperature, gyros, magnetic compass, VOR, global positioning, and indicators. For Bendix/King KAP-140 Autopilot information, refer to Chapter 22, Autopilot - Maintenance Practices and the manufacturer's manual listed in the Introduction, List of Manufacturers Technical Publications.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the table of contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The flight environmental data section describes systems that sense environment conditions and uses the data to influence navigation. This includes systems that depend on pitot and static information and also the outside air temperature system.
  - (2) The attitude and direction section describes systems which use magnetic or inertia forces to sense and display the direction or attitude of the airplane. This includes items like gyros, magnetic compass, magnetic heading, and turn and bank.
  - (3) The landing and taxiing aids section include systems such as the marker beacon system which provide guidance during approach, landing, and taxiing.
  - (4) The dependent position determining section describes systems which provides information to determine position and is mainly dependent on ground installations. This includes systems like VOR, ADF, global positioning, and transponders.



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**PITOT AND STATIC SYSTEMS - MAINTENANCE PRACTICES**

**1. General**

- A. The pitot system supplies ram air pressure to the airspeed indicator from an "L" shaped heated pitot tube. It is found in the left wing at approximately WS 62.00. The heating element in the pitot tube is controlled by the PITOT HEAT/OFF switch on the circuit panel assembly.
- B. The static system provides atmospheric pressure for the autopilot, blind encoder (on airplanes without Garmin G1000), airspeed indicator, altimeter, and vertical speed indicator through tubing connected to the left and right static ports.
  - (1) A static line sump assembly is installed at each static port which collects condensation from the ambient air in the static system. An alternate static source from the cockpit is available for use when the external static source is not serviceable. This alternate source is controlled with the alternate static source valve and is selected by pulling the ALT STATIC AIR PULL ON alternate static source knob on the stationary panel assembly. An opening in the side of the alternate static source valve body is used to get static pressure data from the cockpit area. Refer to the Pilot's Operating Handbook for flight operation with the alternate static source. Refer to Figure 201 for pitot/static system schematic.

**NOTE:** For airplanes with the optional KAP-140 Two Axis Autopilot but without the Garmin G1000, an additional static tube is connected to the autopilot from a tee fitting from the blind encoder.

- C. Correct maintenance of the pitot and static system is necessary for correct operation of the altimeter, vertical speed and airspeed indicators, and, if installed, the autopilot. Leaks, moisture, and blockage can affect readings of the instruments. Under instrument flight conditions, these instrument errors can be unsafe. Cleanliness and security are the principal rules for system maintenance. The pitot tube and static ports must be kept clean with no blockage.
- D. For additional information and maintenance requirements of the blind encoder, refer to the introduction of the List of Manufacturers Technical Publications.

**2. Pitot Tube Removal/Installation**

- A. Pitot Tube Removal (Refer to Figure 202).
  - (1) Set the ALT/BAT MASTER switch to the off position.
  - (2) Make sure the PITOT HEAT switch is set to the OFF position.
  - (3) Get access to the pitot tube assembly in the left wing.
  - (4) Remove the screws that attach the pitot tube assembly to the wing structure.
  - (5) Disconnect the ram air tube from the pitot tube assembly.
  - (6) Disconnect the electrical wires for the pitot tube heater.
- B. Pitot Tube Assembly Installation (Refer to Figure 202).

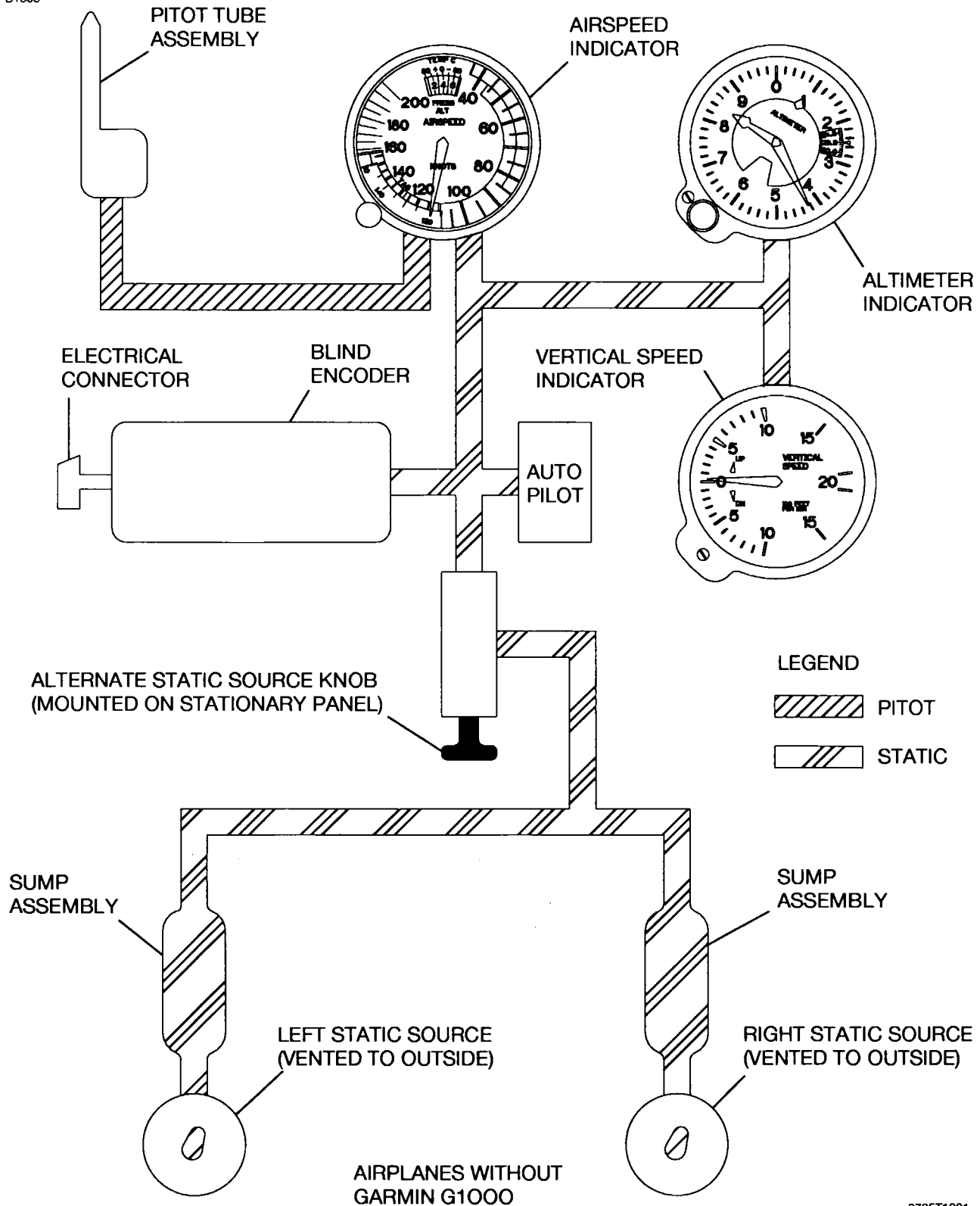
**CAUTION:** Never blow through the pitot lines toward the instruments, as damage will occur to the instruments.

**NOTE:** For correct operation, keep the pitot tube assembly clean and all system components free of obstruction and leaks.

- (1) Set the pitot tube assembly in position and connect the ram air tube to the pitot tube assembly.
- (2) Connect the electrical wires to the pitot tube heater.
- (3) Attach the pitot tube assembly to the wing structure with the screws.
- (4) Set the ALT/BAT MASTER switch to the ON position.
- (5) If necessary, set the PITOT HEAT switch to the HEAT position.
- (6) Do a leak check. Refer to the Pitot System Inspection and Leakage Test.

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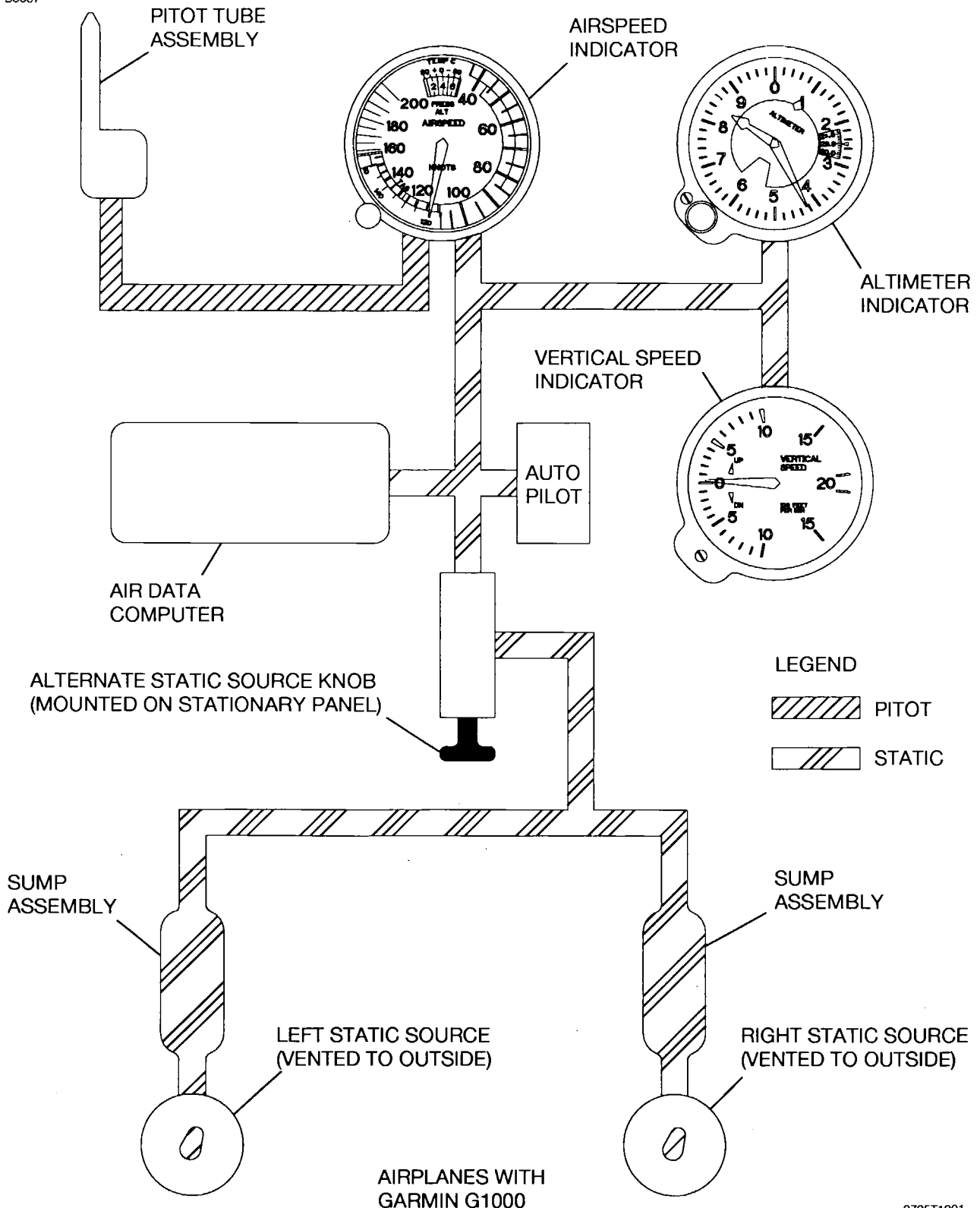


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Pitot/Static System Schematic  
 Figure 201 (Sheet 1)

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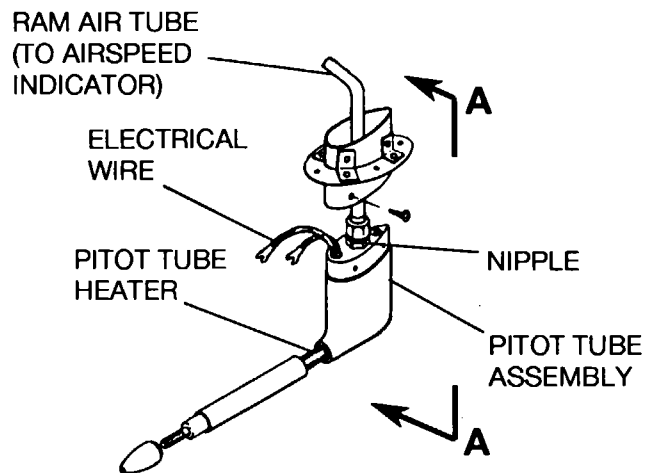
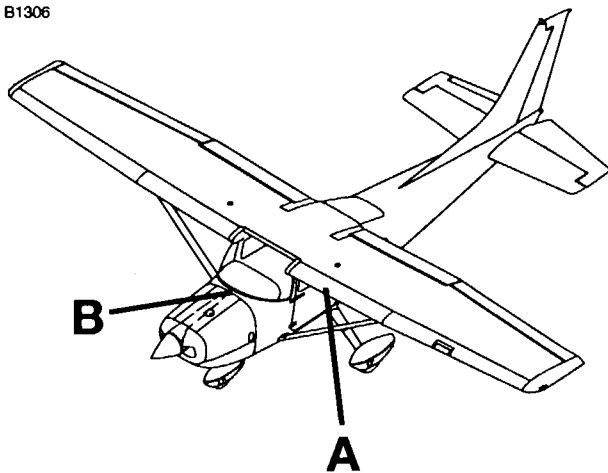


Pitot/Static System Schematic  
 Figure 201 (Sheet 2)

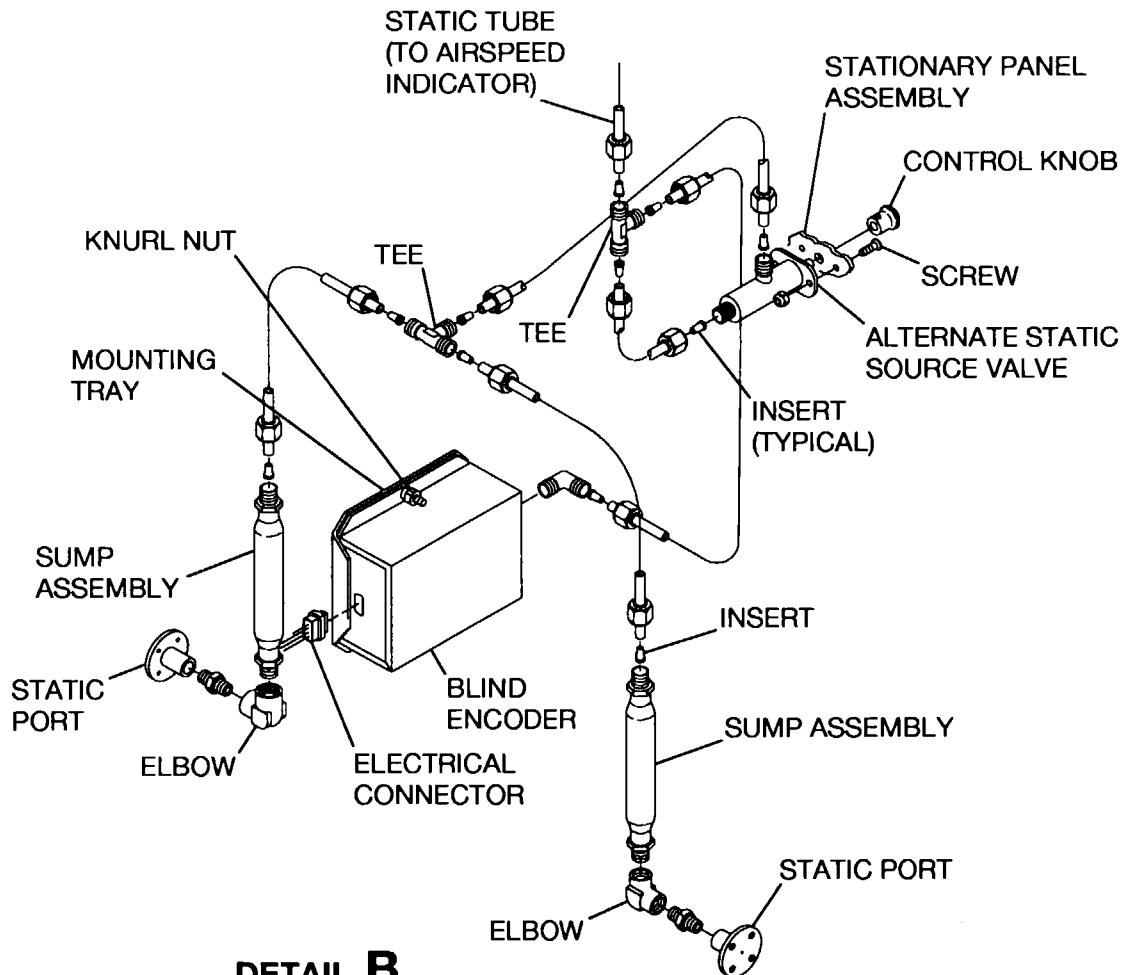
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**DETAIL A**



**DETAIL B**

AIRPLANES WITHOUT GARMIN G1000

Pitot/Static Systems Installation  
 Figure 202 (Sheet 1)

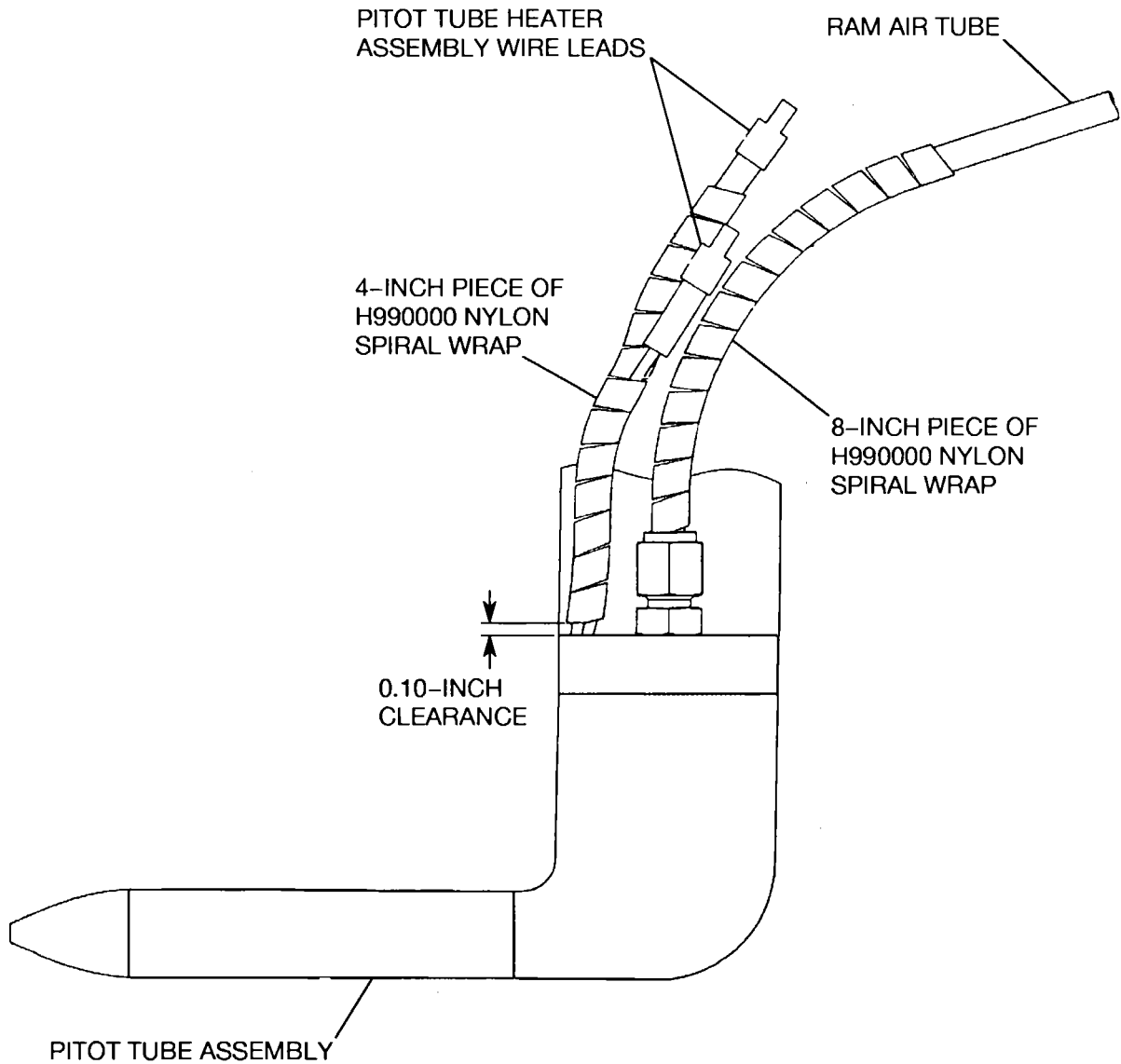
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**VIEW A-A**

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Pitot/Static Systems Installation  
Figure 202 (Sheet 2)

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### 3. Sump Assembly Removal/Installation

**NOTE:** The removal and installation is typical for the left and right sump assembly.

- A. Sump Assembly Removal (Refer to Figure 202).
  - (1) Get access to the sump assembly at FS 7.94.
  - (2) Loosen the nut that connects the static tube to the sump assembly nipple.
  - (3) Turn the sump assembly and remove the sump assembly from the elbow.
- B. Sump Assembly Installation (Refer to Figure 202).

**NOTE:** Apply Teflon® tape (U000912) as necessary where plastic and metal connections interface.

- (1) Attach the sump assembly to the elbow.
- (2) Connect the static tube to the sump assembly nipple with the nut.
- (3) Do a leak check. Refer to the Static Pressure System Inspection and Leakage Test.

### 4. Alternate Static Source Valve Removal/Installation

- A. Alternate Static Source Valve Removal (Refer to Figure 202).
  - (1) Loosen the nuts behind the stationary control panel that connect the two static tubes to the alternate static source valve. Disconnect the static tubes from the alternate static source valve.
  - (2) Remove the screws that attach the alternate static source valve to the stationary control panel.
- B. Alternate Static Source Valve Installation (Refer to Figure 202).
  - (1) Set the alternate static source valve behind the stationary control panel and attach the static tubes with the nuts.
  - (2) Attach the alternate static source valve to the stationary control panel with the screws.
  - (3) Do a leak check. Refer to the Static Pressure System Inspection and Leakage Test.

### 5. Blind Encoder Removal/Installation (On airplanes without Garmin G1000)

- A. Blind Encoder Removal (Refer to Figure 202).

**NOTE:** The blind encoder is behind the stationary instrument panel on the right forward fuselage at WL 0.00, between FS 7.94 and FS 17.00.

- (1) Set the ALT/BAT MASTER switch to the off position.
- (2) Disconnect the static tube from the blind encoder.
- (3) Disconnect the electrical connector from the blind encoder.
- (4) Loosen the knurl nut attaching the blind encoder in the mounting tray and remove the blind encoder.

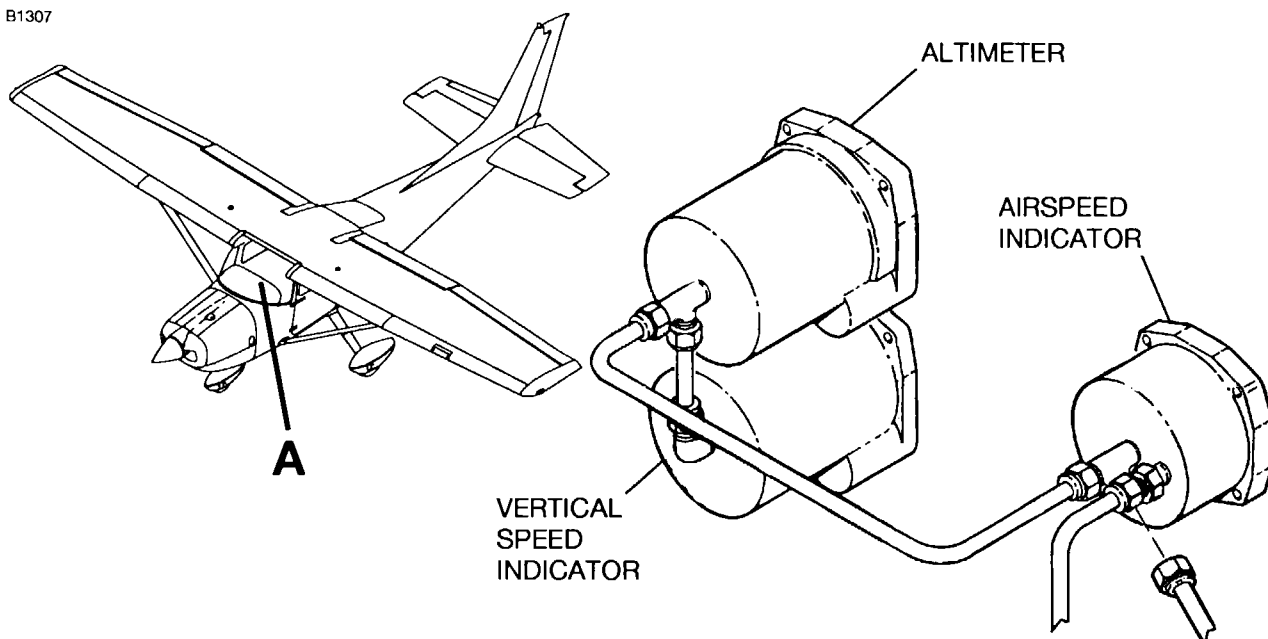
- B. Blind Encoder Installation (Refer to Figure 202).
  - (1) Put the blind encoder in the mounting tray and attach it with the knurl nut.
  - (2) Connect the static tube to the blind encoder.
  - (3) Connect the electrical connector to the blind encoder.
  - (4) Set the ALT/BAT MASTER switch to the ON position.
  - (5) Do a leak check. Refer to the Static Pressure System Inspection and Leakage Test.

### 6. Vertical Speed Indicator Removal/Installation

- A. Vertical Speed Indicator (VSI) Removal (Refer to Figure 203).
  - (1) Set the ALT/BAT MASTER switch to the off position.
  - (2) Remove the center pilot's panel to get access to the back of the VSI. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (3) Disconnect the static tube and the vertical speed connector from the VSI.
  - (4) Remove the screws that attach the VSI to the center pilot's panel.
- B. Vertical Speed Indicator (VSI) Installation (Refer to Figure 203).
  - (1) Install the VSI behind the center pilot's panel and attach it with the screws.

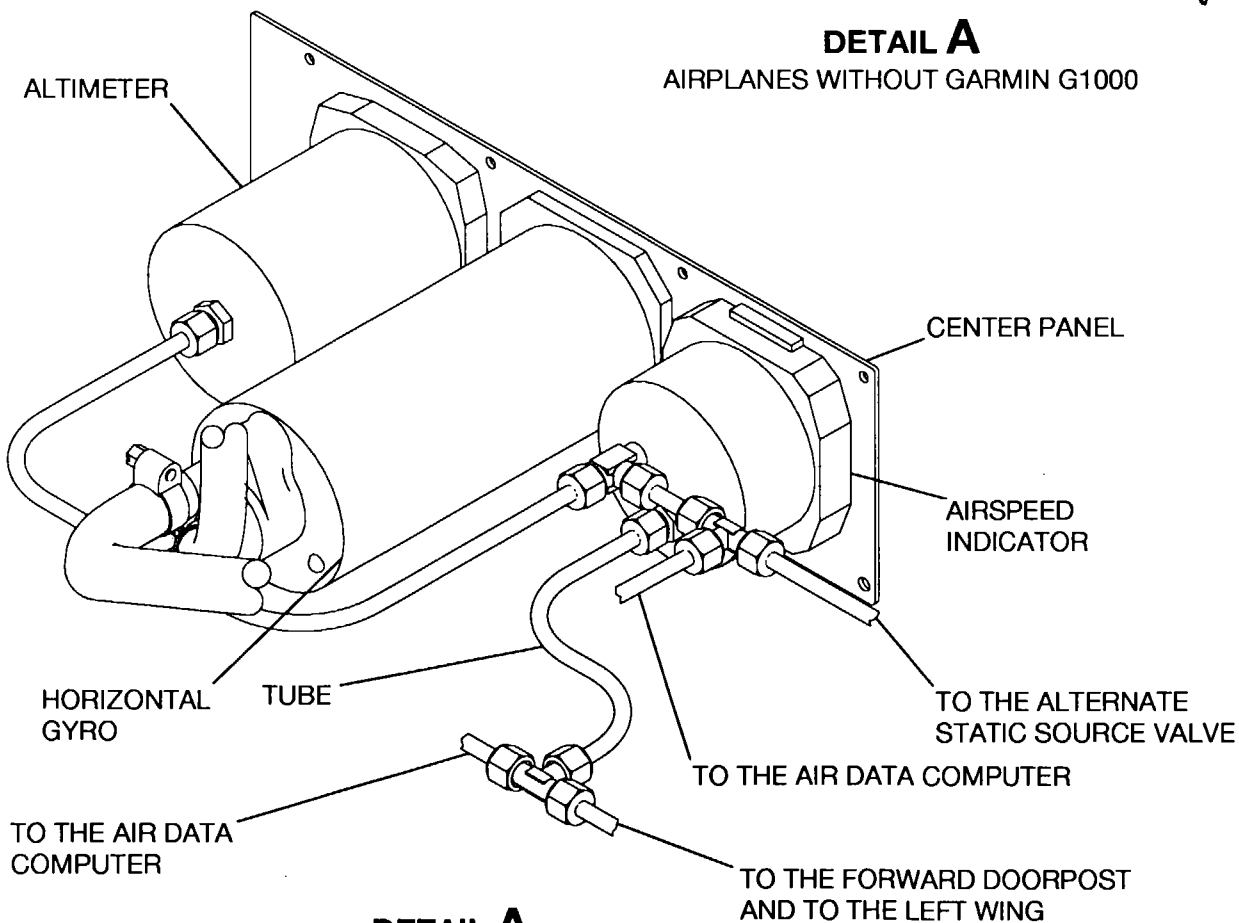
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**DETAIL A**

AIRPLANES WITHOUT GARMIN G1000



**DETAIL A**

AIRPLANES WITH GARMIN G1000

Pitot and Static System Indicator Installation  
 Figure 203 (Sheet 1)

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- (2) Connect the static tube and the vertical speed connector to the VSI.
- (3) Install the center pilot's panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
- (4) Set the ALT/BAT MASTER switch to the ON position.
- (5) Do a leak check. Refer to the Static Pressure System Inspection and Leakage Test.

**7. Altimeter Removal/Installation**

- A. Altimeter Indicator Removal (Refer to Figure 203).
  - (1) Make sure that the MASTER and AVIONICS switches are in the OFF position.
  - (2) Remove the screws that hold the altimeter to the panel.
  - (3) Carefully pull the panel out to get access to the back of the altimeter.
  - (4) Disconnect the static tubes from the tee on the altimeter indicator.
  - (5) Remove the screws that attach the altimeter to the panel.
  - (6) Remove the altimeter from the airplane.
- B. Altimeter Indicator Installation (Refer to Figure 203).
  - (1) Install the altimeter to the panel with the screws.
  - (2) Connect the static tubes to the altimeter.
  - (3) Install the panel to the structure with screws.
  - (4) Do a leak check. Refer to Static Pressure System Inspection and Leakage Test.

**8. Airspeed Indicator Removal/Installation**

- A. Airspeed Indicator Removal (Refer to Figure 203).
  - (1) Make sure that the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the screws that hold the airspeed indicator to the panel.
  - (3) Disconnect the pitot tube from the airspeed indicator.
  - (4) Disconnect the static tube from the airspeed indicator.
  - (5) Disconnect the electrical connector (JI009) from the airspeed indicator.
  - (6) Remove the screws that attach the airspeed indicator to the panel
  - (7) Remove the airspeed indicator from the airplane.
- B. Airspeed Indicator Installation (Refer to Figure 203).
  - (1) Install the airspeed indicator to the panel with the screws.
  - (2) Connect the pitot tube to the airspeed indicator.
  - (3) Connect the static tubes to the airspeed indicator.
  - (4) Connect the electrical connector (JI009) to the airspeed indicator.
  - (5) Install the panel to the structure with the screws.
  - (6) Do a leak check. Refer to Static Pressure System Leak Test/Inspection.

**9. Static Pressure System Leak Test/Inspection**

- A. Do a leak test and do an inspection.
  - (1) Make sure that there are no restrictions or moisture in the static system.
  - (2) Make sure there are no alterations or deformations of the airframe surface in the area around the static ports.

**NOTE:** Airframe surface damage affects the relationship between air pressure in the static pressure system and true ambient air pressure for any flight configuration.

  - (3) Make a seal to one static source port with pressure sensitive tape. The seal must be air tight.
  - (4) Make sure that the valve to the alternate source for the static pressure is closed.
  - (5) Attach a source of suction to the remaining static pressure port.
  - (6) Slowly apply suction until the altimeter indicates a 1000 foot increase in altitude.



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**CAUTION:** When you apply or release suction, do not exceed the range of the vertical speed indicator or the airspeed indicator.

- (7) Stop the suction to maintain a closed system for one minute. Leakage must not exceed 100 feet of altitude loss as indicated on the altimeter.
- (8) If the rate of the leak is within tolerance, slowly release the suction source and remove the tape from the static port.
- (9) If the rate of the leak exceeds the maximum permitted, tighten all the connections first and then do the leak test again. If the rate of the leak still exceeds the maximum permitted, do as follows.
  - (a) Disconnect the static pressure lines from the airspeed indicator and the vertical speed indicator.
  - (b) Attach the lines together with permitted fittings. The altimeter must be the only instrument connected into the static pressure system.
  - (c) Do a leak test to check if the static pressure system or the bypassed instruments are the cause of a leak.
- (10) If the instruments are the cause of the leak, they must be replaced or repaired by an applicable repair station. If the static pressure system is at fault, use the procedure that follows to find the leak.
  - (a) Attach a source of positive pressure to the static source entrance.

**CAUTION:** Do not apply positive pressure with the airspeed indicator or vertical speed indicator connected to the static pressure system.

- (b) Slowly apply positive pressure until the altimeter shows a 500-foot decrease in altitude.
  - (c) Maintain the altimeter indication while checking for leaks. Apply LEAK-TEC or a solution of mild soap and water to the line connections and the static source flange. Watch for bubbles to find the leaks.
  - (d) Tighten the connections that have leaks. Parts that have damage must be repaired or replaced.
  - (e) Connect the airspeed and the vertical speed indicators into the static pressure system.
- (11) Do the leak test again.

#### 10. Pitot System Leak Test/Inspection

- A. Do a leak test and do an inspection.
- (1) Apply a piece of tape over the small hole in the lower aft end of the pitot tube.
  - (2) Attach a piece of rubber or plastic tube over the end of the pitot tube.
  - (3) Close the opposite end of the plastic tube and slowly roll up the tube.
  - (4) Pressurize the pitot system to a minimum airspeed indication of 120 knots with the pitot tube drain hole blocked.
  - (5) Maintain the pressure.
  - (6) After one minute, the leak must not be more than 1 knot after the pressure source has been isolated from the pitot system.

**CAUTION:** Unroll the tubing slowly or damage will occur to the instrument or the air data computer.

- (7) Slowly unroll the tubing to reduce the pressure gradually before you remove it.
- (8) Remove the tape from the small hole at the aft end of the pitot tube.
- (9) If the test reveals a leak in the system, check all the connections for tightness.

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**OUTSIDE AIR TEMPERATURE GAUGE - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. Outside air temperature is measured using a remote-mounted probe connected to a cockpit-mounted indicator.
  - (1) The probe is mounted on the upper cabin roof. This probe transmits an electrical millivolt signal to the cockpit mounted gauge through a pair of wires which route above the cabin headliner, through the left side windshield pillar, and terminating behind the instrument panel.
  - (2) The cockpit-mounted indicator is located in the upper left portion of the instrument panel. The indicator also incorporates a digital clock and voltage-reading functions. Inputs into the indicator include 28.0 VDC for power, internal lighting and keep-alive clock functions, and millivolt inputs from the temperature probe.
  - (3) The indicator may contain a single 1.5 VDC "AA" battery used to power the clock independently from the airplane power. If the indicator contains a battery, the battery must be replaced every two years. Refer to Outside Air Temperature Indicator Removal/Installation.
- B. Maintenance practices consist of removal and installation of the probe and indicator. The probe and indicator are not matched, and may be replaced independent of each other. Probe replacement will require new shielded terminal pins to be attached at the indicator end of the probe.

**2. Probe Removal/Installation**

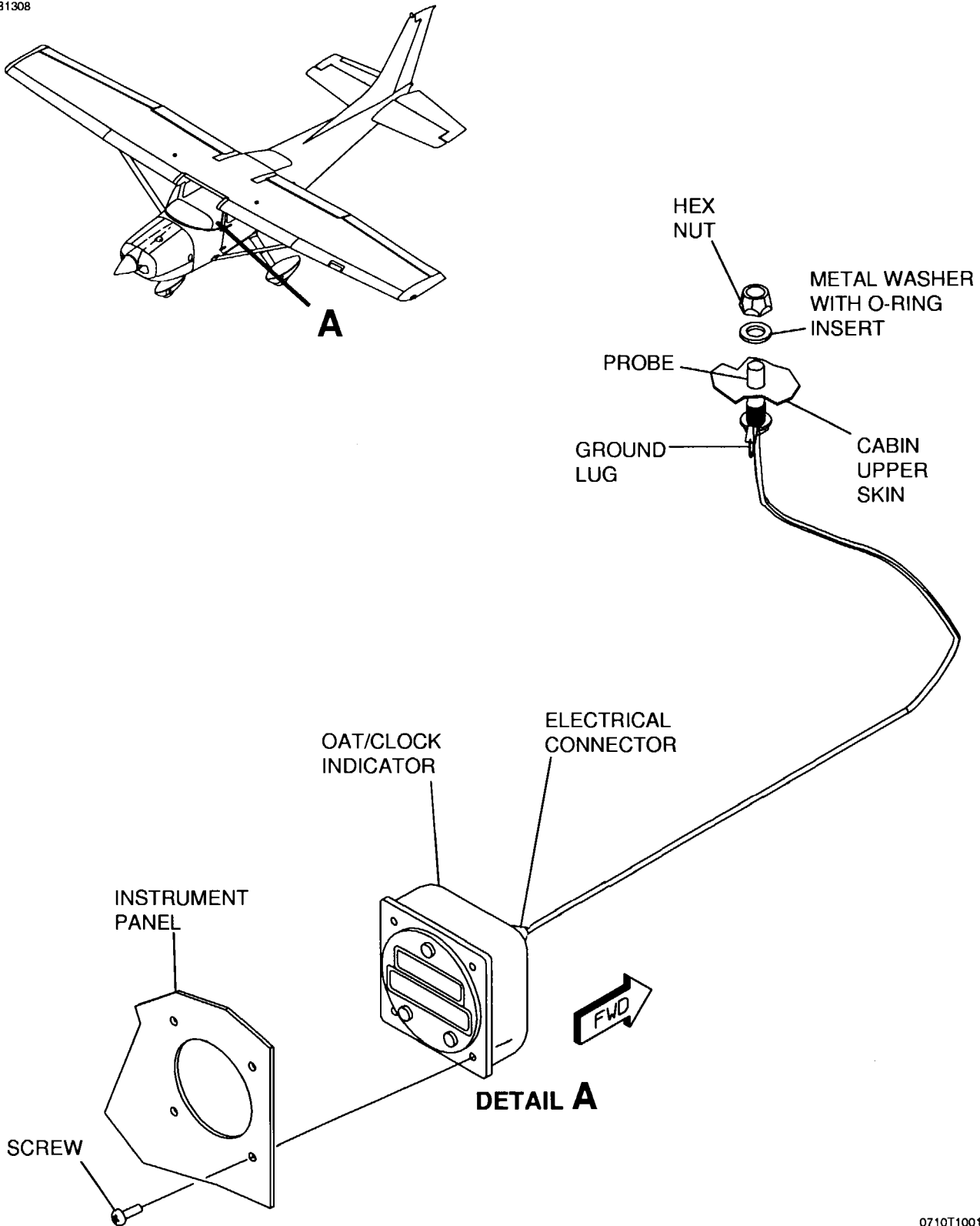
- A. Remove Probe (Refer to Figure 201).
  - (1) Remove overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices, Figure 201.
  - (2) From outside of cabin, loosen and remove nut securing probe to roof skin.
  - (3) From inside of cabin, withdraw probe through roof skin.
  - (4) Remove interior panels as required to free probe wiring from airplane structure.
  - (5) Disconnect electrical connector from backside of OAT/Clock indicator.
  - (6) Remove probe pins from electrical connector.
- B. Install Probe (Refer to Figure 201).
  - (1) Install new terminal pins to end of replacement probe. Ensure shielded wiring is properly grounded. Refer to Model 182S/182T/T182T Wiring Diagram Manual, Chapter 20, Bonding and Grounding - Maintenance Practices.
  - (2) Install terminal pins into electrical connector.
  - (3) Reconnect electrical connector to backside of OAT/Clock indicator.
  - (4) Reroute probe wiring in cabin area, and insert probe and ground lug through roof skin.
  - (5) From outside of cabin, install metal washer (with O-ring insert) and hex nut to probe. Tighten until O-ring compresses and forms a water-tight seal.
  - (6) Reinstall interior panels and overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices, Figure 201.

**3. Outside Air Temperature Indicator Removal/Installation**

- A. Remove the Outside Air Temperature (OAT) Indicator (Refer to Figure 201).
  - (1) Set the ALT/BAT MASTER switch to the off position.
  - (2) Remove the screws that holds the OAT indicator in the instrument panel.
  - (3) Carefully pull the OAT indicator from instrument panel and disconnect the electrical connector.
  - (4) If the indicator has a battery installed, the battery must be replaced every two years.
- B. Install Outside Air Temperature Indicator (Refer to Figure 201).
  - (1) Attach the electrical connector to the OAT indicator.
  - (2) Set in position the indicator in the instrument panel.
  - (3) Attach the OAT indicator to the instrument panel with the screws.
  - (4) Set the ALT/BAT MASTER switch to the ON position.

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Outside Air Temperature Installation  
Figure 201 (Sheet 1)

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**AIR DATA SYSTEM - MAINTENANCE PRACTICES**

**1. General**

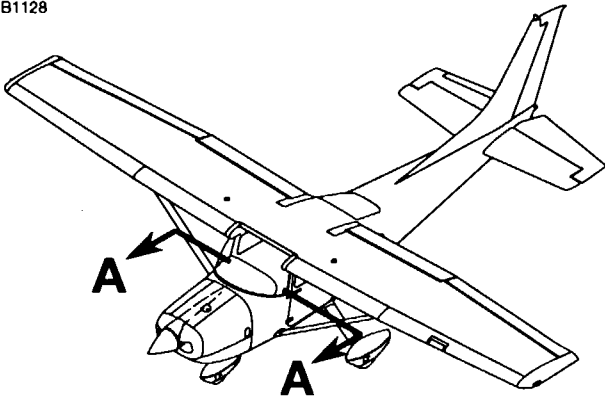
- A. The Air Data System maintenance practices give procedures for the air data unit removal/installation.
- B. The GDC-74 Air Data Unit calculates pitot, static, and outside air temperature functions. The air data unit is an interface of these functions within the integrated avionics systems. The air data unit is forward of the Multi-Function Display (MFD).

**2. GDC-74 Air Data Unit Removal/Installation**

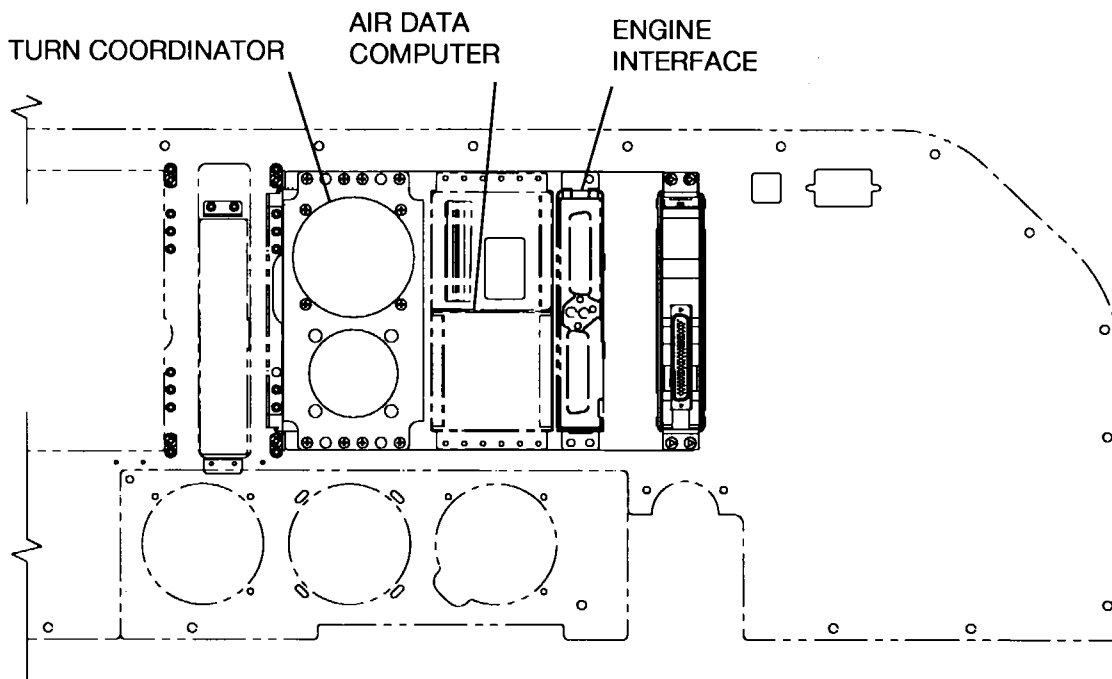
- A. Remove the GDC-74 Air Data Unit (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (3) Loosen the screws that hold the air data unit in position.
  - (4) Move the air data unit aft to get access to the hose and the electrical connector (P741).
  - (5) Disconnect the hose and the electrical connector from the air data unit.
- B. Install the GDC-74 Air Data Unit (Refer to Figure 201).
  - (1) Connect the hose and the electrical connector (P741) to the air data unit.
  - (2) Move the air data unit forward into position.
  - (3) Tighten the screws that hold the air data unit in position.
  - (4) Install the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (5) Do a pitot and static system leakage rate test after installation of the air data unit. Refer to Chapter 34, Pitot and Static Systems - Maintenance Practices.
  - (6) Do a check to make sure the air data unit operates correctly. Refer to the Garmin G1000 Line Maintenance Manual.

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**NOTE:** THE INSTRUMENT PANEL  
IS SHOWN WITH THE  
MULTI-FUNCTION DISPLAY  
(MFD) SCREEN REMOVED:



**VIEW A-A**

Forward Avionics Equipment Installation  
Figure 201 (Sheet 1)

0710T1001  
A3930T368

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**ATTITUDE AND DIRECTION - DESCRIPTION AND OPERATION**

**1. General**

- A. Attitude and direction navigation systems are systems which use magnetic or gyroscopic forces to sense and display the direction or attitude of the airplane. This includes the magnetic compass, horizon gyro, directional gyro, and turn coordinator (roll rate gyro) indicator.
- B. The magnetic compass is located on the airplane centerline of the upper forward windshield. The compass is independent of other navigation systems and does not supply information to other airplane systems.
- C. The three gyroscopic instruments that indicate attitude and direction are mounted in the center pilot panel assembly. The directional gyro and turn coordinator provide information to the autopilot system.

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**ATTITUDE AND DIRECTION - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance information, removal and installation procedures, and operational checks for the horizon attitude gyro, directional gyro, and turn coordinator.
- B. On airplanes without Garmin G1000, three gyroscopic instruments show the attitude and direction of the airplane. The instruments are found in the center pilot panel. These instruments are the horizon attitude gyro, directional gyro, and turn coordinator.
- C. On airplanes with Garmin G1000, two gyroscopic instruments give attitude and direction. The horizon gyro is in the center instrument panel. The horizon gyro gives attitude and direction and is the middle standby instrument. The turn coordinator gives roll rate data to the autopilot and is installed on the left side of the center instrument panel. The turn coordinator cannot be seen in the cockpit.

**2. Operation Notes**

- A. The vacuum system supplies airflow necessary to move the gyro rotor in the horizon gyro. Incorrect operation of the vacuum system will cause the horizon gyro to operate incorrectly.
- B. It is necessary for the horizon gyro to have 4.5 to 5.5 in.hg. of vacuum to operate correctly. The gyro will reach rated performance with correct vacuum applied in a minimum of 3 minutes of rotor spin time.
- C. The gyro rotor can continue to spin for approximately 15 minutes after vacuum in the system is removed. It can show a change in the roll and/or pitch indication while the rotor speed decreases. The gyro rotor will remain in a roll and/or pitch indication when stopped until the system starts again.
- D. If a gyro has been shut down and started again before the rotor has been permitted to stop, more time will be necessary to get the correct pitch and roll indication.

**3. Precautions**

- A. Gyroscopic instruments are very sensitive. They have precision bearings on the gyroscope rotor, pivots, and yoke shaft. Be careful when you move or touch the instrument when it is out of the airplane. If you are not careful when you move or touch the instrument, you can cause damage to the bearings. Dirt and other contaminants can also cause damage to the bearings. Obey these special precautions when you move, install, remove, or ship any gyroscopic instruments.
  - (1) To prevent damage to the gyro, do not move a gyro after the electrical power or vacuum pressure is removed and before the gyro rotor has stopped. The gyro rotor will not fully stop for approximately 15 minutes after the electrical power or vacuum pressure is removed.
  - (2) During the removal of instruments, put soft material between the instruments and the control column.
  - (3) Do not shake or cause vibration of the panel or the instruments.
  - (4) Do not hit the gyroscope against any other object. Do not shake the gyroscope or put the gyroscope on a hard surface. If you are not careful, you can cause damage to the instrument.

**CAUTION:** Always be very careful when you move or hold gyroscopic instruments, because you can easily cause damage.

- (5) Do not remove any wires, labels, tie straps, or any other parts of the gyro that are installed by the manufacturer.
- (6) Visually examine the gyro for any external damage. There must be no scratches, dents, or dings on any part of the gyro. Do not install gyros that have scratches, dents, or dings.
- (7) If you must ship a gyroscopic instrument, make sure that all the female ports have plugs that you can remove, and that all the male receptacles have plastic caps that you can remove.
- (8) Put connector caps on all the electrical pin connectors to make sure that they are not bent or broken.
- (9) Put all gyros in Styrofoam or other soft material for storage and transportation. If possible, ship the gyroscope in the box from the manufacturer in which it was received.

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- (10) Keep the plugs in the ports unless the instrument is installed in an aircraft or maintenance personnel are doing a test.

**4. Prepare the Gyroscopic Instruments for Shipping**

- A. All gyros that are shipped must obey the instructions that follow.
- (1) All ports and vents must have plugs installed in them.
  - (2) All initial seals from the manufacturer must be installed and not damaged.
  - (3) All gyros must be carefully put in the same type of container in which the replacement gyro was received.
  - (4) Put connector caps or adhesive tape on all electrical pin connectors to make sure that they are not bent or broken.

**5. Horizon Attitude Gyro Description and Operation**

- A. The vacuum system supplies the air flow necessary to move the gyro rotor in the horizon attitude gyro. Incorrect operation of the vacuum system will cause the horizon attitude gyro to operate incorrectly. Problems with the vacuum system can cause incorrect indication and decreased performance.
- B. The horizon attitude gyro must have between 4.5 and 5.5 in.hg. of vacuum to operate correctly. With the correct vacuum applied, the gyro will get rated performance in a minimum of 3 minutes of rotor turn time.
- C. The horizon attitude gyro rotor can continue to turn for approximately 15 minutes after the vacuum in the system is removed. It can show a change in the roll and/or pitch indication while the rotor speed decreases. When fully stopped, the gyro rotor will stay in a roll and/or pitch indication until the system starts again.
- D. If a gyro has been stopped and started again before the rotor fully stops, more time will be necessary for the gyro to correctly indicate the pitch and roll of the airplane.

**6. Horizon Attitude Gyro Removal/Installation**

- A. Horizon Attitude Gyro Removal (Refer to Figure 201 or Figure 202).

**CAUTION:** Make sure that the gyro rotor has fully stopped before you move the instrument. The gyro rotor will not stop for approximately 15 minutes after the electrical power or vacuum source is removed. Damage to the instrument will occur if the instrument is moved before the gyro rotor has stopped.

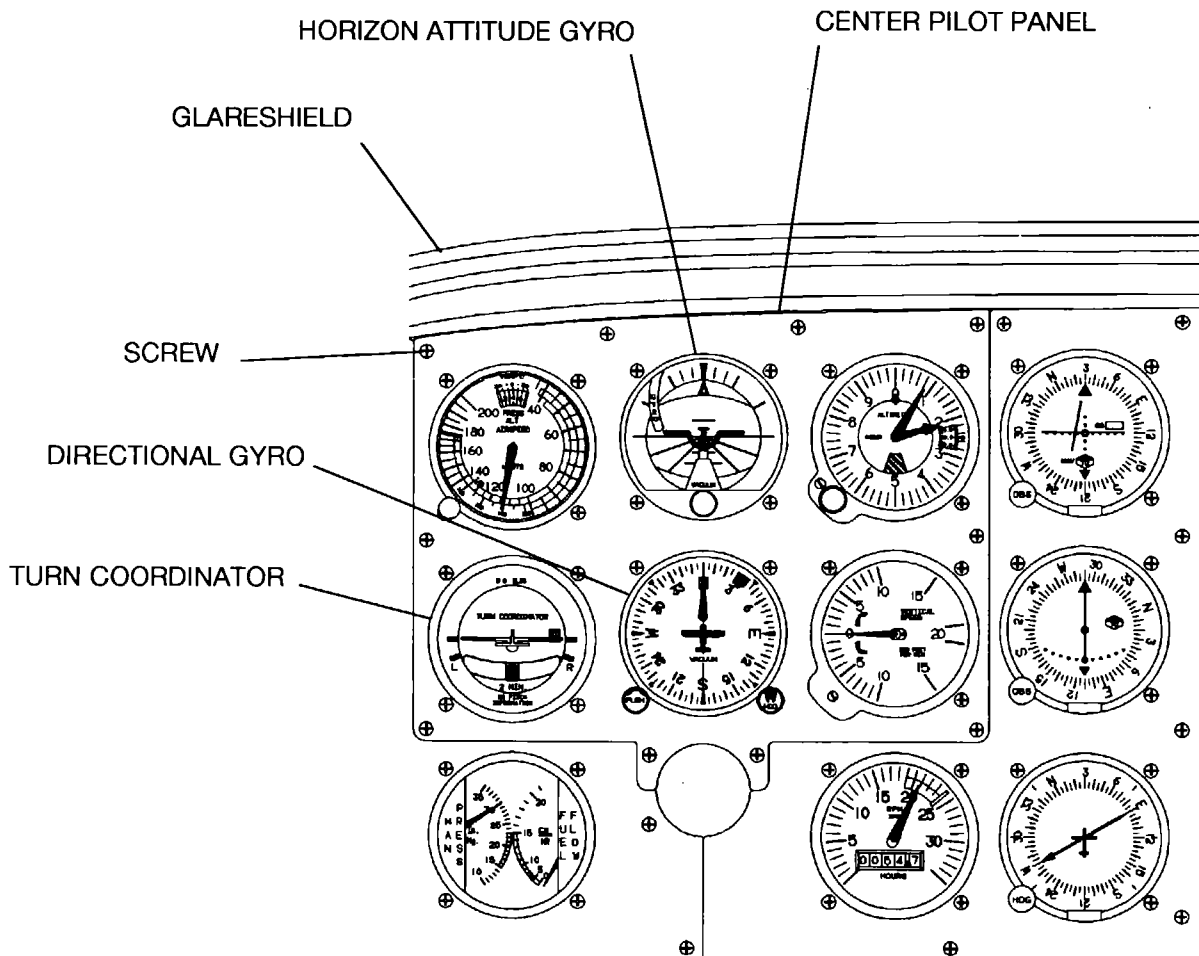
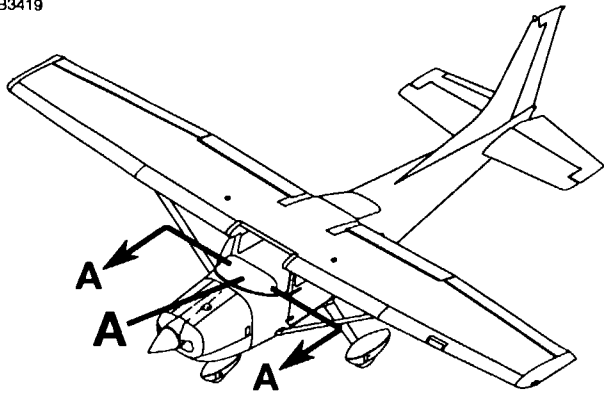
**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Put the MASTER switch and the AVIONICS switch in the off position.
- (2) Remove the screws from the center pilot panel to get access to the back of the horizon attitude gyro.



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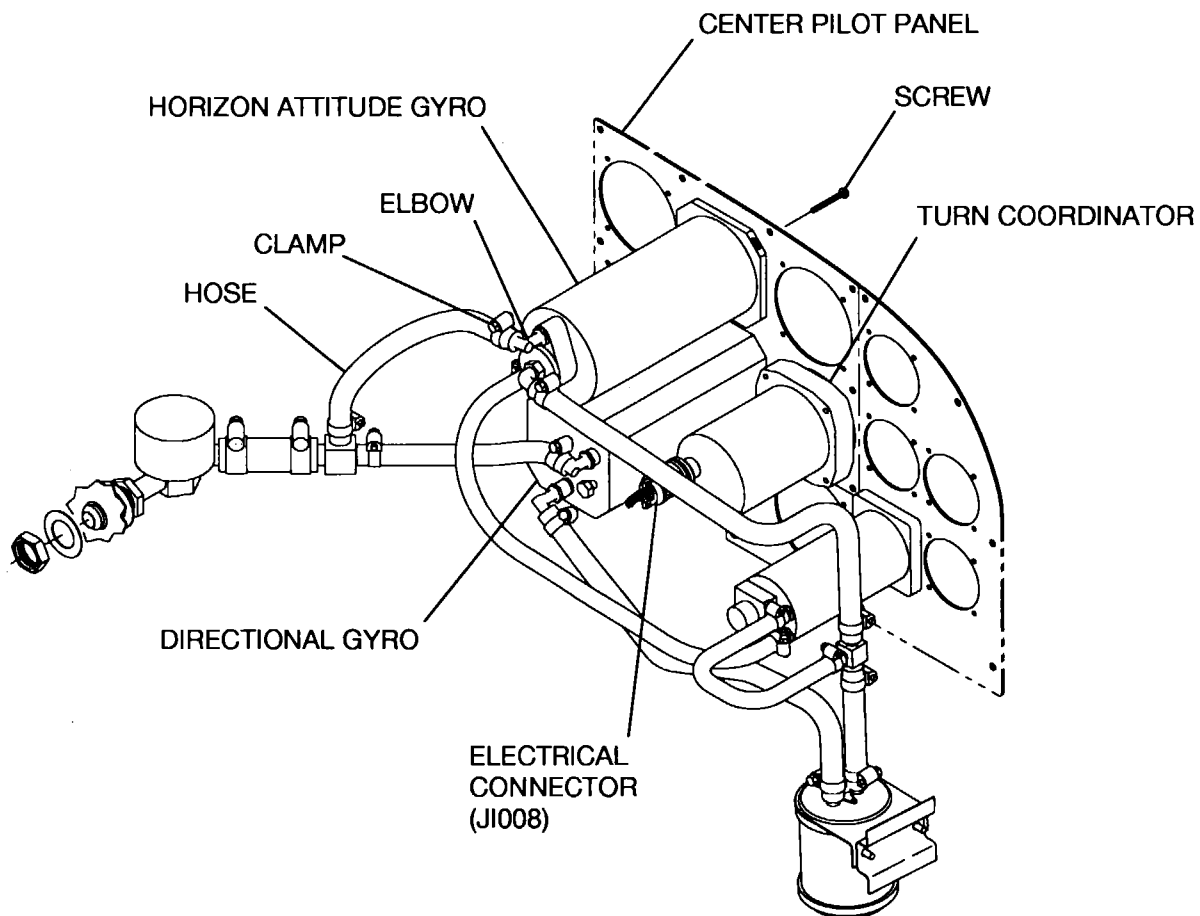
**VIEW A-A**  
 AIRPLANES WITHOUT GARMIN G1000

0710T1001  
 AA0718R1038

Attitude and Direction Instrument Installation (Airplanes without Garmin G1000)  
 Figure 201 (Sheet 1)

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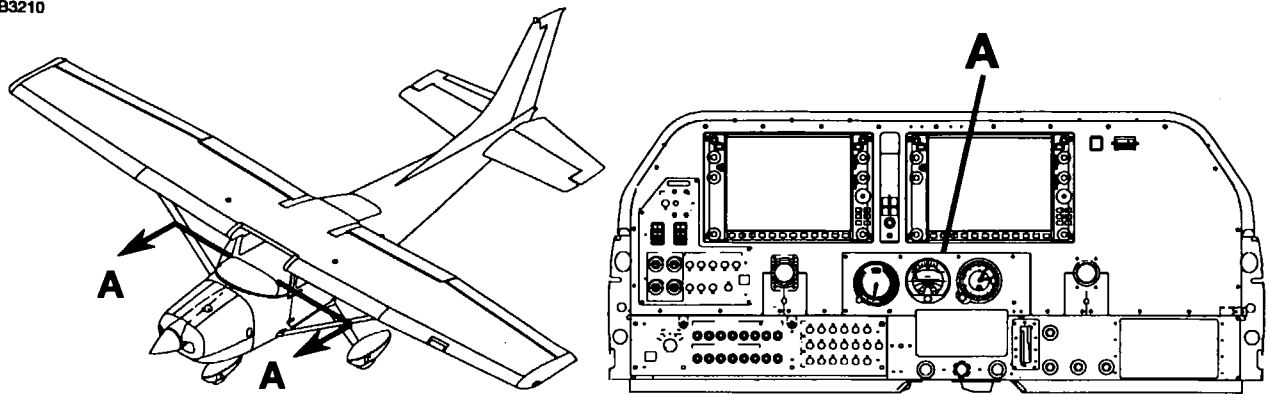
**DETAIL A**  
AIRPLANES WITHOUT GARMIN G1000

B0714T1033

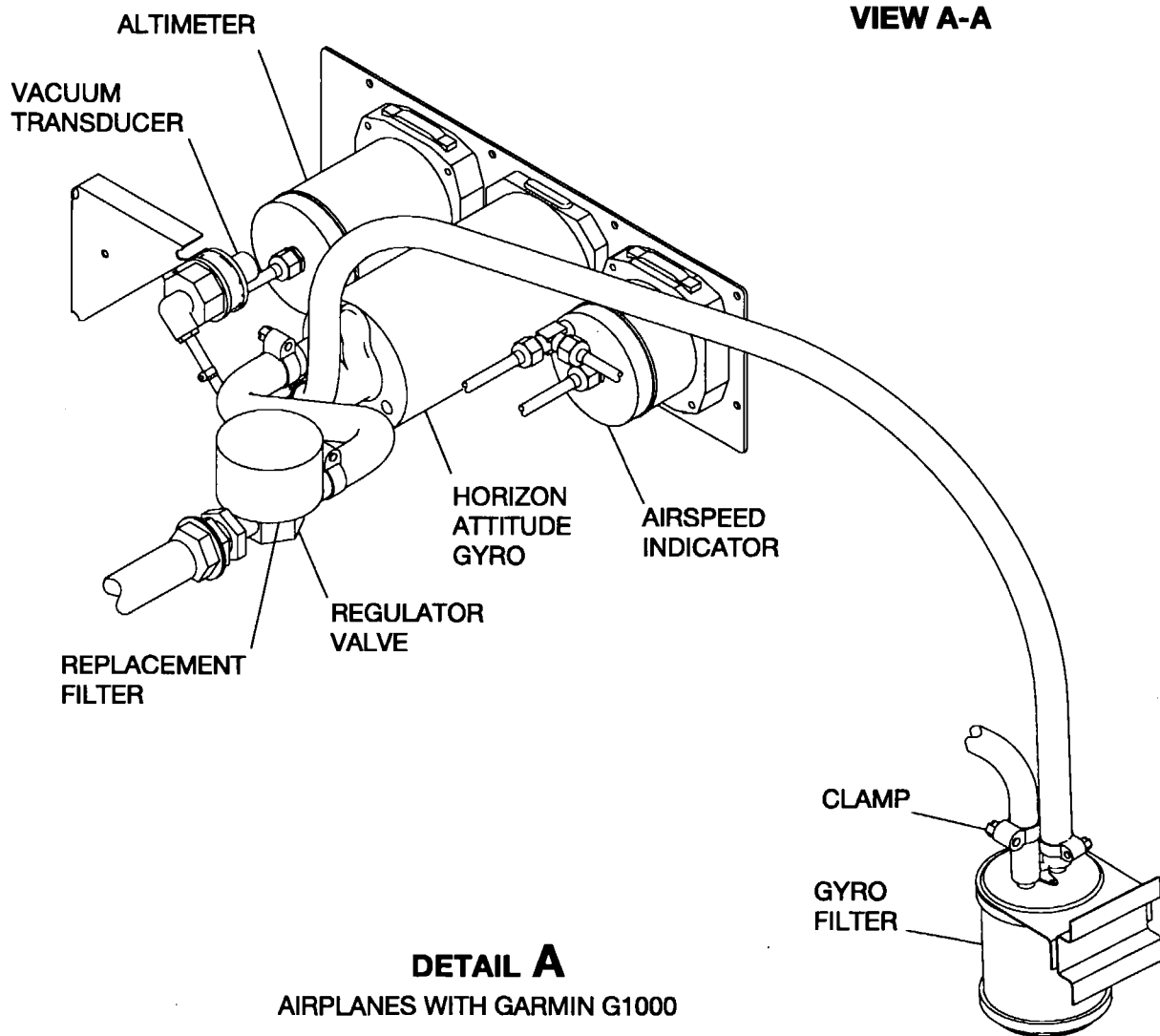
Attitude and Direction Instrument Installation (Airplanes without Garmin G1000)  
Figure 201 (Sheet 2)

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**VIEW A-A**



**DETAIL A**

AIRPLANES WITH GARMIN G1000

0710T1001  
 A1218T1001A  
 B0718T1068

Attitude and Direction Instrument (Airplanes with Garmin G1000)  
 Figure 202 (Sheet 1)

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**CAUTION:** Make sure that you put soft material between the horizon attitude gyro and the control column before you remove the gyro. If you put the sub panel on the control column without any protection, you can damage the horizon attitude gyro and/or the other instruments in the sub panel. Be very careful when you remove the sub panel so that you do not hit the gyro.

- (3) Put a label on the air inlet hose, vacuum outlet hose, and gage hose that are attached to the horizon attitude gyro.
- (4) Loosen the clamps and remove the hoses from the horizon attitude gyro.
- (5) Disconnect the electrical connectors from the horizon attitude gyro.
- (6) Put female plugs over the ports and put a connector cap on the electrical connector.
- (7) Remove the screws that attach the horizon attitude gyro to the center pilot panel.

**CAUTION:** Put a cover on the applicable hose or port, or on the applicable electrical connector when the gyroscopic instrument is out of the airplane or is to be shipped. Damage to the instrument will occur from contamination if a cover is not used.

- (8) Remove the horizon attitude gyro from the airplane.

B. Horizon Attitude Gyro Installation (Refer to Figure 201 or Figure 202).

**CAUTION:** Do not remove the horizon attitude gyro from the box in which it was shipped until it is ready to be installed into the airplane. This will minimize the possibility of accidentally causing damage to the gyro.

**CAUTION:** Remove all plugs from the horizon attitude gyro before you install it in the aircraft.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Attach the horizon attitude gyro to the center pilot panel with the screws.
- (2) Make sure that the horizon attitude gyro is installed level in the panel.
- (3) Remove the female plugs from the ports and remove the connector cap from the electrical connector.
- (4) Make sure that the vacuum lines and the static lines have no kinks in them.
- (5) Attach the air inlet hose, vacuum outlet hose, and gage hose to the horizon attitude gyro and tighten the clamps.
- (6) Attach the horizon attitude gyro connector to the horizon attitude gyro.
- (7) Attach the center pilot panel with the screws.
- (8) Tighten the screws in an opposite sequence.
- (9) Put the MASTER switch and the AVIONICS switch in the ON position.
- (10) Do an operational check of the horizon attitude gyro to make sure that it operates correctly.

7. Horizon Attitude Gyro Operational Check

A. Horizon Attitude Gyro Operational Check.

- (1) Start the airplane engine.
- (2) Let the engine run for no less than 3 minutes.

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- (3) Make sure that the vacuum gage shows between 4.5 and 5.5 in.hg.
- (4) Make sure that the horizon bar becomes stable at the correct position for the attitude of the airplane, or becomes stable at the correct position, begins to vibrate, and then slowly stops vibration altogether.
- (5) Taxi in a straight line. Make sure that the horizon bar stays in the horizontal position while you taxi.
- (6) Do a 360-degree turn. Do not turn sharply as you make the turn. Make sure that the horizon bar does not tip more than 4 degrees from the horizontal during the turn.
- (7) If the horizontal gyro precession is more than 4 degrees from a heading in either direction during a 10-minute period, or does not operate within one or more of the limits given in steps 4 through 6 of this operational check, you must repair the system and/or replace the gyro.

**8. Directional Gyro Description and Operation**

- A. The vacuum system supplies the air flow necessary to move the gyro rotor in the directional gyro. Incorrect operation of the vacuum system will cause the horizon attitude gyro to operate incorrectly. Problems with the vacuum system can cause incorrect indication and decreased performance.
- B. The directional gyro must have between 4.5 and 5.5 in.hg. of vacuum to operate correctly. With the correct vacuum applied, the gyro will get rated performance in a minimum of 3 minutes of rotor turn time.
- C. The directional gyro rotor can continue to turn for approximately 15 minutes after the vacuum in the system is removed. It can show a change in the directional indication while the rotor speed decreases, or the directional gyro dial can start to turn. When fully stopped, the gyro rotor will not correctly indicate changes in the airplane's direction until the system starts again.
- D. If a gyro has been stopped and started again before the rotor fully stops, more time will be necessary for the gyro to correctly indicate the directional changes of the airplane.
- E. The permitted limits for directional gyro drift on the ground or in flight is 4 degrees from a fixed heading, during a 10-minute period.
- F. Continuous turns around a point and/or banks of more than 55 degrees can cause the directional gyro to turn. This is a limit of the gyro and not a cause for removal.

**9. Directional Gyro Removal/Installation (Airplanes without Garmin G1000)**

- A. Directional Gyro Removal (Refer to Figure 201).

**CAUTION:** Make sure that the gyro rotor has fully stopped before you move the instrument. The gyro rotor will not stop for approximately 15 minutes after the vacuum source is removed. Damage to the instrument will occur if the instrument is moved before the gyro rotor has stopped.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Put the MASTER switch and the AVIONICS switch in the off position.
- (2) Remove the screws from the center pilot panel to get access to the back of the directional gyro.

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**CAUTION:** Make sure that you put soft material between the directional gyro and the control column before you remove the gyro. If you put the sub panel on the control column without any protection, you can damage the directional gyro and/or the other instruments in the sub panel. Be very careful when you remove the sub panel so that you do not hit the gyro.

- (3) Put a label on the air inlet hose and the vacuum outlet hose that are attached to the directional gyro.
- (4) Loosen the clamps and remove hoses from the directional gyro.
- (5) Disconnect the directional gyro connector and the electrical connector from the directional gyro.
- (6) Put female plugs over the ports and put a connector cap on the electrical connector.
- (7) Remove the screws that attach the directional gyro to the center pilot panel.

**CAUTION:** Put a cover on the applicable hose or port, or on the applicable electrical connector when the gyroscopic instrument is out of the airplane or is to be shipped. Damage to the instrument will occur from contamination if you do not use a cover.

- (8) Remove the directional gyro from the airplane.

B. Directional Gyro Installation (Refer to Figure 201).

**CAUTION:** Do not remove the directional gyro from the box in which it was shipped until it is ready to be installed into the airplane. This will minimize the possibility of accidentally causing damage to the gyro.

**CAUTION:** Remove all plugs from the directional gyro before you install it in the aircraft.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Use soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Attach the directional gyro to the center pilot panel with the screws.
- (2) Remove the female plugs from the ports and remove the connector cap from the electrical connector.
- (3) Attach the air intake hose and the vacuum outlet hose to the directional gyro and tighten the clamps.
- (4) Attach the directional gyro connector and the electrical connector to the directional gyro.
- (5) Attach the center pilot panel with the screws.
- (6) Put the MASTER switch and the AVIONICS switch in the ON position.
- (7) Do an operational check of the directional gyro to make sure that it operates correctly. Refer to Directional Gyro Operational Check.

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**10. Directional Gyro Operational Check**

A. Directional Gyro Operational Check (Refer to Figure 201).

**NOTE:** The permitted limit for gyro drift on the ground or in flight is 4 degrees from a fixed heading, during a 10-minute period.

- (1) Start the airplane engine.
- (2) Make sure that the vacuum system operates correctly.
  - (a) The vacuum gage must show between 4.5 and 5.5 in.hg.
- (3) Let the directional gyro become stable for at least 3 minutes.
- (4) If the directional gyro dial starts to turn, let the gyro become stable and then push the gyro-caging knob. If the gyro dial continues to turn, repair the system and/or replace the gyro.

**NOTE:** It is usual for the directional gyro dial to turn when the gyro becomes stable. This is a limit of the gyro and not a cause for removal.

- (5) Point the airplane's heading to the north.
- (6) Set the directional gyro to the north.
- (7) Make sure that the directional gyro dial drift is not more than 4 degrees in a 10-minute period.
- (8) Point the airplane's heading and set the directional gyro to each of the other three cardinal headings in turn (West, South, and East).
- (9) Make sure that the directional gyro dial drift is not more than 4 degrees in a 10-minute period at each of these cardinal headings.
- (10) If the directional gyro dial drift is not satisfactory at any heading, repair the system and/or replace the gyro.

**NOTE:** After you stop operation of the airplane, it is usual for the directional gyro dial to continue to turn. This is not a cause to remove the gyro.

**11. Turn Coordinator Removal/Installation (Airplanes without Garmin G1000)**

A. Turn Coordinator Removal (Refer to Figure 201).

**CAUTION:** Make sure that the gyro rotor has fully stopped before you move the instrument. The gyro rotor will not stop for approximately 15 minutes after the vacuum source is removed. Damage to the instrument will occur if the instrument is moved before the gyro rotor has stopped.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Put the MASTER switch and the AVIONICS switch in the off position.
- (2) Remove the screws from the center pilot panel to get access to the back of the turn coordinator.

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**CAUTION:** Make sure that you put soft material between the turn coordinator and the control column before you remove the turn coordinator. If you put the sub-panel on the control column without any protection, you can damage the turn coordinator and/or the other instruments in the sub-panel. Be very careful when you remove the sub-panel so that you do not hit the turn coordinator.

- (3) Disconnect the turn coordinator avionics connector and electrical connector from the turn coordinator.

**CAUTION:** Put a cover on the applicable electrical connector when the gyroscopic instrument is out of the airplane or is to be shipped. Damage to the instrument will occur from contamination if a cover is not used.

- (4) Put connector caps on the turn coordinator avionics connector and electrical connector.
- (5) Remove the screws that attach the turn coordinator to the center pilot panel.
- (6) Remove the turn coordinator from the airplane.

B. Turn Coordinator Installation (Refer to Figure 201).

**CAUTION:** Do not remove the turn coordinator from the box in which it was shipped until it is ready to be installed into the airplane. This will minimize the possibility of accidentally causing damage to the gyro.

**CAUTION:** Remove all plugs from the turn coordinator before you install it in the aircraft.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Attach the turn coordinator to the center pilot panel with the screws.
- (2) Remove the connector caps from the turn coordinator avionics connector and the electrical connector.
- (3) Attach the turn coordinator avionics connector and electrical connector to the turn coordinator.
- (4) Attach the center pilot panel with the screws.
- (5) Put the MASTER switch and the AVIONICS switch in the ON position.
- (6) Set the autopilot roll null (if autopilot is installed). Refer to Autopilot - Maintenance Practices.
- (7) Do an operational check of the turn coordinator to make sure that it operates correctly.

**12. Turn Coordinator Removal/Installation (Airplanes with Garmin G1000)**

A. Turn Coordinator Removal (Refer to Figure 203).



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**CAUTION:** Make sure that the gyro rotor has fully stopped before you move the instrument. The gyro rotor will not stop for approximately 15 minutes after the vacuum source is removed. Damage to the instrument will occur if the instrument is moved before the gyro rotor has stopped.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Use soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

- (1) Put the MASTER switch and the AVIONICS switch in the off position.
- (2) Remove the multi-function display (MFD). Refer to Chapter 34, Control Display Unit - Maintenance Practices.
- (3) Remove the screws that attach the turn coordinator.
- (4) Move the turn coordinator aft to get access to the turn coordinator avionics connector.

**CAUTION:** Put a cover on the applicable electrical connector when the gyroscopic instrument is out of the airplane or is to be shipped. Damage to the instrument will occur from contamination if a cover is not used.

- (5) Disconnect the turn coordinator avionics connector and the electrical connector.
- (6) Put connector caps on the avionics connector and the electrical connector.
- (7) Remove the turn coordinator from the airplane.

B. Turn Coordinator Installation (Refer to Figure 203).

**CAUTION:** Do not remove the turn coordinator from the box in which it was shipped until it is ready to be installed into the airplane. This will minimize the possibility of accidentally causing damage to the gyro.

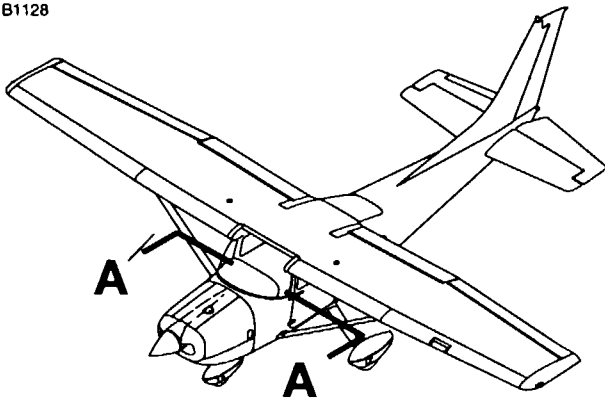
**CAUTION:** Remove all plugs from the turn coordinator before you install it in the aircraft.

**CAUTION:** Be careful with the gyroscopic instruments. Do not hit, shake, or put the instruments on a hard surface. Put soft material between the gyroscopic instruments and any hard surface. Damage to the instruments will occur if the instruments are not carefully moved. The manufacturer's warranty can become void if the gyro is not kept in its initial condition as received from the manufacturer.

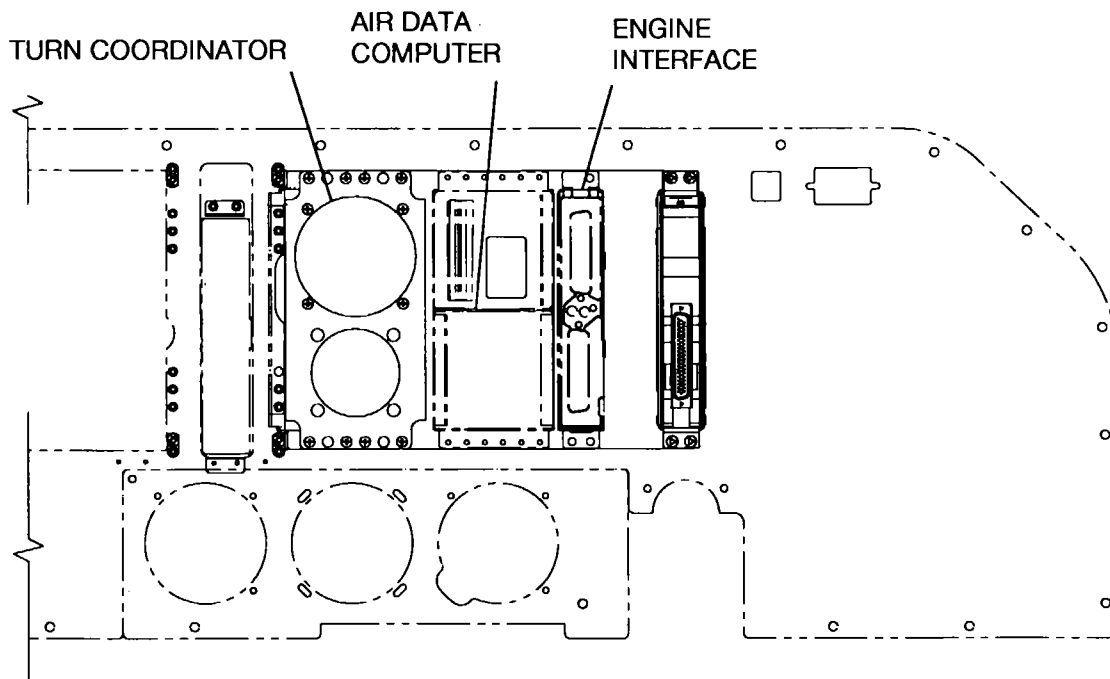
- (1) Remove the connector caps from the turn coordinator avionics connector and the electrical connector.
- (2) Attach the turn coordinator avionics connector and the electrical connector.
- (3) Attach the turn coordinator with screws.
- (4) Install the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
- (5) Put the MASTER switch and the AVIONICS switch in the ON position.
- (6) Set the autopilot roll null (if autopilot is installed). Refer to Autopilot - Maintenance Practices.
- (7) Do an operational check of the turn coordinator to make sure that it operates correctly.

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B1128



**NOTE:** THE INSTRUMENT PANEL IS SHOWN WITH THE MULTI-FUNCTION DISPLAY (MFD) SCREEN REMOVED.



**VIEW A-A**  
AIRPLANES WITH GARMIN G1000

0710T1001  
A3930T368

Turn Coordinator Installation (Airplanes with Garmin G1000)  
Figure 203 (Sheet 1)

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**COMPASS INSTALLATION - MAINTENANCE PRACTICES**

**1. General**

- A. A lighted, magnetic compass is installed on the upper windshield at the airplane centerline.

**2. Compass Removal and Installation**

- A. Remove Compass (Refer to Figure 201).

- (1) Remove electrical power from airplane and turn master switch to "OFF".
- (2) Identify, tag, and disconnect electrical wires for compass lighting.

**NOTE:** Splices are located under upper windshield trim.

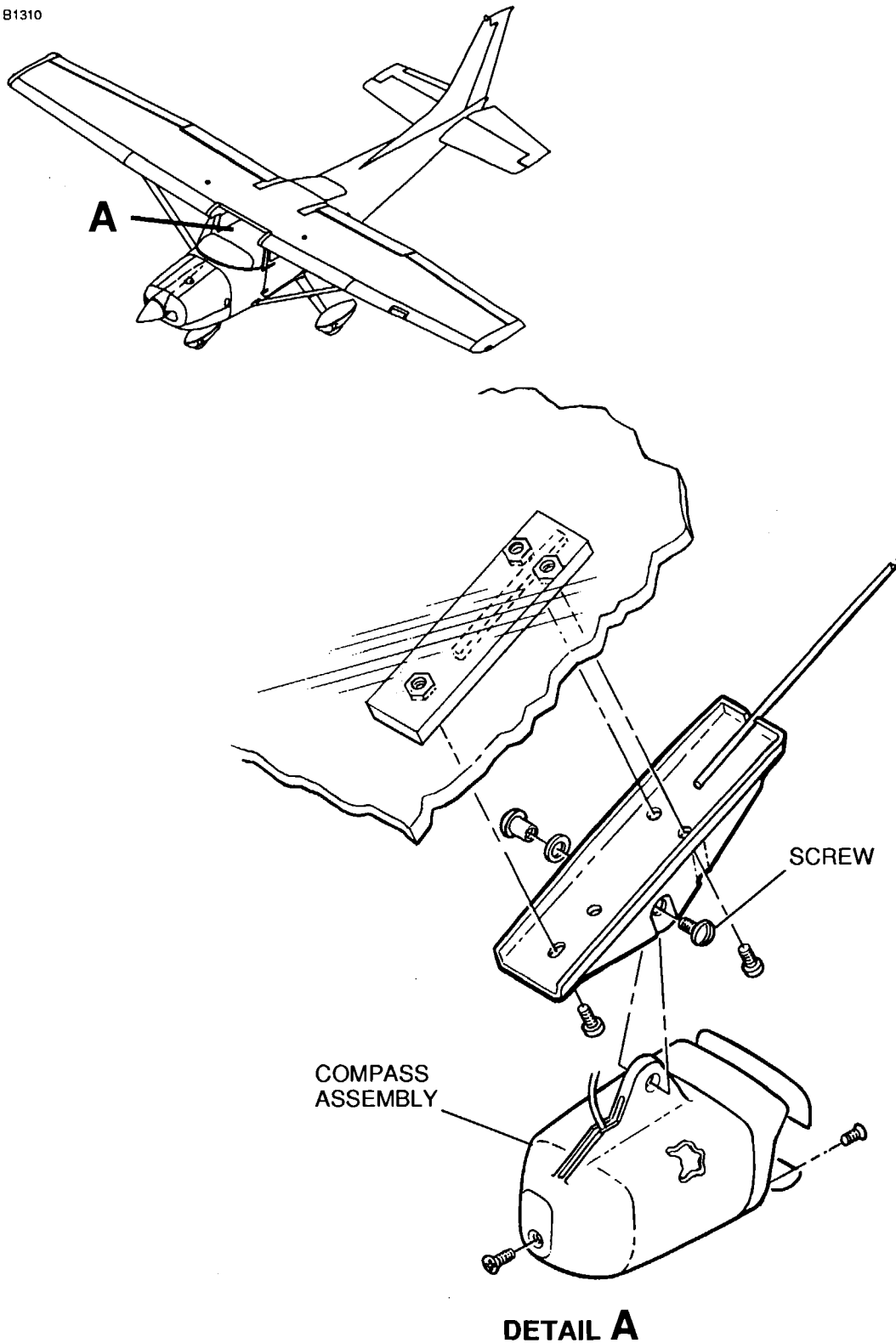
- (3) Remove screw, post, and washers securing compass to compass base.
- (4) Remove compass from airplane.

- B. Install Compass (Refer to Figure 201).

- (1) Secure compass to compass base with screw, post, and washers. Torque screw to 12.5 Inch pounds, +2.5 or - 2.5 Inch pounds (1.41 N.m, +0.28 or -0.28 N.m).
- (2) Connect electrical wires at splices.
- (3) Restore electrical power to airplane as required and turn master switch to "ON".
- (4) Check compass accuracy on compass rose.

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0710T1001  
A0714T1002

Compass Installation  
Figure 201 (Sheet 1)

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**MAGNETOMETER - MAINTENANCE PRACTICES**

**1. General**

- A. The magnetometer maintenance practices give procedures for the magnetometer removal/installation.
- B. The magnetometer senses magnetic direction. The magnetometer uses this information to digitally interface with the integrated avionics system. The magnetometer is in the bottom of the left wing.

**2. GMU-44 Magnetometer Removal/Installation**

**CAUTION:** Do the magnetometer calibration if the GMU-44 magnetometer is removed and replaced after post-installation calibration. The magnetometer can give incorrect information if the calibration is not completed.

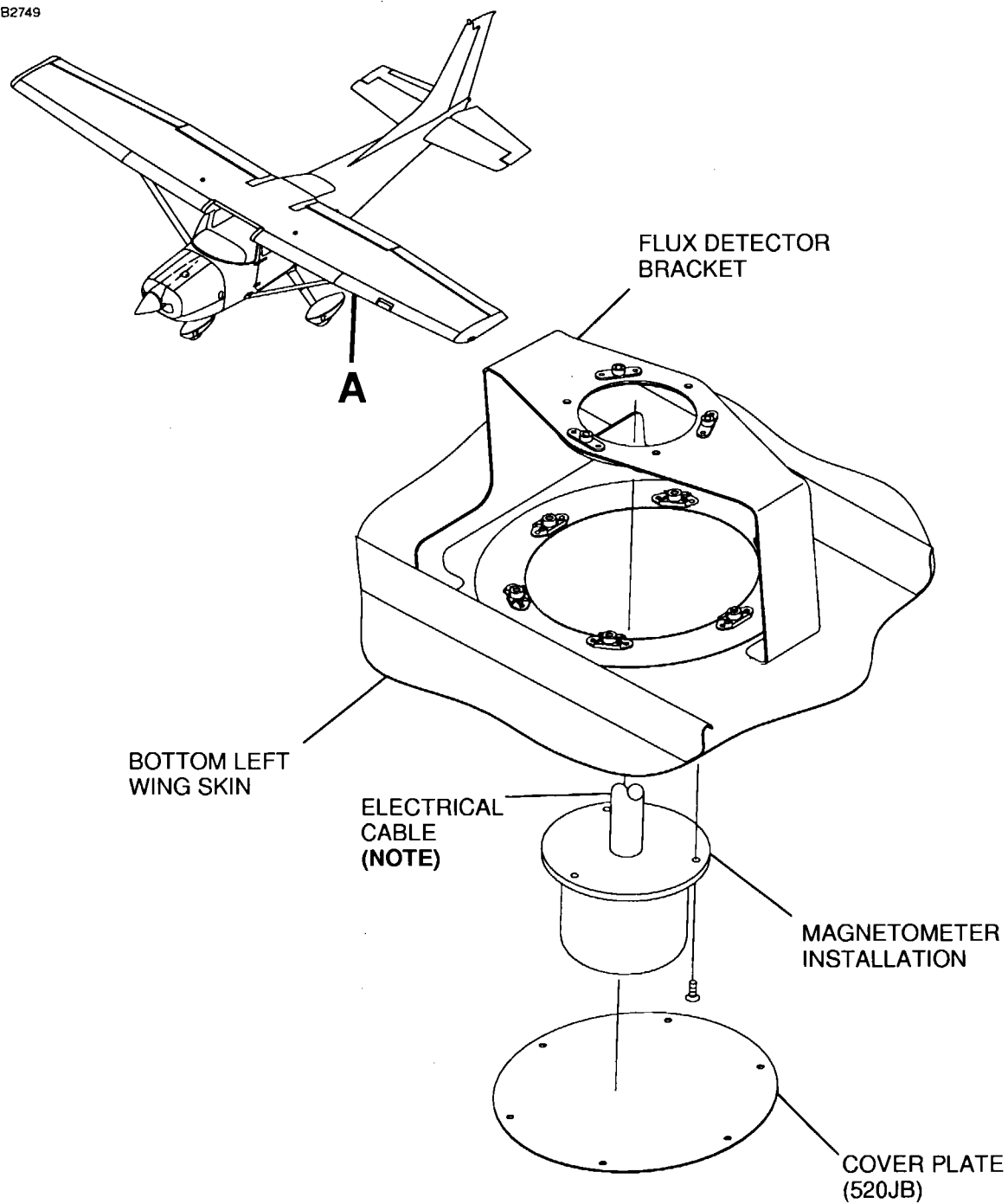
**CAUTION:** Do not move the mounting racks if the GMU-44 magnetometer is removed and replaced. The magnetometer can give incorrect information.

**CAUTION:** Do not use magnetic tools and screws on the magnetometer. Magnetic tools and screws will cause the magnetometer to malfunction.

- A. Remove the Magnetometer (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the access/inspection plate (520DB) to get access to the magnetometer. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Remove the screws that attach the magnetometer to the flux detector bracket.
  - (4) Disconnect the electrical connector (PL302) from the magnetometer.
- B. Install the Magnetometer (Refer to Figure 201).
  - (1) Connect the electrical connector (PL302) to the magnetometer.
  - (2) Attach the magnetometer to the flux detector bracket with the screws.
    - (a) Put the magnetometer in position on the flux detector bracket, temporarily aligned parallel to the longitudinal axis of the airplane.
  - (3) Do the magnetometer calibration and functional test. Refer to the Garmin G1000 Line Maintenance Manual.
  - (4) Install the access/inspection plate (520DB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

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**NOTE:** ELECTRICAL CABLE  
THAT EXTENDS TO THE  
ELECTRICAL CONNECTOR.  
(PL302)

**DETAIL A**

Magnetometer Installation  
Figure 201 (Sheet 1)

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**ATTITUDE HEADING REFERENCE SYSTEM (AHRS) - MAINTENANCE PRACTICES**

**1. General**

- A. The Attitude Heading Reference System (AHRS) has the electronic sensors and hardware that read the airplane's altitude and directional information and digitally interfaces this information in the integrated system. The AHRS unit is in the tailcone.

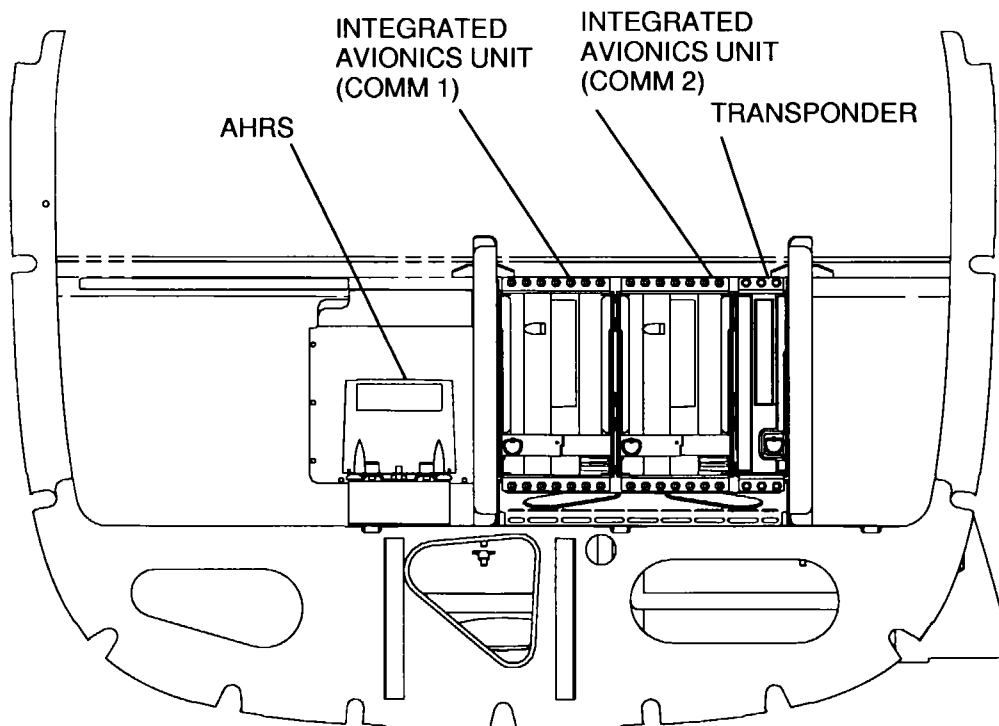
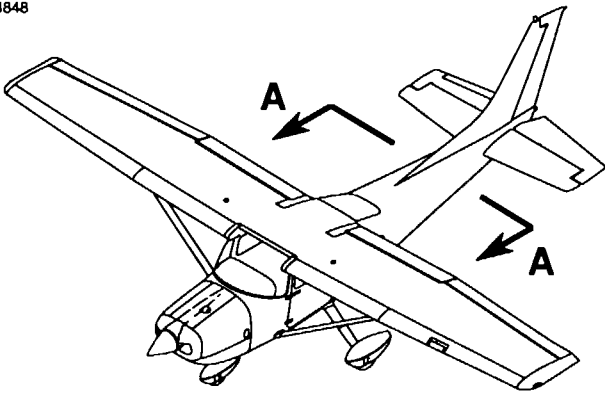
**2. GRS-77 AHRS Removal/Installation**

**CAUTION:** Do not move the unit mounting racks if the GRS-77 AHRS is removed and replaced after post-installation calibration has been completed. The AHRS can give incorrect information.

- A. Remove the AHRS unit (Refer to Figure 201).
- (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the tailcone access/inspection plate (310AR) to get access to the NAV/COM units. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connector (P771).
  - (4) Remove the screws that attach the AHRS unit to the mounting tray.
  - (5) Remove the AHRS unit from the airplane.
- B. Install the AHRS unit (Refer to Figure 201).
- (1) Put the AHRS unit in position in the mounting tray and attach to the tray with screws.
    - (a) If the fasteners that attach the mounting racks are loosened for any reason, the post-installation calibration must be completed. Refer to the Garmin GRS 77/GMU 44 Installation Manual (P/N 190-00207-10).
  - (2) Connect the electrical connector (P771).
  - (3) Install the tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (4) Do a check to make sure the AHRS operates correctly. Refer to the Garmin G1000 Line Maintenance Manual.

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**VIEW A-A**

LOOKING FORWARD AT FS 140  
AIRPLANES THAT HAVE  
THE GARMIN G1000

Tailcone Avionics Installation  
Figure 201 (Sheet 1)

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**MARKER BEACON - DESCRIPTION AND OPERATION**

**1. General**

- A. Marker beacon functions are included in the integrated Bendix/King KMA-26/KMA-28 Audio Amplifier/Intercom/Marker Beacon Receiver. This receiver is a solid state unit and contains a push-button audio selector panel, speaker and headphone isolation amplifiers, a six station intercom, and a marker beacon receiver.

**2. Description and Operation**

- A. As many as three transceivers and six receivers can be controlled by the KMA-26/KMA-28 Audio Amplifier/Intercom/Marker Beacon Receiver. This receiver also has two unswitched and mutable auxiliary inputs, four unswitched and unmutable inputs, and two entertainment inputs.
- B. Separate isolation amplifiers are provided for headphones and speaker to provide isolation even when the same source is selected for both headphones and speaker. Except for the unswitched, unmuted inputs, the speaker output is muted when the MIC key is pressed to transmit. In the PA MIC selector mode, all the audio inputs are muted to the speaker while the microphone is keyed. When the EMG position is chosen on the MIC selector, the pilot's headphones and microphone are connected directly to COM 1, continuing to operate even when power is lost to the KMA-26/KMA28 receiver.
- C. The KMA-26/KMA28 marker beacon receiver presentation uses three colored lenses (blue, amber, and white) with the letter designations O-M-I engraved on the lens for visual station passage indication. The appropriate marker audio tone can also be selected. HI-LO sensitivity and lamp test is selected with the HI SENS/LO SENS/TEST switch adjacent to the marker beacon lights. A marker mute feature mutes the marker audio until after the beacon has been passed. The marker beacon lights are automatically dimmed to compensate for ambient cockpit lighting conditions.
- D. For operating instructions of the KMA-26/KMA28 Audio Amplifier/Intercom/Marker Beacon Receiver, refer to the manufacturer's manual listed in the Introduction, List of Manufacturers Technical Publications.

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**MARKER BEACON - MAINTENANCE PRACTICES**

**1. General**

- A. Maintenance practices have procedures for the removal/installation of the KMA-26/KMA-28 and GMA-1347 Audio Amplifier/Intercom/Marker Beacon Receiver and marker beacon antenna.
- B. For a check of the KMA-26/KMA-28 and GMA-1347 receiver, refer to the manufacturer's manual in the Introduction, List of Manufacturers Technical Publications.

