

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 covers the removal and installation of individual panels comprising the instrument panel

2. Pilot's Center Panel Removal/Installation

- A. Remove Pilot's Center panel. (Refer to [Figure 201](#)).
- (1) Disconnect negative cable from airplane battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
 - (2) Remove screws securing control column collar.
 - (3) Remove screws securing center panel to pilot's outboard and inboard panels.
 - (4) Disconnect all electrical leads from instruments and tag for reinstallation.
 - (5) Disconnect all lines from instruments. Cap all fittings and plug all lines.
 - (6) Remove panel assembly.
- B. Install Pilot's Center panel. (Refer to [Figure 201](#)).
- (1) Remove caps and plugs and connect lines to instruments.
 - (2) Connect all electrical leads and remove tags.
 - (3) Position center panel and install screws.
 - (4) Install screws securing control column collar.
 - (5) Connect battery negative cable. Refer to Chapter 24, [Battery - Maintenance Practices](#).

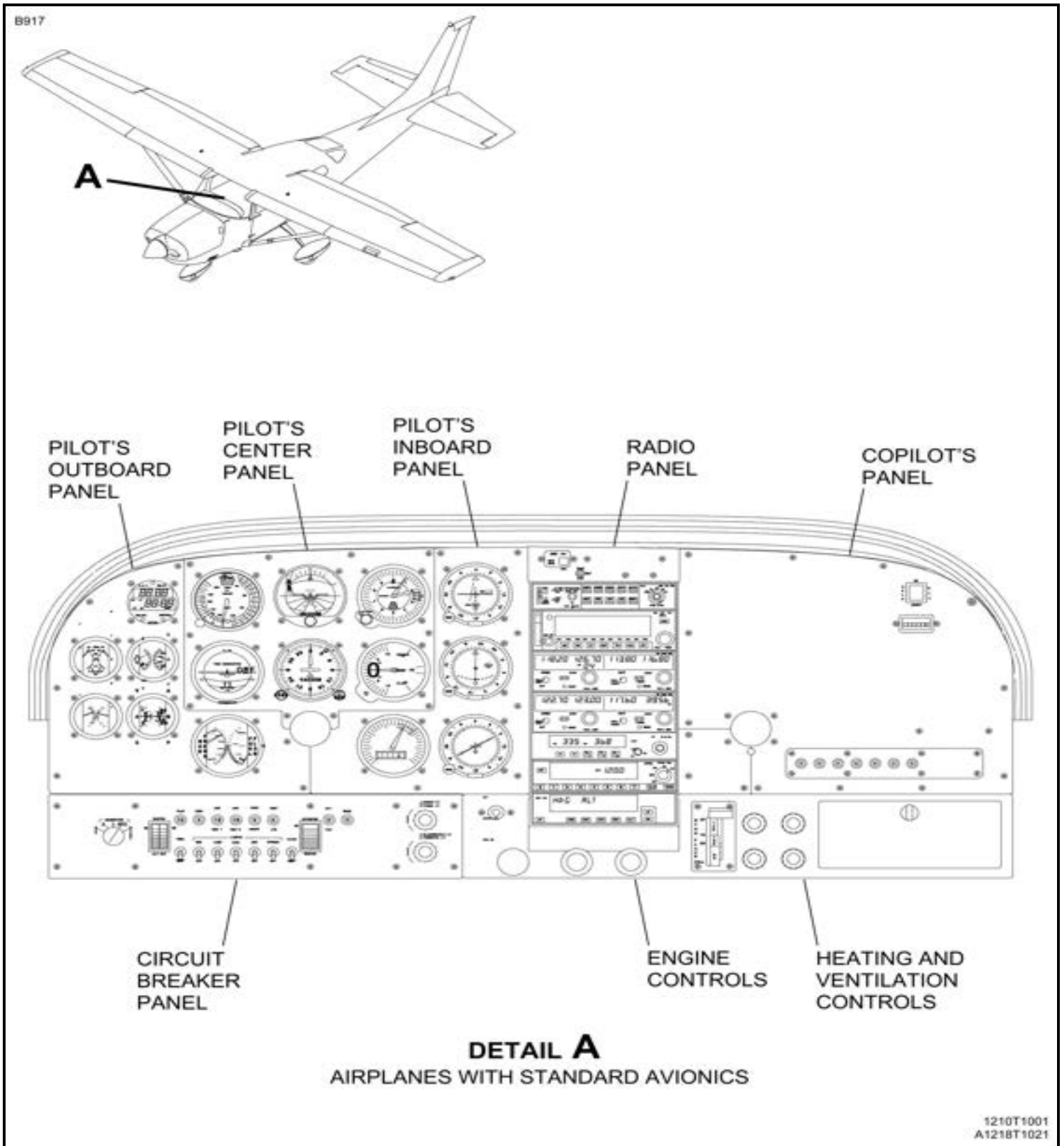
3. Pilot's Inboard/Outboard Panel Removal/Installation

- A. Remove Pilot's Inboard/Outboard Panel. (Refer to [Figure 201](#)).
- (1) Disconnect negative cable from airplane battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
 - (2) Remove screws securing control column collar.
 - (3) Remove screws securing center panel to the pilot's inboard/outboard panel.
 - (4) Disconnect all electrical leads from instruments and tag for reinstallation.
 - (5) Disconnect all lines from instruments. Tag, cap and plug all lines.
 - (6) Remove panel assembly.
- B. Install Pilot's Inboard/Outboard Panel. (Refer to [Figure 201](#)).
- (1) Connect all electrical leads to instruments and remove tags.
 - (2) Connect all lines to instruments and remove tags.
 - (3) Position inboard/outboard panel and install screws.
 - (4) Install screws securing control column collar.
 - (5) Connect battery negative cable. Refer to Chapter 24, [Battery - Maintenance Practices](#).

4. Copilot's Panel Removal/Installation

- A. Remove Copilot's Panel. (Refer to [Figure 201](#)).
- (1) Disconnect negative cable from airplane battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
 - (2) Remove screws securing control column collar.
 - (3) Remove screws securing panel.
 - (4) Disconnect all electrical leads from instruments and tag for reinstallation.
 - (5) Remove panel assembly.
- B. Install Copilot's Panel. (Refer to [Figure 201](#)).
- (1) Connect all electrical leads and remove tags.
 - (2) Position copilot's panel and install screws.
 - (3) Install screws securing control column collar.
 - (4) Connect battery negative cable. Refer to Chapter 24, [Battery - Maintenance Practices](#).

Figure 201 : Sheet 1 : Instrument Panels



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](#) or [Figure 202](#)).

- (1) Make sure the MASTER ALT/BAT and Avionics switch is 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](#) or [Figure 202](#)).

- (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.
- (6) Put the MASTER ALT/BAT and Avionics switch in the on position.

3. Switch Panel Removal/Installation

- A. Remove the Switch Panel (Refer to [Figure 201](#) or [Figure 202](#)).

- (1) Make sure the Master ALT/BAT switch is 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 to the aft side of the panel.
- (4) Disconnect the switches from the electrical connections.

- B. Install the Switch Panel (Refer to [Figure 201](#) or [Figure 202](#)).

- (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](#) or [Figure 202](#)).

- (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](#) or [Figure 202](#)).

- (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](#) or [Figure 202](#)).

- (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.
- (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.
- (6) Remove the screws that attach the control column collars 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 forward side 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 or Figure 202).**

- (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.

Figure 201 : Sheet 1 : Instrument and Control Panel Installation

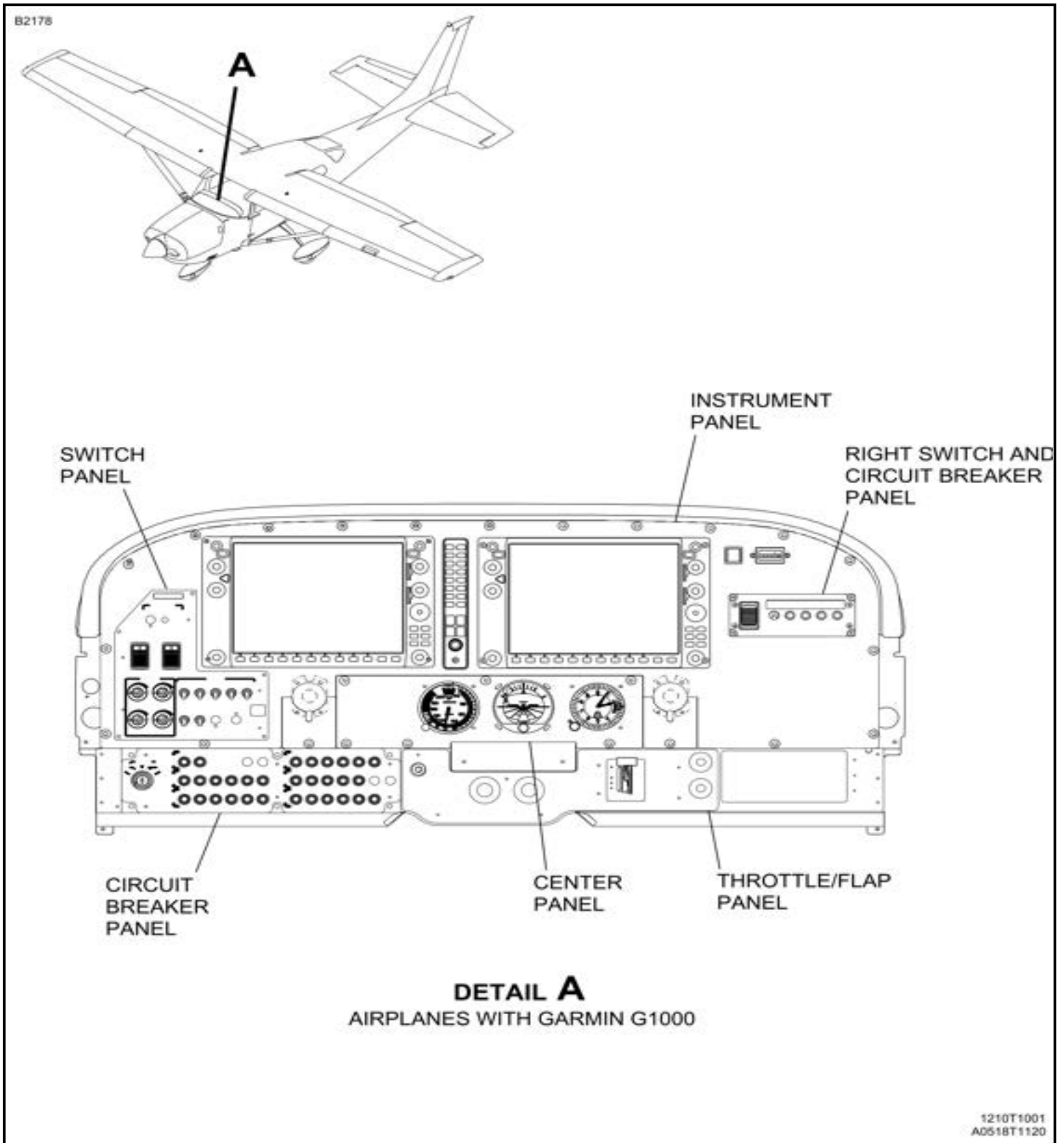
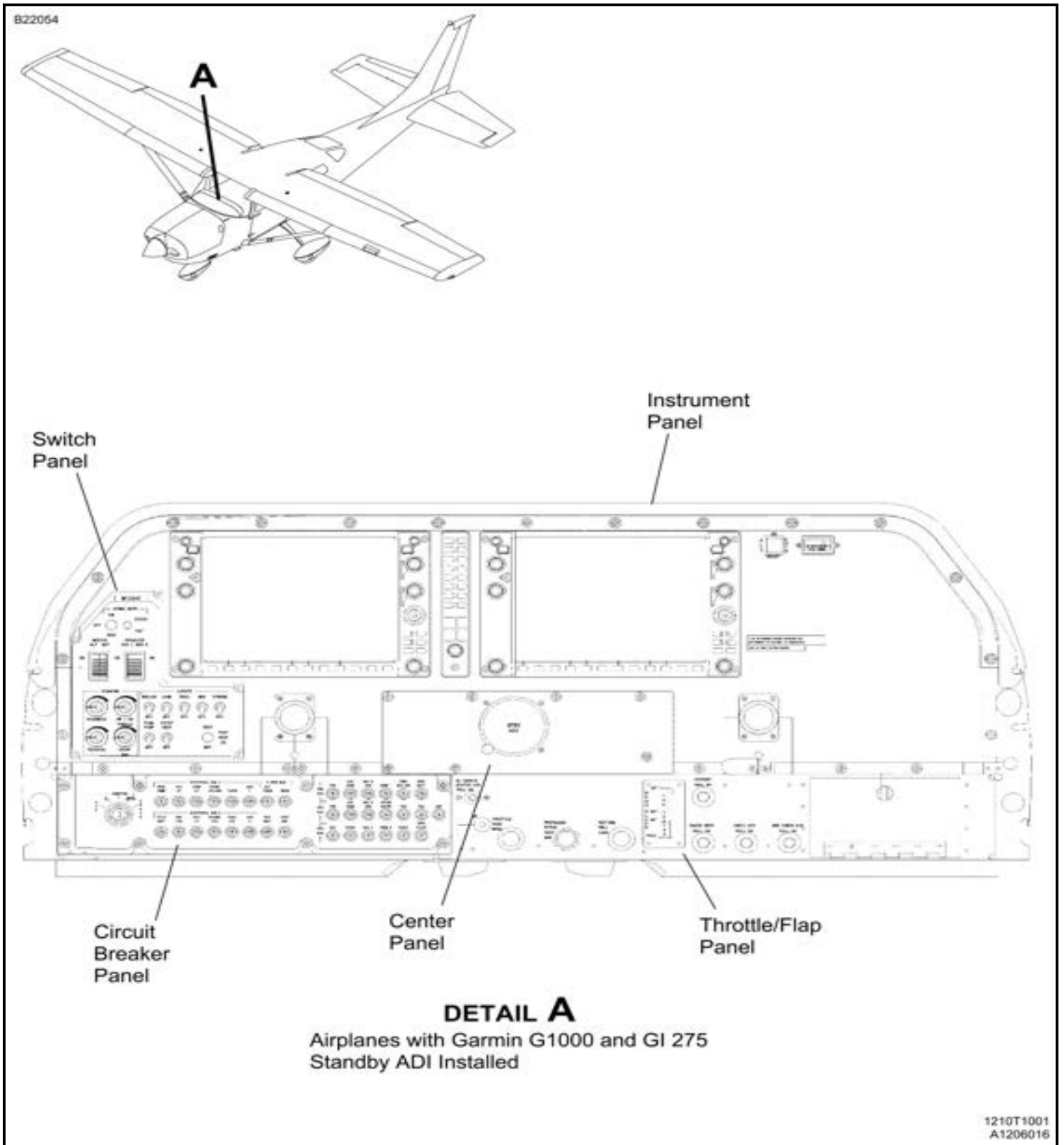