**2. KMA-26/KMA-28 and GMA-1347 Removal/Installation**

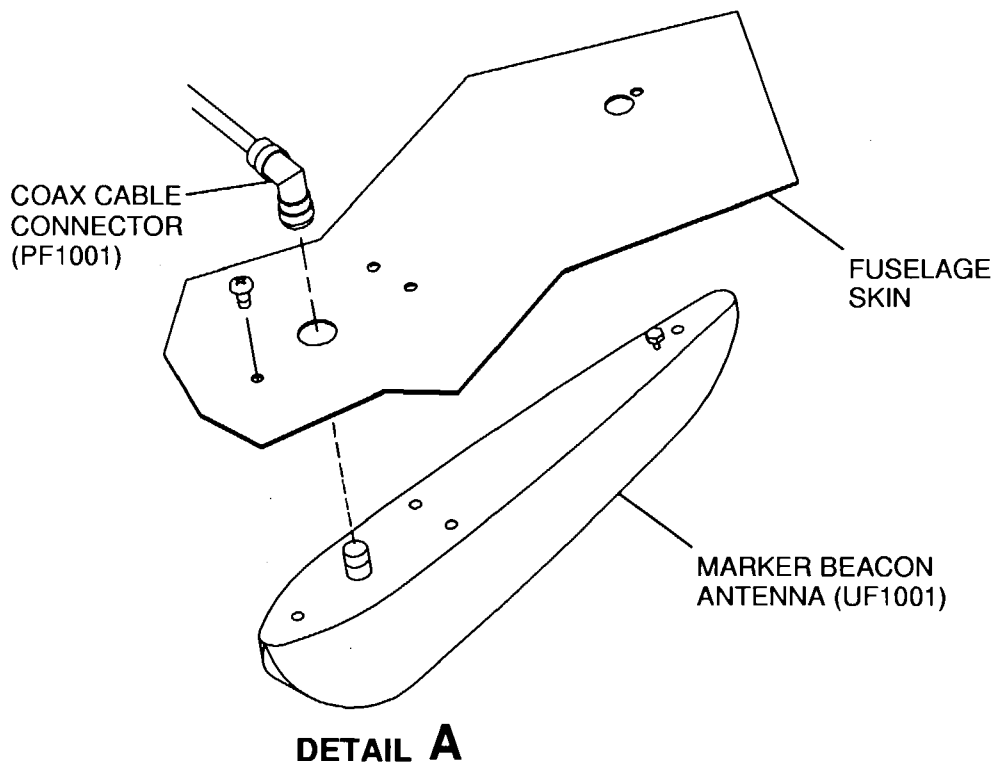
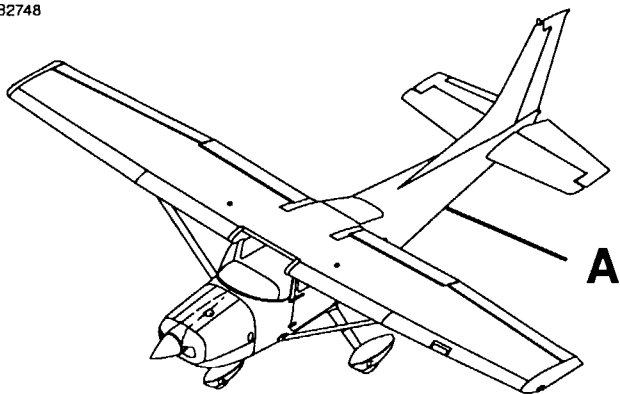
- A. For removal and installation of the KMA-26/KMA-28, GMA-1347 receiver, refer to Chapter 23, Audio Panel - Maintenance Practices.

**3. Marker Beacon Antenna Removal/Installation**

- A. Remove the Marker Beacon Antenna (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the baggage compartment lower access panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (3) Remove the aft floorboard access/inspection plate to get access to the marker beacon antenna.
  - (4) Disconnect the coaxial cable (PF1001) from the antenna.
  - (5) Remove the screws that attach the antenna to the bottom of the fuselage.
- B. Install the Marker Beacon Antenna (Refer to Figure 201).
  - (1) Put the marker beacon antenna in position on the bottom of the fuselage.
  - (2) Attach the antenna with screws.
  - (3) Attach the coaxial cable (PF1001) to the antenna.
  - (4) Install the access/inspection plate to the floor of the airplane.
  - (5) Install the baggage compartment lower access panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

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Marker Beacon Antenna  
Figure 201 (Sheet 1)

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**INDEPENDENT POSITION DETERMINING - DESCRIPTION AND OPERATION**

**1. Description**

- A. The section that follows has the maintenance procedures for the airplane system that gives the position of the airplane. The airplane components of this system are mainly independent of ground installations or satellites such as weather radar.

**2. Operation**

A. KMH-880 Multi-Hazard Awareness System

- (1) The Bendix/King KMH-880 Multi-Hazard Awareness System (MHAS) has Enhanced Ground Proximity Warning System (EGPWS), Terrain Awareness and Warning System (TAWS B), and Traffic Advisory System (TAS) functions. A processor is installed in the aft avionics (tailcone) area. The system also uses a TAS directional antenna that is installed on the top of the fuselage, and an omnidirectional antenna that is installed on the bottom of the fuselage.

B. KTA-870 Traffic Advisory System

- (1) The KTA-870 TAS is installed on airplanes with the Garmin G1000. The KTA-870 TAS interfaces with the Garmin G1000 to track, analyze, and display to the flight crew the range and altitude data of traffic. A processor is installed in the tailcone area. The system also uses a TAS directional antenna that is installed on the top of the fuselage, and an omnidirectional antenna that is installed on the bottom of the fuselage.

C. WX-500 Stormscope

- (1) The WX- 500 Stormscope shows lightning information at ranges of 200 nautical miles. It is designed to interface with Garmin's Control Display Unit (CDU) or Honeywell's Multi-Function Display (MFD). The Stormscope does an analysis of the radiated signals of electrical discharges from storm cells to find thunderstorms. The information is then processed to determine the location and intensity of dangerous thunderstorms.

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**KMH-880 MULTI-HAZARD AWARENESS SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. The Bendix/King KMH 880 Multi-Hazard Awareness System (MHAS) has Enhanced Ground Proximity Warning System (EGPWS) and Traffic Advisory System (TAS) functions. The MHAS system has these main components installed in the tailcone area: a KMH-820 multi-hazard awareness processor, a terrain awareness warning system (TAWS B), a traffic advisory system (TAS), and a KCM-805 configuration module. Altitude information for the system comes from the blind-encoding altimeter and is changed into a digital signal by the KCM-805 configuration module.
- B. Two antennas are necessary for the operation of the MHAS system. An omnidirectional antenna is installed on the bottom side of the fuselage and a TAS directional antenna is installed on the top side of the fuselage.
- C. The KMD-540 Multi-Function Display controls and shows the TAS and EGPWS information. Aural warnings are given through the current audio system in the airplane. Other warnings for terrain are given by the annunciator unit with the TERR N/A lens kit installed.

**2. KMH-820 Processor Removal and Installation**

- A. KMH-820 Processor Removal (Refer to Figure 201).
  - (1) Set the MASTER and AVIONICS switches to the off position.
  - (2) Disengage the IHAS circuit breaker on the circuit breaker panel.

**CAUTION:** Use a tailcone stand when you do work in the tailcone. If you do not use a tailcone stand, the tail of the airplane can fall to the floor.

- (3) Remove tailcone access/inspection plate (310AR) to get access to the processor. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (4) Disconnect the electrical connectors (J5, J6, and J8) from the forward side of the processor.
  - (5) Remove the screws that attach the rack assembly to the support bracket assembly.
  - (6) Remove the processor with the rack assembly from the airplane.
  - (7) Remove the processor from the rack assembly.
- B. KMH-820 Processor Installation (Refer to Figure 201).
  - (1) Put the processor in the rack assembly.
  - (2) Put the processor at the correct location, on the left side of the tailcone.
  - (3) Install the screws that attach the rack assembly to the support bracket assembly.
  - (4) Connect the electrical connectors (J5, J6, and J8) to the forward side of the processor.
  - (5) Install tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (6) Engage the IHAS circuit breaker on the circuit breaker panel.

**3. KMH-880 Interface Adapter Removal and Installation**

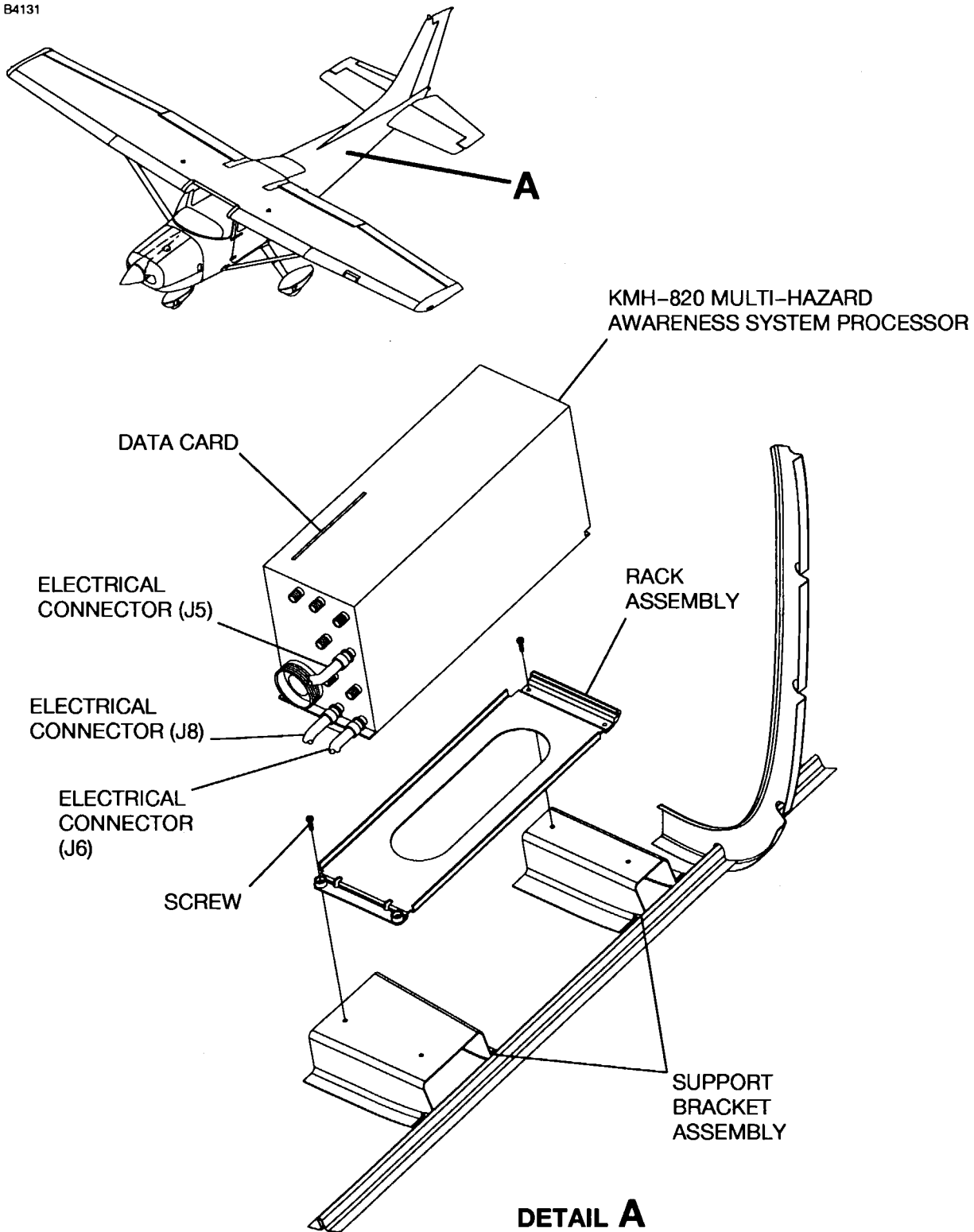
- A. KMH-880 Interface Adapter Removal (Refer to Figure 202).
  - (1) Set the MASTER and AVIONICS switches to the off position.
  - (2) Disengage the IHAS circuit breaker on the circuit breaker panel.

**CAUTION:** Use a tailcone stand when you do work in the tailcone. If you do not use a tailcone stand, the tail of the airplane can fall to the floor.

- (3) Remove tailcone access/inspection plate (310AR) to get access to the interface adapter. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (4) Disconnect the electrical connectors (PT703 and PT704) from the interface adapter.
  - (5) Disconnect the electrical connector (PT705) from the configuration module.
  - (6) Disconnect the electrical connectors from the (PT706 and PT707) from the support bracket assembly.
  - (7) Remove the screws that attach the support bracket to the airplane structure.

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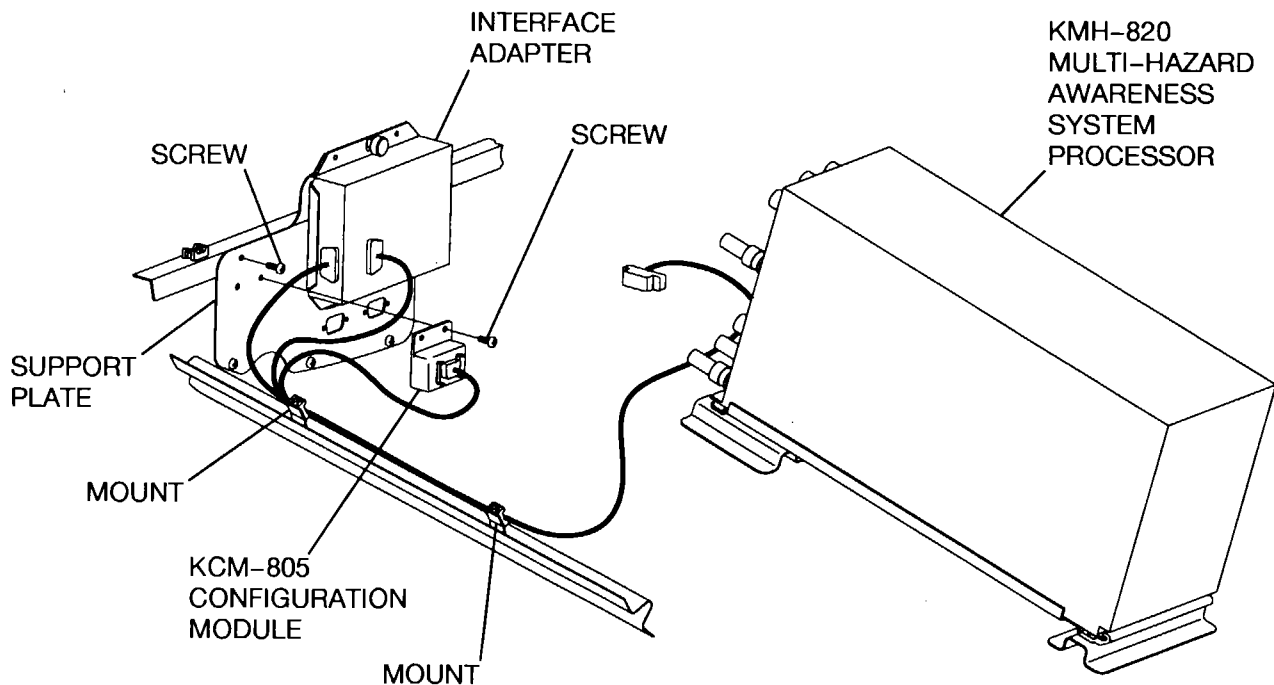
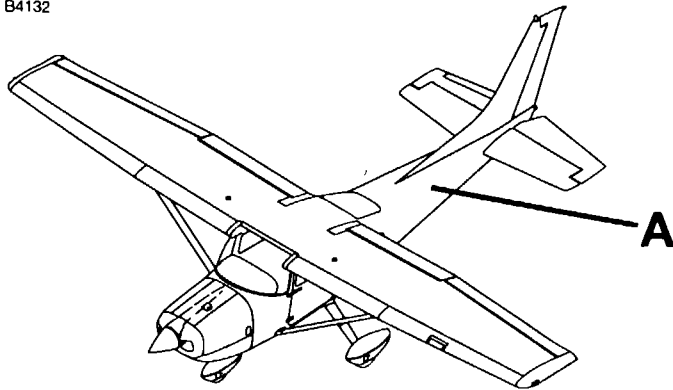


KMH-820 Processor Installation  
Figure 201 (Sheet 1)

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**DETAIL A**

KMH-880 Interface Adapter Installation  
Figure 202 (Sheet 1)

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A0718T1094

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- (8) Remove the support bracket from the airplane.
- (9) Remove the screws that attach the interface adapter to the support bracket.
- (10) Remove the screws that attach the configuration module to the support bracket.

**B. KMH-880 Interface Adapter Installation (Refer to Figure 202).**

- (1) Install the screws that attach the configuration module to the support bracket.
- (2) Install the screws that attach the interface adapter to the support bracket.
- (3) Put the support bracket at the correct location on the airplane structure on the right side of the tailcone.
- (4) Install the screws that attach the support bracket to the airplane structure.
- (5) Connect the electrical connectors (PT703 and PT704) to the interface adapter.
- (6) Connect the electrical connector (PT705) to the configuration module.
- (7) Connect the electrical connectors (PT706 and PT707) to the support bracket assembly.
- (8) Install tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (9) Engage the IHAS circuit breaker on the circuit breaker panel.

**4. Omnidirectional Antenna Removal and Installation**

**A. Omnidirectional Antenna Removal (Refer to Figure 203).**

- (1) Set the MASTER and AVIONICS switches to the off position.
- (2) Disengage the IHAS circuit breaker on the circuit breaker panel.
- (3) Pull the applicable interior upholstery back to get sufficient access to the rear access panel on the floorboard.
- (4) Remove the floor panel to get access to the omnidirectional antenna installation.
- (5) Disconnect the adapter (coax cable) from the omnidirectional antenna.
- (6) Remove the screws that attach the omnidirectional antenna to the bottom of the fuselage.
- (7) Remove the doubler and omnidirectional antenna from the airplane.

**B. Omnidirectional Antenna Installation (Refer to Figure 203).**

- (1) Put the doubler at the correct location on the bottom of the fuselage.
- (2) Put the omnidirectional antenna at the correct location on the bottom side of the fuselage so that the screw holes align with the doubler.
- (3) Install the screws that attach the omnidirectional antenna and doubler to the airplane skin.
- (4) Connect the coax cable to the omnidirectional antenna.
- (5) Verify correct electrical bonding of the antenna to the airplane structure.
- (6) Install the floor panel to the floorboard.
- (7) Install the interior upholstery.
- (8) Engage the IHAS circuit breaker on the circuit breaker panel.

**5. Traffic Awareness System (TAS) Directional Antenna Removal and Installation**

**A. TAS Directional Antenna Removal (Refer to Figure 204).**

- (1) Set the MASTER and AVIONICS switches to the off position.
- (2) Disengage the IHAS circuit breaker on the circuit breaker panel.
- (3) Remove the headliner to get access to the directional antenna.
- (4) Put a label on each of the four adapters and disconnect them from the directional antenna.
- (5) Remove the screws that attach the directional antenna to the top of the fuselage.
- (6) Remove the directional antenna and doubler from the airplane.

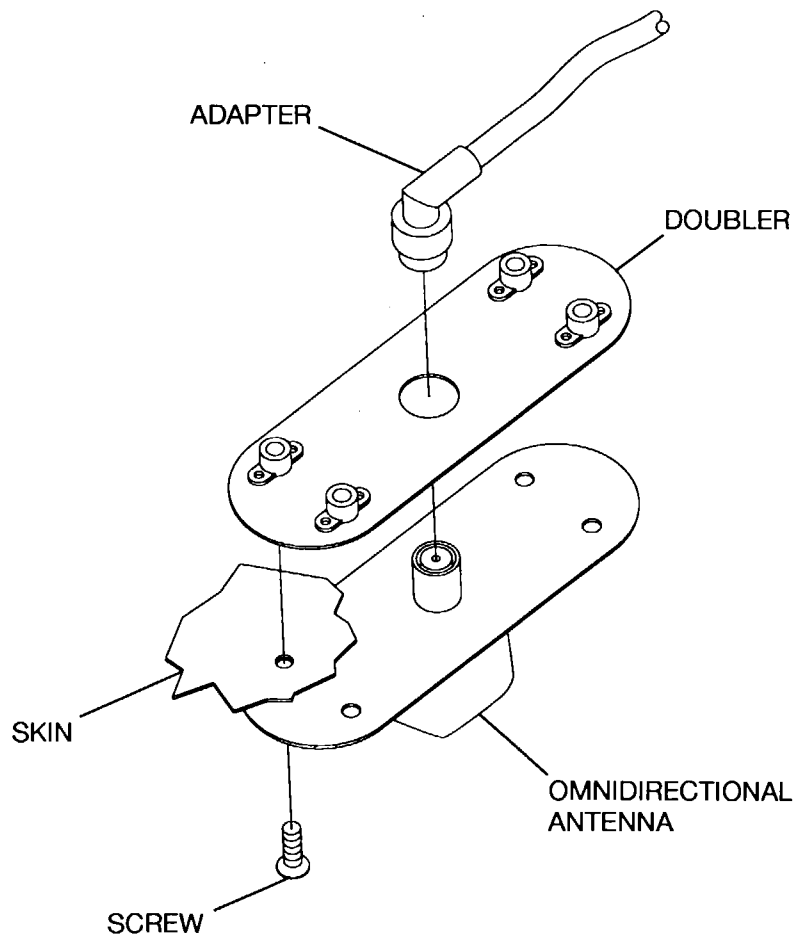
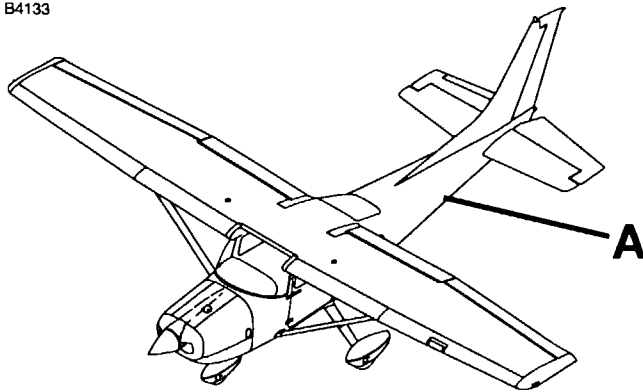
**B. TAS Directional Antenna Installation (Refer to Figure 204).**

- (1) To make sure that the electrical bonding requirement for the antenna is within the acceptable limit, make sure that all of the bonding surfaces of the doubler, antenna, and airplane structure are clean.
- (2) Put the doubler and directional antenna on the fuselage so that the screw holes align through the airplane skin.
- (3) Install the screws that attach the directional antenna and doubler to the airplane skin.
- (4) Remove the labels and connect the four adapters to the correct receptacles on the directional antenna.
- (5) Verify correct electrical bonding of the antenna to the airplane structure.



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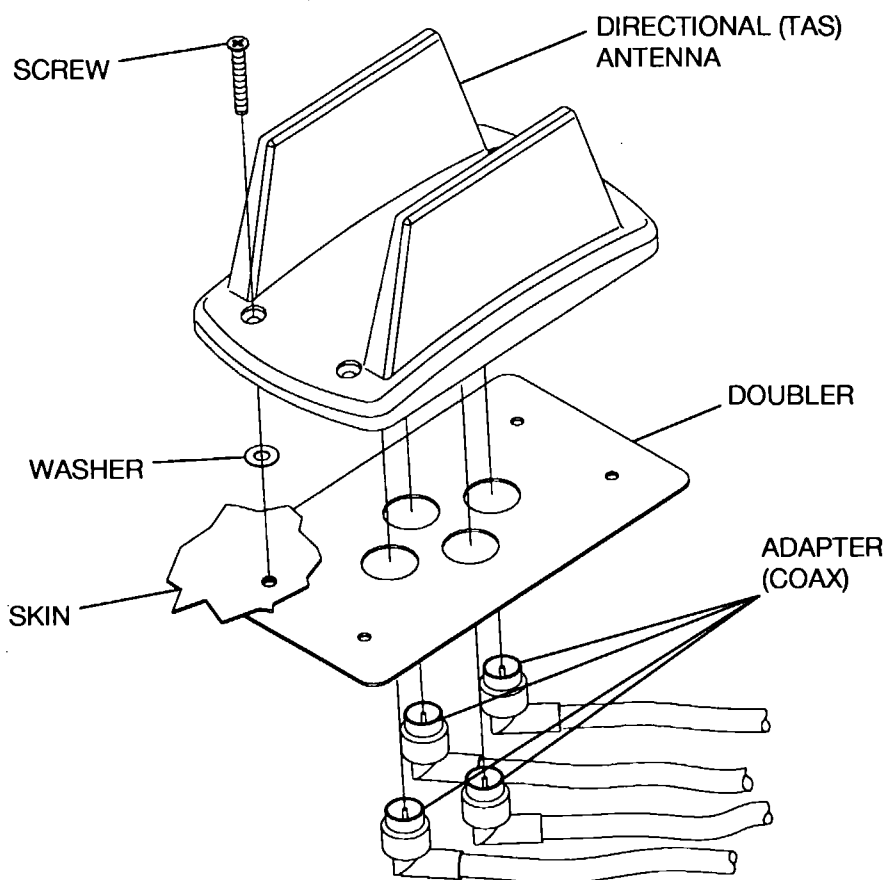
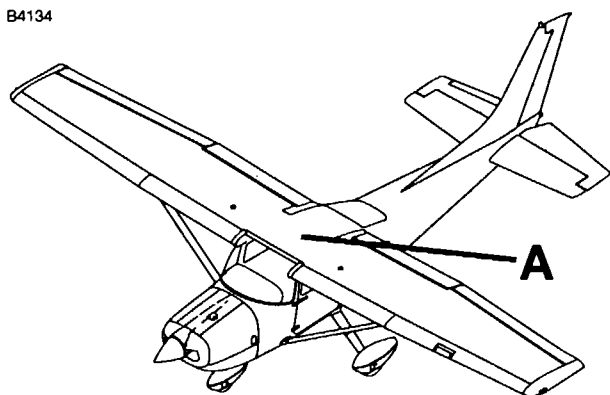
**DETAIL A**

Omnidirectional Antenna Installation  
Figure 203 (Sheet 1)

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**DETAIL A**

TAS Directional Antenna Installation  
Figure 204 (Sheet 1)

0710T1001  
A0718T1074

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- (6) Fillet seal around the antenna with Type I Class B Sealant. Refer to Chapter 20, Fuel, Weather and High-Temperature Sealing - Maintenance Practices.
- (7) Install the headliner.
- (8) Engage the IHAS circuit breaker on the circuit breaker panel.

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**KTA-870 TRAFFIC ADVISORY SYSTEM (TAS) - MAINTENANCE PRACTICES**

**1. General**

- A. The KTA-870 Traffic Advisory System (TAS) is installed on airplanes with the Garmin G1000. The KTA-870 TAS interfaces with the Garmin G1000. This section gives removal and installation procedures for the KTA-810 processor. Two antennas are necessary for the operation of the KTA-870 TAS. Refer to KMH-880 Multi-Hazard Awareness System - Maintenance Practices for the removal and installation procedures for the TAS directional antenna and the omnidirectional antenna.

**2. KTA-810 Processor Removal/Installation**

- A. KTA-810 Processor Removal (Refer to Figure 201).  
(1) Set the MASTER and AVIONICS switches to the off position.  
(2) Disengage the TAS circuit breaker on the circuit breaker panel.

**CAUTION:** Use a tailcone stand when you get in the tailcone. If you do not use a tailcone stand, the tail of the airplane can fall to the floor.

- (3) Remove tailcone access/inspection plate (310AR) to get access to the processor. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.  
(4) Disconnect the electrical connectors (J1, J2, J3, J4, J7, and J10) from the forward side of the processor.  
(5) Remove the 50-ohm terminations from J5, J6, and J8 electrical connections on the forward side of the processor.  
(6) Loosen the two lock nuts that attach the processor to the support bracket.  
(7) Remove the processor from the support bracket.  
(8) Remove the screws that attach the support bracket to the support bracket assembly.  
(9) Remove the support bracket assembly from the airplane.
- B. KTA-810 Processor Installation (Refer to Figure 201).  
(1) Install the screws that attach the support bracket to the support bracket assembly.  
(2) Put the processor in the support bracket and tighten the lock nuts that attach the processor to the support bracket assembly.  
(3) Connect the electrical connectors (J1, J2, J3, J4, J7, and J10) to the forward side of the processor.  
(4) Install the 50-ohm terminations in J5, J6, and J8 electrical connections on the forward side of the processor.  
(5) Install the baggage divider forward of the tailcone.  
(6) Install the rear seat. Refer to Chapter 25, Rear Seat - Maintenance Practices.  
(7) Engage the TAS circuit breaker on the circuit breaker panel.

**3. KCM-805 Configuration Module Removal/Installation**

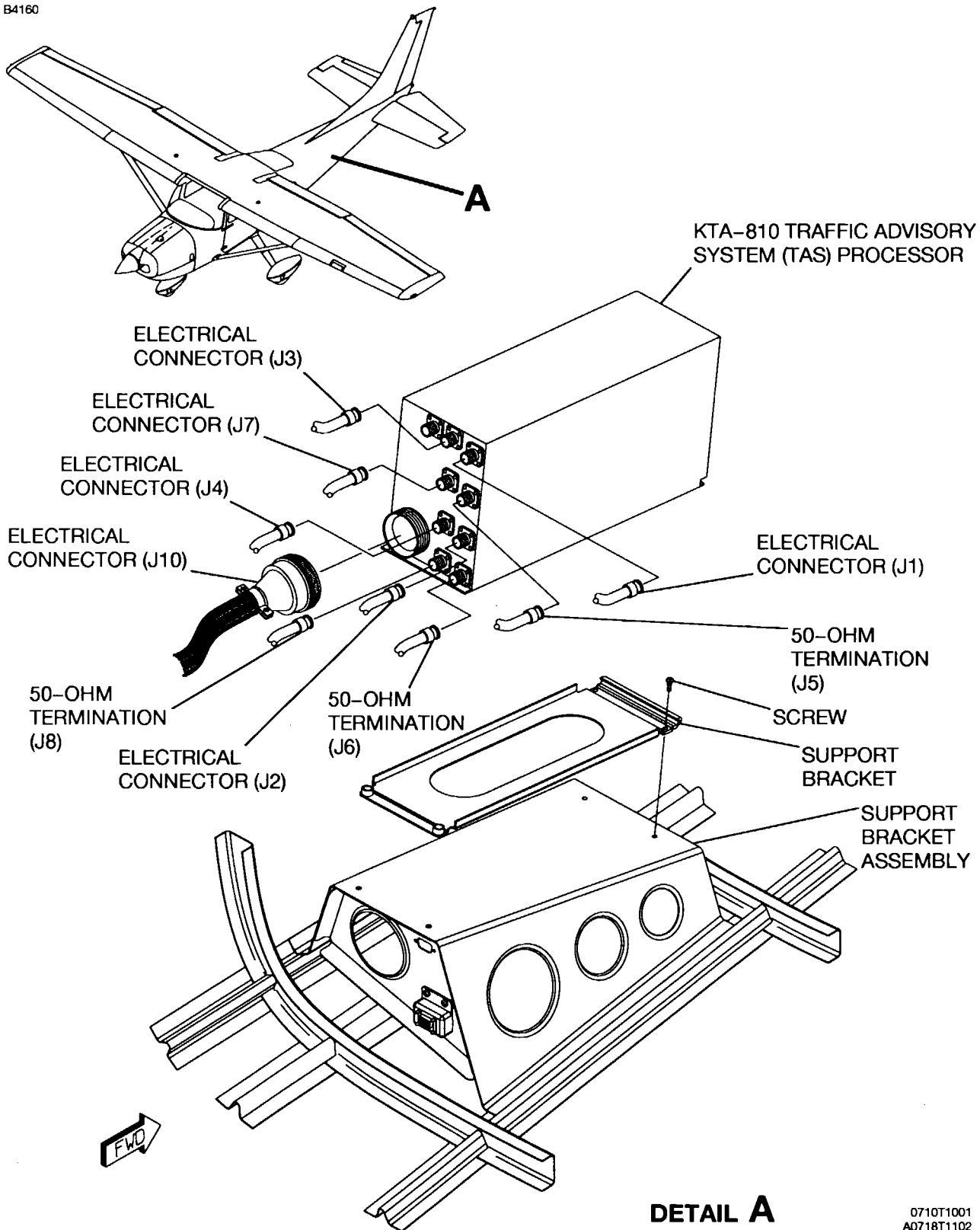
- A. KCM-805 Configuration Module Removal (Refer to Figure 202).  
(1) Set the MASTER and AVIONICS switches to the off position.  
(2) Disengage the TAS circuit breaker on the circuit breaker panel.  
(3) Remove the rear seat to get access to the aft baggage divider. Refer to Chapter 25, Rear Seat - Maintenance Practices.

**CAUTION:** Use a tailcone stand when you get in the tailcone. If you do not use a tailcone stand, the tail of the airplane can fall to the floor.

- (4) Remove the aft baggage divider to get access to the tailcone.  
(5) Disconnect the electrical connector (PT705) from the configuration module.  
(6) Remove the screws that attach the configuration module to the gusset assembly.
- B. KCM-805 Configuration Module Installation (Refer to Figure 202).  
(1) Put the configuration module in position on the support bracket.

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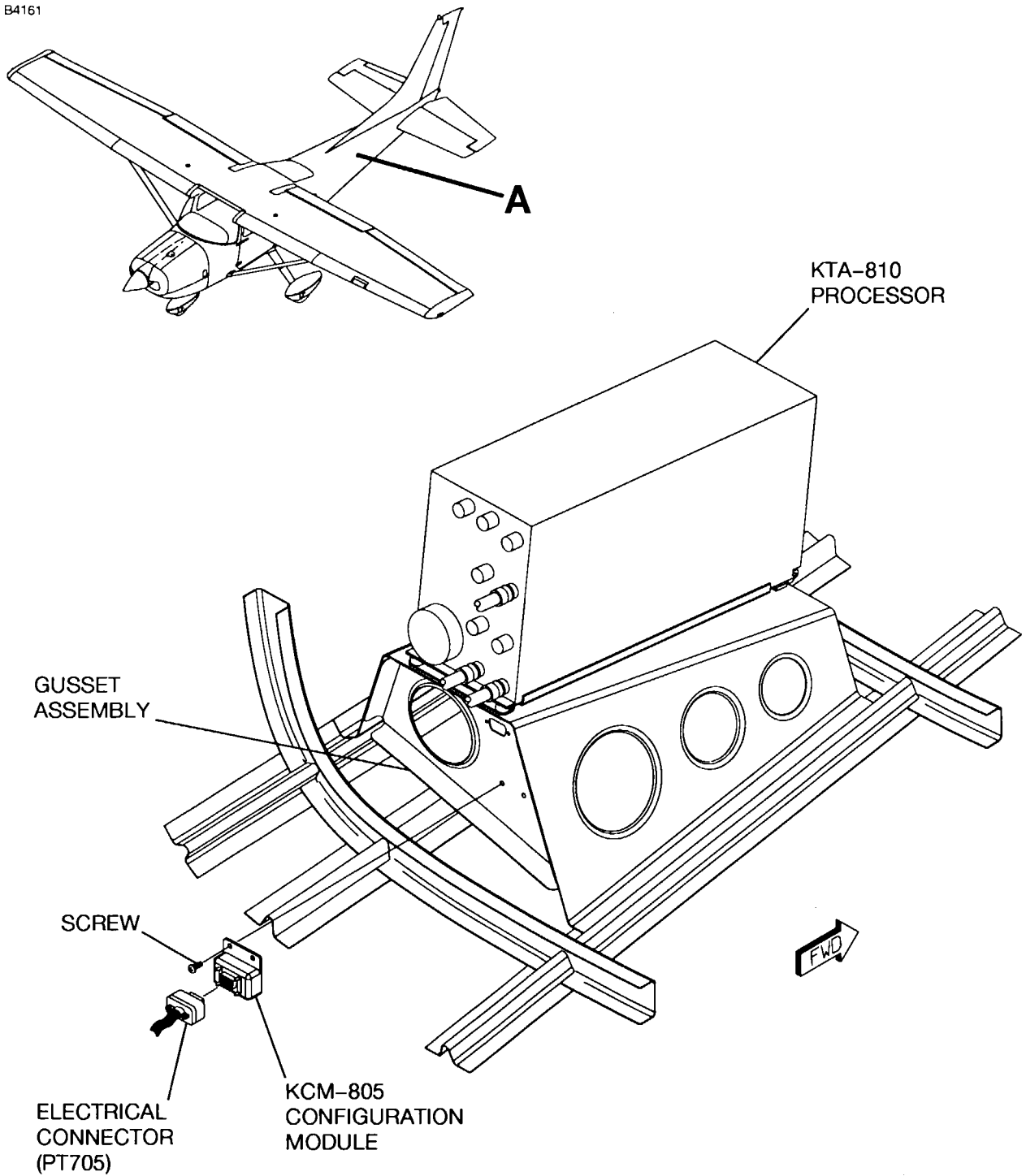
**DETAIL A**

KTA-810 Processor Installation  
 Figure 201 (Sheet 1)

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**DETAIL A**

KCM-805 Configuration Module Installation  
Figure 202 (Sheet 1)

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- (2) Install the screws that attach the configuration module to the gusset assembly.
- (3) Connect the electrical connector (PT705) to the configuration module.
- (4) Install the aft baggage divider.
- (5) Install the rear seat. Refer to Chapter 25, Rear Seat - Maintenance Practices.
- (6) Engage the TAS circuit breaker on the circuit breaker panel.

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**WX-500 STORMSCOPE - MAINTENANCE PRACTICES**

**1. General**

- A. The maintenance practices give the removal and installation procedures for the stormscope, which is installed in the tailcone, aft of the baggage divider.
- B. The WX- 500 Stormscope shows lightning information at ranges of 200 nmi. It is designed to interface with Garmin's Control Display Unit (CDU) or Honeywell's multi-function display (MFD). The stormscope does an analysis of the radiated signals of electrical discharges from storm cells to find thunderstorms. The information is then used to give the location and intensity of dangerous thunderstorms.

**2. WX-500 Stormscope Removal/Installation**

- A. Remove the Stormscope (Refer to Figure 201).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the tailcone access/inspection plate (310AR) to get access to the stormscope. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect the electrical connection.
  - (4) Loosen the knurled nut that holds the stormscope in position.
  - (5) Remove the stormscope from the airplane.
- B. Install the Stormscope (Refer to Figure 201).
  - (1) Set the stormscope in position on the tray and tighten the knurled nut.
  - (2) Connect the electrical connection.
  - (3) Install the tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

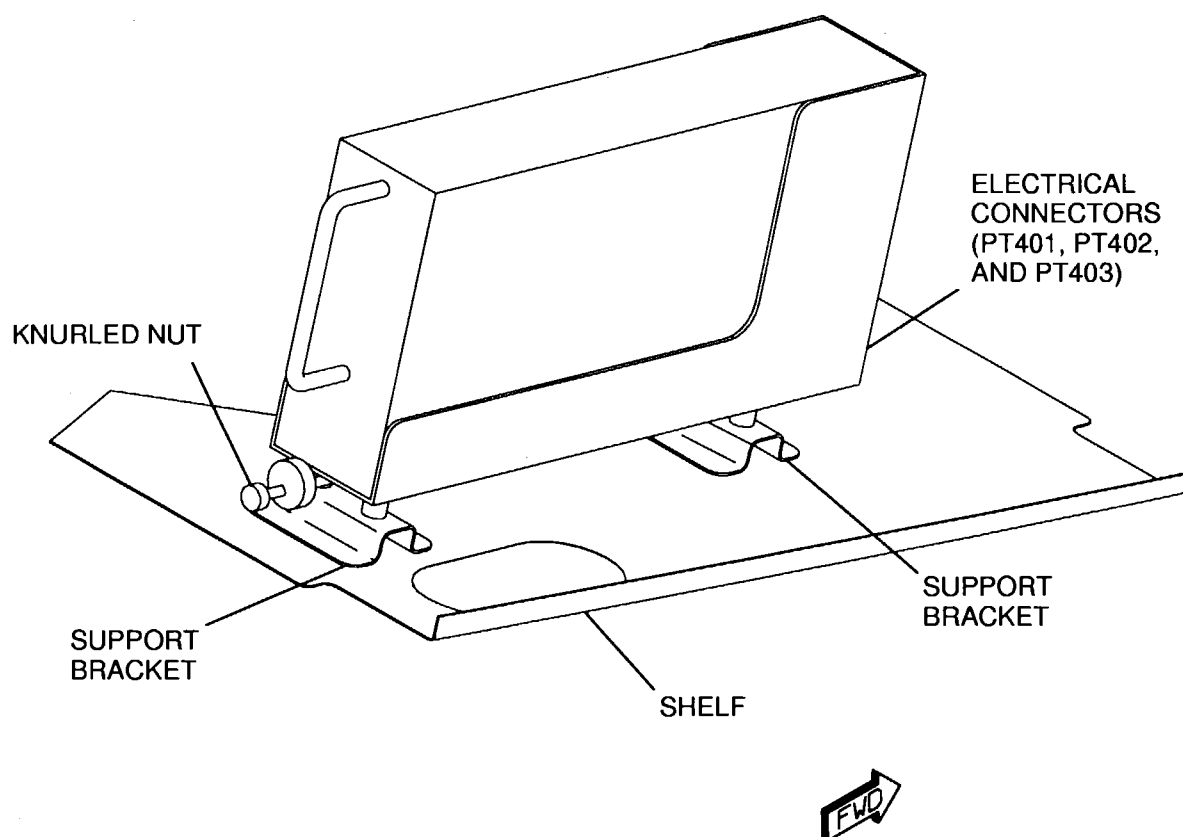
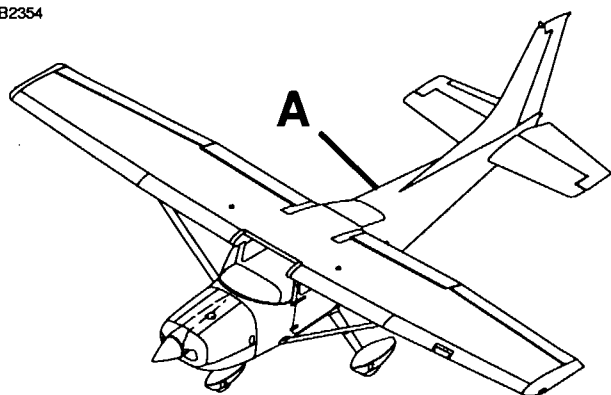
**3. Stormscope Antenna Removal/Installation**

- A. Remove the Stormscope Antenna (Refer to Figure 202).
  - (1) Make sure the MASTER and AVIONICS switches are in the off position.
  - (2) Remove the baggage compartment lower access panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (3) Disconnect the coaxial cable (PF1004) from the antenna.
  - (4) Remove the screws that attach the antenna to the bottom of the fuselage.
- B. Install the Stormscope Antenna (Refer to Figure 202).
  - (1) Put the stormscope antenna in position on the bottom of the fuselage.
  - (2) Attach the antenna with screws.
  - (3) Attach the coaxial cable (PF1004) to the antenna.
  - (4) Install the baggage compartment lower access panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.



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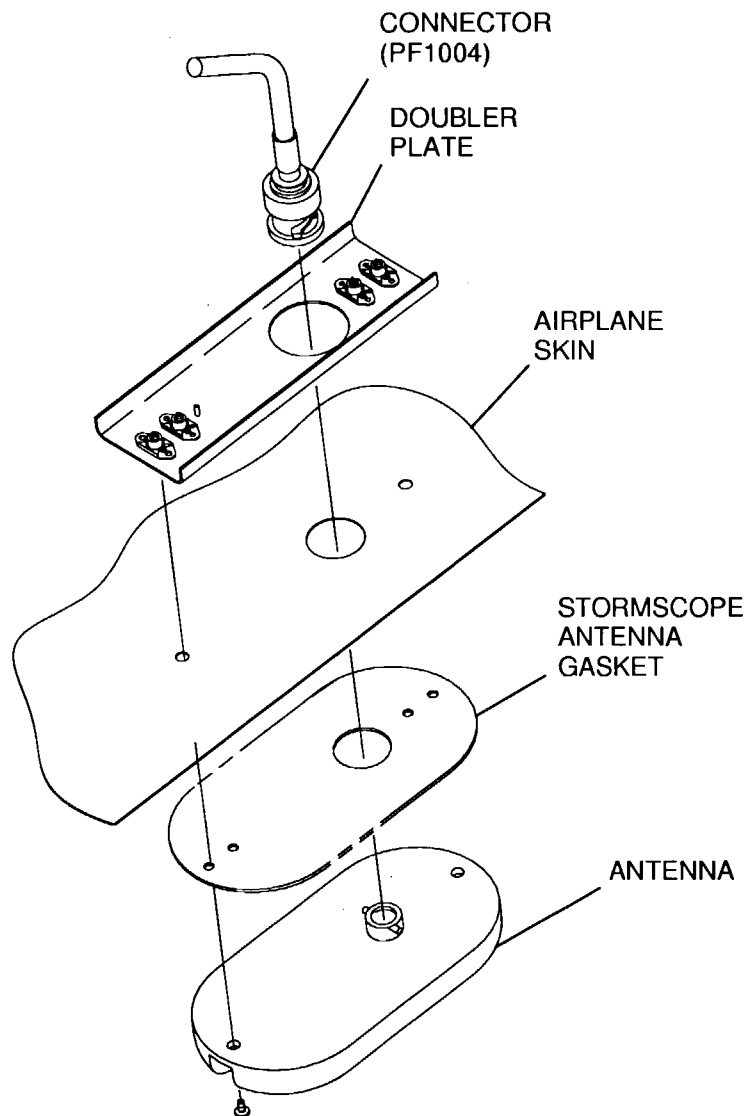
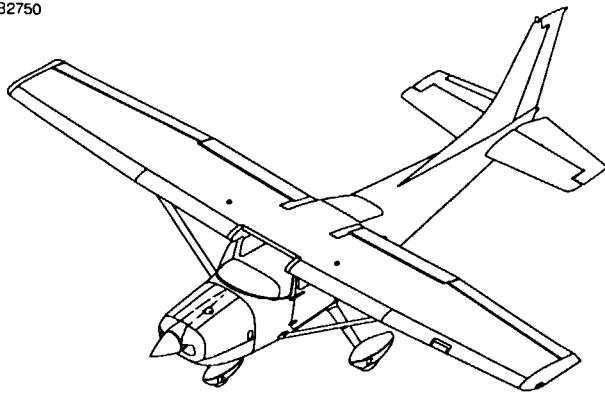
**DETAIL A**

WX-500 Stormscope  
Figure 201 (Sheet 1)

0710T1001  
A0714T1046

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**DETAIL A**

Stormscope Antenna Installation  
Figure 202 (Sheet 1)

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A0714T1049

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**KX-155A COMM/NAV SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives maintenance practices for the KX-155A NAV/COM System component removal and installation. For more system information and the post installation check, refer to the manufacturer's manuals listed in the Introduction, List of Manufacturers Technical Publications.

**2. KX-155A/165A VHF COMM Transceiver/Navigation/VOR/LOC Glideslope Receiver Removal and Installation**

**CAUTION:** Do not interchange the KX-155A and the KX-165A NAV/COM radios. The wiring is not the same for the two different radios. If these radios are interchanged and used with the same wiring, damage can occur to the KX-155A and/or the KX-165A NAV/COM radios.

- A. For removal and installation of the KX-155A receiver, refer to Chapter 23, Communications - Maintenance Practices.

**3. Omni (NAV) Antenna Removal and Installation (182S)**

- A. Remove the Omni (NAV) Antenna (Refer to Figure 201).
- (1) Remove the electrical power from the airplane and turn the master switch to the OFF position.
  - (2) Remove the boots from the antenna radiators.
  - (3) Remove the self-locking hex nuts, and then remove the antenna radiators from the antenna base.
  - (4) Get access to the omni antenna by removing the fin tip.
  - (5) Remove the screws that attach the antenna base to the fin rib.
  - (6) Lift the antenna base to get access to the coax connector. Disconnect the coax connector from the antenna base.
  - (7) Remove the omni antenna from the airplane.
- B. Install the Omni (NAV) Antenna (Refer to Figure 201).
- (1) Position the omni antenna on the fin and connect the coax connector to the antenna base.
  - (2) Attach the antenna base to the fin rib with screws.
  - (3) Install the fin tip.

**CAUTION:** When you use self-locking hex nuts to attach the antenna radiators, do not tighten the nuts too much.

- (4) Attach the antenna radiators to the antenna base with the self-locking hex nuts.
- (5) Install the boots on the antenna radiators.
- (6) Supply electrical power to the airplane as necessary, and turn the master switch to the ON position.

**4. NAV Antenna Coupler Removal and Installation (182S)**

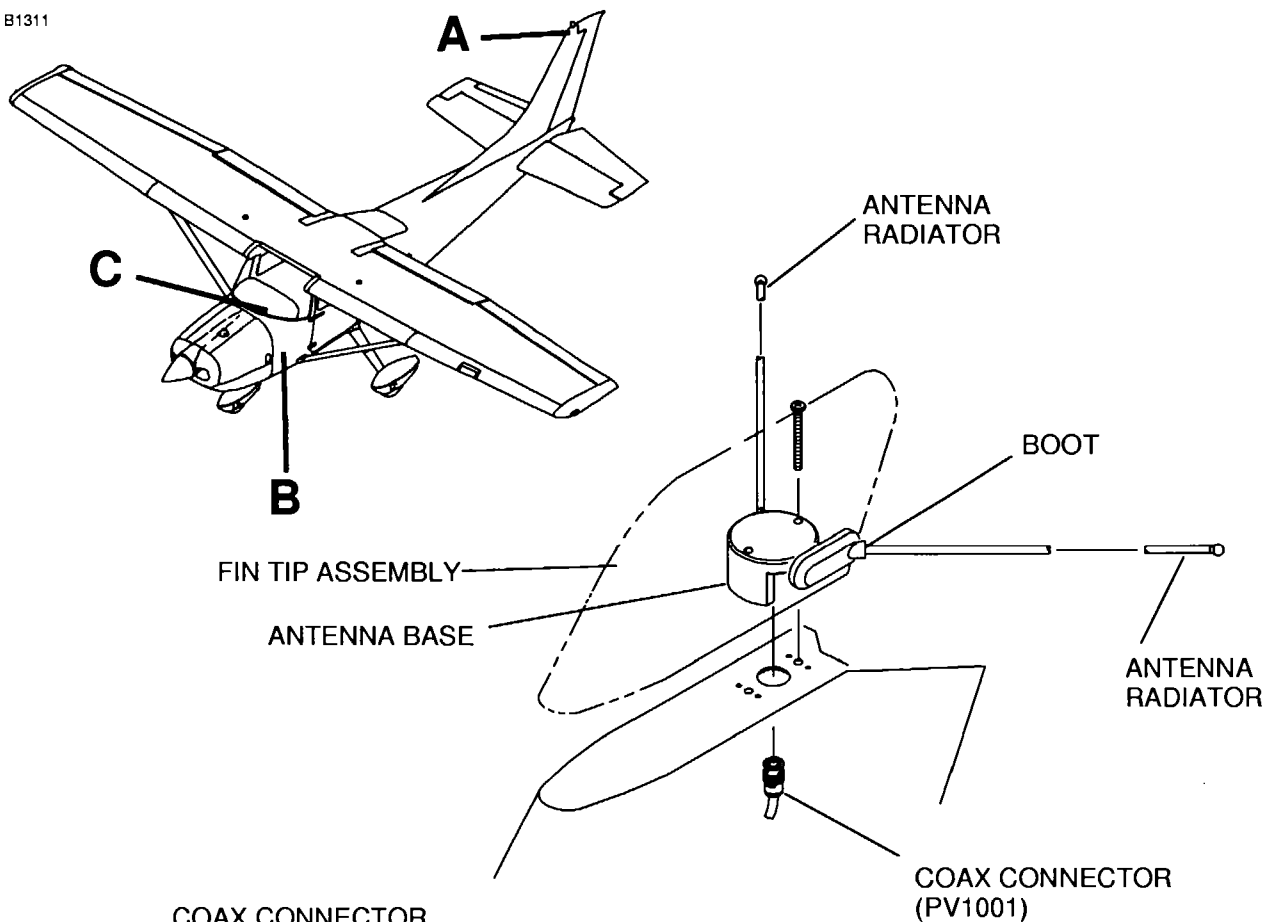
- A. Remove the NAV Antenna Coupler (Refer to Figure 201).

**NOTE:** The NAV antenna coupler is found at FS 8.00 and WL 11.77, between the firewall and instrument panel on the left outboard stringer assembly.

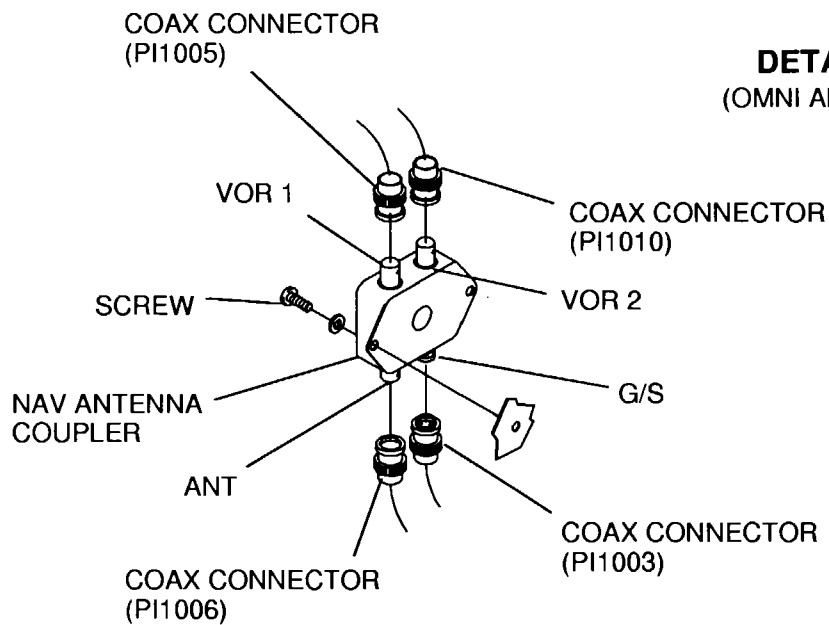
- (1) Remove the electrical power from the airplane and turn the master switch to the OFF position.
- (2) Get access to the NAV antenna coupler.
- (3) Identify, put a label on, and disconnect the antenna coax connectors from the NAV antenna coupler.
- (4) Remove the screws and washers that attach the NAV antenna coupler to the fuselage.
- (5) Remove the NAV antenna coupler from the airplane.

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**DETAIL A**  
 (OMNI ANTENNA)



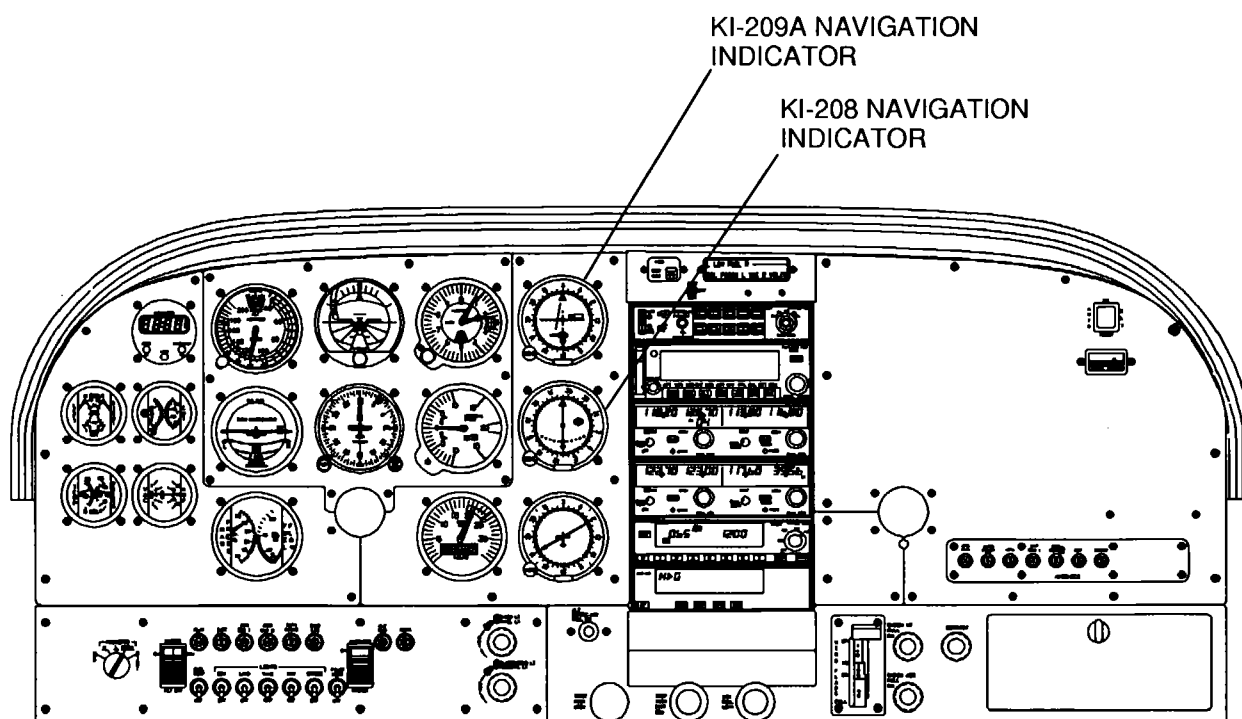
**DETAIL B**

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 B0718T1010

Navigation Components Installation  
 Figure 201 (Sheet 1)

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**DETAIL C**

0718T1001

Navigation Components Installation  
Figure 201 (Sheet 2)

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- B. Install the NAV Antenna Coupler (Refer to Figure 201).
- (1) Put the NAV antenna coupler on the fuselage and attach it with the screws and washers.
  - (2) Connect the antenna coax connectors to the NAV antenna coupler.
  - (3) Supply electrical power to the airplane as necessary, and turn the master switch to the ON position.

**5. KI-209A and KI-208 Navigation Indicators Removal and Installation**

**NOTE:** The KI-209A Navigation Indicator is the NAV 1 indicator and the KI-208 is the NAV 2 indicator. Removal and Installation is typical for the NAV 1 and NAV 2 indicators.

- A. Remove the Navigation Indicator (Refer to Figure 201).
- (1) Remove the electrical power from the airplane and turn the master switch to the OFF position.
  - (2) Remove the inboard pilot panel assembly to get access to the rear of the navigation indicator. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (3) Disconnect the electrical connector from the navigation indicator.
  - (4) Remove the screws that attach the navigation indicator to the inboard pilot panel assembly.
  - (5) Remove the navigation indicator from the airplane.
- B. Install the Navigation Indicator (Refer to Figure 201).
- (1) Put the navigation indicator on the inboard pilot panel assembly and attach it with the screws.
  - (2) Install the electrical connector to the navigation indicator.
  - (3) Attach the inboard pilot panel assembly to the structure with the screws. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (4) Supply the electrical power to the airplane as necessary and turn the master switch to the ON position.

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**GIA - 63 INTEGRATED AVIONICS INSTALLATION - MAINTENANCE PRACTICES**

**1. General**

- A. Two GIA-63 Integrated Avionics Units (IAUs) are on the avionics shelf in the tailcone.
- B. The units have the communication and navigation receiver/transmitter components to operate the GPS, NAV, COM, and Glideslope functions. The GIA 63W has the Wide Area Augmentation System (WAAS) installed. The units are integrated components of the Garmin G1000 avionics system.

**2. GIA - 63 Integrated Avionics Unit Removal/Installation**

- A. Remove the Integrated Avionics Unit.
  - (1) Refer to Chapter 23, Communications - Maintenance Practices

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**KLN-89/KLN-89B/KLN-94 GPS - MAINTENANCE PRACTICES**

**1. General**

- A. Airplanes without the KR-87 ADF System are configured with a KLN-89 GPS Receiver (GPS-VFR) that includes a GPS database. The GPS receiver is located in the avionics radio panel rack. A MD41-230 GPS-NAV selector is located on the annunciator and GPS panel assembly located above the avionics radio panel.
- B. Airplanes with the KR-87 ADF System are configured with a KLN-89B GPS Receiver (GPS-IFR) that includes a GPS data cartridge. The GPS receiver is located in the avionics radio panel rack. A MD41-228 GPS-NAV selector is located on the annunciator and GPS panel assembly, located above the avionics radio panel.
- C. The GPS uses a KA-92 GPS Antenna located above the cabin at FS 43.45, in the general proximity of the COMM antennas.

**2. GPS Receiver Removal and Installation**

- A. Remove GPS Receiver (Refer to Figure 201).
  - (1) Remove electrical power from airplane and turn the master switch to "OFF".
  - (2) Loosen single hex screw, located in recessed hole on face of GPS receiver, counterclockwise. Continue turning hex screw until unit is free to be removed from avionics radio panel rack.
  - (3) Pull GPS receiver from radio panel rack and remove from airplane.
- B. Install GPS Receiver (Refer to Figure 201).
  - (1) Place GPS receiver in radio panel rack and slide forward, engaging fixed electrical connectors and coax connector.
  - (2) Secure unit to avionics radio panel rack by turning hex screw in a clockwise direction until tight.
  - (3) Restore electrical power to airplane as required and turn the master switch to "ON".

**3. KA-92 GPS Antenna Removal and Installation**

- A. Remove GPS Antenna (Refer to Figure 201).
  - (1) Remove electrical power from airplane and turn the master switch to "OFF".
  - (2) Remove screws securing GPS antenna to fuselage skin.
  - (3) Carefully lift GPS antenna and disconnect coax connector from GPS antenna.

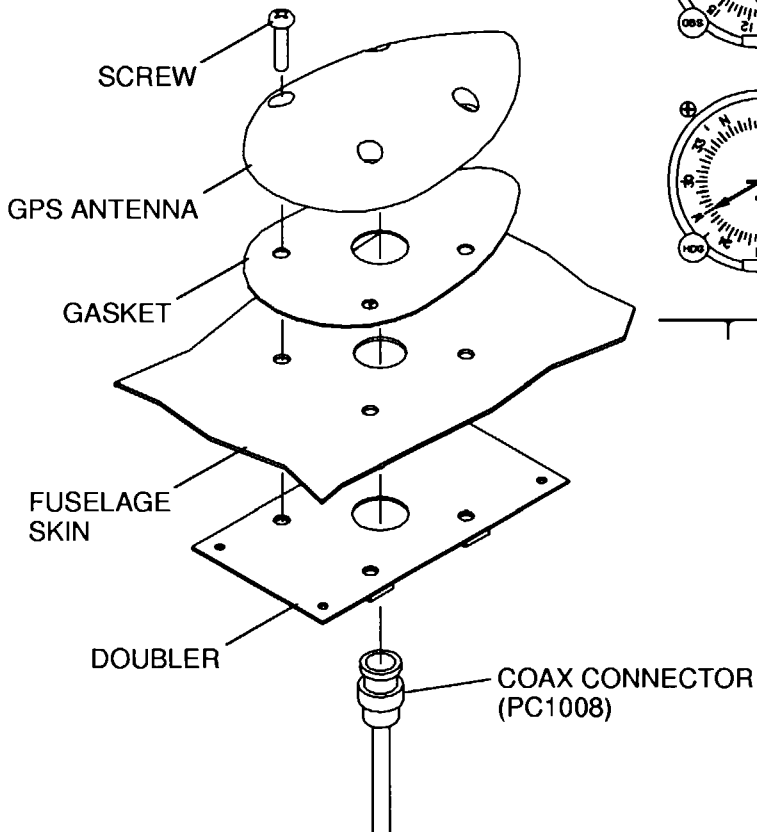
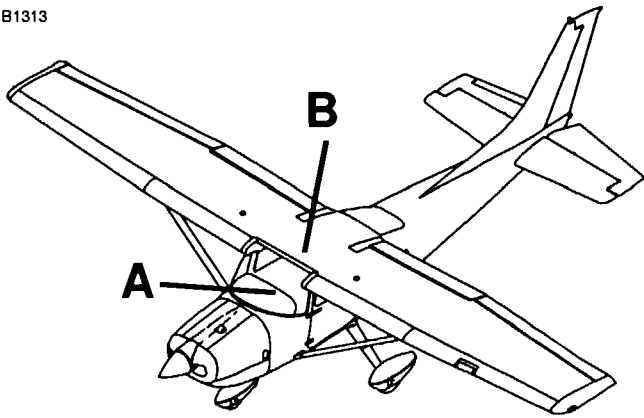
**NOTE:** Secure coax cable using a tie strap, tape, or other suitable material, to prevent connector from slipping through the opening in the fuselage once disconnected from GPS antenna.

  - (4) Remove GPS antenna and gasket from airplane.
- B. Install GPS Antenna (Refer to Figure 201).
  - (1) Place GPS antenna gasket in position on fuselage skin.
  - (2) Position GPS antenna at coax connector opening in fuselage and connect coax connector to GPS antenna.
  - (3) Remove material used to secure coax cable.
  - (4) Secure GPS antenna to fuselage skin with screws.
  - (5) Restore electrical power to airplane as required and turn the master switch to "ON".

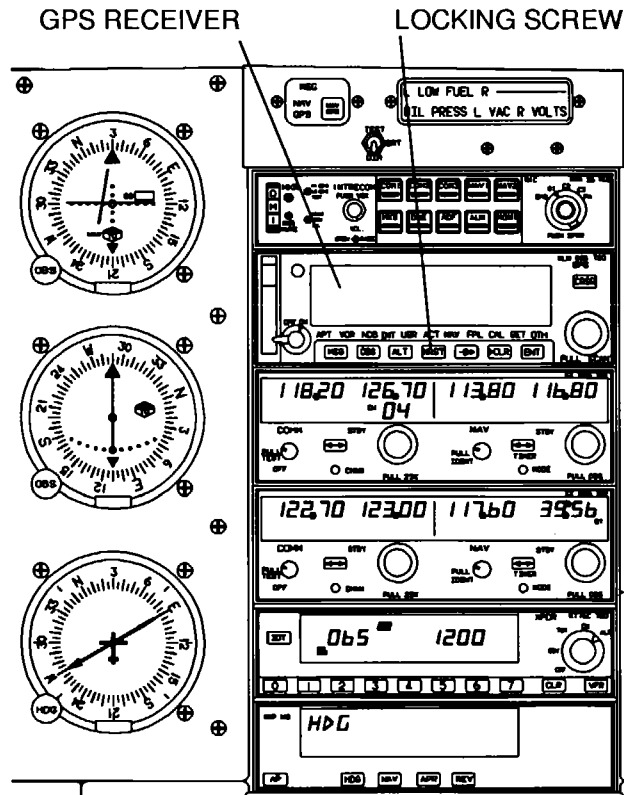


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**DETAIL B**



**DETAIL A**

KLN-89/KLN-89B GPS Installation  
 Figure 201 (Sheet 1)

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**KR-87 ADF SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives removal and installation procedures for the KI-227 ADF indicator, KR-87 ADF receiver, and KA-44B ADF antenna.
- B. On airplanes without Garmin G1000, the KR-87 ADF receiver is installed in the avionics panel radio rack. The KA-44B ADF antenna is installed on the bottom fuselage below the cabin at FS 39.31 and RBL 3.75. Use the KR-87 ADF receiver to tune the KR-87 system. Indications are shown on the KI-227 ADF indicator, located to the left of the receiver on the inboard pilot panel assembly below the navigation indicators.
- C. On airplanes with Garmin G1000, the KR-87 ADF receiver is installed on the instrument panel to the right of the multi-function display (MFD). The ADF antenna is installed on the bottom fuselage below the cabin at FS 39.31 and RBL 3.75. To tune the KR-87 ADF system, use the KR-87 ADF receiver. All indications are shown on the G1000 primary-flight display (PFD).

**2. KR-87 ADF Receiver Removal/Installation (Airplanes without Garmin G1000)**

- A. ADF Receiver Removal (Refer to Figure 201).
  - (1) Remove electrical power from airplane and turn the master switch to off. Disengage the ADF circuit breaker on the avionics circuit breaker panel.
  - (2) Loosen the single locking screw located in the recessed hole on the face of the receiver.
  - (3) Pull the ADF receiver from the radio rack and remove from airplane.
- B. ADF Receiver Installation (Refer to Figure 201).
  - (1) Put the ADF receiver in the radio rack and slide it forward to engage the fixed electrical plug.
  - (2) Tighten the single locking screw located in the recessed hole on the face of the receiver.
  - (3) Connect electrical power to the airplane as needed and turn the master switch to ON. Engage the ADF circuit breaker on the avionics circuit breaker panel.
  - (4) Do an operational test of the ADF receiver.
  - (5) Remove electrical power from the airplane and turn the master switch to off. Disengage the ADF circuit breaker on the avionics circuit breaker panel.

**3. KR-87 ADF Receiver Removal/Installation (Airplanes with Garmin G1000)**

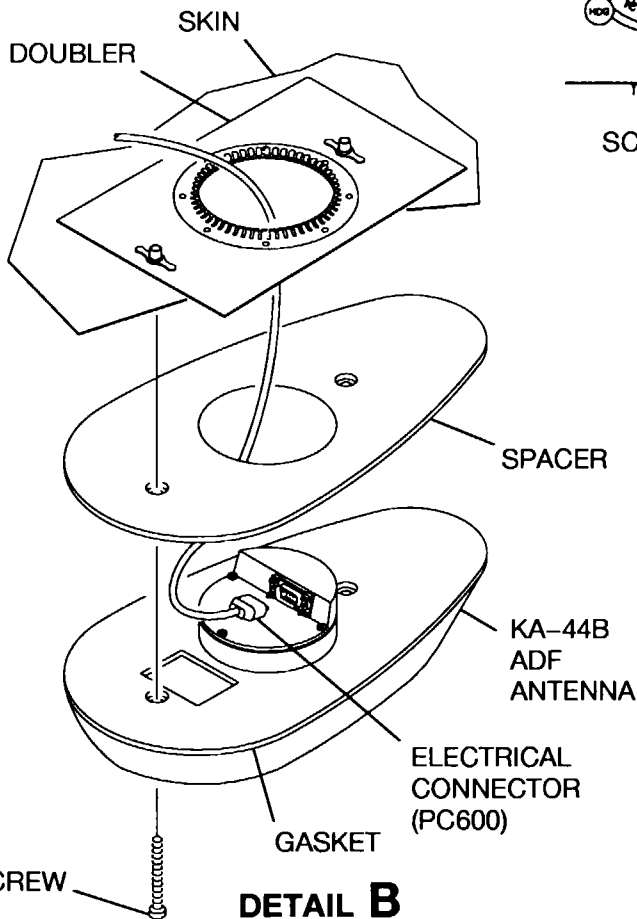
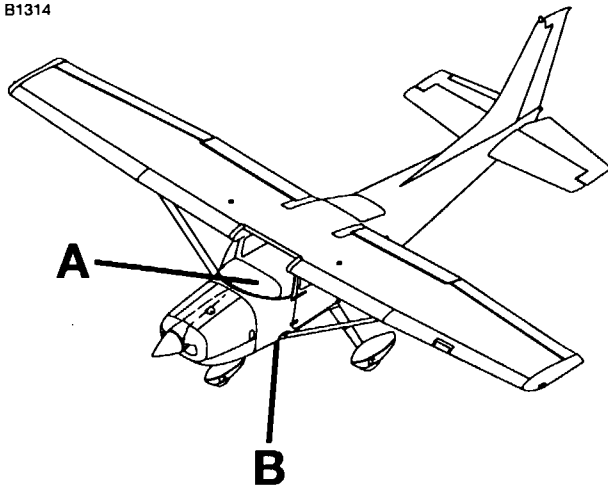
- A. ADF Receiver Removal (Refer to Figure 202).
  - (1) Remove electrical power from the airplane and turn the master switch to off. Disengage the ADF circuit breaker on the avionics circuit breaker panel.
  - (2) Loosen the single locking screw located in the recessed hole on the face of the receiver.
  - (3) Carefully pull the ADF receiver and the bezel from the instrument panel to disengage the electrical connector (P1602) from the ADF receiver.
  - (4) Remove the ADF receiver, with the bezel, from the airplane.
- B. ADF Receiver Installation (Refer to Figure 202).
  - (1) Carefully put the bezel on the rear of the ADF receiver and pull it forward evenly until it is in position directly behind the face of the ADF receiver.
  - (2) Put the ADF receiver in position in the instrument panel and slide it forward to engage the electrical connector (P1602) with the ADF receiver.
  - (3) Tighten the single locking screw located in the recessed hole on the face of the receiver.
  - (4) Connect electrical power to the airplane as needed and turn the master switch to ON. Engage the ADF circuit breaker on the avionics circuit breaker panel.
  - (5) Do an operational test of the ADF receiver.
  - (6) Remove electrical power from the airplane and turn the master switch to off. Disengage the ADF circuit breaker on the avionics circuit breaker panel.

**4. KA-44B ADF Antenna Removal/Installation**

- A. ADF Antenna Removal (Refer to Figure 201).
  - (1) Remove electrical power from airplane and turn the master switch to off.

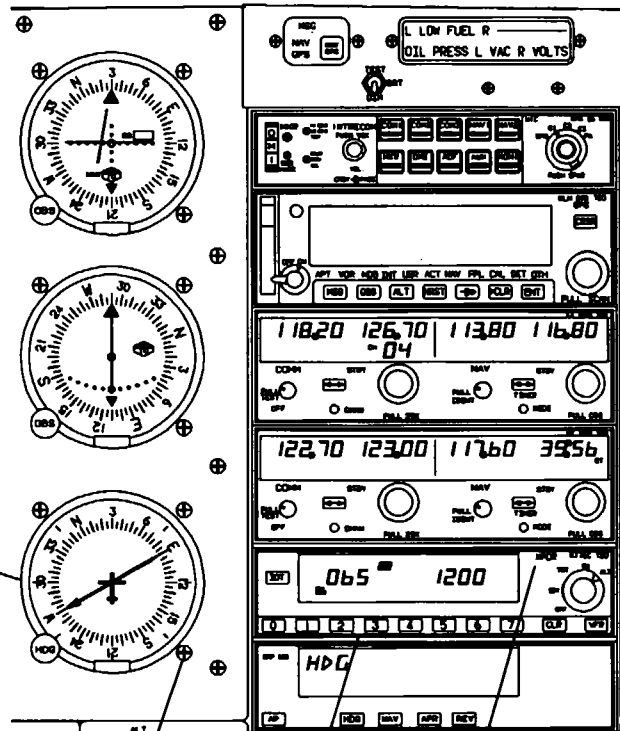
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**DETAIL B**

KI-227 ADF  
 INDICATOR



SCREW

KR-87 ADF  
 RECEIVER

LOCKING  
 SCREW

PILOT INBOARD  
 PANEL ASSEMBLY

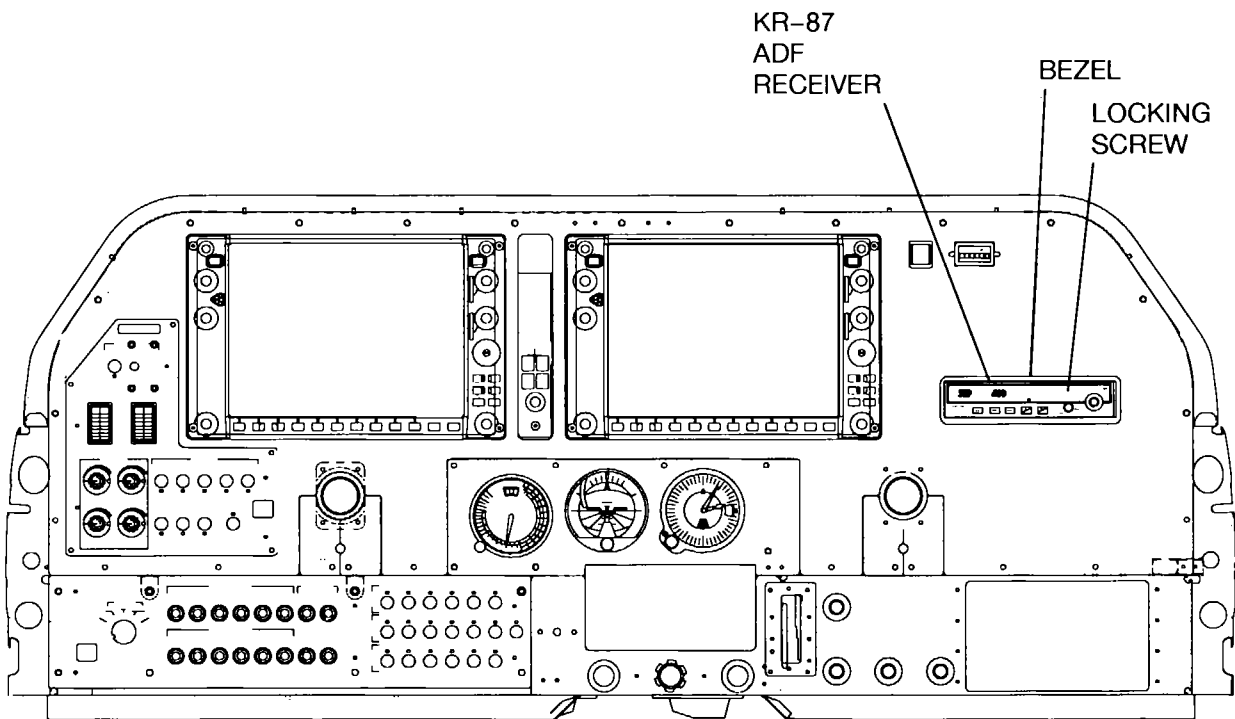
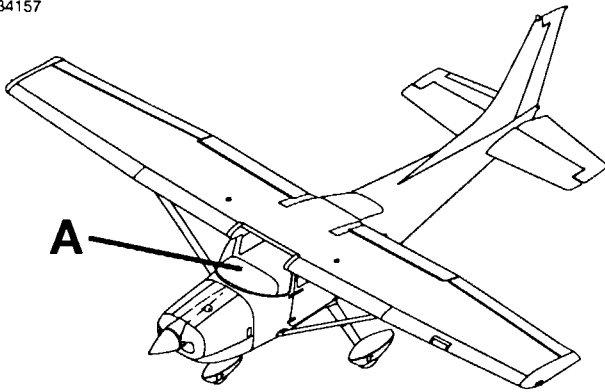
**DETAIL A**  
 AIRPLANES WITHOUT  
 GARMIN G1000

KR-87 ADF Installation  
 Figure 201 (Sheet 1)

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**DETAIL A**  
AIRPLANES WITH THE  
GARMIN G1000

KR-87 ADF Installation  
Figure 202 (Sheet 1)

0710T1001  
A1218T1001A

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- (2) Remove the screws that attach the ADF antenna to the fuselage skin.
- (3) Disconnect the antenna connector (PC600) from the ADF antenna.
- (4) Remove the ADF antenna from the airplane.
- B. ADF Antenna Installation (Refer to Figure 201).
  - (1) Connect the electrical connector (PC600) to the ADF antenna.
  - (2) Attach the ADF antenna to the fuselage skin with the screws.

**5. KI-227 ADF Indicator Removal/Installation**

- A. ADF Indicator Removal (Refer to Figure 201).
  - (1) Remove electrical power from airplane and turn the master switch to off.
  - (2) Remove the inboard pilot panel assembly to gain access to the ADF indicator. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
  - (3) Disconnect the electrical connector (P1603) from the ADF indicator.
  - (4) Remove the screws that attach the ADF indicator to the inboard pilot panel assembly.
  - (5) Remove the ADF indicator from the airplane.
- B. ADF Indicator Installation (Refer to Figure 201).
  - (1) Put the ADF indicator on the inboard pilot panel assembly and attach with the screws.
  - (2) Connect the electrical connector (P1603) to the ADF indicator.
  - (3) Attach the inboard pilot panel assembly to the structure with the screws. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

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**KT-76C TRANSPONDER - MAINTENANCE PRACTICES**

**1. General**

- A. The KT-76C (Mode C) Transponder is installed in the avionics panel radio rack. The CI-105 Transponder Antenna is installed on the bottom of the fuselage at FS 86.50 and RBL 2.50.

**2. KT-76C Transponder Removal and Installation**

- A. Remove Transponder (Refer to Figure 201).
- (1) Remove electrical power from airplane and turn the master switch to "OFF".
  - (2) Loosen single hex screw, located in recessed hole on face of transponder, counterclockwise. Continue turning hex screw until unit is free to be removed from avionics radio panel rack.
  - (3) Pull transponder from avionics radio panel rack and remove from airplane.
- B. Install Transponder (Refer to Figure 201).
- (1) Place transponder in avionics radio panel rack and slide forward, engaging fixed electrical connector (PI800) and coax connector (PI1001).
  - (2) Secure unit to avionics radio panel rack by turning hex screw in a clockwise direction until tight.
  - (3) Restore electrical power to airplane as required and turn the master switch to "ON".

**3. CI-105 Transponder Antenna Removal and Installation**

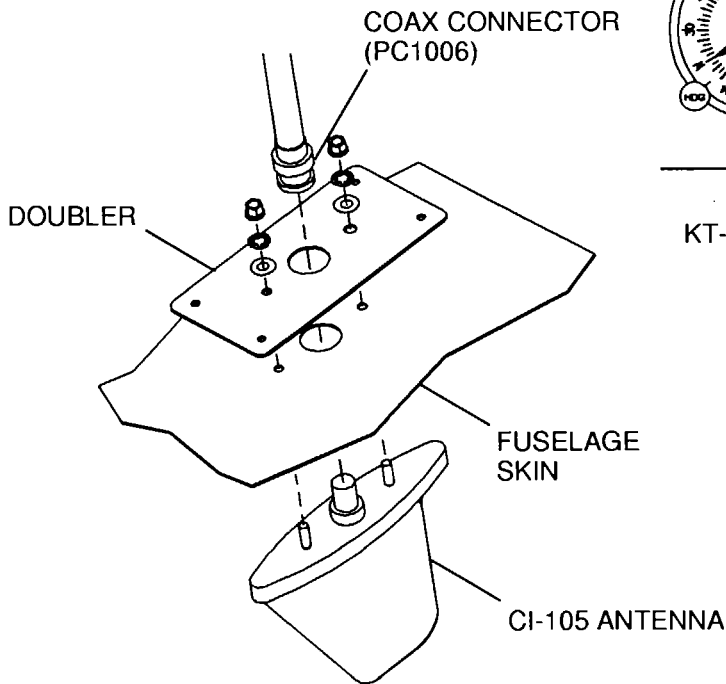
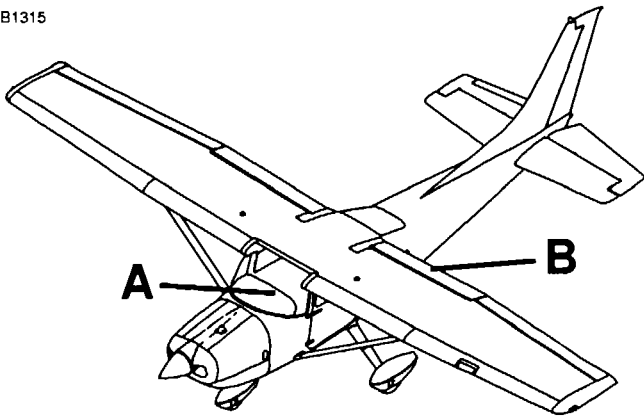
- A. Remove Transponder Antenna (Refer to Figure 201).
- (1) Remove electrical power from airplane and turn the master switch to "OFF".
  - (2) Remove antenna access plate (231EB) to gain access to the antenna. Refer to Chapter 6, Access/Inspection Plates - Description and Operation for plate identification.
  - (3) Remove nuts and washers securing transponder antenna to fuselage.

**NOTE:** Identify locations of washers for use during transponder antenna installation.

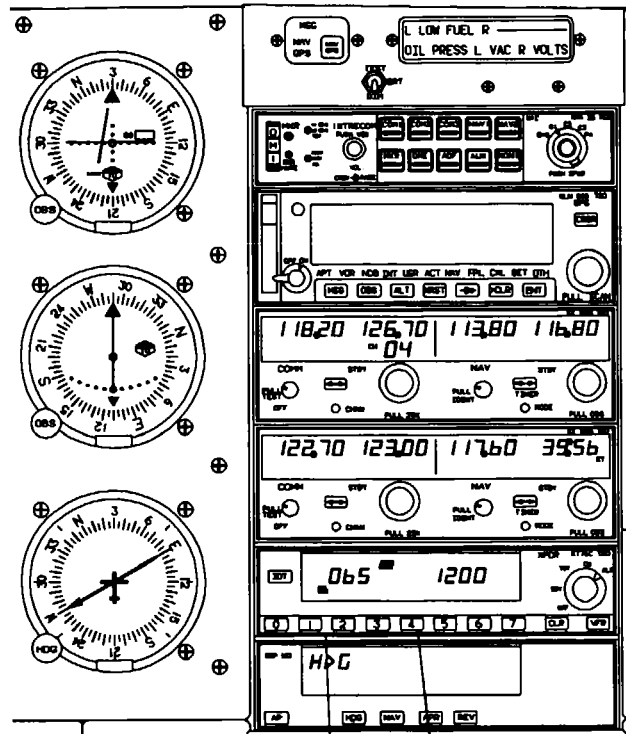
- (4) From outside of airplane, support transponder antenna and remove coax connector (PC1006) from transponder antenna.
  - (5) Remove transponder antenna from airplane.
- B. Install Transponder Antenna (Refer to Figure 201 ).
- (1) Position transponder antenna at opening in fuselage for coax connector. Connect coax connector (PC1006) to transponder antenna.
  - (2) Place transponder antenna studs through fuselage and secure to fuselage with nuts and washers.
  - (3) Verify proper electrical bonding of doubler surface and transponder antenna.
  - (4) Install the antenna access plate (231EB). Refer to Chapter 6, Access/Inspection Plates - Description and Operation for plate identification.
  - (5) Restore electrical power to airplane as required and turn the master switch to "ON".

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**DETAIL B**



KT-76C TRANSPONDER  
 LOCKING SCREW

**DETAIL A**

KT-76C Transponder Installation  
 Figure 201 (Sheet 1)

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 B0518T1042

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**KT-73 MODE S TRANSPONDER - MAINTENANCE PRACTICES**

**1. General**

- A. The KT-73 (Mode S) transponder is installed in the avionics-panel radio mounting rack. The CI-105 transponder antenna is installed on the bottom of the fuselage. For removal and installation procedures on the CI-105 transponder antenna, refer to Chapter 34, KT-76C Transponder - Maintenance Practices.

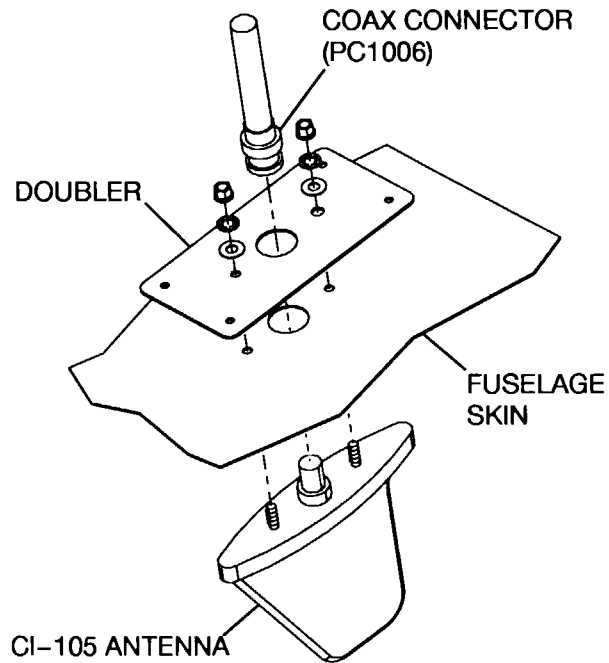
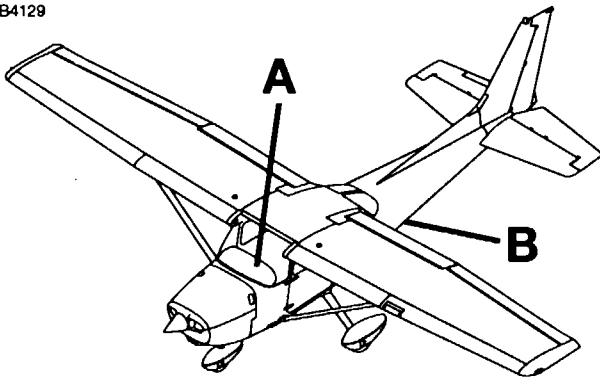
**2. KT-73 Mode S Transponder Removal and Installation**

- A. KT-73 Transponder Removal (Refer to Figure 201).
- (1) Disconnect the main battery. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Turn the single hex-screw, found in the recessed hole on the face of the transponder, counterclockwise.
  - (3) Remove the single hex-screw from the transponder.
  - (4) Pull the transponder from the radio mounting rack.
  - (5) Disconnect the coaxial cable and electrical connector from the transponder.
  - (6) Remove the transponder from the airplane.
- B. KT-73 Transponder Installation (Refer to Figure 201).
- (1) Put the transponder in the avionics radio mounting rack.
  - (2) Connect the electrical connector and the coaxial cable.
  - (3) Put the single hex-screw in the recessed hole on the face of the transponder and turn it clockwise until it is tight.
  - (4) Do a test of the KT-73 transponder.

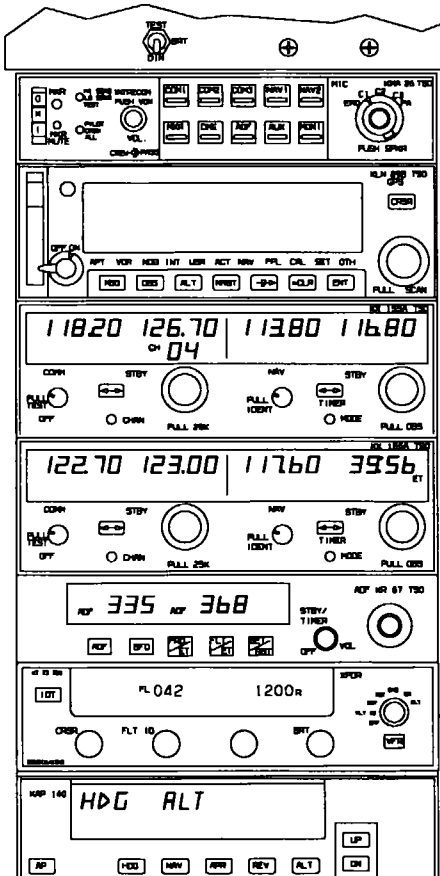


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**DETAIL B**



**KT-73 Mode S  
 TRANSPONDER**

**DETAIL A**

KT-73 Mode S Transponder Installation  
 Figure 201 (Sheet 1)

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 B1218T1067

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**GTX - 33 TRANSPONDER - MAINTENANCE PRACTICES**

**1. General**

- A. The maintenance practices give the removal and installation procedures for the transponder, which is installed on the avionics shelf in the tailcone.
- B. The GTX-33 Transponder is an integrated component of the Garmin G1000 avionics system. The transponder is operated and monitored through the use of the Control Display Units (CDU's).

**2. GTX - 33 Transponder Removal/Installation**

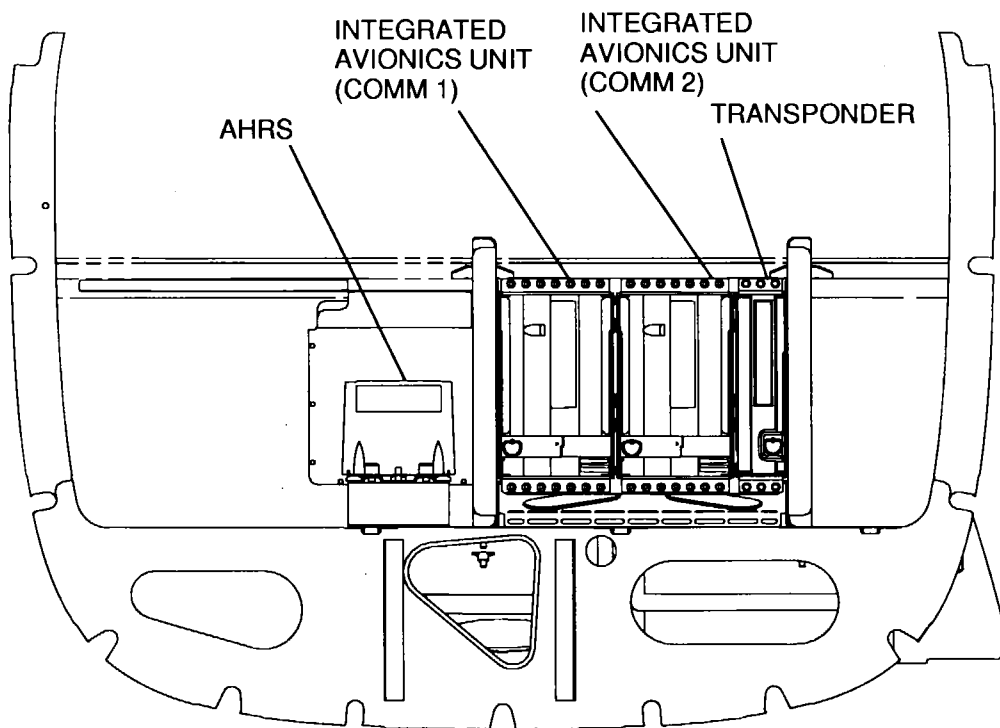
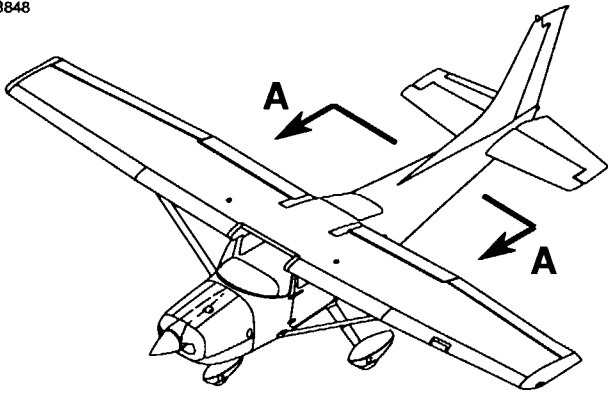
- A. Remove the Transponder (Refer to Figure 201).
  - (1) Set the MASTER switch and AVIONICS switch to the off position.
  - (2) Remove the tailcone access/inspection plate (310AR) to get access to the NAV/COM units. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Turn the quarter turn fastener 90 degrees counterclockwise and lift the locking lever to disengage the transponder.
  - (4) Move the transponder aft out of the mounting rack.
  - (5) Remove the transponder from the airplane.
- B. Install the Transponder (Refer to Figure 201).
  - (1) Put the transponder in position with the locking lever stud in the mounting rack slot.
  - (2) Push the locking lever down and turn the quarter turn fastener 90 degrees clockwise to attach the transponder to the mounting rack.
  - (3) Install the tailcone access/inspection plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (4) Do a check of the transponder to make sure it operates correctly. Refer to the Garmin G1000 Line Maintenance Manual.

**3. Transponder Antenna Removal/Installation**

- A. Remove the Transponder Antenna (Refer to Figure 202).
  - (1) Set the MASTER switch and AVIONICS switch to the off position.
  - (2) Remove the screws that attach the antenna to the bottom of the fuselage.
  - (3) Disconnect the coaxial cable from the antenna (PC1006).
- B. Install the Transponder Antenna (Refer to Figure 202).
  - (1) Attach the coaxial cable to the antenna (P1006).
  - (2) Put the transponder antenna in position on the bottom of the fuselage.
  - (3) Attach the antenna with screws.

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**VIEW A-A**

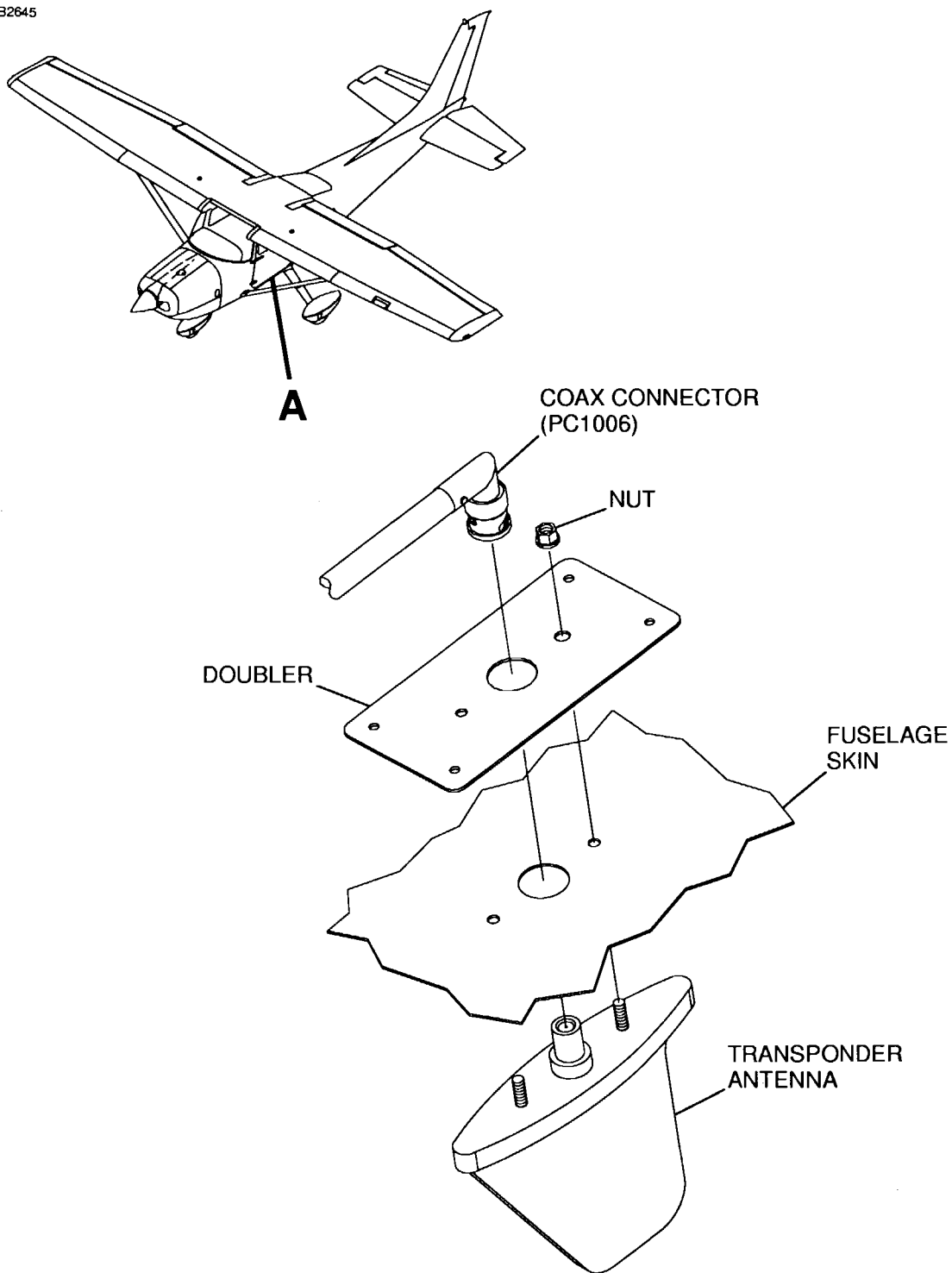
LOOKING FORWARD AT FS 140  
AIRPLANES THAT HAVE  
THE GARMIN G1000

Tailcone Avionics Installation  
Figure 201 (Sheet 1)

0710T1001  
A0714T1044

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**DETAIL A**

Transponder Antenna Installation  
Figure 202 (Sheet 1)

0710T1001  
A0718T1064

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**GDL-69A FIS - DESCRIPTION AND OPERATION**

**1. General**

- A. The GDL-69A Flight Information System (FIS) is a remote-mounted component of the Garmin G1000 avionics system. The GDL-69A gives weather and FIS information to the pilot. The information is controlled and seen through the Multi-Function Display (MFD). Information is sent from the data link receiver to the MFD through the high-speed data bus ethernet data path.