Figure 202 : Sheet 1 :



DIGITAL CLOCK - MAINTENANCE PRACTICES

1. Description and Operation

- A. The digital clock is located in upper left side of the instrument panel and incorporates clock, temperature and voltage readings in a single unit. For removal/installation of the OAT/Clock, refer to [Chapter 34, Outside Air Temperature Gauge - Maintenance Practices](#).

HOUR METER - MAINTENANCE PRACTICES

1. Description and Operation

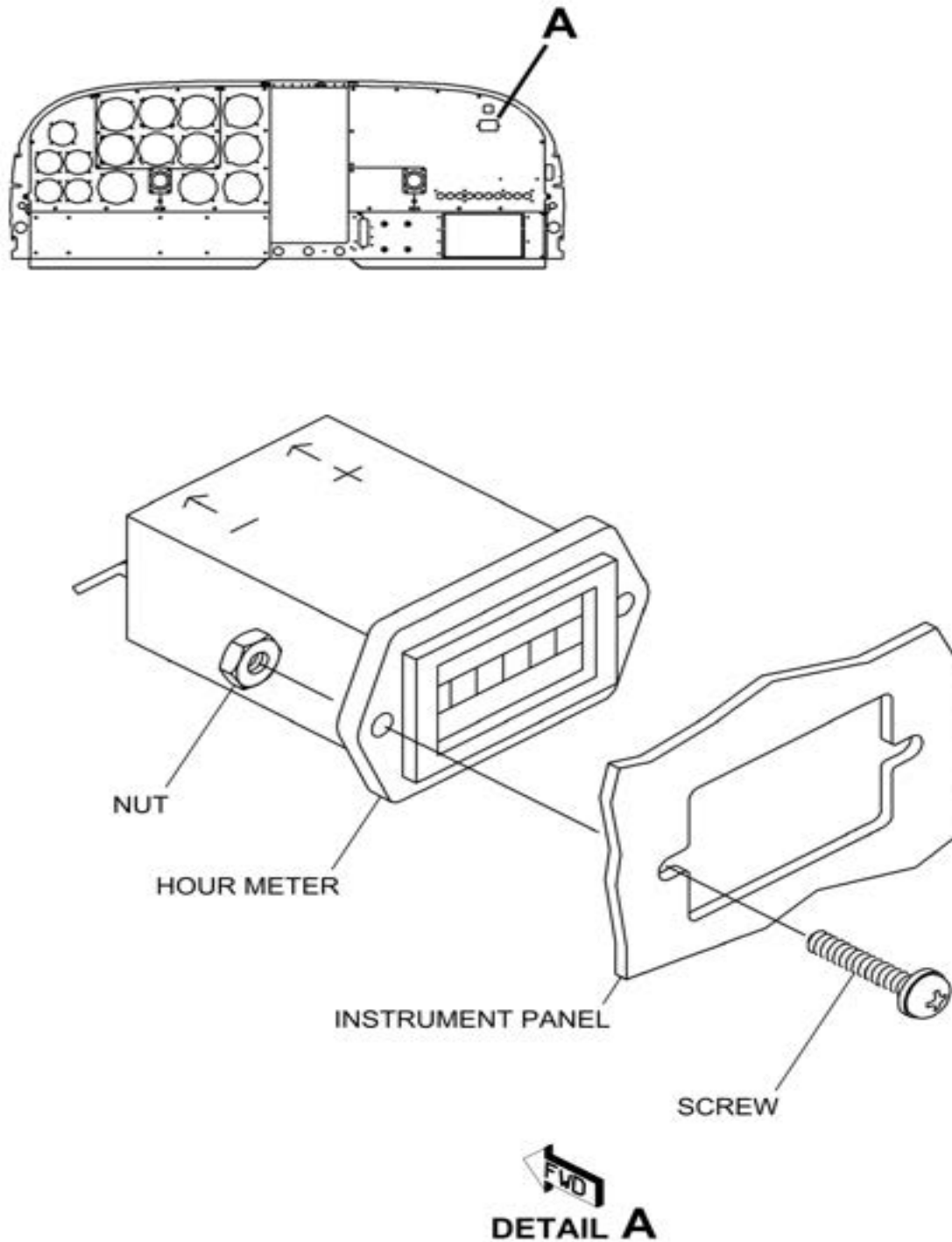
- A. The hour (Hobbs) meter is located in the upper right corner of the instrument panel and provides indication of flight hours based on engine operation.
- B. The hour meter receives power through the WARN circuit breaker located on the lower instrument panel. The hour meter is grounded through the Oil Pressure Switch, 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.

Figure 201 : Sheet 1 : Hour Meter Installation

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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 general description 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 in system troubleshooting.

Table 201. Annunciator Panel Messages and Inputs

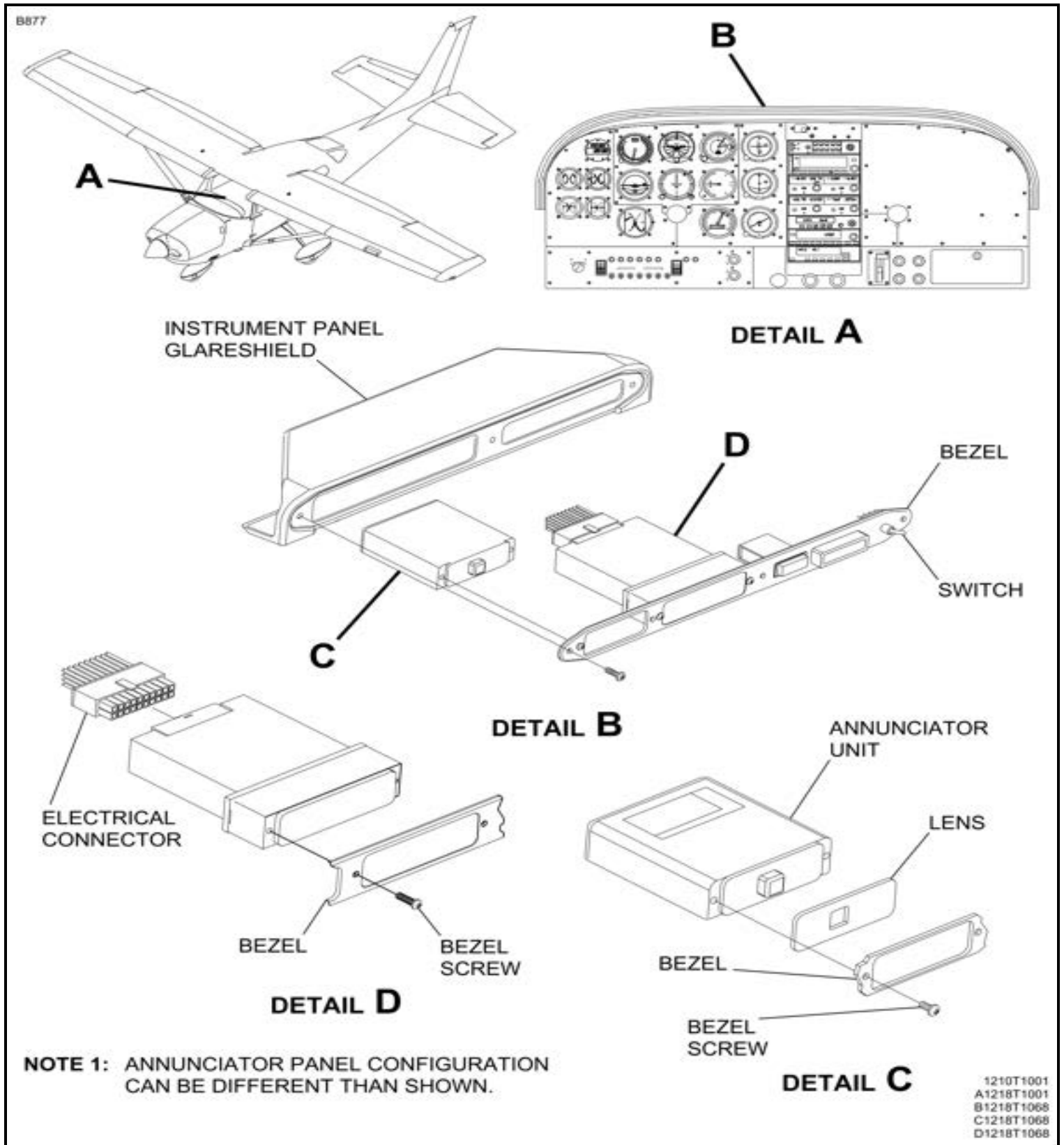
MESSAGE	COLOR	MEANING	SOURCE OF SIGNAL
L LOW FUEL	Amber	Low fuel condition found in the left tank.	Left fuel quantity system.
LOW FUEL R	Amber	Low fuel condition found in the right tank.	Right fuel quantity system.
L LOW FUEL R	Amber	Low fuel condition found in the left and right fuel tanks.	Left and right fuel quantity systems.
L LOW FUEL and left fuel gage needle stay below 0	Amber	Short, open or increasing resistance during a period of time.	Left fuel transmitter or electrical line between the transmitter and fuel gage.
LOW FUEL R and right fuel gage needle stay below 0	Amber	Short, open or increasing resistance during a period of time.	Right fuel transmitter or electrical line between the transmitter and fuel gage.
L LOW FUEL R and both fuel gage needles stay below 0	Amber	Short, open or increasing resistance during a period of time.	Left and right transmitters or electrical lines between the transmitters and fuel gage.
OIL PRESS	Red	Oil pressure less than 20 PSI.	Oil pressure switch that supplies a ground to the annunciator.
L VAC	Amber	Vacuum less than 3.0 In.Hg.	Left vacuum switch (SN012) that supplies a ground to the annunciator.
VAC R	Amber	Vacuum less than 3.0 In.Hg.	Right vacuum switch that supplies a ground to the annunciator.
L VAC R	Amber	Vacuum less than 3.0 In.Hg.	Right vacuum switch and left vacuum switch that supply a ground to the annunciator.
VOLTS	Red	Voltage less than 24.5 VDC, ± 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. Remove the Annunciator Panel. Refer to [Figure 201](#).
- (1) Disconnect the main battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
 - (2) Get access to the back side of the annunciator panel.
 - (3) Disconnect the electrical connectors from the annunciator.

- (4) Remove the screws that attach the annunciator panel to the instrument panel.
 - (5) Carefully remove the annunciator from the airplane.
- B. Install Annunciator Panel (Refer to [Figure 201](#)).
- (1) Connect the electrical connectors to the annunciator panel.
 - (2) Put the annunciator panel in the glareshield and install the screws.
 - (3) Connect the main battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
 - (4) Do a check of the annunciator panel for correct operation.