With a current subscription, XM satellite radio service is available with the GDL-69A. The signals that the data link receives from satellites give better coverage than land-based transmissions. The XM radio is tuned through the MFD. Analog audio is sent to the audio panel and shares the AUX music input with the external audio entertainment input.

GDL-69A capabilities include:

- Graphical NEXRAD Data (NEXRAD)
- Graphical METAR Data (METAR)
- Textual METAR Data
- Textual Terminal Aerodrome Forecasts (TAF)
- City Forecast Data
- Graphical Wind Data (WIND)
- Graphical Echo Tops (ECHO TOP)
- Graphical Cloud Tops (CLD TOP)
- Graphical Lightning Strikes (XM LTNG)
- Graphical Storm Cell Movement (CELL MOV)
- NEXRAD Radar Coverage (displayed with NEXRAD data)
- SIGMETs/AIRMETs (SIG/AIR)
- Surface Analysis with City Forecasts (SFC)
- County Warnings (COUNTY)
- Freezing Levels (FRX LVL)
- Hurricane Track (CYCLONE)
- Temporary Flight Restrictions (TFR).

- B. The GDL-69A XM Weather Data Link is the receiver for the FIS, and is installed behind the instrument panel. It is a remote sensor.
- C. The CI-2480 antenna for the GDL-69A FIS is installed on the left upper surface of the fuselage at FS 65.33.

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**GDL-69A FIS - MAINTENANCE PRACTICES**

**1. General**

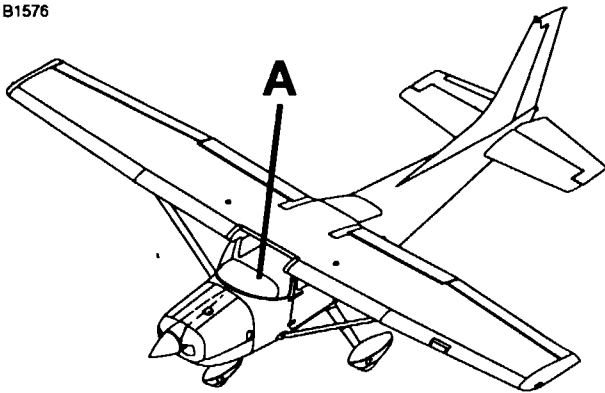
- A. The maintenance practices give the removal and the installation procedures for the GDL-69A XM Weather Data Link. For removal and installation of the CI-2480 antenna for the GDL-69A Flight Information System (FIS), refer to Chapter 23, Communications - Maintenance Practices.

**2. GDL-69A XM Weather Data Link Removal/Installation**

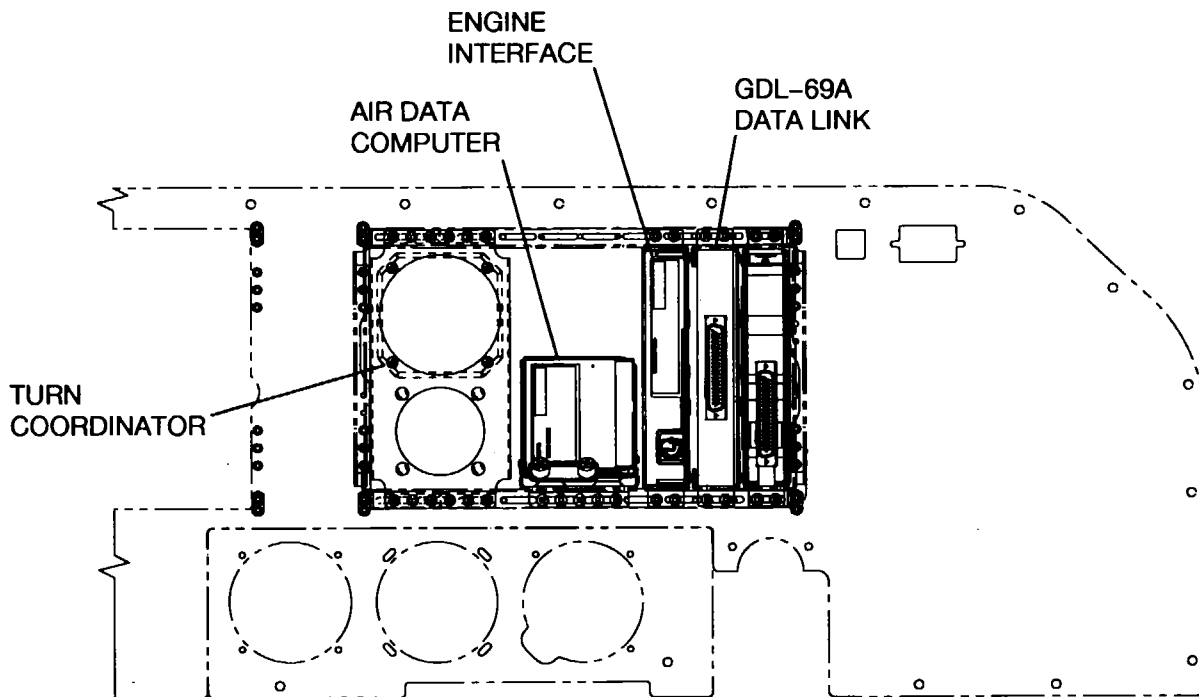
- A. Data Link Removal (Refer to Figure 201).
- (1) Set the MASTER switch and the AVIONICS switch to the off position.
  - (2) Remove the GDU 1040 Multi-Function Display (MFD) unit. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (3) Turn the quarter-turn fastener 90 degrees counterclockwise and lift the locking lever to disengage the data link.
  - (4) Move the data link aft out of the mounting rack.
  - (5) Remove the data link from the airplane.
- B. Data Link installation (Refer to Figure 201).
- (1) Inspect the connector for damaged pins.
  - (2) Carefully push the data link into the rack to engage the connector.
  - (3) Put the data link in position with the locking lever stud in the mounting rack slot.
  - (4) Push the locking lever down and turn the quarter-turn fastener 90 degrees clockwise to attach the data link to the mounting rack.
  - (5) Install the GDU 1040 MFD unit. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (6) Set the MASTER switch and the AVIONICS switch to the ON position.
  - (7) Do a check of the GDL-69A XM Weather Data Link FIS to make sure that it operates correctly. Refer to the Garmin G1000 Line Maintenance Manual, Revision D or later.

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**NOTE:** THE INSTRUMENT PANEL IS SHOWN WITH THE MULTI-FUNCTION DISPLAY (MFD) SCREEN REMOVED.



**DETAIL A**

GDL-69A XM Weather Data Link Installation  
Figure 201 (Sheet 1)

0710T1001  
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**DME - MAINTENANCE PRACTICES**

**1. General**

- A. On airplanes with Garmin G1000, the KN-63 distance measuring equipment (DME) gives range, speed, and time-to-station information displayed through the G1000 display system. The KN-63 DME has a remote-mounted receiver in the rear fuselage at FS 172.10. The DME antenna is on the bottom fuselage below the cabin at FS 114.50.

**2. KN-63 DME Receiver Removal/Installation**

- A. KN-63 DME Receiver Removal (Refer to Figure 201).
- (1) Set the MASTER and the AVIONICS switches to the off position.
  - (2) Disengage the DME/ADF circuit breaker on the avionics circuit breaker panel.
  - (3) Remove the right, aft cabin panel for access to the DME receiver unit.
  - (4) Disconnect the electrical connector (PT1031) from the receiver.
  - (5) Disconnect the electrical connector (PT801) from the receiver.
  - (6) Remove the screws that attach the receiver to the support bracket.
  - (7) Remove the receiver from the airplane.
- B. KN-63 DME Receiver Installation (Refer to Figure 201).
- (1) Install the receiver with the connectors toward the front of the airplane.
  - (2) Put the DME receiver in position.
  - (3) Put the four screws through the receiver at the two holes in the front plate tab and the two slots in the rear plate tab.
  - (4) Attach the receiver to the support bracket assembly with the screws.
  - (5) Make sure that there is a correct electrical bond between the unit and the airplane structure.
  - (6) Attach the electrical connector (PT801) to the DME receiver.
  - (7) Attach the electrical connector (PT1031) to the DME receiver.
  - (8) Install the right, aft cabin panel.
  - (9) Set the MASTER and the AVIONICS switches to the ON position.
  - (10) Engage the DME/ADF circuit breaker on the avionics circuit breaker panel.

**3. DME Antenna Removal/Installation**

- A. DME Antenna Removal (Refer to Figure 202).
- (1) Set the MASTER and the AVIONICS switches to the off position.
  - (2) Disengage the DME/ADF circuit breaker on the avionics circuit breaker panel.

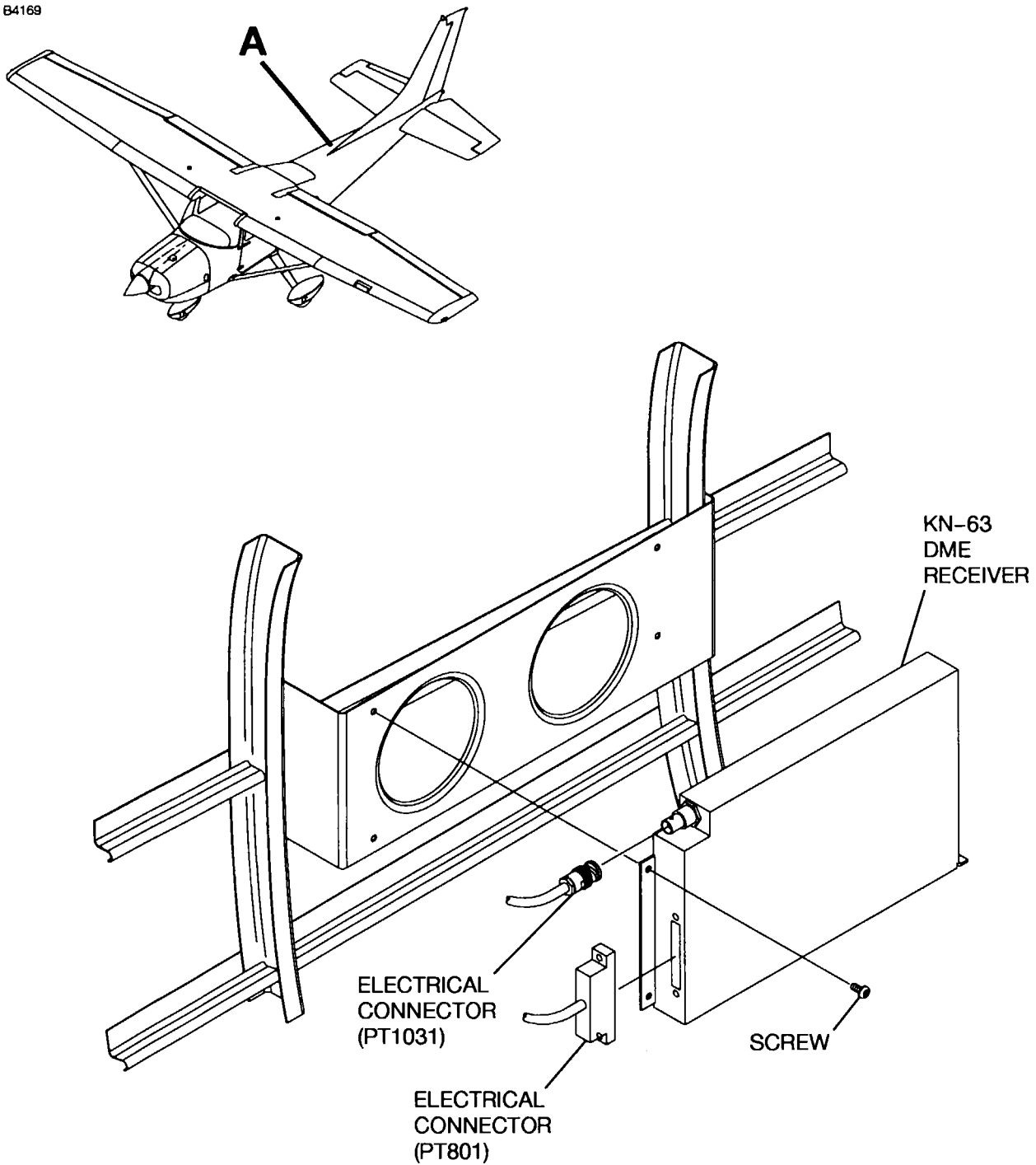
**CAUTION:** Be careful when you remove the nuts from the antenna. The antenna can fall to the ground and as a result, be damaged.

- (3) Remove the nuts and the washers that attach the DME antenna to the airplane at FS 114.50.
  - (4) Disconnect the electrical connector (PF1011) from the antenna.
  - (5) Remove the antenna from the airplane.
- B. DME Antenna Installation (Refer to Figure 202).
- (1) Solvent clean the surface of the airplane skin where you will install the antenna.
  - (2) Put the antenna in position on the airplane skin.
  - (3) Attach the antenna to the airplane skin with the nuts and the washers.
  - (4) Make sure that there is a correct electrical bond between the antenna connector and the skin.
  - (5) Connect the electrical connector (PF1011) to the antenna.
  - (6) Set the MASTER and the AVIONICS switches to the ON position.
  - (7) Engage the DME/ADF circuit breaker on the avionics circuit breaker panel.



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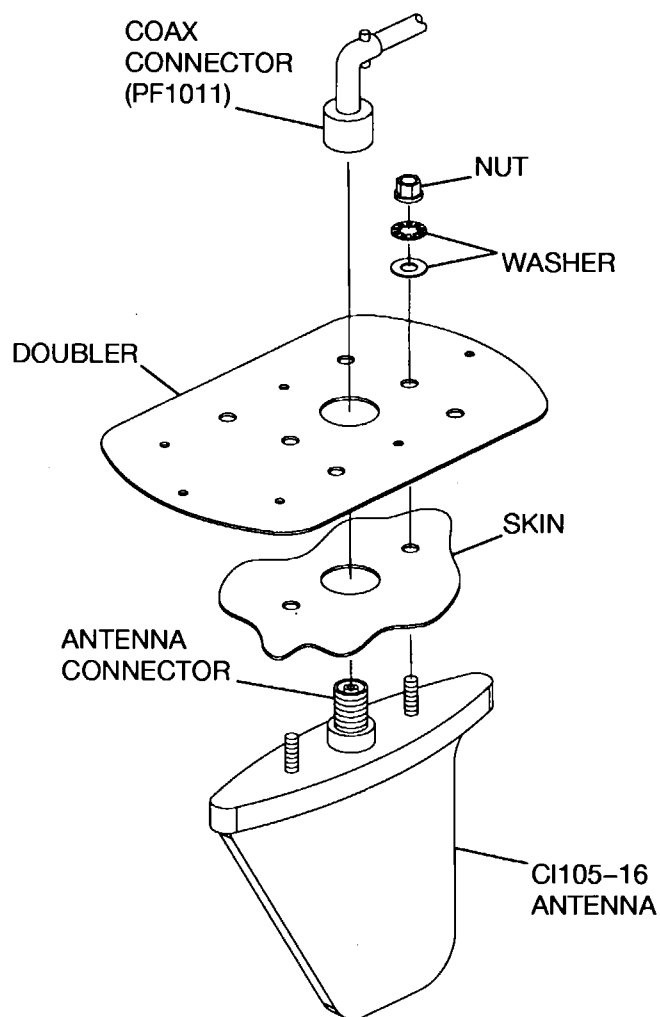
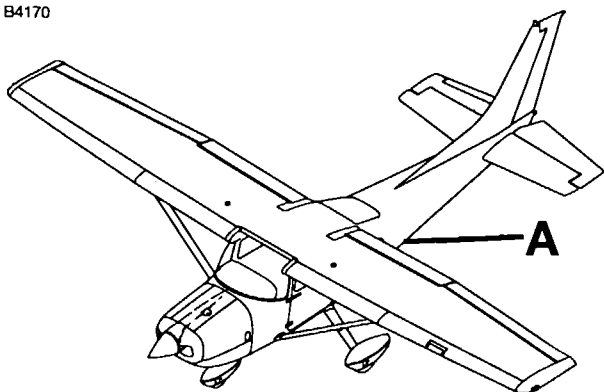
**DETAIL A**

KN-63 DME Receiver Installation  
Figure 201 (Sheet 1)

0710T1001  
A0718T1104

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**DETAIL A**

DME Antenna Installation  
Figure 202 (Sheet 1)

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**KMD-540 MULTI-FUNCTION DISPLAY - MAINTENANCE PRACTICES**

**1. General**

- A. The KMD-540 Multi-Function Display (MFD) can be installed to give the pilot more situational awareness during flight. Enhanced Ground Proximity Warning System (EGPWS), and Traffic Advisory System (TAS) data is given on the color MFD display. Other data, such as Global Positioning System (GPS) data and weather data can be shown on the display. These displays can give the pilot more data that is easy to read in a short period of time.

**2. KMD-540 MFD Removal/Installation**

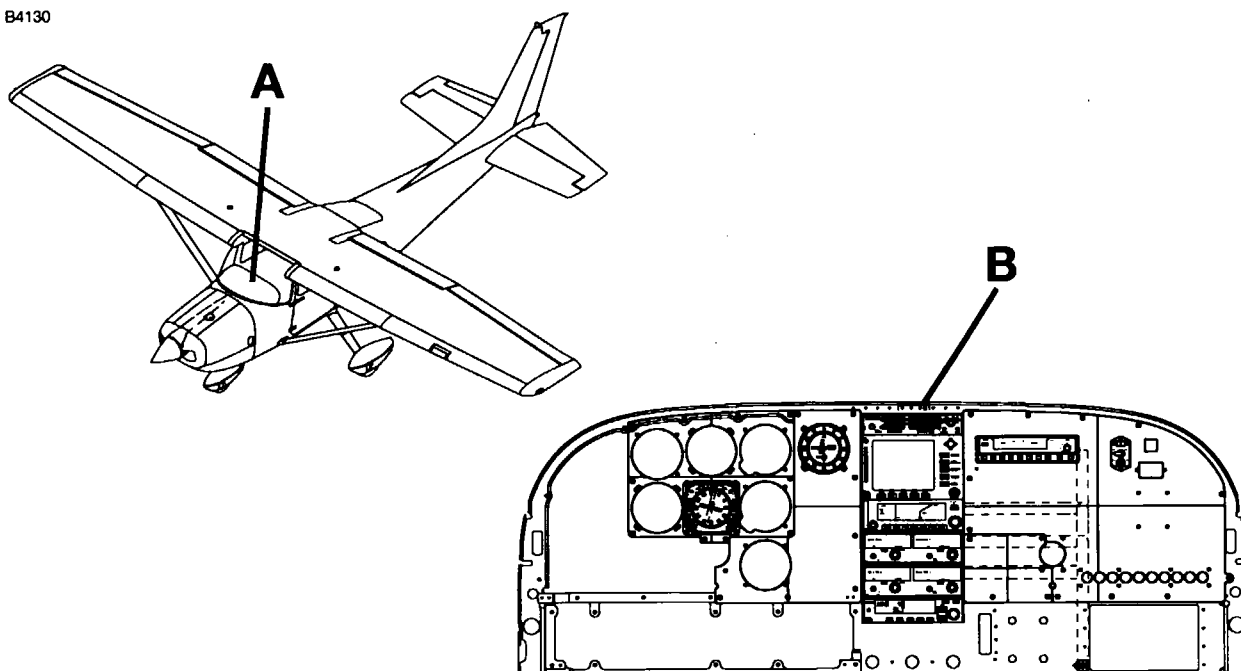
- A. KMD-540 MFD Removal (Refer to Figure 201).
- (1) Disconnect the main battery from the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
  - (2) Disengage the MFD circuit breaker on the circuit breaker panel.
  - (3) Remove the screw in the face of the MFD.
  - (4) Carefully, pull the unit out of the avionics rack.
  - (5) Disconnect the electrical connector from the MFD.
  - (6) Remove the MFD from the airplane.
- B. KMD-540 MFD Installation (Refer to Figure 201).
- (1) Put the MFD in the avionics rack.
  - (2) Connect the electrical connector to the MFD.
  - (3) Install the screw in the face of the MFD.
  - (4) Engage the MFD circuit breaker on the circuit breaker panel.
  - (5) Connect the main battery to the airplane. Refer to Chapter 24, Battery - Maintenance Practices.
  - (6) Do an operational check of the MFD.

**3. KMD-540 MFD Operational Check**

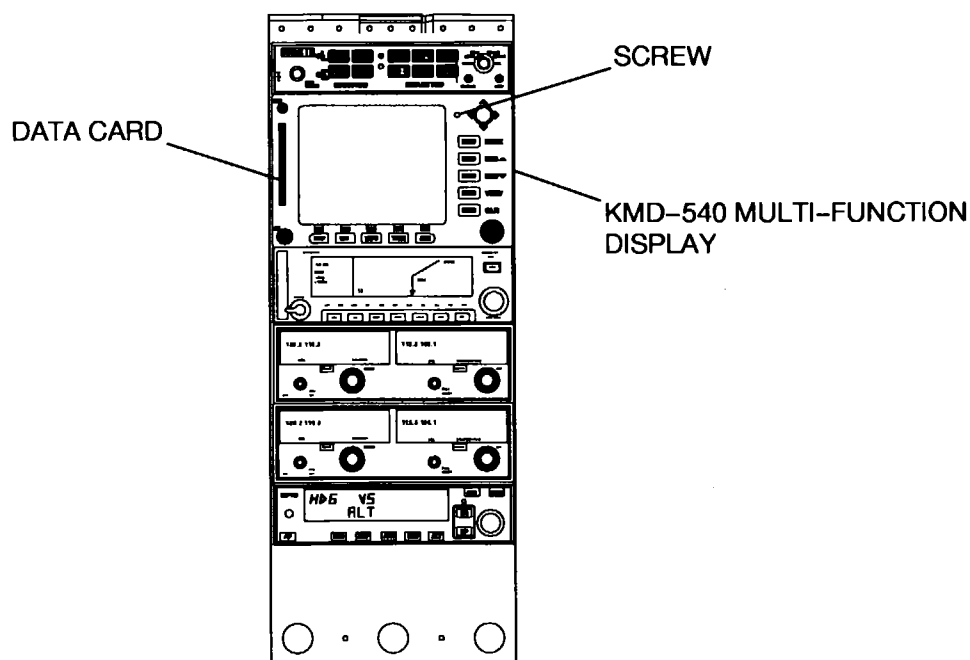
- A. MFD Operational Check.
- (1) Set the MASTER ALT/BAT switch to the ON position.
  - (2) Set the AVIONICS master switch to the ON position.
  - (3) Turn the ON/OFF knob on the KMD-540 MFD to the ON position.
  - (4) Make sure that the KMD-540 title page comes on the screen.
  - (5) Turn the ON/OFF knob on the KMD-540 MFD to the OFF position.
  - (6) Set the AVIONICS master switch to the off position.
  - (7) Set the MASTER ALT/BAT switch to the off position.

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**DETAIL A**



**DETAIL B**

KMD-540 MFD Installation  
 Figure 201 (Sheet 1)

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 A1218T1070

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**CONTROL DISPLAY UNIT - MAINTENANCE PRACTICES**  
**Airplanes with Garmin G1000**

**1. General**

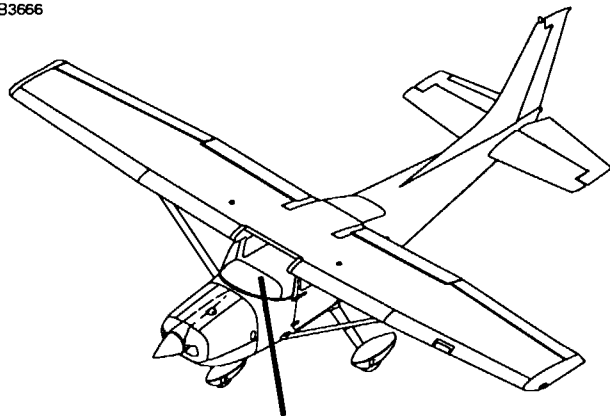
- A. The Control Display Unit (CDU) is a flat screen display which is removed and installed by quick release fasteners and an electrical connector attached to the back. A Garmin Display Unit (GDU-1040) operates as the CDU. The left display serves as the Primary Function Display (PFD). The right display serves as the Multi-Function Display (MFD). Each display is able to give the same information as the other if needed. The displays incorporate the processors that move data through the different components of the integrated system.

**2. Control Display Unit Removal/Installation**

- A. Remove the Control Display Unit (CDU) (Refer to Figure 201).
- (1) Disengage the applicable PFD or MFD circuit breaker for the CDU.
  - (2) Disconnect the quick release fasteners from the CDU.
  - (3) Carefully pull the CDU from the instrument panel and disconnect the electrical connector that is attached to the back of the CDU.
- B. Install the CDU (Refer to Figure 201).
- (1) Connect the electrical connector to the back of the CDU and put the CDU in the instrument panel.
  - (2) Attach the CDU to the instrument panel with the quick release fasteners.
  - (3) Engage the applicable PFD or MFD circuit breaker for the CDU.
  - (4) Make sure the applicable CDU operates correctly. Refer to the Garmin G1000 Line Maintenance Manual.

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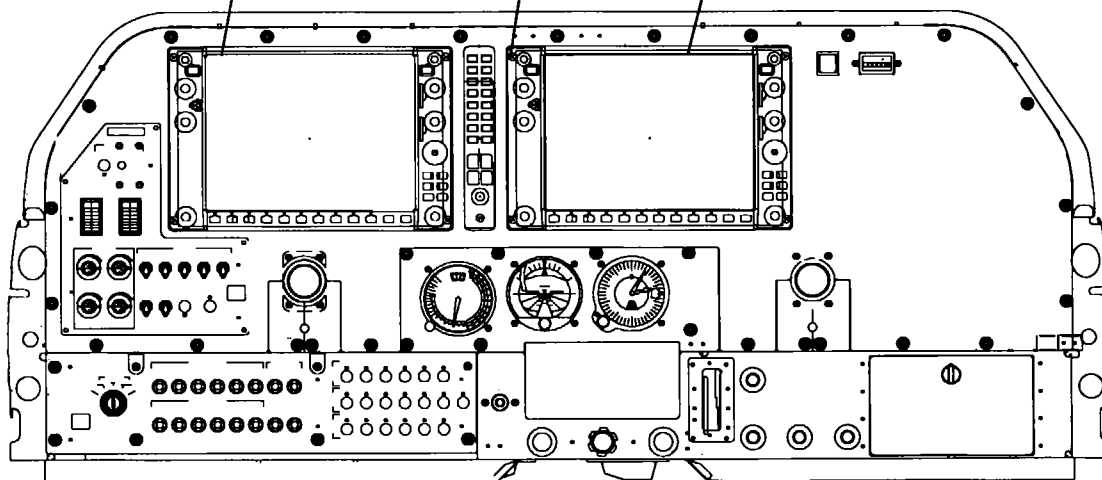


**A**

PRIMARY FLIGHT DISPLAY  
(PFD)

QUICK  
RELEASE  
FASTENER

MULTI-FUNCTION DISPLAY  
(MFD)



**DETAIL A**

Control Display Unit Installation  
Figure 201 (Sheet 1)

0710T1001  
A1218T1044

**CHAPTER**

**35**

**OXYGEN**

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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
35-Title		
35-List of Effective Pages		
35-Record of Temporary Revisions		
35-Table of Contents		
35-00-00	Page 1	Jul 3/2006
35-01-00	Page 1	Mar 1/2005
35-01-00	Pages 201-208	Jul 3/2006





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**OXYGEN - GENERAL**

**1. Scope**

- A. This chapter provides information on components associated with storage and distribution of oxygen to crew and passengers.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Teflon Lubricating Tape	S1465	Commercially Available	To lubricate threads and fittings.
Trichloro-ethylene	ASTM D4080	Commercially Available	To clean oxygen lines.
Naphtha	TT-N-95	Commercially Available	Flush oxygen lines.
Anti-Icing Fluid	TT-I-735	Commercially Available	Flush oxygen lines.
Sherlock Leak Detector	Type CG (MIL-PRF-25567 Oxygen leak detector, Type 1)	Lub-O-Seal Co. Inc. 17519 Lewis Dr. Cypress, TX 77433	To do a leak test of the oxygen system.
Flow rater (0 to 10 Liters per Minute LPM)		Commercially Available	Check pressure flow to passenger mask.
Pressure Gage (0-100 PSIG)		Commercially Available	To check oxygen flow.
Oxygen Outlet Adapter		Commercially Available	Used with pressure gage.
Merthiolate		Commercially Available	To clean oxygen mask's and hose.

**3. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.

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**OXYGEN - DESCRIPTION AND OPERATION**

**1. Description and Operation**

- A. The system has an oxygen cylinder and regulator assembly, filler valve, pressure gage, pressure lines, outlets, and mask assemblies. The oxygen cylinder is attached aft of the baggage compartment. The pilot's mask supply line gives a larger flow of oxygen than the passenger mask supply lines. The pilot's mask has a microphone, keyed by a switch button on the pilot's control wheel. The filler valve is found on the left side of the tailcone.

**WARNING: Do not let oil, grease, or other lubricants near high-pressure oxygen because it can cause a fire. Do not smoke or have an open flame in or near the airplane while you work on the oxygen system.**

- B. Oxygen flow to the outlet ports starts when the oxygen control valve knob, located in the overhead console, is put in the ON position and mask hoses are connected to the overhead oxygen ports.

**NOTE:** Each oxygen port has a spring-loaded valve which prevents the flow of oxygen until a mask hose is connected. Each mask hose has an oxygen flow indicator for visual proof of oxygen flow.

- C. The oxygen system has an emergency release indicator with a green disc installed. The green disc will be pushed out if there is too much oxygen pressure in the system. When there is too much pressure in the oxygen system, a safety disc inside the oxygen regulator will release oxygen from the oxygen tank to the emergency release indicator. The oxygen pressure will then push out the green disc and release oxygen outside the airplane. The indicator disc will release oxygen at a pressure of 80 psi +30 or -30 psi (551 kPa +208 or -208 kPa).

- (1) The emergency release indicator is installed inside the tailcone on the left side. The green indicator disc can be seen when it is not removed, from the outside of the airplane on the left side of the tailcone.
- (2) A indicator disc that has been removed shows a possible problem. Refer to Oxygen - Maintenance Practices.

**NOTE:** Airplanes T18208309 and on do not have an emergency release indicator disc installed. These airplanes have a vent found in the tailcone for emergency oxygen release.

- D. The information that follows is found on the shoulder, neck, or top head of the oxygen cylinder to help in correct identification.

- (1) Cylinder specification followed by service pressure. For example, ICC or DOT-E8162.
- (2) Cylinder serial number. This is found below or directly after the cylinder specification. The symbol of the purchaser, user, or maker, if registered with the Bureau of Explosives, can be found directly below the serial number. The cylinder serial number can possibly be found in an alternative location on the cylinder top head.
- (3) Inspector's official mark. This is found near the serial number.
- (4) Date of manufacture. This is the date of the first hydrostatic test. For example, 6-98 for June 1998. The dash between the month and the year figures can be replaced with the mark of the inspection agency or agency doing the test. For example, 6L98.
- (5) Hydrostatic test date. The dates of subsequent hydrostatic tests must be steel-stamped (month and year) directly below the original manufacturer date. The dash between the month and year figures can be replaced with the mark of the testing agency.
- (6) A Cessna identification placard. This is found near the center of the cylinder body.
- (7) Halogen test stamp (if applicable). The phrase "Halogen Tested," the date of the test (month, day, and year), and the inspector's mark is found below the Cessna identification placard.

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**OXYGEN - MAINTENANCE PRACTICES**

**1. General**

- A. Before you do maintenance on the oxygen system, you must read and understand these maintenance practices.

**2. Precautions**

**WARNING: Do not smoke or have an open flame near the airplane while you do maintenance on the oxygen system. Make sure all electrical power is disconnected and that the airplane is correctly grounded. Oils, grease, and solvents can burn or explode when near to oxygen under pressure.**

- A. Make sure every port on the system is always fully clean and free of water, oil, grease, and solvent contamination.
- B. Put a cap on all openings immediately after you remove a component. Do not use tape or caps which will cause moisture to collect.
- C. Lines and fittings must be clean and dry. One of the methods that follow can be used to clean lines.

**CAUTION:** Most air compressors are lubricated with oil, and a minimum amount of oil can be carried by the airstream into the system. Use a water-lubricated compressor to blow tubing clean only when nitrogen or argon is not available. The air must be clean, dry, and filtered.

- (1) Wash with a vapor-degreasing solution of stabilized trichloroethylene that conforms to MIL-T-7003. Then blow tubing clean with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).
- (2) Flush with naptha that conforms to Specification TT-N-95. Then blow clean and dry with clean, dry filtered air.
- (3) Flush with anti-icing fluid that conforms to MIL-F-5566 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water and dry with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).
- (4) Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455). Put a cap on all lines immediately after they are dry.
- (5) Do not fabricate pressure lines. Replace lines with factory parts, by part number.
- (6) Make sure that your hands are free of dirt and grease before you install the oxygen tubing or fittings.

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**WARNING: Do not use tools that can cause sparks.**

**CAUTION:** With oxygen bottle charged, do not put the control in the ON position with outlet ports (low pressure) open to the atmosphere. Damage to the regulator metering poppet can occur.

**CAUTION:** When a component of the oxygen system has been removed, installed, replaced, or the system has been disassembled in any way, the oxygen system must be purged and a check for leaks must be done.

- D. Use only S1465 Teflon lubricating tape on threads of male fittings. Do not use lubricating tape on coupling sleeves or outside of flares. Use care to prevent contamination of Teflon tape with oil, grease, or other lubricants. The Teflon tape must be used in accordance with the instructions that follow.
- (1) Lay the tape on the threads close to the end of the fitting; Apply the tape clockwise on standard threads and counter-clockwise on the left-hand threads.
  - (2) Apply enough tension while you wind to make the tape form into thread grooves.
  - (3) After the installation of the tape is complete, keep tension on the tape and pull it apart in the direction it was applied. The necessary result is a ragged edge, which makes the tape stay in place. (If you shear or cut it, the tape can unwind.)
  - (4) Press the tape well into the threads.
  - (5) Make connections.
- E. Keep all of the tools used for the installation of the oxygen tubes or fittings free of dirt, grease, and oils.

**NOTE:** An accurate record of the number of recharges must be kept by the owner or his agent if the cylinder is recharged an average of once every other day or more.

### 3. Replacement of Components

- A. Use Figure 201 to help you as you remove and install components in the oxygen system.

**NOTE:** Oxygen cylinder and regulator assemblies cannot always be installed in the field exactly as illustrated in Figure 201, which shows factory installation.

**CAUTION:** The pressure regulator, pressure gage and line, and filler valve must be removed and replaced only by personnel familiar with high-pressure fittings. Obey all maintenance precautions.

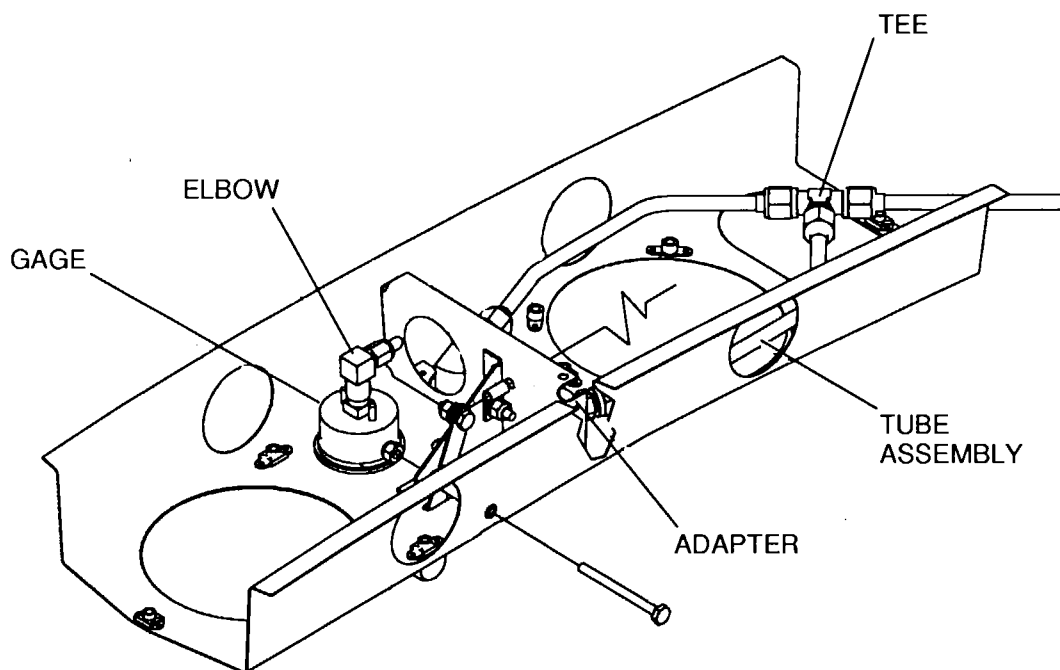
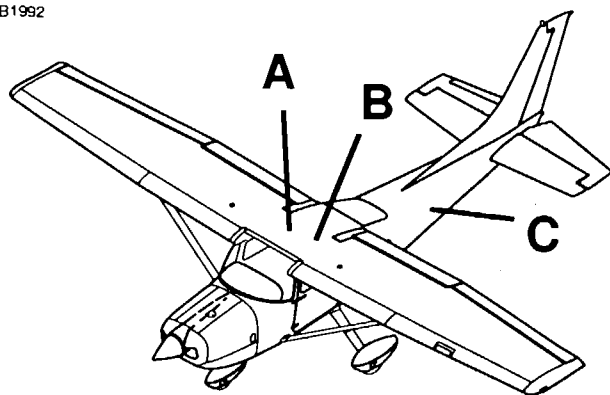
- B. Before you remove the cylinder, open the cabin outlets to release the low-pressure line. Disconnect the push-pull control cable, filler line, pressure gage line, and outlet line from the regulator.

**WARNING: Cap all lines immediately.**

- C. Filler Valve Removal (Refer to Figure 201).
- (1) Remove the line from the quick-disconnect valve at the regulator.
  - (2) Disconnect the chain, but do not remove the cap from the filler valve.
  - (3) Remove the screws that attach the valve and disconnect the pressure line.
  - (4) Cap and seat the pressure line.
  - (5) Remove the filler valve.
- D. Filler Valve Installation (Refer to Figure 201).
- (1) Install the filler valve.
  - (2) Uncap the pressure line and seat.
  - (3) Attach the valve with the screws and connect the pressure line.
  - (4) Connect the chain.
  - (5) Connect the line to the quick-disconnect valve at the regulator.

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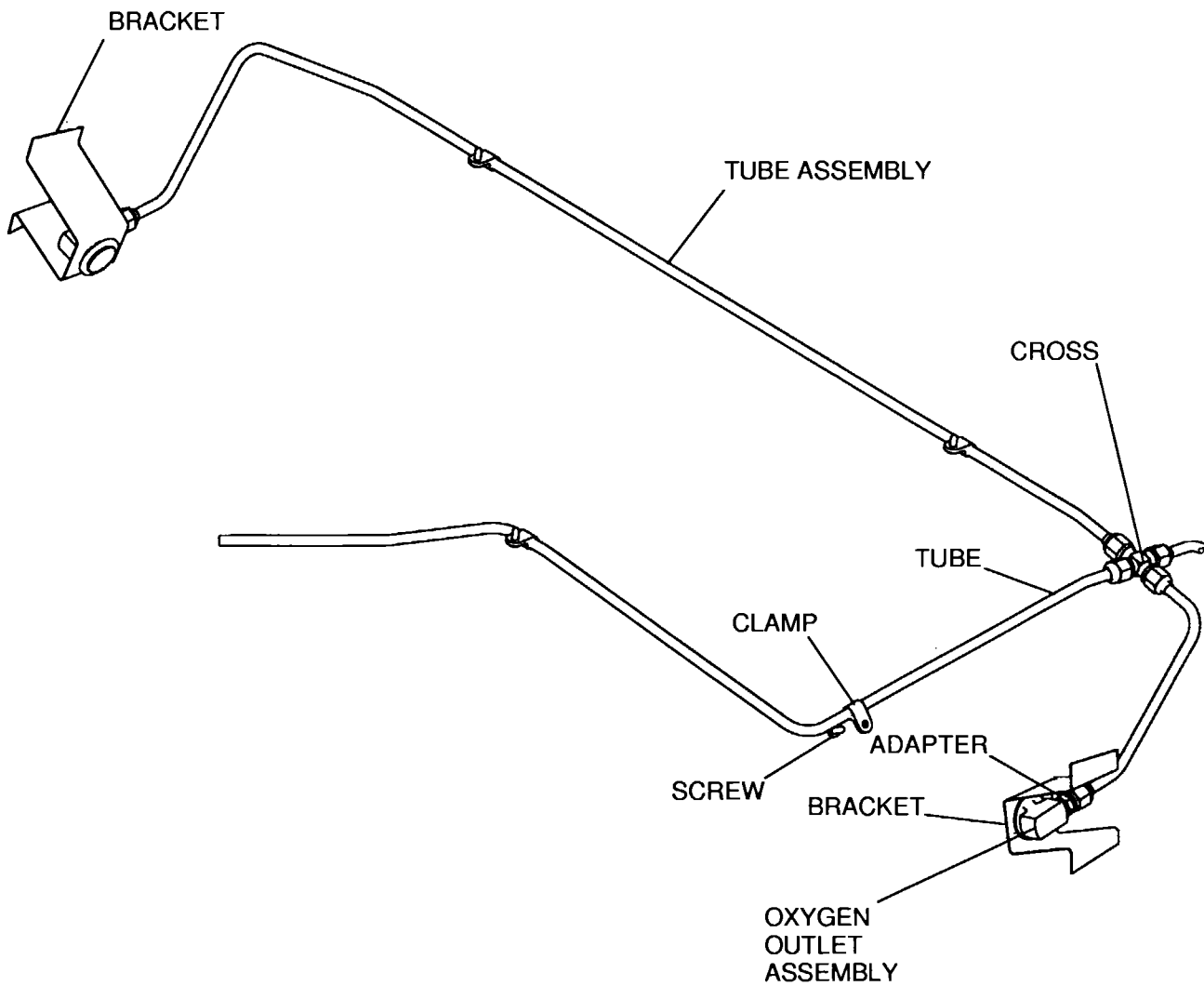
**DETAIL A**

Oxygen System  
Figure 201 (Sheet 1)

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**DETAIL B**

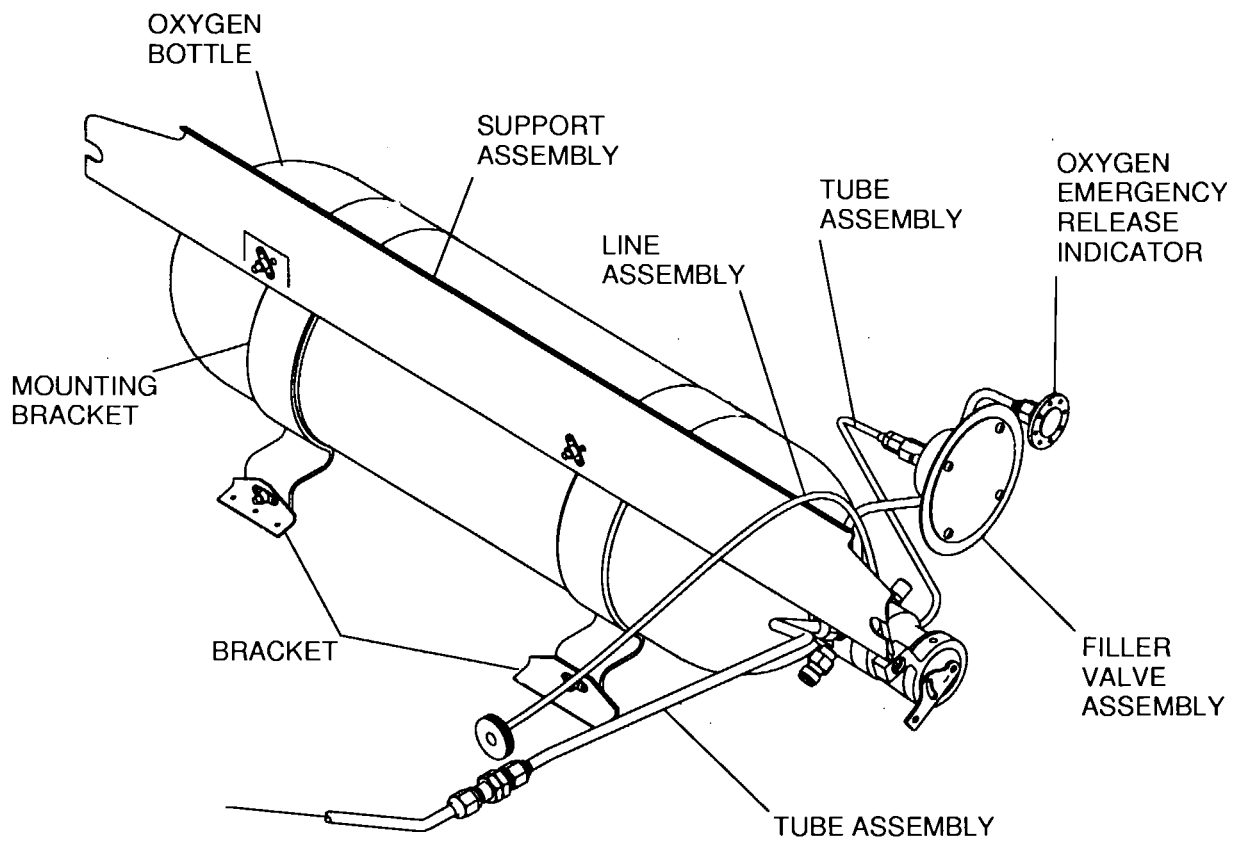
Oxygen System  
Figure 201 (Sheet 2)

0710T1001  
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**DETAIL C**

Oxygen System  
Figure 201 (Sheet 3)

0710T1001  
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- E. To remove all of the oxygen system, lower the headliner and remove the soundproofing to get access to the lines. Refer to Chapter 25 Equipment/Furnishings - Maintenance Practices.

#### 4. Oxygen Release Indicator Disc

**NOTE:** Airplanes T18208309 and On do not have an emergency release indicator disc installed. These airplanes have a vent found in the tailcone for emergency oxygen release.

- A. A release of the indicator disc can be the result of a malfunction. Do the steps that follow to make sure the oxygen cylinder operates correctly before you install a new indicator disc. (Refer to Figure 201).

- (1) Look at the indication on the oxygen gage in the overhead console. If the indication on the gage shows the oxygen cylinder is less than full, then fill the cylinder. Refer to Oxygen System Charging.
  - (a) Look at the oxygen gage to see if it fills with oxygen.
  - (b) If the cylinder will not fill with oxygen, then you must replace the oxygen cylinder or you must do an overhaul. Refer to Replacement of Components.

**NOTE:** The oxygen cylinder and regulator are removed and installed together as one assembly.

- (c) A Scott Aviation approved service center must do the overhaul. Contact Scott Aviation at (716) 686-1666 to find an approved service center.

**NOTE:** The phone number for Scott Aviation after close of business hours is (716) 683-5100.

- (2) To install a new indicator disc, press the disc past the snap ring in the oxygen release indicator fitting found in the left side of the tailcone.
- (3) Do a functional test of the oxygen system. Refer to Oxygen Function Test.

#### 5. Oxygen Cylinder Inspection Requirements

- A. Oxygen Cylinder Inspection (Refer to Figure 201).

- (1) Do an inspection of the full external surface of the cylinder for an indication of damage.
  - (a) Make sure to carefully examine the neck of the cylinder for cracks, distortion, or damaged threads.
- (2) Complete an inspection of the cylinder to see if markings are clear.
- (3) Complete an inspection of the date of the last hydrostatic test. If the test date is expired, do not let the cylinder go back to service until the test has been done.
- (4) Complete an inspection of the cylinder mounting bracket, bracket hold-down bolts, and cylinder holding straps for cracks, deformation, a clean surface, and correct attachment.
- (5) Do a check for signs of interference, chafing, deformation, or deterioration in the area adjacent to where the cylinder is stored and attached.

#### 6. Oxygen Mask Inspection

- A. Oxygen Mask Inspection.

- (1) Do a check of the oxygen masks for fabric cracks and rough face seals.
- (2) Flex the mask hose gently all over and check for signs of deterioration or dirt.
- (3) Do an examination of the mask and hose storage compartment for cleanliness and general condition.

#### 7. Oxygen Mask Maintenance

- A. Oxygen Mask Cleaning and Care.

- (1) Clean and disinfect the mask assemblies after use, as applicable. Use care to avoid damage to the microphone assembly while you clean and sterilize the mask assemblies.
- (2) Wash the mask and the hose with a mild soap solution and rinse it with clean water.

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- (3) To sterilize, rub the mask and hose with a gauze or sponge soaked in a water and merthiolate solution. This solution must contain 1/5 teaspoon of merthiolate per one quart of water. Wipe the mask and hose with a clean cloth and air dry.
- (4) Make sure that each mask breathing tube end is free of nicks and that the tube end will fit into the cabin oxygen receptacle easily and will not leak.
- (5) If a mask assembly has leaks, you cannot breathe through it, or has a damaged microphone, return the mask assembly to the manufacturer or a repair station.
- (6) Replace the hose if it shows signs of deterioration.

## 8. Oxygen System Functional Testing

- A. After the regulator and the cylinder assembly have been replaced or overhauled, do the flow and internal leakage tests that follow to make sure that the system operates correctly.
  - (1) Fully charge the oxygen system in accordance with the procedures outlined in this section.
  - (2) Disconnect the line and the fitting assembly from the pilot's mask and the line assembly. Put the outlet end of the line and the fitting assembly into the cabin outlet and attach the opposite end of the line to a pressure gage (the gage must be calibrated in one-pound increments from 0 to 100 PSI). Put the control lever in the ON position. The gage pressure should read 75 PSI, +10 or -10 PSI.
  - (3) Put the mask and the line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, the test gage pressure must still be 75 PSI, +10 or -10 PSI.
  - (4) Put the oxygen control lever in the OFF position and let the test gage pressure fall to 0 PSI. Remove all the adapter assemblies, but do not remove the one with the pressure gage. The pressure must not rise above 0 PSI after one minute. Remove the pressure gage and the adapter from the oxygen outlet.
  - (5) If you do not get the specified pressure readings when you do this test, remove and replace the cylinder regulator assembly and do the test again.
  - (6) Connect the mask and the line assemblies to each cabin outlet and do a check of each mask for correct operation.
  - (7) Do a check of the pilot's mask microphone and control wheel switch for correct operation. After the check, return all of the masks to the mask case.
  - (8) Recharge the oxygen system in accordance with these procedures.

## 9. System Leak Test

- A. When there are leaks in the system, you must find the opening. Frequently you can find leakage if you listen for the hissing of gas as it escapes. If you cannot hear the oxygen as it escapes, you must soap test all of the lines and connections with a Castile soap and water solution or specified leak-test material. Make the solution sufficiently thick to stay on the contours of the fittings. At the end of the leakage test, remove all of the leak detector or soap and water solution.

**CAUTION:** Do not try to tighten the connections while the system is charged.

## 10. Oxygen System Charging

- A. Charge Oxygen System (Refer to Figure 201).

**WARNING:** Be sure to ground the aircraft and the equipment used to service the system before you charge the oxygen system.

- (1) Use only aviator's breathing oxygen per MIL-0-27210 to charge the oxygen system.
- (2) Do not charge the oxygen cylinders if the equipment fittings used to service the system or the filler valve is corroded or contaminated. If necessary, clean with stabilized trichloroethylene and let air dry. Do not let the solvent enter the internal parts.
- (3) If the cylinder is empty, do not charge, as the cylinder must then be removed, inspected, and cleaned.

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**CAUTION:** A cylinder which is empty can be contaminated. The regulator and cylinder assembly must then be disassembled, inspected, and cleaned by an FAA approved facility before filling. Contamination, as used here, means dirt, dust, or foreign material, or air in large quantities. If a gage line or filler line is disconnected and you put caps on all of the fittings immediately, no contamination of the cylinder will occur unless temperature variation has caused a suction in the cylinder. Air contains water vapor which can condense and freeze. Since there are very small orifices in the system, it is very important that this condition not occur.

- (4) Connect the charging cylinder line from the oxygen service cart to the filler valve.
- (5) Slowly open the valve on the oxygen service cart and charge the airplane oxygen bottle to correct the pressure. Refer to Table 1 for charging pressures at different temperatures.
- (6) Ambient temperature listed in the chart is the air temperature in the area where the system is to be charged. Filling pressure refers to the pressure to which aircraft cylinders must be filled. This table gives approximations only and assumes a rise in temperature of approximately 25° F, due to heat of compression. This table also assumes the aircraft cylinders will be filled as quickly as possible and that they will only be cooled by ambient air; no water bath, or other means of cooling can be used.

Table 201. Oxygen Cylinder Filling Pressures

Ambient Temp. (Degrees F)	Filling Pressure (psig)	Ambient Temp. (Degrees F)	Filling Pressure (psig)
0	1650	50	1875
10	1700	60	1925
20	1725	70	1975
30	1775	80	2000
40	1825	90	2050

**NOTE 1:** Example: If ambient temperature is 70° F, fill the aircraft cylinders to approximately 1,975 psi or as close to this pressure as the gage can read. When they cool, cylinders must have approximately 1,850 psi pressure.

**CHAPTER**

**37**

**VACUUM**

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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
37-Title		
37-List of Effective Pages		
37-Record of Temporary Revisions		
37-Table of Contents		
37-00-00	Page 1	April 1/2002
37-10-00	Pages 101-103	April 1/2002
37-10-00	Pages 201-209	Jan 2/2006



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**VACUUM SYSTEM - GENERAL**

**1. Scope**

- A. This chapter describes those units and components used to provide vacuum necessary to operate the artificial horizon and directional gyros.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on distribution describes those components used in the distribution of vacuum air.
  - (2) The section on indicating describes those components used to indicate relative vacuum pressure in the system.

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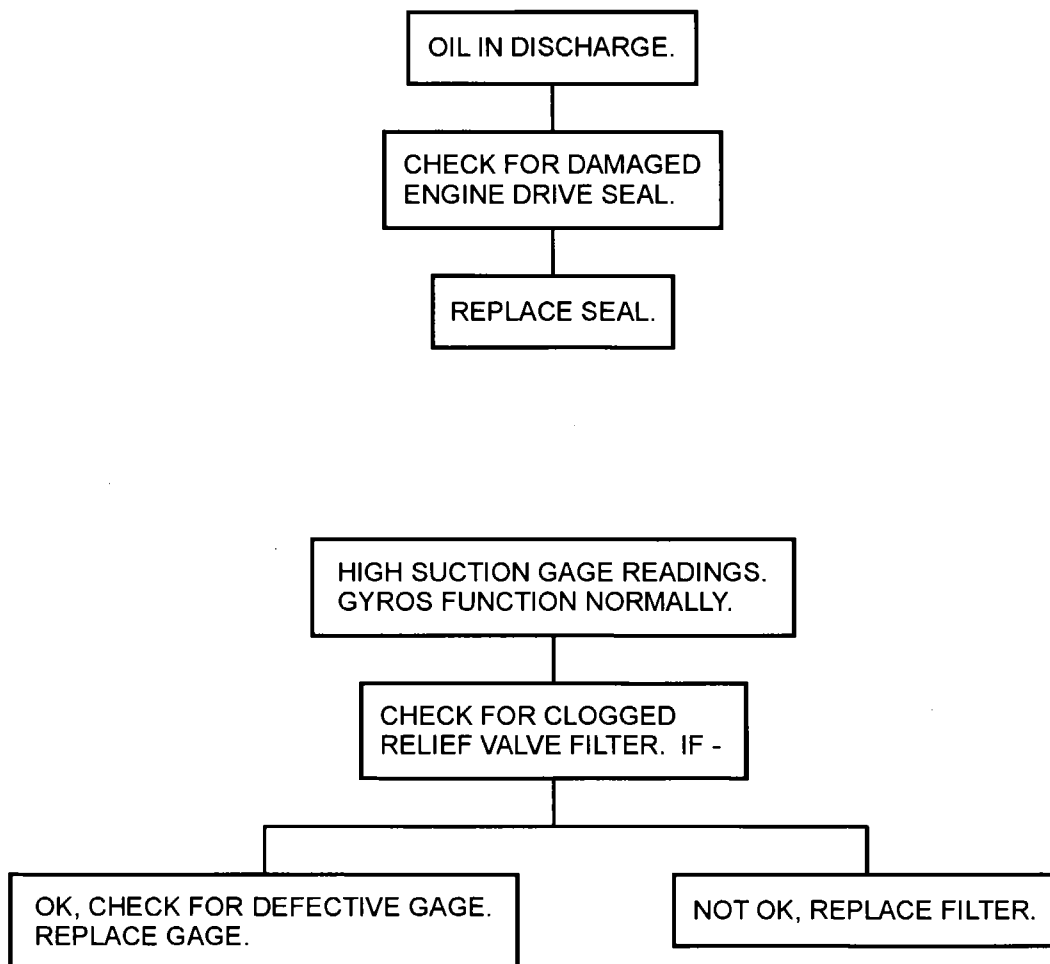
**VACUUM SYSTEM - TROUBLESHOOTING**

**1. General**

- A. A troubleshooting chart has been provided to aid the maintenance technician in system troubleshooting. Refer to Figure 101.

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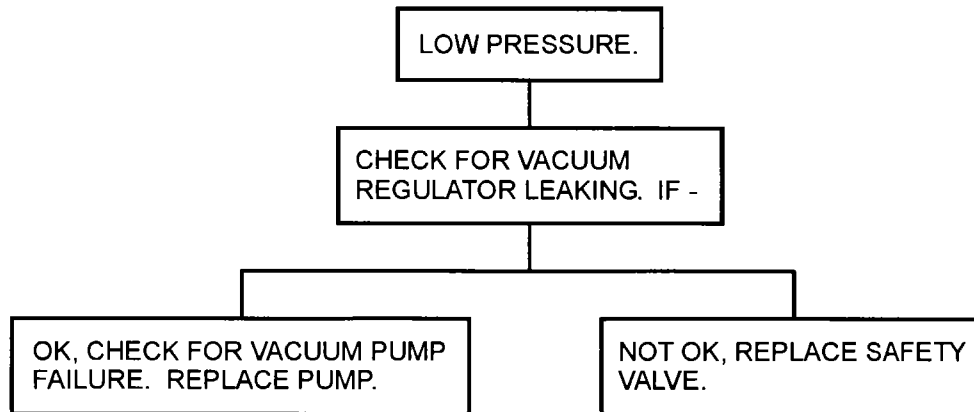
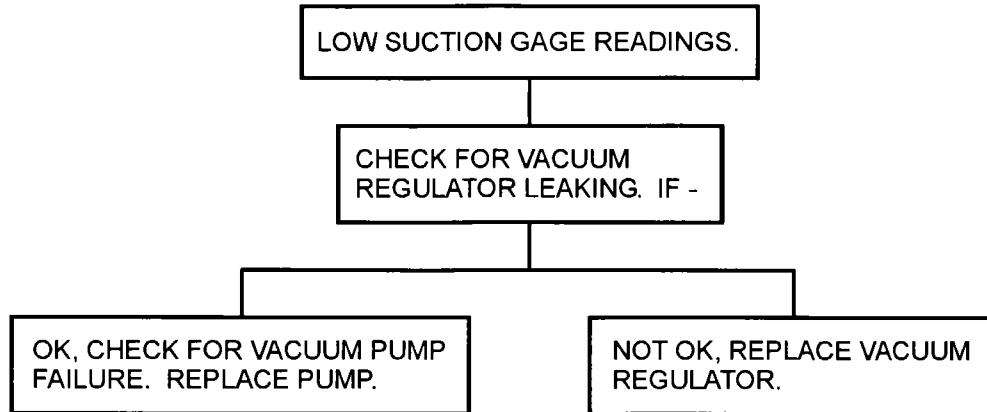
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Vacuum System Troubleshooting Chart  
Figure 101 (Sheet 1)

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Vacuum System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**VACUUM SYSTEM - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The vacuum system has a filter, vacuum gage, vacuum instruments, regulator valve, vacuum manifold, low vacuum annunciator switches, engine-driven vacuum pumps, and related plumbing.
- B. On airplanes without Garmin G1000, the source of vacuum air is in the cabin and is pulled through the system by the engine-driven vacuum pumps. This air goes through the gyro filter at the cabin inlet source before it goes through the vacuum gage and gyro instruments. The vacuum is controlled by the regulator valve. The regulator valve is on the aft side of the firewall. The vacuum air is then pulled through the vacuum manifold and past the low vacuum annunciator switches and then into the vacuum pumps.
- C. On airplanes without Garmin G1000, vacuum pressure is measured by the low vacuum annunciator switches in the engine compartment. The vacuum gage in the instrument panel shows the vacuum pressure.
  - (1) The vacuum gage gives a direct indication of the system vacuum in inches of mercury (in.hg.).
  - (2) The low vacuum annunciator switches are part of the panel annunciator warning system.
    - (a) If the left vacuum switch (SN012) senses a vacuum below 3.0 in.hg., the VAC annunciator will show L VAC.
    - (b) If the right vacuum switch (SN011) senses a vacuum below 3.0 in.hg., the VAC annunciator will show VAC R.
    - (c) If both switches sense a vacuum below 3.0 in.hg., the VAC annunciators will show L VAC R.
  - (3) For more information on the maintenance practices for the panel-mounted annunciator (UI005), refer to Chapter 31, Annunciator Panel - Maintenance Practices.
- D. On airplanes with Garmin G1000, the source of vacuum air is in the cabin and is pulled through the system by the engine-driven vacuum pump. The vacuum pressure is measured by a vacuum transducer. The air goes through the gyro filter at the cabin inlet source before it goes through the horizon gyro indicator. The vacuum is controlled by the regulator valve. The regulator valve and the vacuum transducer are on the aft side of the firewall.

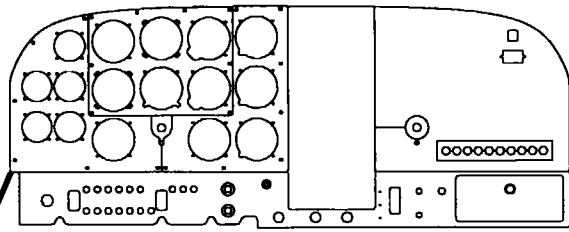
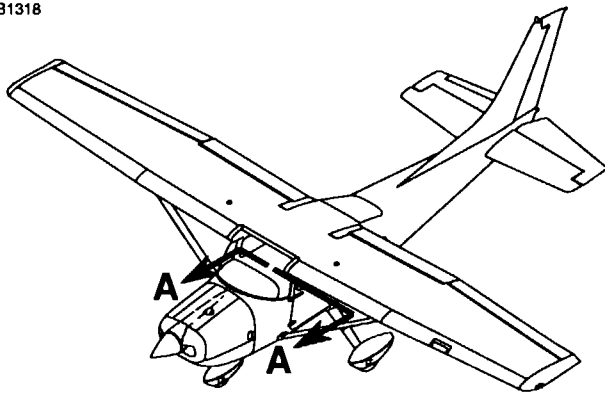
**2. Vacuum Pump Removal/Installation**

**NOTE:** Removal/installation is typical for the vacuum pumps.

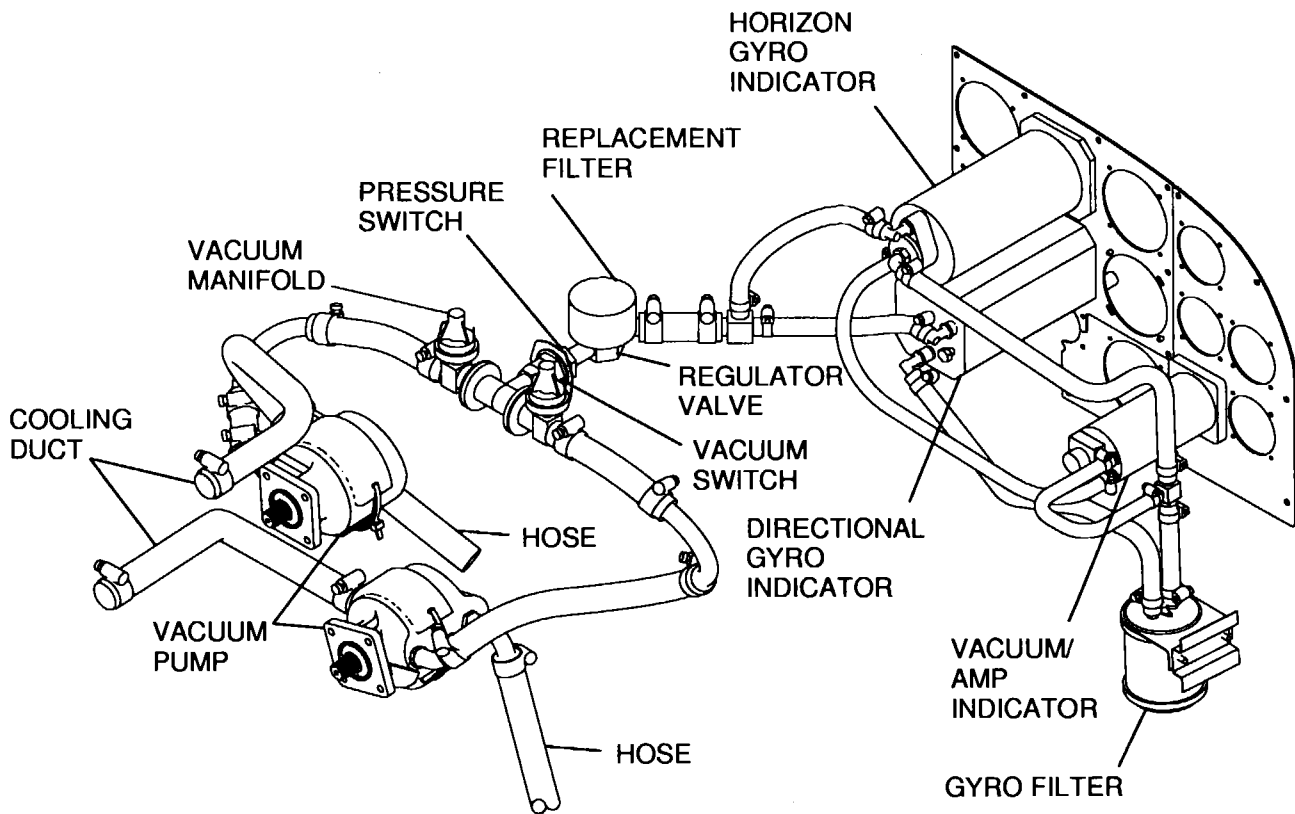
- A. Vacuum Pump Removal (Refer to Figure 201).
  - (1) Remove the engine cowl. Refer to Chapter 71, Cowl - Removal/Installation.
  - (2) Remove the cooling shroud.
  - (3) Disconnect the hoses from the inlet and outlet ports of the vacuum pump.
    - (a) Put caps on the hoses and the vacuum pump ports to prevent entry of foreign object debris.
  - (4) Remove the nuts, lock washers, and flat washers that attach the vacuum pump to the engine.
  - (5) Remove the vacuum pump from the engine.
  - (6) Remove the elbow from the pump.
  - (7) Replace any damaged fittings or nuts.
- B. Vacuum Pump Installation (Refer to Figure 201).

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**VIEW A-A**  
 AIRPLANES WITH STANDARD AVIONICS



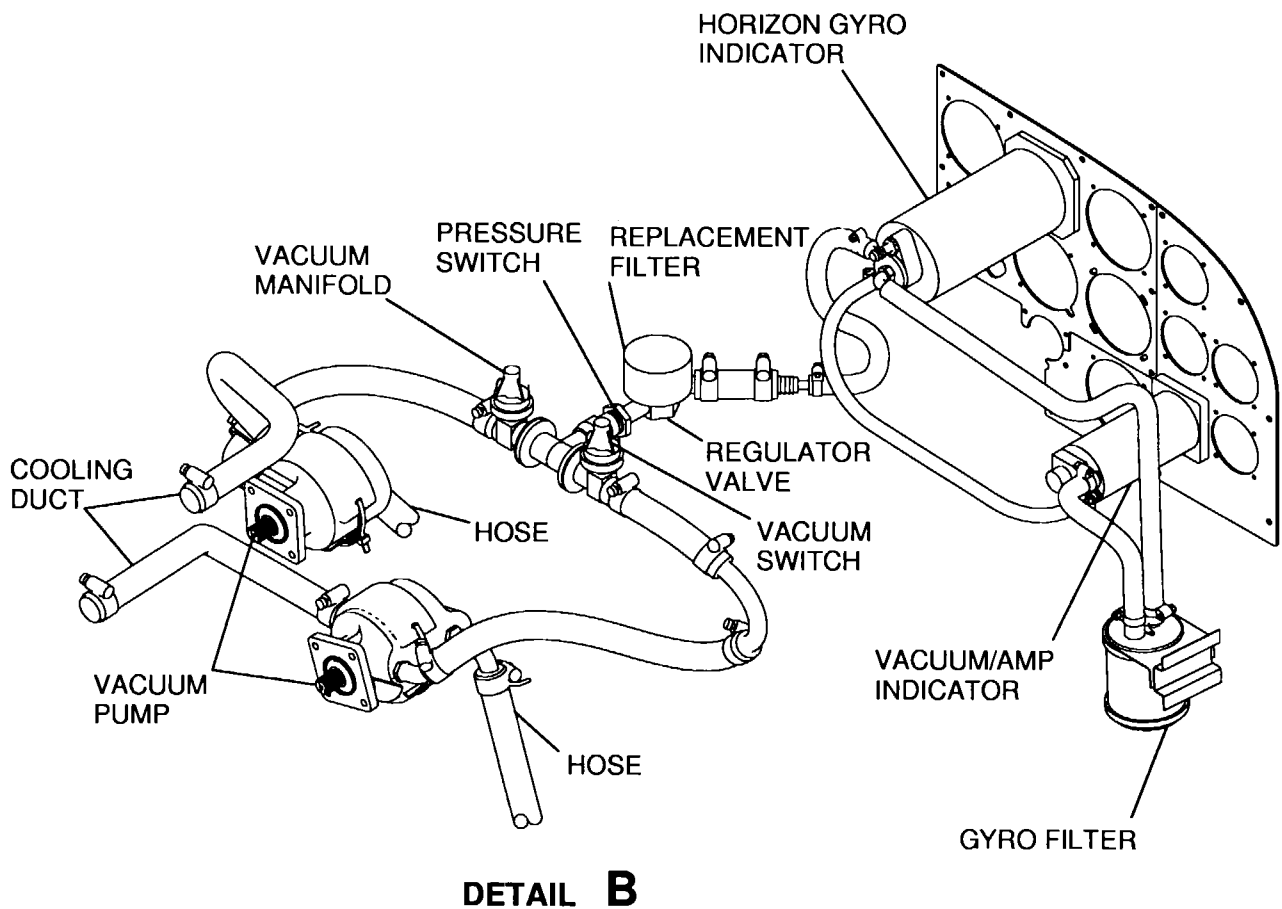
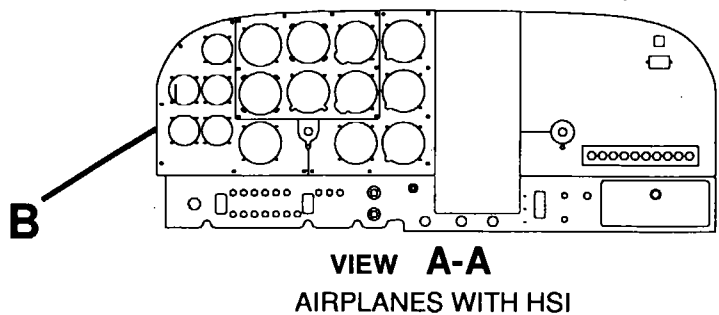
**DETAIL A**

Vacuum System Installation  
 Figure 201 (Sheet 1)

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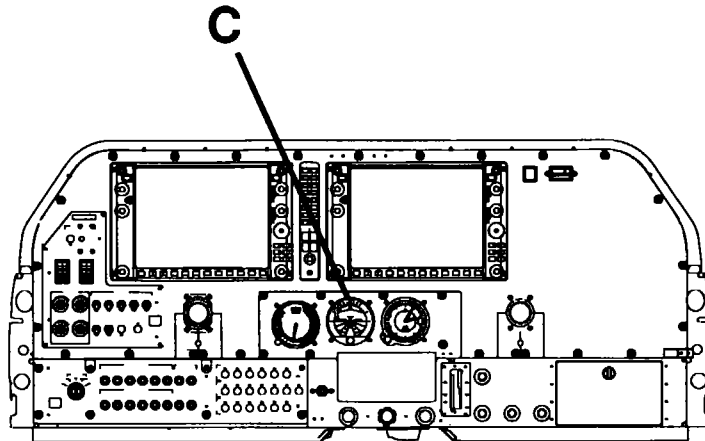


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 B0714T1042

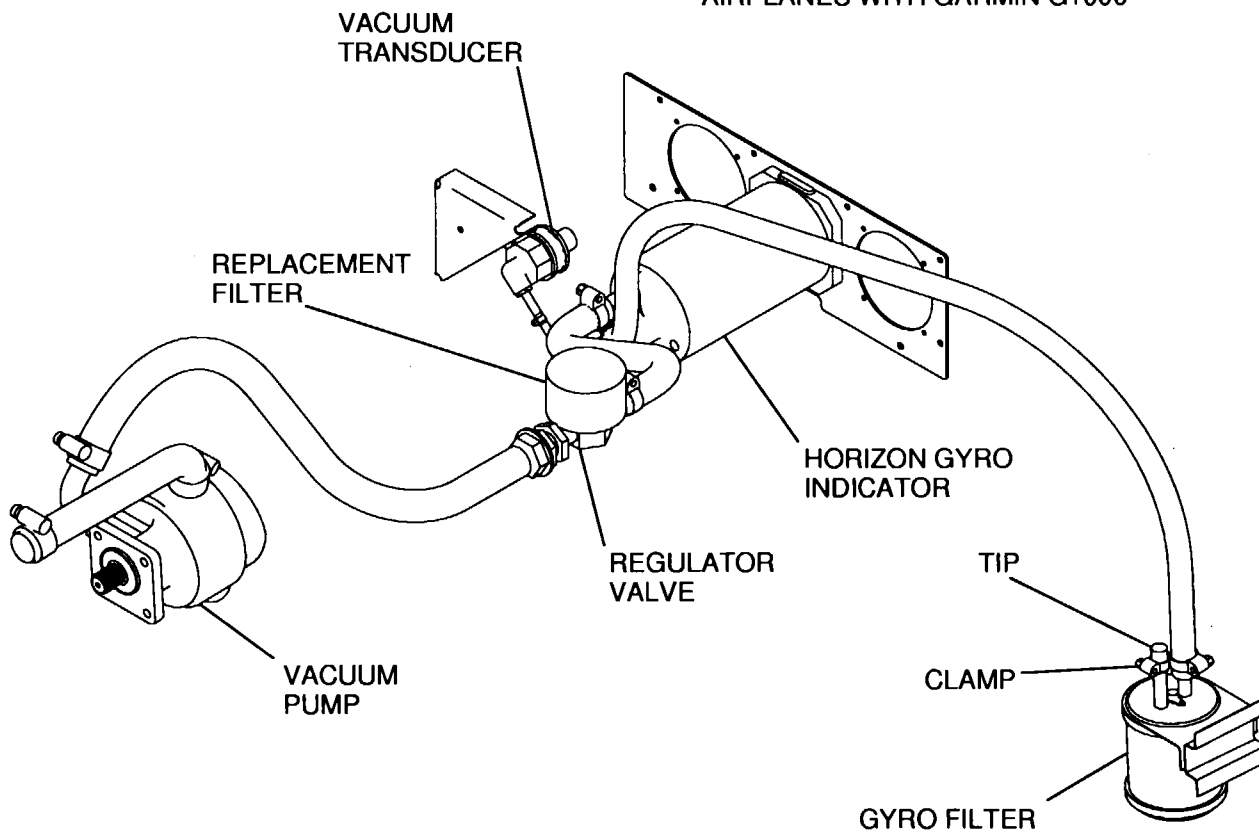
Vacuum System Installation  
 Figure 201 (Sheet 2)

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**VIEW A-A**  
AIRPLANES WITH GARMIN G1000



**DETAIL C**

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Vacuum System Installation  
Figure 201 (Sheet 3)



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**CAUTION:** Do not install a vacuum pump that has been dropped or shows that it was incorrectly held in a vise.

**CAUTION:** Do not use any cork type gaskets when the vacuum pump is installed.

**CAUTION:** Make sure all unwanted material is removed from the system. Foreign object debris will cause damage to the vacuum system components.

**CAUTION:** Hold the pump housing by the flange and protect the flange with soft material such as aluminum, copper, or wood if a vise is used. The pump housing must never be set in a vise with pressure applied across the center of the housing. The pressure will cause damage to the carbon rotor.

**CAUTION:** Do not use Teflon tape, pipe dope, or thread lubricants of any type. Particles of contamination will cause damage to the vacuum system components.

- (1) Put the vacuum pump in a jaw protected vise, with the drive coupling downward.
- (2) Tighten the elbow in the pump by hand.
- (3) Use only a box end wrench to tighten the fittings to the necessary position. Do not make more than 1.5 turns beyond the hand tight position
- (4) Make sure the pump and engine surfaces are clean and free of any old gasket material.
- (5) Set the new pad gasket on the studs of the engine.
- (6) Put the vacuum pump on the studs.
- (7) Attach the pump to the engine with the flat washers, new lock washers, and nuts.
- (8) Torque and tighten the nuts in a cross pattern to 70 inch-pounds, +10 or -10 inch-pounds (7.9 Nm, +1.1 or - 1.1 Nm).
  - (a) To torque the nuts, fabricate a torque wrench adapter (Refer to Figure 202).
    - 1 Weld a 3/8 inch drive to a 7/16 inch wrench with a 12 point cut out in the box end of the wrench.
    - 2 The wrench length must be 2.25 inches (57.15 mm) from the center of box end to the center of the drive.
- (9) Connect the hose to the inlet and the outlet ports of the vacuum pump.
- (10) Put the hose in position so that the exhaust from the vacuum pump is not pointed at the magnetos or the electrical wiring.
- (11) Install the cooling shroud.
- (12) Operate the engine and examine the indication on the vacuum gage. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
- (13) Adjust the indication on the vacuum gage, if necessary. Refer to the vacuum pressure adjustment/test.
- (14) Install the upper engine cowl. Refer to Chapter 71, Cowl - Removal/Installation.

### 3. Vacuum Manifold Removal/Installation

**NOTE:** Airplanes with Garmin G1000 do not have vacuum manifolds.

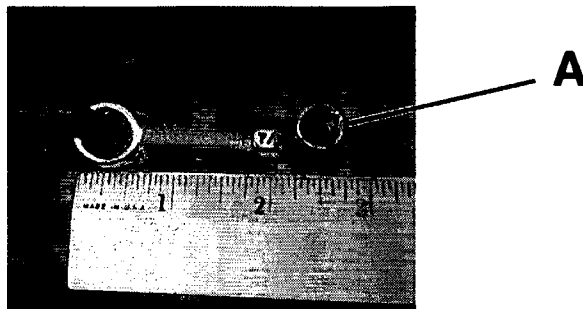
**NOTE:** Removal/Installation is typical for the vacuum manifolds.

#### A. Vacuum Manifold Removal (Refer to Figure 201).

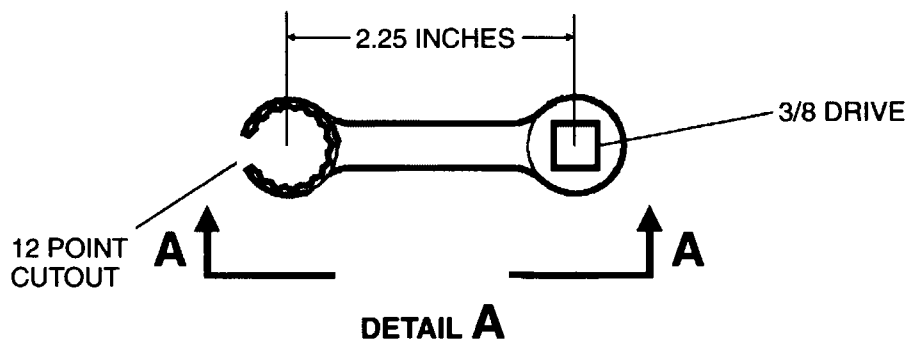
- (1) Remove the engine cowl. Refer to Chapter 71, Cowl - Removal/Installation.
- (2) Remove the hoses from the vacuum manifold.
- (3) Put a label on the applicable electrical connector (SN012 left, SN011 right).
- (4) Disconnect the applicable electrical connector from the vacuum manifold.

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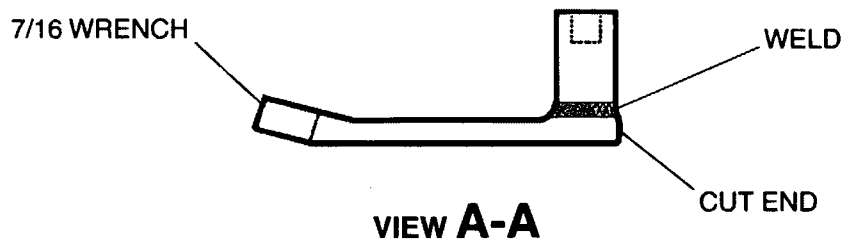
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FABRICATED TORQUE WRENCH  
 ADAPTOR



DETAIL A



Vacuum Pump Torque Wrench Adapter  
 Figure 202 (Sheet 1)

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- (5) Loosen the B-nut that attaches the vacuum manifold to the nipple in the firewall.
- (6) Remove the vacuum manifold from the airplane.

**B. Vacuum Manifold Installation (Refer to Figure 201).**

- (1) Attach the vacuum manifold to the nipple in the firewall and tighten the B-nut.
- (2) Connect the applicable electrical connector (SN012 left, SN011 right) to the vacuum manifold.
- (3) Connect the hoses to the vacuum manifold and attach with the clamps.
- (4) Install the upper engine cowl. Refer to Chapter 71, Cowl - Removal/Installation.

**4. Vacuum Regulator Filter Removal/Installation**

**A. Vacuum Regulator Filter Removal (Refer to Figure 201).**

- (1) Remove the pilot seat. Refer to Chapter 25, Front Seats - Maintenance Practices.
- (2) Remove the vacuum regulator filter.

**B. Vacuum Regulator Filter Installation (Refer to Figure 201).**

- (1) Install the vacuum regulator filter.
- (2) Install the pilot seat. Refer to Chapter 25, Front Seats - Maintenance Practices.

**5. Gyro Filter Removal/Installation**

**A. Gyro Filter Removal (Refer to Figure 201).**

- (1) Remove the bolt and the retainer from the mount and remove the gyro filter.

**B. Gyro Filter Installation (Refer to Figure 201).**

- (1) Put the gyro filter and the retainer on the mount and attach with the bolt.

**6. Vacuum Gage Removal/Installation**

**NOTE:** Airplanes with Garmin G1000 do not have a vacuum gage.

**NOTE:** The vacuum gage and ammeter operate together as a single instrument.

**A. Vacuum Gage Removal (Refer to Figure 201).**

- (1) Disconnect the vacuum and air hoses from the vacuum gage.
- (2) Disconnect the electrical connector (JI019) from the vacuum gage.
- (3) Remove the screws that attach the vacuum gage to the instrument panel and remove the vacuum gage.

**B. Vacuum Gage Installation (Refer to Figure 201).**

- (1) Install the vacuum gage in the instrument panel.
- (2) Attach with the screws.
- (3) Connect the electrical connector (JI019) to the vacuum gage.
- (4) Connect the vacuum and air hoses to the vacuum gage.

**7. Vacuum Transducer Removal/Installation**

**NOTE:** Only airplanes with the Garmin G1000 have a vacuum transducer.

**A. Vacuum Transducer Removal (Refer to Figure 201).**

- (1) Remove the center panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.
- (2) Remove the screw and clamp that hold the vacuum transducer in position.
- (3) Remove the vacuum transducer.

**B. Vacuum Transducer Installation (Refer to Figure 201).**

- (1) Install the vacuum transducer.
- (2) Install the screw and clamp that hold the vacuum transducer in position.
- (3) Install the center panel. Refer to Chapter 31, Instrument and Control Panels - Maintenance Practices.

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**8. Vacuum Manifold Test (For airplanes with the Parker Airborne manifold)**

- A. The vacuum manifold must be tested periodically to determine its condition and serviceability. Refer to Chapter 5, Inspection Time Limits for inspection intervals. Refer to Parker Hannifin Corporation/Airborne Division's Product Reference Memo #39 (or latest revision) for the procedures.

**9. Vacuum Pressure Adjustment/Test (For airplanes with the Parker Airborne regulator valve or the Aero Accessories regulator valve)**

**NOTE:** Before the adjustment procedure, the entire pneumatic system must be inspected and tested for leaks, restrictions, and unserviceable components. Failure to correct all system anomalies will lead to reduced dry air pump service life.

- A. Prepare the System for the Test (Refer to Figure 201).  
(1) Remove the gyro (central air) filter.
- B. Do a Check of the Regulator Valve.

**CAUTION:** Make sure that the temperature of the engine does not go above the maximum engine temperature during the adjustment/test of the regulator valve.

**NOTE:** At engine speeds between 1200 RPM and full throttle, suction must fall between 4.5 in.hg. and 5.5 in.hg. (green range on gage).

- (1) Start the engine, warm up to the normal operating temperature, and run at static RPM. Refer to Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
- (2) Make sure the suction gage indication does not go above 5.5 in.hg.
- (3) Run the engine at 1200 RPM and make sure the gage indication does not go below 4.5 in.hg.
- (4) If the suction indication falls outside of the range, shut down the engine and adjust the regulator valve in the steps that follow.
  - (a) Bend the locking tab upward on the lower surface of the regulator valve.

**CAUTION:** Be careful when you turn the adjustment screw. Do not turn it too much in either direction. When you turn it too much in either direction, damage can occur to the equipment.

- (b) Turn the adjustment screw on the lower surface of the regulator valve in the direction to increase or decrease the pressure as necessary.

**NOTE:** As you face the adjustment screw, when you turn it clockwise the pressure increases. When you turn it counterclockwise, the pressure decreases.

- (c) Tap the regulator after you adjust it to help reset the components.
    - (d) Bend the locking tab downward to keep the adjustment screw in place when the correct pressure has been set.
- (5) Run the engine at static RPM and make sure the gage indication does not go above 5.5 in.hg.
- (6) Run the engine at 1200 RPM and make sure the gage indication does not go below 4.5 in.hg.
- (7) Shut down the engine.
  - (a) For airplanes without the Garmin G1000, make sure that the L VAC R lights come on.
  - (b) For airplanes with the Garmin G1000, make sure that the low vacuum annunciator visual and aural warnings come on.
- (8) Attach the filter element to the gyro (central air) filter.
- (9) Before you start the engine, make sure that the low vacuum annunciators are on.
  - (a) For airplanes without the Garmin G1000, make sure that the L VAC R lights are on.
  - (b) For airplanes with the Garmin G1000, make sure that the low vacuum annunciator visual warning is on.

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- (10) Run the engine for a final time at static RPM and observe the indication on the suction gage.
  - (a) If the indication falls noticeably after the filter is installed, replace the filter.
- (11) Reduce the engine speed to 1200 RPM and make sure that the suction stays in the green range (does not fall below 4.5 in.hg.). and that the low vacuum annunciations are off.
  - (a) For airplanes without the Garmin G1000, make sure that the L VAC R lights go off.
  - (b) For airplanes with the Garmin G1000, make sure that the low vacuum annunciator visual and aural warnings go off.
- (12) Shut down the engine.

• **CHAPTER**

• **51**

• **STANDARD  
PRACTICES -  
STRUCTURES**

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**STRUCTURES - GENERAL**

**1. Scope**

- A. This chapter provides a description of general airplane structures and corrosion characteristics. For repair of structural members and repair techniques used throughout the airplane, refer to the Single Engine Models 172, 182, T182, 206, and T206 1996 and On Structural Repair Manual.

**2. Definition**

- A. This chapter is divided into two sections briefly described below.
- (1) The section on structures provides an overall description of the airplane structure and methods of construction used on the airplane.
  - (2) The section on corrosion provides a general description of corrosion characteristics, types of corrosion and typical corrosion areas.

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**STRUCTURES - DESCRIPTION AND OPERATION**

**1. Description**

- A. The fuselage is of semimonocoque construction and consists of three major sections: forward section, center section, and tailcone section. Construction consists of formed bulkheads, longitudinal stringers, reinforcing channels and skin. Frame members of the cabin section are constructed of formed bulkhead channels. Bulkheads are formed "U" channel sections. Principal material is 2024-0 alclad aluminum alloy which, after forming, is heat treated to a 2024-T42 condition and painted with epoxy primer. All bulkheads in the fuselage are constructed of formed sheet metal or reinforced sheet metal.
- B. The wings are of all-metal, strut-braced, semi monocoque construction, utilizing two spars. Each wing consists of an outer wing panel with an integral fuel bay, an aileron and a flap. Flanged upper and lower edges of all ribs serve as cap- strips, in addition to providing rigidity to the rib. The skin, riveted directly to each rib flange, provides the cellular strength for each successive rib bay. The nose, center, and trailing edge rib segments are riveted together through the front and rear spars to form the basic airfoil sections. Alclad stringers stiffen the skin between ribs. Spars are comprised of machine milled, tapered extrusions riveted to sheet metal webs.
- C. The full cantilever, all-metal tail group consists of a vertical stabilizer and rudder, and a horizontal stabilizer and elevators. The horizontal stabilizer is of one-piece construction, consisting of spars, ribs and skins. Elevators are constructed of aluminum spars, ribs and skin panels. The skin panels are riveted to ribs and spars. A balance weight is located in the outboard end of each elevator, forward of the hinge line. An elevator trim tab, attached to the elevator, is constructed of a spar, ribs, and skin; all riveted together. The vertical stabilizer is constructed of a forward spar, an aft spar, ribs and skin. The rudder is constructed of spars, ribs and skin panels. The rudder trim tab is constructed of a spar, ribs, and skin; all riveted together.
- D. The main landing gear is constructed of 6150 alloy spring steel tubing with attaching parts of high strength 7075-T73 aluminum alloy forgings. Nose gear components are 4130, 6150 alloy steel and 7075-T73 aluminum alloy forgings.
- E. The engine mount is constructed of welded 4130 steel tubing.
- F. The engine cowling consists of upper and lower formed aluminum sections. The upper section includes an oil inspection/filler door, and the lower section includes an air induction scoop with an engine induction system air filter. Both sections are removable.

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**CORROSION - DESCRIPTION AND OPERATION**

**1. General**

- A. This section describes corrosion so the maintenance technician can identify the various types of corrosion and apply preventative measures to minimize corrosion activity. For corrosion control and corrosion damage, refer to the Single Engine Structural Repair Manual 1996 and On.

**2. Characteristics of Corrosion**

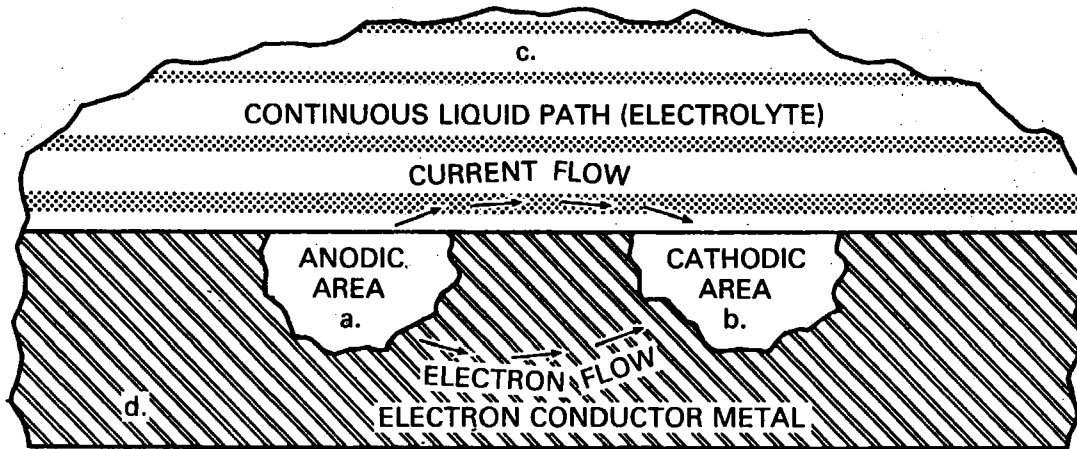
- A. Corrosion is a natural phenomenon which destroys metal by chemical or electrochemical action and converts it to a metallic compound, such as an oxide, hydroxide, or sulfate. All metals used in airplane construction are subject to corrosion. Attack may take place over an entire metal surface, if exposed, or it may be penetrating in nature, forming deep pits. It may follow grain boundaries or it may penetrate a surface at random. Corrosion may be accentuated by stresses from external loads or from lack of homogeneity in the metallic structure or from improper heat treatment. It is promoted by contact between dissimilar metals or with materials which absorb moisture, such as wood, rubber, felt, dirt, etc.
- (1) The following conditions must exist for electrochemical corrosion to occur. Refer to Figure 1 for an illustration of electrochemical corrosion.
    - (a) There must be a metal that corrodes and acts as the anode.
    - (b) There must be a less corrodible metal that acts as the cathode.
    - (c) There must be a continuous liquid path between the two metals which acts as the electrolyte, usually condensation and salt or other contamination.
    - (d) There must be a conductor to carry the flow of electrons from the cathode to the anode. This conductor is usually in the form of a metal-to-metal contact (rivets, bolts, welds, etc.)
  - (2) The elimination of any one of the four conditions described above will stop the corrosion reaction process.
  - (3) One of the best ways to eliminate one of the four described conditions is to apply an organic film (such as paint, grease, plastic, etc.) to the surface of the metal affected. This will prevent the electrolyte from connecting the cathode to the anode, and current cannot flow, therefore, preventing corrosion reaction. Refer to Figure 1 for a typical organic film application.
  - (4) At normal atmospheric temperatures, metals do not corrode appreciably without moisture, but the moisture in the air is usually enough to start corrosive action.
  - (5) The initial rate of corrosion is usually much greater than the rate after a short period of time. This slowing down occurs because of the oxide film that forms on the metal's surface. This film tends to protect the metal underneath.
  - (6) When components and systems constructed of many different types of metals must perform under various climatic conditions, corrosion becomes a complex problem. Salt on metal surfaces (from sea coast operation) greatly increases the electrical conductivity of any moisture present and accelerates corrosion.
  - (7) Other environmental conditions which contribute to corrosion are:
    - (a) Moisture collecting on dirt particles.
    - (b) Moisture collecting in crevices between lap joints, around rivets, bolts and screws.

**3. Types of Corrosion**

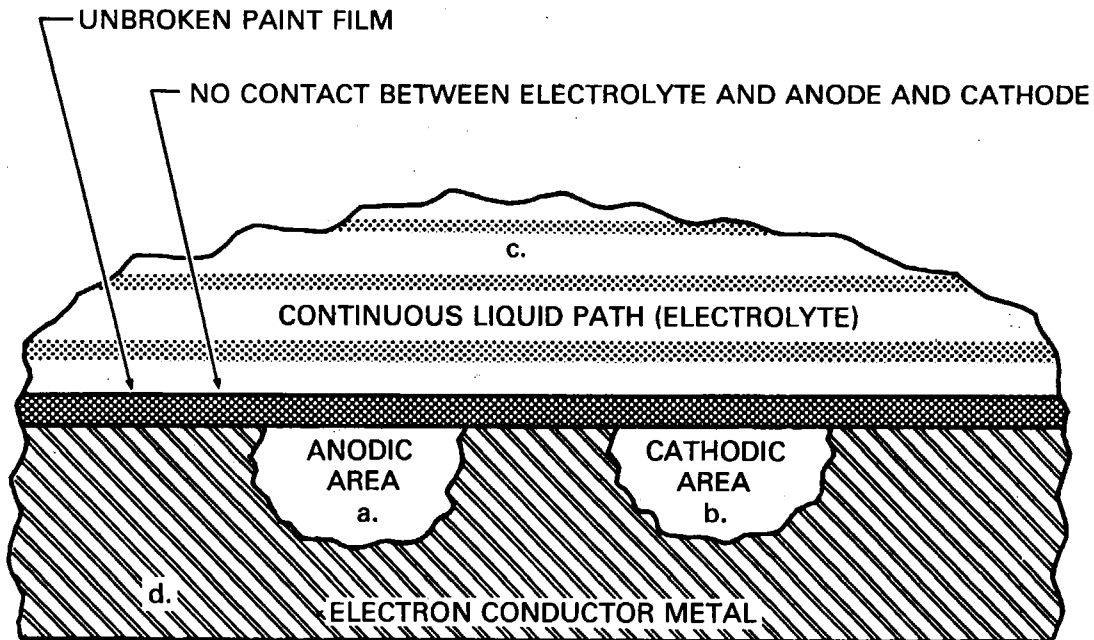
- A. Corrosion Types.
- (1) Direct Surface Attack - The most common type of general surface corrosion results from direct reaction of a metal surface with oxygen in the atmosphere. Unless properly protected, steel will rust and aluminum and magnesium will form oxides. The attack may be accelerated by salt spray or salt-bearing air, by industrial gases or by engine exhaust gases.
  - (2) Pitting - While pitting can occur in any metal, it is particularly characteristic of passive materials, such as the alloys of aluminum, nickel and chromium. It is first noticeable as a white or gray powdery deposit similar to dust, which blotches the surface. When the deposits are cleaned away, tiny pits can be seen in the surface.
  - (3) Dissimilar Metal Corrosion - When two dissimilar metals are in contact and are connected by an electrolyte (continuous liquid or gas path), accelerated corrosion of one of the metals occurs. The most easily oxidized surface becomes the anode and corrodes. The less active member

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SIMPLIFIED CORROSION CELL



CORROSION ELIMINATION BY APPLICATION OF ORGANIC FILM

2682T1017

Corrosion Identification  
Figure 1 (Sheet 1)

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of the couple becomes the cathode of the galvanic cell. The degree of attack depends on the relative activity of the two surfaces; the greater the difference in activity the more severe the corrosion. Relative activity in descending order is as follows:

- (a) Magnesium and its alloys.
  - (b) Aluminum alloys 1100, 3003, 5052, 6061, 220, 355, 356, cadmium and zinc.
  - (c) Aluminum alloys 2014, 2017, 2024, 7075 and 195.
  - (d) Iron, lead and their alloys (except stainless steel).
  - (e) Stainless steels, titanium, chromium, nickel, copper, and their alloys.
  - (f) Graphite (including dry film lubricants containing graphite).
- (4) Intergranular Corrosion - Selective attack along the grain boundaries in metal alloys is referred to as intergranular corrosion. It results from lack of uniformity in the alloy structure. It is particularly characteristic of precipitation hardened alloys of aluminum and some stainless steels. Aluminum extrusions and forgings in general may contain nonuniform areas, which in turn may result in galvanic attack along the grain boundaries. When attack is well advanced, the metal may blister or delaminate, which is referred to as 'exfoliation'.
- (5) Stress Corrosion - This results from the combined effect of static tensile stresses applied to a surface over a period of time. In general, cracking susceptibility increases with stress, particularly at stresses approaching the yield point, and with increasing temperature, exposure time and concentration of corrosive ingredients in the surrounding environment. Examples of parts which are susceptible to stress corrosion cracking are aluminum alloy bell cranks employing pressed-in taper pins, landing gear shock struts with pipe thread-type grease fittings, clevis joints and shrink fits.
- (6) Corrosion Fatigue - This is a type of stress corrosion resulting from the cyclic stresses on a metal in corrosive surroundings. Corrosion may start at the bottom of a shallow pit in the stressed area. Once attack begins, the continuous flexing prevents repair of protective surface coating or oxide films and additional corrosion takes place in the area of stress.