Figure 201 : Sheet 1 : Annunciator Panel Installation



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
Wrench	Proto Stanley Part No. C418	Watkins Inc. 711 West 2 nd. Wichita, Kansas 67203	To remove cover from brake master cylinder.
Tape	Polyurethane Y8671	Commercially Available	To cover main gear strut at upper end where strut fairing could cause chafing.
Shims	1241660-1, 1241660-3, .125 inch 1241660-2, 1241660-4, .250 inch	Cessna Aircraft Company Cessna Parts Distribution Department 701, CPD 2 5800 East Pawnee Road Wichita, Kansas 67218-5590	To center heavy duty fairing on wheel when wheel alignment shims are installed.
Rivet Setting Kit	199-1	Cessna Aircraft Company	To rivet brake linings to back plate.
Wheel Balancing Equipment		Comercially Available	To balance landing gear wheels.

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](#).

Figure 101 : Sheet 1 : Main Landing Gear Troubleshooting Chart

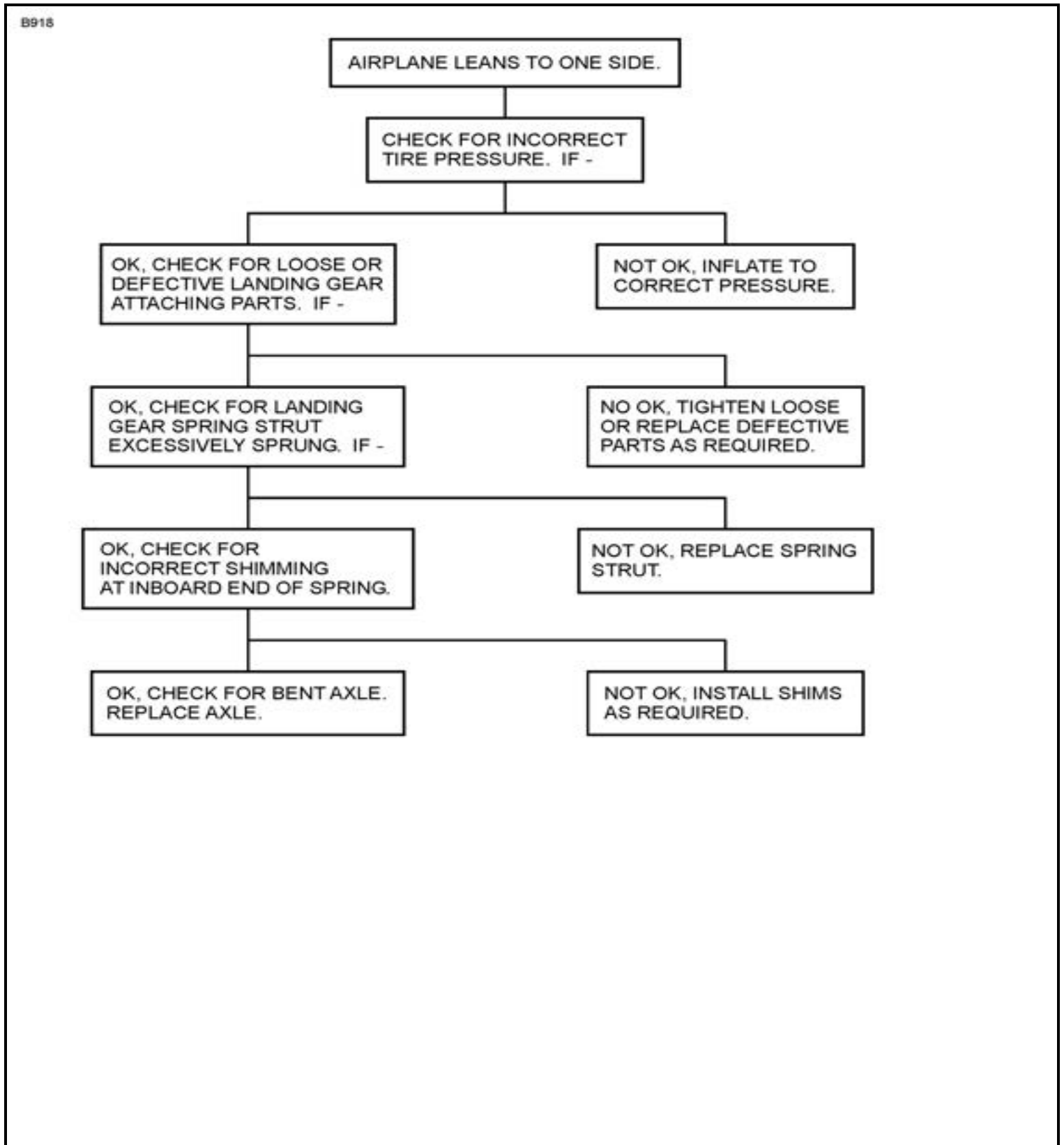
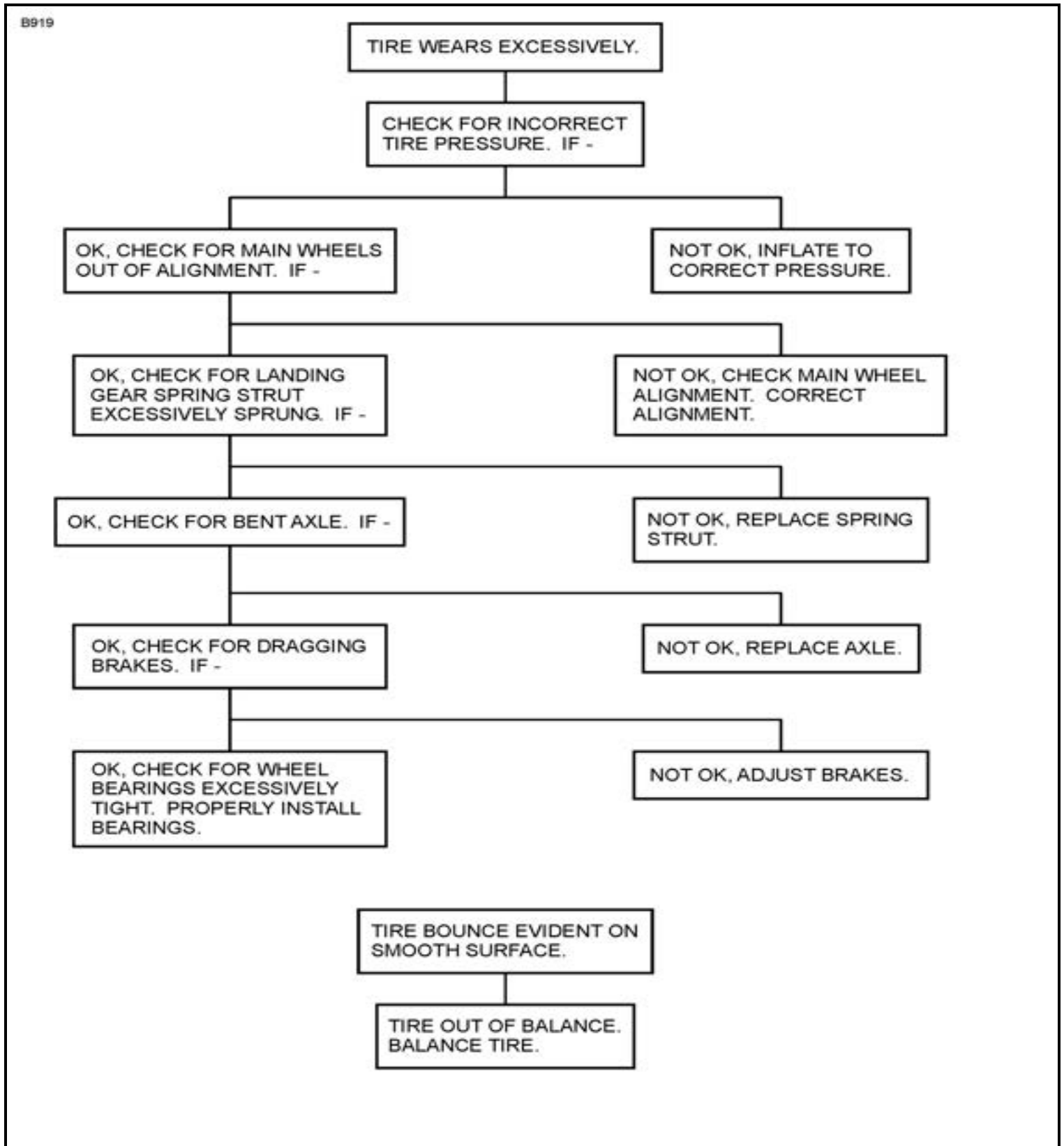