#### 4. Typical Corrosion Areas

A. This section lists typical areas of the airplane which are susceptible to corrosion. These areas should be carefully inspected at periodic intervals to detect corrosion as early as possible.

- (1) Engine Exhaust Trail Areas.
  - (a) Gaps, seams and fairings on the lower right side of the fuselage, aft of the engine exhaust stack, are typical areas where deposits may be trapped and not reached by normal cleaning methods.
  - (b) Around rivet heads, skin laps and inspection covers on the airplane lower fuselage, aft of the engine secondary exhaust stack, should be carefully cleaned and inspected.
- (2) Battery Box and Battery Vent Opening.
  - (a) The battery, battery cover, battery box and adjacent areas, especially areas below the battery box where battery electrolyte may have seeped, are particularly subject to corrosive action. If spilled battery electrolyte is neutralized and cleaned up at the same time of spillage, corrosion can be held to a minimum by using a weak boric acid solution to neutralize the battery electrolyte (ni-cad battery) or baking soda solution to neutralize the lead acid-type battery electrolyte. If boric acid or baking soda is not available, flood the area with water.
- (3) Steel Control Cables (including Stainless Steel).
  - (a) Checking for corrosion on control cables is normally accomplished during the preventative maintenance check. During preventative maintenance, broken wires and wear of the control cables are also checked.
  - (b) If the surface of the cable is corroded, carefully force the cable open by reverse twisting and visually inspect the interior. Corrosion on the interior strands of the cable constitutes failure and the cable must be replaced. If no internal corrosion is detected, remove loose external rust and corrosion with a clean, dry, coarse-weave rag or fiber brush.

**NOTE:** Do not use metallic wools or solvents to clean installed cables. Use of metallic wool will embed dissimilar metal particles in the cables and create further corrosion. Solvents will remove internal cable lubricant, allowing cable strands to abrade and further corrode.

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- (c) After thorough cleaning of the exterior cable surface, apply a light coat of lubricant (VV-L-800) to the external cable surface.
- (4) Internal Fuel Tanks.
  - (a) The presence of soil contamination (a brown slimy substance) and pitting-type corrosion may occur in the lower areas of the integral fuel tanks of certain airplanes. This condition can cause a general degradation of some top coating and some depolymerization and loosening of sealant materials in lower areas.
  - (b) The contaminants resemble normal aluminum corrosion products, including a considerable quantity of iron. The brown, slimy deposits are microbial in nature. Examination of the corrosion pits by metallurgical techniques indicate the presence of intergranular attacks.

## 5. Corrosion Detection

- A. Corrosion Defoliation. The primary means of corrosion detection is visual, but in situations where visual inspection is not feasible, other techniques must be used. The use of liquid dye penetrant, magnetic particle, X-ray and ultra-sonic devices can be used, but most of these sophisticated techniques are intended for the detection of physical flaws within metal objects, rather than the detection of corrosion.
- (1) Visual Inspection. A visual check of the metal surface can reveal the signs of corrosive attack, the most obvious of which is a corrosive deposit. Corrosion deposits of aluminum or magnesium are generally a white or grayish-white powder, while the color of ferrous compounds varies from red to dark reddish-brown.
    - (a) The indications of corrosive attack are small, localized discolorations of the metal surface. Surfaces protected by paint or plating may only exhibit indications of more advanced corrosive attack by the presence of blisters or bulges in the protective film. Bulges in lap joints are indications of corrosive build-up which is well advanced.
    - (b) In many cases the inspection area is obscured by structural members, equipment installations or, for other reasons, are awkward to check visually. In such cases, mirrors, borescope or similar devices can be used to inspect the obscured areas. Any means which allows a thorough inspection can be used. Magnifying glasses are valuable aids for determining whether or not all corrosive products have been removed during clean up operations.
  - (2) Liquid Dye Penetrant Inspection. Inspection for large stress-corrosion or corrosion fatigue cracks on nonporous or nonferrous metals may be accomplished using dye penetrant processes. The dye applied to a clean metallic surface will enter small openings or cracks by capillary action. After the dye has an opportunity to be absorbed by any surface discontinuity, the excess dye is removed and a developer is applied to the surface. The developer acts like a blotter and draws the dye from cracks or fissures back to the surface, giving visible indication of any fault that is present on the surface. The magnitude of the fault is indicated by the quantity of dye brought back to the surface by the developer.

## 6. Corrosion Damage Limits

- A. Following cleaning and inspection of the corroded area, the actual extent of the damage may be evaluated using the following general guidelines and good, sound maintenance judgement. Determine the degree of corrosion damage (light, moderate, or severe) with a dial-type depth gage, if accessibility permits. If the area is inaccessible, clay impressions, or any other means which will give accurate results, should be used. In the event the corrosion damage is severe, contact Cessna Propeller Aircraft Product Support for assistance.
- (1) Light Corrosion - Characterized by discoloration or pitting to a depth of approximately 0.001 inch maximum. This type of damage is normally removed by light hand-sanding or a minimum of chemical treatment.
  - (2) Moderate Corrosion - Appears similar to light corrosion except there may be blistering or some evidence of scaling or flaking. Pitting depths may be as deep as 0.010 inch. This type of damage is normally removed by extensive hand-sanding or mechanical sanding.
  - (3) Severe Corrosion - General appearance may be similar to moderate corrosion with severe blistering exfoliation and scaling or flaking. Pitting depths may be as deep as 0.10 inch. This type of damage is normally removed by extensive mechanical sanding or grinding (if not complete part replacement).

**CHAPTER**

**52**

**DOORS**



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**DOORS - GENERAL**

**1. Scope**

- A. This chapter provides maintenance information on doors. Provided are removal/installation instructions and rigging procedures.

**2. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. The following is a brief description of each section. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.
- (1) The cabin door section provides information on removal/installation and rigging of the doors.
  - (2) The baggage door section provides information on removal/installation.

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**CABIN DOORS - DESCRIPTION AND OPERATION**

**1. Description**

- A. A cabin door is installed on each side of the airplane. Each door has an outer sheet skin that is chemically bonded to an inner pan assembly. Each door has a latch assembly, an inside handle, a pair of external hinges, and a doorstop assembly.

**2. Operation**

- A. The cabin doors open by the inside or outside handle, that is connected to internal components.
- (1) The cabin door latch is a two-part assembly latch base, external handle, spring-loaded latch bolt and pull-bar assembly, and a spring-loaded catch pin assembly. The interior handle base plate assembly is directly connected to the cabin door latch by an adjustable push rod assembly. This push rod assembly has two clamps attached 180 degrees apart on the main rod. These clamps operate a cable assembly that moves a cable pin from the top aft end of the cabin door into the aft top door sill.
  - (2) The door latch exterior handle is extended when the cabin door is open. The handle is held in position by the spring-loaded latch catch engaged with the latch bolt through the hole in the bolt. The push rod assembly will move forward. The attached cable assembly will be retracted from the top door sill with the cable pin in a recess in the pin guide. The interior handle will move approximately 15 degrees aft of the vertical position.
- B. The cabin doors close and latch by the internal or external handle connected with internal components.
- (1) The cabin door moves the catch pin over the actuator attached to the cover plate. The cover plate is on the rear door post. The catch pin disengages the latch catch from the latch bolt as the catch pin is moved forward. The latch handle extends and the pull-bar assembly compresses. The latch handle is pulled in and the latch bolt is moved on the latch striker. The latch striker is on the rear door post.
  - (2) The push rod assembly moves aft and moves the cable pin from the pin guide in the door into the top aft door sill receptacle when the exterior handle is pushed flush with the fuselage skin. The interior door handle has moved from approximately 15 degrees aft of the vertical position to approximately 45 degrees forward of the vertical position. The interior handle pushed to the horizontal position, flush with the armrest, will overcenter the door latch.
- C. The cabin doors have a key lock.
- (1) The key lock turns and moves the pin into the exterior latch handle when the cabin door is closed and the exterior latch handle is flush.

**NOTE:** It is possible to lock the cabin door when the exterior handle is used and the push rod assembly is not adjusted correctly. The rigging and adjustment procedures must be used to correctly adjust the push rod.

- (2) An optional Medeco lock is installed on the cabin doors on some airplanes.

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**CABIN DOORS - MAINTENANCE PRACTICES**

**1. General**

- A. The cabin door maintenance practices give procedures for the removal and installation of the cabin doors, weatherstrip, locks, latches, handles, and cable assemblies.
- B. The cabin door maintenance practices also give procedures for the adjustment and the test of the cabin door, latch cable, and inside handle.

**2. Cabin Door Removal/Installation**

**NOTE:** The removal and installation procedures given are for the pilot's door. The procedures for the copilot's door are typical.

- A. Cabin Door Removal (Refer to Figure 201).
  - (1) Open the cabin door.
  - (2) Remove the nut, screw, and spacers from the stop fitting.
  - (3) Remove the nuts and screws that attach the hinges to the fuselage structure.
  - (4) Remove the cabin door from the airplane.
- B. Cabin Door Installation (Refer to Figure 201).
  - (1) Put the cabin door in position and attach the door with the screws and nuts.
  - (2) Install the screw, spacers, and nut on the stop fitting.
  - (3) Close and latch the cabin door.
  - (4) Make sure the cabin door is correctly adjusted. Refer to Cabin Door Adjustment/Test.

**3. Cabin Door Weatherstrip Removal/Installation**

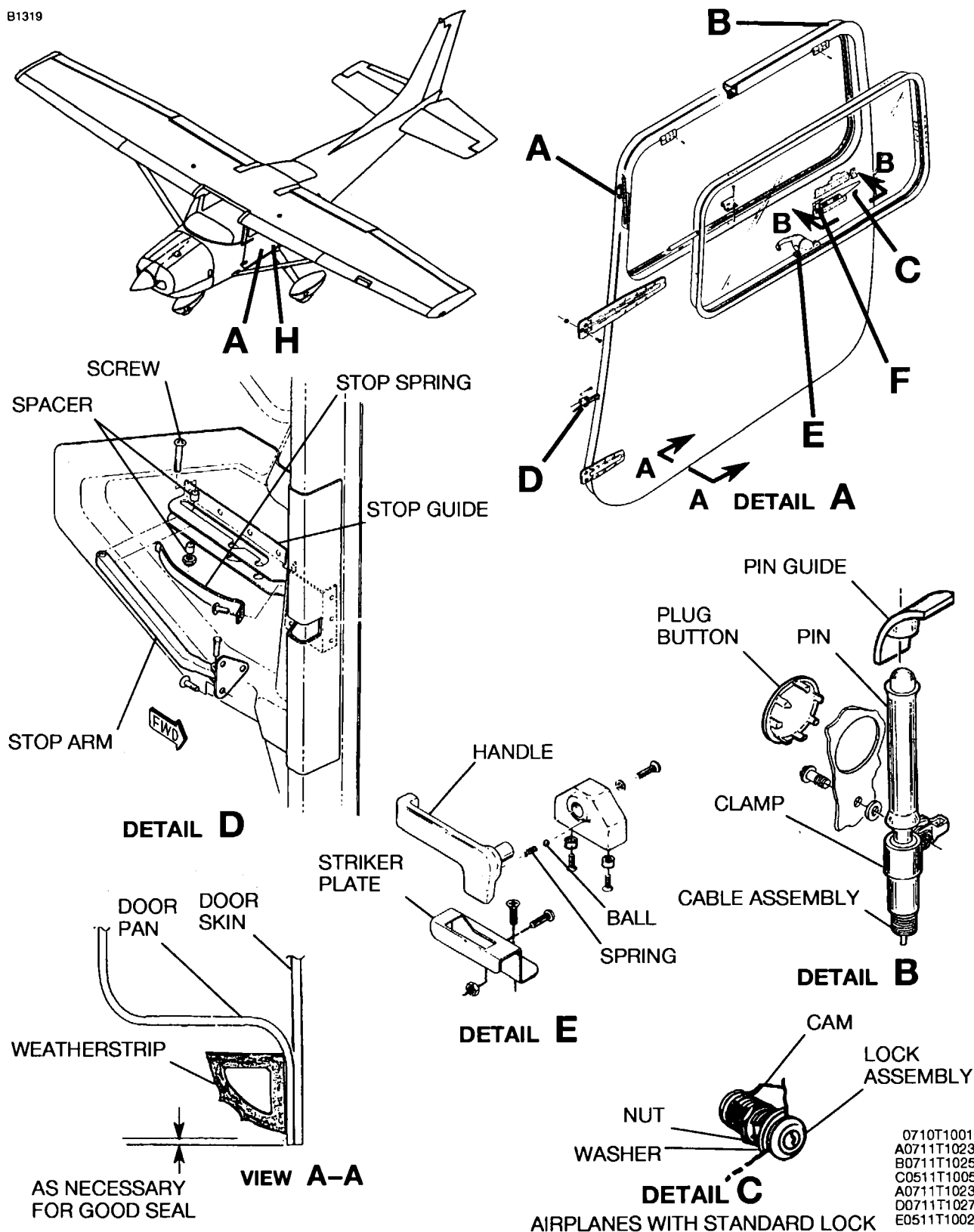
- A. Cabin Door Weatherstrip Removal (Refer to Figure 201).
  - (1) Use a nonmetallic scraper to remove the weatherstrip and adhesive from the door assembly.
  - (2) Use solvent to remove all remaining adhesive from the door surface.
- B. Cabin Door Weatherstrip Installation (Refer to Figure 201).
  - (1) Cut the new weatherstrip to the correct length with the used weatherstrip as a template.
  - (2) Cut a small notch in the butt ends of the new weatherstrip to let water drain.
  - (3) Put the weatherstrip in position with the notches at the door low point.
  - (4) Apply a thin, smooth layer of EC-1300L, or equivalent adhesive to the two surfaces.
  - (5) Let the adhesive dry until it is tacky.
  - (6) Push the weatherstrip in position.
  - (7) Do not stretch the weatherstrip around the door corners.

**4. Cabin Door Latch Lock Removal/Installation**

- A. Cabin Door Latch Lock Removal (Refer to Figure 201).
  - (1) Remove the cam from the latching side of the locking arm.
  - (2) Remove the washers between the cam and the locking arm.
  - (3) Remove the locking arm pin from the locking arm and the catch base assembly.
- B. Cabin Door Latch Lock Installation (Refer to Figure 201).
  - (1) Assemble the locking arm with the locking arm pin.
    - (a) Put one washer on each side of the locking arm.
    - (b) Swage the locking arm pin so there is minimum movement between the parts.
    - (c) Cut the unwanted material from the pin.
  - (2) Put the locking arm pin into the 0.125 inch (3.2 mm) diameter hole at the catch base assembly.
  - (3) Align the hole in the locking arm with the hole in the latch base assembly and install the pin.
  - (4) Put three washers between the cam and the locking arm.
  - (5) Attach the cam to the latch side of the locking arm.

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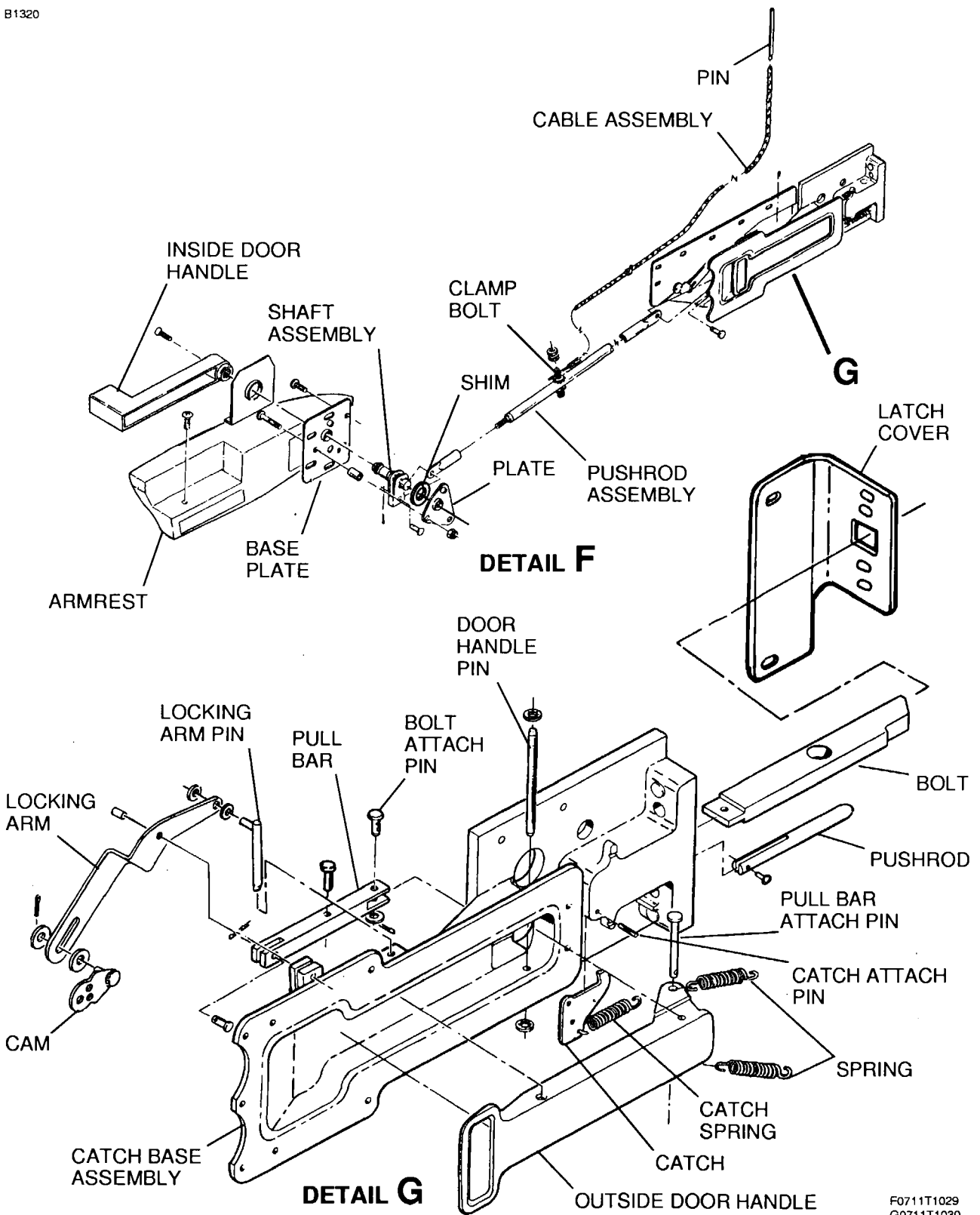
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Cabin Door Installation  
 Figure 201 (Sheet 1)

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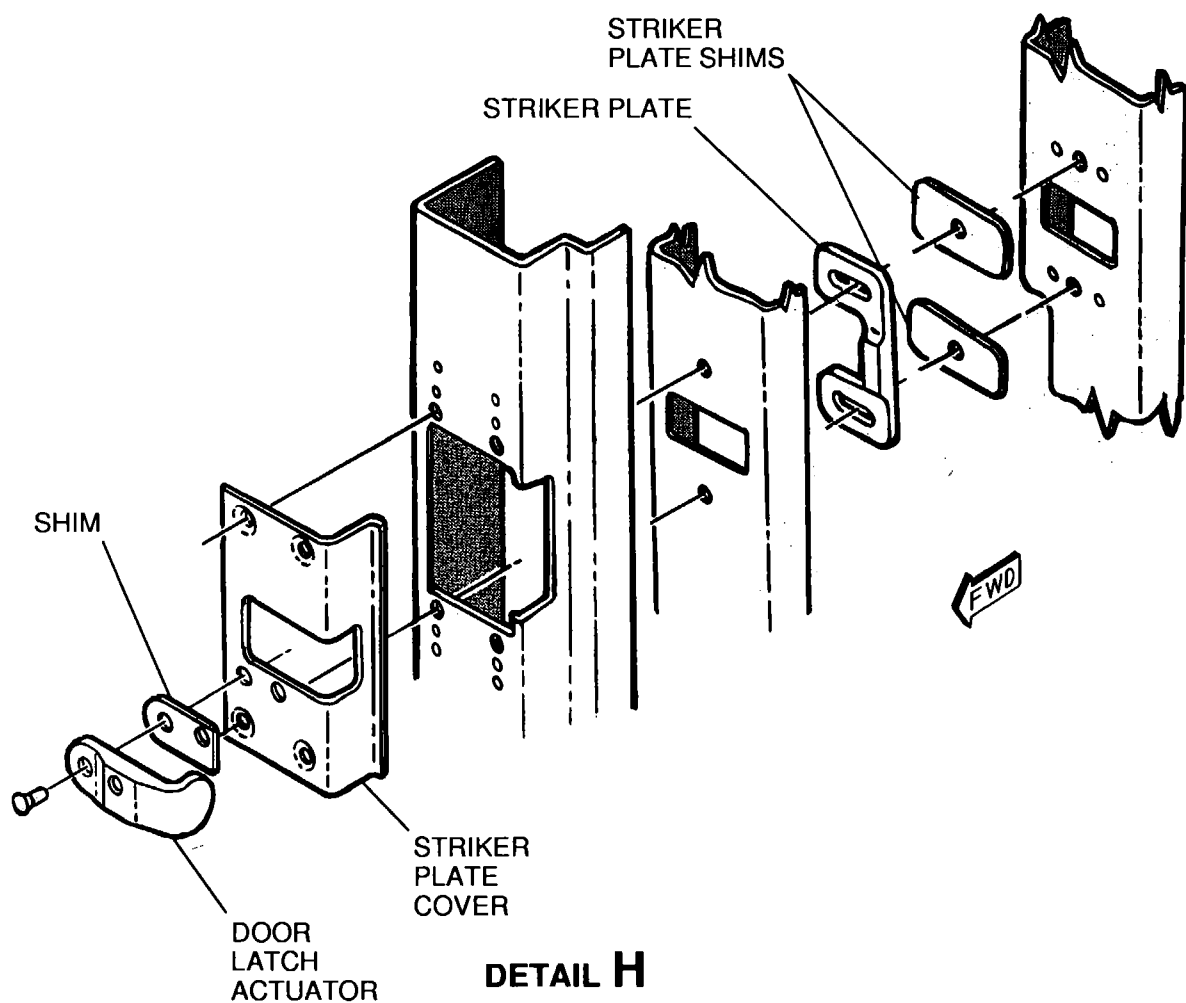
Cabin Door Installation  
 Figure 201 (Sheet 2)

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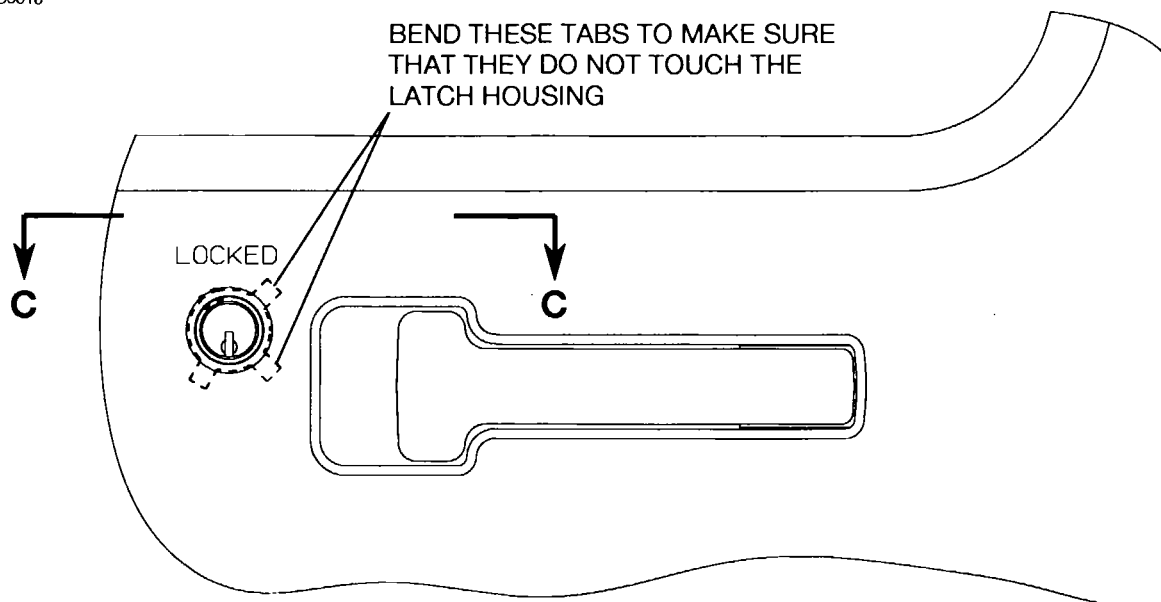


Cabin Door Installation  
Figure 201 (Sheet 3)

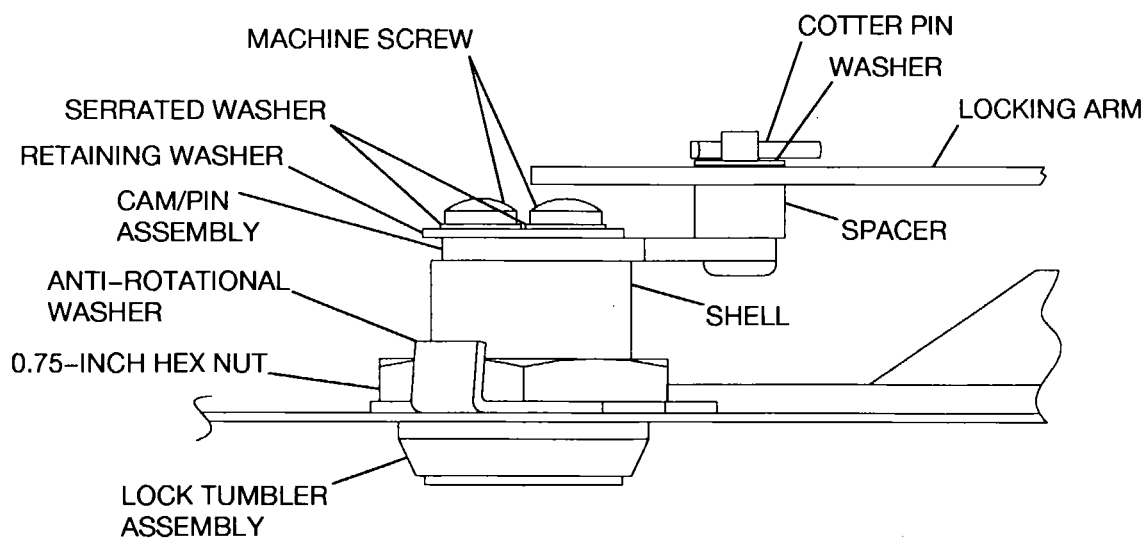
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**VIEW B-B**  
 AIRPLANES WITH MEDECO LOCK



**VIEW C-C**  
 LOCK SHOWN IN UNLOCKED POSITION

Cabin Door Installation  
 Figure 201 (Sheet 4)

BB1211T1038  
 CC1211T1038

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**5. Cabin Door Latch Assembly Removal/Installation**

- A. Cabin Door Latch Assembly Removal (Refer to Figure 201).
- (1) Remove the cabin door lock assembly. Refer to Cabin Door Lock Assembly Removal/Installation.
  - (2) Remove the rivets that attach the latch base to the door skin.
  - (3) Remove the screws that attach the latch to the door pan.
  - (4) Remove the pushrod and bolt.
  - (5) Pull the latch handle through the cutout in the door skin.
  - (6) Remove the latch assembly from the airplane.
- B. Cabin Door Latch Assembly Installation (Refer to Figure 201).
- (1) Put the latch assembly in the closed position between the door pan and the door skin.
  - (2) Make sure the cable assembly is forward of the latch base attach plate, and inboard of latch base cup.
  - (3) Extend the latch handle through the cutout in the door skin.
  - (4) Push the latch assembly aft so the bolt and pushrod extend through their related holes.
  - (5) Release the pushrod so the bolt is fully extended and the handle is flush.
  - (6) Attach the latch to the door pan with the screws through the base assembly and through the aft flange of the door pan.
  - (7) Make sure the door skin dimension around the latch assembly is correct.

**CAUTION:** Do not make the holes oversize in the latch base.

- (8) Drill eleven 0.128 inch (3.25 mm) diameter holes that align with the latch base.
- (9) Make sure the cabin door latch cable assembly rigging and the cabin door inside handle rigging is done before the latch base is attached to the skin. Refer to Cabin Door Latch Cable Assembly Adjustment/Test and Cabin Door Inside Handle Rigging.
- (10) Attach the latch base to the door skin with rivets.
- (11) Install the cabin door lock assembly. Refer to Cabin Door Lock Assembly Removal/Installation.

**6. Cabin Door Latch Cable Assembly Installation**

- A. Cabin Door Latch Cable Assembly Removal (Refer to Figure 201).
- (1) Remove the screw and clamp that attach the cable assembly to the door.
  - (2) Remove the plug button.
  - (3) Remove the pin from the pin guide.
  - (4) Pull the pin end of the cable from the top of the door.
  - (5) Remove the nut and clamp from the opposite end of the cable casing.
  - (6) Remove the cable assembly from the door.
- B. Cabin Door Latch Cable Assembly Installation (Refer to Figure 201).
- (1) Attach the clamp and nut one inch (25 mm) from the end of the cable casing on the pin end of the cable assembly.
  - (2) Put the pin end of the cable between the door pan and the door skin at the aft end of the door.
  - (3) Push the pin end of the cable to the top of the door.
  - (4) Remove the plug button and align the pin of the cable with the pin guide.
  - (5) Put the pin through the pin guide.
  - (6) Align the clamp on the cable casing through the hole that is below the 0.875 inch (22.22 mm) access hole.
  - (7) Install the screw.
  - (8) Make sure the cable operates freely.
    - (a) Add washers as necessary if the cable does not operate freely.
  - (9) Do the cabin door latch cable assembly rigging. Refer to Cabin Door Latch Cable Assembly Rigging.

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**7. Cabin Door Lock Assembly Removal/Installation (On airplanes with standard locks)**

- A. Cabin Door Lock Assembly Removal (Refer to Figure 201).
  - (1) Remove the lower door accent panel and main door panel to get access to the cabin door lock assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the armrest door plugs, door panel insert at the armrest, armrest, door handle and cover plate from the door to get access to the cabin door lock assembly.
  - (3) Remove the nut and washer.
  - (4) Remove the cabin door lock assembly.
- B. Cabin Door Lock Assembly Installation (Refer to Figure 201).
  - (1) Put the cabin door lock assembly in position.
  - (2) Install the washer and nut.
  - (3) Install the armrest door plugs, door panel insert at the armrest, armrest, door handle and cover plate.
  - (4) Install the lower door accent panel and main door panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**8. Cabin Door Lock Assembly Removal/Installation (On airplanes with Medeco locks)**

- A. Cabin Door Lock Assembly Removal (Refer to Figure 201).
  - (1) Remove the lower door accent panel and main door panel to get access to the cabin door lock assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the armrest door plugs, door panel insert, armrest, door handle, and cover plate from the door to get access to the cabin door lock assembly.
  - (3) Remove the cotter pin, washer, locking arm, and spacer from the lock assembly.
  - (4) Remove the hex nut and the anti-rotational washer that attach the lock tumbler assembly to the door structure and the cam assembly.
  - (5) Remove the lock assembly from the door.
- B. Cabin Door Lock Assembly Installation (Refer to Figure 201).
  - (1) Put the cabin door lock assembly in position on the cabin door.
  - (2) Install the hex nut and the anti-rotational washer that attach the lock tumbler assembly to the door structure and the cam assembly. Install the anti-rotational washer under the hex nut.
  - (3) Torque the nut.
  - (4) Bend the applicable tab on the anti-rotational washer against the flat part of the nut.
  - (5) Install the spacer, locking arm, washer, and cotter pin that connect the lock assembly to the door handle.
  - (6) Bend the applicable tabs on the cam-pin assembly to make sure that they do not touch the latch housing.
  - (7) Install the armrest door plugs, door panel insert, armrest, door handle, and cover plate.
  - (8) Install the lower door accent panel and main door panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**9. Cabin Door Lock Cam Assembly Removal/Installation (On airplanes with standard locks)**

- A. Cabin Door Lock Cam Assembly Removal (Refer to Figure 201).
  - (1) Remove the lower door accent panel and main door panel to get access to the cabin door lock cam assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the armrest door plugs, door panel insert at the armrest, armrest, door handle, and cover plate from the door to get access to the cabin door lock cam assembly.
  - (3) Remove the cam stop screw from the cabin door lock cam assembly.
  - (4) Remove the cam assembly.
- B. Cabin Door Lock Cam Assembly Installation (Refer to Figure 201).
  - (1) Put the cam assembly in position.
  - (2) Install the cam stop screw with Loctite 242.
  - (3) Install the armrest door plugs, door panel insert at the armrest, armrest, door handle, and cover plate.

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- (4) Install the lower door accent panel and main door panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**10. Cabin Door Lock Cam Assembly Removal/Installation (On airplanes with Medeco locks)**

- A. Cabin Door Lock Cam Assembly Removal (Refer to Figure 201).
  - (1) Remove the lower door accent panel and main door panel to get access to the cabin door lock cam assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the armrest door plugs, door panel insert, armrest, door handle, and cover plate from the door to get access to the cabin door lock cam assembly.
  - (3) Remove the machine screws, serrated washers, and retaining washer from the cabin door lock cam assembly.
  - (4) Remove the cam assembly.
- B. Cabin Door Lock Cam Assembly Installation (Refer to Figure 201).
  - (1) Put the cam assembly in position.
  - (2) Install the machine screws, serrated washers, and retaining washer that attach the cam assembly to the cabin door lock. Install the machine screws with Loctite 242.
  - (3) Install the armrest door plugs, door panel insert, armrest, door handle, and cover plate.
  - (4) Install the lower door accent panel and the main door panel. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**11. Cabin Door Adjustment/Test**

- A. Adjust the new cabin doors.

**CAUTION:** Do not adjust the bonded door flange or the airplane structure with force. The bonded areas and the structural components can be damaged.

- (1) Trim the door flange as necessary to get a gap between the door skin and fuselage skin of 0.09 inch (2.3 mm) or less.
- B. Adjust the cabin doors.

**NOTE:** The cabin doors must be smooth with the fuselage skin.

- (1) Use the slots at the door latch plate to adjust the latch assembly and the bolt engagement with the rotary clutch on the door post.

**12. Cabin Door Latch Cable Assembly Rigging**

- A. Do the Cabin Door Latch Cable Assembly Rigging (Refer to Figure 201).
  - (1) Pull the cable tight.
  - (2) Attach the clamp and the nut to the cable so it aligns with the 0.193 inch (4.9 mm) diameter hole in the door pan.
  - (3) Make sure the door latch is open.
  - (4) Cut the casing of the cable assembly approximately two inches (50 mm) from the clamp bolt on the push rod assembly.
  - (5) Put the core of the cable through the clamp.
  - (6) Pull the core of the cable through the clamp bolt so the pin extends approximately 0.125 inch (3.2 mm) from the door pan contour.
  - (7) Cut the core of the cable approximately one inch (25 mm) forward of the push rod clamp.
  - (8) Attach the two nuts to the push rod clamp bolt.
  - (9) Make sure the latch operates freely.
    - (a) If the latch binds up and will not operate freely, remove the cable core from the clamp and operate the latch.
    - (b) Do a check of the cable for possible adjustments that will make the latch operate correctly.
  - (10) Install the cover assembly.

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- (11) Do another cable operational check.

**13. Cabin Door Inside Handle Rigging**

- A. Do the Cabin Door Inside Handle Rigging (Refer to Figure 201).
- (1) Attach the pushrod assembly to the pull bar and attach it with the pin while the latch is attached to the door pan.
  - (2) Do not install the cotter pin.
  - (3) Make sure the latch is in the closed position.
  - (4) Remove the pin that connects the push-pull rod to the latch base assembly.
  - (5) Adjust the rod so a load of 6 to 12 pounds (2.7 to 5.4 kilograms) is necessary at the end of the inner handle to move it from the closed position to the over center position.

**NOTE:** The rod can be turned in or out 180 degree to make the applicable adjustments.

**NOTE:** The rod must be attached to the latch assembly before the cabin door inside handle rigging can be done.

**14. Latch Assembly Adjustment/Test**

- A. Do the adjustment of the latch assembly. (Refer to Figure 201).
- (1) Make sure the cabin door is installed and fitted to the fuselage before the adjustment/test can be done.
  - (2) Make sure the cabin door latch is in the OPEN position before the adjustment/test can be done.
  - (3) Make sure the door latch operates smoothly and freely.
  - (4) Make sure the bolt or pull bar are not filed, ground, or sanded in any way.

**NOTE:** A noise can be heard when the inside handle is pushed down. It is recommended that the outside door handle be flush with the door skin, although the noise is heard.

- (5) Install shims to adjust the striker plate forward to give a minimal clearance between the bolt and the striker plate.

**NOTE:** This adjustment will make sure that the pushrod will engage the latch catch. It will also make sure the exterior handle will stay open until the door is closed again when the door is opened from the outside.

- (6) Install shims as necessary below the actuator on the cover assembly.

**NOTE:** If the cabin door is too far forward, the door latch will not operate correctly because the latch assembly pushrod will not cause the bolt to move.

- (7) Close the cabin door from inside the airplane.
- (8) Make sure the exterior handle is flush with the door skin when you close the door.
  - (a) If the exterior handle is not flush with the door skin when the door is closed, adjust the push-pull rod out.
    - 1 Remove the screws and the nuts that attach the base plate to the door.
    - 2 Remove the smaller end of the push-pull rod and turn it 180 degrees.
    - 3 Install the screws and nuts that attach the base plate.
- (9) Do a check for slippage between the cable casing and the clamps that attach the cable.
- (10) Install the cotter pin in the clevis pin.

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**BAGGAGE DOOR - MAINTENANCE PRACTICES**

**1. General**

- A. A baggage door is installed on the left side of the airplane, aft of the cabin door. The baggage door allows access into the baggage area and into the tailcone.
- B. A rubber weatherstrip is cemented around the edge of the doorsill.
- C. An optional Medeco lock is installed on the baggage door on some airplanes.

**2. Baggage Door Removal/Installation**

- A. Baggage Door Removal (Refer to Figure 201).
  - (1) Open the baggage door.
  - (2) Disconnect the doorstop chain.
  - (3) Remove the upholstery panel from the door.
  - (4) Remove the bolts that attach the door to the hinges.
- B. Baggage Door Installation (Refer to Figure 201).
  - (1) Put the baggage door in position on the hinges and attach it with the bolts.
  - (2) Install the upholstery panel to the door.
  - (3) Connect the door stop chain.
  - (4) Close the baggage door and do a check for smooth operation.

**3. Baggage Door Weatherstrip Removal/Installation**

- A. Baggage Door Weatherstrip Removal (Refer to Figure 201).
  - (1) Remove the baggage door.
  - (2) With a nonmetallic scraper, remove the seal and its adhesive from the doorsill.
  - (3) Remove the adhesive residue and clean the doorsill area with DeSoclean 110 Solvent.
- B. Baggage Door Weatherstrip Installation (Refer to Figure 201).
  - (1) Use the old seal or the doorsill area as a guide to measure and cut the new seal to length.
  - (2) Apply a thin, even coat of EC1300L Adhesive around the circumference of the doorsill area.
  - (3) Make sure that you put the seam at the bottom center of the doorsill.
  - (4) Make sure that you do not stretch the seal around the corners of the doorsill.
  - (5) Press the new seal into the adhesive. Allow the adhesive to cure per the manufacturer's instructions, and make sure that the seal completely adheres to the doorsill with no gaps between the seal and the doorsill.
  - (6) Install the baggage door.

**4. Baggage Door Weatherstrip Inspection**

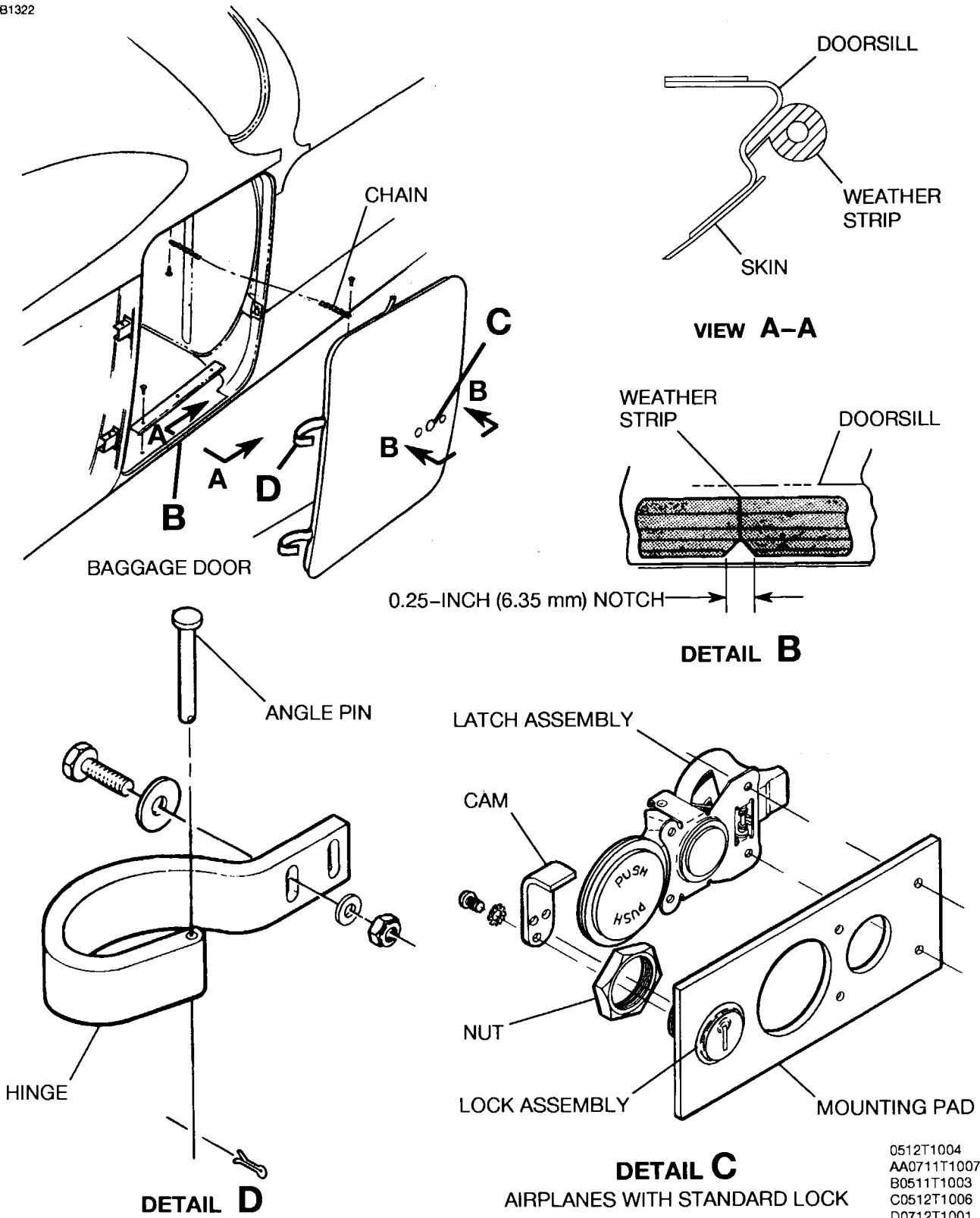
- A. Do an Inspection of the Baggage Door Weatherstrip.
  - (1) Put a 4-inch by 11-inch piece of paper between the baggage door frame and the baggage door. Close the baggage door. Slowly pull on the paper to make sure there is seal tension. Move the paper around the perimeter of the door to test the door seal tension.
  - (2) Remove the paper from the door frame. Make sure that the baggage door is closed. Pour a gallon of water over the door and tailcone door frame. After the water no longer drips, open the door and inspect for leaks.
  - (3) If you find a leak, towel dry the upholstery with a clean, dry towel. Install the weatherstrip again as necessary to make sure that there are no leaks around the seal area of the baggage door.

**5. Baggage Door Lock Assembly Removal/Installation (On airplanes with Medeco lock)**

- A. Baggage Door Lock Assembly Removal (Refer to Figure 201).
  - (1) Remove the baggage door panel to get access to the lock assembly of the baggage door. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the 0.75-inch hex nut and the anti-rotational washer that attach the lock tumbler assembly to the door structure and the cam assembly.
  - (3) Remove the lock assembly from the door.

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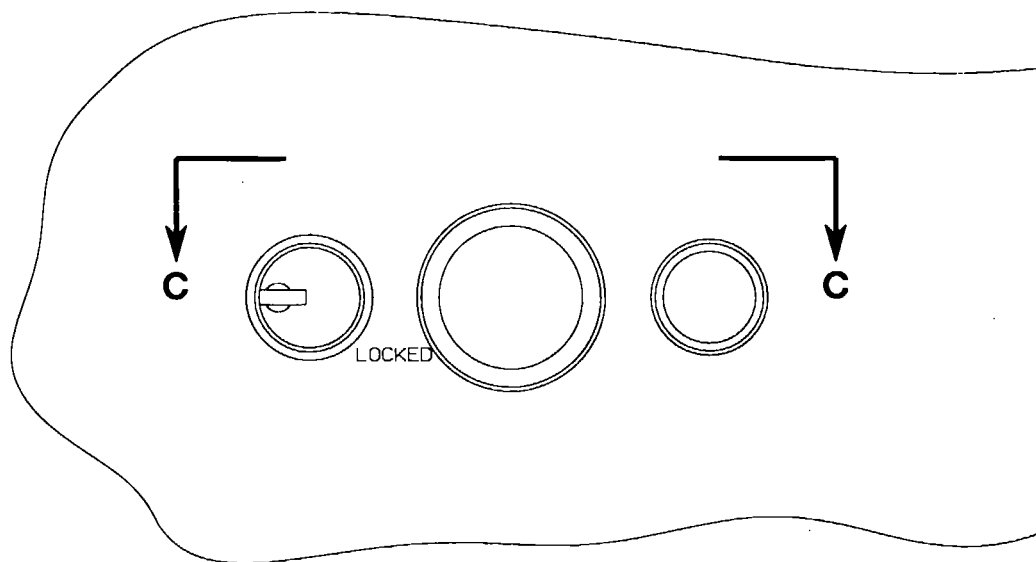


Baggage Door Installation  
 Figure 201 (Sheet 1)

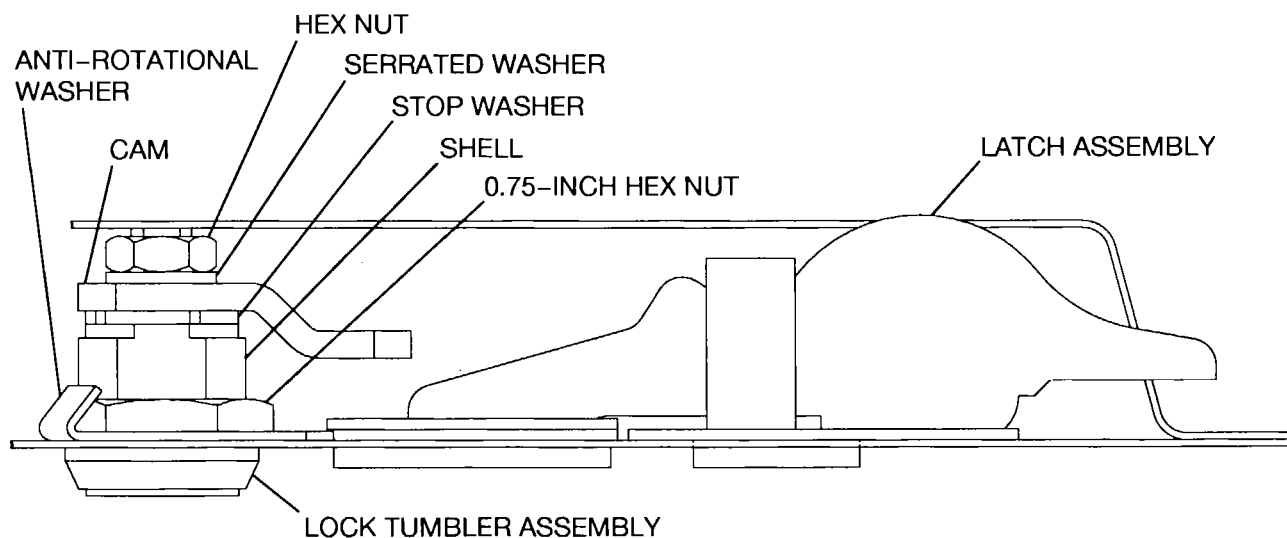


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**VIEW B-B**  
AIRPLANES WITH MEDECO LOCK



**VIEW C-C**  
LOCK SHOWN IN LOCKED POSITION

Baggage Door Installation  
Figure 201 (Sheet 2)

BB0711T1048  
CC0711T1048

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- B. Baggage Door Lock Assembly Installation (Refer to Figure 201).
- (1) Put the baggage door lock assembly in position on the baggage door.
  - (2) Install the 0.75-inch hex nut and the anti-rotational washer that attach the lock tumbler assembly to the door structure and the cam assembly. Make sure that the anti-rotational washer is installed under the 0.75-inch hex nut.
  - (3) Torque the nut.
  - (4) Bend the applicable tab on the anti-rotational washer against the flat part of the nut.
  - (5) Install the baggage door panel to the baggage door. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**6. Baggage Door Lock Cam Assembly Removal/Installation (On airplanes with Medeco lock)**

- A. Baggage Door Lock Cam Assembly Removal (Refer to Figure 201).
- (1) Remove the baggage door panel to get access to the baggage door lock assembly. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the hex nut and the serrated washer that attach the cam assembly to the baggage door lock.
  - (3) Remove the cam assembly.
- B. Baggage Door Lock Cam Assembly Installation (Refer to Figure 201).
- (1) Put the cam assembly in position.
  - (2) Install the hex nut and the serrated washer that attach the cam assembly to the baggage door lock. Install the hex nut with Loctite 242.
  - (3) Install the baggage door panel to the baggage door. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**CHAPTER**

**55**

**STABILIZERS**

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**STABILIZERS - GENERAL**

**1. Scope**

- A. This chapter provides maintenance information on the horizontal and vertical stabilizer.

**2. Definition**

- A. The section on horizontal stabilizer provides instructions for removal and installation of the horizontal stabilizer.
- B. The section on vertical fin provides instructions for removal and installation on the vertical fin.

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**HORIZONTAL STABILIZER - MAINTENANCE PRACTICES**

**1. General**

- A. The horizontal stabilizer is of metal construction, consisting of ribs and spars covered with skin. A formed metal leading edge is riveted to the assembly to complete the structure. The elevator trim tab actuator is contained within the horizontal stabilizer. The underside of the stabilizer contains a covered opening which provides access to the actuator. Hinges are located on the rear spar assembly to support the elevators.
- B. This section provides removal and installation instructions for the horizontal stabilizer.

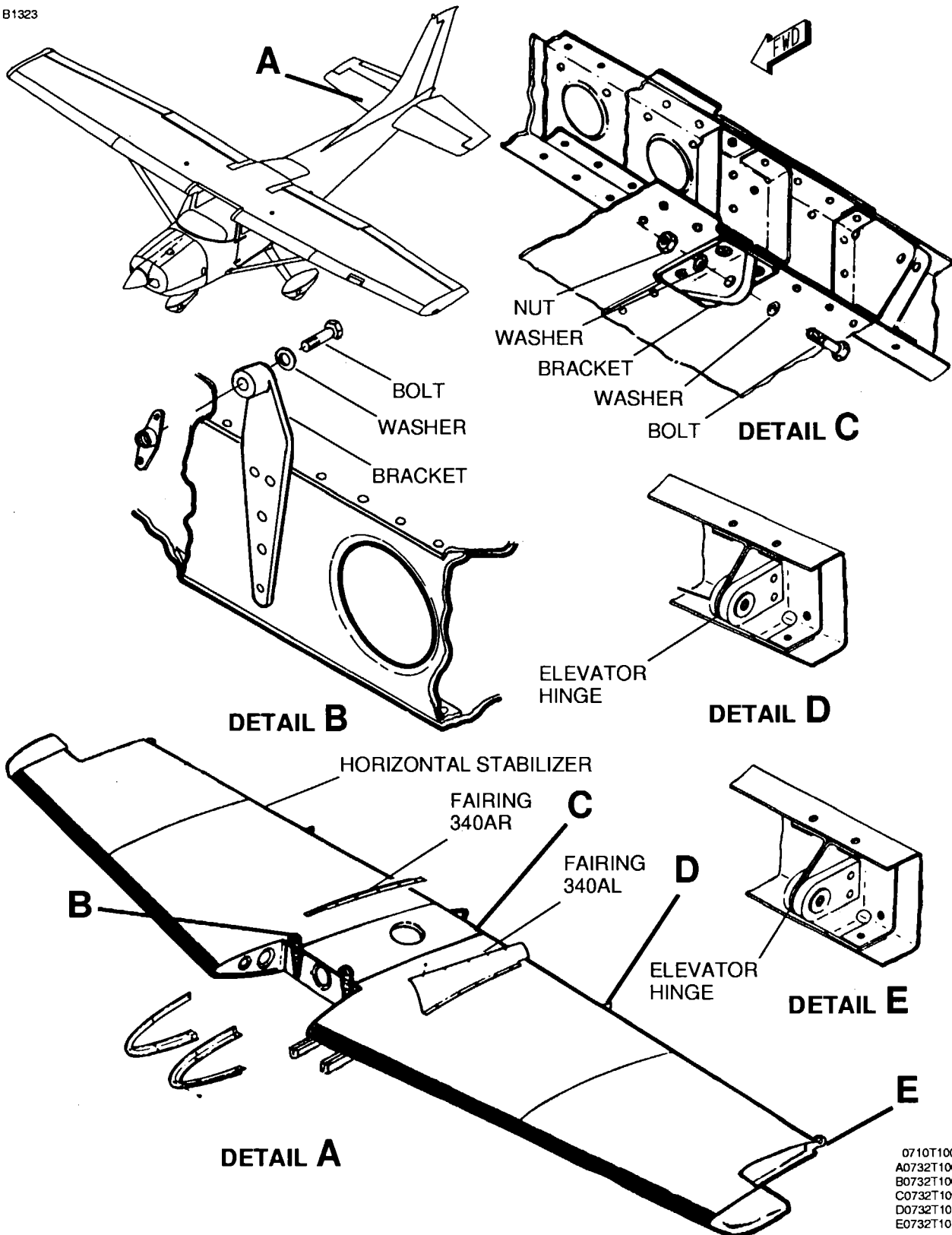
**2. Horizontal Stabilizer Removal/Installation**

- A. Remove Horizontal Stabilizer (Refer to Figure 201).
  - (1) Remove elevators. Refer to Chapter 27, Elevator Control System - Maintenance Practices.
  - (2) Remove rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (3) Remove vertical stabilizer. Refer to Vertical Stabilizer - Maintenance Practices.
  - (4) Disconnect elevator trim control cables at clevis and turnbuckle inside tailcone.
  - (5) Remove pulleys which route the aft cables into horizontal stabilizer, and pull cables out of tailcone. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices.
  - (6) Remove bolts securing horizontal stabilizer to fuselage.
  - (7) Remove horizontal stabilizer.
- B. Install Horizontal Stabilizer (Refer to Figure 201).
  - (1) Install horizontal stabilizer to fuselage using bolts.
  - (2) Reroute cables into tailcone and install pulleys.
  - (3) Reconnect elevator trim control cables at clevis and turnbuckle inside tailcone.
  - (4) Install vertical stabilizer. Refer to Vertical Stabilizer - Maintenance Practices.
  - (5) Install rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (6) Install elevators. Refer to Chapter 27, Elevator Control System - Maintenance Practices.
  - (7) Rig elevator. Refer to Chapter 27, Elevator Control System - Maintenance Practices.
  - (8) Rig rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (9) Rig elevator trim. Refer to Chapter 27, Elevator Trim Control - Maintenance Practices.



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Horizontal Stabilizer Installation  
 Figure 201 (Sheet 1)

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**VERTICAL FIN - MAINTENANCE PRACTICES**

**1. General**

- A. The vertical fin is of metal construction, consisting of ribs and spars covered with aluminum skin. The trailing edge of the fin contains three hinges used to attach the rudder.
- B. Maintenance practices consist of removal and installation of the vertical fin.

**2. Vertical Fin Removal/Installation**

- A. Remove Vertical Fin (Refer to Figure 201).
  - (1) Remove rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (2) Remove upper fairing 340AL and 340AR. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
  - (3) Disconnect all electrical and navigation leads from base of fin area.
  - (4) Remove screws attaching dorsal to fin.
  - (5) Disconnect elevator cable from elevator bell crank.
  - (6) Remove hardware attaching fin rear spar to fuselage fitting.

**WARNING: Carefully note position of spacers and/or shims, if installed, for reinstallation.**

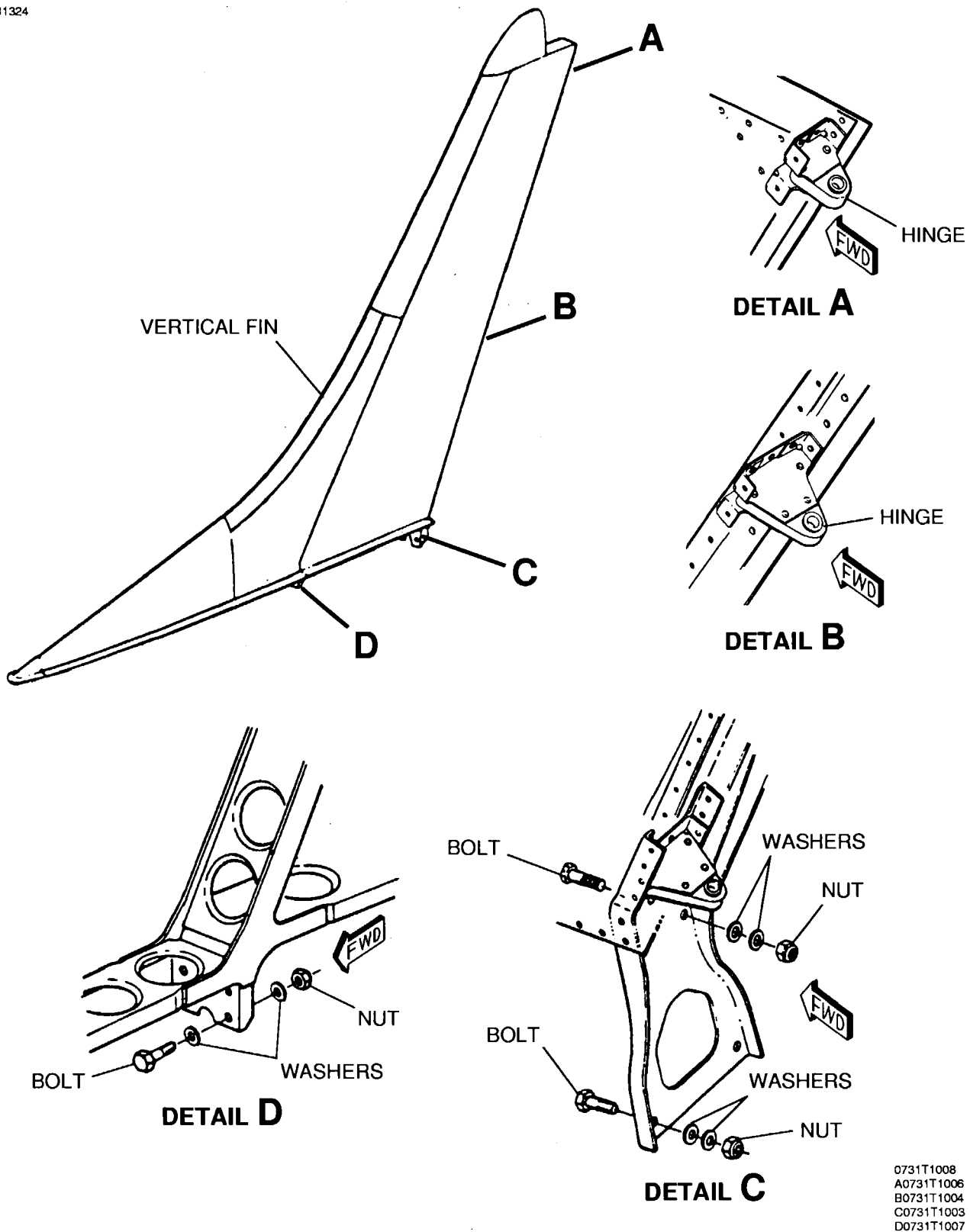
- (7) Remove upper elevator stop bolts.
  - (8) Remove bolts attaching fin front spar to fuselage bulkhead and remove fin from fuselage.
- B. Install Vertical Fin (Refer to Figure 201).
  - (1) Place fin on fuselage and secure front spar of fin to fuselage. Torque bolts 50 inch-pounds to 70 inch pounds (6 to 8 N.m).
  - (2) Install upper elevator stop bolts.
  - (3) Attach fin rear spar to fuselage fitting using retained hardware. Torque bolts 100 inch-pounds to 140 inch-pounds (11 to 16 N.m).

**WARNING: Spacers and/or shims must be reinstalled in the position from which they were removed.**

- (4) Connect elevator cable to elevator bell crank. Refer to Chapter 27, Elevator Control System - Maintenance Practices.
  - (5) Secure dorsal to fin using screws.
  - (6) Reconnect all electrical and navigation leads.
  - (7) Install rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (8) Rig rudder. Refer to Chapter 27, Rudder Control System - Maintenance Practices.
  - (9) Rig Elevator. Refer to Chapter 27, Elevator Control System - Maintenance Practices.
  - (10) Install upper fairing 340AL and 340AR. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

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Vertical Fin Installation  
 Figure 201 (Sheet 1)

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 A0731T1006  
 B0731T1004  
 C0731T1003  
 D0731T1007

**CHAPTER**

**56**

**WINDOWS**

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**WINDOWS - GENERAL**

**1. Scope**

A. This chapter provides information on windows used throughout the airplane.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following listed items:

NAME	NUMBER	MANUFACTURER	USE
Mild soap or detergent (hand dishwashing type without abrasives)		Commercially Available	To clean windshields and windows.
Aliphatic Naphtha	Type II Federal Specification TT-N-95	Commercially Available	To remove deposits from windshields and windows.
Novus	Number 1	Commercially Available	To clean acrylic windshields and windows.
Novus	Number 2	Commercially Available	To remove minor surface scratches in acrylic windshields and windows.
Novus	Number 3	Commercially Available	To remove heavy scratches and abrasions in acrylic windshields and windows.
Mirror Glaze	MGH-7	Meguiars Mirror Bright Polish 210 N. First Ave. Arcadia, CA 91006	To clean and polish acrylic windshields and windows.
Soft cloth, such as, Cotton flannel or cotton terry cloth		Commercially Available	To apply and remove wax and polish.
Windshield sealant tape	U000927S	Available from Cessna Parts Distribution Cessna Aircraft Company Department 701 5800 E. Pawnee Rd. Wichita, KS 67218-5590	To seal windshield and fixed windows.
Repcon rain repellent	6850-00-139-5297	Unelko Corporation 7428 East Karen Drive Scottsdale, Arizona 85260	To repel rain from windshield.
Wax	Paste type hard	Commercially Available	To wax windshield and windows.
Fuel, pressure and weather sealant	Pro Seal 890	Courtaulds Aerospace	To seal cabin door windows



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**3. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. The following is a brief description of each section. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.
- (1) The section on flight compartment windows provides maintenance instructions for repair and replacement of the windshield.
  - (2) The section on cabin windows provides maintenance instructions for the cabin side and cabin rear windows.
  - (3) The section on door windows provides maintenance instructions for openable windows located in the cabin doors.

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**WINDSHIELDS AND WINDOWS - DESCRIPTION AND OPERATION**

**1. General**

- A. This section provides instructions and tips for cleaning and installing windshields and windows used in the airplane.

**2. Tools, Equipment and Materials**

- A. For a list of required tools, equipment and materials, refer to Windows - General.

**3. Cleaning Instructions**

**CAUTION:** Windshields and windows (acrylic-faced) are easily damaged by improper handling and cleaning techniques.

**CAUTION:** Do not use methanol, denatured alcohol, gasoline, benzene, xylene, methyl propyl ketone, acetone, carbon tetrachloride, lacquer thinner, commercial or household window cleaning sprays on windshields or windows.

A. Instructions For Cleaning.

- (1) Place airplane inside hangar or in shaded area and allow to cool from heat of sun's direct rays.
- (2) Using clean (preferably running) water, flood the surface. Use bare hands with no jewelry to feel and dislodge any dirt or abrasive materials.
- (3) Using a mild soap or detergent (such as a dishwashing liquid) in water, wash the surface. Again use only the bare hand to provide rubbing force. (A clean cloth may be used to transfer the soap solution to the surface, but extreme care must be exercised to prevent scratching the surface.)
- (4) When contaminants on acrylic windshields and windows cannot be removed by a mild detergent, Type II aliphatic naphtha, applied with a soft clean cloth, may be used as a cleaning solvent. Be sure to frequently refold cloth to avoid redepositing contaminants and/or scratching windshield with any abrasive particles.
- (5) Rinse surface thoroughly with clean fresh water and dry with a clean cloth.
- (6) Hard polishing wax should be applied to acrylic surfaces. (The wax has an index of refraction nearly the same as transparent acrylic and will tend to mask any shallow scratches on the windshield surface.)
- (7) Acrylic surfaces may be polished using a polish meeting Federal Specification P-P-560 applied per the manufacturers instructions.

**NOTE:** When applying and removing wax and polish, use a clean, soft cloth, such as cotton flannel.

**4. Windshield and Window Preventive Maintenance**

**NOTE:** Utilization of the following techniques will help minimize windshield and window crazing.

A. General Notes and Techniques For Acrylic Windshields.

- (1) Keep all surfaces of windshields and windows clean.
- (2) If desired, wax acrylic surfaces.
- (3) Carefully cover all surfaces during any painting, powerplant cleaning or other procedure that calls for use of any type of solvents or chemicals.
- (4) Do not park or store airplane where it might be subjected to direct contact with or vapors from: methanol, denatured alcohol, gasoline, benzene, xylene, methyl propyl ketone, acetone, carbon tetrachloride, lacquer thinner, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
- (5) Do not leave sunvisors up against windshield when not in use. The reflected heat from these items causes elevated temperatures on the windshield. If solar screens are installed on the inside of the airplane, make sure they are the silver appearing, reflective type.

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- (6) Do not use a power drill motor or other powered device to clean, polish, or wax surfaces.

**5. Windshield and Window Installation Techniques**

**A. Installation Techniques.**

- (1) Special drills must be used when drilling holes in acrylic. Standard drills will cause the hole to be oversized, distorted, or excessively chipped.
- (2) Whenever possible, a coolant, such as a plastic drilling wax, should be used to lubricate the drill bit.
- (3) Drilled holes should be smooth with a finish of 125 rms (root mean square).
- (4) The feed and speed of the drill is critical. Refer to Table 1 for thickness versus drill speed information.

Table 1. Material Thickness vs. Drill Speed

Thickness (inches)	Thickness (mm)	Drill Speed (RPM)
0.062 to 0.1875	1.57 to 4.76	1500 to 4500
0.250 to 0.375	6.35 to 9.52	1500 to 2000
0.4375	11.10	1000 to 1500
0.500	12.70	500 to 1000
0.750	19.05	500 to 800
1.00	25.4	500

- (5) In addition to feed and speed of the drill bit, the tip configuration is of special importance when drilling through acrylic windows and windshields. Tip configuration varies with hole depth, and the following information applies when drilling through acrylic:
- (a) Shallow Holes - When hole depth to hole diameter ratio is less than 1.5 to 1, the drill shall have an included tip angle of 55 degrees to 60 degrees and a lip clearance angle of 15 degrees to 20 degrees.
  - (b) Medium Deep Holes - When hole depth to hole diameter ratio is from 1.5 to 1 up to 3 to 1, the drill shall have an included tip angle of 60 degrees to 140 degrees and a lip clearance angle of 15 degrees to 20 degrees.
  - (c) Deep Holes - when hole depth of hole diameter ratio is greater than 3 to 1, the drill shall have an included tip angle of 140 degrees and a lip clearance of 12 degrees to 15 degrees.
- (6) Parts which must have holes drilled shall be backed up with a drill fixture. Holes may be drilled through the part from one side. However, less chipping around holes will occur if holes are drilled by drilling the holes from both sides. This is accomplished by using a drill with an acrylic backup piece on the opposite side. Remove the drill from the hole and switch the backup plate and finish drilling from the opposite side.

**6. Windshield Rain Repellent**

- A. Repcon is a rain repellent and surface conditioner that may be used to increase the natural cleaning of the windshield during rain. Apply in accordance with manufacturers instructions.

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**WINDSHIELD - MAINTENANCE PRACTICES**

**1. General**

- A. This section provides instructions for removal and installation of the window as well as repair techniques applicable to acrylic windshields and windows.

**2. Windshield Removal/Installation**

- A. Remove Windshield (Refer to Figure 201).

- (1) Remove wing fairings.
- (2) Remove air vent tubes. Refer to Chapter 21, Fresh Air Distribution - Maintenance Practices.
- (3) Drill out rivets securing front retainer strip.
- (4) Remove and tape compass clear of work area. Do not disconnect electrical wiring.

**CAUTION:** If windshield is to be reinstalled, be sure to protect windshield during removal.

- (5) Pull windshield straight forward, out of side and top retainers. Remove top retainer if necessary.
- (6) Clean sealer from inner sidewalls and bottom of retainers.

- B. Install Windshield (Refer to Figure 201).

- (1) If windshield is to be reinstalled, clean off old sealer and felt, then install new felt around edges of windshield.
- (2) If new windshield is to be installed, remove protective cover and clean.
- (3) Apply new felt to edges of windshield.
- (4) Apply windshield sealant tape along the sides and bottom of felt. Refer to Windows - General, for a list of sealant tape.
- (5) Position bottom edge of windshield against deck skin.
- (6) Starting at upper corner, gradually work windshield into position.

**NOTE:** Use care not to crack windshield when installing. If not previously removed, top retainer may be removed if necessary.

**NOTE:** Screws and self-locking nuts may be used instead of rivets which fasten front retaining strip to cowl deck. If at least No. 6 screws are used, no loss of strength will result.

- (7) Install compass
- (8) Tighten or install windshield retainers as required.
- (9) Install air vent tube. Refer to Chapter 21, Fresh Air Distribution - Maintenance Practices.
- (10) Install wing fairings.

**NOTE:** Tape gap between windshield and leading edge with cloth industrial tape 2.5 inches wide on both sides.

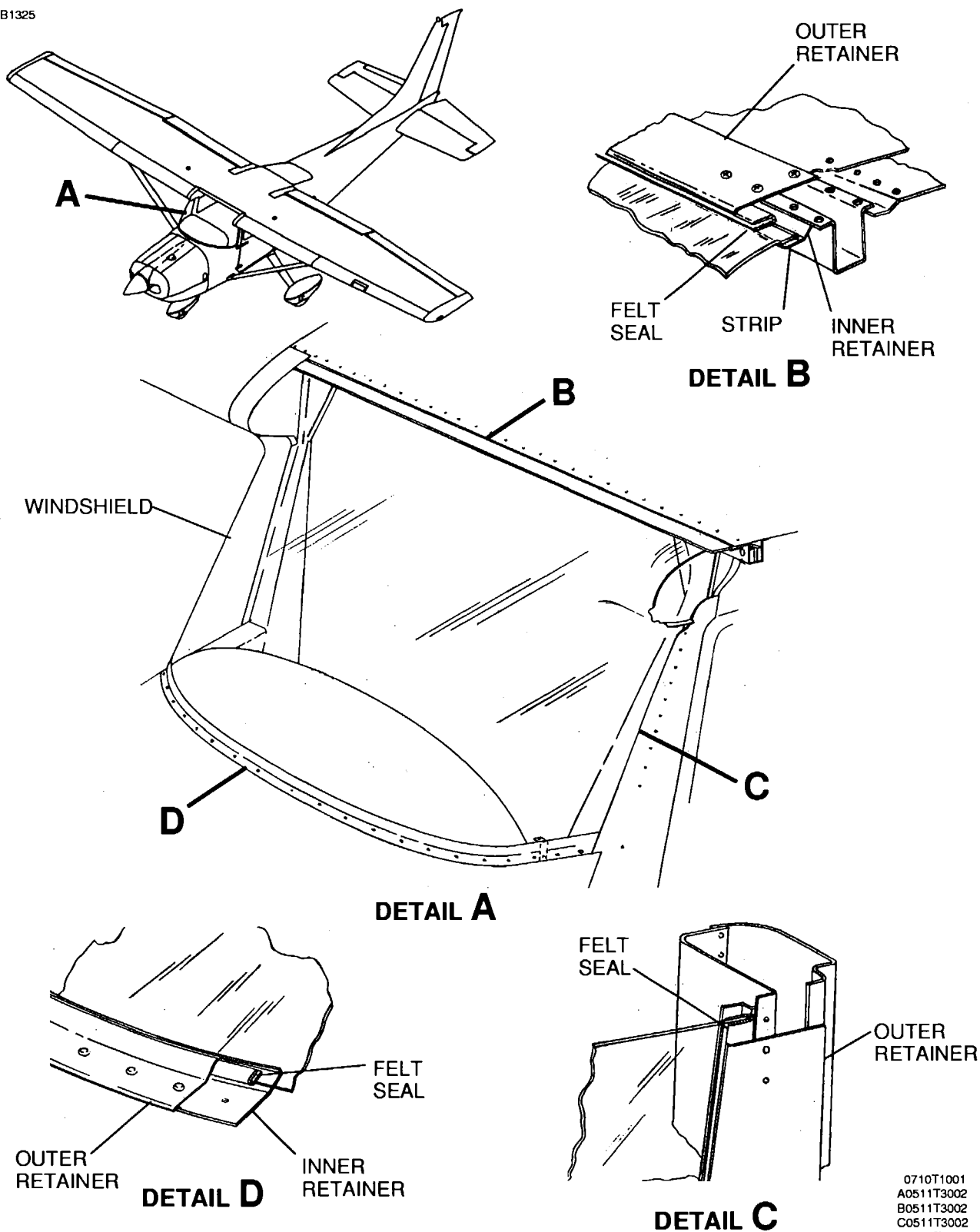
**3. Temporary Repairs**

- A. Temporary repairs to windshields and windows can be accomplished using the following steps. Refer to Figure 202 for an illustration of repair techniques.

- (1) When a crack appears, drill a hole at end of crack to prevent further spreading. Hole should be approximately 1/8 inch (3.2 mm) diameter, depending on length of crack and thickness of material.
- (2) Temporary repairs to flat surfaces can be accomplished by placing a thin strip of wood over each side of the surface, and inserting small bolts through the wood and plastic. A cushion of sheet rubber or airplane fabric should be placed between wood and plastic on both sides.
- (3) A temporary repair can be made by drilling small holes along both sides of crack, 1/8 to 1/4 inch (3.2 to 6.4 mm) apart, and lacing edges together with soft wire. This type of repair is used as a temporary measure only, and as soon as facilities are available, panel should be replaced.

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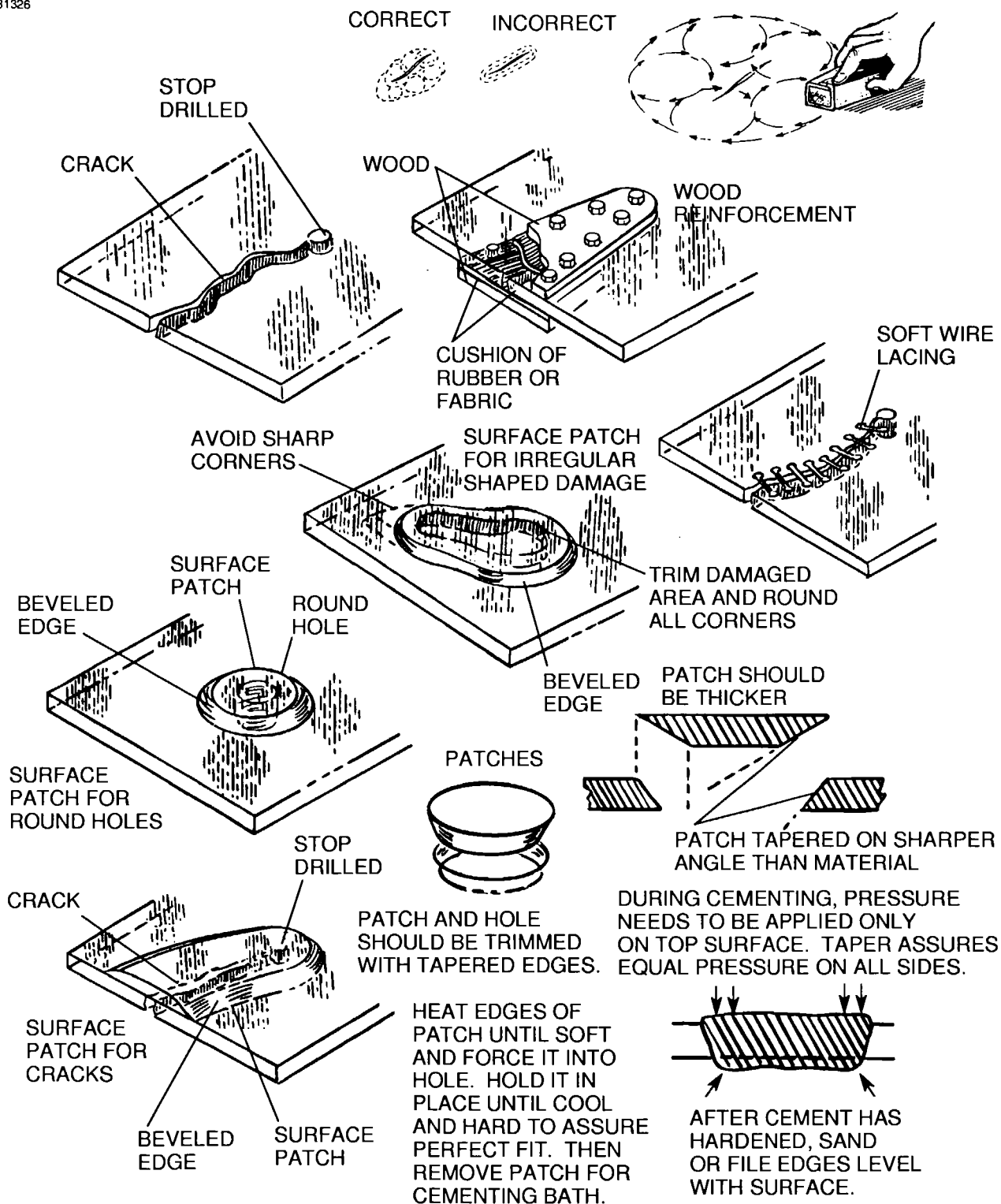


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 A0511T3002  
 B0511T3002  
 C0511T3002  
 D0511T3002

Windshield Installation  
 Figure 201 (Sheet 1)

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Windshield/Window Repair  
 Figure 202 (Sheet 1)

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**CABIN WINDOWS - MAINTENANCE PRACTICES**

**1. General**

- A. The airplane has two side windows and a rear window, all found in the rear cabin area. Maintenance procedures are limited to the removal and installation of the windows. For instructions on temporary repair, refer to Windshield - Maintenance Practices.

**2. Rear Window Removal/Installation**

- A. Remove the Rear Window (Refer to Figure 201).
- (1) Remove the upholstery as necessary to get access to the retainer strips inside the cabin. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the rivets as necessary to remove the outer retainer strip from the aft edge of the window.
  - (3) To remove the window, lift the aft edge and pull the window aft. If you cannot remove the window easily, rivets that attach the retainer strips inside the cabin can also be removed and the retainer strips loosened or removed.
- B. Install the Rear Window (Refer to Figure 201).
- (1) If the same window is being installed again, remove all the remaining sealant from the window.
  - (2) Clean the channels and retainers to remove all the remaining sealant.
  - (3) Make sure that the window fits correctly, and carefully grind off unwanted plastic.
  - (4) Put a felt strip around all the edges of the window, and apply sealant to prevent leaks.
  - (5) Install the rear window in the airplane and attach the window with retainer strips and rivets.
  - (6) Install the upholstery. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**3. Side Window Removal/Installation**

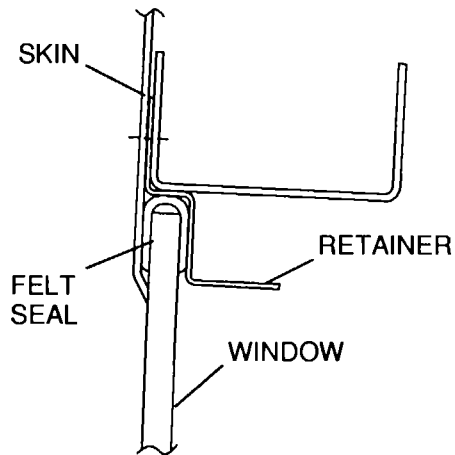
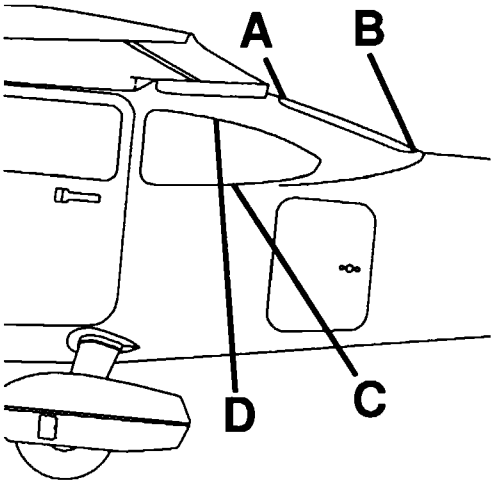
- A. Remove the Side Window (Refer to Figure 201).
- (1) Remove the upholstery as necessary to get access to the retainer strips inside the cabin. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
  - (2) Remove the rivets that attach the retainer strips to the airplane.
  - (3) Remove the window from the airplane.
- B. Install the Side Window (Refer to Figure 201).
- (1) If the same window is being installed again, remove all the remaining sealant from the window.
  - (2) Clean the channels and retainers to remove all the remaining sealant.
  - (3) Put a felt strip around all the edges of the window, and apply sealant to prevent leaks.
  - (4) Install the side window in the airplane and attach the window with retainer strips and rivets.
  - (5) Install the upholstery. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**4. Optional Openable Side Window**

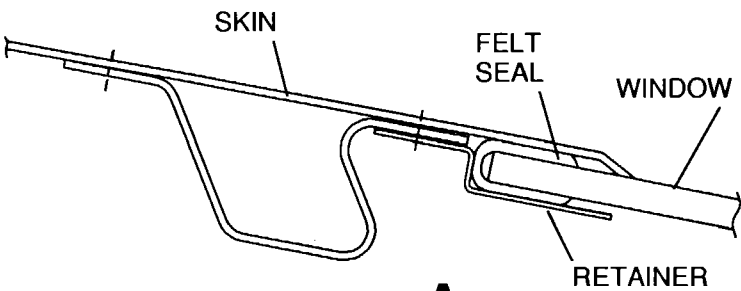
- A. Some airplanes have an optional openable side window found on the left side of the airplane aft of the pilot's cabin door window. These windows have hinges and are a part of the side window. The window opens to the inside, and has two latches at the top and three hinges at the bottom. The removal and installation procedure for the openable window assembly is the same as the removal and installation procedure for the standard side window. If the openable side window is damaged, all of the window assembly must be replaced.

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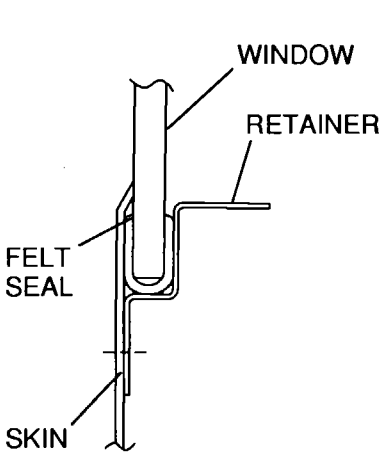
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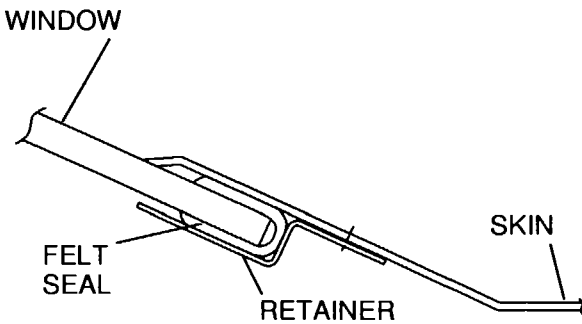
**DETAIL D**



**DETAIL A**



**DETAIL C**



**DETAIL B**

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A0711T1003  
B0711T1004  
C0711T1005  
D0711TC1006

Cabin Windows Installation  
Figure 201 (Sheet 1)



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**CABIN DOOR WINDOWS - MAINTENANCE PRACTICES**

**1. General**

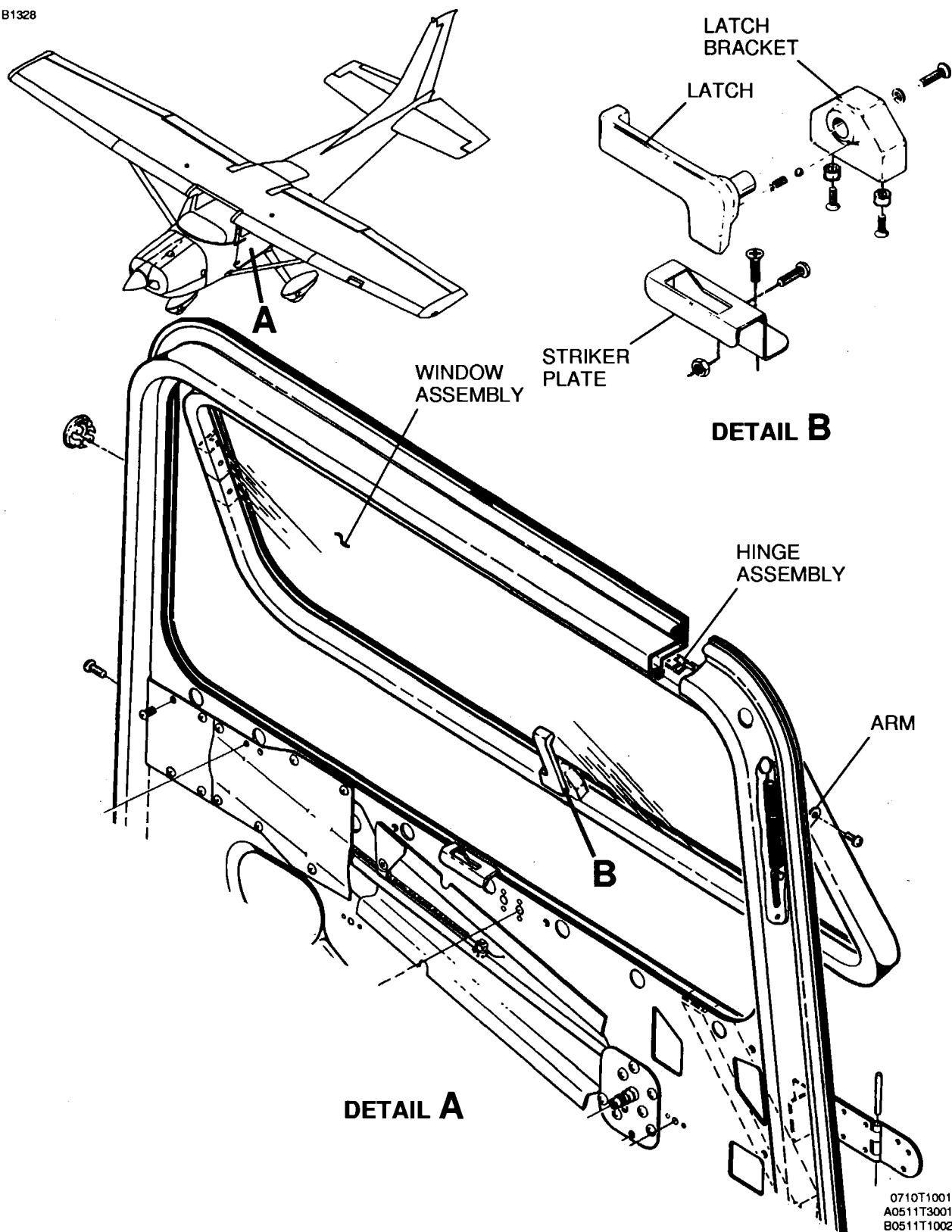
- A. This maintenance practices section consists of removal and installation of the hinged windows located in each door. For instructions on temporary repair to the cabin door windows, refer to Windshield - Maintenance Practices.

**2. Cabin Door Window Removal/Installation**

- A. Remove Cabin Door Window (Refer to Figure 201).
- (1) Disconnect arm from window assembly.
  - (2) Remove hinge pins from hinge.
  - (3) To remove frame from window, drill out blind rivets at frame splice.
- B. Install Cabin Door Window (Refer to Figure 201).
- (1) Install window in frame using rivets. Ensure that sealing strip and an adequate coating of Pro Seal 890 (Type I) sealing compound is used around all edges of panel.
  - (2) Position window assembly to door.
  - (3) Secure window assembly to hinge using hinge pin.

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Cabin Door Window Installation  
Figure 201 (Sheet 1)

**CHAPTER**

**57**

**WINGS**

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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
57-Title		
57-List of Effective Pages		
57-Record of Temporary Revisions		
57-Table of Contents		
57-00-00	Page 1	Aug 4/2003
57-10-00	Pages 201-208	April 1/2002



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**WINGS - GENERAL**

**1. Scope**

- A. This chapter provides instructions on wing removal and installation. Information and repair procedures beyond the scope of this chapter can be found in the Single Engine Models 172, 182, 206 and T206 1996 and On Structural Repair Manual.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following listed items:

NAME	NUMBER	MANUFACTURER	USE
Grease	MIL-G-21164	E/M Corporation Box 2200 Highway 52 N.W. West Lafayette, IN 47906	To lubricate wing attach fittings and bolts upon reinstallation.
■ Polyurethane Tape	P840306	3M 3M Center Minneapolis, MN 55144	To eliminate chafing of wing struts from strut fairings.

**3. Definition**

- A. This chapter contains a single section on wing removal, installation and adjustment.

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**WINGS AND WING STRUTS - MAINTENANCE PRACTICES**

**1. Description and Operation**

**WARNING:** Some right wings have a spar cap of 0.100 inches thick, and are not to be used on increased weight STC's (such as float planes).

- A. Each metal wing is a semicantilever, semimonocoque type, with two main spars and suitable ribs for the attachment of the skin. Panels are riveted to ribs, spars and stringers to complete the structure. An all metal, piano hinged aileron, flap and detachable wing tip are mounted on each wing assembly. Each wing also incorporates an integral fuel bay located between the two spars at the inboard portion of the wing. Each wing is supported in position by a single lift strut. It consists of a streamlined tube riveted to two end fittings for attachment at the wing and at the fuselage.
- B. For a skeletal view of the wing assembly, refer to Chapter 6, Airplane Stations - Description and Operation.

**2. Wing and Strut Removal/Installation**

- A. Remove the Wing and Strut (Refer to Figure 201).

**CAUTION:** The wing must be supported with a sling or a maintenance stand when the fasteners are loosened. If a sling or stand is not available, a minimum of four people must be used to handle the wing.

- (1) Remove the fairings from the wing and fuselage intersection.
- (2) Remove the inspection plates as required to allow for disconnection of all the electrical, mechanical and fuel connections.
- (3) Drain the fuel. Refer to Chapter 12, Fuel - Servicing.
- (4) Disconnect the electrical wires at the wing root disconnects.
- (5) Disconnect the fuel lines at the wing root.
- (6) Disconnect the pitot tube on the left wing. Refer to Chapter 34, Pitot And Static Systems - Maintenance Practices.
- (7) Disconnect the fresh air distribution duct at the wing root.
- (8) Disconnect the aileron cables at the aileron bell crank. Refer to Chapter 27, Aileron Control System - Maintenance Practices.

**NOTE:** For easier routing of cables, attach a guide wire to each cable before it is pulled free from the wing. Disconnect the cable from the guide wire, leaving the guide wire routed through the wing. The guide wire will be attached to the cable during installation and used to pull the cable into position.

- (9) Remove the cabin headliner to get access to the flap cables at the turnbuckle. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.
- (10) Disconnect the flap cables at the turnbuckle and pull cables into wing root area. Refer to Chapter 27, Flap Control System - Maintenance Practices.

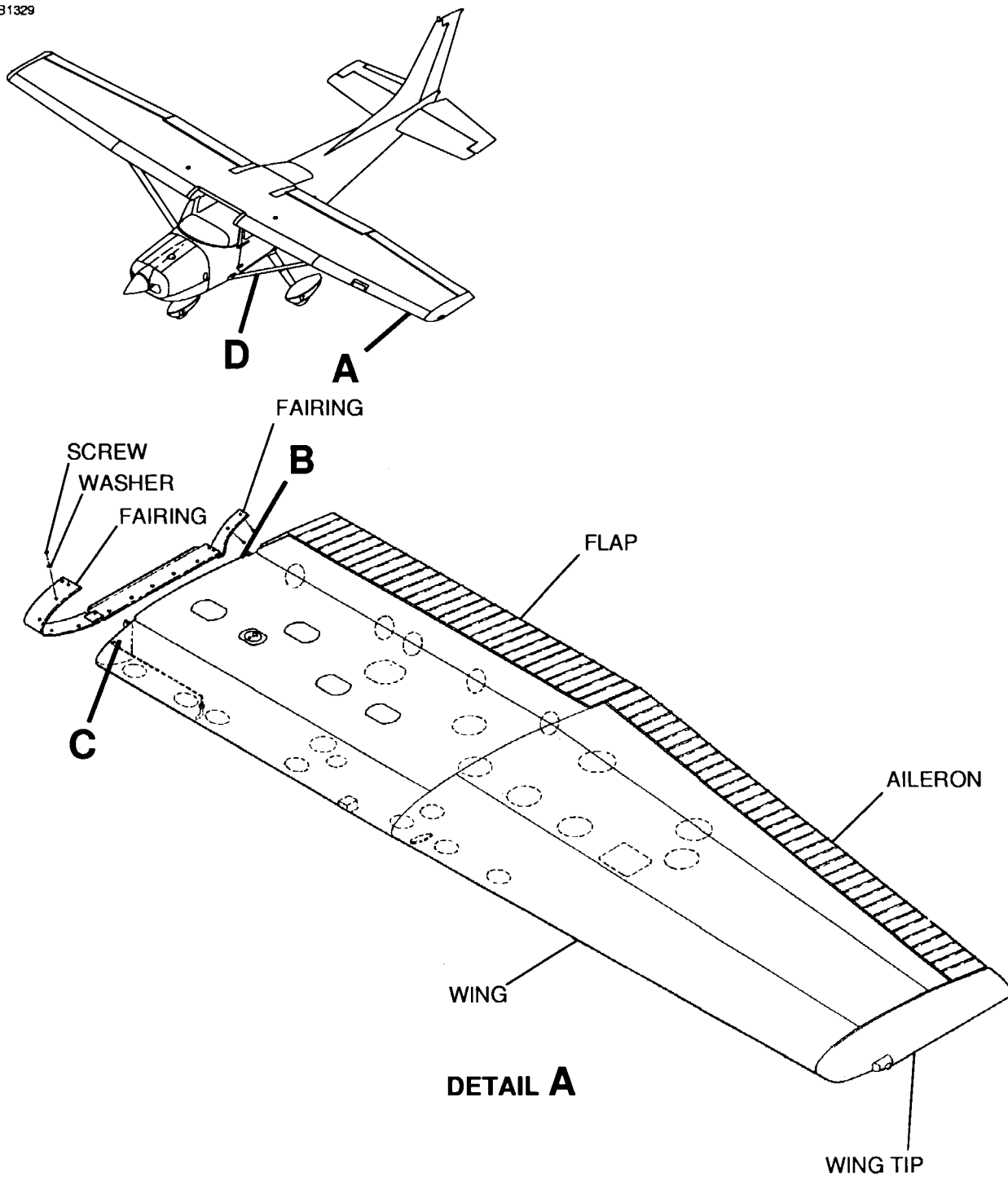
**NOTE:** For easier routing of cables, attach a guide wire to each cable before it is pulled free from the wing. Disconnect the cable from the guide wire, leaving the guide wire routed through the wing. The guide wire will be attached to the cable during installation and used to pull the cable into position.

- (11) Remove the screws from the strut fairings.
- (12) Move the fairings toward the center of the strut.
- (13) Support the wing at the outboard end.
- (14) Remove the strut-to-wing attach bolt and the strut-to-fuselage attach bolt.
- (15) Remove the strut from the wing and fuselage.
- (16) Tape the flaps in a streamlined position to prevent flap movement during handling.