Figure 101 : Sheet 2 : Main Landing Gear Troubleshooting Chart



MAIN LANDING GEAR - MAINTENANCE PRACTICES

1. General

- A. The main landing gear maintenance practices give removal/installation instructions for the left main landing gear. The removal/installation for the right main landing gear is typical unless differently specified.
- B. Standard or heavy-duty size main wheel speed fairings can be installed. The fairings are installed over the wheels and attach to mount plates that attach to the axle mounting flange. The wheel fairings are installed with adjustable scrapers that are installed in the lower aft part of the fairing, behind the wheels. A brake fairing is installed over the lower strut and is attached to the speed fairing.
- C. The flat spring main landing gear struts attach to the airplane at the inboard and outboard forgings. The forgings are located at the center of the fuselage. A hydraulic brake line is routed down the aft side of each spring strut and is enclosed by a fairing.

2. Main Landing Gear Speed Fairing Removal/Installation

- A. Remove the Main Landing Gear Speed Fairing (Refer to [Figure 201](#)).
 - (1) Remove the screws that attach the brake fairing to the main wheel speed fairing.
 - (2) Remove the screws that attach the speed fairing to the mounting plate.
 - (3) If the heavy-duty main wheel speed fairings are installed, record the part number, position, and location of shims between the fairing and mounting plate.
- B. Install the Main Landing Gear Speed Fairing (Refer to [Figure 201](#)).
 - (1) Set the speed fairing in position over the wheel.
 - (2) Install the bolt through the outboard side of the speed fairing to the axle nut.
 - (a) If you have the heavy-duty main wheel speed fairing to install, install the shims in the same position as they were when removed.
 - (3) Install the screws that attach the speed fairing to the mounting plate which is bolted to the axle.
 - (4) Install the screws that attach the brake fairing to the speed fairing.

NOTE: Shims are necessary to set the fairing on the wheel to center when wheel alignment shims are installed.

CAUTION: You must do a check of the clearance every time the scraper has been moved, the tire changed and when you install the speed fairings. Damage can occur if the correct clearance is not set between the tire and scraper. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct rotation. You must clean the scraper for correct tire rotation.

- (5) Do a check of the clearance between the tire and 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 (13.97 mm) to a maximum of 0.80 inch (20.32 mm).
- (6) Clean off any fuel and oil from the speed fairings to prevent stains and deterioration.

CAUTION: Set the tire pressure to the correct pressure. Damage can occur to the fairings if the tire pressure is not correct.

- (7) Do a check of the tire pressure and adjust as necessary. Refer to Chapter 12, [Tires - Servicing](#).

3. Main Landing Gear Brake Fairing Removal/Installation

- A. Remove the Main Landing Gear Brake Fairing (Refer to [Figure 201](#)).
 - (1) Remove the screws from the perimeter of the brake fairing.
 - (2) Remove the screws from the nutplates that hold the fairing together.
 - (3) Remove the brake fairing from the landing gear.
- B. Install the Main Landing Gear Brake Fairing (Refer to [Figure 201](#)).
 - (1) Set the brake fairing over the landing gear.
 - (2) Install screws in the nutplates that hold the fairing together.

- (3) Install screws around the perimeter of the brake fairing.

4. Main Landing Gear Removal/Installation

- A. Remove the Main Landing Gear (Refer to [Figure 201](#)).

NOTE: This procedure is for the removal of the landing gear as a complete assembly.

- (1) Remove the pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (2) Remove access plate [230JB or 230KB](#). 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 connect the fuselage fairing to the fuselage.
- (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 comes out of the fuselage skin.
 - (a) Put a cover on or put a plug in the disconnected fittings to prevent contamination.
- (7) Remove the bolt, countersunk washer, flat washer, and nut that connects the spring strut and to the inboard forging.
- (8) Remove any shims and record the position and location of shims, if removed.
- (9) Remove the bolts, washers, and nuts that attach the spring strut and channel to the outboard forging.

CAUTION: Make sure that you are careful when the channel is removed so that damage does not occur to it.

- (10) Remove the spring strut from the fuselage forgings.
 - (a) Record the shims put below the inboard end of the spring.
 - (b) Identify the shims to be sure they are replaced correctly after the installation of the landing gear.

- B. Install The Main Landing Gear (Refer to [Figure 201](#)).

- (1) Install the channel in outboard forging.

NOTE: The convex surface of the channel is installed against the lower side of the strut. The concave side of the channel is to be installed pointed down, so that it touches the lower edge of the slot in the forging.