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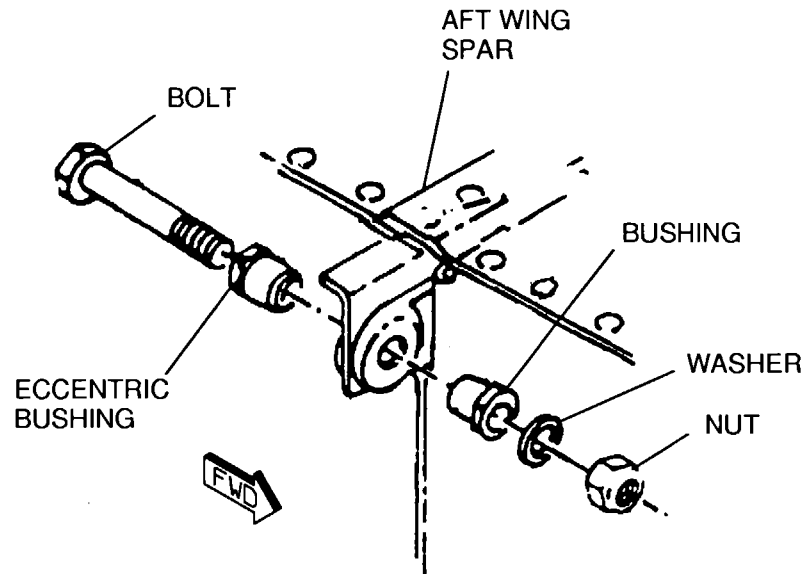


Wing and Strut Installation  
Figure 201 (Sheet 1)

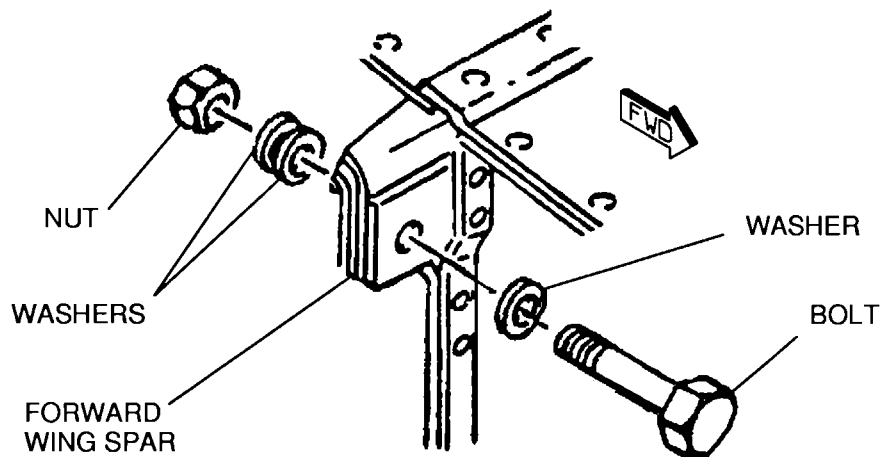
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**DETAIL B**



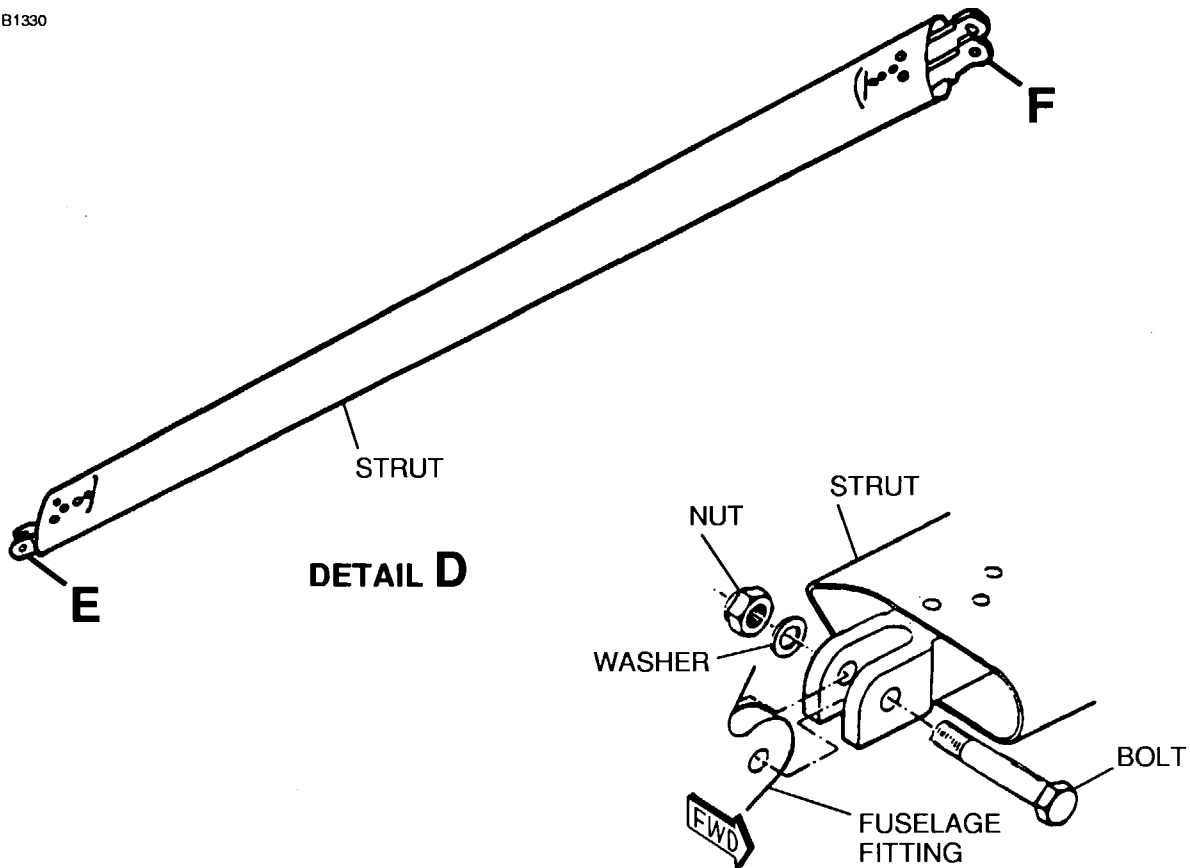
**DETAIL C**

Wing and Strut Installation  
Figure 201 (Sheet 2)

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C0520R1002

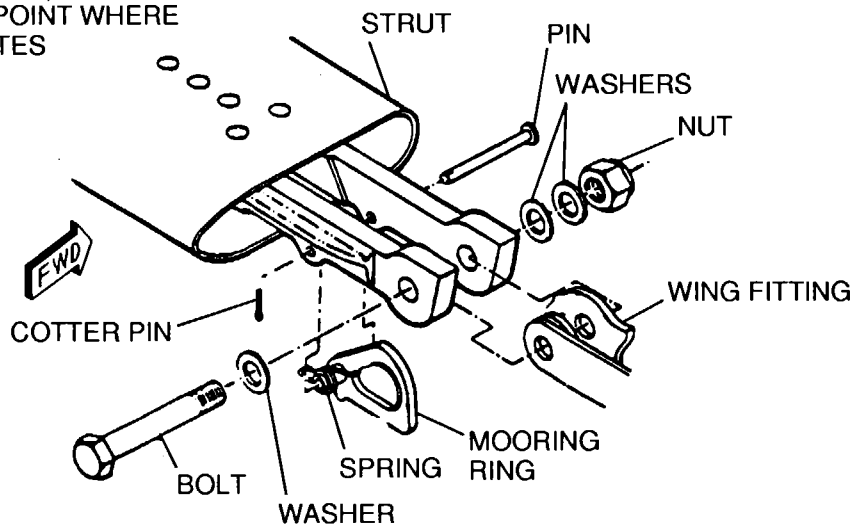
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**NOTE:** WRAP WING STRUT USING  
 3M Y8671 POLYURETHANE  
 TAPE (1 INCH WIDE)  
 CENTERED AT POINT WHERE  
 CUFF TERMINATES

**DETAIL E**



**DETAIL F**

D0720R1004  
 E0720R1005  
 F0720R1006

Wing and Strut Installation  
 Figure 201 (Sheet 3)

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- (17) Mark position of the wing attachment eccentric bushings in relationship to the fittings. The bushings are used to rig out wing heaviness.

**NOTE:** Wings must be rigged at installation if bushings are not marked.

- (18) Remove the nuts, washers, bushings and bolts attaching the wing spars to the fuselage.

**NOTE:** It may be necessary to rock the wings slightly and/or to use a long drift punch to remove attaching bolts.

- (19) Remove the wing and lay it on a padded stand.

B. Install the Wing and Strut (Refer to Figure 201).

**CAUTION:** Do not lubricate the threads of the bolts.

- (1) Lightly lubricate the wing attach bolts and holes with MIL-G-21164 grease before installing bolts.
- (2) Hold the wing in position and install the bolts, bushings, washers and nuts attaching the wing spars to the fuselage fittings. Make sure eccentric bushings are positioned as marked.
- (3) Torque the front wing spar bolts 290 to 410 inch-pounds.
- (4) Torque the rear wing spar bolts 450 to 500 inch-pounds.
- (5) Install the 0.38 inch seal around strut with 0.12 inch gap on lower surface.
- (6) Install the bolts, spacers and nuts to attach the upper and lower ends of the wing strut to the wing and fuselage fittings.
- (7) Route the flap cables using the guide wires.
- (8) Connect the flap cables at the turnbuckle above the headliner. Refer to Chapter 27, Flap Control System - Maintenance Practices.
- (9) Route the aileron cables using the guide wires.
- (10) Connect the aileron cable at the aileron bell crank. Refer to Chapter 27, Aileron Control System - Maintenance Practices.
- (11) Connect the fresh air distribution at wing root.
- (12) Connect the pitot tube. Refer to Chapter 34, Pitot And Static Systems - Maintenance Practices.
- (13) Connect the fuel lines at the wing root.
- (14) Connect the electrical wires at the wing root.
- (15) Complete a leak check of the pitot tube. Refer to Chapter 34, Pitot And Static Systems - Maintenance Practices.
- (16) Remove the tape from the flaps.
- (17) Rig the flap system. Refer to Chapter 27, Flap Control System - Maintenance Practices.
- (18) Rig the aileron system. Refer to Chapter 27, Aileron Control System - Maintenance Practices.
- (19) Fuel the wing bay. Refer to Chapter 12, Fuel Servicing.
- (20) Check the operation of the fuel quantity system. Refer to Chapter 28, Fuel Storage and Distribution - Maintenance Practices.
- (21) Install the wing root fairings.
- (22) Install the cabin headliner. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

**3. Adjustment (Correcting Wing Heavy Conditions)**

**NOTE:** If considerable control wheel pressure is required to keep the wings level in normal flight, a "wing heavy" condition exists and can be corrected by the following procedure.

A. Adjustment Procedures (Refer to Figure 201).

**CAUTION:** The eccentric cams must be adjusted after all flight control systems have been adjusted and rigged.

- (1) If necessary, rig the flight controls. Refer to Chapter 27, Flight Controls - General.
- (2) Remove the wing fairing strip from the heavy side of the airplane.

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**CAUTION:** Make sure you rotate the eccentric bushings together. If you rotate just one, you will destroy the alignment between the off-center bolt holes in the bushings. A nonalignment of a bolt will result in a force on the bolt which will damage the hole in the wing spar.

- (3) Loosen the aft wing spar nuts and rotate eccentric bushings simultaneously until the bushings are positioned with the thick side of the eccentrics up.

**NOTE:** This will lower the trailing edge of the wing, and decrease wing heaviness by increasing angle of incidence of the wing.

- (4) Torque the front wing spar bolts 290 to 410 inch-pounds.  
(5) Torque the rear wing spar bolts 450 to 500 inch-pounds.  
(6) Install the fairing strip.  
(7) Test fly the airplane.

**CAUTION:** Make sure the eccentric bushings are rotated simultaneously. Rotating them separately will destroy the alignment between the off-center bolt holes in the bushings, thus exerting a shearing force on the bolt, with possible damage to the hole in the wing spar.

- (a) If the wing heavy condition continues, remove the fairing strip on the lighter wing, loosen the nut and rotate the eccentric bushings simultaneously until the bushings are positioned with the thick side of the eccentrics down.

**NOTE:** This will raise the trailing edge of the wing, thus increasing wing heaviness to balance heaviness in the opposite wing.

- (8) Torque the rear wing spar bolts 450 to 500 inch-pounds.  
(9) Install fairing strip and repeat flight test.

#### 4. Strut Damage and Repair Criteria

**CAUTION:** If the strut is severely dented, cracked or deformed, it must be replaced.

##### A. Damage Caused by the Strut Fairings.

**NOTE:** The following procedures are applicable only to the specific areas of the strut.

- (1) The strut must be replaced if a groove is more than 0.010 inch in depth and is less than 0.75 inch from a rivet center.  
(2) The strut must be replaced if a groove is more than 0.75 inch from a rivet center and the groove depth is more than 0.025 inch.  
(3) If groove depth is less than 0.025 inch and is more than 0.75 inch from a rivet center, the strut must be repaired, tapering gradually to the original surface and burnishing out to a smooth finish.  
(a) Blend and smooth the surface area of the groove. Make sure not to remove any more material from the groove.  
(b) Check the area using a dye penetrant to make sure there are no cracks.  
(c) Apply Alodine and repaint the area.

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B. Damage Caused by the Cabin Door.

**NOTE:** The following applies to the wing struts with grooves worn in the lower trailing edge. This type of damage can occur with cabin door usage with a missing or incorrectly adjusted door stop. A incorrectly adjusted door stop allows the door to hit against the aft edge of the strut at the lower end.

- (1) The strut must be replaced if a groove is deeper than 50 percent of the original material thickness.
- (2) Repair the strut if a groove is less than 50 percent of the original material thickness.
  - (a) Blend and smooth the surrounding surface area of the groove. Make sure not to remove any more material from the groove.
  - (b) Check the area using a dye penetrant to make sure there are no cracks.
  - (c) Apply Alodine and repaint the area.
  - (d) Rig the door to prevent door from rubbing the strut tube.

**5. Wing Tip Removal/Installation**

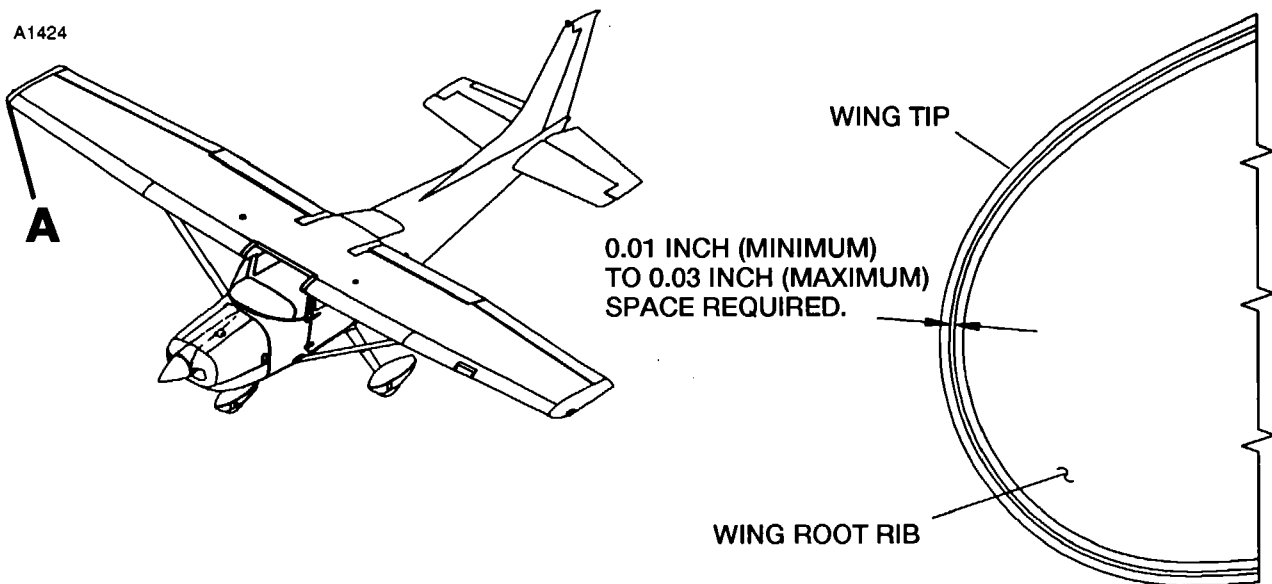
A. Remove the Wing Tip (Refer to Figure 202).

- (1) Remove the wing tip.
- (2) Remove the strobe light and the navigation light ground straps to power supply.
- (3) Disconnect the navigation lights electrical connector.
- (4) Disconnect the strobe lights electrical connector.
- (5) Remove wing tip from wing.

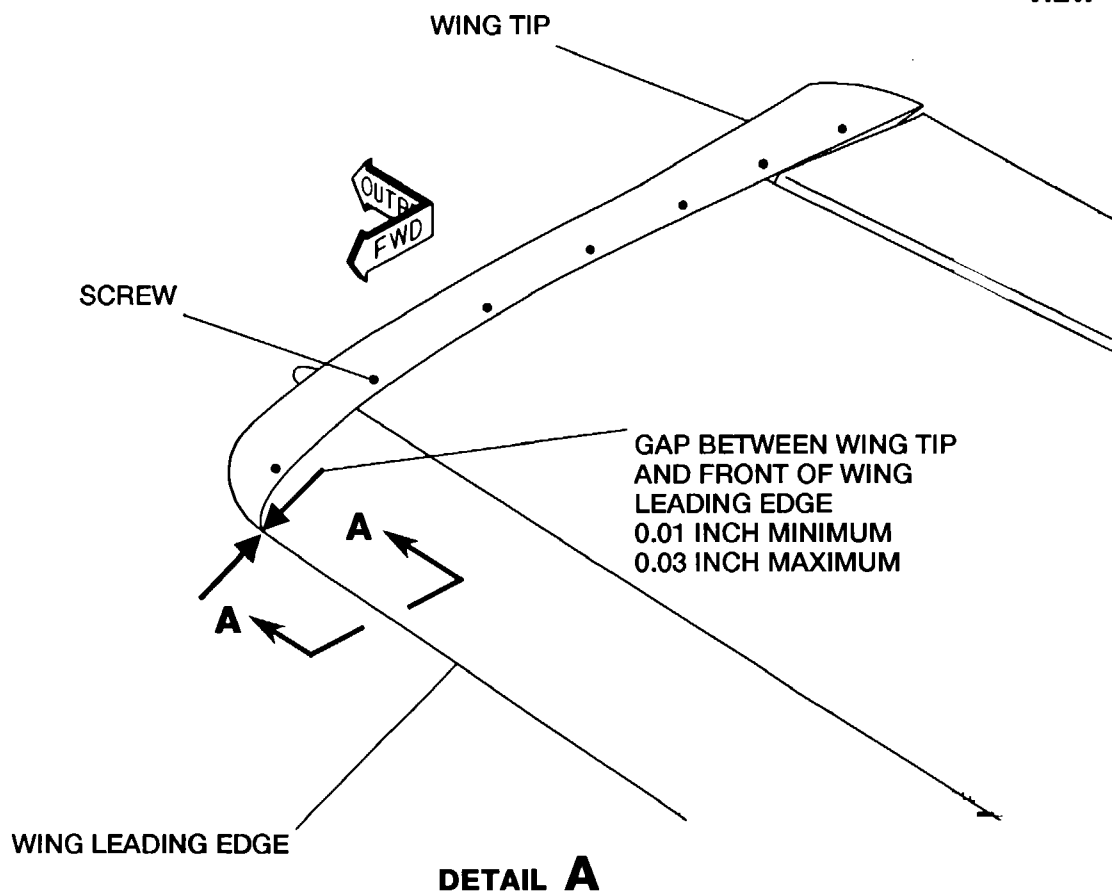
B. Install the Wing Tip (Refer to Figure 202).

- (1) Connect the strobe lights electrical connector.
- (2) Connect the navigation lights electrical connector.
- (3) Move the wing tip into position over the wing tip rib. Make sure the existing holes in the wing tip align with the attach holes in the wing skin/rib nutplates.
- (4) Make a curved spacer from phenolic or aluminum which is 0.01 inch to 0.03 inch thick and is 1.0 inch to 2.0 inches in length. Make sure it matches the contour of the leading edge.
- (5) Install the spacer at the leading edge of the wing between the skin and the inside contour of the wing tip.
- (6) Start at the aft of the tip and work forward, attach the wing tip to wing using screws.
- (7) When all screws are installed, remove the spacer to leave a gap of 0.01 inch to 0.03 inch between the skin and the inside contour of the wing tip.

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**VIEW A-A**



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A0510T1001  
A-A0523T1001

Wing Tip Installation  
Figure 202 (Sheet 1)

• **CHAPTER**

• **61**

**PROPELLERS**

•



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**PROPELLER - GENERAL**

**1. Scope**

- A. This chapter contains information for removal and installation of the propeller and propeller governor, and adjustment and rigging procedures for the propeller governor.

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**PROPELLER - MAINTENANCE PRACTICES**

**1. General**

- A. The airplane is equipped with a two or three bladed, constant-speed, metal propeller. Maintenance practices consist of removal and installation of the propeller and spinner. For additional information, troubleshooting, adjustments, and maintenance procedures not addressed in this section, see the applicable McCauley Service Manual. Refer to Introduction, List of Manufacturers Technical Publications.

**2. Propeller and Spinner Removal and Installation**

- A. Remove Propeller and Spinner (Refer to Figure 201).  
(1) Remove all power from airplane.

**WARNING: Exercise care when working with the propeller. Always treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller. Ensure magneto switch is in the OFF position before turning propeller.**

**WARNING: Ensure magneto is grounded before turning propeller.**

- (2) Remove twelve screws and washers securing spinner to spinner bulkhead assembly.  
(3) Remove spinner, spinner support, and shims from prop cylinder.

**NOTE:** Note number of shims for use during reinstallation of spinner.

- (4) Remove cowl assemblies as required to gain access to propeller mounting bolts.

**NOTE:** If equipped with prop deice system, remove brush block assembly before removing propeller, to prevent possible brush damage.

- (5) Cut safety wire from mounting bolts.  
(6) Remove mounting bolts as follows:  
(a) Evenly back off mounting bolts approximately 0.25 of an inch (6.35 mm).  
(b) Pull propeller assembly forward, taking up the 0.25 inch (6.35 mm) provided by backing off mounting bolts.

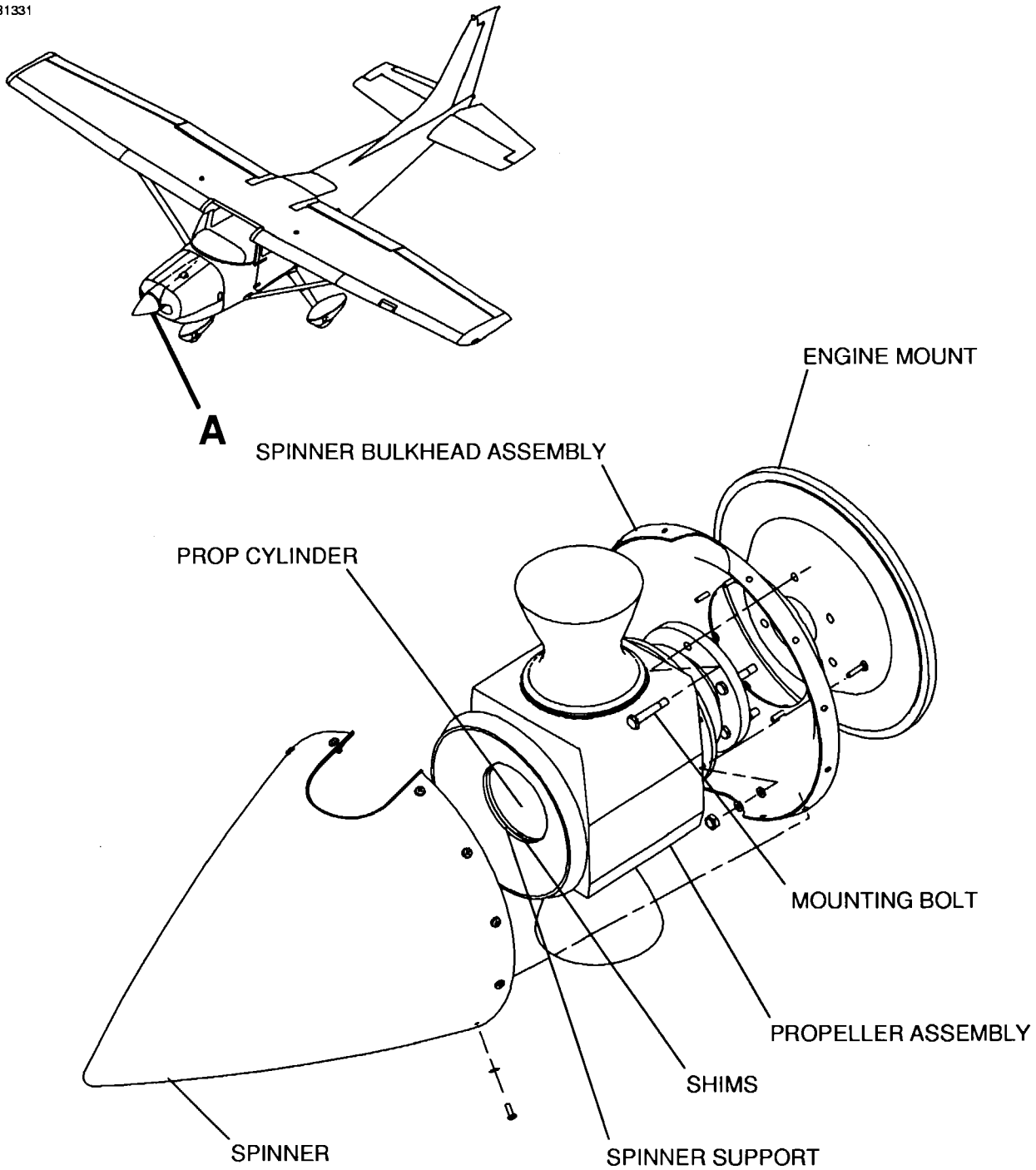
**NOTE:** As the propeller assembly is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

- (c) Continue evenly backing off the mounting bolts and pulling the propeller assembly forward, 0.25 inch (6.35 mm) at a time, until all bolts are completely removed.  
(7) Remove propeller assembly and O-Ring from engine prop shaft.

- B. Install Propeller and Spinner (Refer to Figure 201).

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**DETAIL A**

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Propeller and Spinner Installation  
Figure 201 (Sheet 1)

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**WARNING:** Exercise care when working with the propeller. Always treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller. Ensure magneto switch is in the OFF position before turning propeller.

**WARNING:** Ensure magneto is grounded before turning propeller.

- (1) Clean mating surfaces of propeller assembly, spinner bulkhead assembly, engine prop shaft and mating surfaces.
- (2) Apply film of MIL-L-7711 lubricant, or equivalent, to new O-Ring and engine prop shaft.
- (3) Install new O-Ring.
- (4) Carefully slide propeller assembly unto engine prop shaft and align propeller assembly to engine and secure with mounting bolts.
- (5) Torque mounting bolts incrementally in a crossing pattern to 60 foot-lbs, +5 or -5 foot-lbs (660-780 in-lbs).
- (6) Safety wire mounting bolts in sets of two or three bolts. Refer to Chapter 20, Safetying - Maintenance Practices.
- (7) Position shims, spinner support, and spinner on prop cylinder.
- (8) Lightly press spinner snugly against spinner support and check alignment of mounting holes in spinner with holes in spinner bulkhead assembly.

**NOTE:** Without increasing pressure on spinner, the mounting holes in spinner need to be positioned approximated 0.050 inch (1.27 mm) forward of the true center of holes in spinner bulkhead assembly.

- (a) Add or remove shims as required to position spinner mounting holes 0.050 inch (1.27 mm) forward of holes in spinner bulkhead assembly.
- (9) Push hard on spinner until spinner mounting holes are aligned with the spinner bulkhead assembly holes and install four (4) screws and washers equally spaced around circumference of spinner.

**NOTE:** Use only the number of shims that will allow just enough alignment for screws to be installed while pushing hard against spinner.

- (10) Relax force against spinner and install remaining screws and washers. Tighten all screws uniformly around spinner.
- (11) Install cowl assemblies.
- (12) Check engine oil and service as needed.

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**PROPELLER GOVERNOR - MAINTENANCE PRACTICES**

**1. General**

- A. The propeller governor is a single-acting, centrifugal type, which boosts oil pressure from the engine and directs it to the propeller where the oil is used to increase blade pitch. The governor is installed on the forward, upper left side of the engine.
- B. Maintenance practices consist of removal and installation of the propeller governor, high RPM stop adjustment, and rigging of the governor control. For additional information, troubleshooting, adjustments, and maintenance procedures not addressed in this section, refer to the applicable McCauley Service Manual.

**2. Propeller Governor Removal/Installation**

- A. Remove the Propeller Governor (Refer to Figure 201).
  - (1) Remove all power from airplane.

**WARNING: Treat the propeller as if the ignition switch were on. Do not stand or allow anyone to stand in the arc of the propeller. Make sure the magneto switch is set to the OFF position before turning propeller.**

- (2) Remove cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (3) Remove the cotter pin, nut, washers, and bolt attaching the control cable to the control arm.

**NOTE:** Identify washers and position of washers for use when reconnecting control cable to control arm.

- (4) Loosen the screws attaching the control cable to the control cable bracket.
  - (5) Remove the control cable from the bracket restraint.
  - (6) Remove the nuts and washers attaching the propeller governor to the engine.
  - (7) Remove the propeller governor and gasket.
- B. Install the Propeller Governor (Refer to Figure 201).
  - (1) Clean the smooth surfaces of propeller governor and engine mounting surface.
  - (2) Install a new mount gasket.

**WARNING: Treat the propeller as if the ignition switch were on. Do not stand or allow anyone to stand in the arc of the propeller. Make sure the magneto switch is set to the OFF position before turning propeller.**

**WARNING: Make sure you ground the magneto before you turn the propeller.**

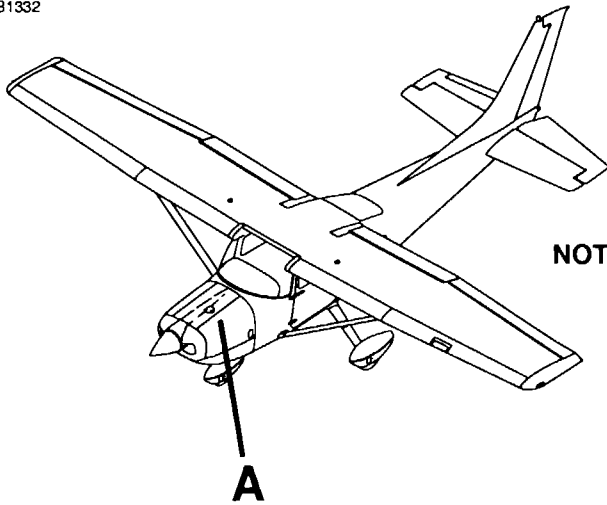
**CAUTION:** Do not force the spline engagement. Rotate the crankshaft slightly and the splines will mesh smoothly when properly aligned.

- (3) Position the propeller governor and attach to the engine with the washers and nuts.
    - (a) If required, rotate the crankshaft to properly align the propeller governor and the engine splines.
  - (4) Install the control cable in the bracket restraint and tighten the screws.
  - (5) Attach the control cable to the control arm with the bolt, washers, and nut.
    - (a) Torque the nut to 30 inch-pounds.

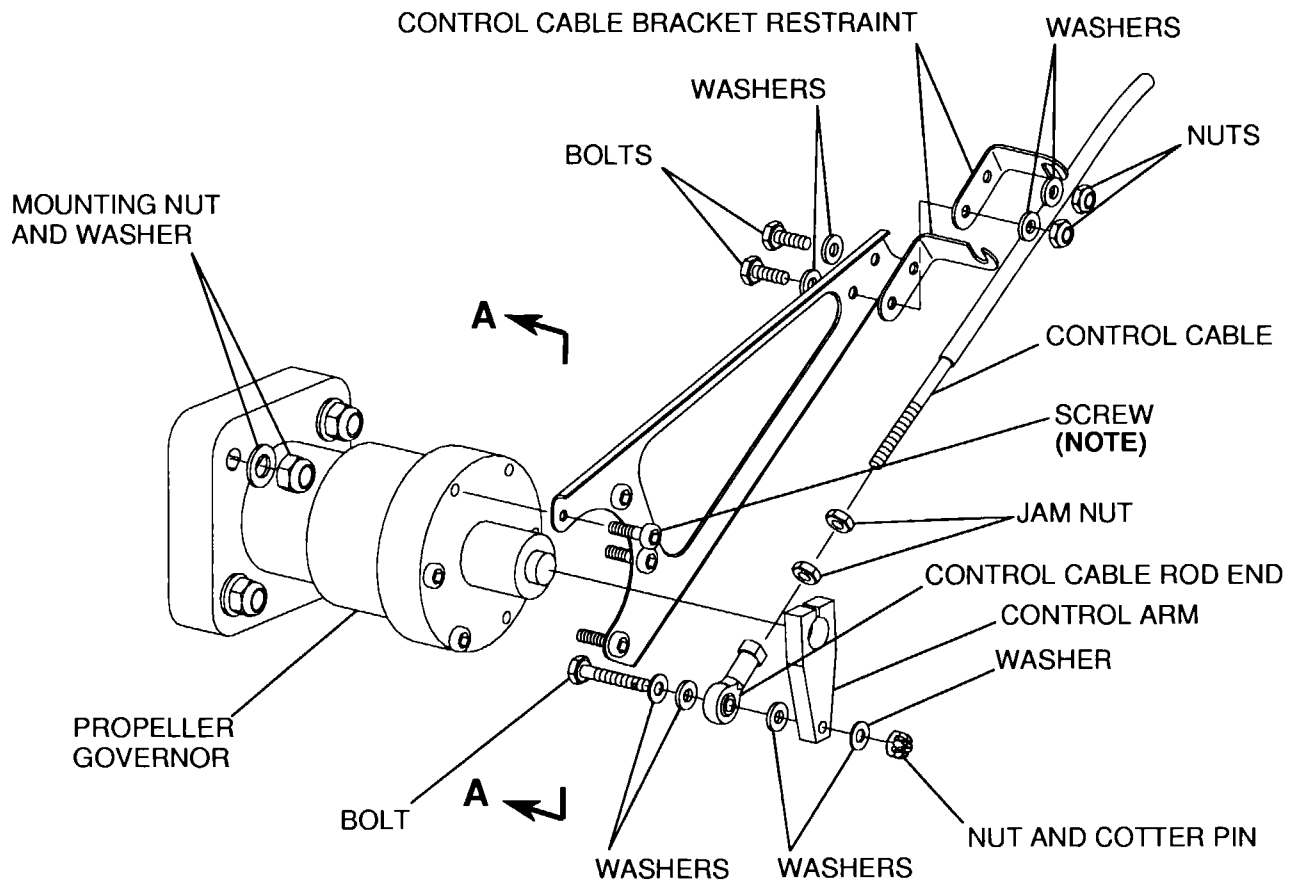


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**NOTE:** THESE SCREWS MAY ONLY BE USED ONCE. WHEN REMOVED, THESE SCREWS MUST BE REPLACED WITH NEW SCREWS. REFERENCE MCCAULEY SERVICE LETTER 2000-11, OR LATEST REVISION, FOR SCREW AND TORQUE RECOMMENDATIONS.



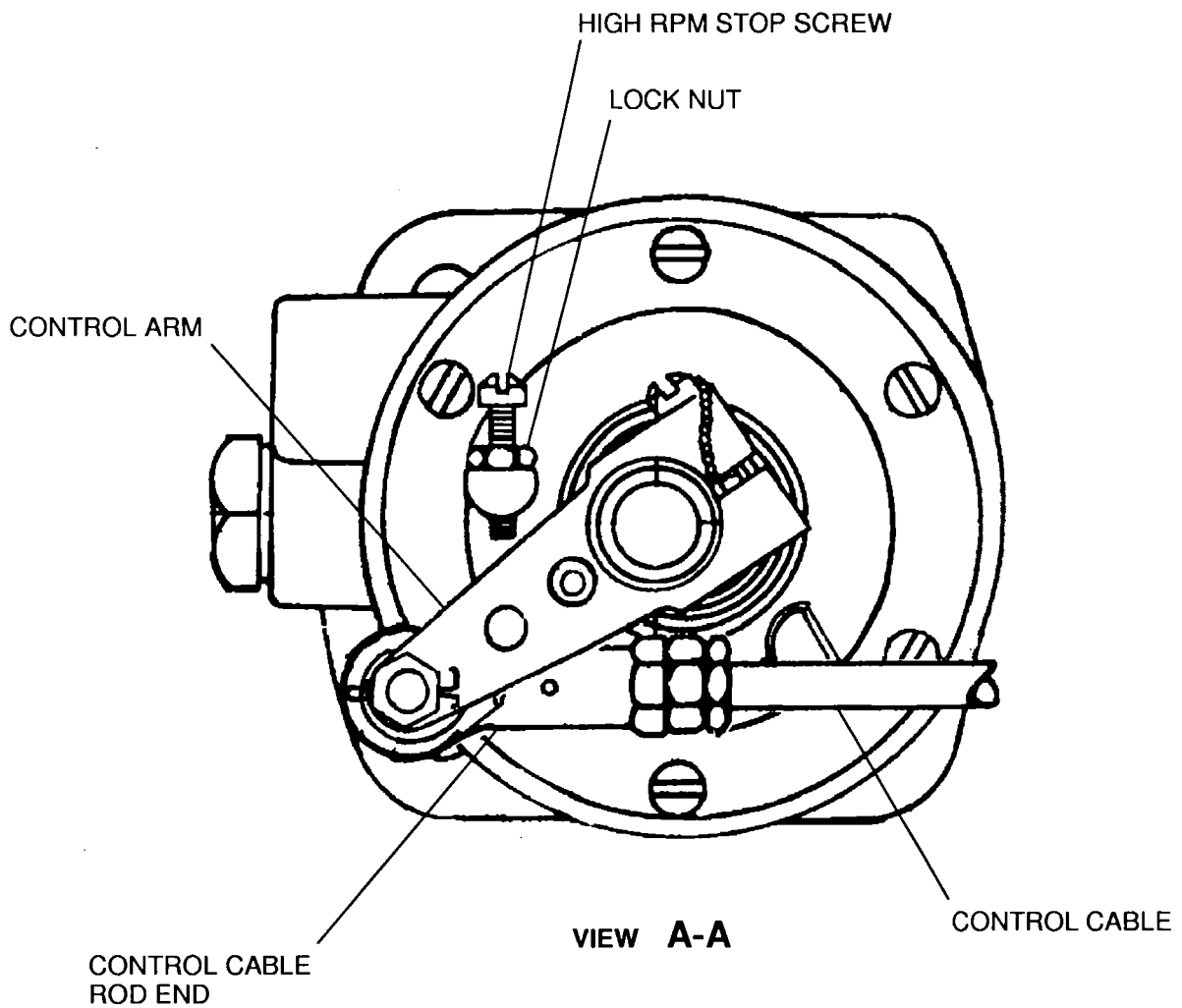
**DETAIL A**

Propeller Governor Installation  
 Figure 201 (Sheet 1)

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AA0755R1011

Propeller Governor Installation  
Figure 201 (Sheet 2)

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**CAUTION:** Do not exceed 50 inch-pounds.

- (b) Continue to torque the nut past 30 inch-pounds until the cotter pin hole lines up with castellations in the nut.
- (c) Install a new cotter pin.
- (6) Rig the governor control. Refer to governor control rigging.
- (7) Install cowling. Refer to Chapter 71, Cowling - Maintenance Practices.

**3. High RPM Stop Screw Adjustment**

**WARNING:** Treat the propeller as if the ignition switch is set to on. Do not stand or allow anyone to stand in the arc of the propeller. Make sure the magneto switch is set to the OFF position before turning propeller.

**WARNING:** Make sure you ground the magneto before you turn the propeller.

- A. Adjust the High RPM Stop Screw (Refer to Figure 201).
- (1) Remove the cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (2) Cut and discard the safety wire from high RPM stop screw.
  - (3) Loosen the high RPM stop screw lock nut.
  - (4) Turn the high RPM stop screw in (clockwise) for decrease in RPM or out (counterclockwise) to increase maximum RPM. One complete turn will cause a change of approximately 25 RPM.

**NOTE:** Due to climate conditions, field elevation, low pitch propeller blade angle, and other factors, the engine may not reach rated RPM on the ground. It may be necessary to readjust the governor high RPM stop screw after test flying to obtain maximum rated RPM when airborne.

- (5) Torque the lock nut to 8 to 12 inch-pounds.
- (6) Adjust the propeller governor control as necessary to maintain full travel. Make sure the governor control arm contacts the high RPM stop screw in both the maximum and minimum settings (bottomed out against both high and low pitch stops). Make sure a cushion exists at both positions of control arm travel. Refer to governor control rigging.
- (7) Safety wire high RPM stop screw. Refer to Chapter 20, Safelying - Maintenance Practices.
- (8) Install cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
- (9) Test and operate the governor and propeller combination.

**4. Propeller Control Cable**

- A. Remove the Propeller Control Cable (Refer to Figure 201).

**CAUTION:** The control cable is not repairable and must be replaced at every engine overhaul or when maximum linear movement exceeds 0.050 inch.

- (1) Remove the upper cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
- (2) Remove the cotter pin, nut, washers, and bolt attaching the control cable to the control arm. Discard the cotter pin.
- (3) Remove the control cable rod end.
- (4) Remove the nuts and bolts attaching the clamp bracket and pull control cable out of the grommet on the engine baffle.
- (5) Remove the control cable nut and washer at the firewall.
- (6) Pull control cable aft through firewall.
- (7) Remove the nut and washer from the control cable.
- (8) Remove the nut and washer on the forward side of the instrument panel from control cable while pulling control cable from the instrument panel.

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- B. Install the Propeller Control Cable (Refer to Figure 201).
- (1) Route the control cable through the instrument panel.
  - (2) Route control cable through firewall and install the instrument panel washer nut.
  - (3) Install firewall washer and nut.
  - (4) Route cable through grommet in engine baffle.
  - (5) Attach the clamp bracket on the control cable.
  - (6) Rig governor control. Refer to Governor Control Rigging.
  - (7) Install cowling. Refer to Chapter 71, Cowling - Maintenance Practices.

5. Governor Control Rigging

**WARNING: Treat the propeller as if the ignition switch is set to on. Do not stand or allow anyone to stand in the arc of the propeller. Make sure the magneto switch is set to the OFF position before turning propeller.**

**NOTE:** The result of rigging of the governor control is full travel of the governor control arm (bottomed out against both high and low pitch stops), with some cushion at both ends of the control travel.

- A. Rig the Governor Control (Refer to Figure 201).
- (1) Remove the cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (2) Remove the cotter pin, nut, washers, and bolt attaching the control cable to the control arm.
    - (a) Identify the washers and position of washers for attaching the control cable to the control arm.
  - (3) Set the governor control in the cockpit to full forward. Pull the governor control back approximately 0.125 inch and lock in this position.

**NOTE:** This allows cushion which will make sure there is full contact with the governor high RPM stop screw.

- (4) Set the governor control arm against the high RPM stop screw.
- (5) Loosen the jamnuts on the control cable rod end.
- (6) Adjust rod end to align with control arm.
  - (a) Make sure the threads engage during adjustments. If necessary, adjust the position of the control cable in the control cable bracket restraint to achieve proper alignment and for threads to engage.
- (7) Attach the control cable to the control arm with the bolt, washers, and nut.
  - (a) Torque the nut to 30 inch-pounds.

**CAUTION:** Do not exceed 50 inch-pounds.

- (b) Continue to torque the nut past 30 inch-pounds until the cotter pin hole lines up with castellations in the nut.
  - (c) Install a new cotter pin.
- (8) Tighten the loose jamnuts on the control cable rod end.
- (9) Operate the propeller control to make sure the governor control arm has full travel and contacts stop in both directions with proper cushion.
- (10) Install the cowling. Refer to Chapter 71, Cowling - Maintenance Practices.

**CHAPTER**

**71**

**POWER PLANT**

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**POWERPLANT - GENERAL**

**1. Scope**

- A. This chapter contains maintenance information on the powerplant and associated components. For engine related information not found in this chapter, refer to applicable Textron Lycoming maintenance manuals, listed in Introduction - List of Manufacturers Technical Publications.

**2. Definition**

- A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows:
- (1) The section on powerplant provides description, operation, troubleshooting and removal/installation information for the engine.
  - (2) The section on engine cowlings provides removal and installation instructions for the engine cowlings.
  - (3) The section on mounts provides removal and installation procedures for the engine mount.
  - (4) The section on air induction provides removal and installation procedures for the air induction part of the fuel system.
  - (5) The section on drain lines provides removal and installation instructions on the various drain lines used in the engine compartment.

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**ENGINE - DESCRIPTION AND OPERATION**

**1. Description and Operation**

- A. Textron Lycoming's IO-540 AB1A5 and TIO-540-AK1A are direct drive, six cylinder, fuel injected, horizontally opposed, air cooled engines. The cylinders, numbered from front to rear, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right front cylinder is number 1 and the other cylinders on the right side of the engine are identified by odd numbers 3 and 5. The left front cylinder is number 2 and the other cylinders on the left side are identified as 4 and 6.
- B. For a technical description of the engine, refer to Table 1. For an illustration of the engine, refer to Figure 1 and Figure 2.
- C. For information beyond the scope of this chapter, refer to applicable engine manuals listed in Introduction - List of Manufacturers Technical Publications.

Table 1. IO-540-AB1A5 Technical Description

Rated Horsepower at 2400 RPM	230
Number of Cylinders	6 Horizontally Opposed
Displacement	541.5 Cubic Inches (8.875 l)
Bore	5.125
Stroke	4.375
Compression Ratio	8.5:1
Firing Order	1-4-5-2-3-6
Magnetos:	
Right Magneto	Slick Model No. 6351 (fires at 23° BTDC)
Left Magneto	Slick Model No. 6351 (fires at 23° BTDC)
Spark Plugs	18MM
Torque:	420 Inch-pounds
Valve Rocker Clearance (hydraulic tappets collapsed)	0.028 to 0.080 inch
Fuel Injector	RSA-5AD1
Tachometer	Mechanical Drive
Oil Capacity	9.0 Quarts (8.52 l)
Oil Pressure	
Minimum Idling	20 PSI
Normal	50 to 90 PSI
Maximum	115 PSI
Oil Temperature	

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Table 1. IO-540-AB1A5 Technical Description (continued)

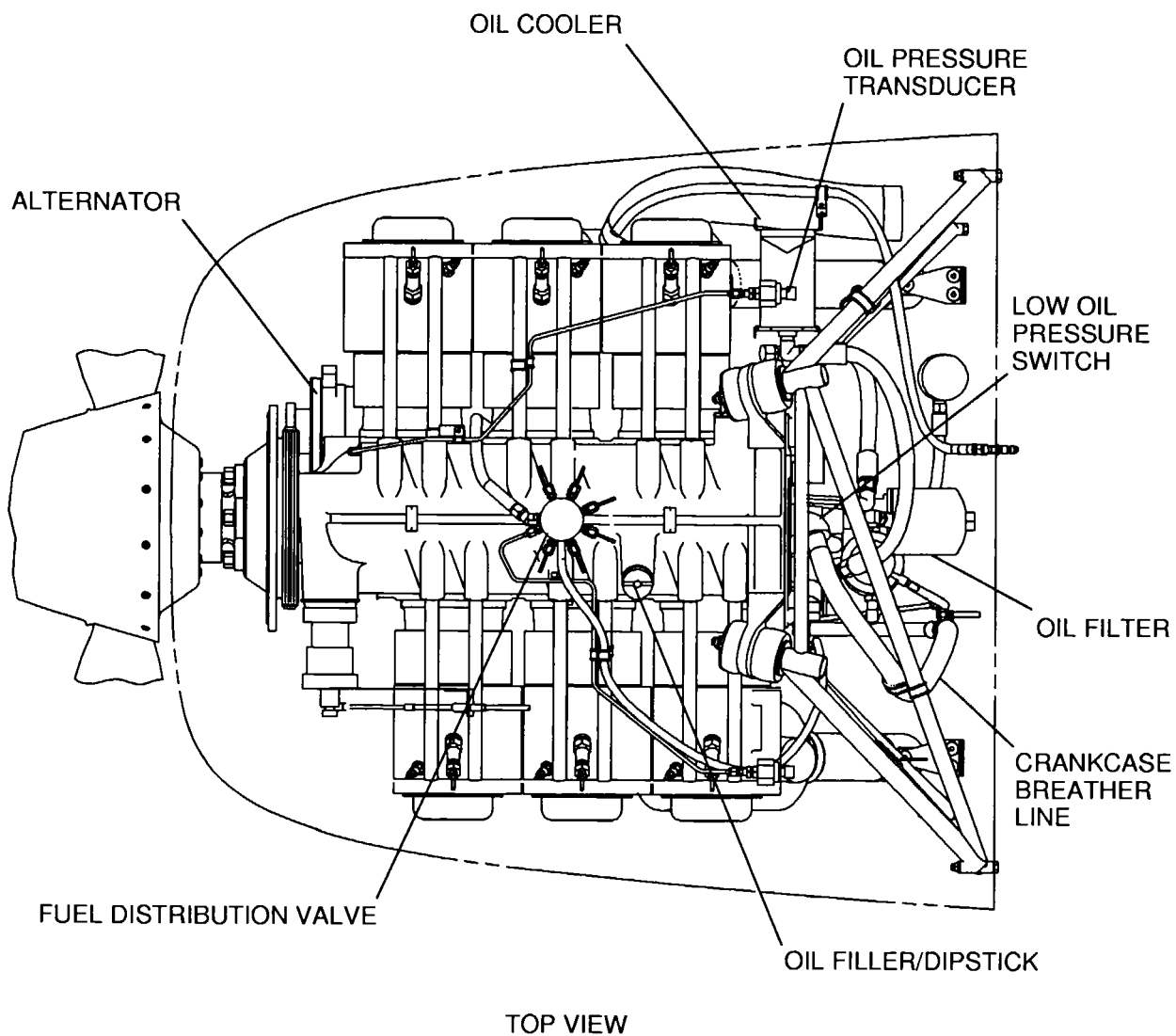
Normal	100 to 245°F (38 to 118°C)
Maximum	245°F (118°C)
Dry Weight - with accessories	382 Lbs

Table 2. TIO-540-AK1A Technical Description

Rated Horsepower at 2400 RPM	235
Number of Cylinders	6 Horizontally Opposed
Displacement	541.5 Cubic Inches (8.875 l)
Bore	5.125
Stroke	4.375
Compression Ratio	8.0:1
Firing Order	1-4-5-2-3-6
Magnetos:	
Right Magneto	Slick Model No. 6361 (fires at 20° BTDC)
Left Magneto	Slick Model No. 6361 (fires at 20° BTDC)
Spark Plugs	18MM
Torque:	420 Inch-pounds
Valve Rocker Clearance (hydraulic tappets collapsed)	0.028 to 0.080 inch
Fuel Injector	RSA-5AD1
Tachometer	Mechanical Drive
Oil Capacity	9.0 Quarts (8.52 l)
Oil Pressure	
Minimum Idling	20 PSI
Normal	50 to 90 PSI
Maximum	115 PSI
Oil Temperature	
Normal	100 to 245°F (38 to 118°C)
Maximum	245°F (118°C)
Dry Weight - with accessories	472 Lbs

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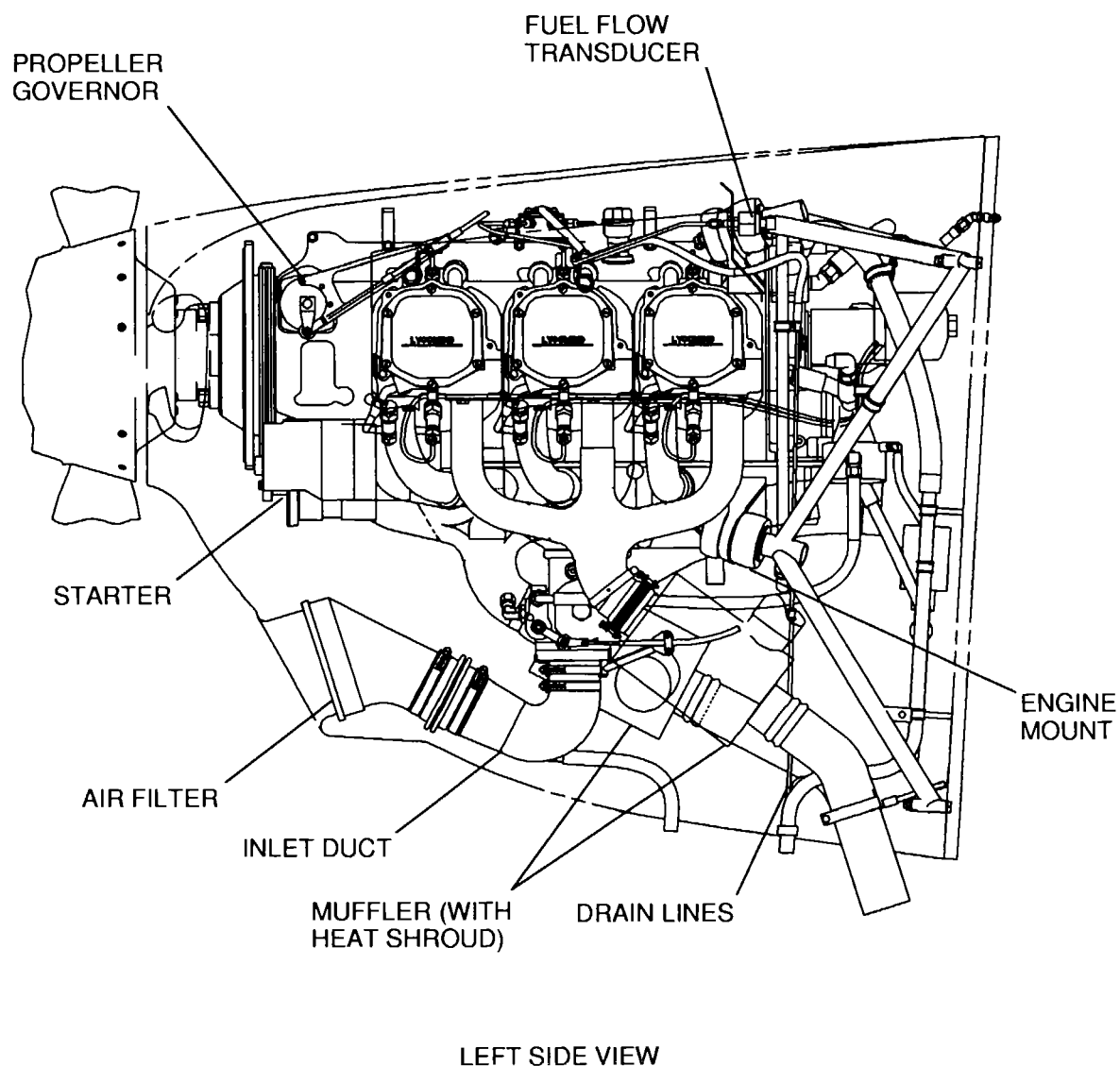


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Engine Installation  
Figure 1 (Sheet 1)

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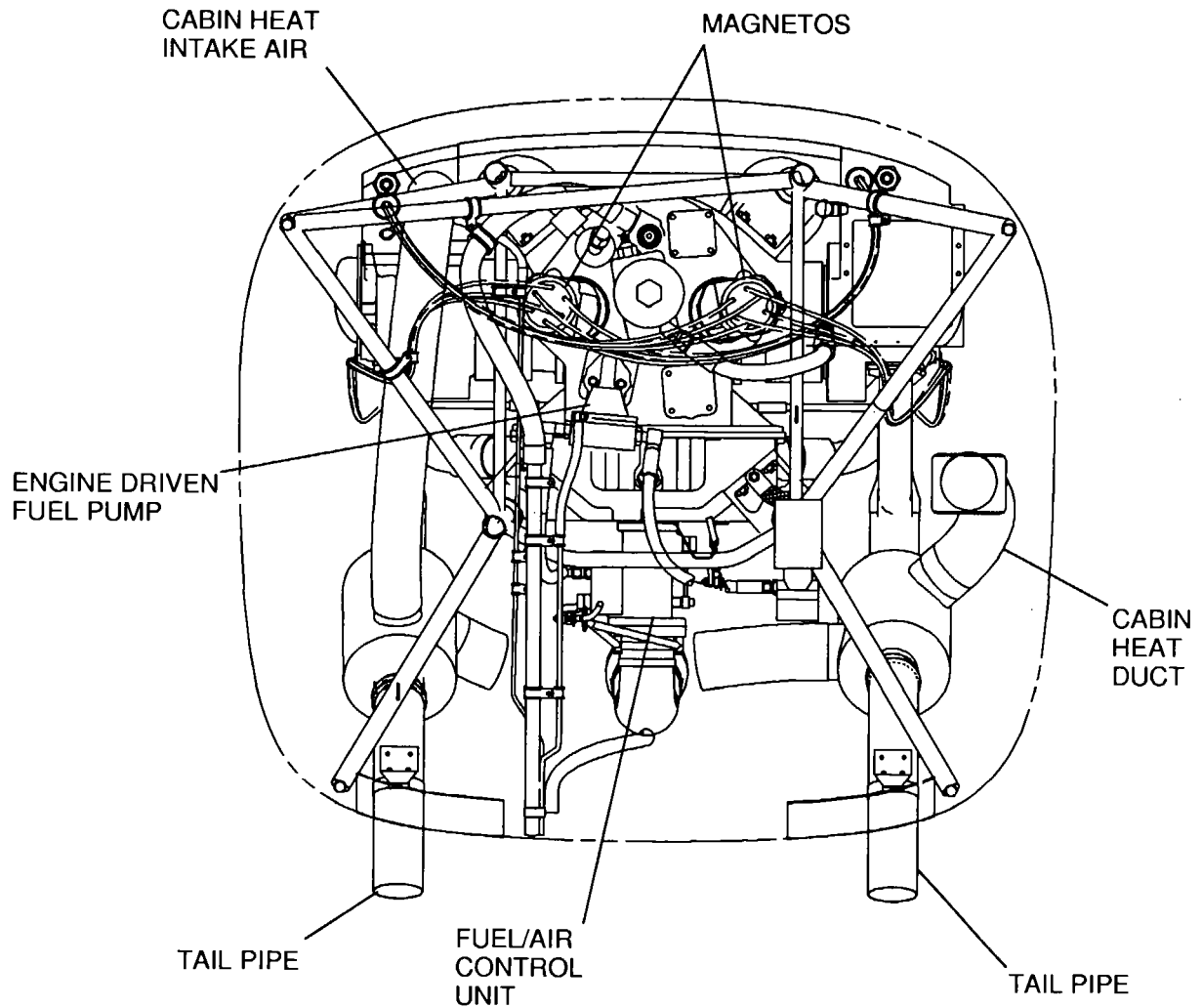


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Engine Installation  
Figure 1 (Sheet 2)

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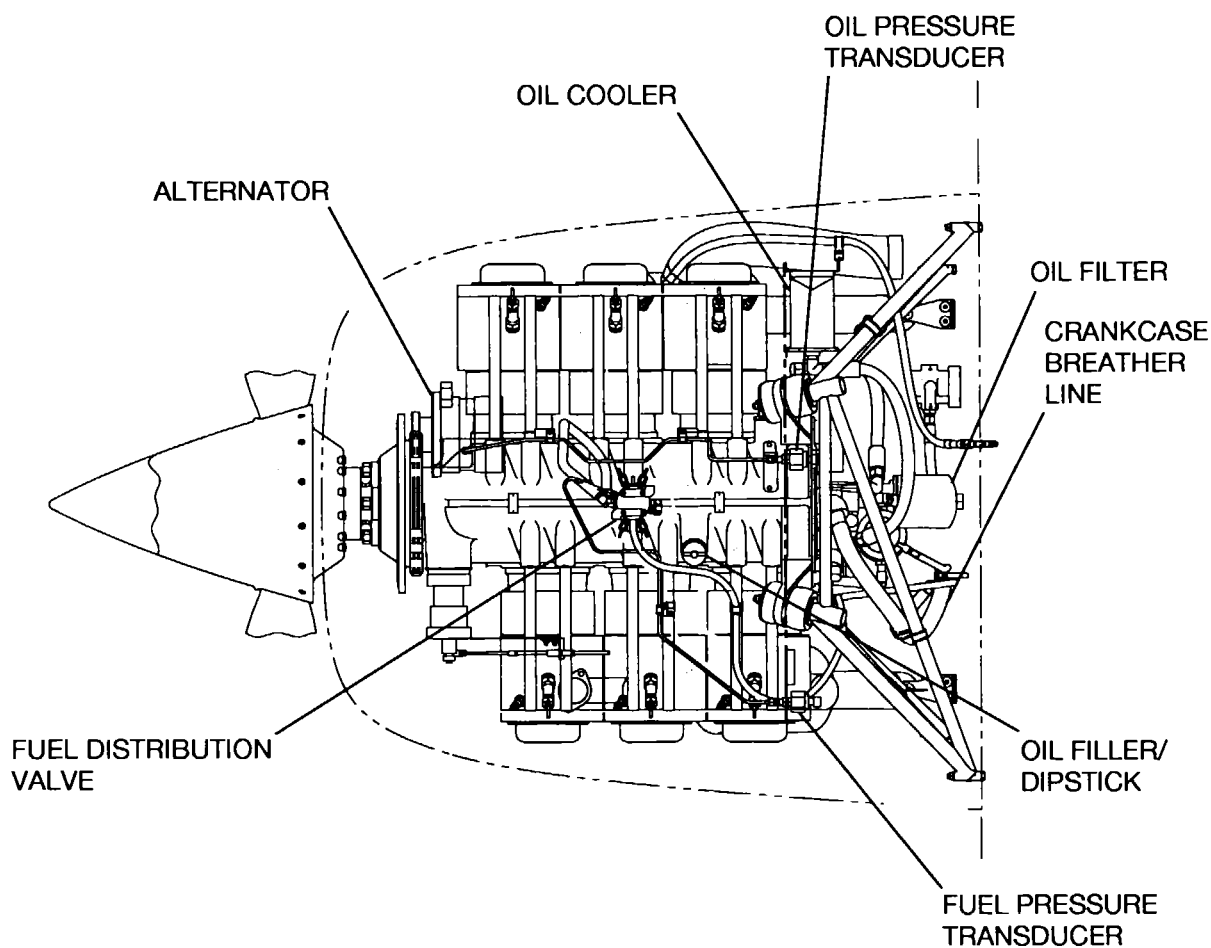
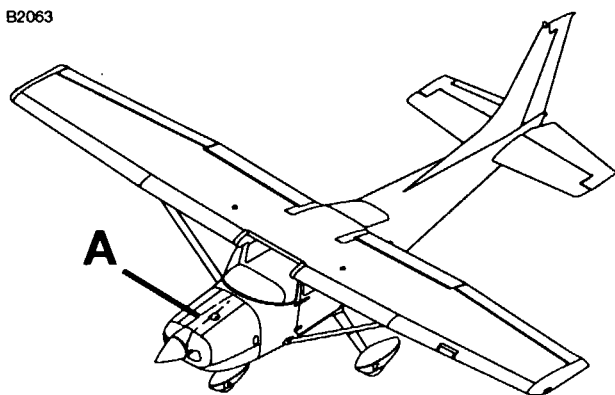
VIEW LOOKING FORWARD

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Engine Installation  
Figure 1 (Sheet 3)

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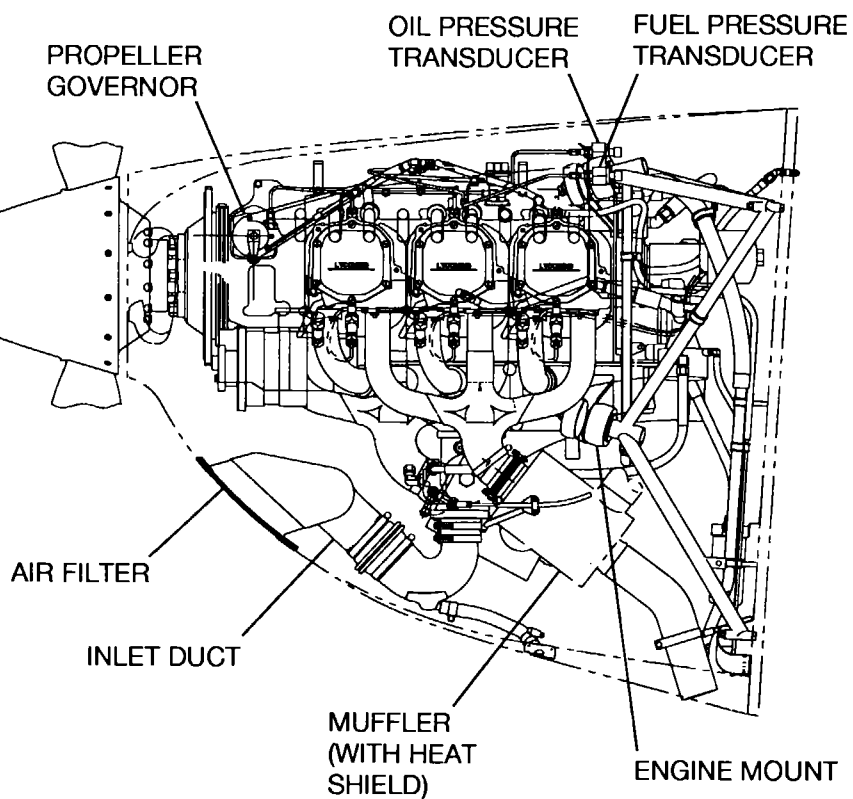
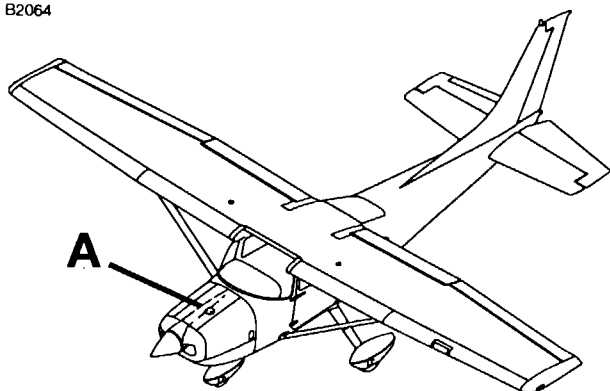
**DETAIL A**  
TOP VIEW (182T)

Engine Installation  
Figure 1 (Sheet 4)

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**DETAIL A**  
LEFT SIDE SHOWN (182T)

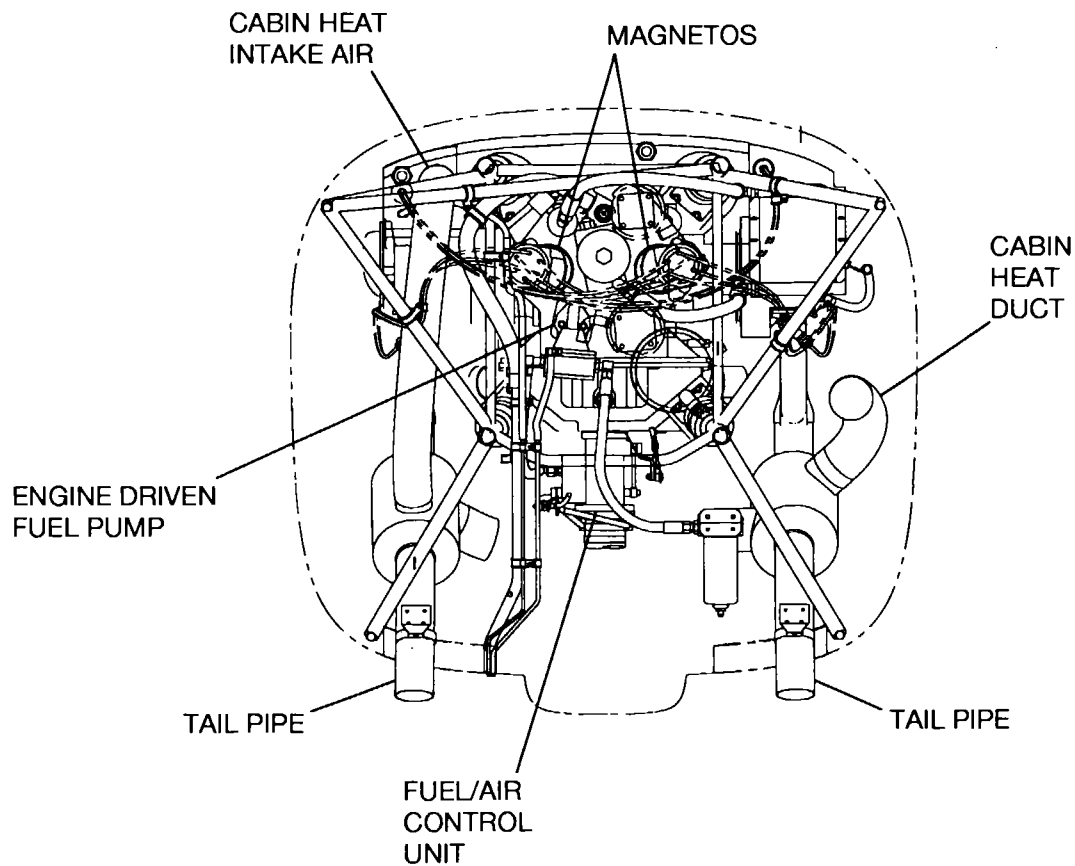
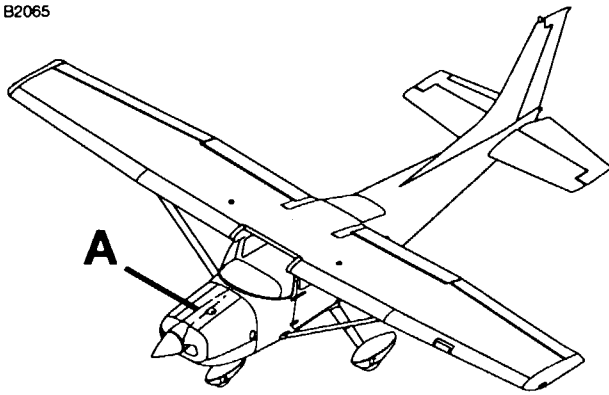
Engine Installation  
Figure 1 (Sheet 5)

0710T1001  
A0750T635D



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**MODEL 182/T182**  
MAINTENANCE MANUAL

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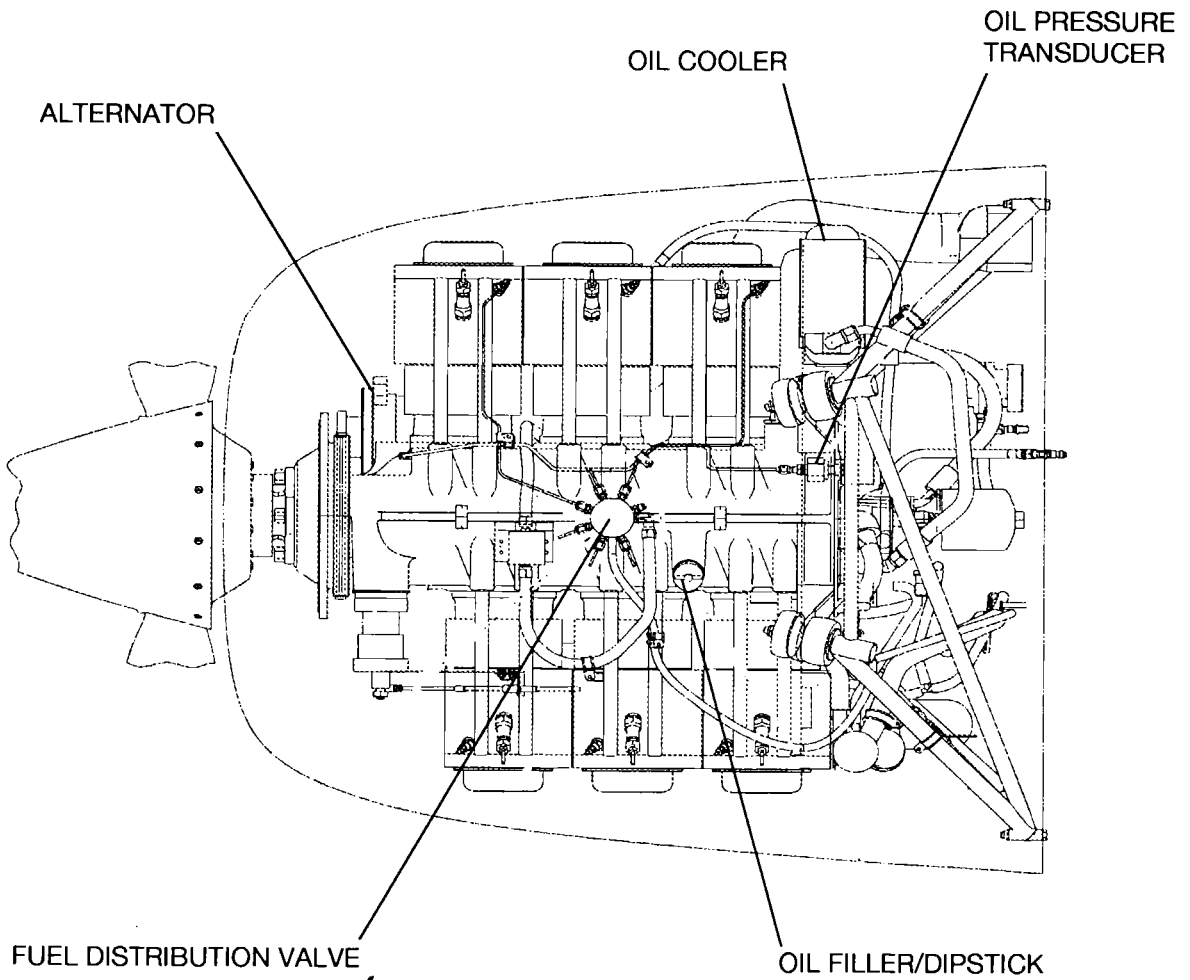
**DETAIL A**  
VIEW LOOKING FORWARD (182T)

Engine Installation  
Figure 1 (Sheet 6)

0710T1001  
A0750T635D

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B2069

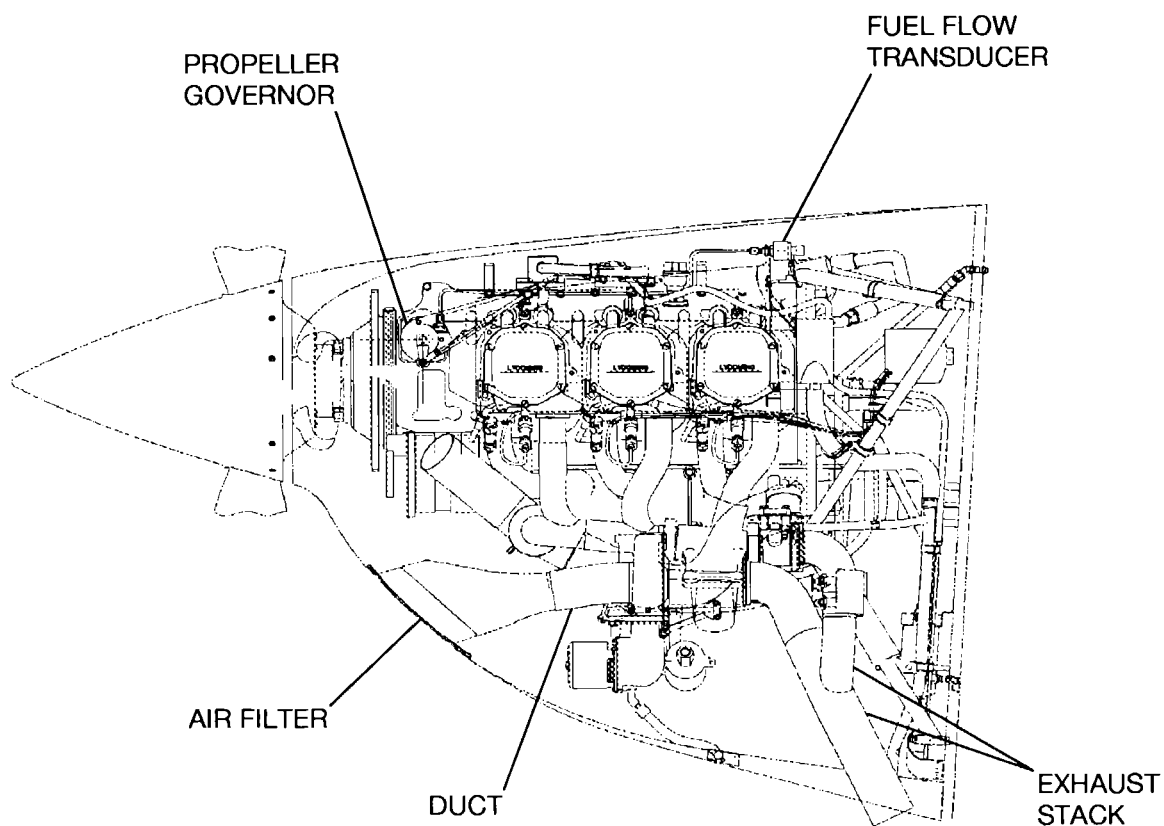


0750T636

Engine Installation  
Figure 1 (Sheet 7)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B2067



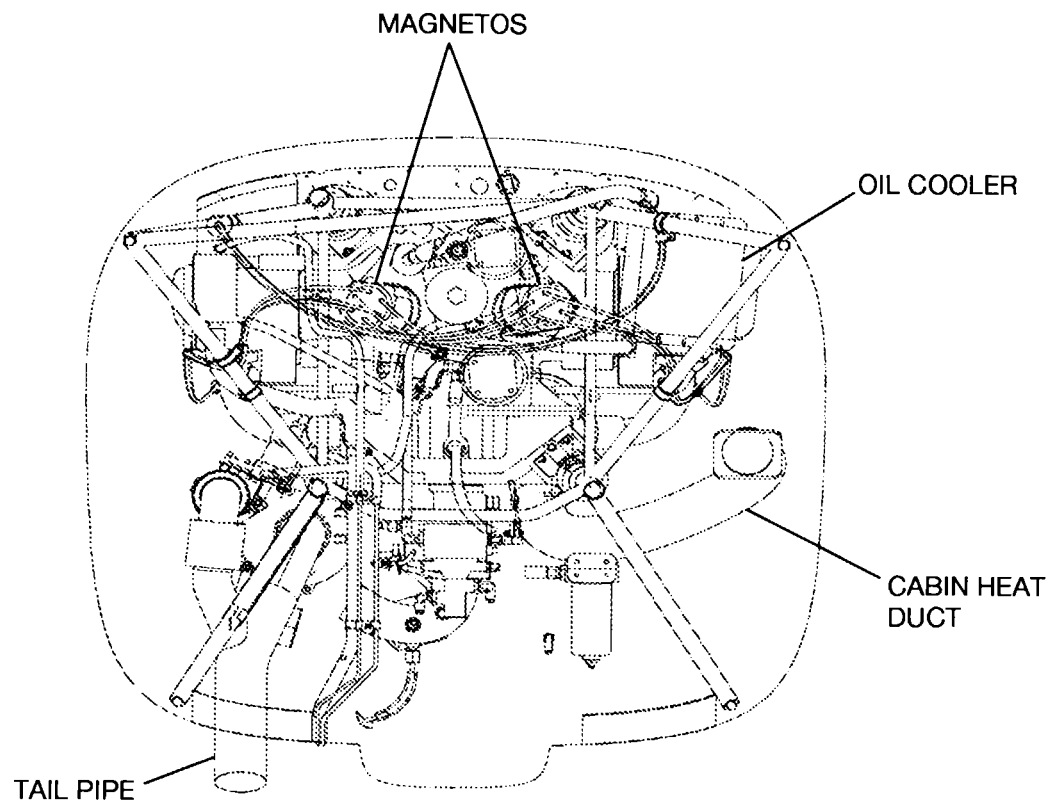
LEFT SIDE VIEW (T182T)

0750T636

Engine Installation  
Figure 1 (Sheet 8)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B2068



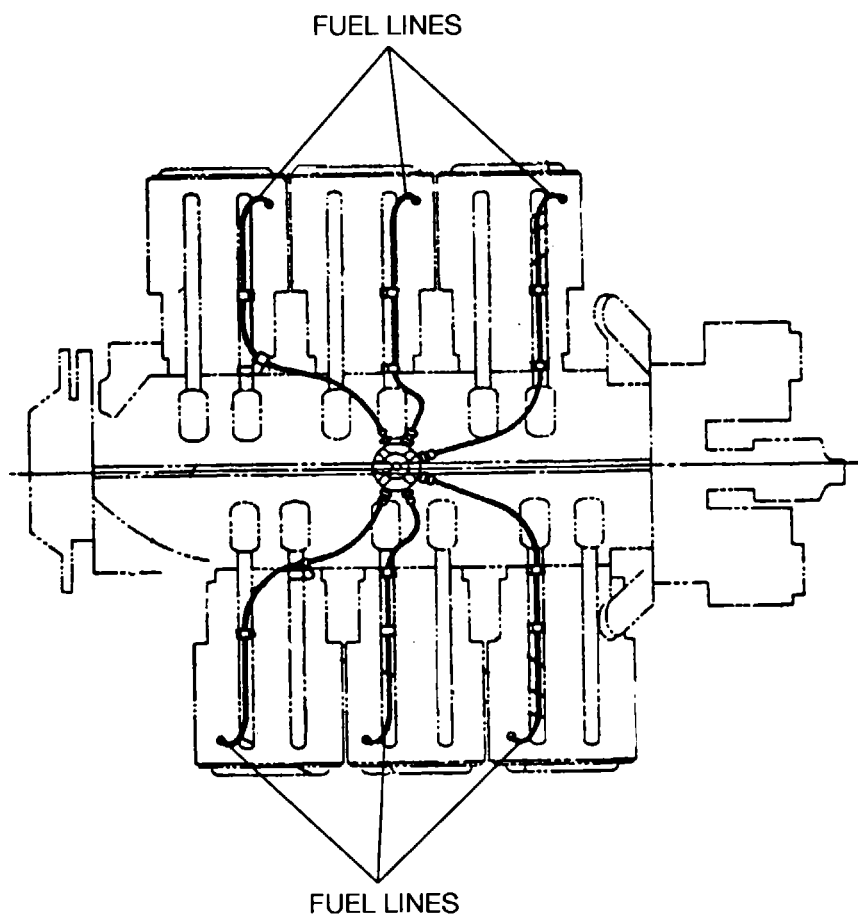
VIEW LOOKING FORWARD (T182T)

0750T636

Engine Installation  
Figure 1 (Sheet 9)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

B1995



Fuel Line Location  
Figure 2 (Sheet 1)

0750T636

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**ENGINE - TROUBLESHOOTING**

**1. Troubleshooting Chart**

- A. Use the chart that follows and the information in Chapter 74, Ignition System - Troubleshooting to help with engine and fuel system troubleshooting. For more information than that given in this chapter, refer to the applicable engine manuals and publications listed in the Introduction, List of Manufacturers Technical Publications.
- B. Static Run-up Procedures.

**NOTE:** If the engine operates at a lower power than usual, use the troubleshooting chart and the procedures that follow to find the cause of the low power condition.

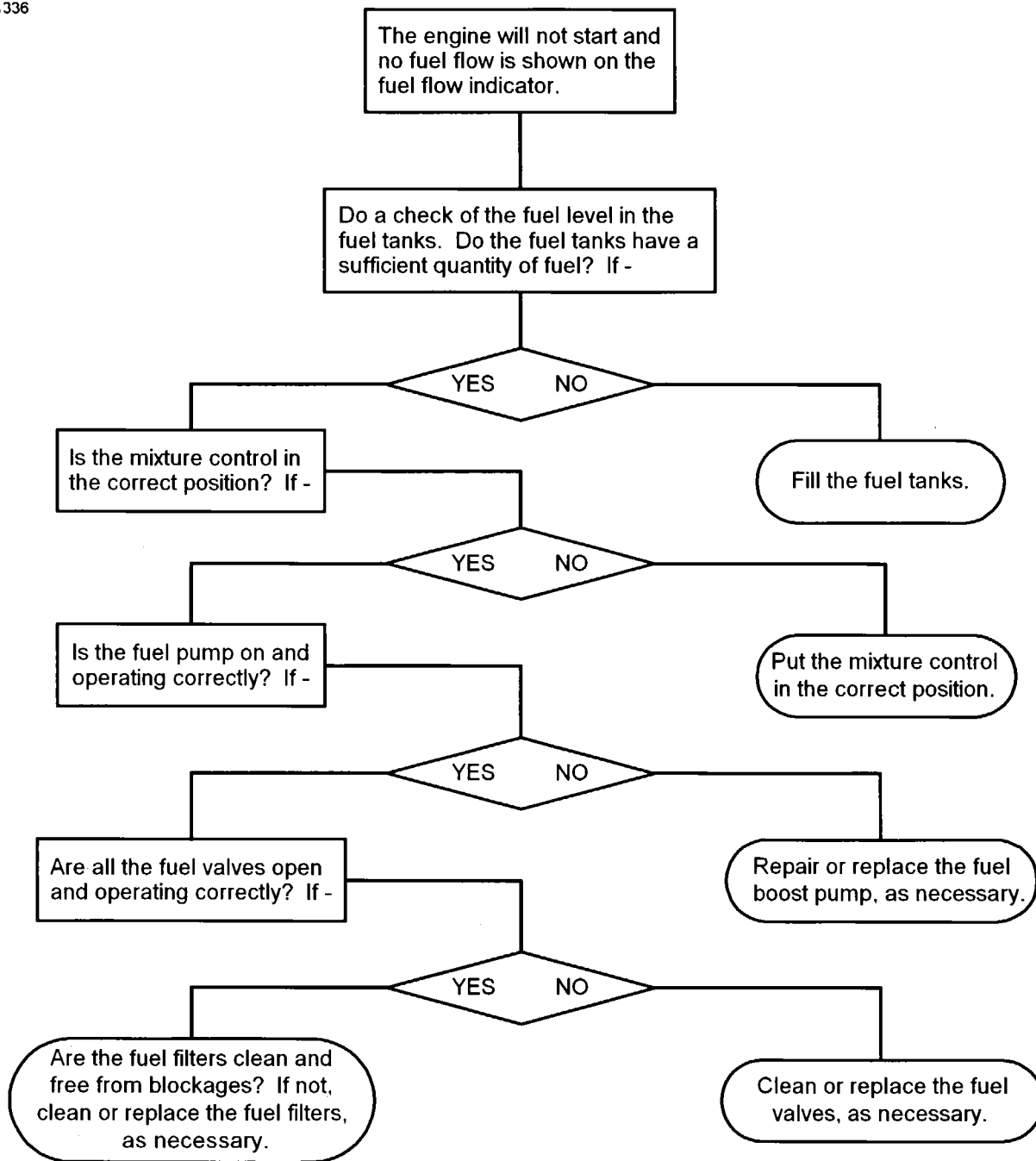
- (1) Align the airplane 90 degrees to the right of the wind direction.
- (2) Operate the engine at full throttle in accordance with procedures given in the Pilot's Operating Handbook and the approved Airplane Flight Manual.
- (3) Record the engine revolutions per minute (RPM).
- (4) Align the airplane 90 degrees to the left of the wind direction.
- (5) Operate the engine again at full throttle.
- (6) Record the RPM again.
- (7) Calculate the average RPM from the recorded RPM figures. The RPM must be between 2350 and 2400 RPM.

**NOTE:** Differences in atmospheric pressure, temperature, and humidity can have an important effect on run-up RPM. Low static run-up RPM information must be used with other troubleshooting procedures to find if other maintenance is needed.

- (8) If the run-up shows low power, do a check of the items that follow.
  - (a) Make sure that the alternate air door operates correctly and that the door stays closed while the airplane is in operation.
  - (b) Measure the magneto timing, and examine the spark plugs and ignition harness. Make sure that they are correctly set and are in good condition.
  - (c) Make sure that the fuel injection nozzles are clean and free from contamination. Make sure that the un-metered fuel flow is correct.
  - (d) Make sure that the induction air filter is clean and in good condition. Clean or replace the induction air filter, as necessary.
  - (e) Do the engine compression check.