- (2) Install the seal and external fairing plate over the upper end of the landing gear spring.
- (3) Install the spring into place and put the shims in position at the inboard end of the spring.
 - (a) Install the bolt and countersunk washer in the top of the inboard end of the spring at the inboard forging. Make sure that the bolt with the countersunk washer is correctly installed.
 - (b) Install the washer and nut on the bottom of the inboard forging.

NOTE: Aluminum shims are installed at the inboard end of the spring, as necessary, to make the wings level within a total tolerance of 3.00 inches. The maximum number of shims permitted is two. Do not use steel washers for shims.

- (c) Torque the inboard bolt to 160 to 190 inch-pounds.
- (4) Install the bolts with the countersunk washers in the top of the outboard forging and channel. Make sure that the bolt with the countersunk washer is correctly installed.
- (5) Install the nuts on the bottom of the outboard forging.
- (6) Torque the outboard bolts to 660 to 750 inch-pounds.
 - (a) Make sure that when the outboard bolts are torqued, no less than 80% of the channel touches the lower side of the strut.
- (7) Install the access plate [230JB or 230KB](#). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (8) Remove the caps and connect the hydraulic brake line to the fitting.
 - (a) Install the bleeder screw.
 - 1 Fill and bleed the brake system. Refer to [Brake System - Maintenance Practices](#).
- (9) Install the fuselage fairing with the screws to the fuselage.
- (10) Remove the airplane from jacks. Refer to Chapter 7, [Jacking - Maintenance Practices](#).
- (11) Install the pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (12) Complete a check of the wheel alignment. Refer to [Main Wheel Alignment](#).

5. Brake Line Fairing Removal/Installation

A. Remove the Brake Line Fairing (Refer to [Figure 201](#)).

- (1) Remove the brake fairing. Refer to [Remove Main Landing Gear Brake Fairing](#).
- (2) Disconnect the brake line at the brake assembly.
 - (a) Put a cap on or a plug in the line and fitting to prevent contamination.
- (3) Remove the brake line out of the clip and move the line away from the strut.
- (4) Remove the brake line fairing from the airplane.
- (5) Remove all of the original adhesive, as well as any rust, paint or scale, with a wire brush and sandpaper.
- (6) Sand the inner surface of the brake fairing.
 - (a) Move the sandpaper marks lengthwise to leave primer on the strut.

CAUTION: Solvent must not be used on vinyl fairing.

- (7) Thoroughly clean the bonding surfaces.
 - (a) Remove all of the solvent with a clean, dry cloth if a solvent is used.
- (8) Let the surfaces be slightly roughed or abraded, and prevent deep scratches or nicks.

NOTE: It is important for the surfaces to be dry and clean.

B. Install the Brake Line Fairing (Refer to [Figure 201](#)).

- (1) Prepare the Type IV adhesive. Refer to the manufacturer's directions.
- (2) Apply a thin coat of adhesive to each of the bonding surfaces.
- (3) Press the brake line into the groove of the fairing.
 - (a) Raise the fairing to attach it to the aft side of the strut.
 - (b) Fit the brake line into the clip.
- (4) Immediately Wind masking tape around the fairing and strut in five equally spaced places.
 - (a) Remove too much adhesive with solvent.
- (5) Let the adhesive to fully cure, refer to the manufacturer's directions, before flexing the gear.
- (6) After the recommended curing time, remove the tape and connect the brake line.
- (7) Prime the strut.
- (8) Paint the strut to the original color if necessary.
- (9) Fill and bleed the brake system. Refer to [Brake System - Maintenance Practices](#).
- (10) Install the brake fairing. Refer to [Install Main Landing Gear Brake Fairing](#).

6. Main Wheel Alignment Check

A. Align the Main Wheel (Refer to [Figure 202](#), Table 201 and Table 202).

NOTE: You can get main wheel alignment through the use of tapered shims between the flange of the axle and axle mounting fitting.

- (1) Set the toe-in and camber within the tolerances listed in Table 201, Camber Adjustment, while the cabin and fuel cells are empty to get approximately zero toe-in and zero camber at gross weight.

NOTE: The setting is zero toe-in and zero camber at normal operating weight.

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'	---

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

- (a) If the airplane is normally operated at less than gross weight and abnormal tire wear occurs, align the wheels to get the setting for the load conditions under which the airplane normally operates.

NOTE: Always use the least number of shims possible to get the desired result.

- (2) Make sure that the floor is level in the work area.
- (3) Hang a plumb bob from the tie down ring and from the forward inspection cover plate. The plumb bob must be attached to the forward screw of the inspection plate.

NOTE: The cover plate is located aft of the nose gear on the bottom of the fuselage.

7. Main Landing Gear Step Removal/Installation

A. Remove The Main Landing Gear Step (Refer to [Figure 201](#)).

- (1) Tap the main landing gear step out of position to remove it. Use a non-metallic tool.

CAUTION: Do not finish sand the parts. A slightly roughened surface is necessary to achieve a good bond.

- (2) Use 180 grit aluminum oxide sandpaper or cloth to remove all the corrosion and old adhesive from the step.
- (3) Use 180 grit aluminum oxide sandpaper or cloth to remove the old adhesive and any corrosion from the area on the main landing gear spring that the step will be bonded to.
- (4) Remove all the deep nicks or scratches.

B. Install The Main Landing Gear Step (Refer to [Figure 201](#)).

- (1) Make sure that you prime the landing gear step and spring separately for increased corrosion protection.
- (2) Apply primer to the main landing gear step. Refer to Chapter 20, [Interior and Exterior Finish - Cleaning/Painting](#).
- (3) Apply primer to the main landing gear spring. Refer to Chapter 20, [Interior and Exterior Finish - Cleaning/Painting](#).
- (4) Bond the primed step to the primed landing gear spring using Type II Class A adhesive.

- (5) Tap the step firmly into the attach point to make a tight fit.
- (6) Do not place any weight on the step until the sealant has cured.
- (7) Apply a small fillet of adhesive at all edges of the attach point.
- (8) Paint the primed areas of the main landing gear step and spring.
- (9) After the paint has dried, seal the intersection of the spring and step assembly using Type XIV Class B sealant.

8. Main Landing Brake Clip Removal/Installation

- A. Remove The Main Landing Gear Brake Clip (Refer to [Figure 201](#)).
 - (1) Tap the brake clip out of position with a non-metallic tool.