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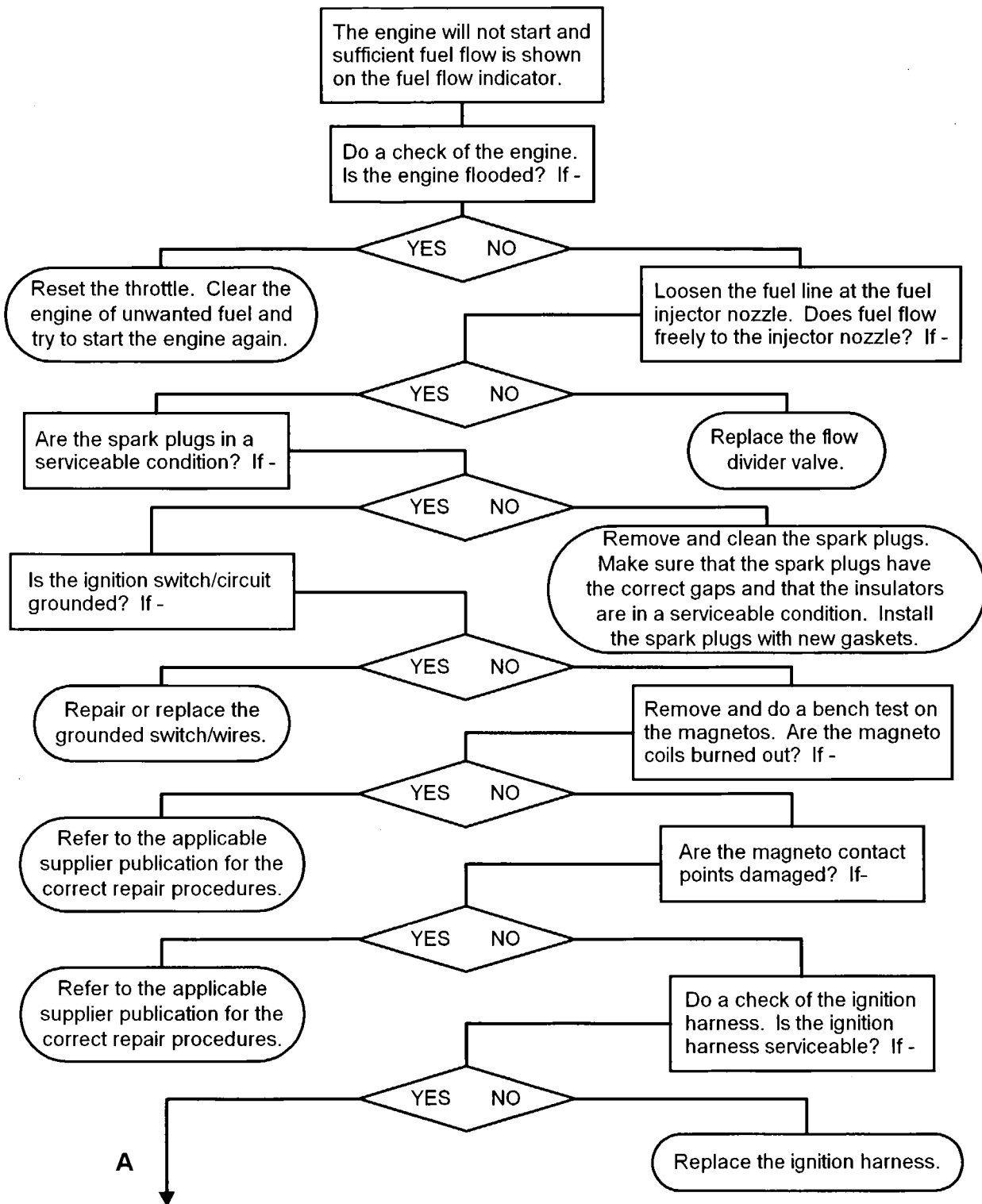
B1336



Engine Troubleshooting Chart  
Figure 101 (Sheet 1)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

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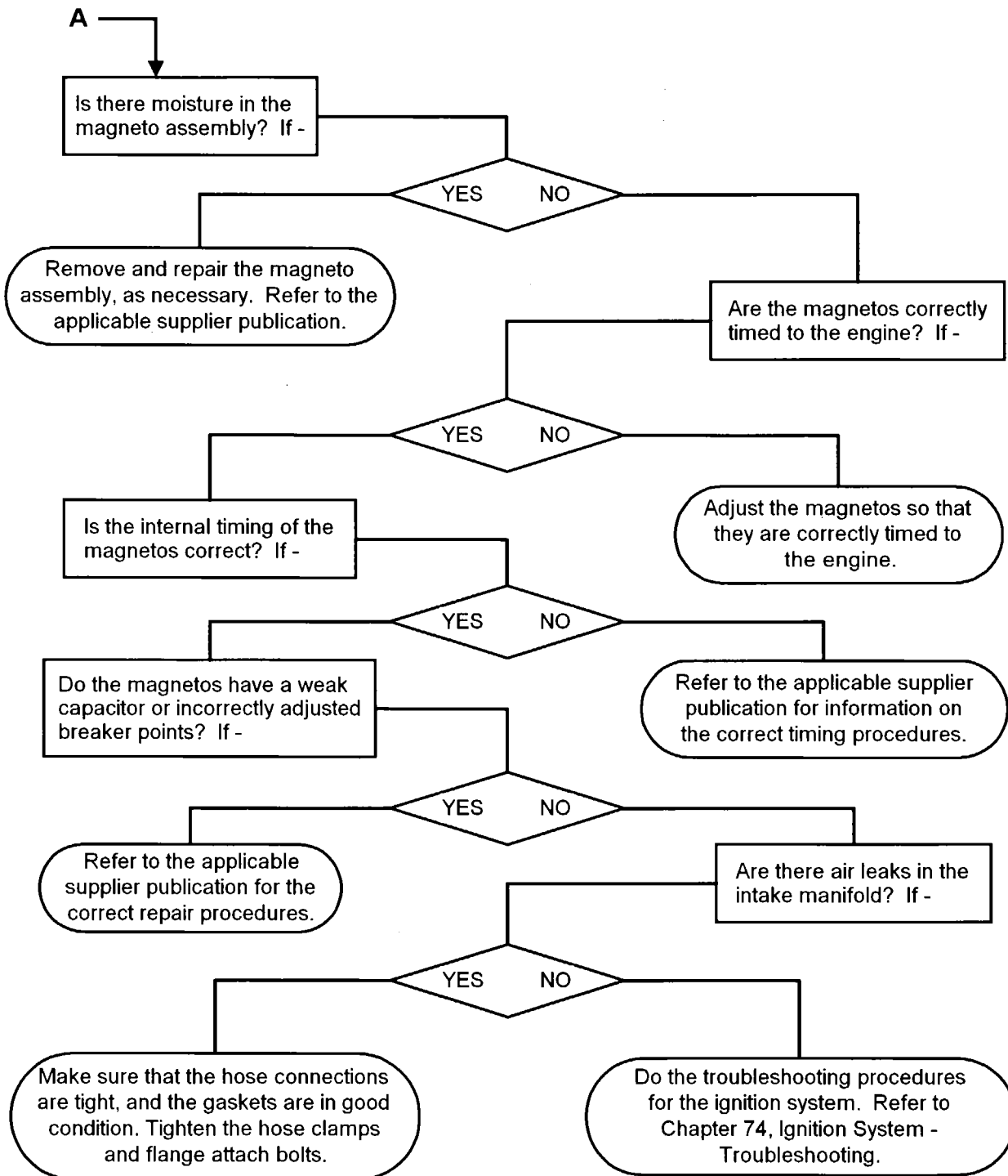


Engine Troubleshooting Chart  
 Figure 101 (Sheet 2)



CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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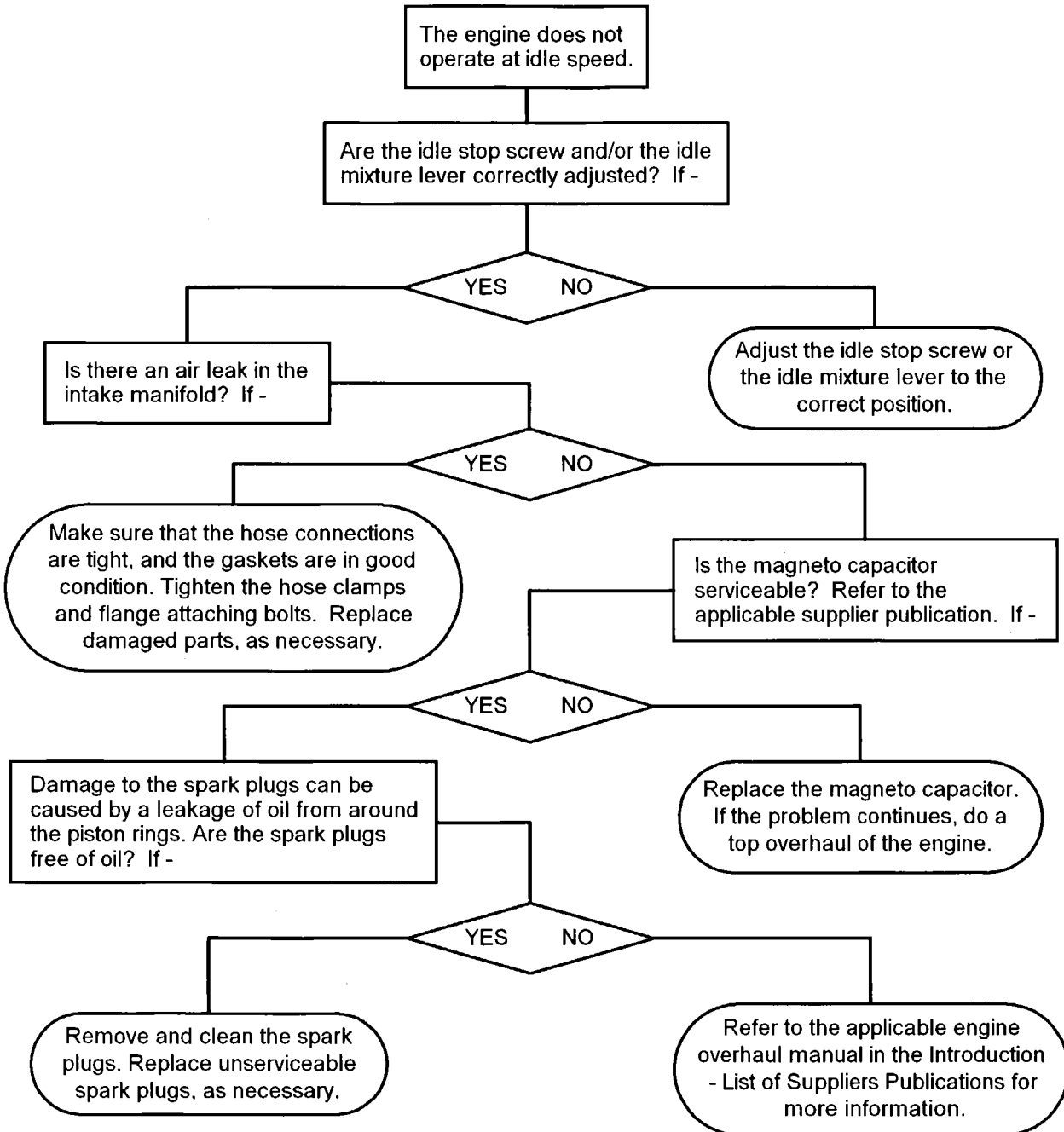
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 3)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
MAINTENANCE MANUAL

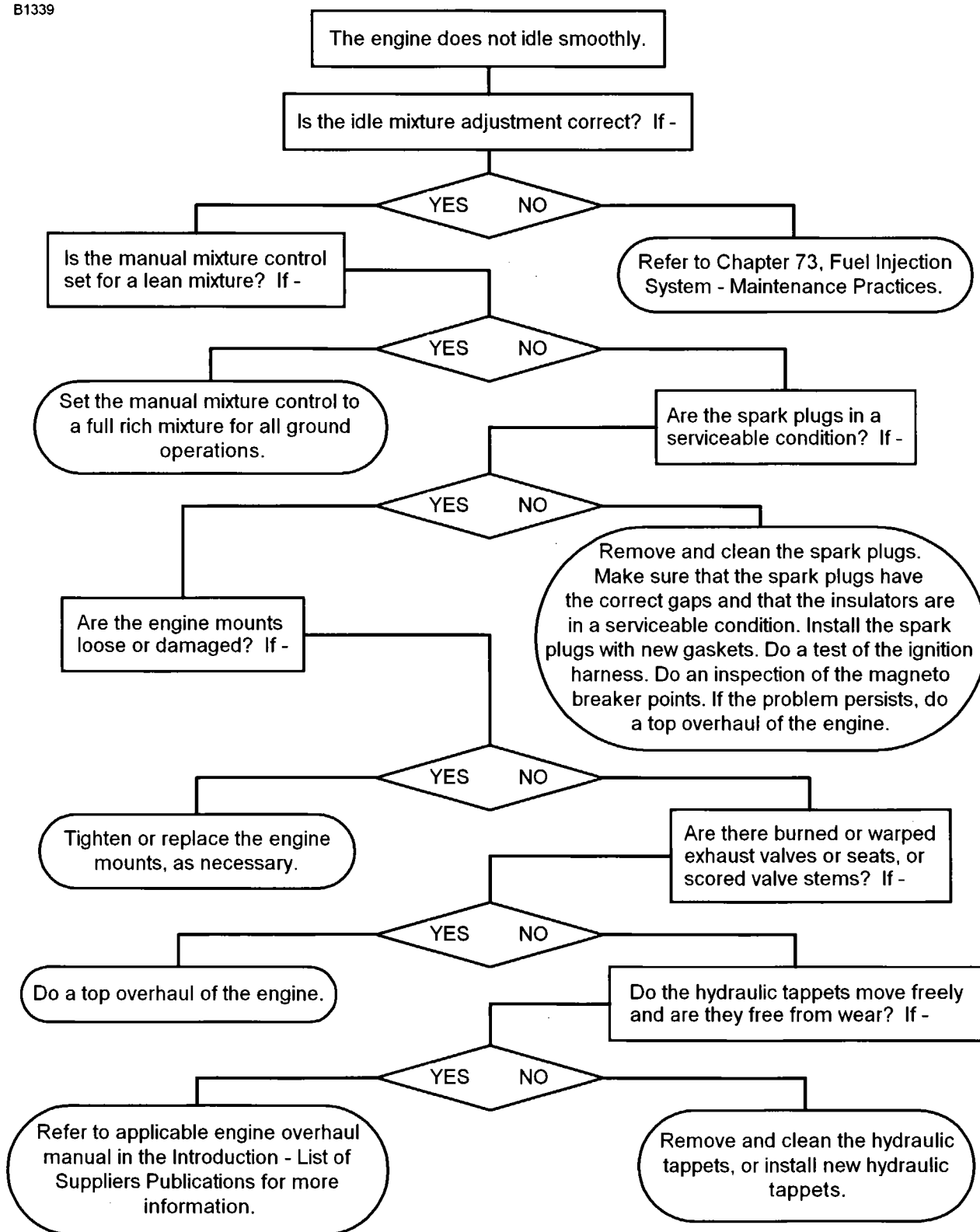
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Engine Troubleshooting Chart  
Figure 101 (Sheet 4)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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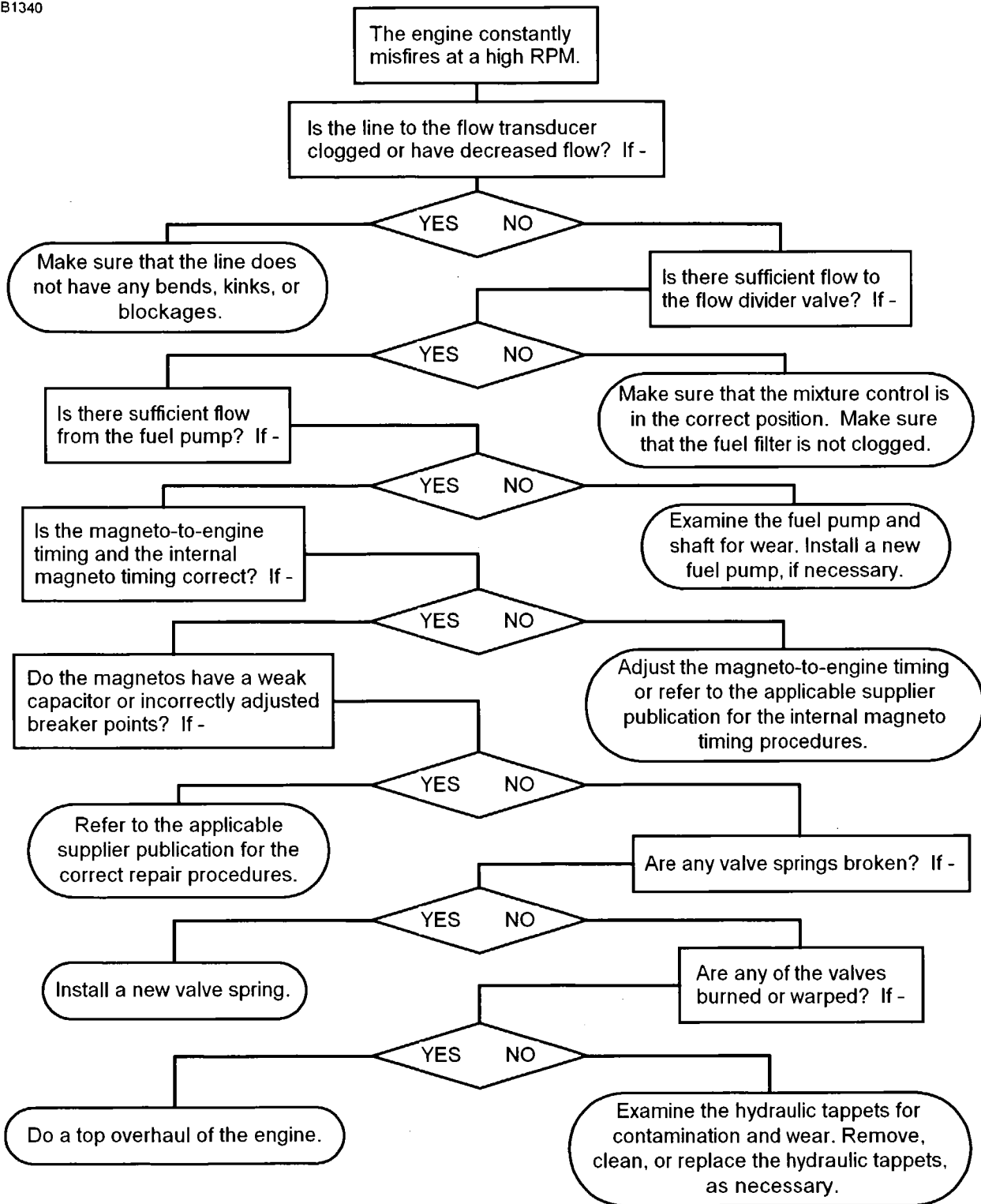
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 5)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

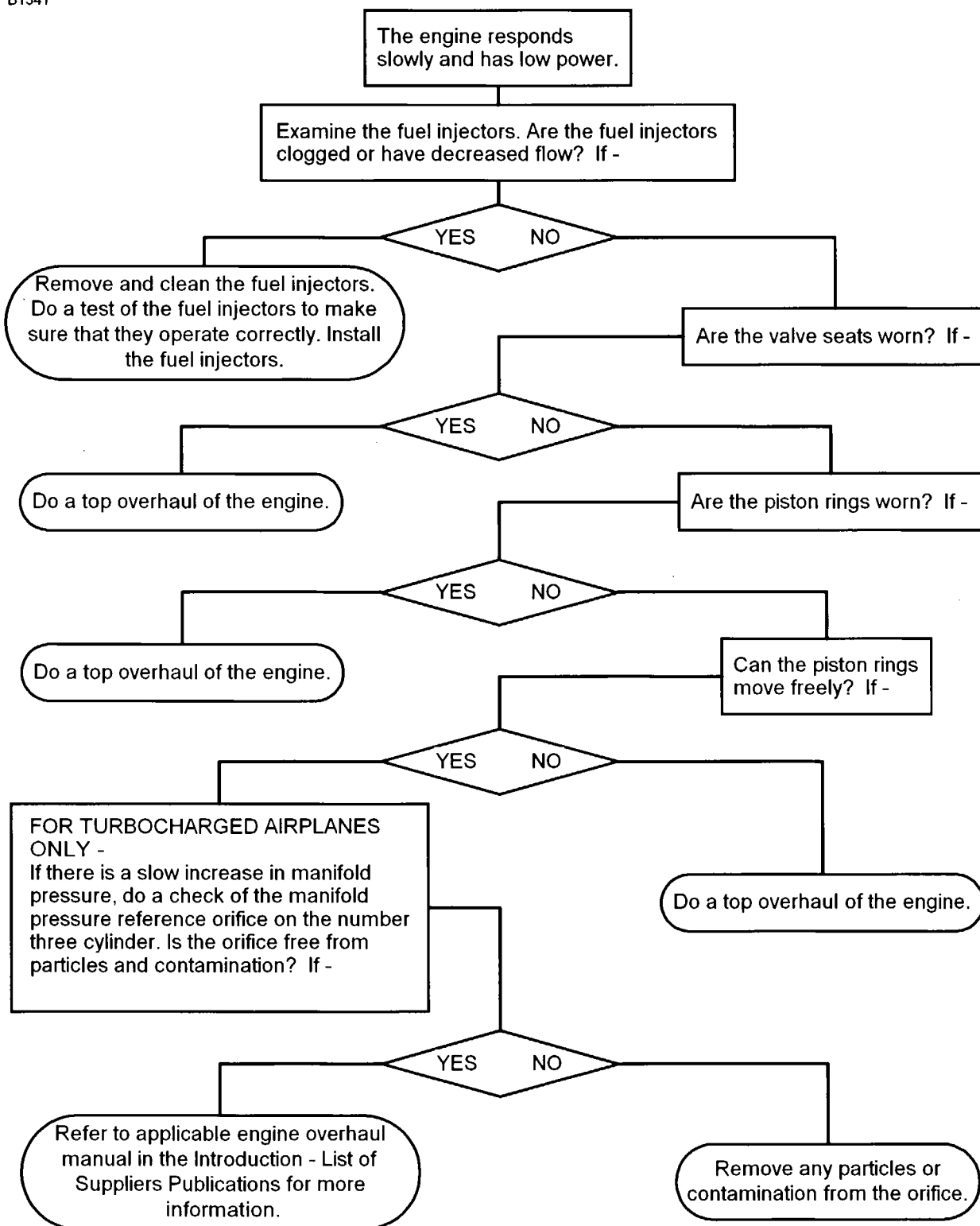
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 6)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

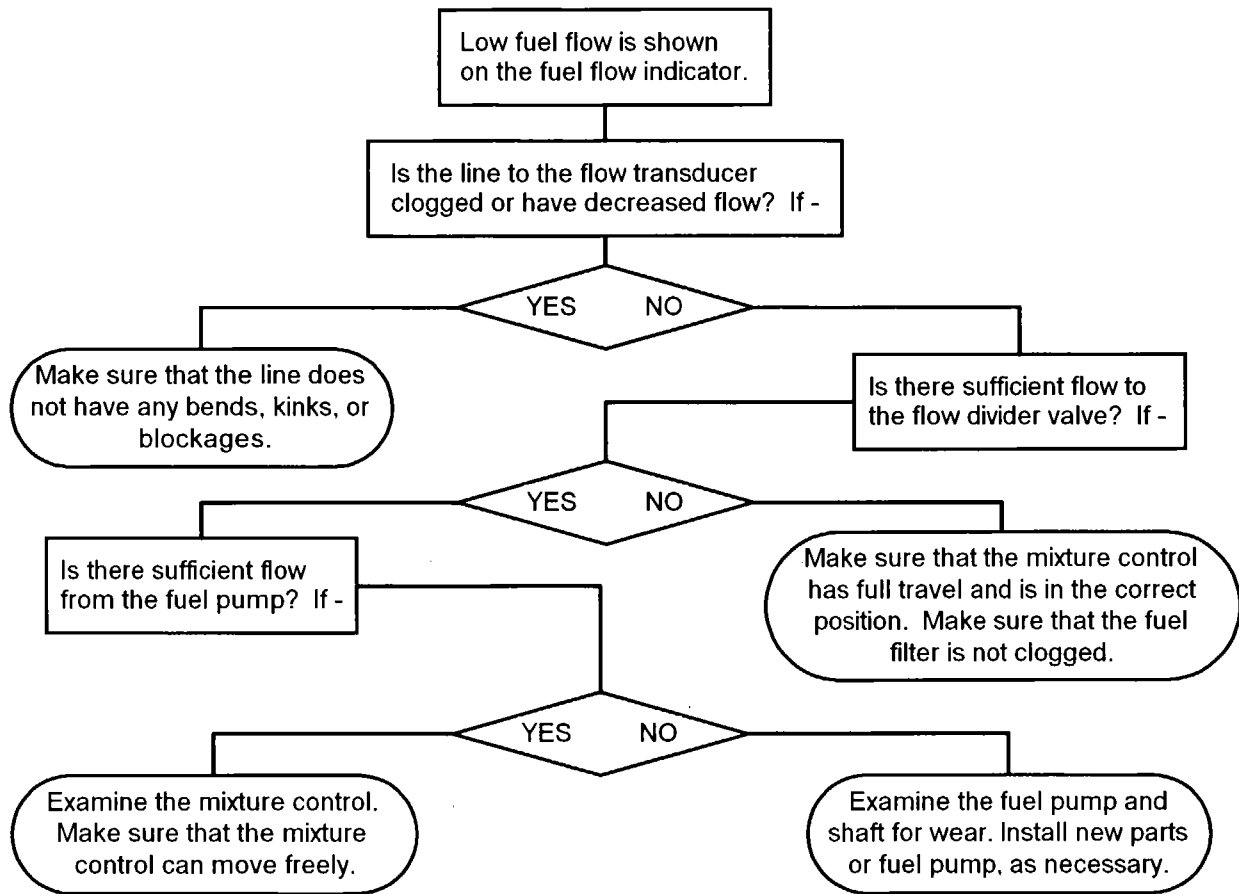
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 7)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

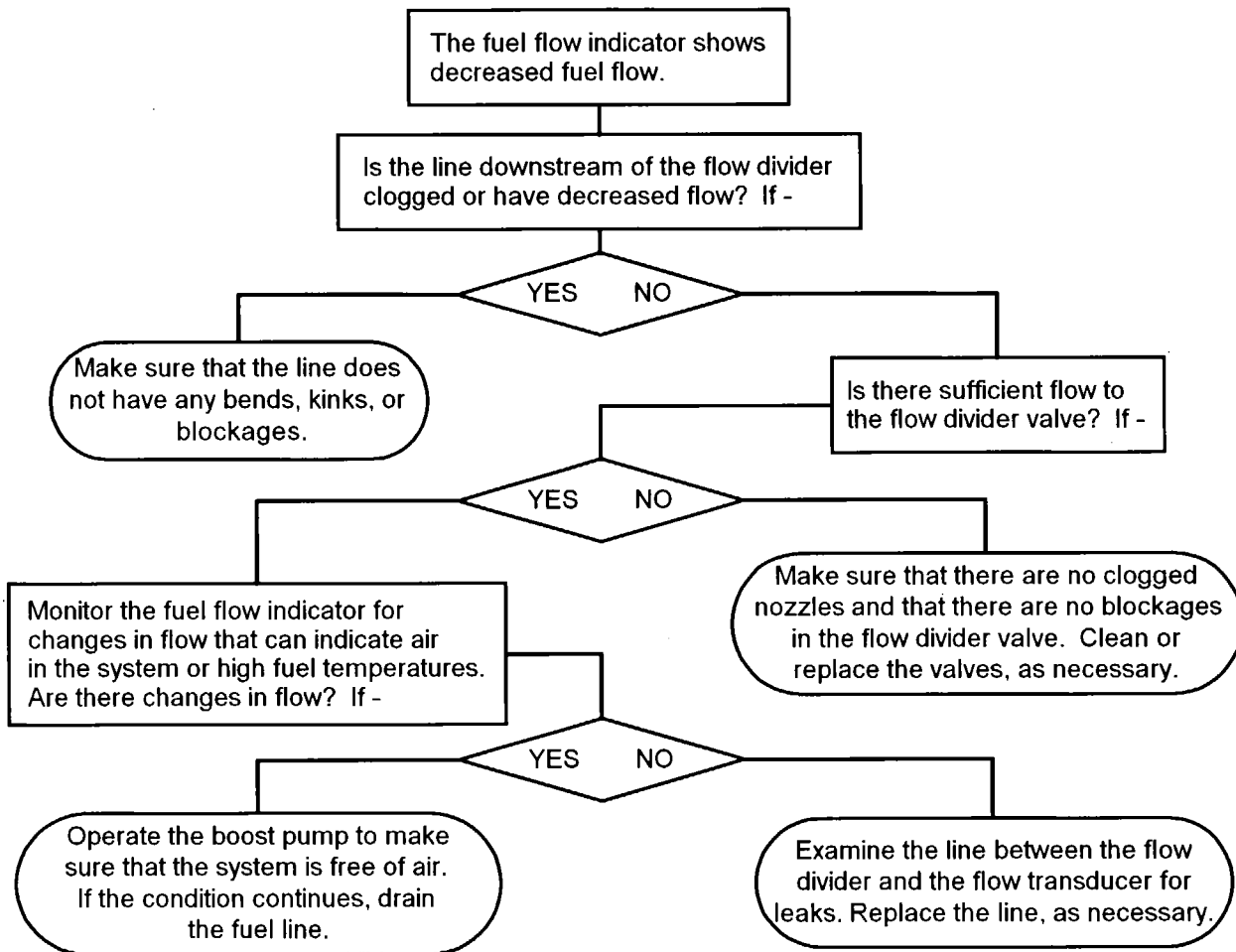
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 8)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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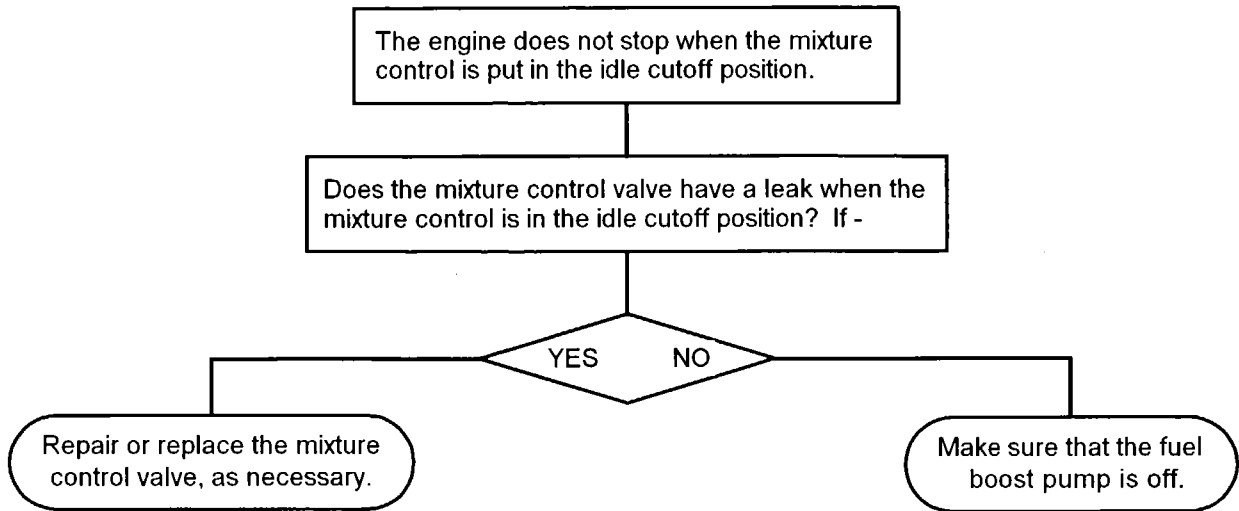
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 9)

CESSNA AIRCRAFT COMPANY  
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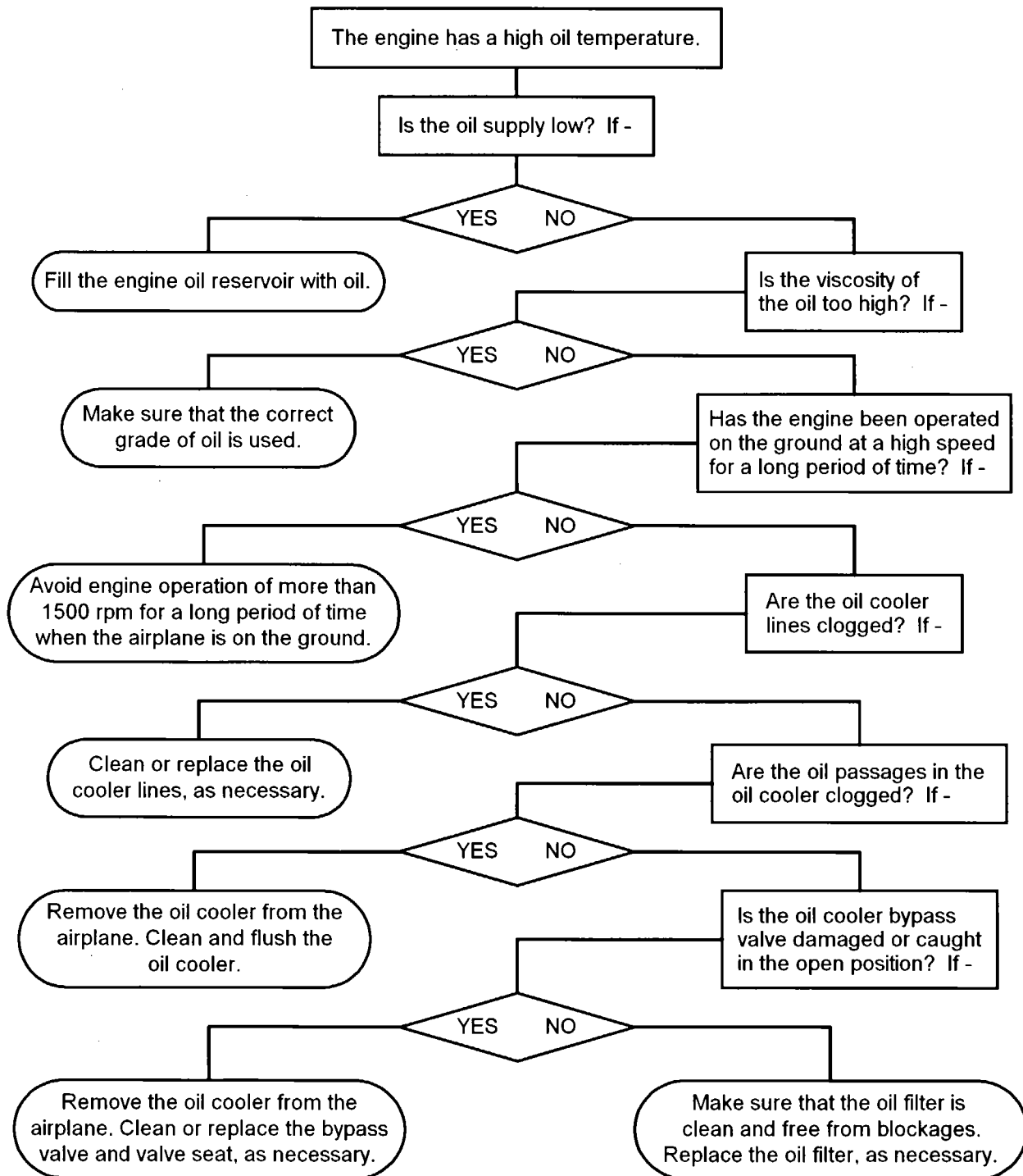


Engine Troubleshooting Chart  
Figure 101 (Sheet 10)



CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
 MAINTENANCE MANUAL

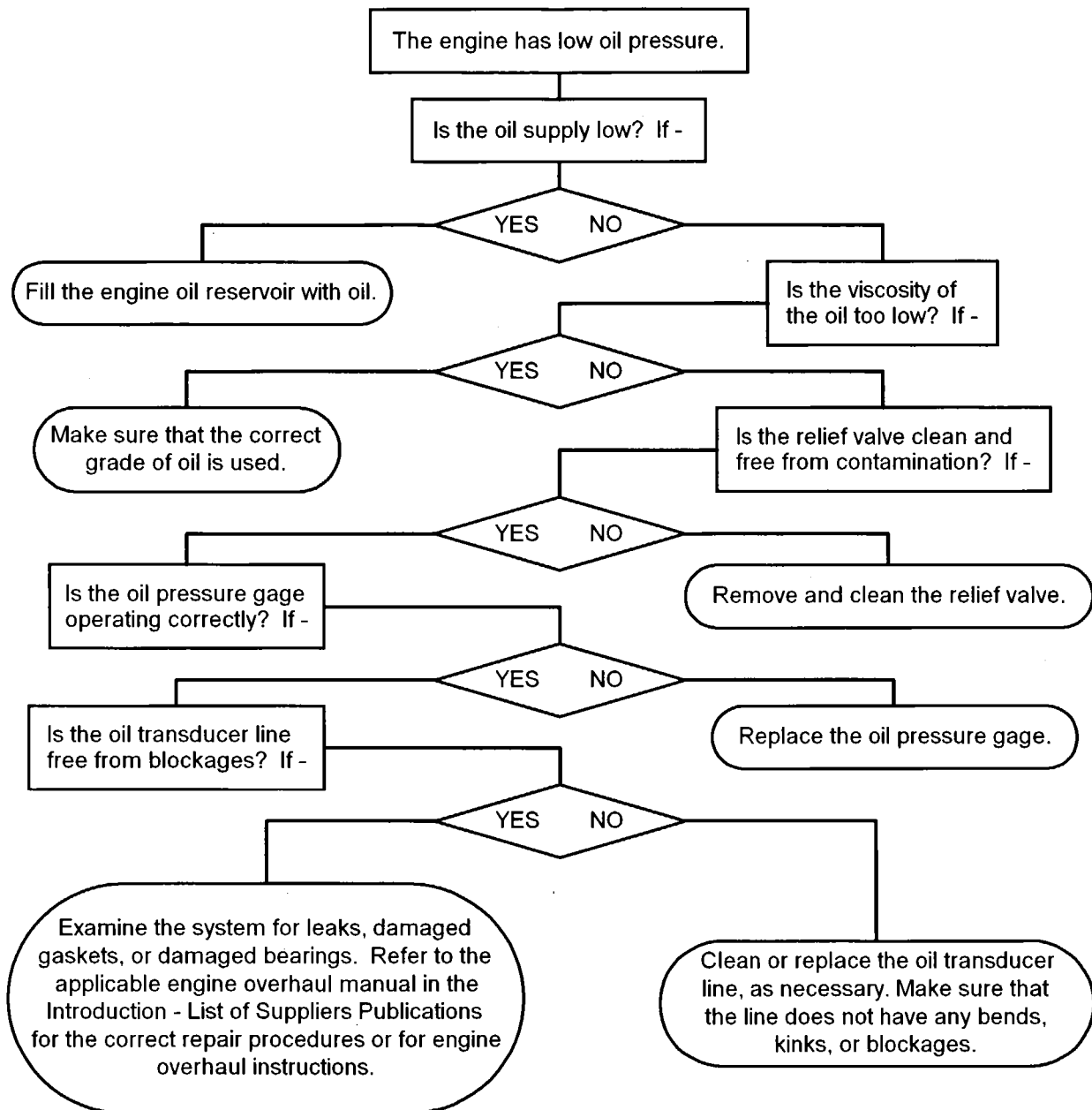
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 11)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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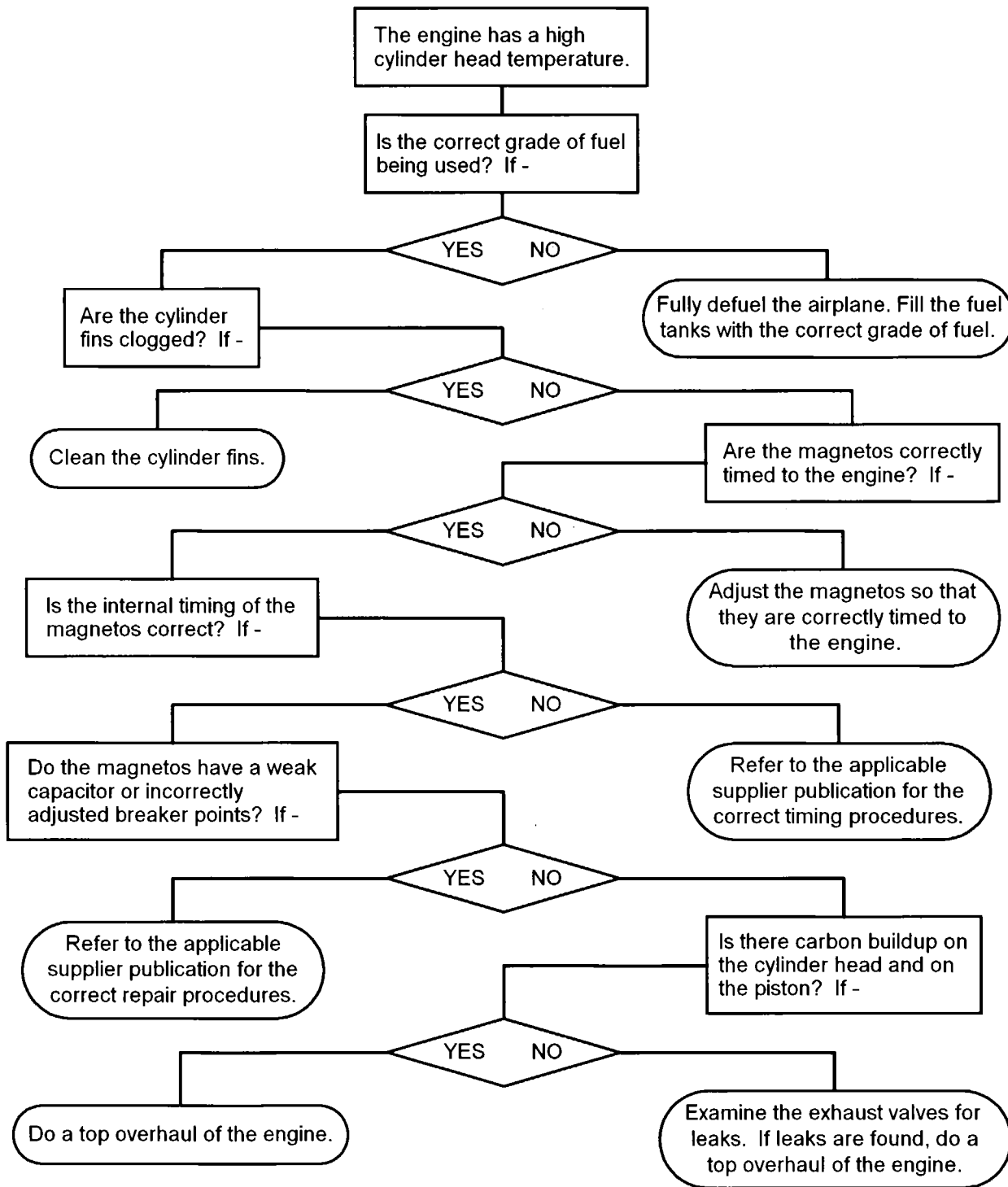
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 12)

CESSNA AIRCRAFT COMPANY  
**MODEL 182/T182**  
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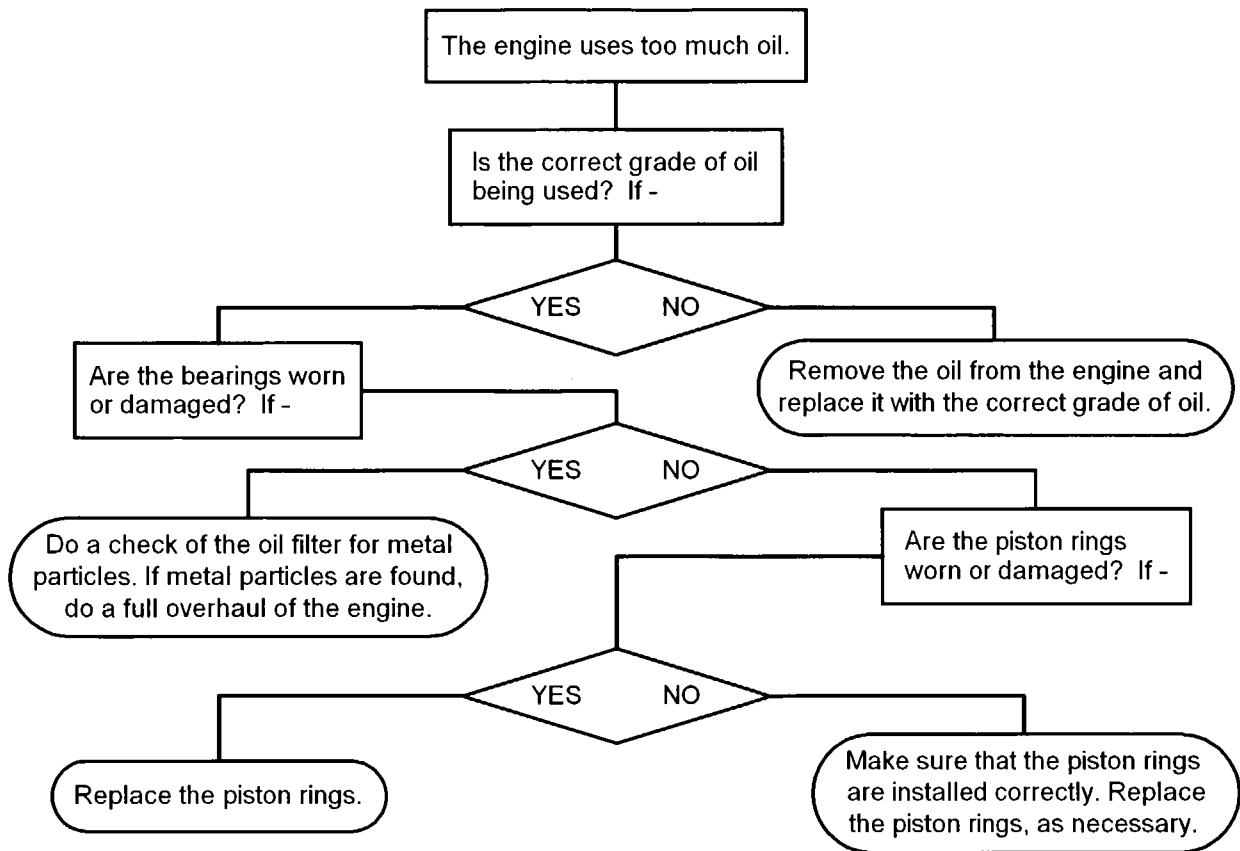
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Engine Troubleshooting Chart  
 Figure 101 (Sheet 13)

CESSNA AIRCRAFT COMPANY  
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MAINTENANCE MANUAL

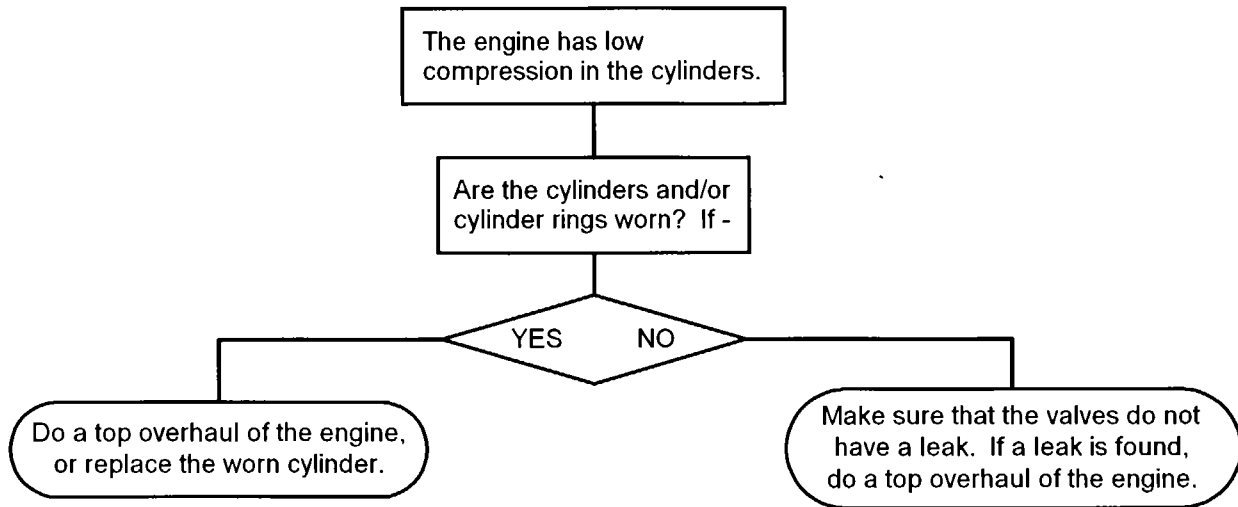
B1347



Engine Troubleshooting Chart  
Figure 101 (Sheet 14)

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Engine Troubleshooting Chart  
Figure 101 (Sheet 15)

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**ENGINE - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives procedures for the removal and installation of the engine and the engine mount from the firewall. For more maintenance information, refer to the applicable engine publications which are listed in the Introduction - List of Manufacturers Technical Publications.

**2. Engine Removal/Installation**

- A. Remove the Engine and the Engine Mount.

**NOTE:** This procedure shows how you remove the engine and engine mount from the firewall. If the engine is removed from the engine mount and the engine mount stays attached to the firewall, some of the steps will not be necessary. To disconnect the engine from the engine mount, remove the (4) AN7 bolts that connect the (4) shock mounts to the engine mounting flange and the engine mount tube.

- (1) Set all cabin switches to the OFF position.
- (2) Set the fuel shutoff valve to the OFF position.
- (3) Remove the engine cowl. Refer to Chapter 71, Cowling - Maintenance Practices.

**NOTE:** Do the subsequent steps from the right side of the airplane.

- (4) Disconnect the positive and negative battery leads from the battery.
- (5) Loosen the C-clamp that attaches the flexible duct to the firewall-mounted heater valve.
- (6) Remove the flexible duct from the heater valve.

**WARNING:** If the P lead wire from the magnetos is disconnected, the electrical ground is removed from the magneto circuit. This will cause hot magnetos. Attach a ground wire to the magneto or remove all the high tension wires from the spark plugs before you turn the propeller.

- (7) Disconnect the P lead wires on the magnetos.
- (8) Remove the propeller governor. Refer to Chapter 61, Propeller Governor - Maintenance Practices.
- (9) Disconnect the electrical connector from the Exhaust Gas Temperature (EGT) Probe.
- (10) Disconnect the fuel outlet line at the fuel strainer.
- (11) Disconnect the throttle cable at the fuel/air control unit and record the position of the washers and spacers for later installation.
- (12) Disconnect the vacuum hoses at the firewall-mounted manifold/check valve.
- (13) Disconnect and put a label on the electrical wires on the low vacuum annunciator switches.

**NOTE:** Do the subsequent steps from the left side of the airplane.

- (14) Loosen and remove the clamps from the tachometer drive cable in the engine area.
- (15) Disconnect the tachometer drive cable from the rear of the accessory case.
- (16) Cut the tie wraps (sta straps) that attach the different wire bundles to the engine mount.
- (17) On the bottom side of the engine, loosen and remove the clamps that attach the starter wires to the sump area.
- (18) Remove the starter wires from the starter.
- (19) Disconnect the ground strap from the engine mount.
- (20) Disconnect the electrical connector from the fuel flow transducer.
- (21) Disconnect the electrical connector from the low oil pressure switch.
- (22) Disconnect the electrical connector from the oil pressure transducer.
- (23) Remove the two screws on the rear side of the upper right baffles. Remove the electrical connector from the baffles and separate the baffles.

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- (24) Loosen the clamps that attach the battery vent tube to the drain line cluster.
- (25) Remove the vent tube through the clamps.
- (26) Remove the bolt and spacer that attach the drain line cluster to the firewall.
- (27) Loosen and remove the ram air tubes on the rear side of the upper left baffle.
- (28) Put a stand under the tail tie-down to adjust for a tail heavy condition, which will occur when the engine is removed from the airframe.
- (29) Attach the hoist to the lifting strap on top of the engine.

**CAUTION:** Do not lift the engine higher than necessary. If you lift the engine too high, it puts a strain on the attach bolts.

- (30) Start to take up the engine weight using the hoist.
- (31) Remove the bolts that attach the engine and engine mount to the firewall.

**NOTE:** Record the sequence of nuts, washers, and flat washers.

**NOTE:** You can get access to the bolt heads from inside the cockpit to keep them from turning.

- (32) Slowly lift the engine using the hoist until the engine and engine mount move free of the bolts.

**B. Install the Engine and Engine Mount.**

- (1) Attach the engine mount to the firewall. Refer to Engine Mount - Maintenance Practices.
- (2) Lift the engine into position with the hoist.
- (3) Torque the firewall bolts to between 160 and 190 inch-pounds.
- (4) Remove the stand from under the tail tie-down.
- (5) Attach the ram air tubes to the rear side of the upper left baffle.
- (6) Attach the drain line cluster to the firewall with a bolt and spacer.
- (7) Put the battery vent tube through the drain line clamps and tighten the clamps.
- (8) Put the wires from the electrical connector through the baffle cutout area.
- (9) Attach the baffle pieces together with screws.
- (10) Connect the electrical connector to the oil pressure transducer.
- (11) Connect the electrical connector to the low oil pressure switch.
- (12) Connect the electrical connector to the fuel flow transducer.
- (13) Connect the ground strap to the engine mount.
- (14) Connect the starter wires to the starter.
- (15) Connect the starter wires to the sump area with clamps.
- (16) Connect the different wire bundles to the engine mount with tie wraps.
- (17) Connect the tachometer drive cable to the rear of the accessory case.
- (18) Connect the tagged wires to the low vacuum annunciator switches.
- (19) Connect the vacuum lines to the firewall-mounted manifold/check valve.
- (20) Connect the throttle and mixture control cables to the fuel air control unit.
- (21) Connect the fuel outlet line to the fuel strainer.
- (22) Connect the electrical connector to the EGT Probe.
- (23) Install the propeller governor. Refer to Chapter 61, Propeller Governor - Maintenance Practices.
- (24) Connect the P leads to the magnetos.
- (25) If necessary, connect the high tension wires to the spark plugs.
- (26) Connect the flexible duct to the firewall-mounted heater valve.
- (27) Make sure that all the controls and lines are installed correctly and can move freely.
- (28) Make sure that all fuel fittings are tight and that there are no leaks.
- (29) Connect the positive and negative leads to the battery.
- (30) Install the engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices.

**3. Engine Cleaning**

- A. Clean the engine.**

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**CAUTION:** All openings must be covered with caps to prevent solvent entry into the engine. Cover the electrical accessories (starters, alternators, etc.) before the cleaning solvent is applied.

- (1) Clean the engine using a Stoddard solvent or equivalent chemical.

**4. Engine Storage**

- A. If the engine is removed for storage purposes, refer to the Lycoming Service Letter L180B (or latest revision) for preservation procedures.



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**COWL - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The engine has a top cowl, two side cowls and a bottom cowl. The front of the engine has a top and bottom or a left and right nose-cap that is made of composite material. The cowls use quick-release fasteners that lock into receptacles for easy removal and installation. The nose-caps attach to each other with screws.
- B. There are two cowl flaps in the bottom cowl. They help control the engine temperature and operate by a control lever in the cockpit.

**2. Side Cowl Removal/Installation**

**NOTE:** The removal and installation is typical for the left and right side cowl.

- A. Remove the Side Cowl (Refer to Figure 201).
  - (1) Disconnect the quick-release fasteners around the edges of the side cowl and remove the cowl from the airplane.
- B. Install the Side Cowl (Refer to Figure 201 for the same cowl you removed or Figure 202 for installation of a new side cowl).
  - (1) Install the same cowl you removed.
    - (a) Attach the top edge of the cowl to the airplane.
    - (b) Attach the forward, aft and bottom edges of the cowl to the airplane.
  - (2) Install a new side cowl.

**NOTE:** When a new side cowl is installed, it must be fitted to the airplane. The new cowl must be cut and adjusted for the correct fit. The installation for the left and right side of each new side cowl is typical.

**CAUTION:** You must examine the cowl after you complete each step and install each quick-release fastener to make sure the cowl does not wrinkle and the contour of the cowl will match the contour of the airplane.

- (a) Make sure the cowl matches the contour of the airplane correctly before you install it.

**NOTE:** The cowl must fit the contour of the airplane without force used to make it fit.

- 1 Hold the cowl in position on the airplane to examine for the correct contour.
- 2 If the cowl does not fit the contour of the airplane, it is acceptable to make small form adjustments by hand to help fit the contour.
- 3 If you cannot form the cowl by hand to the correct contour, then replace the cowl before you try to fit it to the airplane.
- (b) Set the cowl in position on the airplane with hole number (1) aligned with the receptacle.

**NOTE:** The holes for the quick-release fasteners are numbered in Figure 202, Detail A.

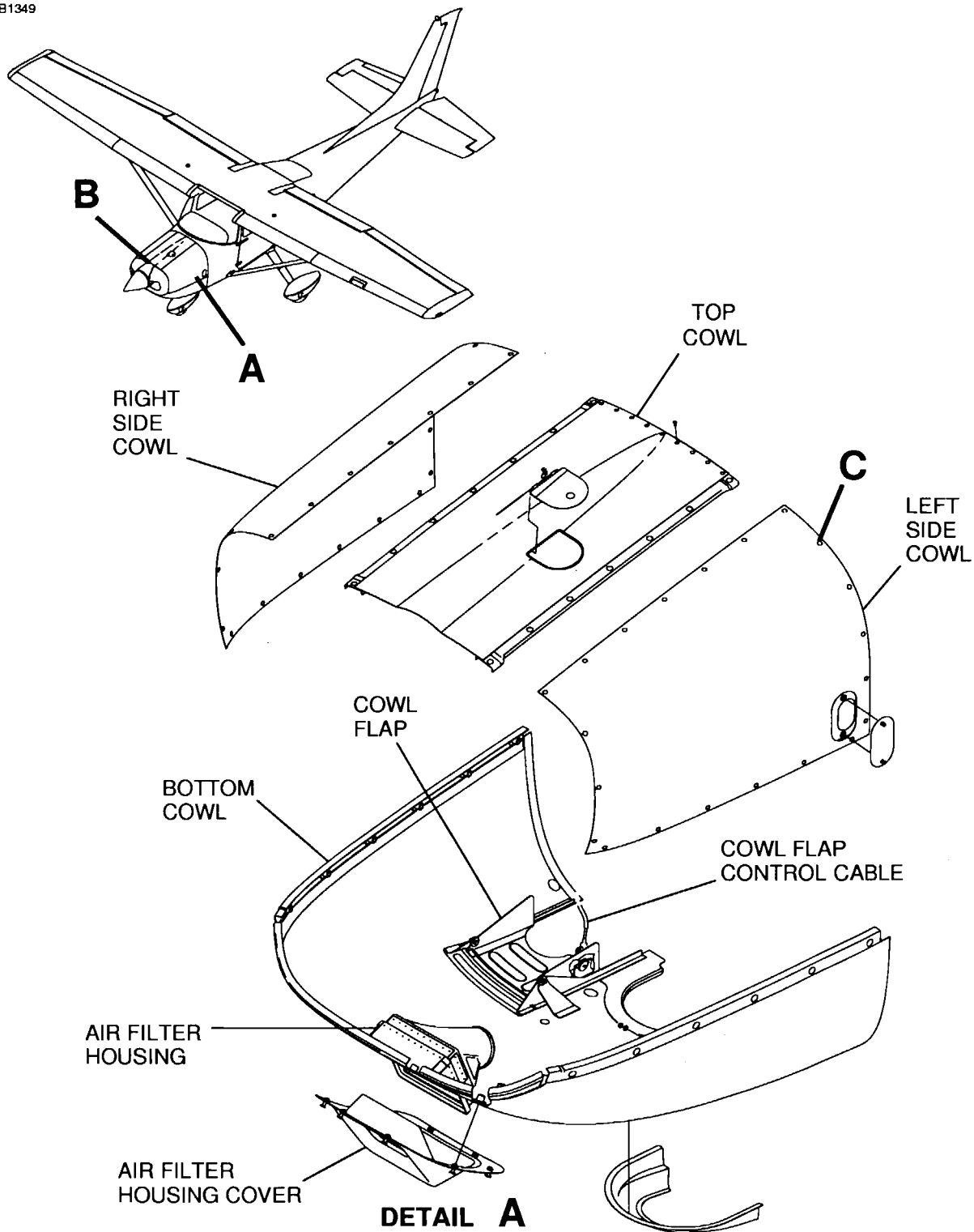
- (c) If a new right side cowl is to be installed, material from the cowl must be removed to let the cowl fit on the fuselage edge next to the fuel step handle.

**CAUTION:** Make sure you remove minimal cowl material as necessary.

- 1 Make a mark for the material to be removed from the cowl for clearance around the fuel step handle.
- 2 Remove the cowl.

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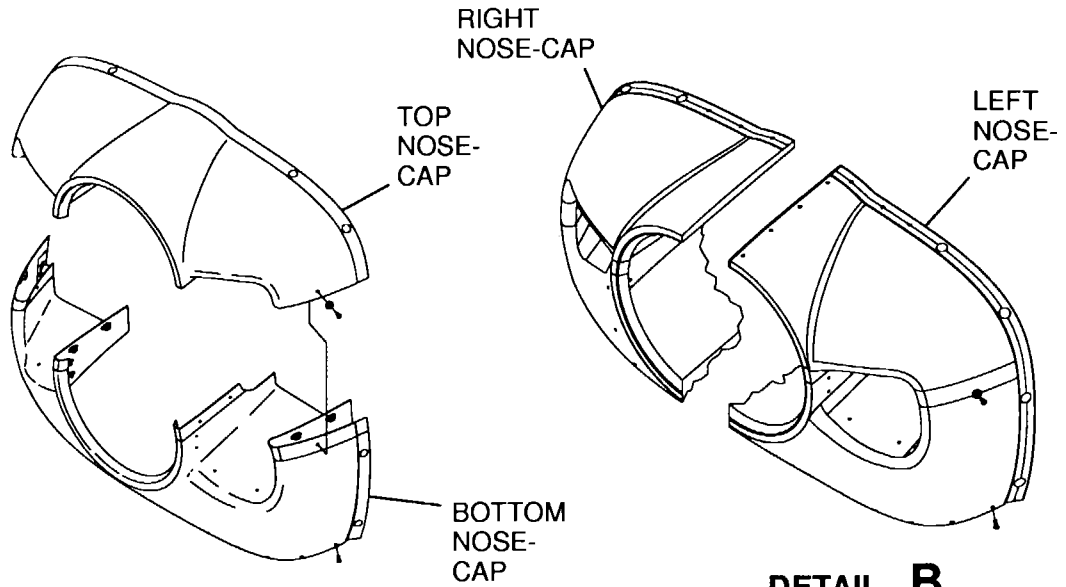


Engine Cowl Installation  
Figure 201 (Sheet 1)

0710T1001  
A0752T1002  
A0752T1004

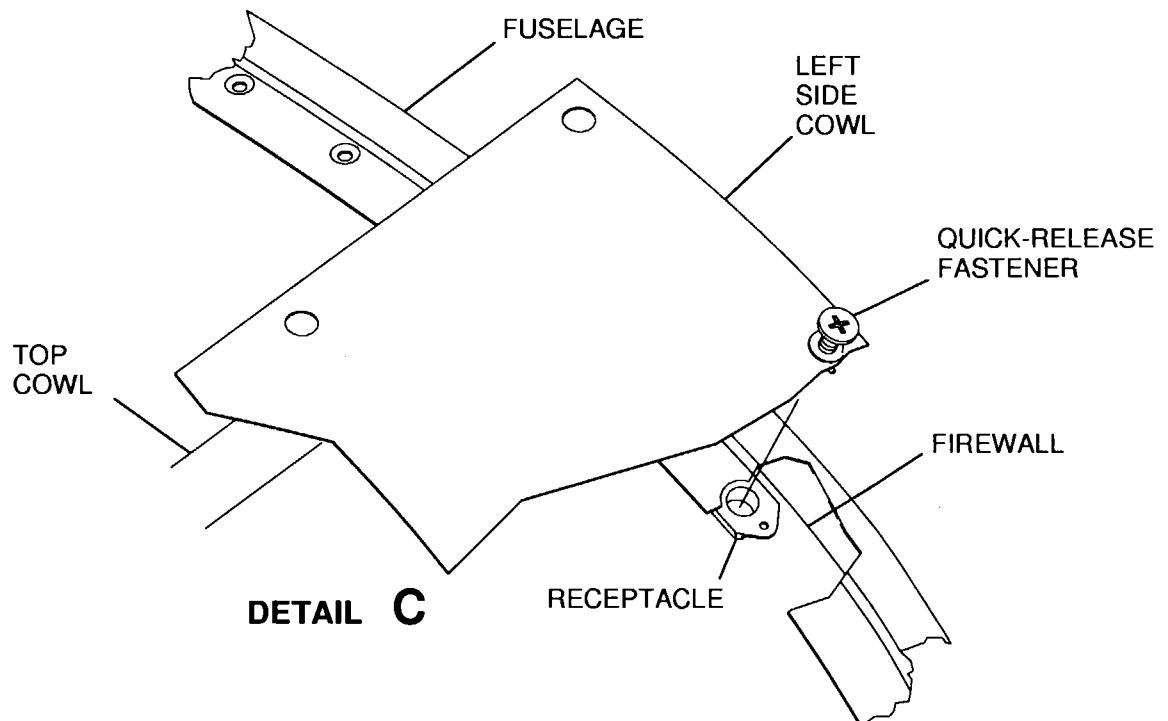
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**DETAIL B**  
AIRPLANES 18280001 THRU 18280667

**DETAIL B**  
AIRPLANES 18280668 AND ON AND  
AIRPLANES T18208001 AND ON



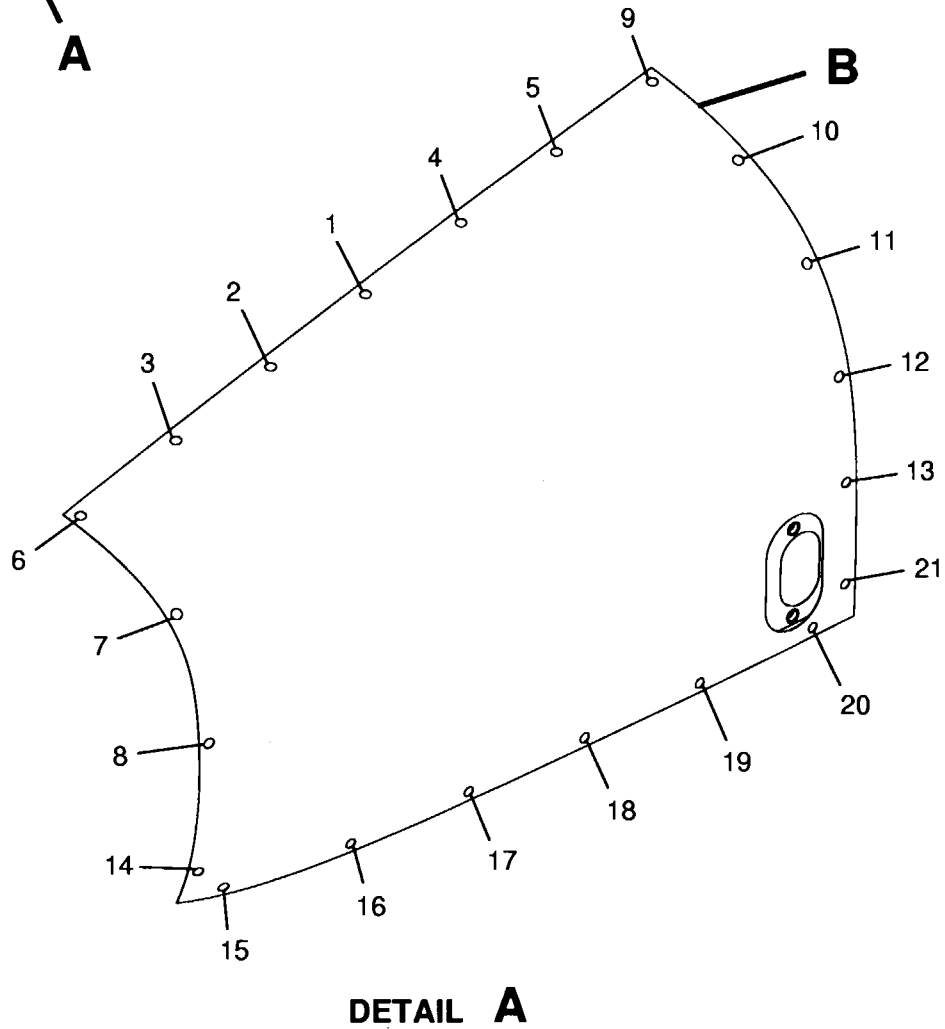
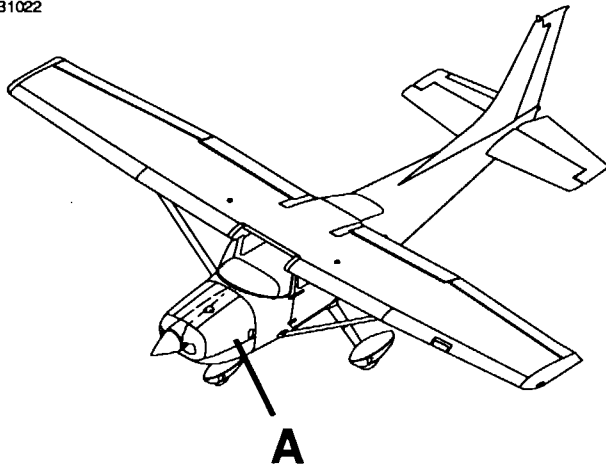
**DETAIL C**

0710T1001  
A0752T1007  
B0753T1007  
C0752T1003A

Engine Cowl Installation  
Figure 201 (Sheet 2)

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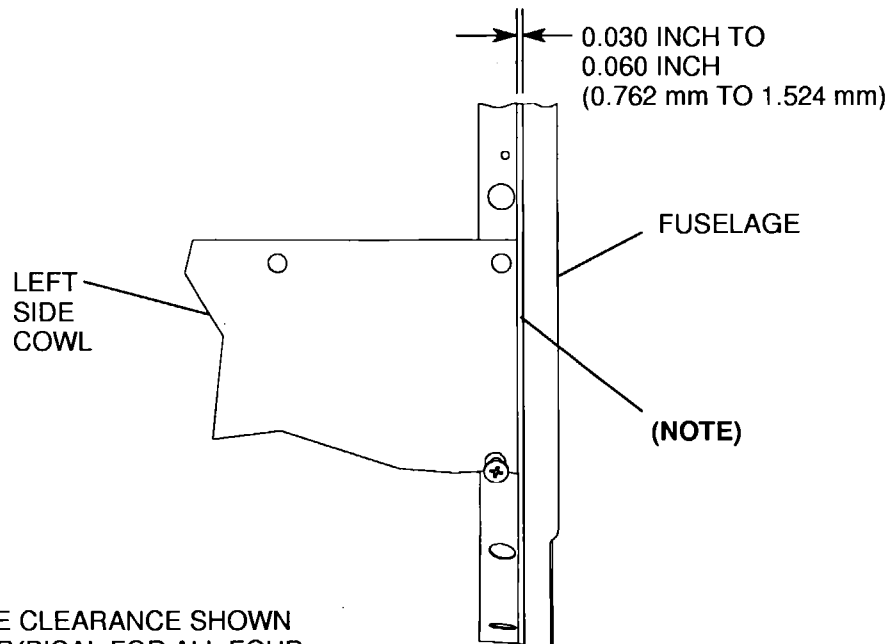
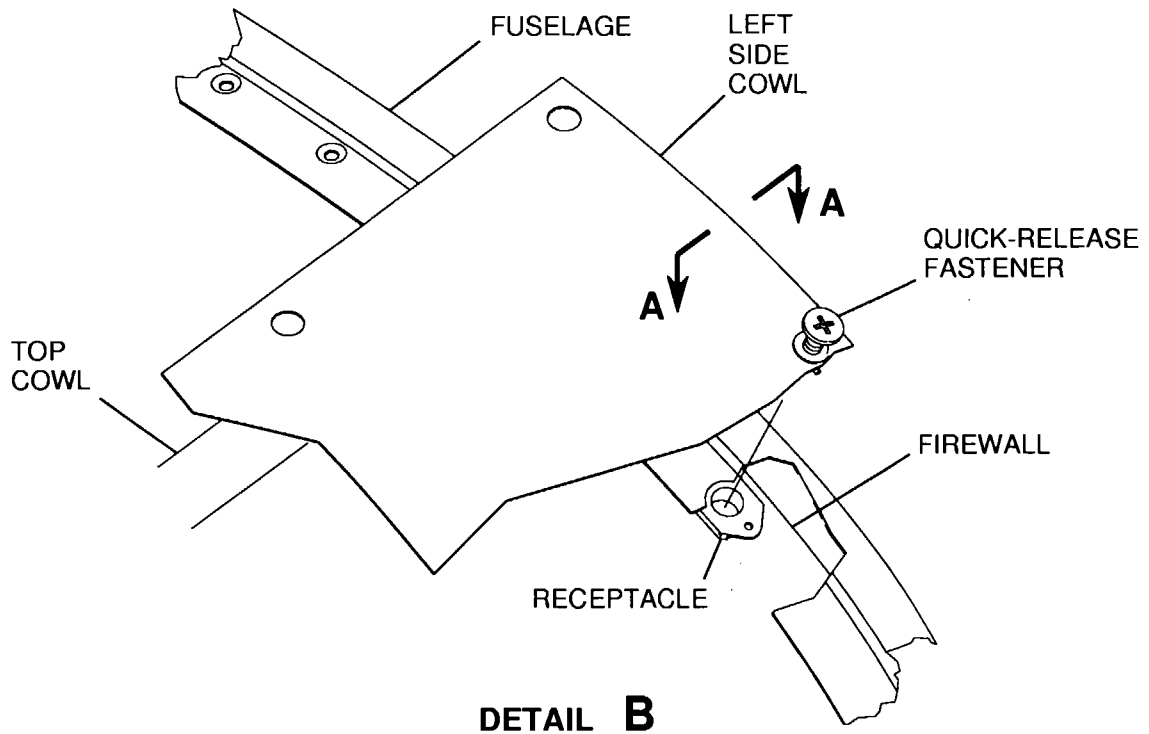


New Side Cowl Installation  
 Figure 202 (Sheet 1)

0710T1001  
 A0752T1002

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**NOTE:** THE CLEARANCE SHOWN  
IS TYPICAL FOR ALL FOUR  
EDGES OF THE SIDE COWLS

**VIEW A-A**

New Side Cowl Installation  
 Figure 202 (Sheet 2)

B0752T1007  
 AA0752T1007

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- 3 Remove the marked material from the cowl.

**NOTE:** A 0.75 inch (19 mm) drum sander will work good to remove the cowl material.

- (d) Align the cowl on the airplane and use duct tape to hold it in position.

**CAUTION:** Do not use a regular drill or damage to the receptacle can occur if you drill too deep.

- (e) Use a counterbore with an applicable size pilot to fit the pilot hole and spot-face the cowl to 0.470 inch (12 mm) for the number (1) hole.  
(f) Install a quick-release fastener with a grommet and lock it in position at hole number (1).  
(g) Remove the duct tape so you can move the cowl as necessary to align the holes that remain.

**CAUTION:** Make sure you spot-face and install the quick-release fasteners and grommets in the sequence shown on Figure 202, Detail A.

- (h) Use a counterbore to spot-face each pilot hole and install each quick-release fastener and grommet in the sequence shown in Figure 202, Detail A.

- 1 If the pilot hole is not centered over the receptacle, use a small round file to move the center of the pilot hole so it will be aligned over the receptacle.
- 2 If you increase the pilot hole diameter in the cowl with a round file, you must change the counterbore pilot to fit the pilot hole.
- 3 If you do not have the correct size pilot for the counterbore, use a piece of steel sheet-metal and drill a hole to the same diameter as the counterbore pilot which can be used as a template to help guide the counterbore.

**NOTE:** The template thickness must be sufficient to help keep the counterbore aligned with the receptacle. Use a minimum thickness of 0.032 inch (0.81 mm) material for the template.

- a Clamp the template to the bottom side of the cowl hole. Make sure to align the template pilot hole over the receptacle as you align it.
  - b With the template as a guide, spot-face the pilot hole with the counterbore.
- (i) After all the cam-locks are installed, the cowl edges must be cut to the correct size.

**CAUTION:** Make sure you mark the cowl for the correct clearance. You cannot have more than 0.060 inch (1.524 mm) clearance between the edges of the cowl. If you cut too much off the cowl, the cowl cannot be used.

- 1 Use an edge scribe to mark a line along all edges of the new cowl, which will give 0.030 to no more than 0.060 inch (0.762 to 1.524 mm) clearance between the edges of the cowls. Loosen only the quick-release fasteners as necessary to let the scribe move through that area of the cowl. Make sure you install the quick-release fastener as soon as you move through the area.
  - 2 Remove the cowl and cut just along the outside of the scribed line with sheet metal snips.
  - 3 Smooth the cowl edges with a file and sandpaper to the scribed line.
- (j) Install the cowl.
- 1 Attach the top edge of the cowl to the airplane.
  - 2 Attach the forward, aft and bottom edges to the airplane.

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- (k) Measure around all edges for the side cowl clearance to make sure there is a 0.030 to 0.060 inch (0.762 to 1.524 mm) between the cowls and that there is no overlap of the cowl edges.
- (l) Disconnect the quick-release fasteners around the new cowl and remove the cowl.
- (m) Apply the finish paint. Refer to Chapter 12, Airplane Exterior - Cleaning/Painting.
- (n) Install the cowl.
  - 1 Attach the top edge of the cowl to the airplane.
  - 2 Attach the forward, aft and bottom edges to the airplane.

C. If Necessary, Install More Fasteners to the Left or Right Side Cowl (Refer to Figure 202).

**NOTE:** As many as two more fasteners can be installed if the cowl does not tightly set on the nose-cap. The illustration shows the left cowl, the right cowl is typical.

- (1) Make a mark with approximate equal distance between position six and seven, and/or between eight and fourteen for the new fasteners and receptacles. Make sure to keep the same edge distance as the other fasteners.

**NOTE:** The holes will be drilled with the nose-cap and side cowl attached to make sure the holes are correctly aligned.

- (2) Remove the side cowl and look to see if there is anything beneath the nose-cap that could be damaged when you drill. Make sure the new receptacle will not touch components beneath the nose-cap such as engine cooling baffles and seals.

**CAUTION:** Make sure before you install the cowl, that you will not drill into anything on the engine side of the nose-cap.

- (3) Install the side cowl.

**CAUTION:** Use a drill-stop to prevent the drill going to deep and cause damage to something on the engine side of the nose-cap.

- (4) Drill with a drill-stop to make a pilot hole in the cowl and nose-cap.
- (5) Use a counterbore with an applicable size pilot to fit the pilot hole and spot-face the cowl and nose-cap to 0.470 inch (12 mm).
- (6) Remove the cowl.
- (7) Increase the receptacle hole diameter in the nose-cap to 0.562 inch (14 mm).
- (8) Install the new fastener in the cowl.
- (9) Install the new receptacle in the nose-cap.
- (10) Remove all metal shavings.
- (11) Install the side cowl.

### 3. Top Cowl Removal/Installation

A. Remove the Top Cowl (Refer to Figure 201).

- (1) Disconnect the quick-release fasteners from the side cowls and remove the cowls.
- (2) Remove the screws installed in the aft and forward edges of the top cowl. Keep the screws for the top cowl installation.
- (3) Remove the top cowl from the airplane.

B. Install the Top Cowl (Refer to Figure 201).

- (1) Put the top cowl in position on the airplane.
- (2) Install the screws in the aft and forward edges of the top cowl.
- (3) Install the side cowls with the quick-release fasteners.

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**4. Nose-Cap Removal/Installation**

- A. Remove the Nose-Cap (Refer to Figure 201).
  - (1) Disconnect the quick-release fasteners from the side cowls and remove the cowls.
  - (2) Remove the screws that attach the nose-cap to the bottom cowl. Keep the screws for the nose-cap installation.
  - (3) Remove the screws that attach the two parts of the nose-cap together and remove the two nose-cap pieces.
- B. Install the Nose-Cap (Refer to Figure 201).
  - (1) Put the two nose-cap parts in position on the airplane.
  - (2) Attach the two nose-cap parts together with the screws.
  - (3) Install the screws that attach the nose-cap to the bottom cowl.

**5. Bottom Cowl Removal/Installation**

- A. Remove the Bottom Cowl (Refer to Figure 201).
  - (1) Disconnect the quick-release fasteners from the side cowls and remove the cowls.
  - (2) Loosen the hose clamp installed on the air filter housing hose.

**NOTE:** When the bottom cowl is removed, the air filter housing will remain attached to it.

  - (3) Remove the nuts and bolts that attach the control cables to the cowl flaps.
  - (4) Remove the screws that attach the aft edge of the bottom cowl to the firewall and remove the cowl.
- B. Install the Bottom Cowl (Refer to Figure 201).
  - (1) Install the screws that attach the aft edge of the bottom cowl to the firewall.
  - (2) Attach the control cables with the bolts and nuts to the cowl flaps.
  - (3) Connect the hose for air filter housing and tighten the hose clamp.
  - (4) Install the side cowls with the quick-release fasteners.
  - (5) Install the screws that attach the forward edge of the bottom cowl to the nose cap.

**6. Cowl Repair**

- A. For repair procedures to the cowl, refer to the Single Engine Models 172,182, 206, and T206 1996 and On Structural Repair Manual.

**7. Cowl Flap Removal/Installation**

- A. Remove the Cowl Flap (Refer to Figure 203).
  - (1) Set the cowl flap control lever in the OPEN position.
  - (2) Remove the nuts, bolts and washers that attach the control clevises to the cowl flap shock mounts. Keep the hardware for the control clevis installation.
  - (3) Remove the lock nuts, bolts, washers and bushing from the cowl flaps and remove the cowl flaps from the airplane. Keep the hardware for cowl flap installation.
- B. Install the Cowl Flap (Refer to Figure 203).
  - (1) Install the cowl flaps with the bushings, washers, bolts and lock nuts.
  - (2) Attach the cowl flap control clevises to the cowl flap shock mounts with the washers, bolts and nuts.
    - (a) If the cowl flaps need rigged, the control clevis needs to remain disconnected.
  - (3) Rig the cowl flaps if necessary. Refer to Cowl Flap Rigging.

**8. Cowl Flap Rigging**

- A. Rig the Cowl Flap (Refer to Figure 203).

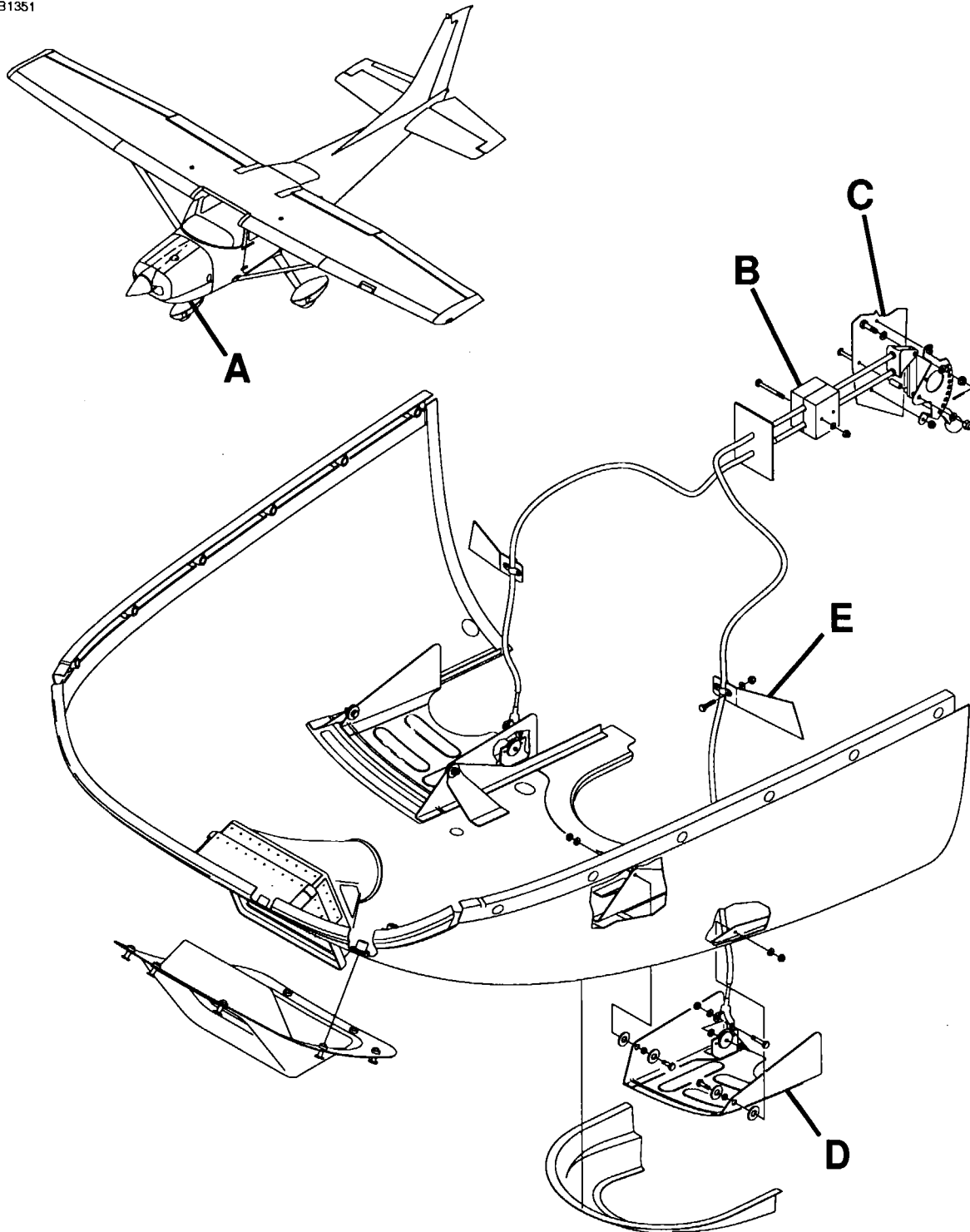
**NOTE:** The cowl flap rigging is typical for each side.

- (1) Disconnect the cowl flap control clevises from the cowl flap shock mounts.



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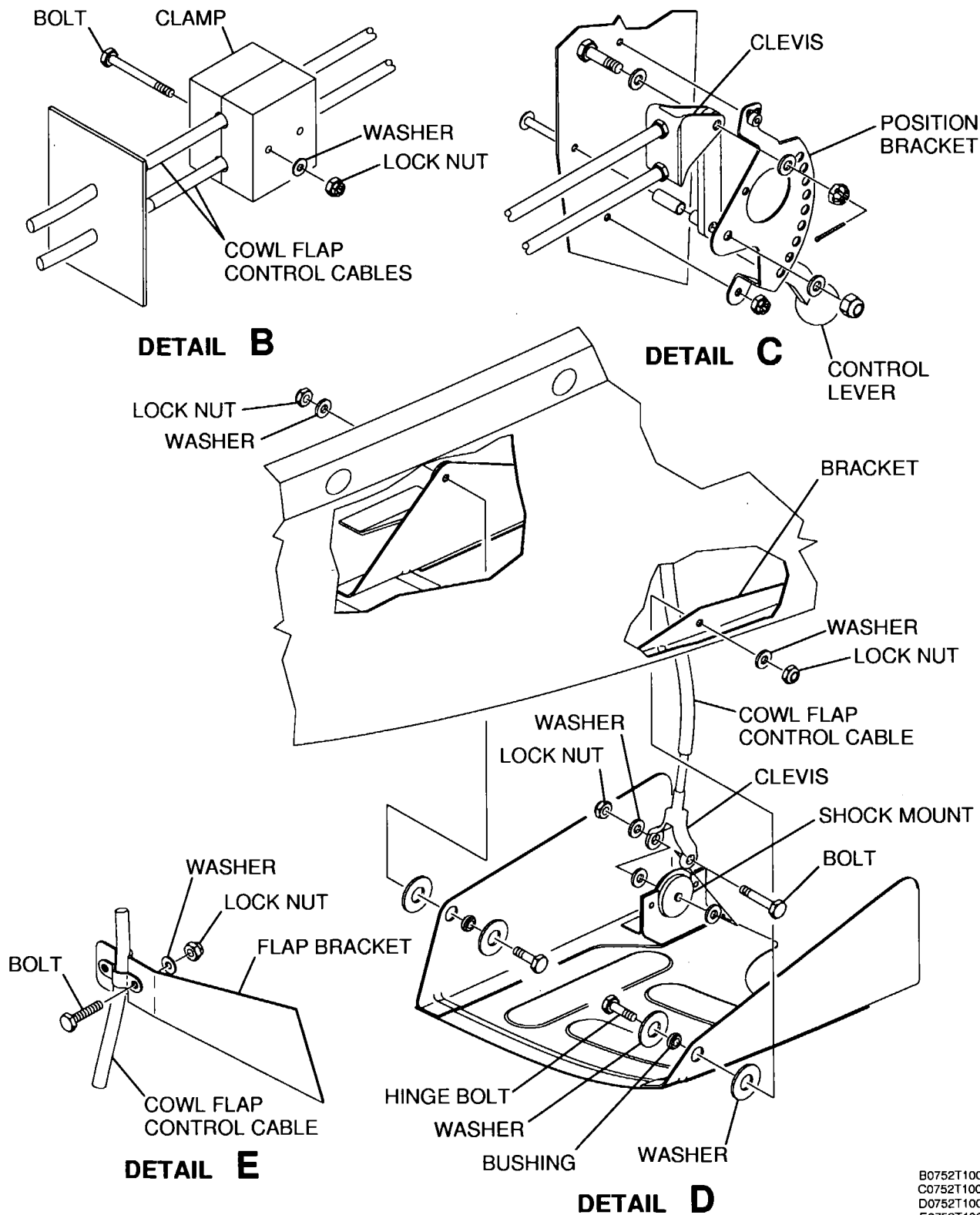
**DETAIL A**

Cowl Flap Installation  
Figure 203 (Sheet 1)

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A0752T1004

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B0752T1004  
 C0752T1004  
 D0752T1004  
 E0752T1004

Cowl Flap Installation  
 Figure 203 (Sheet 2)

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- (2) Make sure that the flexible controls reach their internal stops in each direction.
- (3) Identify the controls so that the full travel can be easily examined and maintained while you complete the rigging procedures.
- (4) Set the cowl flap control lever in the CLOSED position.
  - (a) If the control lever cannot be set in the closed position, adjust the controls at the top clevis to position the control lever in the bottom hole of the position bracket.
- (5) Hold one cowl flap flat with the trailing edge of bottom cowl.
- (6) Set in position and adjust the clevis to align with the cowl flap mount.
- (7) Attach the clevis to the shock mount with the bolt, washers and lock nut.

**NOTE:** Make sure the threads are visible in the clevis inspection holes.

- (8) Make sure all the clamps and nuts are tight.
- (9) Make sure the cowl flaps fully open to 25 degrees +0 or -1 degree, measured with an inclinometer held against the cowl flap and that they fully close.

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**ENGINE MOUNT - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The engine mount is made of 4130 steel and uses four rubber mounts to isolate engine noise and vibration from the engine mount. The engine mount is attached to the fuselage at four points on the firewall with bolts, washers, and nuts.

**2. Engine Mount Procedures**

- A. Shock Mount Procedures (Refer to Figure 201).  
(1) The shock mounts that connect the engine to the engine mount are made of a synthetic material and metal, which are installed to decrease noise and vibration.

**CAUTION:** Do not clean the shock mounts with any type of solvent.

- (2) Use a clean, dry cloth to clean the shock mounts.  
(3) Examine the shock mounts and replace them as necessary.  
(a) Examine the metal parts for cracks and deterioration as a result of wear and age.  
(b) Examine the synthetic material for separation, swelling, cracks on the pad, and incorrect alignment with the engine.  
(4) When you install the shock mounts, make sure that you install them in the order that follows.  
(a) For the top shock mount, install the largest shock mount aft of the mounting flange.  
(b) For the bottom shock mount, install the largest shock mount forward of the mounting flange.

**NOTE:** You can put zero, one, or two washers (S1450-7N32-125) between the tubular engine mount and each lower engine shock mount to correctly align the engine with the nose cap.

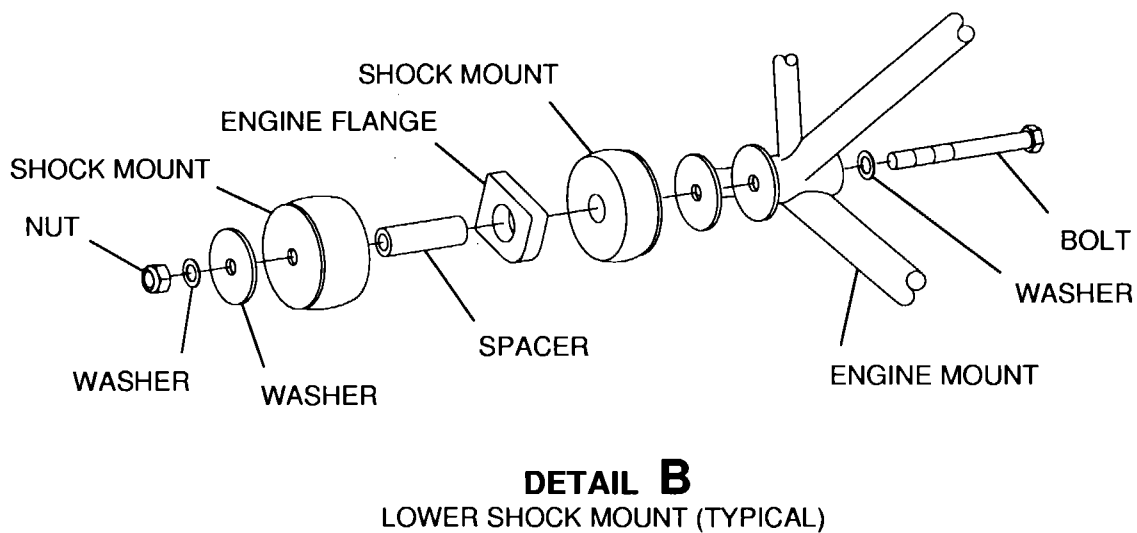
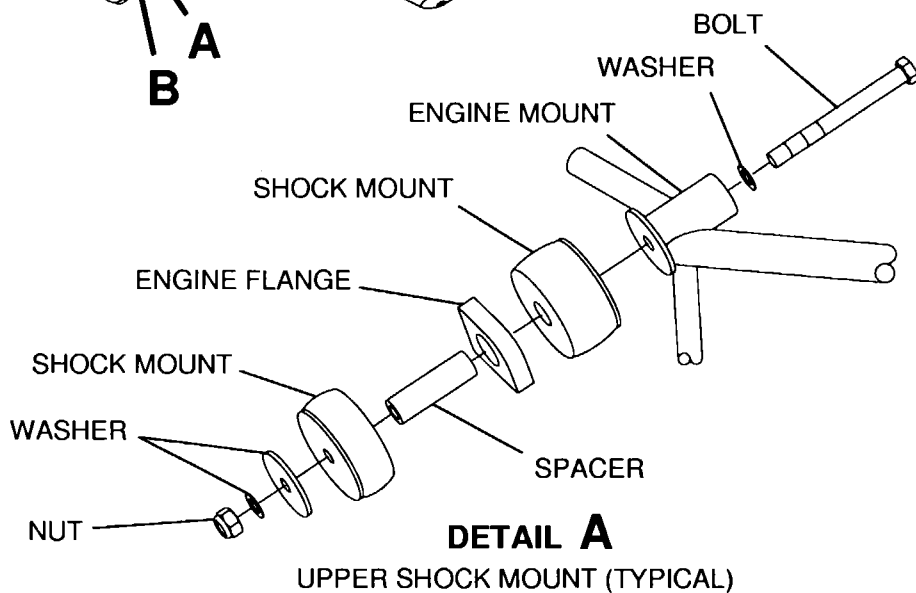
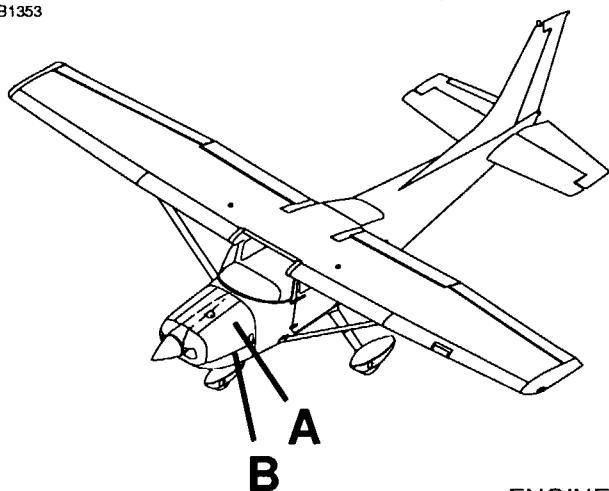
- (5) Make sure that the nuts are torqued to between 450 and 500 inch-pounds (51 to 56 N.m) for installation with no engine weight on the shock mounts.
- B. Firewall Mounting Procedures (Refer to Figure 202).  
(1) Attach the engine mount to the firewall with bolts, washers, flat washers, and nuts as illustrated in Figure 202. Torque the nuts to between 160 and 190 inch-pounds (18 to 21.5 N.m) with no engine weight on the shock mounts.
- C. Removal Notes.  
(1) For specific engine mount removal instructions, refer to the Engine - Maintenance Practices section of this chapter.

**3. Engine Mount Repairs**

- A. Use the procedures given in the Single Engine Models 172, 182, 206, and T206 (1996 and On) Structural Repair Manual to repair the engine mount.

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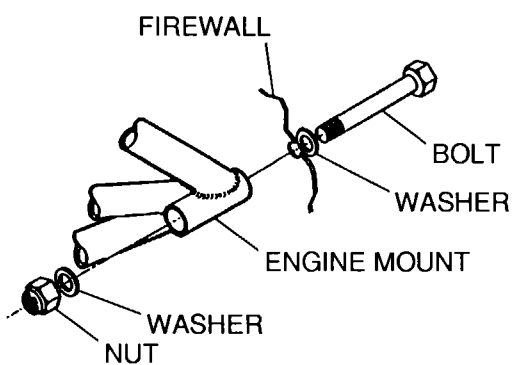
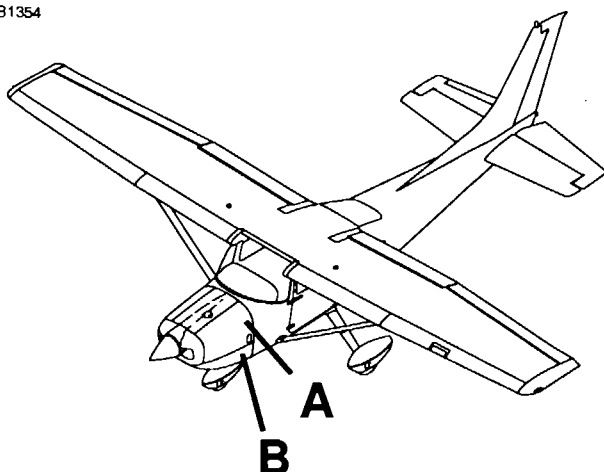


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 B0751T1001

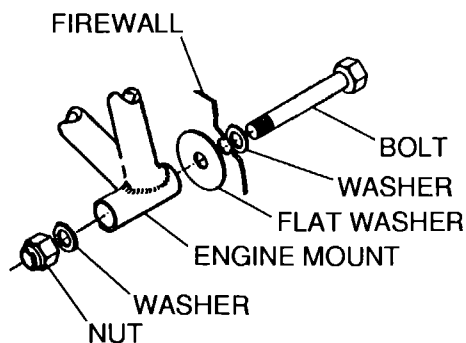
Engine Shock Mount Installation  
 Figure 201 (Sheet 1)

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**DETAIL A**  
 UPPER FIREWALL ENGINE MOUNT



**DETAIL B**  
 LOWER FIREWALL ENGINE MOUNT

Firewall Engine Mount Installation  
 Figure 202 (Sheet 1)

0710T1001  
 A05511001  
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**AIR INDUCTION SYSTEM - MAINTENANCE PRACTICES**

**1. Description and Operation**

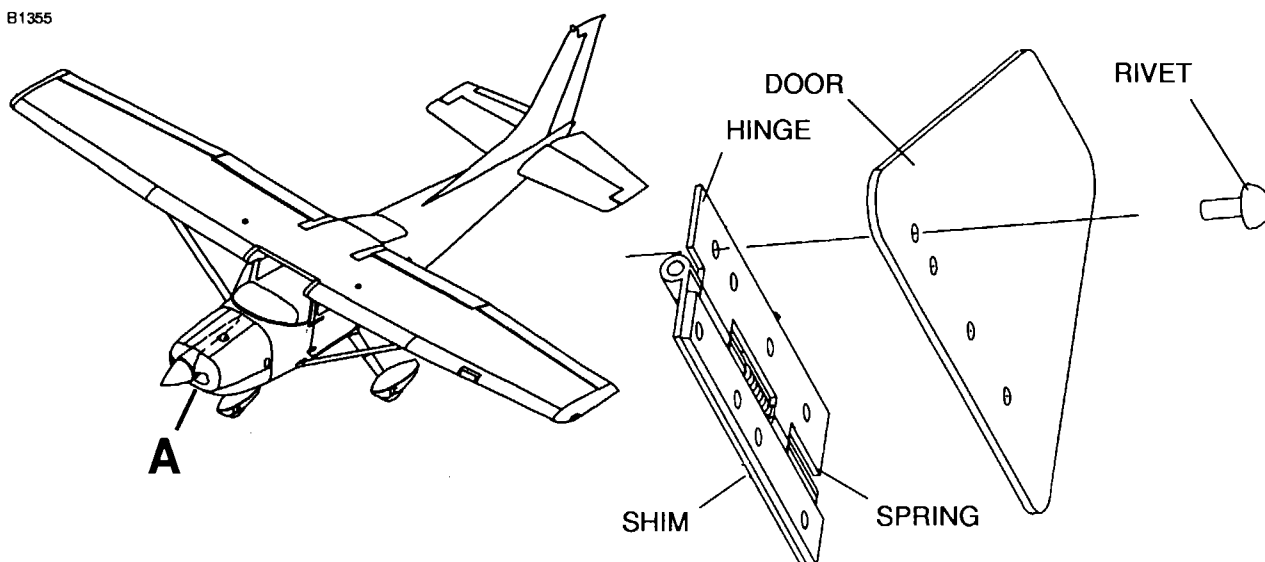
- A. Ram air to the engine enters the induction air box through the induction filter, located in the forward part of the lower engine cowl. From the induction air box, the air is directed to the inlet of the fuel/air control unit and, ultimately, through individual intake runners into their respective cylinders.
- B. For a more comprehensive description of how the air induction system relates to fuel injection, refer to Chapter 73, Fuel Injection System - Description and Operation.

**2. Air Induction System Removal/Installation**

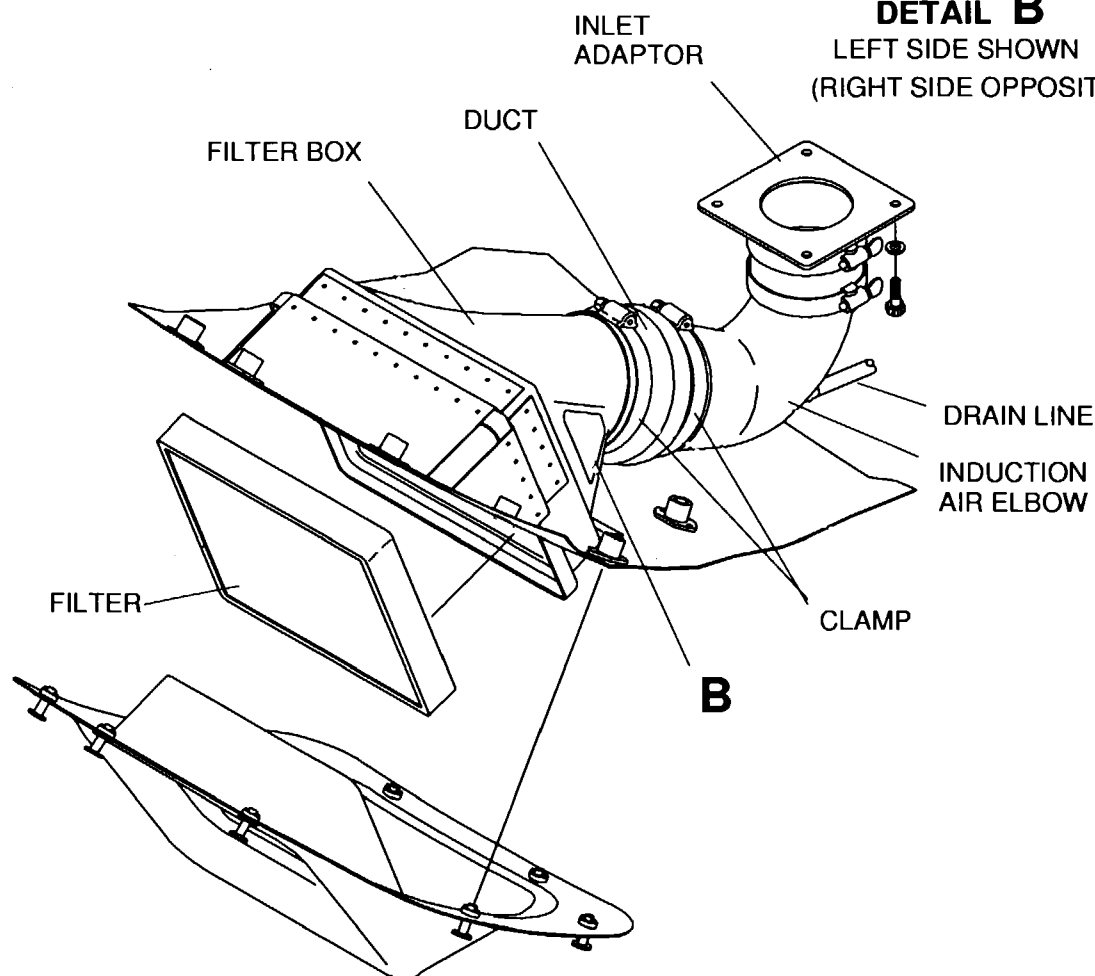
- A. Remove System Components (Refer to Figure 201).
  - (1) Loosen fasteners securing air filter bracket to lower cowl. Remove air filter bracket and air filter.
  - (2) Remove lower cowl. Refer to Cowling - Maintenance Practices.
  - (3) Loosen clamps on duct to disconnect filter box from induction air elbow.
  - (4) To remove induction air elbow, loosen clamps at inlet adaptor and at drain line. Slide induction air elbow down and away from inlet adaptor.
- B. Install System Components (Refer to Figure 201).
  - (1) Position induction air elbow to inlet adaptor and secure using clamp.
  - (2) Secure drain line to induction air elbow using clamp.
  - (3) Install lower cowl. Refer to Cowling - Maintenance Practices.
  - (4) Secure air filter and air filter bracket to lower cowl using quick release fasteners.

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**DETAIL B**  
 LEFT SIDE SHOWN  
 (RIGHT SIDE OPPOSITE)



**DETAIL A**

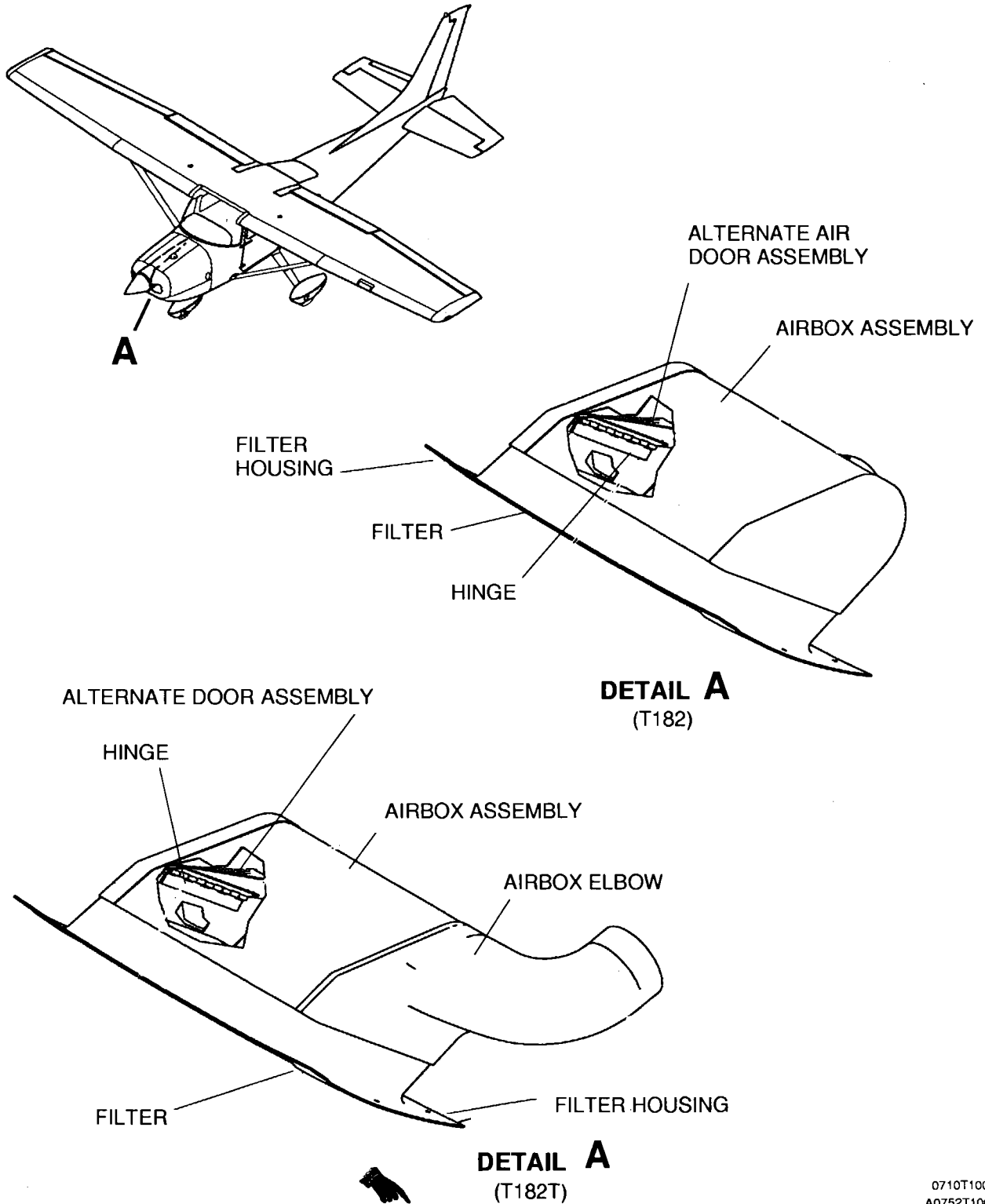
Induction Air System  
 Figure 201 (Sheet 1)

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 A0752T1003  
 B0550T1003



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Induction Air System  
Figure 201 (Sheet 2)

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A0752T1003

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**DRAIN LINES - MAINTENANCE PRACTICES**

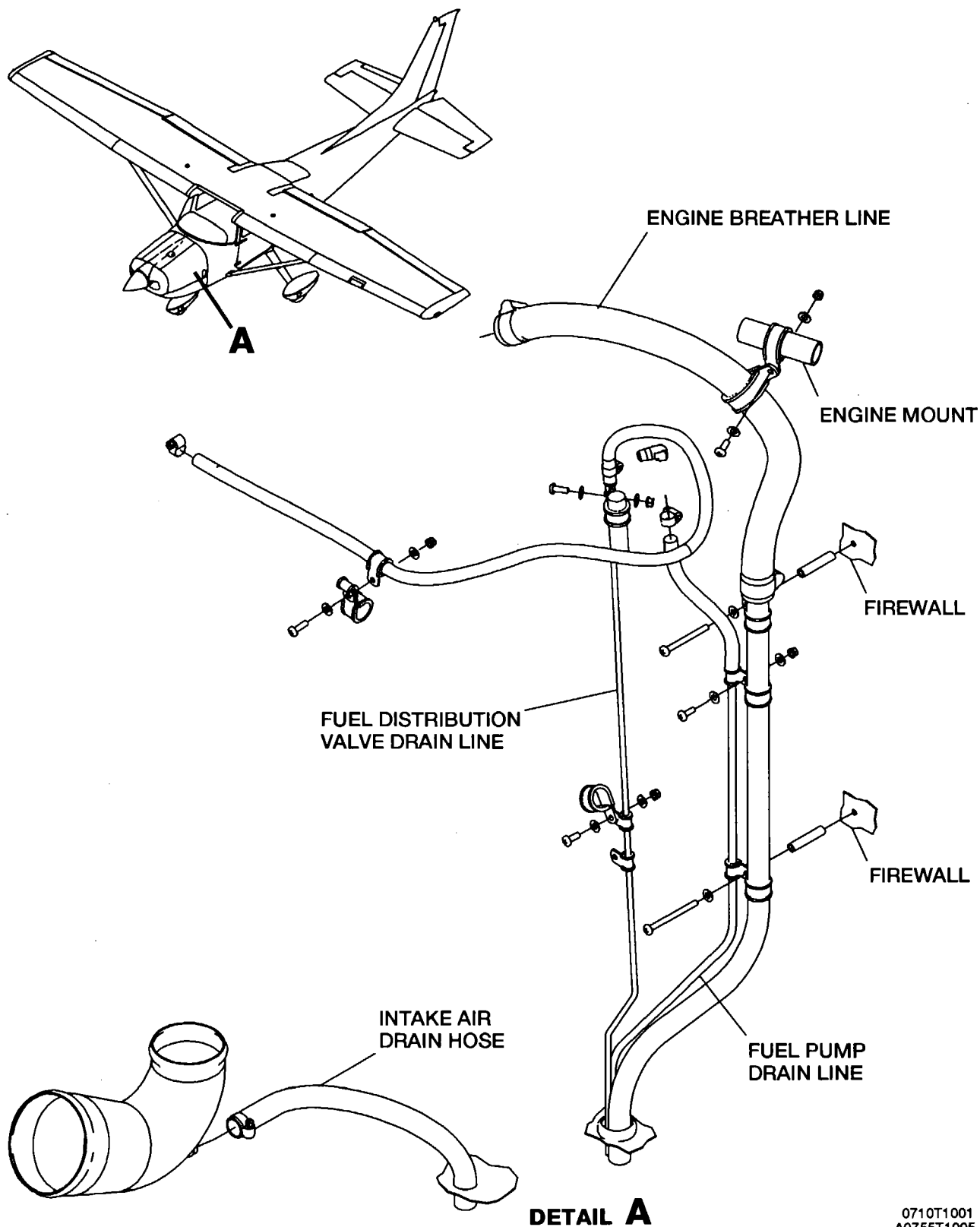
**1. Description and Operation**

- A. Various components within the engine compartment are equipped with drain lines to allow fluid and/or vapor to escape and vent to the atmosphere. These lines are typically secured using hose clamps, and are routed together in a cluster on the left side of the forward firewall.

**2. Maintenance Practices**

- A. Maintenance practices for all drain lines are typical. Line removal and installation consists of removing clamps and other devices used to secure the lines to various structure. Lines should be checked for condition and security when removed, and installed in reverse order.
- B. For an illustration of various drain lines, refer to Figure 201.

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A0755T1005

Engine Drain Lines Installation  
Figure 201 (Sheet 1)

**CHAPTER**

# **73**

**ENGINE  
FUEL AND  
CONTROL**

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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
73-Title		
73-List of Effective Pages	Page 1	Jan 1/2007
73-Record of Temporary Revisions		
73-Table of Contents		Jan 1/2007
73-00-00	Page 1	April 1/2002
73-00-01	Pages 1-3	April 1/2002
73-00-01	Pages 101-103	Jan 1/2007
73-00-01	Pages 201-206	Jan 1/2007
73-30-00	Pages 201-202	April 1/2002



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**ENGINE FUEL AND CONTROL - GENERAL**

**1. Scope**

- A. This chapter provides information on the fuel injection system used for the IO-540 AB1A5 engine. Information beyond the scope of this chapter can be found in Chapter 28, Fuel - General and in various publications which are listed in Introduction - List of Manufacturers Technical Publications.

**2. Definition**

- A. This chapter is divided into sections and subsections to assist maintenance personnel in locating specific systems and information. The following is a brief description of each section. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.
- (1) The section on fuel injection covers procedures used to troubleshoot and maintain the fuel injection system.
  - (2) The section on fuel flow indicator covers procedures used to maintain the indicating portion of the system.



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**FUEL INJECTION SYSTEM - DESCRIPTION AND OPERATION**

**1. General**

- A. This section covers the RSA Fuel Injection system used on the IO-540-AB1A5 and the TIO-540-AK1A engines. For a schematic of the fuel injection system, refer to Figure 1.

**2. Description**

- A. The fuel injection system is a low pressure, multinozzle, continuous flow system which injects raw fuel into the engine cylinder heads. The injection system is based on the principle of measuring engine air consumption to control fuel flow. More airflow through the venturi will result in more fuel being delivered to the engine, and less airflow through the venturi results in a decreased flow of fuel to engine.
- B. System components consist of the fuel/air control unit, the fuel distribution valve (flow divider), injection nozzles (6 total) and lines used to connect the components. A description of the components is as follows:
- (1) Fuel/Air Control Unit - The fuel/air control unit, also known as the 'servo regulator,' is located on the underside of the engine and integrates the functions of measuring airflow and controlling fuel flow. The control unit consists of an airflow sensing system, a regulator section and a fuel metering section.
  - (2) Fuel Distribution Valve - The fuel distribution valve, also known as a 'spider' or a flow divider, is located on top of the engine and serves to distribute fuel evenly to the cylinders once it has been regulated by the fuel/air control unit. Also attached to the fuel distribution valve is a rigid line which feeds into a pressure transducer. This transducer measures fuel pressure and translates that reading into fuel flow at the cockpit indicator.
  - (3) Injection Nozzles - Each cylinder contains an injection nozzle, also known as an air bleed nozzle or a fuel injector. This nozzle incorporates a calibrated jet that determines, in conjunction with fuel pressure, the fuel flow entering each cylinder. Fuel entering the nozzle is discharged through the jet into an ambient air pressure chamber within the nozzle assembly. This nozzle assembly also contains a calibrated opening which is vented to the atmosphere, and allows fuel to be dispersed into the intake portion of the cylinder in an atomized, cone shaped pattern.

**3. Operation**

- A. Fuel is stored in the wing tanks and is delivered to the fuel injection system via a series of lines, valves and pumps. From the engine driven fuel pump, fuel enters the fuel/air control unit, passes through the fuel distribution valve, and is routed to individual injection nozzles at each cylinder.

**NOTE:** For a schematic of the entire fuel system, refer to Chapter 28, Fuel Storage and Distribution - Description and Operation, Figure 1.

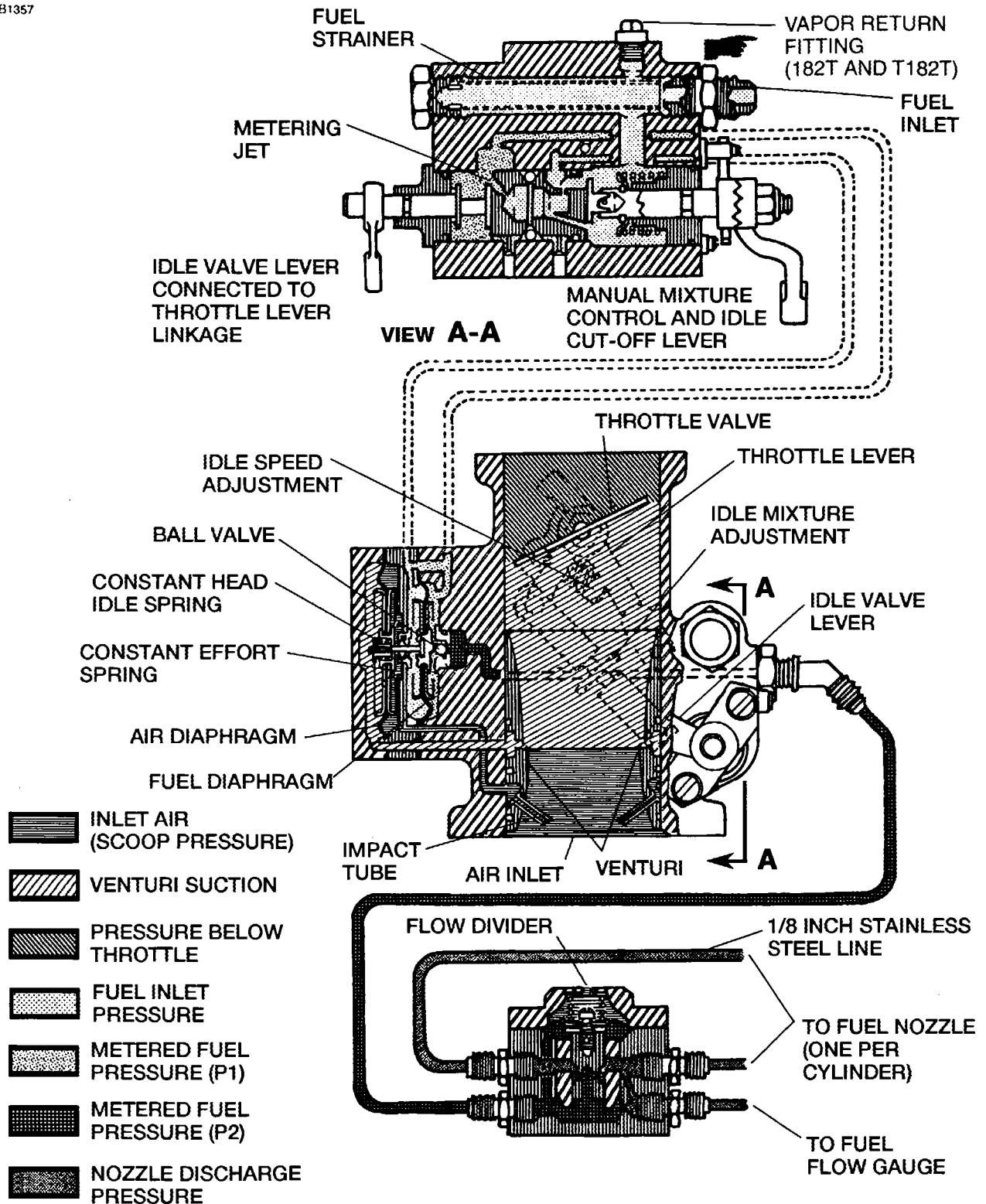
- B. The heart of the injection system is the fuel/air control unit, which occupies the position ordinarily used by the carburetor at the engine intake manifold inlet. The fuel/air control unit is comprised of an integrated airflow sensing system, a regulator section and a fuel metering section. Operation of the fuel injection system is based on the principle of measuring airflow and using the airflow signal to operate a servo valve. The accurately regulated fuel pressure established by the servo valve, when applied across the fuel control system, makes fuel flow proportional to airflow.
- (1) The airflow sensing system consists of a throttle body which houses the air throttle valve, the venturi, servo valve and fuel control unit. The differential pressure between impact air and the venturi throat pressure is a measurement of the velocity of the air entering the engine. These pressures are vented through drilled channels in the throttle body to both sides of an air diaphragm and create a force across the diaphragm. A change in air throttle position or a change in engine speed will change the air velocity, which in turn changes the force across the air diaphragm.

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- (2) The regulator section contains the air diaphragm, mentioned in the preceding paragraph, and a fuel diaphragm. Fuel inlet pressure is applied to one side of the fuel diaphragm. The other side of the fuel diaphragm is exposed to fuel that has passed through the metering jet (metered fuel pressure). The differential pressure across the fuel diaphragm is referred to as the fuel metering force.
  - (a) The air metering force applied to the air diaphragm is transmitted through the regulator stem and tends to move the ball valve in the opening direction. The fuel metering force across the fuel diaphragm acts to oppose the air metering force and tends to close the ball valve. Because the air forces are very low in the idle range, a constant head idle spring is provided to maintain an adequate fuel metering force at low RPM.
  - (b) As the air metering force increases, the spring compresses until the spring retainer touches the air diaphragm and acts as a solid member. The constant effort spring produces a force which provides a smooth transfer from idle to low power cruise operation. Whenever the air metering, fuel metering and spring forces are balanced, the ball valve maintains a fixed position.
- (3) The fuel metering section is contained within the throttle body casting and consists of an inlet fuel screen, a rotary idle valve and a rotary mixture valve. Both idle speed (closed throttle position) and idle mixture (relationship between throttle position and idle valve position) may be adjusted externally to meet individual engine requirements.
  - (a) The idle valve is connected to the throttle valve by means of an external adjustable link. The idle valve controls fuel flow through the low speed range of operation and is adjustable to obtain good idling characteristics without affecting fuel metering in the high power range.
  - (b) The mixture control valve gives full rich mixture on one stop and a progressively leaner mixture as it is moved toward idle cutoff. The full rich stop defines sea level requirements and the mixture control provides for altitude leaning.

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Fuel Injection System Schematic  
 Figure 1 (Sheet 1)

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**FUEL INJECTION SYSTEM - TROUBLESHOOTING**

**1. General**

A. This section gives troubleshooting information for the fuel injection system.

**2. Fuel Injection System Troubleshooting**

A. Do the troubleshooting procedures if the problem is on the chart. Refer to Table 101.

Table 101. Fuel Injection System Troubleshooting

PROBLEM	PROBABLE CAUSE	SOLUTION
HIGH FUEL FLOW READING.	Plugged nozzle if the high fuel flow reading is combined with a loss of power, roughness, or if you cannot set the idle mixture easily.	Remove and clean the nozzles. Soak the nozzles in Hoppes #9 Gun cleaning solvent for 20 minutes. Rinse the nozzles in a Stoddard solvent. Blow dry the nozzles. Do a check of the system for contamination.
	Faulty gage or pressure transducer. (Non-NAV 3 or non-turbo)	Use a mechanical gage and make sure the transducer pressure indication is correct. Replace the gage or pressure transducer as necessary.
UNSATISFACTORY FUEL CUTOFF.	Incorrect installation of the aircraft linkage to the mixture control.	Adjust the linkage.
	Mixture valve leaks.	Refer to the servo mixture valve RS-16.
ENGINE WILL NOT INCREASE TO THE NECESSARY RPM.	Contamination in the air chamber.	Refer to Precision Airmotive Corporation service information letter RS-40.
ROUGH IDLE.	Small air leaks in the induction system through loose intake pipes.	Do a check of the clamps and connectors. Repair leaks as necessary.
	Large air leaks in the induction system.	Repair leaks as necessary.
	Fuel hose fittings loose.	Tighten the fittings.
	Fuel vaporizes in the fuel lines or distributor. Found only in high ambient temperature conditions or after a long operation at a low RPM setting.	<u>Keep temperatures low:</u> Avoid long ground runs. <u>During a hot engine restart:</u> Operate the engine at 1,200 - 1,500 for several minutes to reduce residual heat in the engine compartment.

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Table 101. Fuel Injection System Troubleshooting (continued)

LOW TAKEOFF FUEL FLOW.	Faulty gage or pressure transducer. (Non-NAV 3 or non-turbo)	Use a mechanical gage and make sure the transducer pressure indication is correct. Replace the gage or pressure transducer as necessary.
	Contamination in the flow divider.	Clean the flow divider.
	Fuel pump pressure is not correctly adjusted.	Adjust the fuel pump pressure.
ENGINE IS DIFFICULT TO START.	Incorrect starting procedure.	Refer to the Pilot's Operating Handbook.
	Flooded engine.	Crank the engine to clear it with the throttle open and the mixture in the IDLE/CUTOFF position.
	Throttle valve is opened too far.	Open the throttle to approximately 800 RPM.
	A prime that is not sufficient (usually combined with a backfire).	Increase the quantity of priming.

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Table 101. Fuel Injection System Troubleshooting (continued)

ENGINE OPERATES ROUGH.	Too rich or too lean mixture.	Adjust the mixture control. If the mixture is too rich, the engine will run smoothly when leaned. If the mixture is too lean, the engine will run smoothly when the mixture is enriched. Adjust idle mixture to give a 10 - 50 PRM rise at idle.
	Plugged nozzle(s) (usually combined with high takeoff fuel flow). (Non-NAV 3 or non-turbo)	Remove and clean the nozzles. Soak the nozzles in a Hoppes #9 Gun cleaning solvent for 20 minutes. Rinse the nozzles with a Stoddard solvent. Blow dry the nozzles. Do a check of the system for contamination.
	Air leak in the induction system.	Do a check for leaks.
	Air leak in the fuel line from the fuel tank to the servo.	Do a check for the leak. Connect clear tubing between the servo and the flow divider and look for air bubbles. Find and correct the source of the leak. This can include the boost pump, the engine-driven pump, or any hose or line connection.
NO FUEL FLOW INDICATION DURING PRIME	Flow divider sticks.	Do an inspection of the flow divider. Clean the flow divider.
	Flow divider sticks.	Send to repair station.

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**FUEL INJECTION SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives instructions for removal and installation, adjustment, and cleaning of components in the fuel injection system. For more maintenance information, refer to the applicable fuel injection component maintenance manuals which are listed in the Introduction - List of Manufacturers Technical Publications.

**2. Precautions**

- A. Obey these general precautions and rules when you refuel, defuel, clean the fuel tank, repair, assemble or disassemble system components, and do electrical system tests and repairs on the airplane fuel system.
- (1) Put covers or caps on all disconnected hoses, lines, and fittings to prevent residual fuel drainage, thread damage, or entry of dirt or unwanted material into the fuel system.
  - (2) When the fuel system is opened, use the fuel boost pump to flush the system with 1/2 gallon of fuel at the inlet of the servo and flow divider.
  - (3) When you work on fuel injection system, keep all parts clean and free from contamination.

**3. Fuel/Air Control Unit Removal/Installation**

- A. Remove the Fuel/Air Control Unit.
- (1) Put the cockpit-mounted FUEL SELECTOR valve in the OFF position.
  - (2) Remove the lower cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (3) Remove the clamp that attaches the induction air elbow to the inlet adaptor.
  - (4) Disconnect the fuel inlet and outlet lines from the control unit.
  - (5) Remove the mixture and throttle control linkages from the control unit. Record the number and position of the washers for installation.
  - (6) Cut the safety wire at the base of the control unit. Remove the bolts that attach the inlet adaptor and throttle cable bracket to the base of the control unit.
  - (7) Remove the nuts, lock washers, and flat washers that attach the control unit to the oil sump. Put a cover on the engine intake opening and put the control unit in a sealed, clean environment to prevent the collection of unwanted particles in the unit.
- B. Install the Fuel/Air Control Unit.
- (1) Remove the engine intake cover from the sump area.
  - (2) Install the control unit to the sump using washers, lock washers, and a nut.
  - (3) Install the inlet adaptor and throttle cable bracket to the base of the control unit. Safety the bolts with wire.
  - (4) Connect the mixture and throttle control linkages to the control unit. Make sure that all washers are in the correct position and that the cotter pins are installed where necessary.
  - (5) Connect the fuel inlet and outlet lines to the control unit.
  - (6) Attach the induction air elbow to the inlet adaptor using the clamp.
  - (7) Install the lower cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (8) Put the cockpit-mounted FUEL SELECTOR valve in the ON position.

**4. Fuel Distribution Valve Removal/Installation**

- A. Remove the Fuel Distribution Valve.
- (1) Remove the upper cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (2) Disconnect all the lines from the fuel distribution valve.
  - (3) Remove the nuts, bolts, washers, and spacers that attach the fuel distribution valve to the engine case.
- B. Install the Fuel Distribution Valve.
- (1) Attach the fuel distribution valve to the engine case using the nuts, bolts, washers, and spacers.
  - (2) Install all the lines to the fuel distribution valve.
  - (3) Install the upper cowl. Refer to Chapter 71, Cowl - Maintenance Practices.

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## 5. Injection Nozzles Removal/Installation

**NOTE:** The nozzles have two pieces. Make sure that the nozzle inserts stay with the nozzle bodies and that the nozzles are installed in the same cylinder from which they were removed.

- A. Remove the Injection Nozzles.
  - (1) Remove the upper cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (2) Remove the rigid fuel lines from the individual nozzles.
  - (3) Remove the nozzles from the cylinders.
- B. Install the Injection Nozzles.

**CAUTION:** Use only fuel-soluble lubricants (such as engine oil) on the nozzle threads during installation.

- (1) Attach the nozzles to the intake cylinders. Torque the nozzles to between 55 and 60 inch-pounds (between 6.2 and 6.8 N.m).
- (2) Connect the rigid fuel lines to the nozzles.
- (3) Install the upper cowl. Refer to Chapter 71, Cowl - Maintenance Practices.

## 6. Injection Nozzle Flow Test

- A. Check the Injection Nozzles For Blockages.
  - (1) If you think that a nozzle is blocked, disconnect the injector lines from the nozzles.
  - (2) Seal the nozzles with clean valve stem caps to protect the nozzles from contamination during removal.
  - (3) Remove the nozzles. Refer to Injection Nozzles Removal/Installation.
  - (4) Pull the injector lines up and make sure that the lines are not kinked.
  - (5) Install the nozzles back into the lines.
  - (6) Let the fuel flow into clear containers (bottles with graduations are recommended) using the auxiliary fuel pump and examine the nozzle discharge pattern.
  - (7) When the mixture control is put in the full rich position, the nozzles must make a pencil-stream pattern. The nozzles must also release the same amount of fuel in each cylinder. If you see an unusual flow pattern, or see that the amount of fuel in each container is different, the nozzles must be cleaned. Refer to Injector Nozzle Cleaning.
  - (8) After cleaning the nozzles, install clean valve stem caps for protection. After cleaning the nozzles, it is recommended that they be installed into the injector lines and that a nozzle flow test is done to make sure that the nozzles are clean.
  - (9) After a successful flow test, install the flow caps and install the nozzles in the cylinders.
  - (10) Remove the flow caps and connect the injector lines to the nozzles.

## 7. Idle and Mixture Adjustment

- A. Airplanes with the RSA Fuel Injection System, refer to the Precision Airmotive Service Letter SIL RS-67.
- B. Adjustment Procedures (Refer to Figure 201).

**WARNING:** During the adjustment procedure, stay away from the propeller and/or propeller blast to prevent possible injury or death.

**NOTE:** Make sure that the alternate air door is in the closed position during this adjustment.

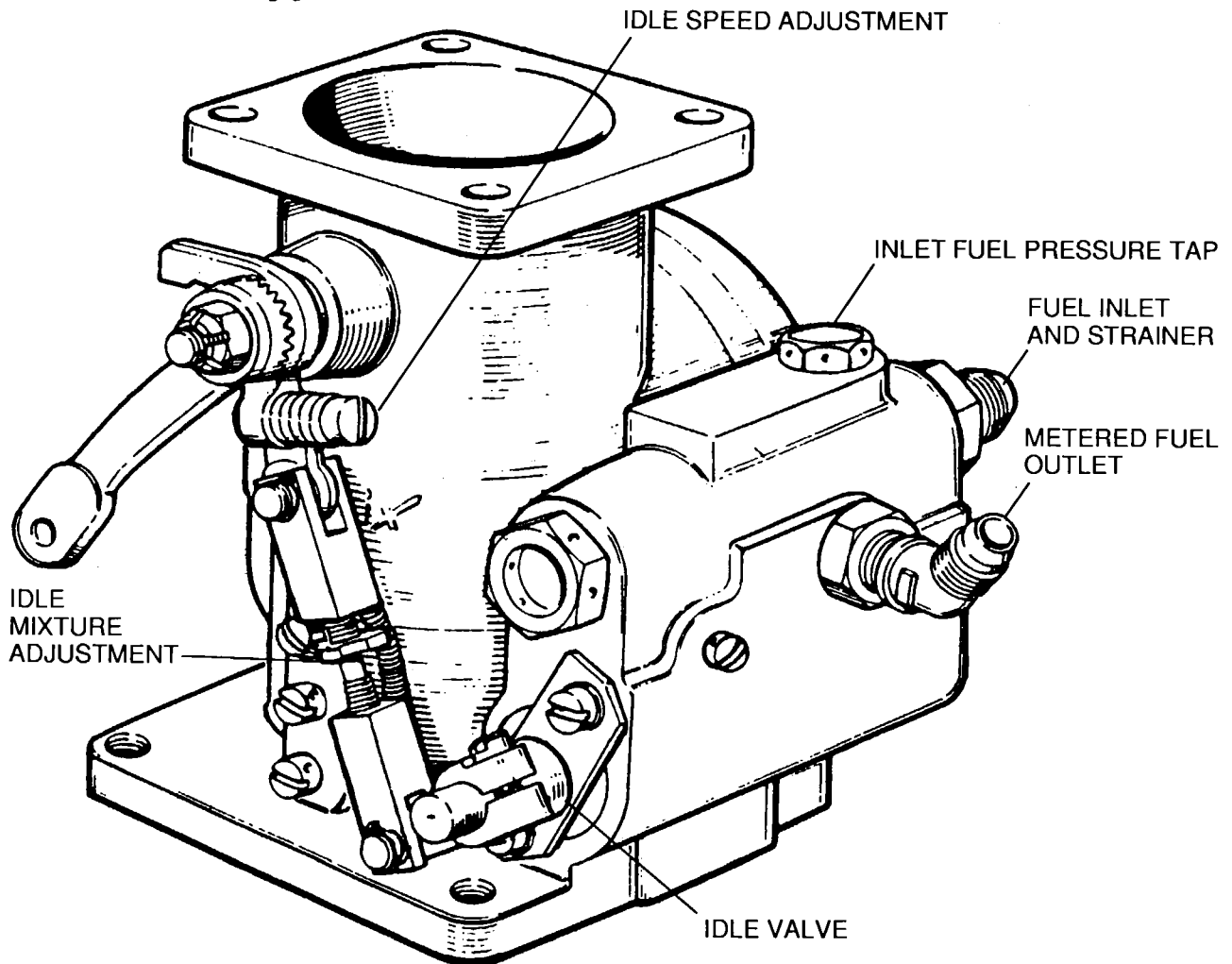
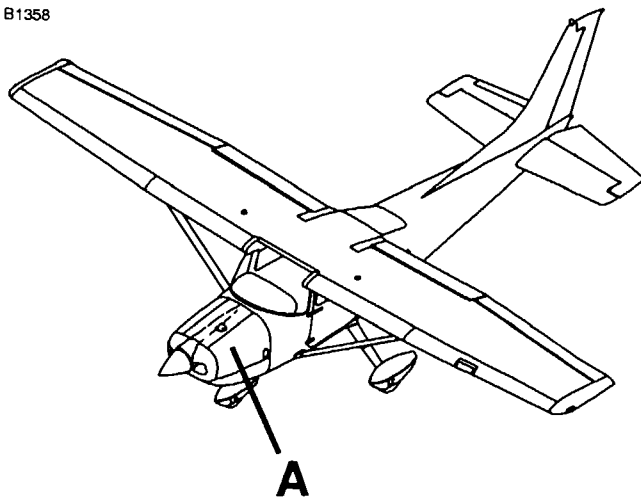
- (1) Operate the engine until the oil temperature increases to 150° F.

**NOTE:** If the cowl has been removed, it may not be possible to get an oil temperature of 150° F at cooler ambient temperatures. In that condition, it will be necessary to set the idle speed and mixture at a lower temperature.



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**DETAIL A**

Idle and Mixture Adjustment  
Figure 201 (Sheet 1)

0710T1001  
A0556T1002

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- (2) With the mixture control in the full rich position, set the idle speed to 650, +25 or -25 RPM.
- (3) Set the throttle to approximately 1800 RPM and immediately return it to idle. The idle speed should be approximately the same as the speed set in step 2.

**CAUTION:** Adjust the fuel mixture control by turning the knob quickly for approximately the first inch, then very slowly until you get the highest rpm and the engine speed starts to decline. When the engine speed first starts to increase, it will increase the rpm a small quantity. A speed hesitation will then occur as the mixture control is continually moved to the lean position. Do not mistake this as the total increase in rpm. Continue the slow turning of the mixture control until seeing or sensing a decrease in the engine rpm. This is the total increase in rpm which shows the mixture strength at the engine idle speed.

- (4) Turn the mixture control knob to lean the mixture. The engine RPM will increase. This increase must be set between 10 and 50 RPM.

**NOTE:** To help in the adjustment of the fuel mixture, a stamp on one half of the clevis on the fuel servo shows the direction the thumb wheel must be moved to make the mixture more rich and increase the RPM rate of change. Likewise, turning the thumb wheel in the opposite direction will make the mixture to more lean and decrease the RPM rate of change.

- (5) After each adjustment is made, the engine speed must be increased to approximately 1800 RPM and held for about 10-15 seconds to clean the spark plugs and clear the cylinders of excess fuel.
- (6) Move the throttle back to the idle position. Repeat the procedure until you get the desired RPM rate change at idle.

**NOTE:** If the mixture was too rich or too lean when this procedure was started, it will be necessary to adjust the engine speed again as the fuel mixture is adjusted to the desired value. Set the idle speed to the necessary RPM after the leaned mixture has been set to get the 10 to 50 RPM increase.

- (7) Operate the engine to full throttle and back to idle to make sure that the setting has not changed.
- (8) Install the cowl and operate the engine until the oil temperature increases to a minimum of 150°F (65°C) to make sure that the settings have not changed.

**NOTE:** Small changes in the idle speed and RPM are permitted. Find the cause of any large variations in RPM.

## 8. Injector Nozzle Cleaning

- A. The injector nozzles must be cleaned at time intervals given in Chapter 5, Inspection Time Limits.
- B. Clean the Injector Nozzles.
  - (1) Remove the nozzles from the engine.
  - (2) Examine the nozzles carefully for signs of varnish buildup and/or dirty screens.
  - (3) Soak the nozzles in Methyl Ethyl Ketone, Hopps #9 gun cleaner, or other solvent to remove all contamination and varnish from the nozzle. Some particles of contamination that cannot be cleaned with other methods can be cleaned with ultrasonic cleaning methods.
  - (4) Dry the nozzles using compressed shop air at no more than 30 PSI. Blow the air through the nozzle in the direction opposite of the fuel flow.

## 9. Fuel Strainer Cleaning

- A. The fuel strainer must be cleaned at time intervals given in Chapter 5, Inspection Time Limits.

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- B. Clean the Fuel Strainer (Refer to Figure 201).
  - (1) Remove the fuel inlet line to get access to the fuel strainer.
  - (2) Remove and clean the fuel strainer with unleaded gasoline or Stoddard solvent.
  - (3) Install the fuel strainer in the control unit with new O-rings.
  - (4) Install the fuel inlet line.

**10. Air Throttle Shaft Lubrication**

- A. The air throttle shaft must be lubricated at time intervals given in Chapter 5, Inspection Time Limits.
- B. To lubricate the air throttle shaft, apply a drop of engine oil to the ends of the air throttle shaft. Make sure that the oil can flow into the throttle shaft bushings.

**11. Engine Driven Fuel Pump Pressure Setting (T182)**

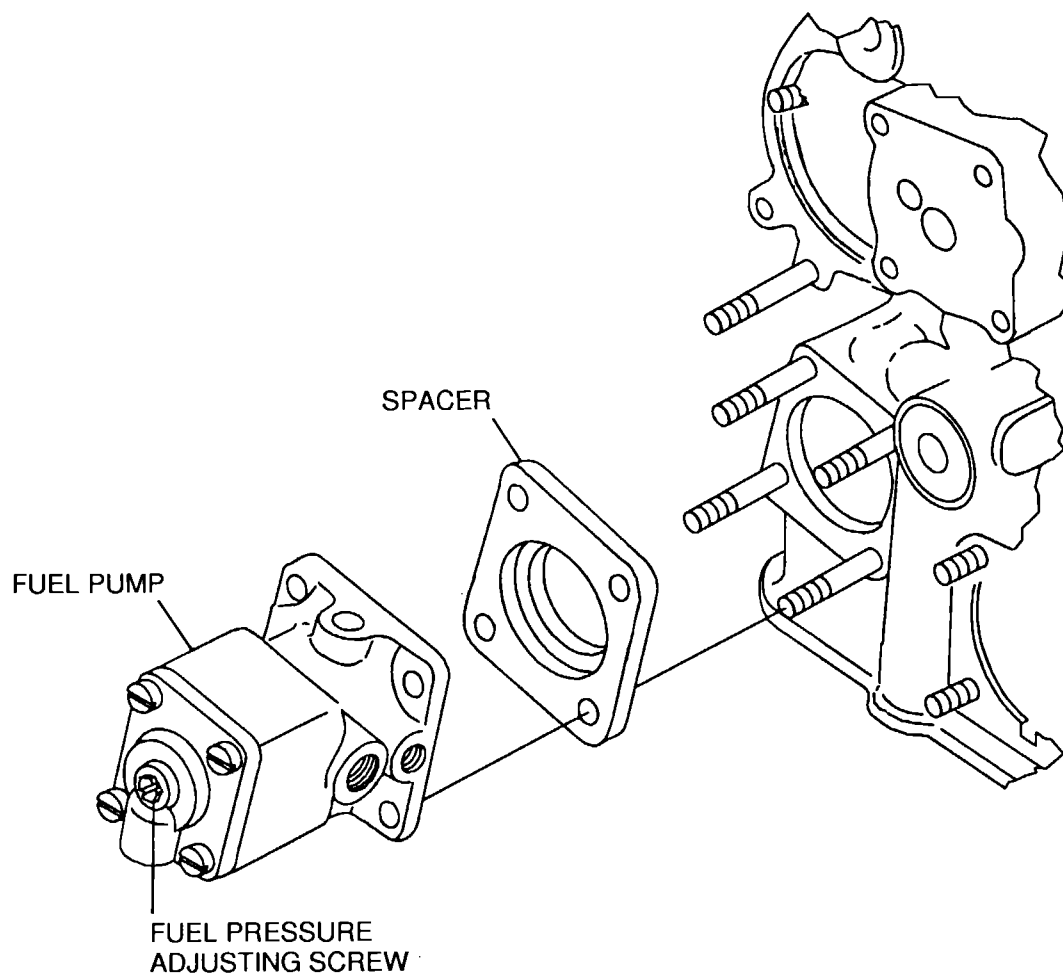
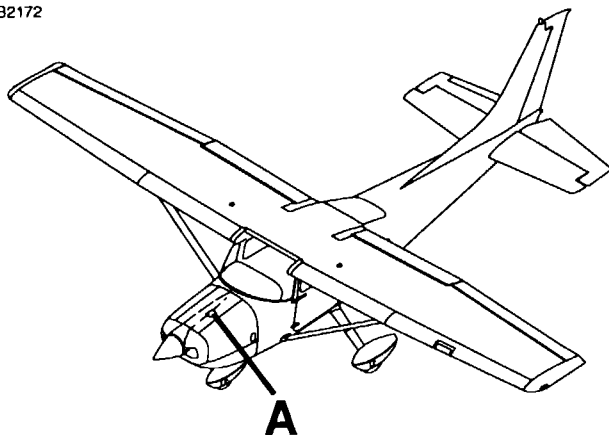
- A. Set the pressure of the engine driven fuel pump (T182) (Refer to Figure 202).
  - (1) Start and operate the engine to increase the oil temperature to 150° F.
  - (2) Operate the engine at maximum continuous power, 32 inches MAP, 2400 RPM, and record the fuel pump pressure. The fuel pressure specification is between 32 and 36 psi.
  - (3) If the fuel pump pressure is not in specifications, stop the engine and adjust the fuel pressure adjusting screw until the pressure is between 32 and 36 psi.

**WARNING: Stop the engine during the fuel pump pressure adjustment, and start it again to measure fuel pressure. Operation of the engine during the fuel pump pressure adjustment can cause injury.**

- (a) Set the fuel pressure by loosening the lock nut and turning the fuel pressure adjusting screw to get the necessary discharge pressure. Turning the screw clockwise increases pressure; turning the screw counterclockwise decreases pressure. When you have the correct pressure, hold the adjusting screw with a screwdriver and tighten the lock nut to between 23 and 30 inch-pounds of torque. Measure the valve setting after tightening the lock nut, and safety the lock nut with wire.

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**DETAIL A**

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Engine-Driven Fuel Pump Pressure Setting (T182)  
Figure 202 (Sheet 1)

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**FUEL FLOW INDICATOR - MAINTENANCE PRACTICES**

**1. General**

- A. Engine fuel flow is measured by use of an engine compartment mounted transducer and a cockpit mounted indicator. Components of the system include the fuel flow transducer (UN006), the cockpit mounted manifold pressure/fuel flow gauge (EI015), wiring to connect the two electrical components and rigid fuel line running from the fuel distribution valve to the transducer.
- B. Maintenance is limited to removal and installation of the components.

**2. EGT/Fuel Flow Gauge Removal/Installation**

**NOTE:** The Fuel flow gauge is incorporated on the right half of the dual function EGT/fuel flow gauge (EI015), mounted on the left side of the instrument panel.

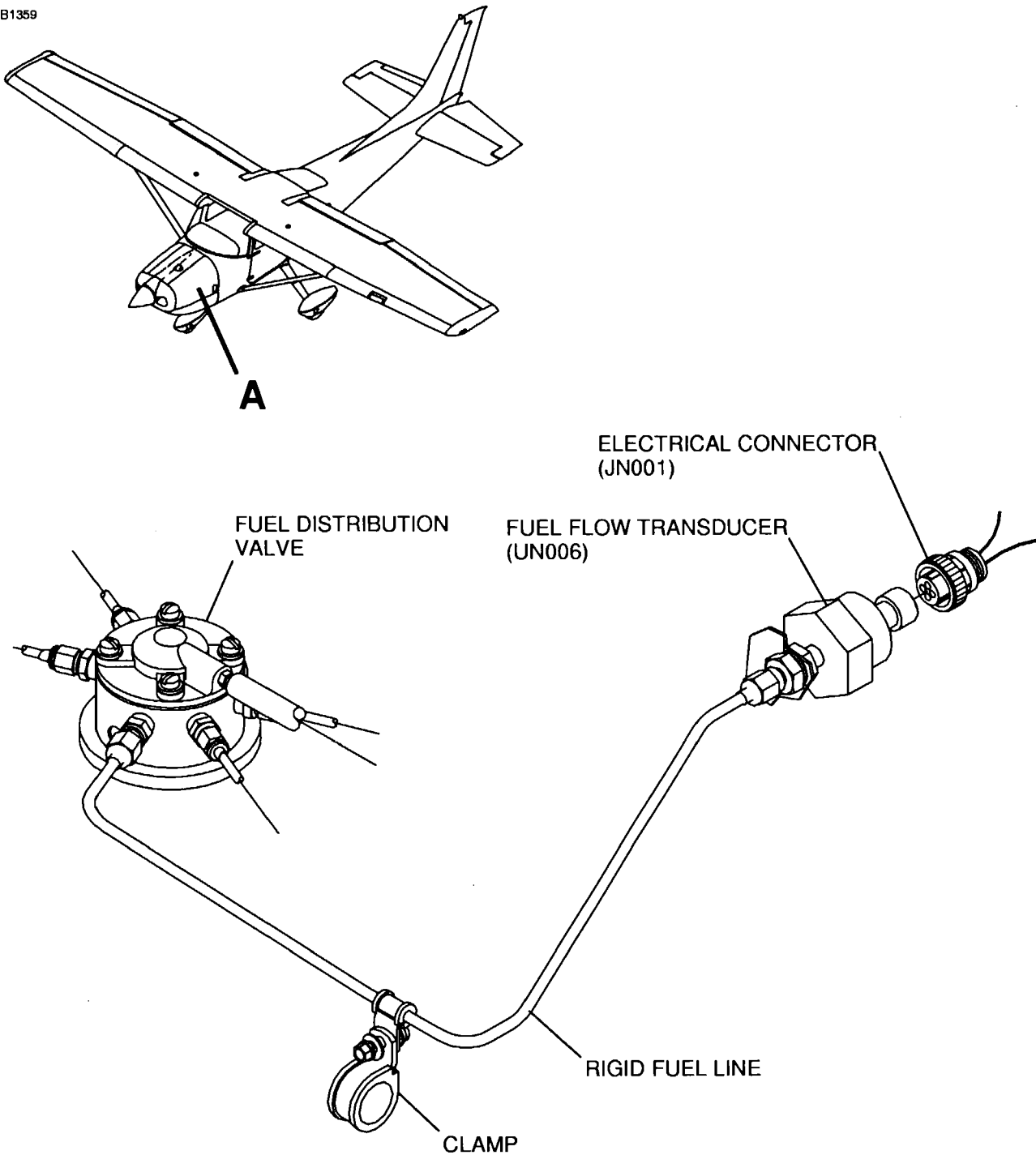
- A. Remove Fuel Flow Gauge (EI015).
  - (1) Ensure all electrical power to airplane is off.
  - (2) Remove screws securing gauge to instrument panel.
  - (3) Carefully withdraw gauge from bottom side of instrument panel and disconnect electrical connector JI033 from gauge.
- B. Install Fuel Flow Gauge (EI015).
  - (1) Connect electrical connector JI033 to gauge.
  - (2) Install gauge in instrument panel using screws.
  - (3) Restore electrical power to airplane and ensure gauge is connected and functioning properly.

**3. Transducer and Line Removal/Installation**

- A. Remove Transducer UN006 (Refer to Figure 201).
  - (1) Ensure all electrical power to airplane is off.
  - (2) Remove upper cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (3) Disconnect electrical connector JN001 from fuel flow transducer.
  - (4) Disconnect rigid line leading from fuel distribution valve to transducer.
  - (5) Remove transducer from baffle.
- B. Install Transducer UN006 (Refer to Figure 201).
  - (1) Install fuel flow transducer to baffle.
  - (2) Connect rigid line leading from fuel distribution valve to transducer.
  - (3) Connect electrical connector JN001 to fuel flow transducer.
  - (4) Reinstall upper cowling. Refer to Chapter 71, Cowling - Maintenance Practices.
  - (5) Restore electrical power to airplane and ensure gauge is connected and functioning properly.

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**DETAIL A**

0710T1001  
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Fuel Flow Indicating Installation  
Figure 201 (Sheet 1)

**CHAPTER**

**74**

**IGNITION**

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**LIST OF EFFECTIVE PAGES**

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74-List of Effective Pages		
74-Record of Temporary Revisions		
74-Table of Contents		
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74-10-00	Pages 101-103	April 1/2002
74-10-00	Pages 201-205	Jul 1/2007
74-30-00	Pages 601-602	April 1/2002



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**IGNITION SYSTEM - GENERAL**

**1. Scope**

- A. This chapter covers the ignition system used on the IO-540-AB1A5, IO-540-AB1A5 and TIO-540-AK1A engines.

**2. Tools, Equipment and Materials**

**NOTE:** Refer to the following table for tools, equipment and material used throughout the chapter.

NAME	NUMBER	MANUFACTURER	USE
Luberex Grease	10-1206	Cessna Aircraft Company Cessna Parts Distribution Email: Department 701, CPD 25800 East Pawnee Wichita, KS 67218-5590	To lubricate ignition switch components.
Ignition Switch Parts Kit	A3770	Cessna Aircraft	To rebuild the ignition switch.

**3. Definition**

- A. This chapter contains two sections on the ignition system. The first section provides a troubleshooting chart to aid in identifying common problems which may occur in the ignition system. The second section contains maintenance practices for the ignition system.

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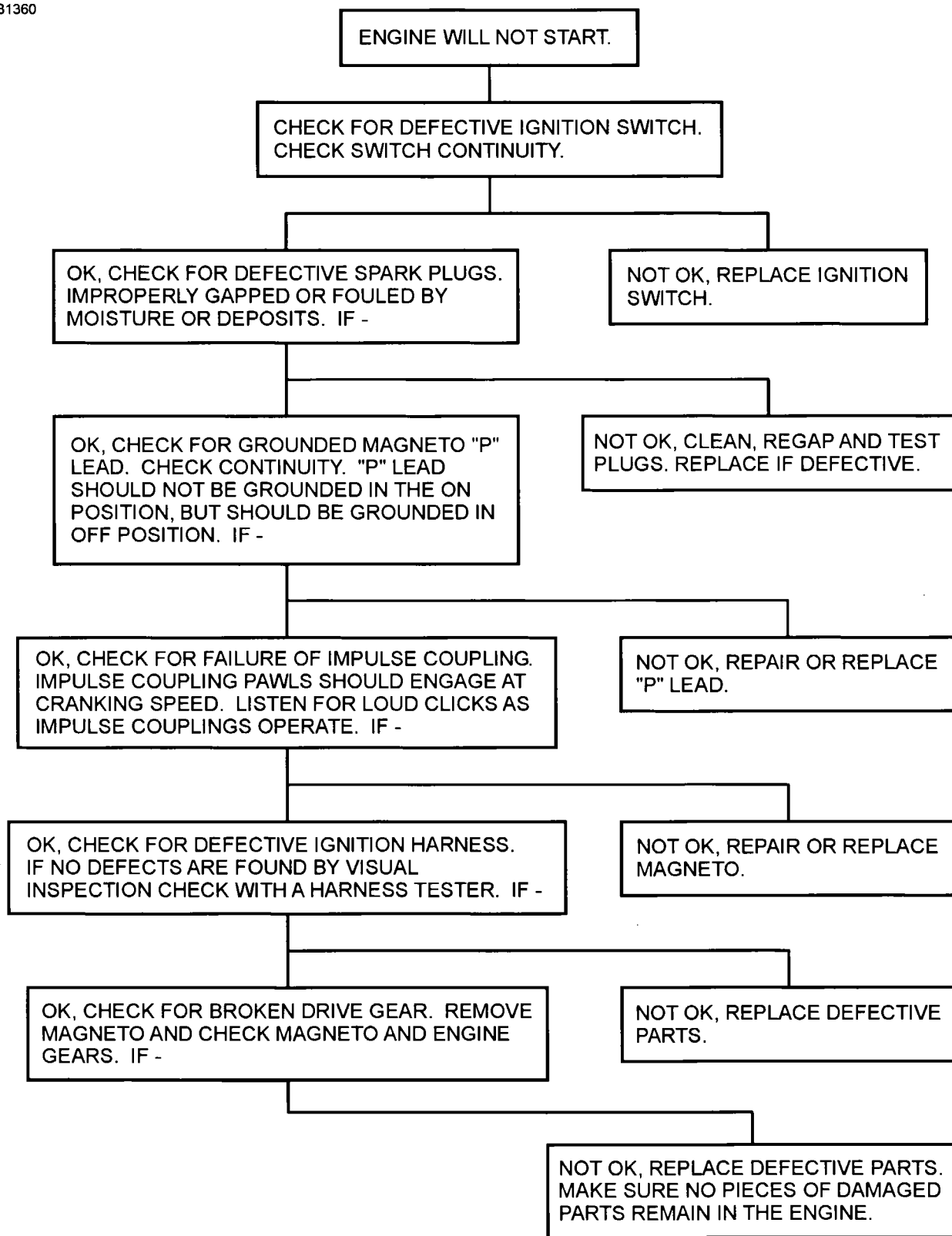
**IGNITION SYSTEM - TROUBLESHOOTING**

**1. General**

- A. The following chart has been provided to aid maintenance technicians in system troubleshooting. Refer to Figure 101. This chart should be used in conjunction with Chapter 71, Engine - Troubleshooting to provide a comprehensive look at solutions to engine problems. For information beyond the scope of this chapter, refer to applicable engine and ignition system manuals and publications listed in Introduction - List of Manufacturers Technical Publications.

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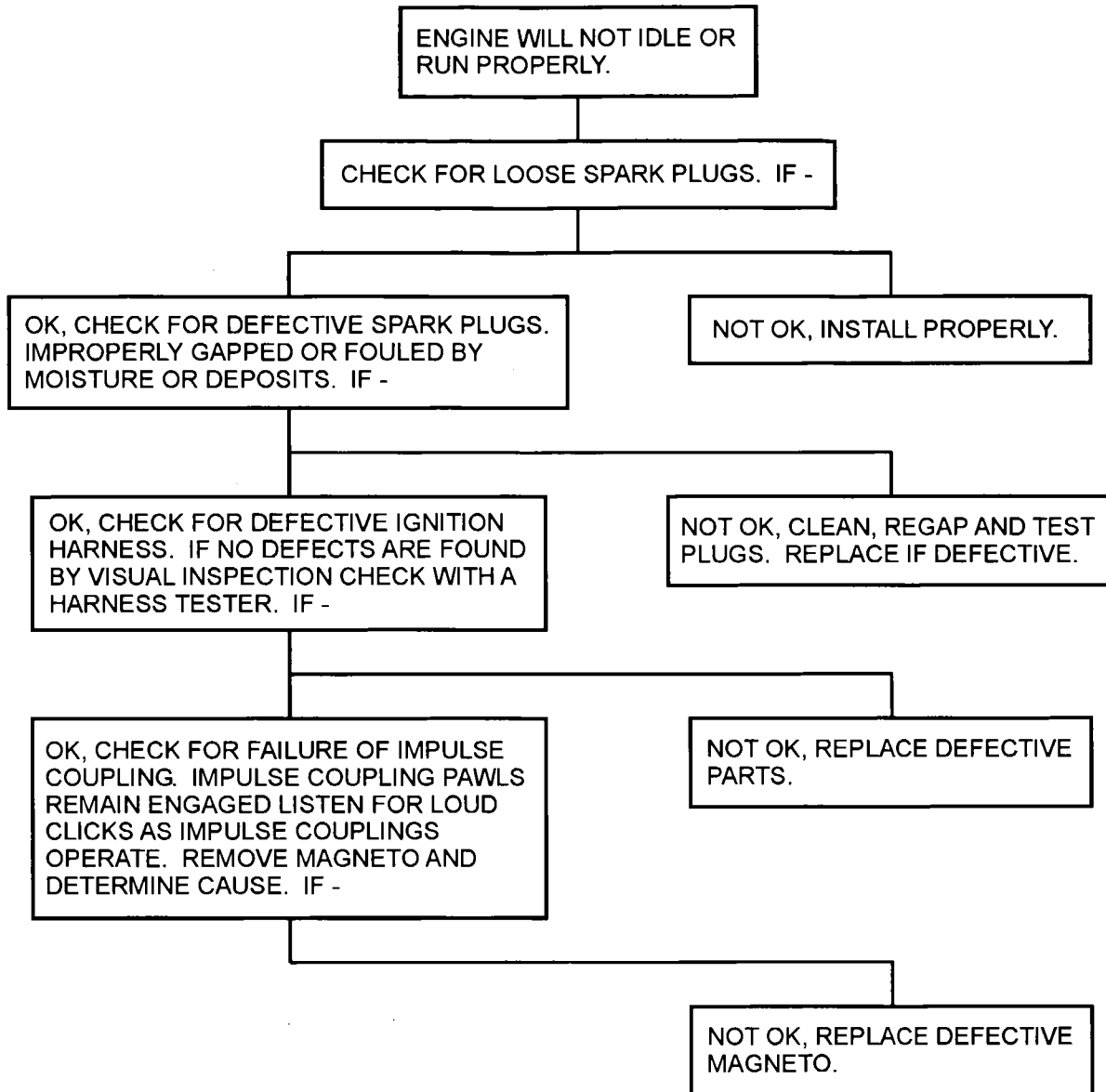
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Ignition System Troubleshooting Chart  
Figure 101 (Sheet 1)

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Ignition System Troubleshooting Chart  
Figure 101 (Sheet 2)

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**IGNITION SYSTEM - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The engine utilizes two Slick 6351 series, impulse coupled magnetos to fire dual plugs in each cylinder.
- B. For complete description, operation, troubleshooting, maintenance, overhaul and lubrication requirements of the magnetos, refer to Unison 4300/6300 Series Magneto Maintenance and Overhaul Manual.
- C. For inspection time requirements of the magnetos, refer to Chapter 5, Inspection Time Limits. For inspection procedures, refer to Unison 4300/6300 Series Magneto Maintenance and Overhaul Manual and latest revisions.

**2. Magneto Removal/Installation**

**NOTE:** The removal and installation for each magneto is typical.

- A. Remove the Magneto (Refer to Figure 201).
  - (1) Remove the engine cowl. Refer to Chapter 71, Engine Cowl - Maintenance Practices.

**WARNING: Make sure that each magneto P-lead is grounded.**

**WARNING: Before you turn the propeller, remove a minimum of one spark plug from each cylinder to prevent the start of the engine at that time.**

- (2) Remove the screws that attach the high tension outlet cover to the magneto.
- (3) Disengage the high tension cover from the magneto.
- (4) For a reference point when you install the magneto, turn the propeller in the normal direction until each impulse coupling releases near Top Dead Center (TDC) on the number one cylinder compression stroke.

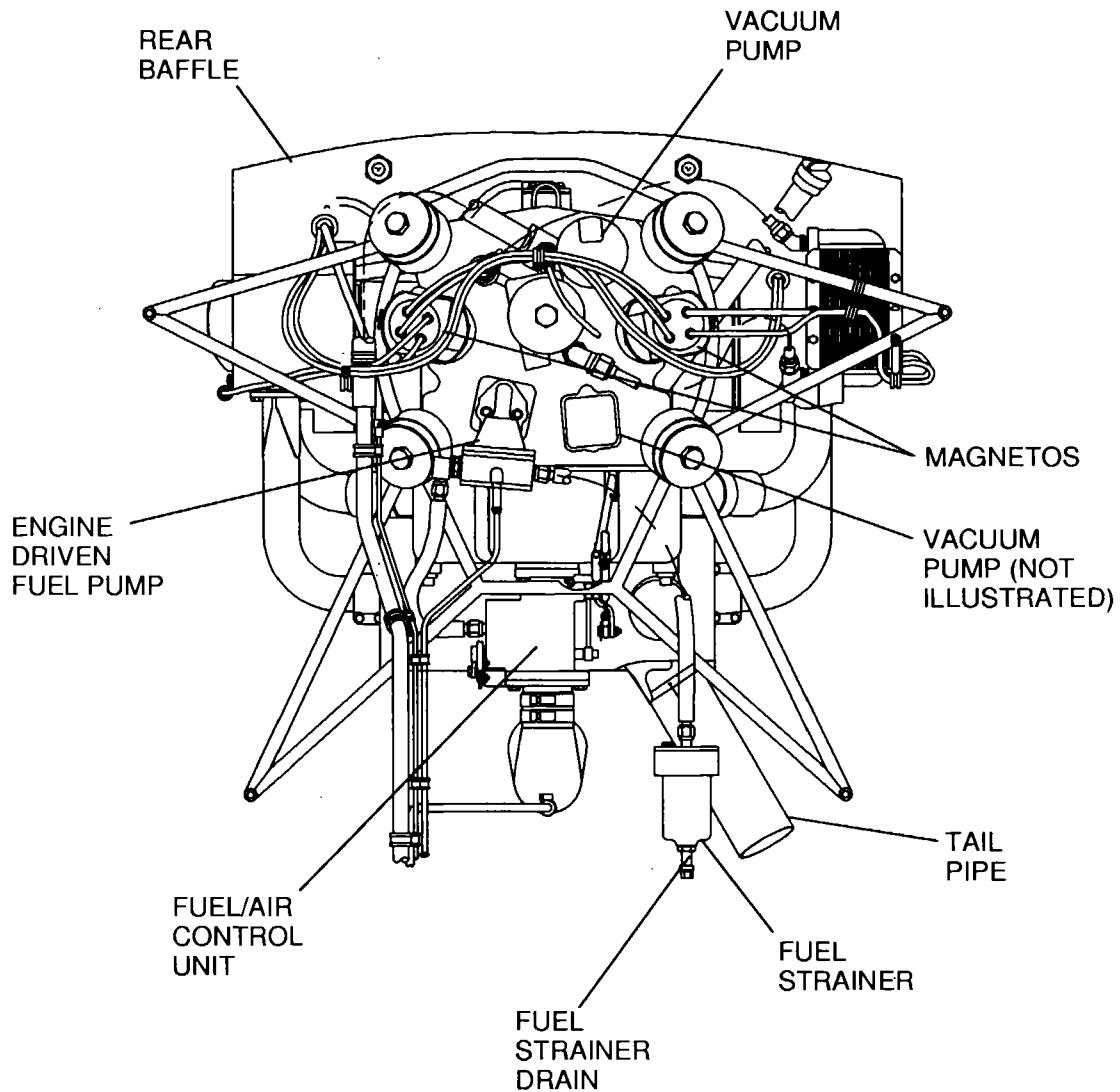
**NOTE:** You will hear a click sound from the impulse couplings when they release.

- (5) You can find the crankshaft position by the marks on the front or aft face of the starter ring gear support. Refer to the Lycoming Service Instruction 1437 or latest revision for more instructions.
  - (a) When you use the marks on the front face of the ring gear, they must be aligned with the small hole that is found at the two o'clock position on the front face of the starter housing.
  - (b) When you use the marks on the aft face of the ring gear, they must be aligned with the engine case parting line.
- (6) Turn the propeller in the opposite direction of the normal propeller operation to approximately 30 degrees BTDC (Before Top Dead Center) on the number one cylinder compression stroke.
- (7) Turn the propeller in the normal direction slowly forward until the number one cylinder compression stroke is at:
  - 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.
- (8) Disconnect the P-lead and ground wire from the magneto.
- (9) Examine the magneto angle to help make sure you put it in the same position for installation.
- (10) Remove the nuts, washers and clamps that attach the magneto to the engine housing.
- (11) Remove the magneto from the housing.

- B. Install the Magneto (Refer to Figure 201).

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Magneto Installation  
Figure 201 (Sheet 1)



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**CAUTION:** Make sure the gasket surfaces are clean to prevent oil leaks.

- (1) Apply a small quantity of silicone grease such as DC4 to each side of the new magneto base gasket, which will help future timing adjustments.
- (2) Make sure the magneto drive gear is installed correctly, the is nut torqued correctly and the cotter pin is installed. Refer to the Lycoming Service Instructions 1437 or latest revision and the Unison 4300/6300 Magneto Maintenance and Overhaul Manual Instructions.

**CAUTION:** Make sure you remove the T-118 timing pin immediately after you attach the magneto to the accessory case and before the magneto or propeller is turned.

- (3) Insert the T-118 timing pin into the L timing hole in the magneto distributor block.
- (4) Turn the magneto rotor in the opposite of normal direction until the timing pin is engaged fully into the distributor gear.
  - (a) If the magneto rotor does not move freely and the pin will not go into the hole in the gear, the pin has hit the pointer on the gear.
  - (b) Pull the pin out far enough to continue to turn the magneto freely in the opposite direction of normal movement until the pointer has passed the pin, then insert the pin.
    - 1 Turn the magneto rotor until the pin engages the gear.
- (5) Do a check of the crankshaft to make sure the propeller didn't move and is still set in position with the number one cylinder on the compression stroke at:
  - 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.
- (6) If the propeller as been turned and only one magneto was removed, it will be necessary to engage the impulse coupling on the magneto that is installed, and establish the crankshaft position. Refer to step 2.A.(4) thru 2.A.(7) before you continue.
- (7) Do the steps that follow with the number one cylinder on the compression stroke at:
  - 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.

**CAUTION:** Make sure you remove the T-118 timing pin immediately after you attach the magneto to the accessory case and before the magneto or propeller is turned.

- (a) Install the magneto with the new base gasket and the T-118 timing pin in position.
  - (b) Engage the magneto drive gear with the engine gear, in a position that will give a range of magneto timing adjustments in each direction.
  - (c) Hold the magneto in position against the accessory case and install the nuts, flat washers, clamps and new lock washers.
  - (d) Finger tighten each nut by hand.
  - (e) Remove the timing pin.
- (8) Before you continue, you must adjust the magneto timing. Refer to Magneto-to Engine External Timing Adjustment.
- (9) With the magneto set in position, first tighten each nut to 8 foot-pounds (10 N.m).
- (10) Tighten each nut from one side to another, to a torque of 17 foot-pounds (23 N.m).
- (11) Connect the P-lead to the magneto.
- (12) Attach a ground wire to the magneto.
- (13) Attach the high tension outlet cover to the magneto.
- (14) Tighten the P-lead nut to a torque of 13 to 15 inch-pounds (17 to 20 N.m).

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**CAUTION:** Make sure you remove the T-118 timing pin before the magneto or propeller is turned.

- (15) Install the spark plugs.
- (16) Install the cowl. Refer to Chapter 71, Engine Cowl - Maintenance Practices.
- (17) Complete a engine preflight operational check of the ignition system. Refer to the Pilot's Operating Handbook.

### 3. Magneto-to-Engine External Timing Adjustment

#### A. Adjust the Magneto-to-Engine Timing.

**NOTE:** The Magneto-to-Engine timing can be adjusted a maximum total of 0.125 inch (3.17 mm) movement from the original factory position, or between each internal timing adjustment. The external timing movement of 0.125 inch (3.17 mm) approximately equals 5 degrees of internal timing change.

- (1) Before the first field adjustment of external timing, the magneto and accessory case must be indexed as necessary to monitor external timing adjustments.
  - (a) The magneto must be removed and internal timing adjusted in accordance with Unison 4300/6300 Series Aircraft Magnetos Maintenance and Overhaul Instructions Form L-1363B or latest revision, when the external timing adjustments collect up to 0.125 inch (3.17 mm) movement change.
- (2) Make sure the ignition is in the OFF position.
- (3) Remove the engine cowl. Refer to Chapter 71, Engine Cowl - Maintenance Practices.
- (4) Remove a minimum of one spark plug from each cylinder.
- (5) Make sure that cylinder number one is on the compression stroke at:
  - 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.
- (6) Connect a standard aircraft magneto timing light between an acceptable engine ground and the P-lead terminal of the magneto.

**NOTE:** Most standard aircraft magneto timing lights show open points with a Light On condition and/or a signal that you can hear.

- (7) Loosen the mount clamps that attach the magneto to the accessory case so that the magneto will turn on the accessory case.
- (8) Turn the ignition switch to the BOTH position.
  - (a) Look at the magneto from the aft side of the engine.
    - 1 If the timing light is illuminated, turn the magneto frame clockwise until the timing light shuts off.
    - 2 Turn the magneto frame counter-clockwise until the timing light comes on, which shows that the contact breaker points are open.

**CAUTION:** Do not torque the nuts more than 17 foot-pounds (23 n-m.) or the mounting flange can crack.

- (9) With the magneto set in position, first tighten each nut to 8 foot-pounds (10 N.m).
- (10) Tighten each nut from one side to another, to a torque of 17 foot-pounds (23 N.m).
- (11) Complete a check of the magneto timing to make sure it has not changed. Refer to Magneto-to-Engine Timing Check.

### 4. Magneto-to-Engine Timing Check

- A. Complete a Check of the Magneto-to-Engine Timing (Refer to Figure 201).
  - (1) Make sure the ignition is in the OFF position.

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- (2) Remove the engine cowl. Refer to Chapter 71, Engine Cowl - Maintenance Practices.
- (3) Remove a minimum of one spark plug from each cylinder.
- (4) Connect a standard aircraft magneto timing light between an acceptable engine ground and the P-lead terminal of the magneto.

**NOTE:** Most standard aircraft magneto timing light indicate open points with a Light On condition and/or an signal that you can hear.

- (5) Turn the ignition switch to the BOTH position.
- (6) Turn the propeller in the normal direction of movement until each impulse coupling releases as the number one cylinder moves near TDC (Top Dead Center) on the compression stroke.

**NOTE:** You will hear a click sound from the impulse couplings when they release.

- (7) Turn the propeller in the opposite direction of normal propeller operation to approximately 30 degrees BTDC (Before Top Dead Center), then slowly forward to:
  - 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.
- (8) Slowly turn the propeller in the normal direction of movement until the timing light comes on.
- (9) Examine the crankshaft to make sure it is in the correct position.

**NOTE:** The timing light must come on with the number one cylinder on the compression stroke at:

- 182S - 23 degrees BTDC
  - 182T - 23 degrees BTDC
  - T182T (Airplanes T182008001 thru T182008664) - 20 degrees BTDC
  - T182T (Airplanes T182008665 and On) - 23 degrees BTDC.
- (10) If the crankshaft is not in the correct position you will have to make an adjustment. Refer to Magneto-to-Engine External Timing Adjustment.
  - (11) Turn the ignition switch to the OFF position.
  - (12) Install the spark plugs.
  - (13) Install the ignition leads on the spark plugs.
  - (14) Install the cowl. Refer to Chapter 71, Engine Cowl - Maintenance Practices.
  - (15) Complete a engine preflight operational check of the ignition system. Refer to the pilot's operating handbook.

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**IGNITION SWITCH - INSPECTION/CHECK**

**1. Description**

- A. The following inspection and lubrication procedures are designed for the ACS brand ignition switch and should be accomplished every 2000 hours.

**2. Tools, Equipment and Materials**

- A. Refer to Ignition System - General for a list of required tools, equipment and materials.

**3. ACS Ignition Switch Inspection and Lubrication**

**NOTE:** Refer to Figure 601 for the following steps.

**A. Switch Removal.**

- (1) Disconnect battery.
- (2) Remove switch assembly from instrument panel by loosening locknut on the forward side of panel and removing decorative nut on aft side of panel.

**NOTE:** Wiring need not be removed from posts of switch if wiring is of sufficient length to allow switch assembly to be moved to a position where disassembly can be accomplished. If wiring is to be disconnected, tag or mark wires for reinstallation.

**B. Switch Disassembly.**

- (1) Hold switch body in position shown in Figure 601.
- (2) Remove screws and washers.
- (3) Lift terminal board assembly from body, being careful not to lose springs and cups.

**C. Switch Cleaning.**

- (1) Clean switch contacts and the three movable contact cups using alcohol on a cotton tip swab.

**D. Switch Inspection.**

- (1) Inspect movable contact cups and switch contacts on the terminal board assembly for excessive wear or corrosion and for loose contacts or terminals. If the silver plating on the contact cups is worn through to the brass material, or they are burned or pitted from arcing or are corroded, they should be replaced. If the contacts on the contact block exhibit any of the above conditions or the terminals are loose, the terminal board assembly should be replaced.

**E. Switch Reassembly.**

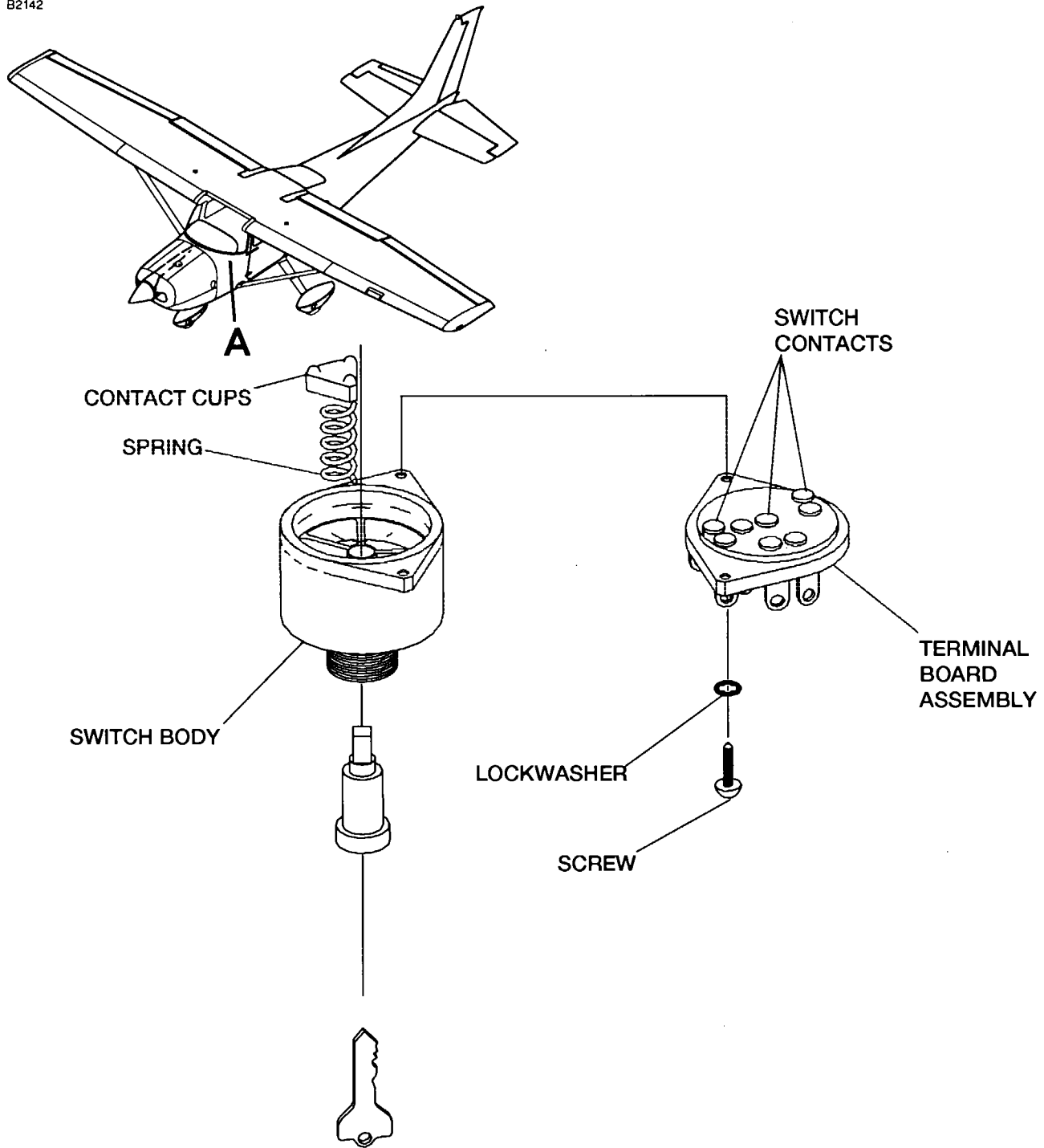
- (1) Apply a thin coating of Lubrex 10-1206 lubricant to switch contacts and the three movable contact cups. Ensure all contact areas are covered with lubricant.
- (2) Reassemble switch using new parts, if required. Ensure that cups and springs are positioned in switch body so that no binding occurs. Secure terminal board assembly to switch body with retained washers and screws.
- (3) Mark switch with a dab of red paint on the terminal board retaining screws.
- (4) If removed, reconnect wiring to backside of switch.
- (5) Install switch in panel and secure using existing hardware.
- (6) Reconnect battery and perform an operational check of the switch.

**F. Operational Check.**

- (1) Start engine. Refer to Model 182 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
- (2) Check magnetos for normal engine RPM drop.
- (3) Verify that both magnetos are grounded when switch is in the OFF position.
  - (a) Reduce engine RPM to idle, and turn switch to the OFF position. Engine should quit immediately, signifying that both magnetos have been grounded through the ignition switch.
- (4) After engine stops, move mixture control to idle cutoff position.

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**DETAIL A**

ACS Ignition Switch Inspection/Lubrication  
Figure 601 (Sheet 1)

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A0558T1004

**CHAPTER**

**76**

**ENGINE CONTROLS**

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**ENGINE CONTROLS - GENERAL**

**1. Scope**

A. This chapter describes those controls used to regulate engine power.

**2. Tools, Equipment and Materials**

**NOTE:** Equivalent substitutes may be used for the following item:

NAME	NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 700	Cortaulds Aerospace 5426 San Fernando Rd. Glendale, CA 91209	Firewall Sealing

**3. Definition**

A. This Chapter is divided into sections to aid maintenance technicians in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief description of the sections follows:

- (1) The section on throttle control describes the throttle handle, cable and linkage.
- (2) The section on fuel mixture control describes the mixture handle, cable and linkage.
- (3) Both sections include removal/installation, rigging and inspection requirements.

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**THROTTLE CONTROL - MAINTENANCE PRACTICES**

**1. General**

- A. The throttle control is a push-pull type that has a knurled friction knob, which prevents unwanted movement of the control caused by vibration. The ball bearing type rod end on the throttle is attached to the engine with an already-drilled steel AN bolt, castellated nut, and cotter pin. Make sure that you do not use Aluminum AN bolts to attach the rod end to the engine.

**NOTE:** Steel AN bolts without an already-drilled shank are identified with an "A" suffix (AN3-6A). A steel bolt of the same size, with the shank drilled for castellated nut and cotter pin, is identified as AN3-6. Aluminum AN bolts are not used to attach the rod end to the engine.

- B. When you adjust the throttle control, make sure that the throttle control slides smoothly through the full range of travel, that it locks tightly with the friction lock, and that the throttle arm operates through its full range of travel. Do not lubricate the throttle control. If the throttle control does not move freely, replace it.
- C. When you disconnect the engine controls, make sure that you monitor the exact position, size, and number of parts used. Then you can connect the engine controls correctly.

**2. Throttle Control Removal/Installation**

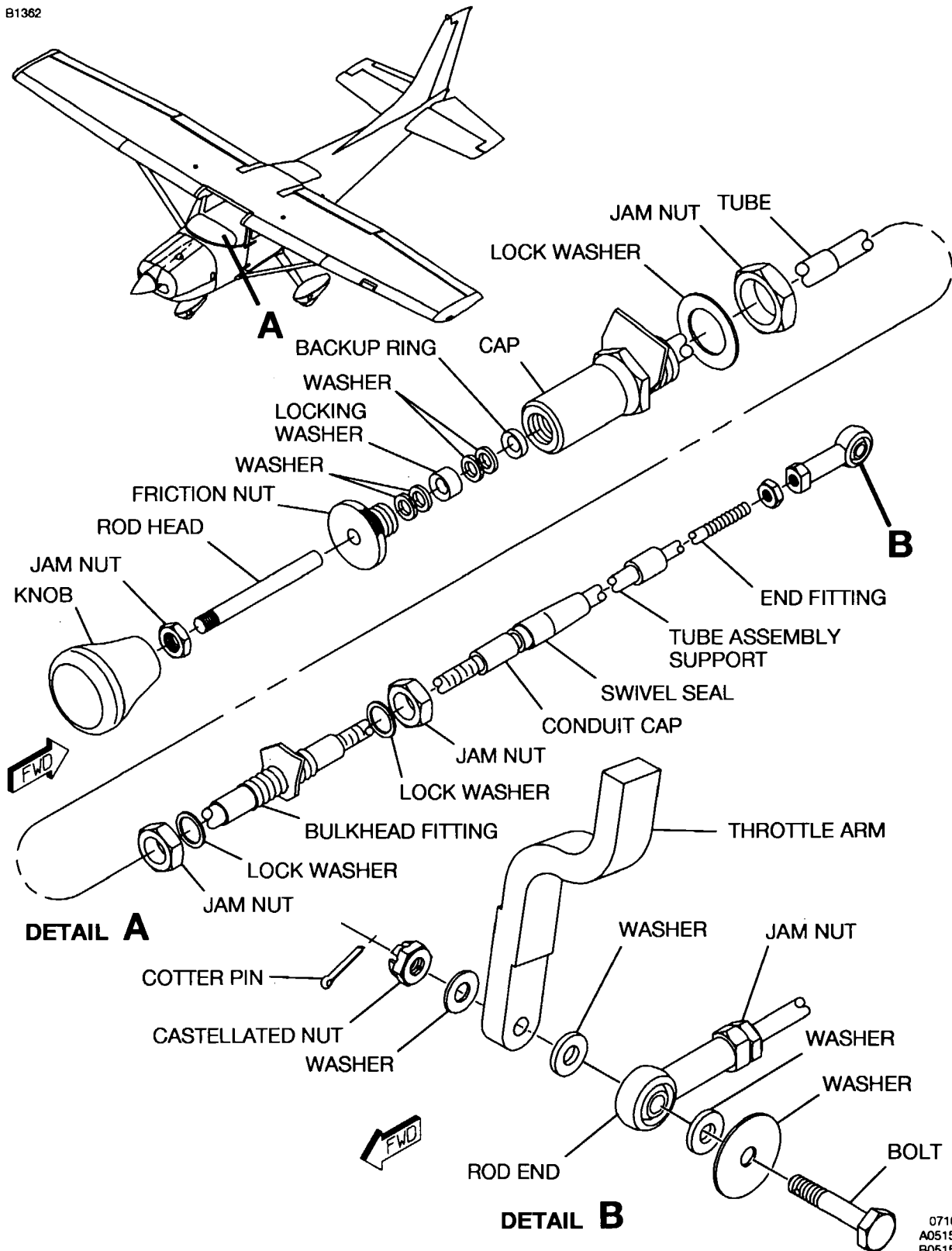
- A. Throttle Control Removal (Refer to Figure 201).
- (1) Remove the engine cowl. Refer to Chapter 71, Cowling - Removal/Installation.
  - (2) Remove the cotter pin, castellated nut, bolt, and washers that attach the throttle control rod end to the fuel/air control unit throttle arm. Discard the cotter pin.
  - (3) Remove the rod end and the jam nut from the throttle control.
  - (4) Remove the clamp that attaches the throttle control to the engine mount.
  - (5) Remove the throttle control jam nut and the lock washer from the forward side of the firewall.
  - (6) In the cockpit, loosen the throttle control jam nuts and the lock washers from the forward side of the instrument panel and the aft side of the firewall.
  - (7) Carefully pull the throttle control through the firewall and the instrument panel as you remove the lock washers and the jam nuts, and remove it from the airplane.
- B. Throttle Control Installation (Refer to Figure 201).
- (1) In the cockpit, carefully pull the throttle control through the instrument panel and then place the lock washers and the jam nuts over the throttle control.
  - (2) Pull the throttle control through the firewall and position the throttle control in the instrument panel.
  - (3) Attach the throttle control to the instrument panel with the jam nut and the lock washer at the instrument panel.
  - (4) Position the lock washer and the lock nut on the throttle control on the aft side of the firewall.
  - (5) In the engine compartment, put the lock washer and the jam nut over the throttle control and attach it to the firewall.
  - (6) Install the jam nut and the rod end on the throttle control.
  - (7) Attach the throttle control rod end to the fuel/air control unit throttle arm with the bolt, washers, castellated nut, and new cotter pin.
  - (8) Attach the throttle control to the engine mount with the clamp.
  - (9) Make sure that the routing of the throttle control is the same as when you removed it.
  - (10) Make sure that the throttle control moves freely.
  - (11) Make sure that no preload occurs from an incorrectly-small bend radius.
  - (12) Adjust the throttle control as necessary. Refer to Throttle Control Adjustment/Test.
  - (13) Install the engine cowl. Refer to Chapter 71, Cowling - Removal/Installation.

**3. Throttle Control Adjustment/Test**

- A. Throttle Control Check (Refer to Figure 201).
- (1) Pull the throttle control knob full out and make sure that the idle stop on the throttle body makes contact.

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 A0515C1006  
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Throttle Control Installation  
 Figure 201 (Sheet 1)

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- (2) Push the throttle control knob full in and check that the full power stop on the throttle body makes contact.
- (3) Do a check to make sure that the throttle has no less than 0.125-inch (3.18 mm) and no more than 0.25-inch (6.35 mm) cushion at each stop.
- (4) Work the throttle control in and out until you can make sure that it moves freely.

**B. Throttle Control Adjustment (Refer to Figure 201).**

- (1) Disconnect the throttle control rod end from the throttle arm.
- (2) Loosen the jam nut and adjust the throttle control rod end to get the necessary adjustment.
- (3) Tighten the jam nut.
- (4) Connect the throttle control rod end to the throttle arm. Torque the nut to 30 inch pounds and then continue to tighten the nut until the cotter pin hole aligns with the castellations in the nut. Do not torque the nut to more than 50 inch pounds.
- (5) Install the cotter pin.

**4. Throttle Control Inspection/Check**

**A. Throttle Control Inspection**

- (1) Do a check of the throttle control attachment to the throttle body. Make sure that the bolt, castellated nut, cotter pin, rod end, and rod end jam nut are correctly attached and in good condition.
- (2) Do a check of the rod end witness hole for proper rod end engagement with the throttle control.
- (3) Make sure that the throttle control moves smoothly through the full range of travel.
- (4) Make sure that the throttle control locks correctly and tightly with the friction lock.
- (5) Make sure that the throttle arm operates correctly through the full range of travel.

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**FUEL MIXTURE CONTROL - MAINTENANCE PRACTICES**

**1. General**

- A. The mixture control is a push-pull type that has a knurled friction knob, which prevents unwanted movement of the control caused by vibration. The ball bearing type rod end on the throttle is attached to the engine with an already-drilled steel AN bolt, castellated nut, and cotter pin. Make sure that you do not use Aluminum AN bolts to attach the rod end to the engine.

**NOTE:** Steel AN bolts with an undrilled shank are identified with an 'A' suffix (AN3-6A). A steel bolt of the same size, with the shank drilled for castellated nut and cotter pin is identified as AN3-6. Aluminum bolts and undrilled bolts must not be used in this application.

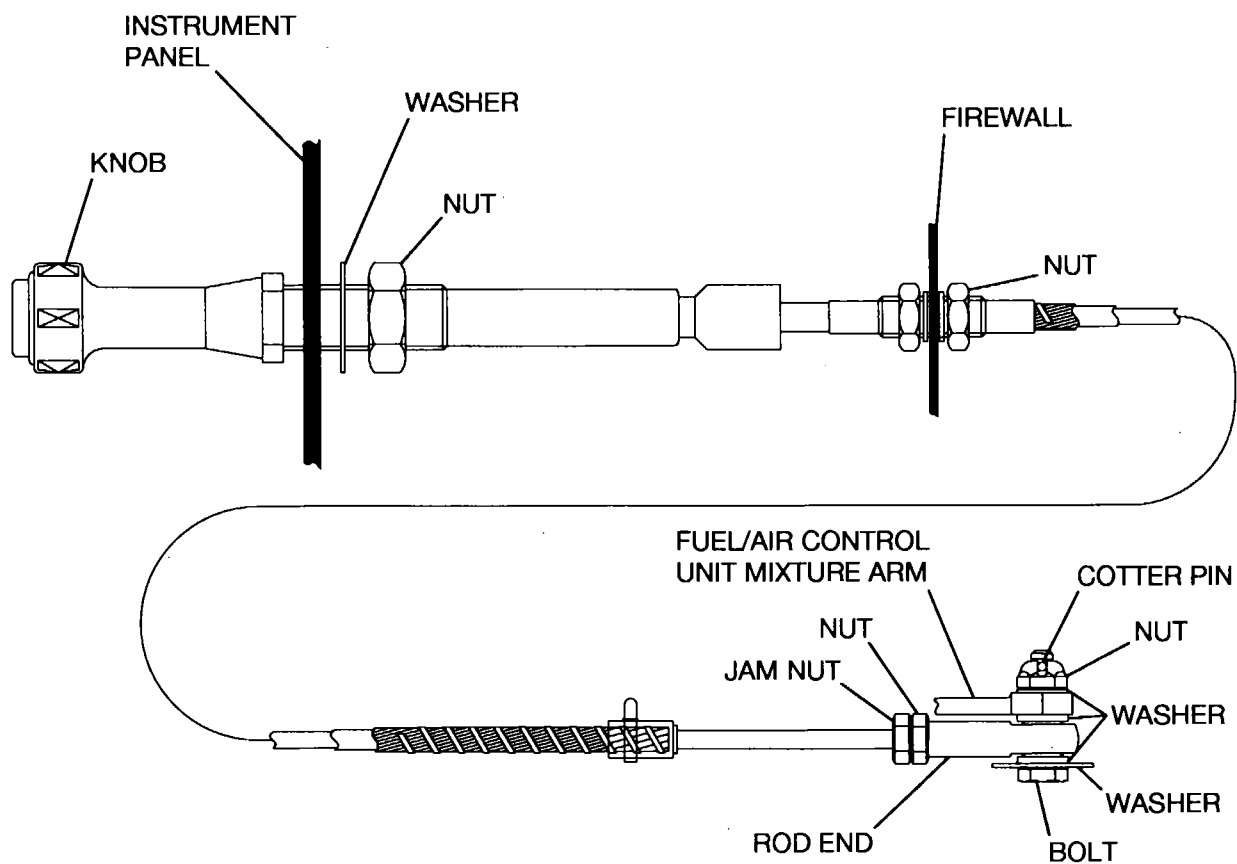
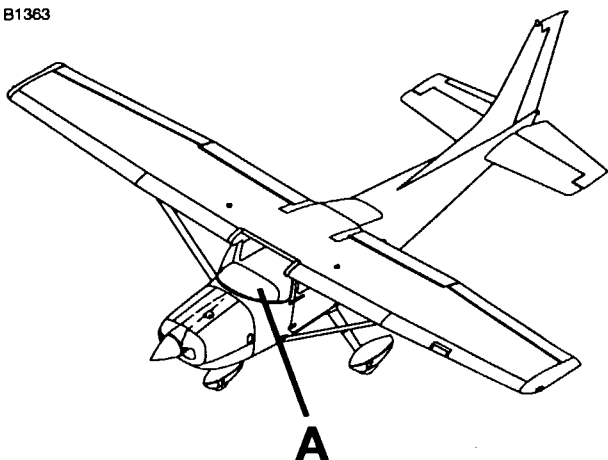
- B. When you adjust the fuel mixture control, make sure that the fuel mixture control slides smoothly throughout the full range of travel, that it adjusts through the full vernier range, and that the mixture arm operates through the full range of travel. Do not lubricate the fuel mixture control. If the fuel mixture control does not move freely, replace it.
- C. When you disconnect the engine controls, make sure that you monitor the exact position, size, and number of parts used. Then you can connect the engine controls correctly.

**2. Fuel Mixture Control Removal/Installation**

- A. Fuel Mixture Control Removal (Refer to Figure 201).
- (1) Remove the engine cowl. Refer to Chapter 71, Cowling - Removal/Installation.
  - (2) Remove the cotter pin, nut, bolt, and washers that attach the mixture control rod end to the fuel/air control unit mixture arm. Discard the cotter pin.
  - (3) Remove the rod end, nut, and jam nut from the fuel mixture control.
  - (4) Remove the clamp that attaches the fuel mixture control to the mixture control bracket.
  - (5) Remove the fuel mixture control nut and the washer from the forward side of the firewall.
  - (6) In the cockpit, remove the fuel mixture control nuts and the washers from the forward side of the instrument panel and the aft side of the firewall.
  - (7) Carefully pull the fuel mixture control through the firewall and the instrument panel nuts and washers, and remove it from the airplane.
- B. Fuel Mixture Control Installation (Refer to Figure 201).
- (1) In the cockpit, carefully pull the fuel mixture control through the instrument panel, and then place the washers and the nuts over the fuel mixture control.
  - (2) Pull the fuel mixture control through the firewall.
  - (3) Tighten the nut against the washer at the instrument panel to attach the fuel mixture control to the instrument panel.
  - (4) Position the washer and the nut on the fuel mixture control on the aft side of the firewall.
  - (5) In the engine compartment, put the washer and the nut over the fuel mixture and attach it to the firewall.
  - (6) Install the jam nut, nut, and rod end on the fuel mixture control and tighten.
  - (7) Attach the mixture control rod end to the fuel/air control unit mixture arm with the bolt, washers, and nut.
  - (8) Torque the nut to 30 inch pounds and then continue to tighten the nut until the cotter pin hole aligns with the castellations in the nut. Do not torque the nut to more than 50 inch pounds.
  - (9) Install the cotter pin.
  - (10) Attach the fuel mixture control to the mixture control bracket with the clamp.
  - (11) Make sure that the routing of the fuel mixture control is the same as when you removed it.
  - (12) Make sure that the throttle control moves freely.
  - (13) Make sure that no preload occurs from an incorrectly small bend radius.
  - (14) Adjust the mixture control as necessary. Refer to Fuel Mixture Control Adjustment/Test.
  - (15) Install the engine cowl. Refer to Chapter 71, Cowling - Removal/Installation.

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**DETAIL A**

Fuel Mixture Control  
 Figure 201 (Sheet 1)

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**3. Fuel Mixture Control Adjustment/Test**

**A. Fuel Mixture Control Check.**

- (1) Push the fuel mixture control full in and make sure that the mixture arm on the fuel/air control unit is fully open (rich).
- (2) Pull the fuel mixture control full out and make sure that the mixture arm on the fuel/air control unit is fully closed (lean).
- (3) Do a check to make sure that the fuel mixture control has no less than 0.125-inch (3.18 mm) and no more than 0.25-inch (6.35 mm) cushion at each stop.
- (4) Work the fuel mixture control in and out until you can make sure that it moves freely.

**B. Fuel Mixture Control Adjustment**

- (1) Disconnect the fuel mixture control rod end from the fuel/air control unit.
- (2) Loosen jam nut and adjust rod end to obtain desired setting. The witness hole in the rod end must be covered with the mixture cable threads.
- (3) Tighten the jam nut.
- (4) Connect rod end to throttle body. If necessary, you can reposition the mixture control housing in the mixture control bracket clamp.
  - (a) Torque the nut to 30 inch pounds and then continue to tighten the nut until the cotter pin hole aligns with the castellations in the nut.
  - (b) Do not torque the nut to more than 50 inch pounds.
- (5) Install the cotter pin.

**4. Fuel Mixture Control Inspection/Check**

**A. Fuel Mixture Control Inspection**

- (1) Do a check of the fuel mixture control attachment to the throttle body. Make sure that the bolt, castellated nut, cotter pin, and rod end are correctly attached and in good condition. The witness hole in the rod end must be covered with the mixture cable threads.
- (2) Make sure that the fuel mixture control moves smoothly through the full range of travel.
- (3) Make sure that the fuel mixture arm operates correctly through the full range of travel.
- (4) Make sure that the fuel mixture control adjusts through the full vernier range.



**CHAPTER**

**77**

**ENGINE INDICATING**

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**ENGINE INDICATING - GENERAL**

**1. Scope**

- A. This chapter tells how the components are used to measure and show engine output.

**2. Definition**

- A. The sections divided in this chapter help the maintenance technicians to find information. Refer the Table of Contents to further help locate the applicable subject.
- (1) The section about the tachometer tells how the engine RPM is measured.
  - (2) The section on the engine temperature system tells how the engine temperature is monitored and measured.

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**TACHOMETER - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. On airplanes with standard avionics, the engine speed (RPM) is measured by an indicator found in the cockpit. The tachometer maintenance practices give removal and installation procedures for the tachometer and drive cable.
- B. On airplanes with Garmin G1000, the engine speed (RPM) is measured by the tachometer sending unit and changed to an electrical signal. The Garmin Control Display Units (CDU) display the engine speed. The tachometer maintenance practices give removal and installation procedures for the tachometer sending unit.

**2. Tachometer and Drive Cable Removal/Installation**

**NOTE:** Airplanes without Garmin G1000 have a tachometer and drive cable.

- A. Remove Tachometer and Drive Cable (Refer to Figure 201).
  - (1) On backside of instrument panel, disconnect drive cable from tachometer.
  - (2) Disconnect electrical connector (J1014) from backside of tachometer.
  - (3) Remove screws securing tachometer to instrument panel and remove tachometer.
  - (4) Remove upper engine cowl. Refer to Chapter 71, Engine Cowling - Maintenance Practices.
  - (5) Disconnect drive cable at rear of accessory case.
  - (6) Remove two screws securing firewall shield to firewall.
  - (7) Withdraw drive cable through firewall.
- B. Install Tachometer and Drive Cable (Refer to Figure 201).
  - (1) Install drive cable through firewall.
  - (2) Connect drive cable to accessory case housing.
  - (3) Install firewall shield to firewall using screws.
  - (4) Install tachometer to instrument panel using four screws.
  - (5) Connect electrical connector (J1014) to tachometer.
  - (6) Connect drive cable to backside of tachometer.
  - (7) Reinstall upper engine cowl. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

**3. Tachometer Sending Unit Removal/Installation**

**NOTE:** Airplanes with Garmin G1000 have a tachometer sending unit.

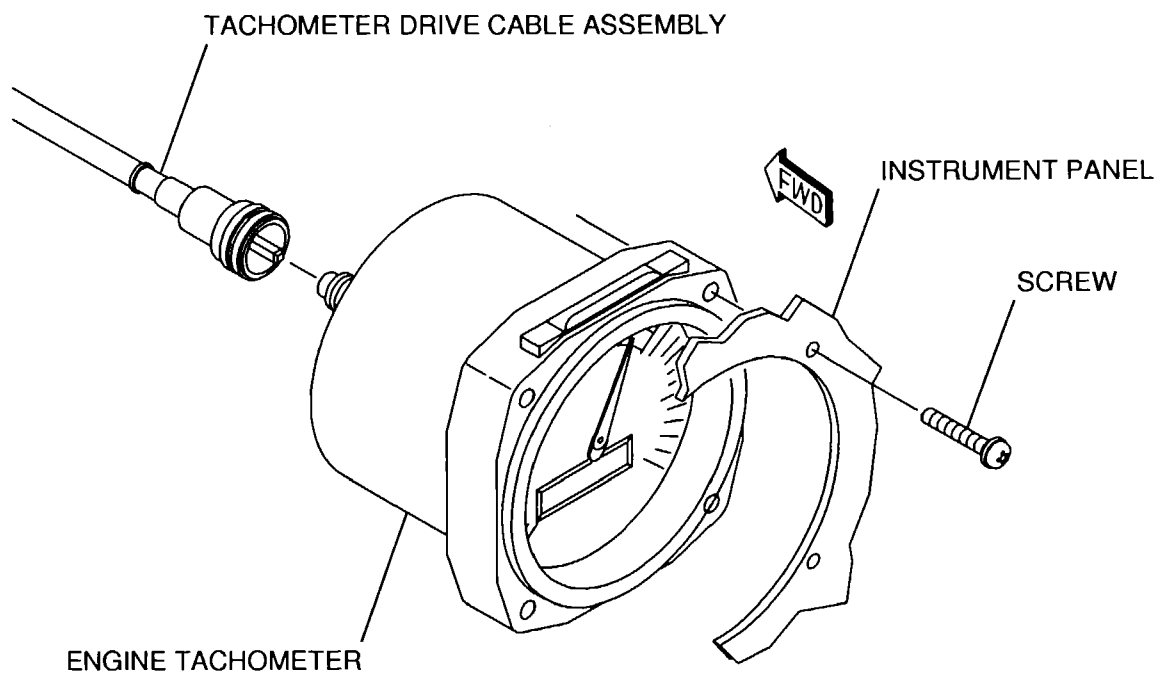
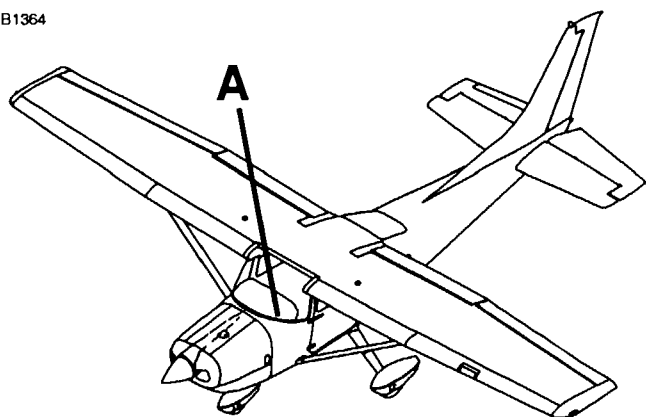
- A. Remove the Tachometer Sending Unit (Refer to Figure 202).
  - (1) Make sure the MASTER switch is in the off position.
  - (2) Remove the top cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (3) Disconnect the electrical connector (PN025).
  - (4) Loosen the knurled nut.
  - (5) Remove the tachometer sending unit from the airplane.
- B. Install the Tachometer Sending Unit (Refer to Figure 202).
  - (1) Put the tachometer sending unit in position on the airplane.
  - (2) Tighten the knurled nut.
  - (3) Connect the electrical connector (PN025).

**NOTE:** If irregular tachometer indications have occurred, the use of Stabilant 22 contact enhancer on the electrical connector (PN025) can possibly decrease the occurrence of these indications.

- (4) Install the side cowl. Refer to Chapter 71, Cowl - Maintenance Practices.

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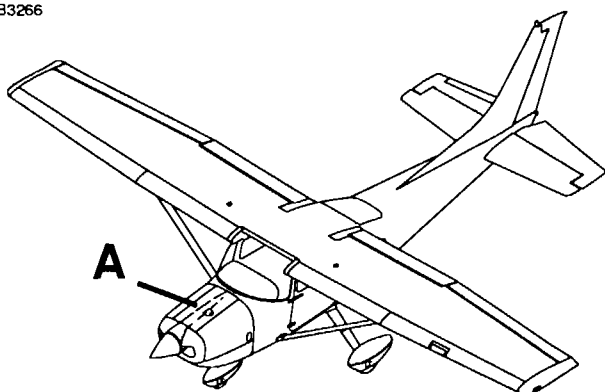
**DETAIL A**

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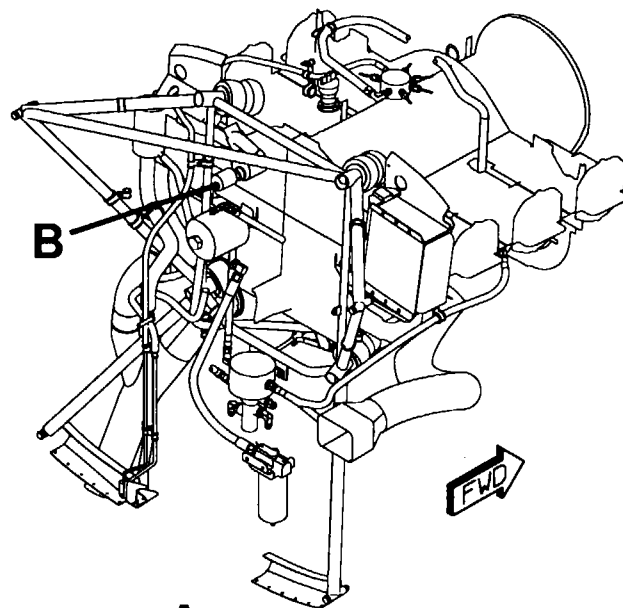
Tachometer Installation  
Figure 201 (Sheet 1)

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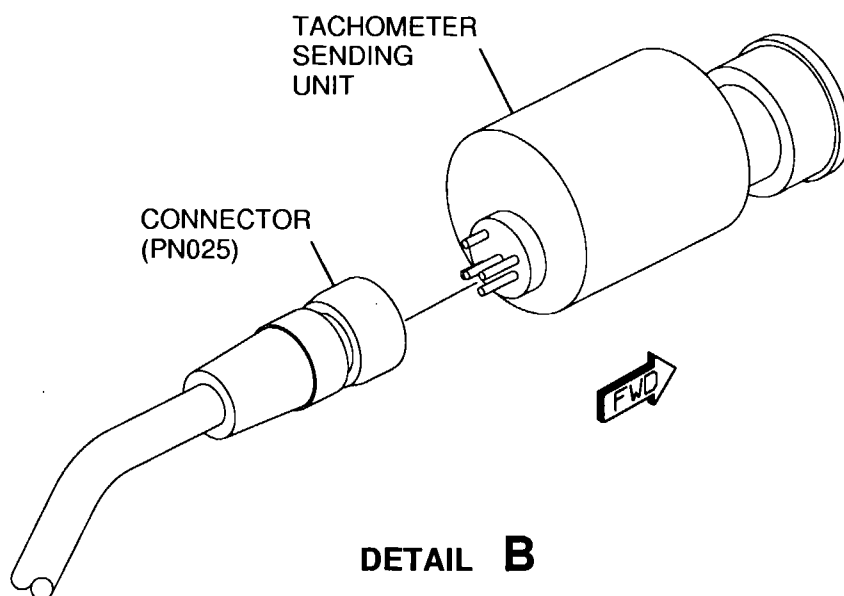
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**NOTE:** NON-TURBO AIRPLANE SHOWN,  
TURBO AIRPLANE SIMILAR



**DETAIL A**



**DETAIL B**

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A0758T1002  
B0758T1003

Tachometer Sending Unit Installation  
Figure 202 (Sheet 1)



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**ENGINE TEMPERATURE - DESCRIPTION AND OPERATION**

**1. Description**

- A. The section that follows has removal and installation procedures for the system which will show different temperatures in the engine. The system that shows the temperature for the engine includes the indicators and probes for the Cylinder Head Temperature (CHT), Exhaust Gas Temperature (EGT) for the non-turbo airplanes, and the Turbine Inlet Temperature (TIT) for airplanes with a turbo engine.

**2. Operation**

- A. Non-Turbocharged Airplanes.
- (1) On the non-turbocharged airplanes, the EGT system is used to measure the temperature of the exhaust gas. The measurement gives an indication of the fuel/air mixture for the pilot. The system has one indicator installed in the instrument panel, which gives the two functions that show the EGT and CHT information. A probe installed in the exhaust and a probe installed in a cylinder, send the temperature information to the TIT/CHT indicator. On airplanes with Garmin G1000, each cylinder has EGT and CHT probes.
- B. Turbocharged Airplanes.
- (1) On turbocharged airplanes, the TIT system is used to measure temperature of the exhaust gas as it enters the turbine. The measurement gives an indication of the fuel/air mixture for the pilot. The system has one indicator installed in the instrument panel, which gives two functions that show the TIT and CHT information. A probe installed in the turbine inlet and a probe installed in a cylinder, send the temperature information to the TIT/CHT indicator. On airplanes with Garmin G1000, each cylinder has EGT and CHT probes.

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**ENGINE TEMPERATURE INDICATING SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. Maintenance of the engine temperature system includes the removal and installation of the different components.

**2. EGT/CHT Indicator Removal/Installation**

**NOTE:** The procedures that follow are for airplanes without Garmin G1000.

- A. Remove the EGT/CHT Indicator (Refer to Figure 201).
- (1) Set the ALT/BAT MASTER switch to the off position.
  - (2) Remove the outboard pilot panel. Refer to Chapter 31, Instrument And Control Panels - Maintenance Practices.
  - (3) Disconnect the plug connector (JI017) from the rear of the indicator.
  - (4) Remove the indicator from the instrument panel.
- B. Install the EGT/CHT Indicator (Refer to Figure 201).
- (1) Install the indicator in the instrument panel.
  - (2) Connect the plug connector (JI017) to the rear of the indicator.
  - (3) Install the outboard pilot panel. Refer to Chapter 31, Instrument And Control Panels - Maintenance Practices.
  - (4) Set the ALT/BAT MASTER switch to the ON position.
  - (5) Make sure the EGT/CHT Indicator light operates correctly.

**3. TIT/CHT Indicator Removal/Installation**

**NOTE:** The procedures that follow are for airplanes without Garmin G1000.

- A. Remove the TIT/CHT Indicator (Refer to Figure 201).
- (1) Set the ALT/BAT MASTER switch to the off position.
  - (2) Remove the outboard pilot panel. Refer to Chapter 31, Instrument And Control Panels - Maintenance Practices.
  - (3) Disconnect the plug connector (JI018) from the rear of the indicator.
  - (4) Remove the indicator from the instrument panel.
- B. Install the TIT/CHT Indicator (Refer to Figure 201).
- (1) Install the indicator in the instrument panel.
  - (2) Connect the plug connector (JI018) to the rear of the indicator.
  - (3) Install the outboard pilot panel. Refer to Chapter 31, Instrument And Control Panels - Maintenance Practices.
  - (4) Set the ALT/BAT MASTER switch to the ON position.
  - (5) Make sure the TIT/CHT Indicator light operates correctly.

**4. EGT Probe Removal/Installation**

- A. Remove The EGT Probe (Refer to Figure 202 or Figure 203).

**NOTE:** The EGT probe is welded to the clamp.

**NOTE:** Airplanes with the Garmin G1000 have an EGT probe at each cylinder. Removal and installation of the EGT probes are typical.

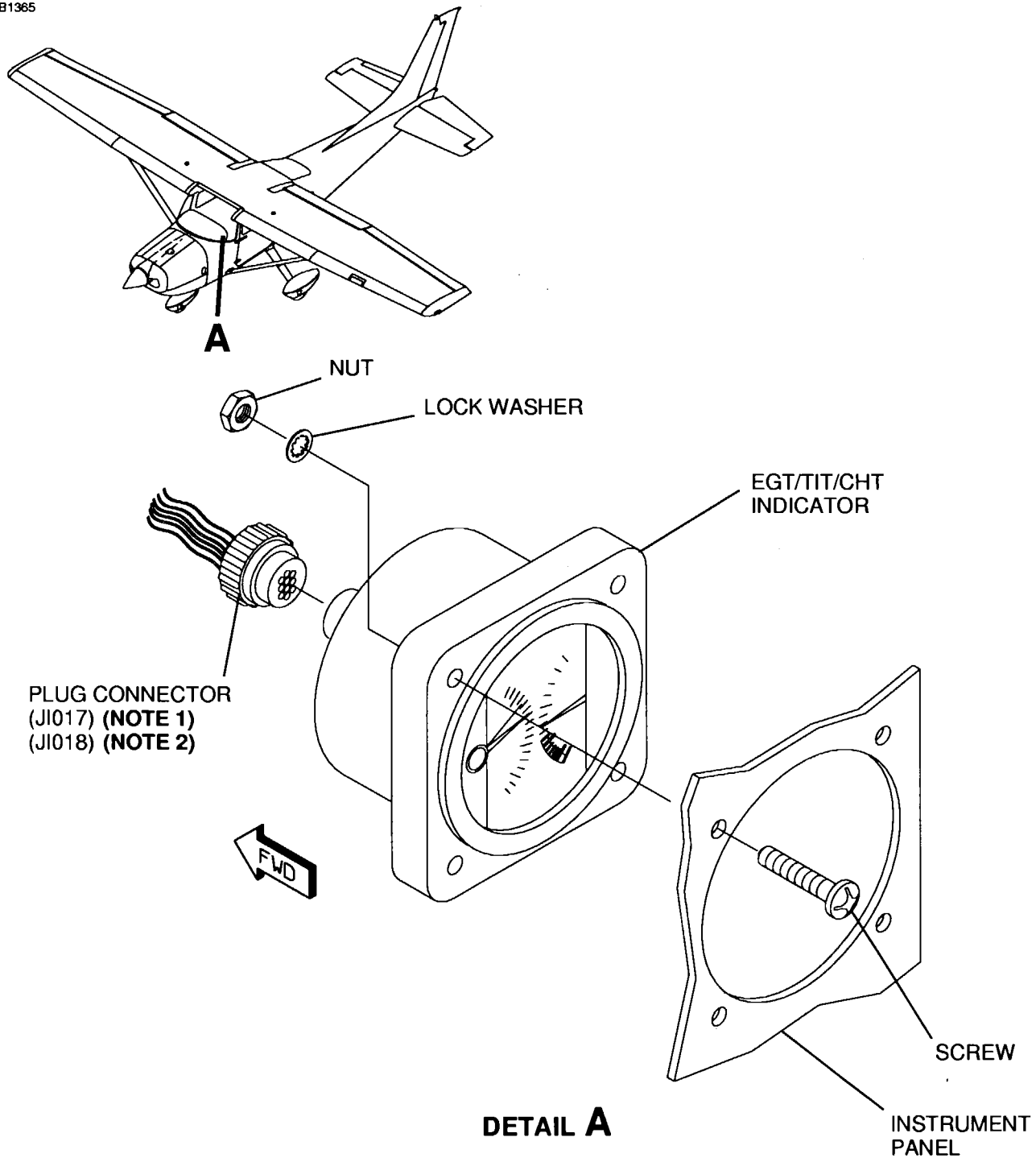
- (1) Remove the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

**CAUTION:** Make sure the exhaust system and engine are cool before the probes are removed.

- (2) Disconnect the electrical connectors.

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**NOTE 1:** FOR AIRPLANES 18280001 AND ON

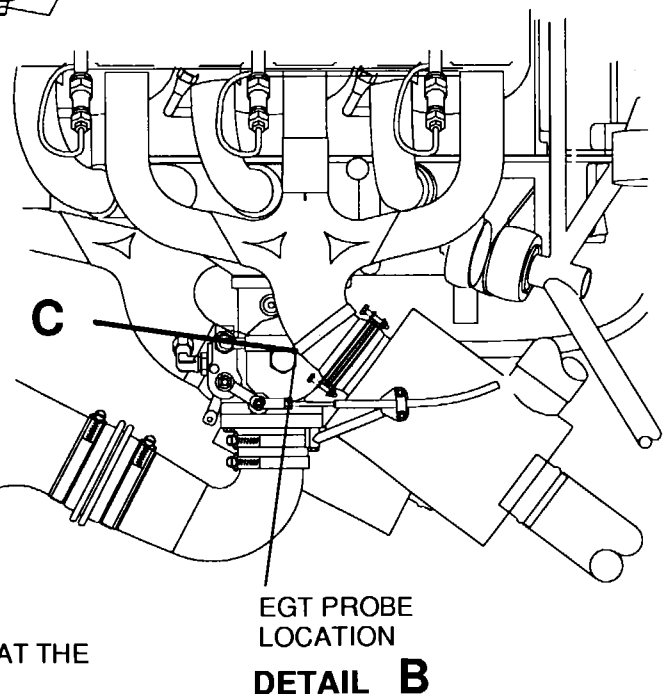
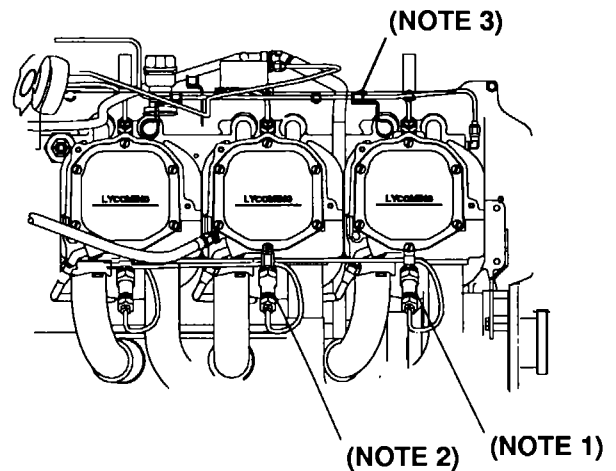
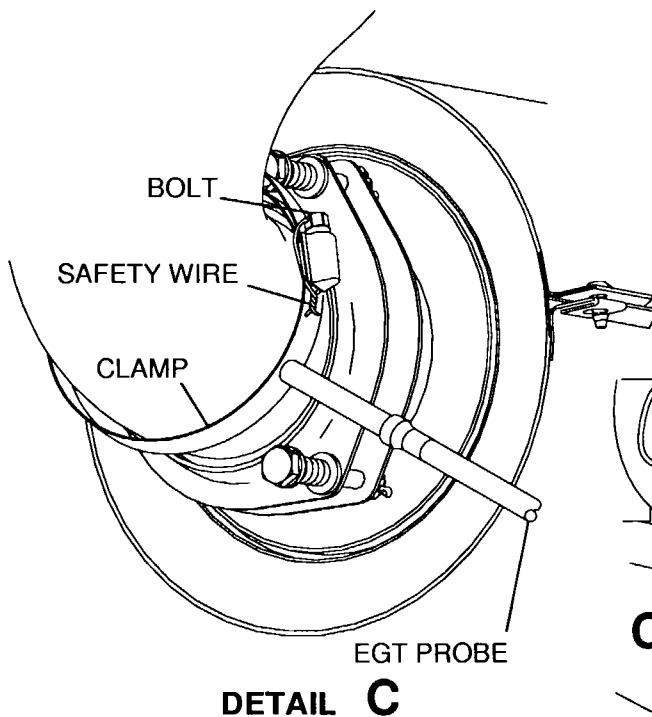
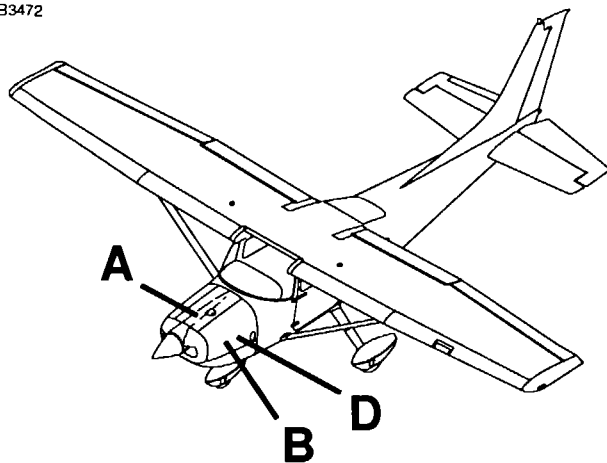
**NOTE 2:** FOR TURBO AIRPLANES T18208001 AND ON

EGT/TIT/CHT Indicator Removal/Installation  
Figure 201 (Sheet 1)

0710T1001  
A0718T1041

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**NOTE 1:** MODEL 182S AIRPLANES 18280001 THRU 18280944 CHT PROBE LOCATION IS AT THE NUMBER 1 CYLINDER

**NOTE 2:** MODEL 182T AIRPLANES 18280945 AND ON CHT PROBE LOCATION IS AT THE NUMBER 3 CYLINDER

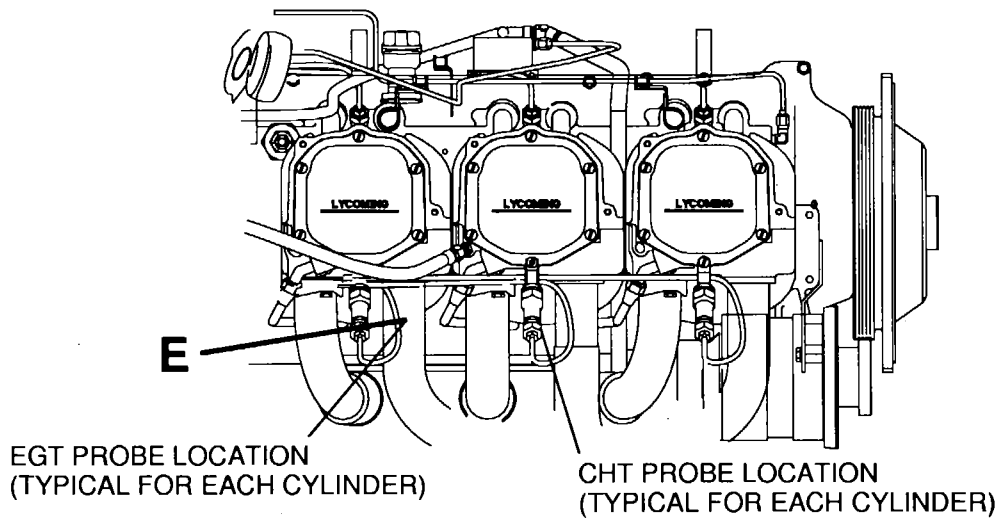
**NOTE 3:** MODEL T182 CHT PROBE LOCATION IS AT THE NUMBER 4 CYLINDER

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 A0755T1013  
 B0755T1017  
 C0755T1001

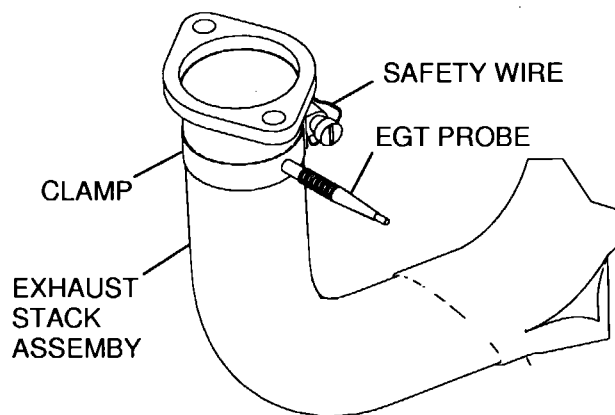
EGT/CHT Probe Location (182S)  
 Figure 202 (Sheet 1)

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**DETAIL A**  
AIRPLANES WITH GARMIN G1000



**DETAIL E**

EGT/CHT Probe Location (182T)  
Figure 203 (Sheet 1)

A0755T1013  
E0755T1001

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- (3) Cut and remove the safety wire from the EGT probe clamp and screw.
- (4) Loosen the clamp screw.
- (5) Remove the clamp with the attached probe from the exhaust pipe.

B. Install the EGT Probe (Refer to Figure 202 or Figure 203).

- (1) Attach the clamp with the EGT probe to the exhaust pipe.
- (2) Tighten the screw for the clamp
- (3) Attach safety wire to the EGT probe clamp and screw.
- (4) Connect the electrical connectors.
- (5) Attach the connectors together with a tie strap.
- (6) Install the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.
- (7) Make sure the EGT operates correctly. Refer to the Pilot's Operating Handbook.

**5. TIT Probe Removal/Installation**

A. Remove the TIT Probe (Refer to Figure 204).

- (1) Remove the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

**CAUTION:** Make sure the exhaust system and engine are cool before the probes are removed.

- (2) Disconnect the electrical connectors.
- (3) Remove the TIT probe from the turbine inlet.

B. Install the TIT Probe (Refer to Figure 204).

- (1) Install the TIT probe to the turbine inlet.
- (2) Connect the electrical connectors.
- (3) Attach the connectors together with a tie strap.
- (4) Install the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.
- (5) Make sure the TIT operates correctly. Refer to the Pilot's Operating Handbook.

**6. CHT Probe Removal/Installation**

**NOTE:** The CHT probes use a bayonet style connector.

A. Remove the CHT Probe (Refer to Figure 202 or Figure 203).

**NOTE:** Airplanes with the Garmin G1000 have a CHT probe at each cylinder. Removal and installation of the CHT probes is typical.

- (1) Remove the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

**CAUTION:** Make sure the exhaust system and engine are cool before the probes are removed.

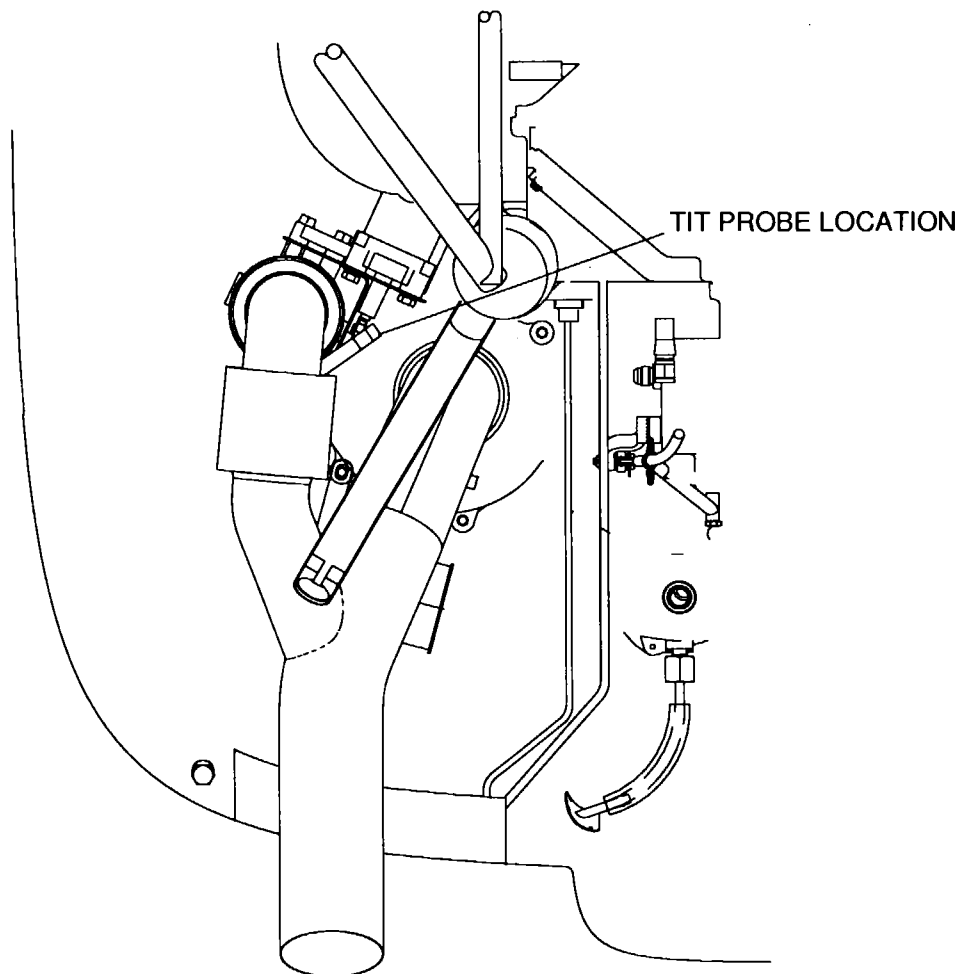
- (2) Remove the terminal nut.
- (3) Disconnect the terminal from the CHT probe.
- (4) Turn the CHT probe to remove from the cylinder head.

B. Install the CHT Probe (Refer to Figure 202 or Figure 203).

- (1) Install the CHT probe into the cylinder head.
- (2) Connect the terminal on the CHT probe.
- (3) Install the terminal nut.
- (4) Install the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.
- (5) Make sure the CHT operates correctly. Refer to the Pilot's Operating Handbook.

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**DETAIL D**  
T182 AIRPLANES

TIT/CHT Probe Location (T182)  
Figure 204 (Sheet 1)

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**MANIFOLD PRESSURE TRANSDUCER - MAINTENANCE PRACTICES**

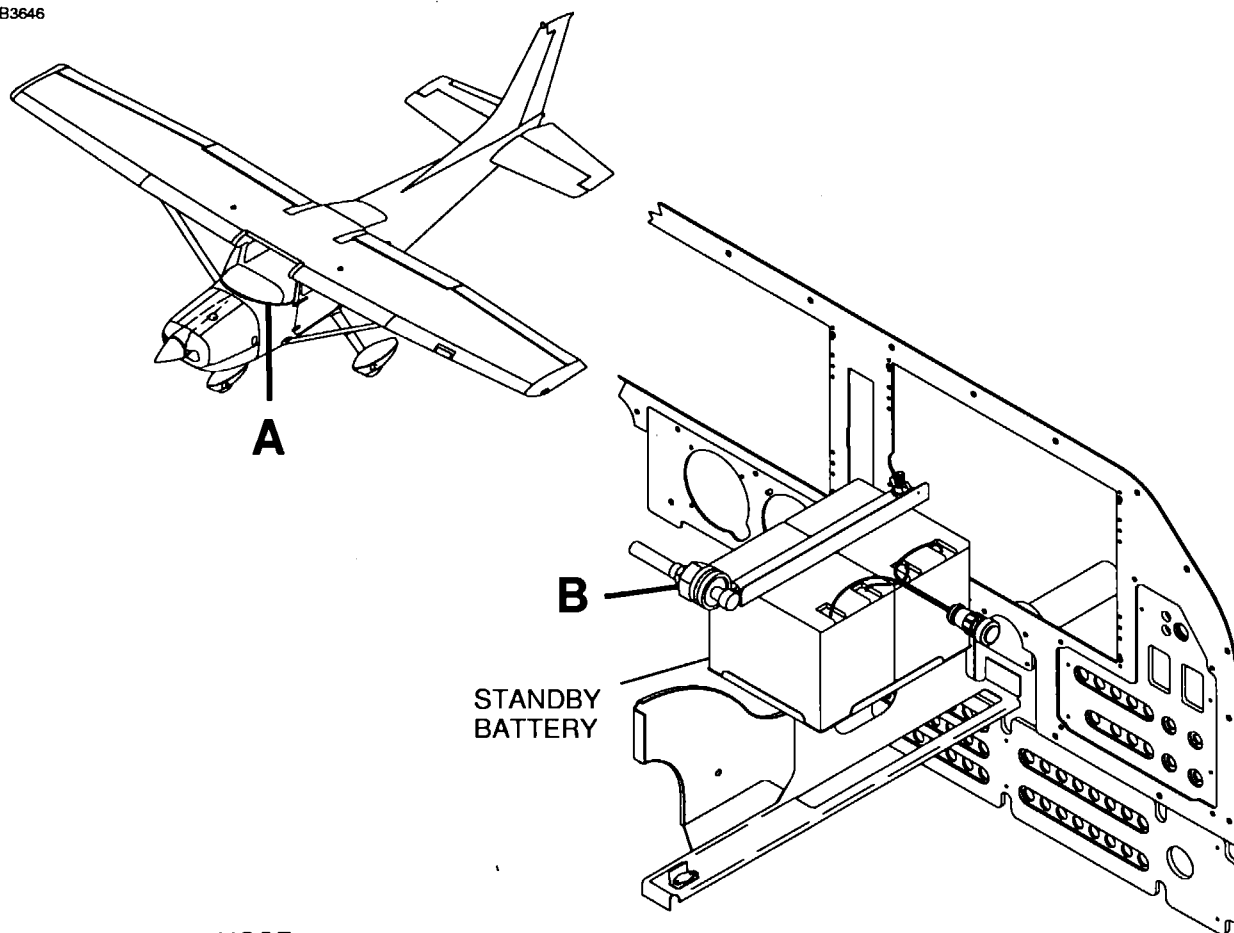
**1. Manifold Pressure Transducer Removal/Installation**

- A. Remove the Manifold Pressure Transducer (Refer to Figure 201).
  - (1) Remove the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (2) Remove the bolt, washer and clamp that hold the manifold pressure transducer in position.
  - (3) Disconnect the pressure line and electrical connector.
  - (4) Remove the manifold pressure transducer.
- B. Install the Manifold Pressure Transducer (Refer to Figure 201).
  - (1) Connect the pressure line and electrical connector.
  - (2) Put the manifold pressure transducer in position.
  - (3) Install the bolt, washer and clamp that hold the manifold pressure transducer in position.
  - (4) Install the PFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.

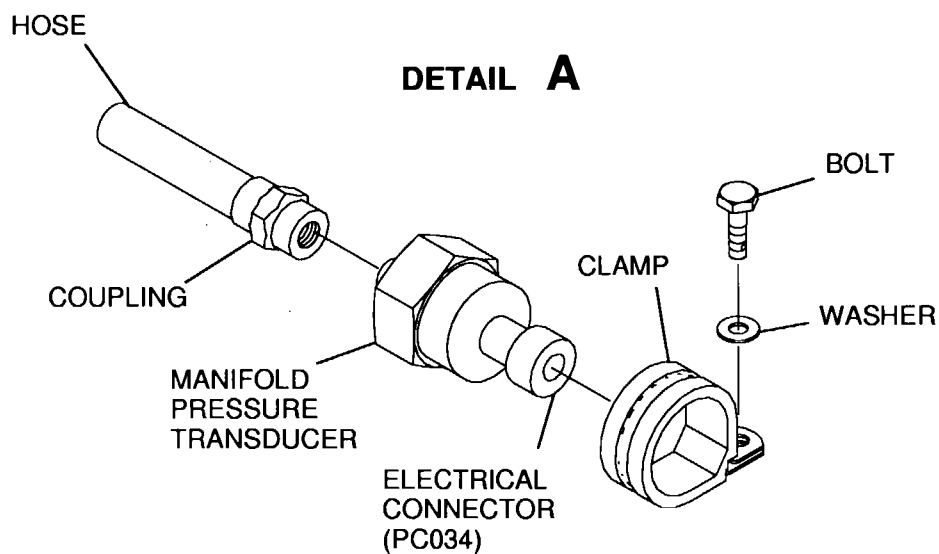


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**DETAIL A**



**DETAIL B**

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B0714T1053

Manifold Pressure Transducer Installation  
Figure 201 (Sheet 1)

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**GEA-71 ENGINE/AIRFRAME UNIT - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The GEA-71 Engine/Airframe Unit is a microprocessor Line Replaceable Unit (LRU). It is used to monitor sensor inputs and operate annunciator outputs for the airframe and engine systems.
- B. The GEA-71 is an interface for different sensors on the airplane and gives airframe and engine information through a digital interface to the GIA-63 Integrated Avionics Units (IAUs). The GIA-63s are then an interface with the GDU 1040 Primary Flight Display (PFD) and Multi-Function Display (MFD). Typically, the MFD gives engine information while the PFD gives airframe alerts from the GEA-71. Engine and airframe information is also shown on the PFD and/or MFD, while the system is in the reversionary mode.
- C. The PFD and MFD displays operate as the user for the GEA-71. All configuration adjustments are controlled by software adjustments through the MFD and PFD displays.

**2. General**

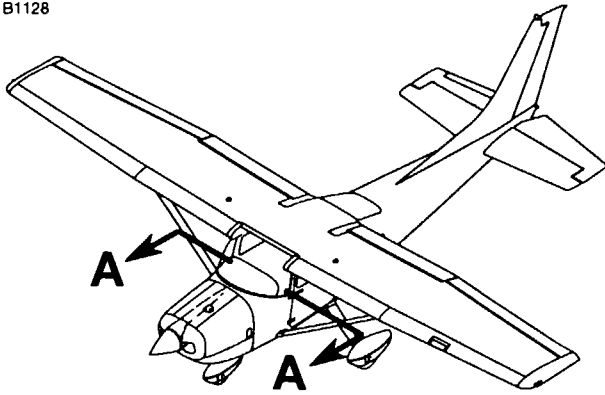
- A. The maintenance procedures that follow are for the removal and installation of the engine/airframe unit.

**3. GEA-71 Engine/Airframe Unit Removal/Installation**

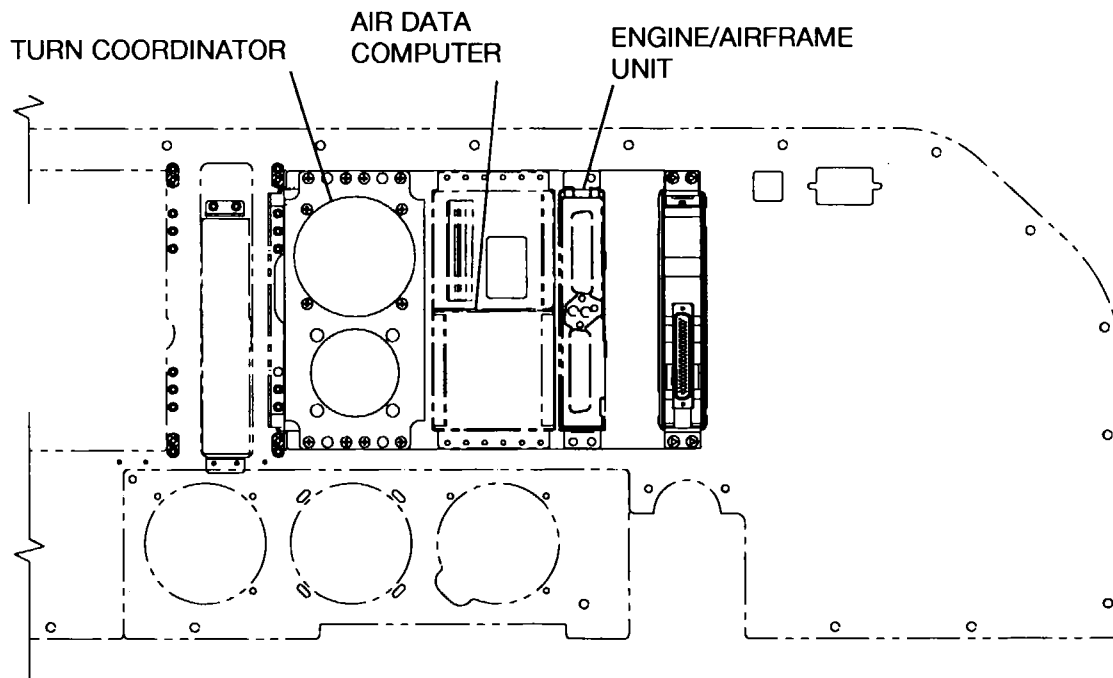
- A. Engine/Airframe Unit Removal (Refer to Figure 201).
  - (1) Put the AVIONICS MASTER switch in the off position.
  - (2) Remove the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (3) Remove the screws that attach the engine/airframe unit to the structure.
  - (4) Remove the engine/airframe unit from the airplane.
- B. Engine/Airframe Unit Installation (Refer to Figure 203).
  - (1) Put the engine/airframe unit in position.
  - (2) Attach the engine/airframe unit to the structure with the screws.
  - (3) Install the MFD. Refer to Chapter 34, Control Display Unit - Maintenance Practices.
  - (4) If applicable, put the AVIONICS MASTER switch in the ON position.
  - (5) Do a check to make sure the engine/airframe unit operates correctly. Refer to the Garmin G1000 Line Maintenance Manual.

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**NOTE:** THE INSTRUMENT PANEL IS SHOWN WITH THE MULTI-FUNCTION DISPLAY (MFD) SCREEN REMOVED.



**VIEW A-A**  
AIRPLANES WITH GARMIN G1000

0710T1001  
A3930T368

Forward Avionics Equipment Installation  
Figure 201 (Sheet 1)

**CHAPTER**

**78**

**EXHAUST**

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**LIST OF EFFECTIVE PAGES**

CHAPTER-SECTION-SUBJECT	PAGE	DATE
78-Title		
78-List of Effective Pages		
78-Record of Temporary Revisions		
78-Table of Contents		
78-00-00	Page 1	April 1/2002
78-10-00	Pages 201-203	April 1/2002
78-10-01	Pages 201-205	Jan 1/2007

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Description and Operation .....	78-10-00 Page 201
Exhaust System Removal/Installation .....	78-10-00 Page 201
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EXHAUST SYSTEM (TURBOCHARGED) - MAINTENANCE PRACTICES .....	78-10-01 Page 201
General .....	78-10-01 Page 201
Description and Operation .....	78-10-01 Page 201
Exhaust Stack Assembly Removal/Installation .....	78-10-01 Page 201
Heat Shroud Removal/Installation .....	78-10-01 Page 201
Exhaust System Inspection .....	78-10-01 Page 205

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**EXHAUST - GENERAL**

**1. Scope**

- A. This Chapter provides information for removal and installation of the components of the exhaust system.



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**EXHAUST SYSTEM - MAINTENANCE PRACTICES**

**1. General**

- A. This section provides instructions for removal, installation, and inspection of the exhaust system.

**2. Description and Operation**

- A. The exhaust system consists of two exhaust stacks, two muffler assemblies, two tail pipes, and associated hardware. The muffler assemblies are equipped with heat shrouds to provide cabin heat. The left muffler shroud is equipped with an air intake duct connected to the upper left engine baffle. A duct interconnects the left and right heat shrouds. A duct connected to the right heat shroud is routed to the cabin heat control valve on the firewall. For cabin heat installation refer to Chapter 21, Air Conditioning - General.

**3. Exhaust System Removal/Installation**

- A. Exhaust System Removal (Refer to Figure 201).

- (1) Remove upper and lower engine cowling.
- (2) Remove clamp from left shroud intake duct and retain.
- (3) Remove clamps from duct interconnecting the left and right heat shrouds, and remove duct and retain.
- (4) Remove clamp from right heat shroud duct and retain.
- (5) Remove nuts, washers and bolts from clamps securing tail pipes to shock mounts on the firewall and retain bolts and clamps, discard nuts and washers.

**NOTE:** If exhaust assemblies are to be removed as a unit proceed to step (8).

- (6) Remove nuts, washers, and bolts from clamps securing tail pipes to mufflers and retain. Remove tail pipes.
- (7) Remove cotter pins, nuts, washers, bolts, and springs securing mufflers to exhaust stack and retain bolts and springs, discard cotter pins, nuts and washers. Remove mufflers.
- (8) Disconnect electrical lead from EGT thermocouple.
- (9) Remove nuts and washers securing exhaust stack to engine cylinders and retain.
- (10) Remove exhaust stacks and gaskets. Discard gaskets.

- B. Exhaust System Installation (Refer to Figure 201).

- (1) Using new gaskets, position exhaust stacks on engine cylinders and install washers and nuts.
- (2) Torque nuts 100 to 110 inch- pounds (11.3 to 12.4 N.m).

**NOTE:** If exhaust assemblies were removed as a unit proceed to step (4).

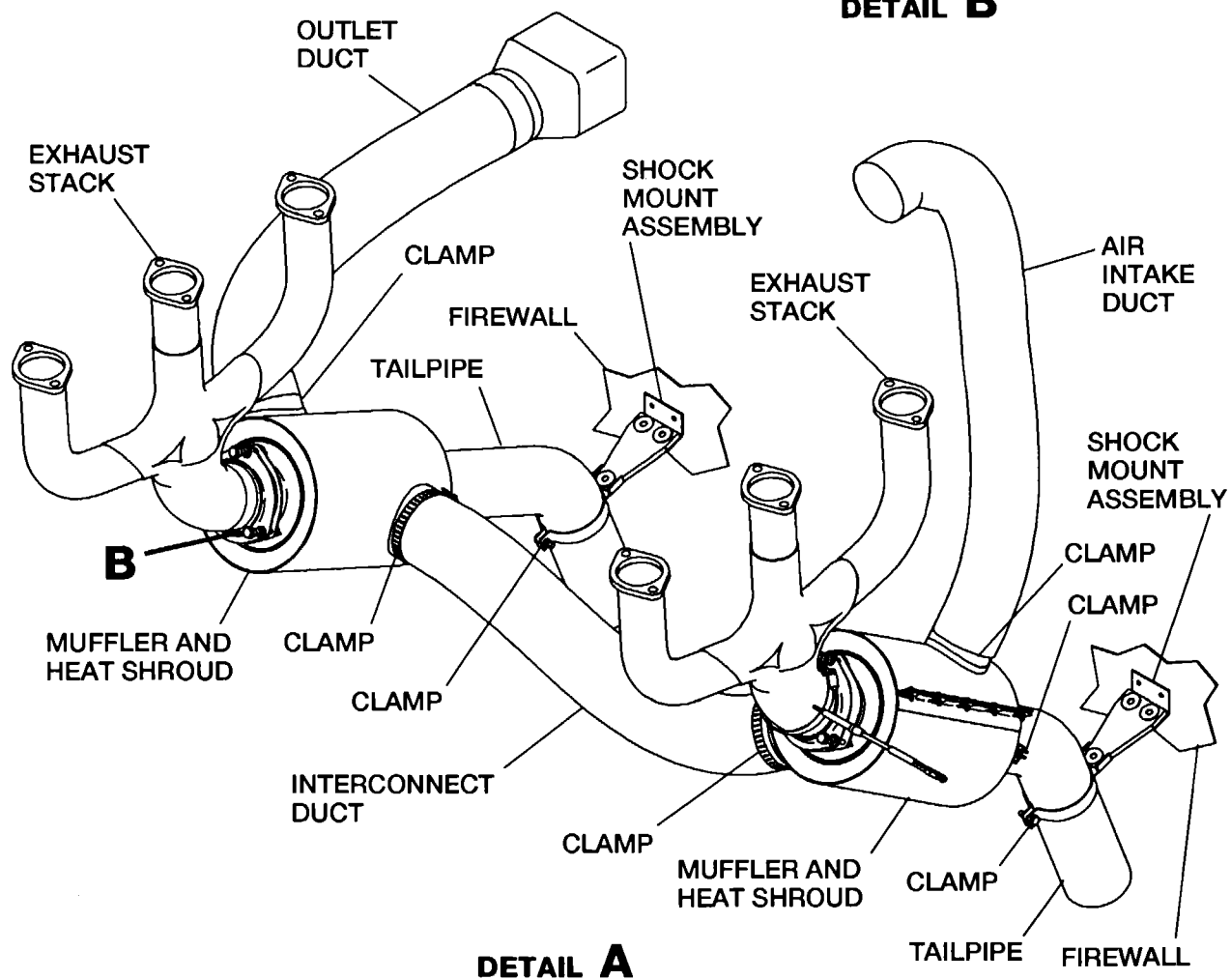
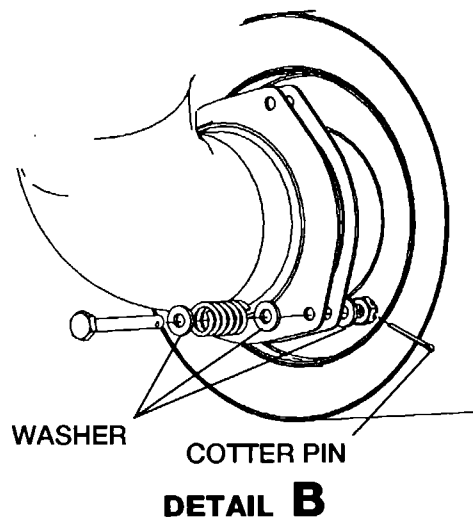
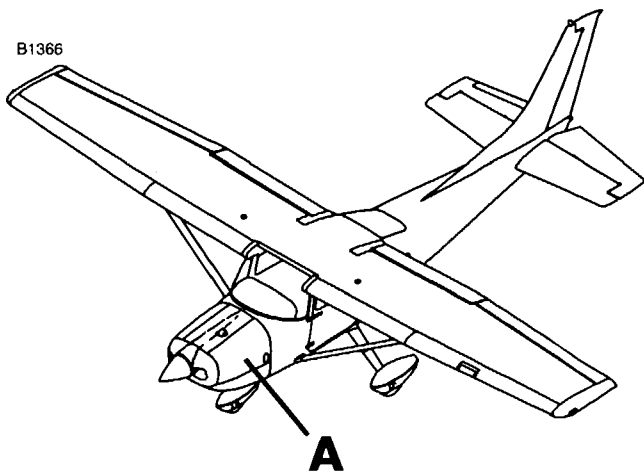
- (3) Position muffler assemblies on exhaust stacks and install springs, bolts, washers, and castellated nuts securing mufflers to exhaust stacks. Install castellated nuts with the minimum amount of clearance required for the cotter pins to pass through nuts and bolts.
- (4) Install tail pipes using clamps, bolts, new washers, and new nuts.
- (5) Install clamps, bolts, nuts, and washers securing tail pipes to shock mounts on the firewall.
- (6) Using clamp secure left intake duct to shroud.
- (7) Using clamps install duct interconnecting the left and right heat shrouds.
- (8) Using clamp secure duct to right heat shroud.
- (9) Connect electrical lead on EGT thermocouple.
- (10) Install engine cowlings.

**4. Exhaust System Inspection**

- A. Exhaust System Inspection and Leak Test. (Refer to Chapter 5 - Time Limits/Maintenance Checks for inspection intervals).

- (1) Remove upper and lower engine cowling.
- (2) Check areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack, hole or around the slip joints.

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 A0755T1001

Exhaust System Installation  
 Figure 201 (Sheet 1)

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- (3) After visual inspection an air leak check should be made on the system as follows:
- (a) Attach the pressure side of an industrial vacuum cleaner to the tail pipe opening, using a rubber plug to effect a seal as required.

**NOTE:** The inside of vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

- (b) With vacuum cleaner operating, all joints in the exhaust system may be leak checked manually by feel, or by using a soap and water solution and watching for bubbles. Forming of bubbles indicates leaks; if bubbles form at the welded joints or show cracks in the muffler canister, end plates, or tubes, the system is not considered acceptable.
  - (c) Repeat procedure for opposite exhaust.
- (4) Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure may be used:
- (a) Remove exhaust stack assemblies.
  - (b) Remove heat shrouds from mufflers.
  - (c) Use rubber expansion plugs to seal openings.
  - (d) Using a manometer or gage, apply approximately 1.5 PSI (three inches of mercury) (10.3 kPa) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.
  - (e) Exhaust stacks found defective must be replaced before the next flight.
- (5) Install exhaust system and perform inspection in step (3).

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**EXHAUST SYSTEM (TURBOCHARGED) - MAINTENANCE PRACTICES**

**1. General**

- A. This section gives instructions for the removal, installation, and inspection of the exhaust system (turbocharged).

**2. Description and Operation**

- A. The exhaust system (turbocharged) has an exhaust stack assembly, heat shroud, and associated hardware. The heat shroud supplies cabin heat. The shroud has an air intake duct connected to the upper right engine baffle. A duct connects the shroud to the cabin heat control valve on the firewall. For cabin heat installation, refer to Chapter 21, Heating/Defrosting - Maintenance Practices.

**NOTE:** The exhaust system (turbocharged) has Lycoming components, with the exception of the heat shroud and exhaust stack. For more information on the exhaust system (turbocharged) and its components, refer to the Lycoming Operator's Manual.

**3. Exhaust Stack Assembly Removal/Installation**

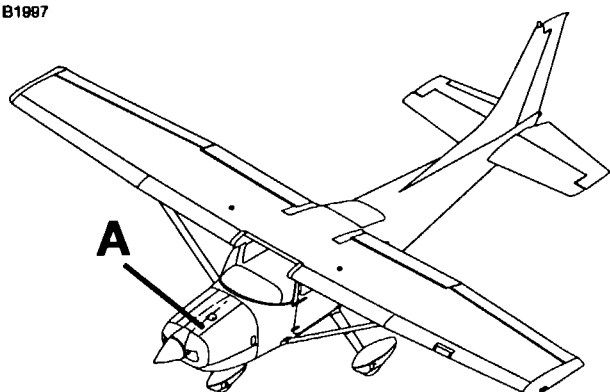
- A. Exhaust Stack Assembly Removal (Refer to Figure 201).
- (1) Remove the upper and lower right engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices.
  - (2) Remove the clamps that attach the tailpipe assembly to the turbocharger and wastegate.
- B. Exhaust Stack Assembly Installation (Refer to Figure 201).
- (1) Install the clamp that attaches the tailpipe assembly to the wastegate. Torque the clamp to between 70 and 90 inch-pounds.
  - (2) Install the clamp that attaches the tailpipe assembly to the turbocharger.
    - (a) Add 20 inch-pounds (2.3 N.m) to the running torque for the nut of the Aeroquip S1921-2 coupling.
    - (b) Add 50 inch-pounds (5.6 N.m) to the running torque for the nut of the NUCO S1921-2 coupling.
  - (3) Install the upper and lower right engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices

**4. Heat Shroud Removal/Installation**

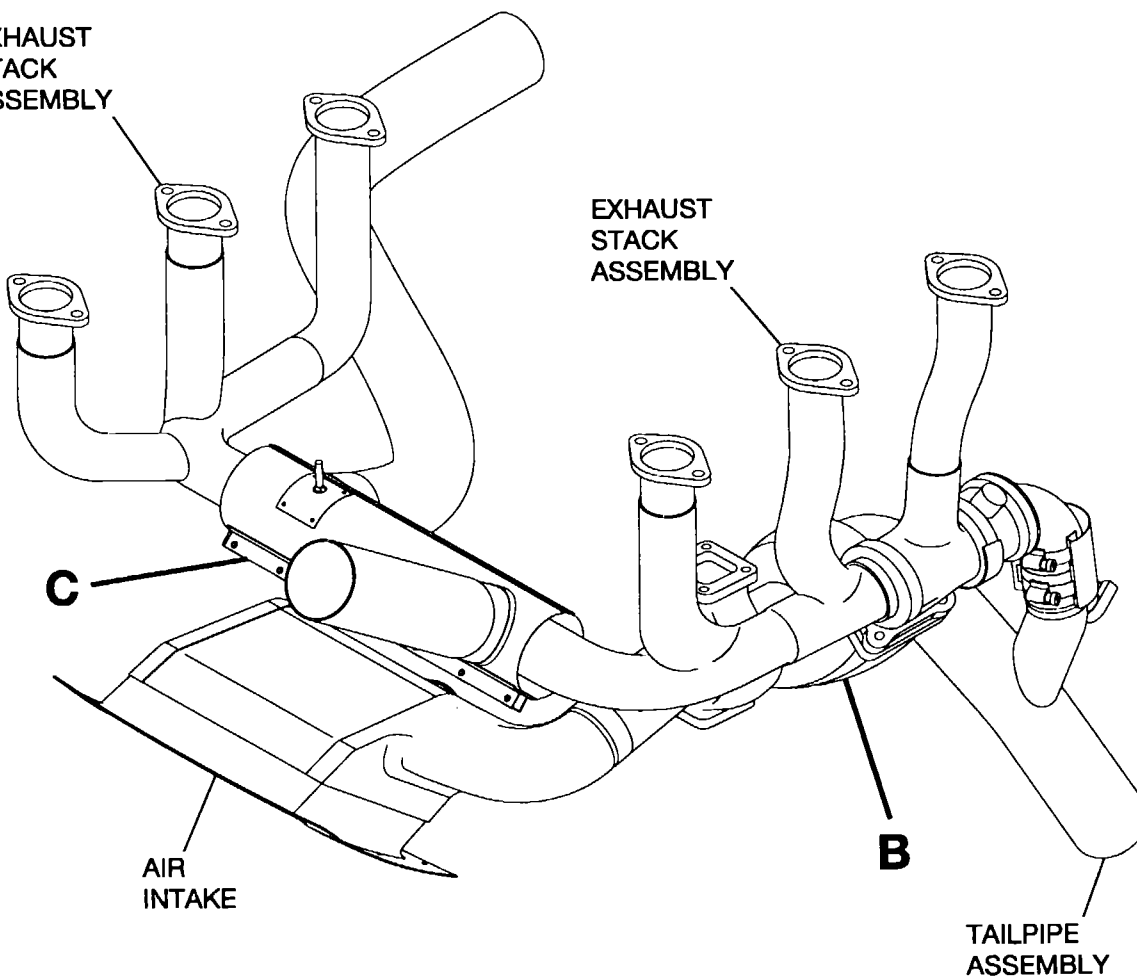
- A. Heat Shroud Removal (Refer to Figure 201).
- (1) Remove the upper and lower, left and right engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices
  - (2) Remove the left and right nose-caps.
  - (3) Remove the exhaust system. Refer to the Lycoming Operator's Manual for removal of the exhaust system.
  - (4) Remove and keep the screws from the heat shroud intake duct.
  - (5) Remove and keep the clamp from the heat shroud outlet duct.
  - (6) Remove and keep the screws that attach the heat shroud assembly to the exhaust system.
- B. Heat Shroud Installation (Refer to Figure 201).
- (1) Attach the heat shroud assembly to the exhaust system with the screws.
  - (2) Attach the outlet duct to the heat shroud with the clamp.
  - (3) Attach the intake duct to the heat shroud with the screws.
  - (4) Install the exhaust system. Refer to the Lycoming Operator's Manual for installation of the exhaust system.
  - (5) Install the left and right nose-caps.
  - (6) Install the upper and lower, left and right engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices

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EXHAUST  
STACK  
ASSEMBLY



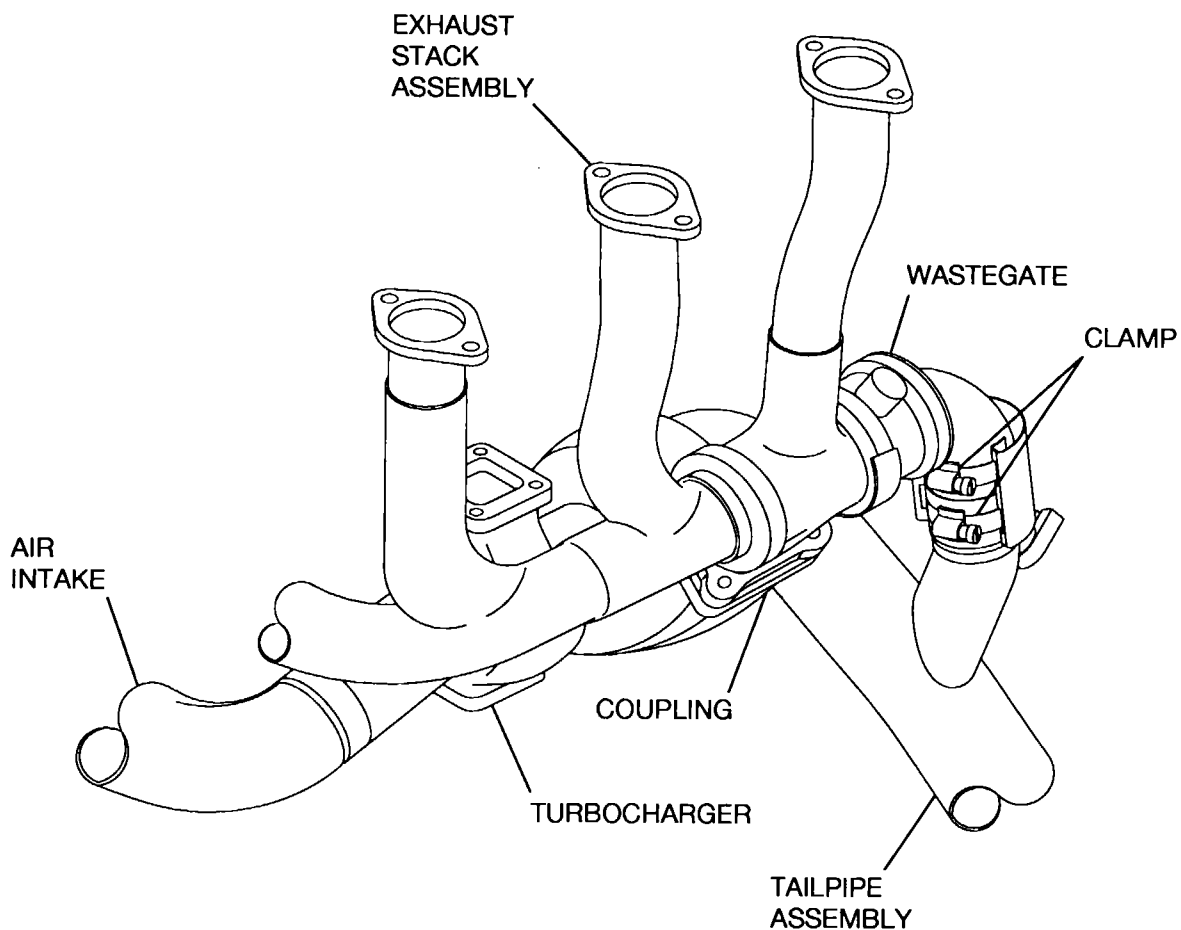
**DETAIL A**

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Exhaust System Installation (T182)  
Figure 201 (Sheet 1)

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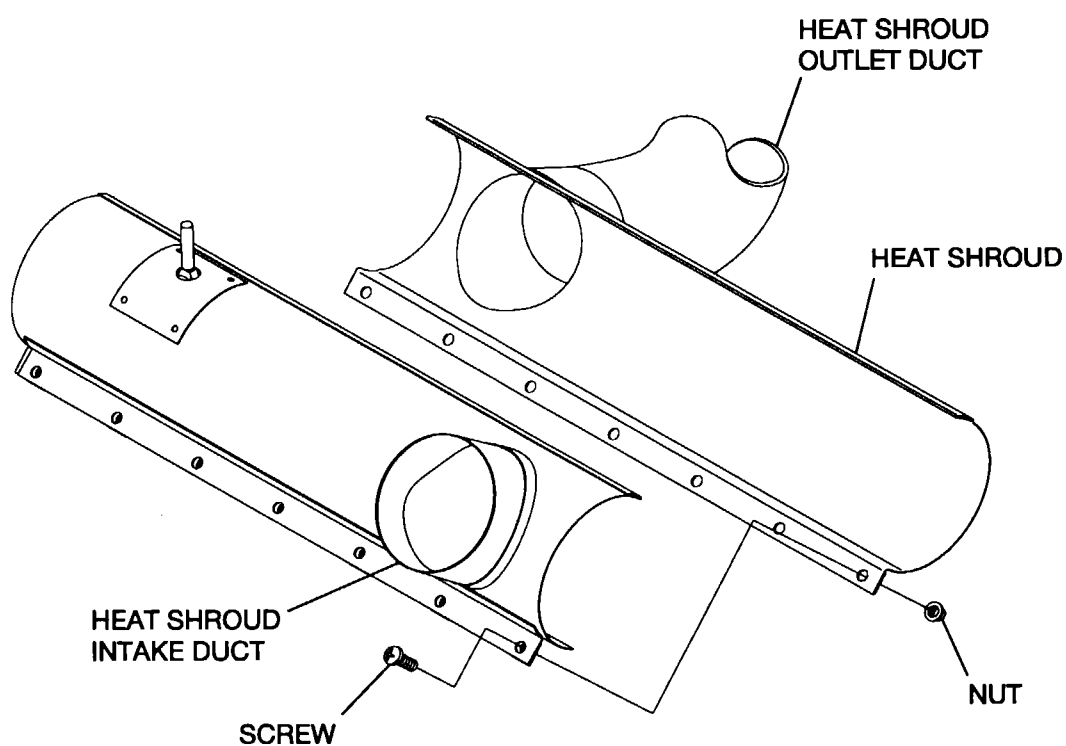
**DETAIL B**

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Exhaust System Installation (T182)  
Figure 201 (Sheet 2)

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**DETAIL C**

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Exhaust System Installation (T182)  
Figure 201 (Sheet 3)

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**5. Exhaust System Inspection**

- A. Exhaust System Inspection and Leak Test. Refer to Chapter 5, Time Limits/Maintenance Checks for inspection intervals.
- (1) Remove the upper and lower right engine cowl. Refer to Chapter 71, Cowl - Maintenance Practices
  - (2) Examine the areas adjacent to welds and slip joints. Look for contamination in these areas. Contamination is a sign that exhaust gases escape through cracks, holes, or spaces around the slip joints.
  - (3) After a visual inspection, an air leak check must be done on the system. Use the procedure that follows.
    - (a) Attach the pressure side of an industrial vacuum cleaner to the exhaust stack opening with a rubber plug to make a seal, as necessary.

**NOTE:** The inside of the vacuum cleaner hose must be free of contamination that can be blown into the engine exhaust system.
    - (b) With the vacuum cleaner in operation, all joints in the exhaust system can be examined manually by touch, or with a soap and water solution. The formation of bubbles is satisfactory; if the bubbles are blown away, the system is not satisfactory.

**NOTE:** Bubbles are satisfactory at the slip joint, but not satisfactory at weld joints.
  - (4) When you cannot get access to a surface for a visual inspection, or for a more positive test, use the procedure that follows.
    - (a) Remove the exhaust stack assemblies.
    - (b) Remove the heat shroud from the muffler.
    - (c) Use rubber expansion plugs to seal all the openings.
    - (d) With a manometer or equivalent gage, apply approximately 1.5 PSI (three inches of mercury or 10.3 kPa) air pressure while each stack assembly is in water. Leaks will come into view as bubbles and can be easily seen.
    - (e) Exhaust stacks that are damaged must be replaced before the next flight.
  - (5) Install the exhaust system and do the inspection in step (3).



• **CHAPTER**

• **79**

**OIL**

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**OIL - GENERAL**

**1. Scope**

- A. This chapter provides maintenance instructions for those components which distribute oil and which indicate oil condition. For information beyond the scope of this material, refer to appropriate Textron Lycoming Operator's and Overhaul Manuals, and to Chapter 71, Engine - Troubleshooting.

**2. Definition**

- A. This chapter is divided into sections to assist maintenance personnel in locating specific information. The following is a brief description of each section. For locating information within the chapter, refer to the Table of Contents at the beginning of the chapter.
  - (1) The section on distribution provides information on removal and installation of the external oil cooler.
  - (2) The section on indicating provides information on indicators, transducers and switches used to indicate oil temperature and pressure.

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**OIL COOLER - MAINTENANCE PRACTICES**

**1. General**

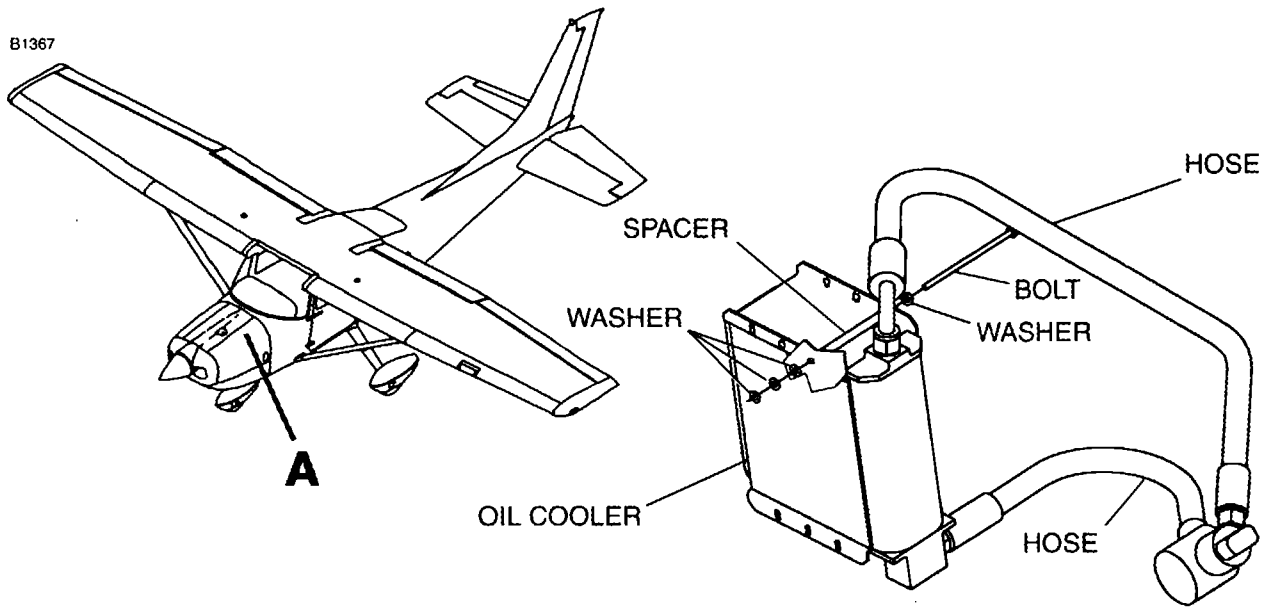
- A. This section provides maintenance instructions for removal and installation of the externally mounted oil cooler.

**2. Oil Cooler Removal/Installation**

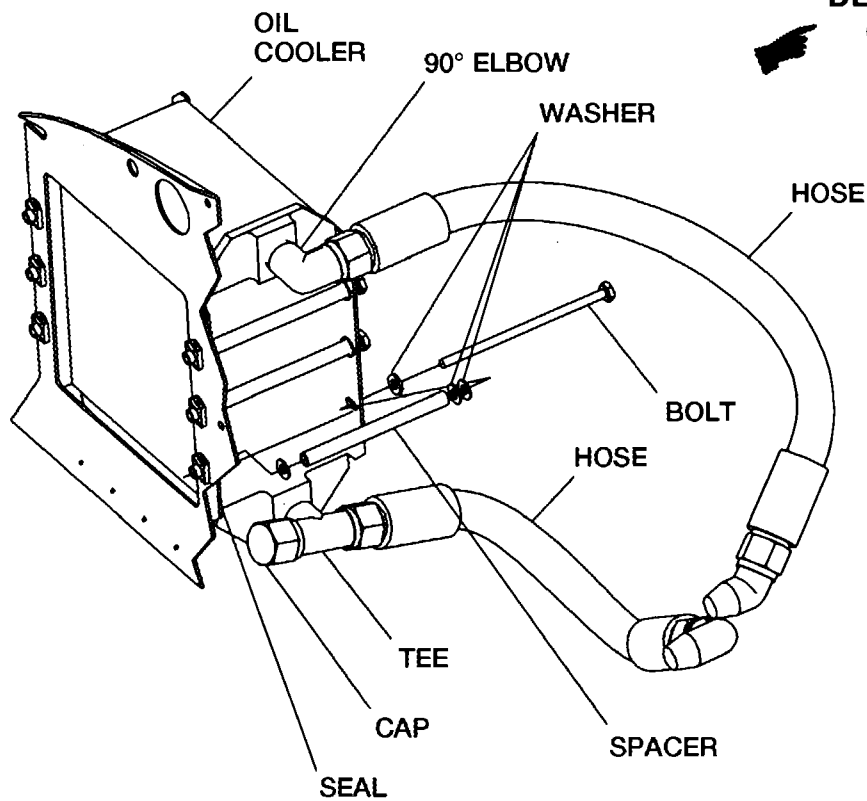
- A. Remove Oil Cooler (Refer to Figure 201).
- (1) Remove upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.
  - (2) Label and disconnect inlet and outlet hoses leading into oil cooler.
  - (3) Remove bolts, washers and spacers securing oil cooler to back of engine baffles.
- B. Install Oil Cooler (Refer to Figure 201).
- (1) Secure oil cooler and hose clamp to rear of engine baffles using bolts, spacers and washers.
  - (2) Attach inlet and outlet hoses to oil cooler.
  - (3) Install upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.

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**DETAIL A**  
 (T182T)



**DETAIL A**  
 (182S AND 182T)

Oil Cooler Installation  
 Figure 201 (Sheet 1)

0710T1001  
 A0756T1001  
 A0756T1002

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**AIR/OIL SEPARATOR ASSEMBLY - MAINTENANCE PRACTICES**

**1. General**

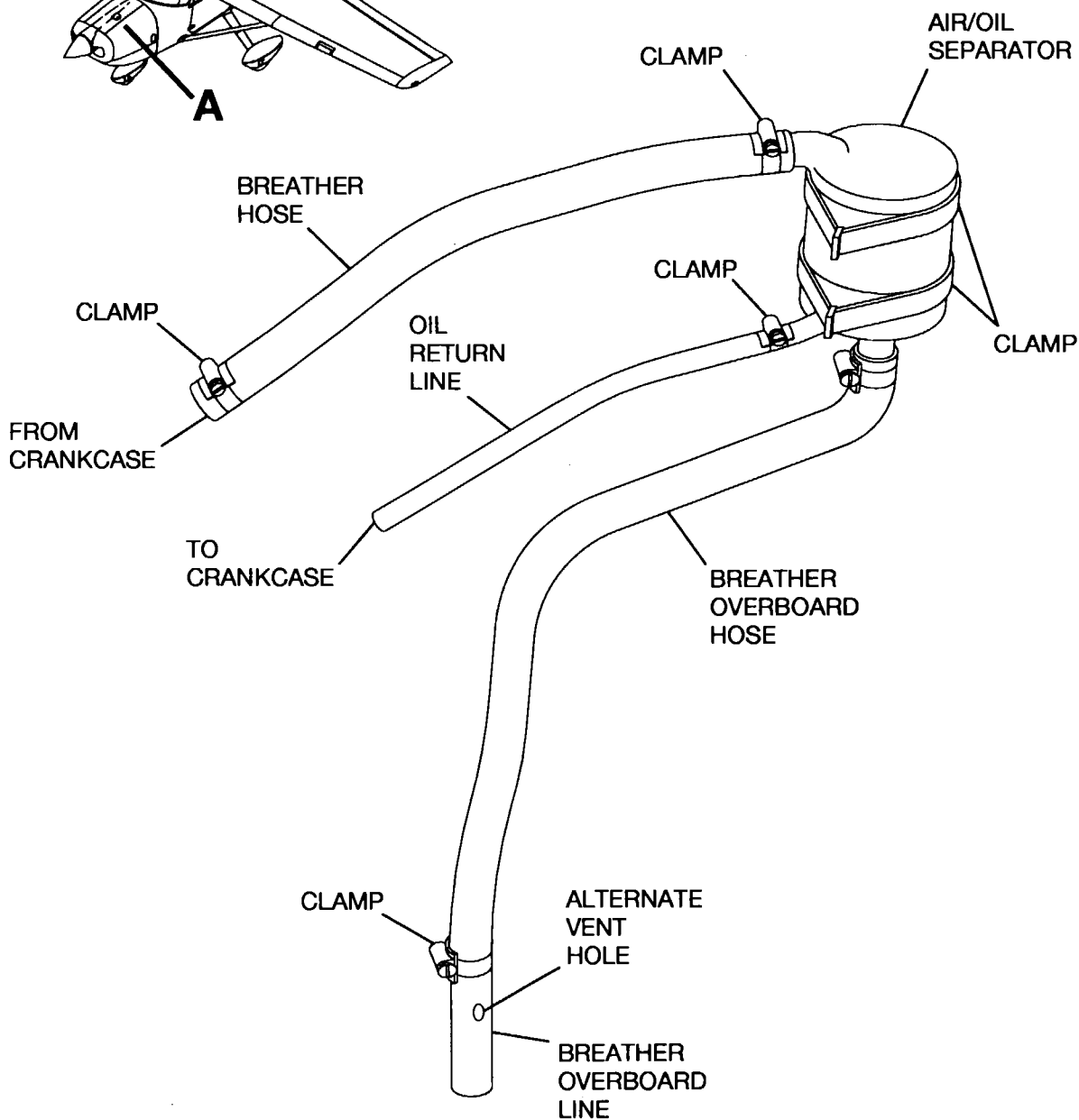
- A. Turbocharged airplanes have an air/oil separator assembly installed in the breather system. During engine operation, air pressure collects in the crankcase and it is necessary to release that pressure. The air/oil separator removes oil from the air before it is released through the breather overboard line. After the air/oil separator removes the oil from the air, the oil is put back in the crankcase where it is used again. The separator assembly has three hoses. One connects the separator to the crankcase breather line, one connects the separator to the crankcase oil return line, and one connects the separator to the breather overboard line.

**2. Air/Oil Separator Assembly Removal and Installation**

- A. Air/Oil Separator Assembly Removal. Refer to Figure 201.
- (1) Remove the upper cowling to get access to the engine compartment. Refer to Chapter 71, Cows - Maintenance Practices.
  - (2) Turn the screws on the clamps that connect the hoses to the air/oil separator counterclockwise to loosen them.
  - (3) Disconnect the hoses from the oil breather.
  - (4) Turn the screws on the clamps that connect the air/oil separator to the engine baffle counterclockwise to loosen them.
  - (5) Remove the air/oil separator from the airplane.
- B. Air/Oil Separator Assembly Installation. Refer to Figure 201.
- (1) Put the air/oil separator in the clamps that attach it to the engine baffle.
  - (2) Turn the screws on the clamps that connect the air/oil separator to the engine clockwise to tighten them.
  - (3) Connect the hoses to the air/oil separator.
  - (4) Turn the screws on the clamps that connect the hoses to the air/oil separator clockwise to tighten them.
  - (5) Install the upper cowling. Refer to Chapter 71, Cows - Maintenance Practices.



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## Air/Oil Separator Assembly Installation

### Figure 201 (Sheet 1)

**79-20-10**      Page 202  
Jan 2/2006

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**OIL PRESSURE INDICATORS - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. Oil pressure is measured at two distinct points on the engine and provides both indicator readings and low oil pressure annunciation.
- (1) The oil pressure indicator system is comprised of an oil pressure line, a transducer and a cockpit mounted combination pressure/temperature indicator. Oil for the system is tapped at the upper right side of the case. This oil is routed, via rigid line, to a transducer mounted on the rear baffle area. This transducer produces an electrical signal which is routed to the cockpit mounted oil pressure/oil temperature indicator.
  - (2) The low oil pressure annunciation system is comprised of a pressure switch and associated wiring. The switch is mounted on the upper right rear of the engine block. It is configured so that when oil pressure is below 20 PSI, a ground is supplied to the instrument panel mounted annunciator. This causes the OIL PRESS light to illuminate on the annunciator. When oil pressure is greater than 20 PSI, the ground switches to the hobbs meter, activating the meter and extinguishing the OIL PRESS light.

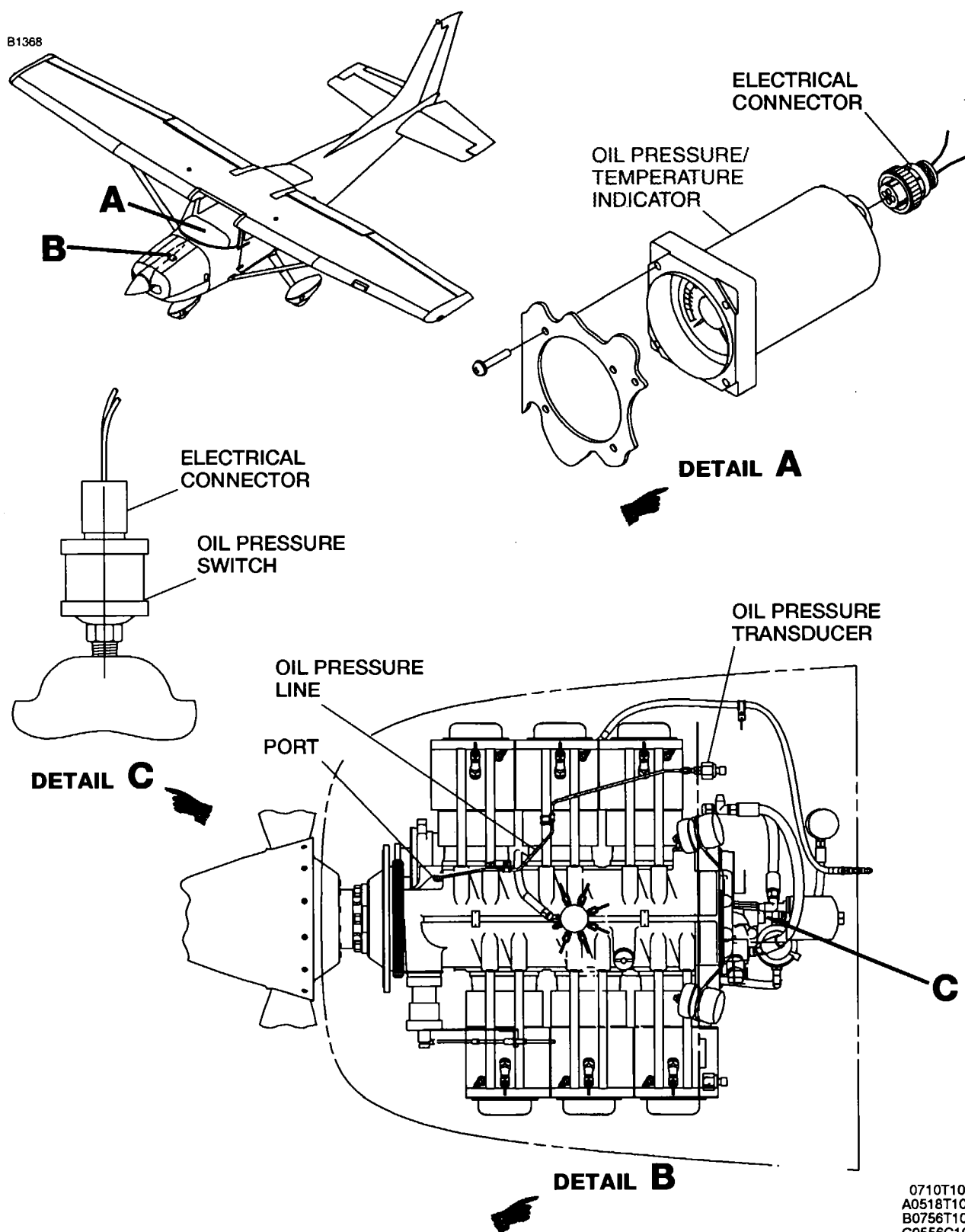
**2. Oil Pressure Indicator and Transducer Removal/Installation**

- A. Remove Oil Pressure Indicator (Refer to Figure 201).
- (1) Ensure electrical power to airplane is off.
  - (2) Remove screws securing indicator to instrument panel.
  - (3) Unscrew electrical connector from backside of indicator.
  - (4) Carefully withdraw indicator from backside of instrument panel.
- B. Install Oil Pressure Indicator (Refer to Figure 201).
- (1) Connect electrical connector to backside of indicator.
  - (2) Position indicator to instrument panel.
  - (3) Secure to panel using screws.
- C. Remove Transducer (Refer to Figure 201).
- (1) Remove upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.
  - (2) Disconnect oil pressure line at transducer.
  - (3) Disconnect electrical connector from transducer.
  - (4) Remove nut securing transducer to rear of baffle and remove transducer.
- D. Install Transducer (Refer to Figure 201).
- (1) Install transducer to rear baffle and secure using nut.
  - (2) Connect electrical connector to transducer.
  - (3) Connect oil line at transducer.
  - (4) Reinstall upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.

**3. Low Oil Pressure Switch Removal/Installation**

- A. Remove Switch (Refer to Figure 201).
- (1) Ensure electrical power to airplane is off.
  - (2) Remove upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.
  - (3) Disconnect electrical connector from switch.
  - (4) Unscrew switch from engine block.
- B. Install Switch (Refer to Figure 201).
- (1) Using U544006 sealant (or equivalent) on threads, hand tighten new switch.

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 A0518T1034  
 B0756T1002  
 C0556C1006

Oil Pressure Indication Installation  
 Figure 201 (Sheet 1)

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**CAUTION:** Do not use Teflon tape.

**CAUTION:** Clean any sealer or other debris from the switch fitting before installation. Ensure foreign material is removed and clear of the pressure hole in the end of the switch fitting.

- (2) Use a 7/16 inch wrench to tighten switch approximately 1 to 1 1/2 turns (not to exceed 60 inch pounds) beyond hand tight.

**CAUTION:** Do not use excessive torque on plastic switch connection housing when hand tightening.

**CAUTION:** Use only the hex fitting to final tighten. Excessive torque will damage the switch. Do not round the corners of the hex fitting.

- (3) Connect electrical connector to switch.
- (4) Reinstall upper cowling. Refer to Chapter 71, Cowls - Maintenance Practices.

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**OIL TEMPERATURE INDICATOR - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The oil temperature system consists of a sending unit, a combination oil temperature/oil pressure indicator and wire connecting the two components. Oil temperature is measured in the accessory case area and provides cockpit readings in °F.

**2. Sending Unit Removal/Installation**

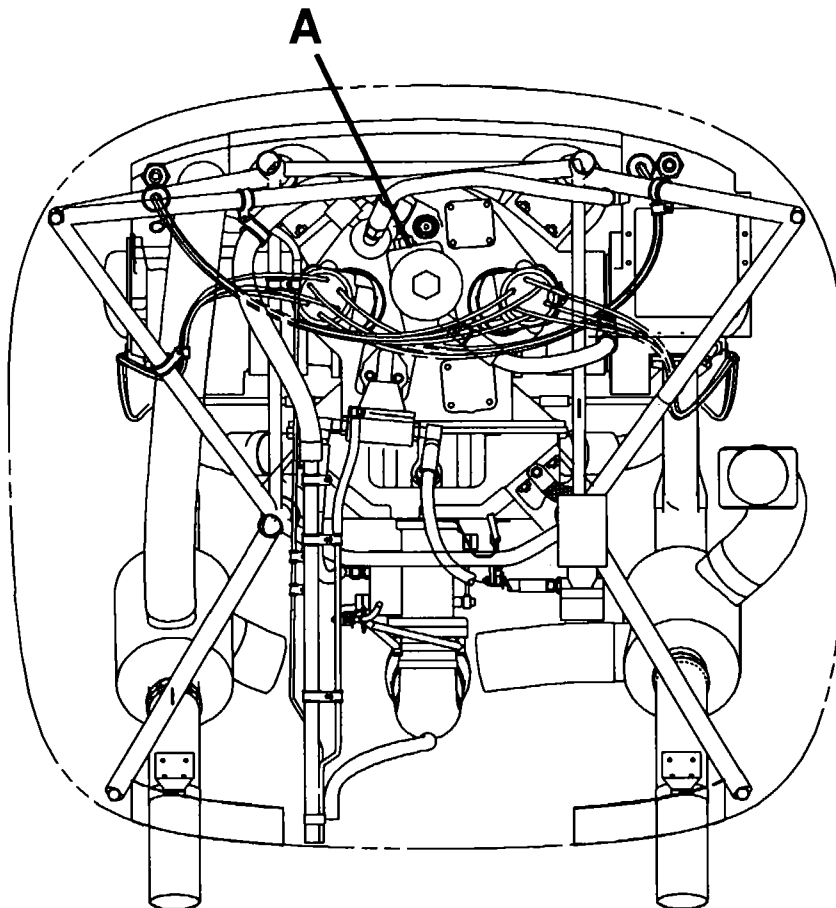
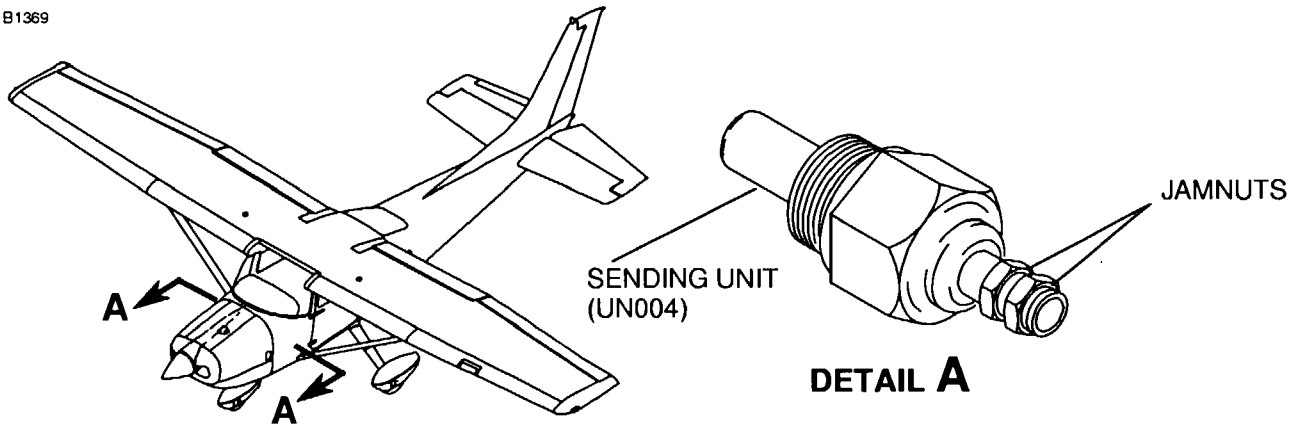
- A. Remove Sending Unit (Refer to Figure 201).  
(1) Remove upper engine cowl. Refer to Chapter 71, Cowls - Maintenance Practices.  
(2) Disconnect ring terminal wiring at sending unit.  
(3) Loosen and remove sending unit from accessory case.
- B. Install Sending Unit (Refer to Figure 201).  
(1) Reinstall sending unit to accessory case.  
(2) Attach ring terminal wire to sending unit. Torque jamnut to 20 Inch Pounds, maximum.  
(3) Install upper engine cowl. Refer to Chapter 71, Cowls - Maintenance Practices.

**3. Pressure Indicator Removal/Installation**

- A. For removal and installation of the Oil Temperature/Oil Pressure Indicator, refer to Oil Pressure Indicators - Maintenance Practices.

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**VIEW A-A**  
VIEW LOOKING FORWARD

Oil Temperature Installation  
Figure 201 (Sheet 1)

0710T1001  
AS2335T  
AA0750T1005

• **CHAPTER**

• **80**

**STARTING**

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Bendix Starter Drive Assembly Cleaning/Lubrication .....	80-10-00 Page 201

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**STARTING - GENERAL**

**1. Scope and Definition**

- A. This chapter is comprised of a single section on the starting system. The section details removal and installation instructions for the engine starter.

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**STARTER - MAINTENANCE PRACTICES**

**1. Description and Operation**

- A. The airplane is equipped with a direct drive 24 VDC starter attached at the front (propeller end) lower left side of the engine. The ignition key operates the starter solenoid. When the solenoid is operated, its contacts close and an electrical current energizes the starter. Then a pinion gear in the starter engages the crankshaft ring gear. When the engine reaches a given speed, centrifugal action decouples the starter pinion from the crankshaft ring gear.

**2. Starter Removal/Installation**

- A. Remove the Starter (Refer to Figure 201).
- (1) Remove the upper and lower engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.
  - (2) Disconnect the negative terminal from the battery.
  - (3) Remove the baffle from the engine.
  - (4) Disconnect the large electrical wire (positive lead) at the starter.
  - (5) Cut and discard the safety wire and remove the bolt that attaches the alternator attach bracket to the starter. If necessary, loosen the alternator belt.
  - (6) Remove the one bolt and three nuts that attach the starter to the crankcase and remove the starter from the engine.
- B. Install the Starter (Refer to Figure 201).
- (1) With the one bolt and three nuts, attach the starter to the engine crankcase. Step torque the fasteners diagonally.
    - (a) On Sky-Tec starters, torque the bolt and nuts to 204 inch-pounds.
  - (2) Attach the alternator attach bracket to the starter with the bolt and torque.
    - (a) On Sky-Tec starters, torque the bolt to 204 inch-pounds.
  - (3) If necessary, reset the alternator belt tension.
  - (4) Use safety wire on the bolt to the attach bracket. Refer to Chapter 20, Safetying - Maintenance Practices.
  - (5) Connect the positive lead to the starter. Make sure the protective boot fully covers the power terminal stud on the starter.
    - (a) On Sky-Tec starters, torque the nut on the power terminal stud to 50 inch-pounds, +5 or -5 inch-pounds.
- NOTE:** Sky-Tec starters have a metric nut on the power terminal stud.
- (6) On Sky-Tec starters, use high-temperature tie straps and connector to attach the positive lead to the starter. Refer to Figure 202.
  - (7) Attach the left front baffle to the engine.
  - (8) Connect the negative terminal to the battery.
  - (9) Install the upper and lower engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

**3. Bendix Starter Drive Assembly Cleaning/Lubrication**

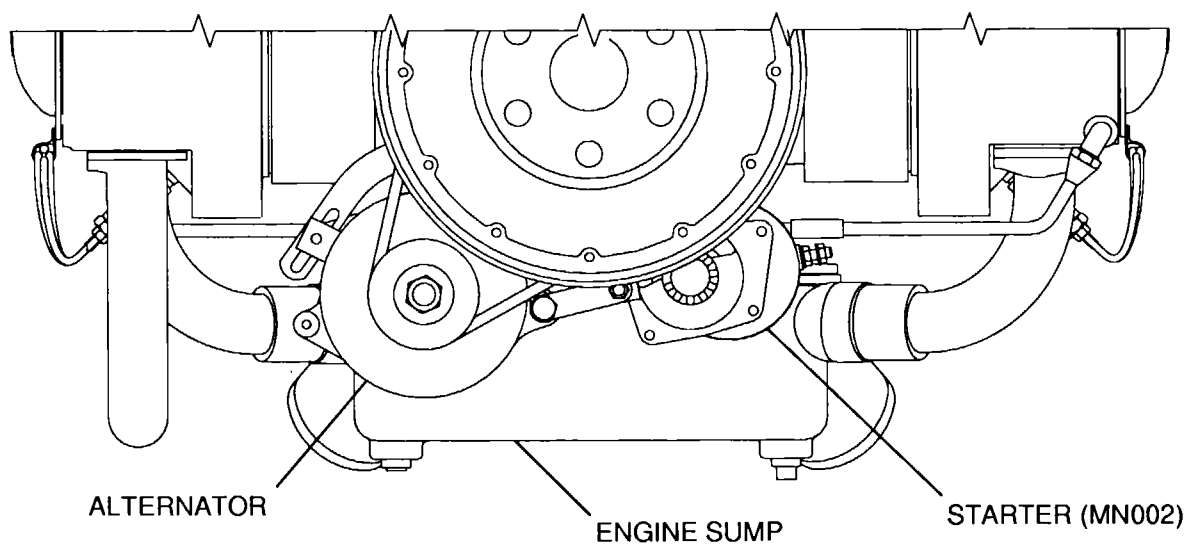
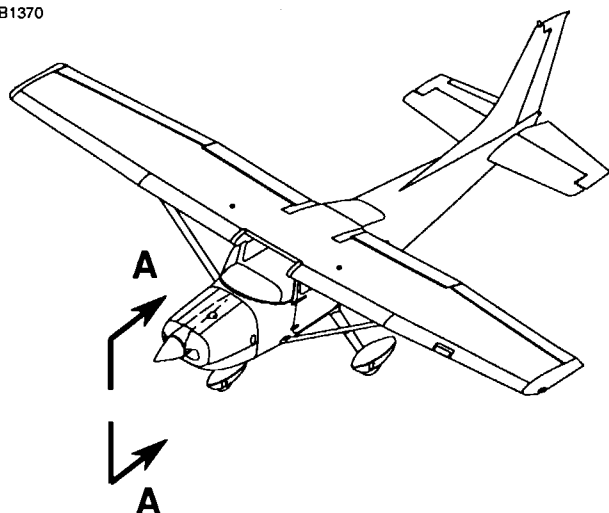
- A. Clean the Bendix starter drive assembly (Refer to Figure 201).

**CAUTION:** Use only a clean petroleum spirit. Do not use any other type of solvent.

- (1) Clean the starter drive with a clean petroleum spirit.
- B. Lubricate the starter drive assembly (Refer to Figure 201).

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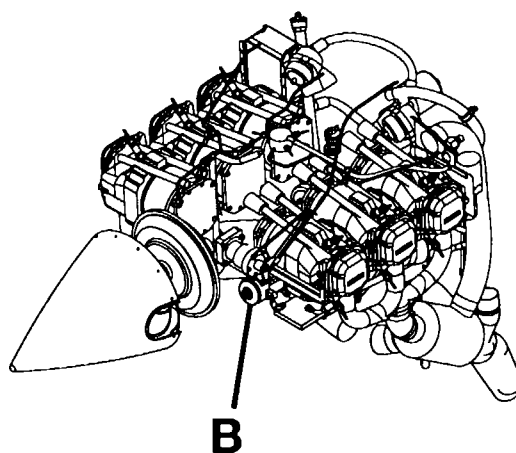
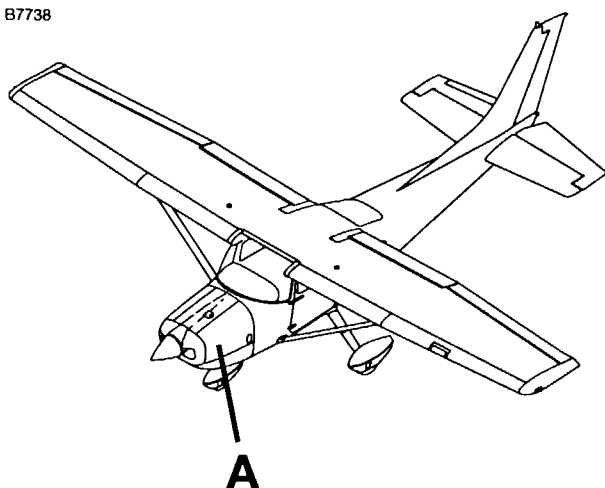
**VIEW A-A**

Starter Installation  
Figure 201 (Sheet 1)

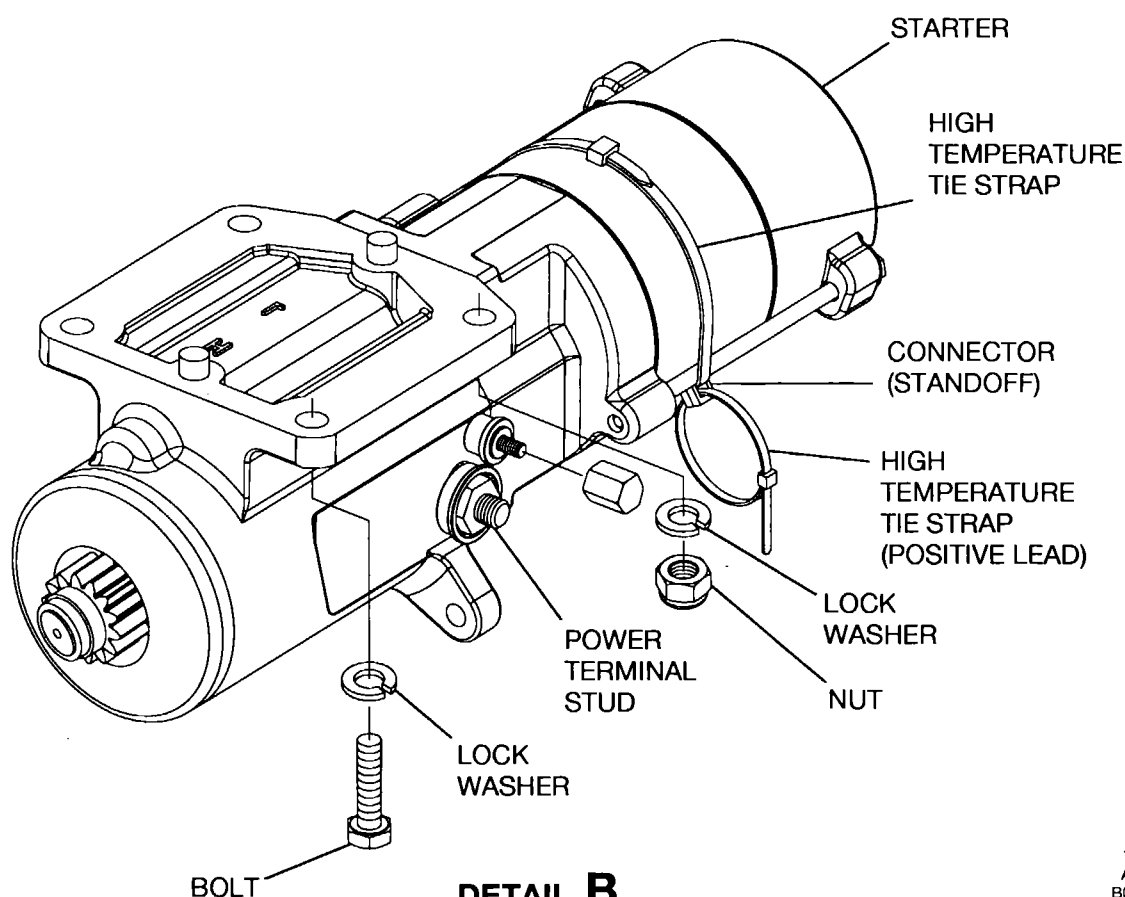
0710T1001  
A-A0750T1002

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**DETAIL A**



**DETAIL B**

Sky-Tec Starter Installation  
 Figure 202 (Sheet 1)

1210T1001  
 A0750T635  
 B0550T1010  
 C0550T1010

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**CAUTION:** Do not use grease, oil or graphite lubricants. Use only silicone spray lubricants which are recommended for correct operation.

- (1) Lubricate the Bendix starter drive assembly with a silicone spray such as Crown Industrial Products silicone spray 8034.

**CHAPTER**

**81**

**TURBINES**



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**TURBINES - GENERAL**

**1. Scope**

- A. This chapter describes procedures and components of the turbocharger.

**2. Definition**

- A. This chapter is divided into sections and subsections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the sections incorporated in this chapter is as follows.
- (1) The section on turbocharger provides procedures and techniques for the adjustment of the absolute pressure sloped controller and for the performance check of the turbocharger and sloped controller.

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**TURBOCHARGER CONTROLS - MAINTENANCE PRACTICES**

**1. General**

- A. The turbocharger is controlled by the wastegate assembly and absolute pressure sloped controller. The sloped controller is designed to maintain the rated deck pressure at wide open throttle, and to maintain a reduced deck pressure at part-throttle settings. The controller senses both deck and manifold pressure and monitors the differential between them. If either the deck pressure or differential pressure rises above pre-determined values for a given throttle setting, the controller opens the exhaust bypass valve, thus lowering compressor speed and output.

A pressure relief valve, set slightly in excess of maximum deck pressure, is installed to prevent excessive overboost in the event of a system malfunction.

**2. Sloped Controller Adjustment**

- A. Sloped Controller Adjustments.

- (1) With engine oil temperature at middle of green arc slowly open throttle and note maximum manifold pressure obtainable. Do not exceed 32.5 inches Hg.
- (2) Using a flat-bladed screwdriver rotate metering valve seat clockwise to increase manifold pressure and counterclockwise to decrease manifold pressure. Lightly tap the unit after each adjustment to seat internal parts. Set manifold pressure to  $32 \pm 0.5$  inches Hg.

**NOTE:** When adjusting rotate in VERY small increments as this is an extremely sensitive adjustment. Approximately 13 degrees rotation will change the manifold pressure reading about one inch Hg.

- (3) Operate engine as in step 2A.(1) to verify that the controller adjustment provides a maximum manifold pressure of  $32 \pm 0.5$  inches of Hg.
- (4) After final adjustment the aircraft must be flight tested to check results.
- (5) Repeat this procedure until desired results are obtained.