CAUTION: Do not finish sand the parts. A slightly roughened surface is necessary to achieve a good bond.
 - (2) Remove all corrosion and old adhesive by hand sanding. Use 180 grip aluminum oxide cloth or paper.
 - (3) Remove all deep nicks or scratches.
- B. Install The Main Landing Gear Brake Clip (Refer to [Figure 201](#)).
 - (1) Apply EA9309.3NA adhesive or equivalent epoxy adhesive to the brake clip.
 - (2) Install the brake clip to the mount. Attach it firmly with a clamp until the sealant has cured.
 - (3) Apply a small fillet of adhesive at all edges of the brake clip at the mount area.

9. Main Landing Gear Corrosion Inspection

- A. Inspect the main landing gear spring assembly for corrosion (Refer to [Figure 201](#)).

NOTE: The bottom surface of the gear leg has a 0.012 Inch compressive distance to prevent stress risers and to extend the spring fatigue life.

 - (1) Inspect the main landing gear spring assembly for corrosion and damage.
 - (a) Find the corrosion damage. Refer to Chapter 51, [Corrosion - Description and Operation](#).
 - 1 Remove the step. Refer to [Main Landing Gear Removal/Installation](#).
 - 2 Make sure that the corrosion and damage does not extend more than the shot peened compressive layer unless the landing gear strut is correctly shot peened to an Almen intensity of 0.007C to 0.010C with 330 steel shot.
 - (2) Remove the corrosion. Refer to the Single Engine Models 172, 182, T182, 206 and T206 1996 and On Structural Repair Manual, Chapter 51, [Corrosion and Corrosion Control - General](#).

CAUTION: Do not use chemical strippers as they are not approved for use on high strength steels due to hydrogen embrittlement.

CAUTION: Do not use a power sander as it is not approved on high strength steels because of the possibility of heat.

 - (a) Use a 180 grit or finer aluminum oxide sandpaper or cloth to sand the main landing gear fairing.
 - (b) Use a 400 grit aluminum oxide sandpaper or cloth to sand the finish on the main landing gear fairing.
 - (c) Use a dry abrasive blast to remove the corrosion in the pitted areas.
 - (3) Use a solvent to clean the main landing gear fairing. Refer to Chapter 20, [General Solvents/Cleaners - Maintenance Practices](#).
 - (4) Install the step. [Refer to Main Landing Gear Removal/Installation](#).
 - (5) Apply a primer and paint the main landing gear fairing as soon as possible to prevent oxidation. Refer to Chapter 20, [Interior and Exterior Finish - Cleaning/Painting](#).
 - (a) Apply Matterhorn white 830 series Acry Glo polyurethane topcoat.

Figure 201 : Sheet 1 : Main Landing Gear Installation

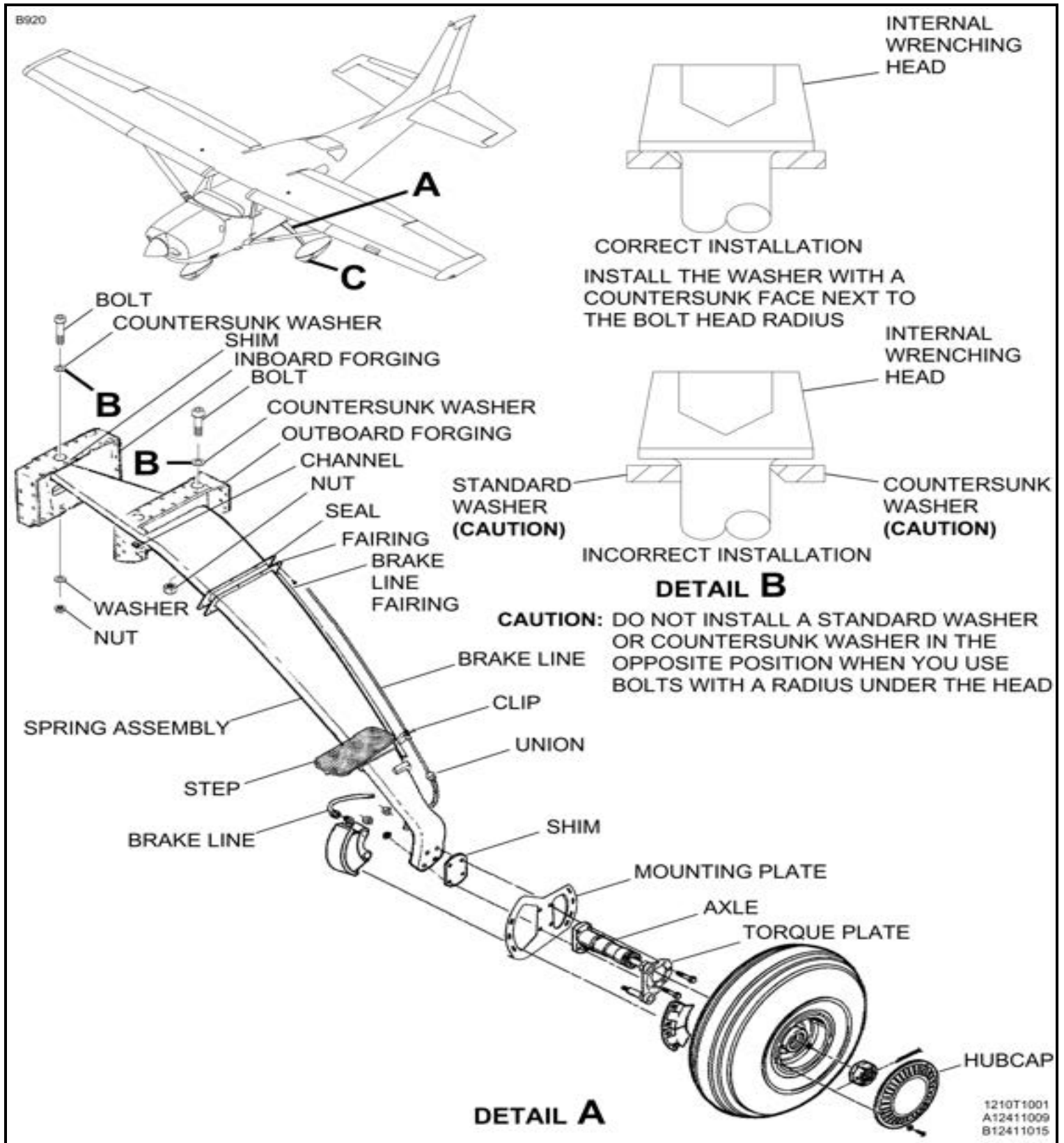


Figure 201 : Sheet 2 : Main Landing Gear Installation

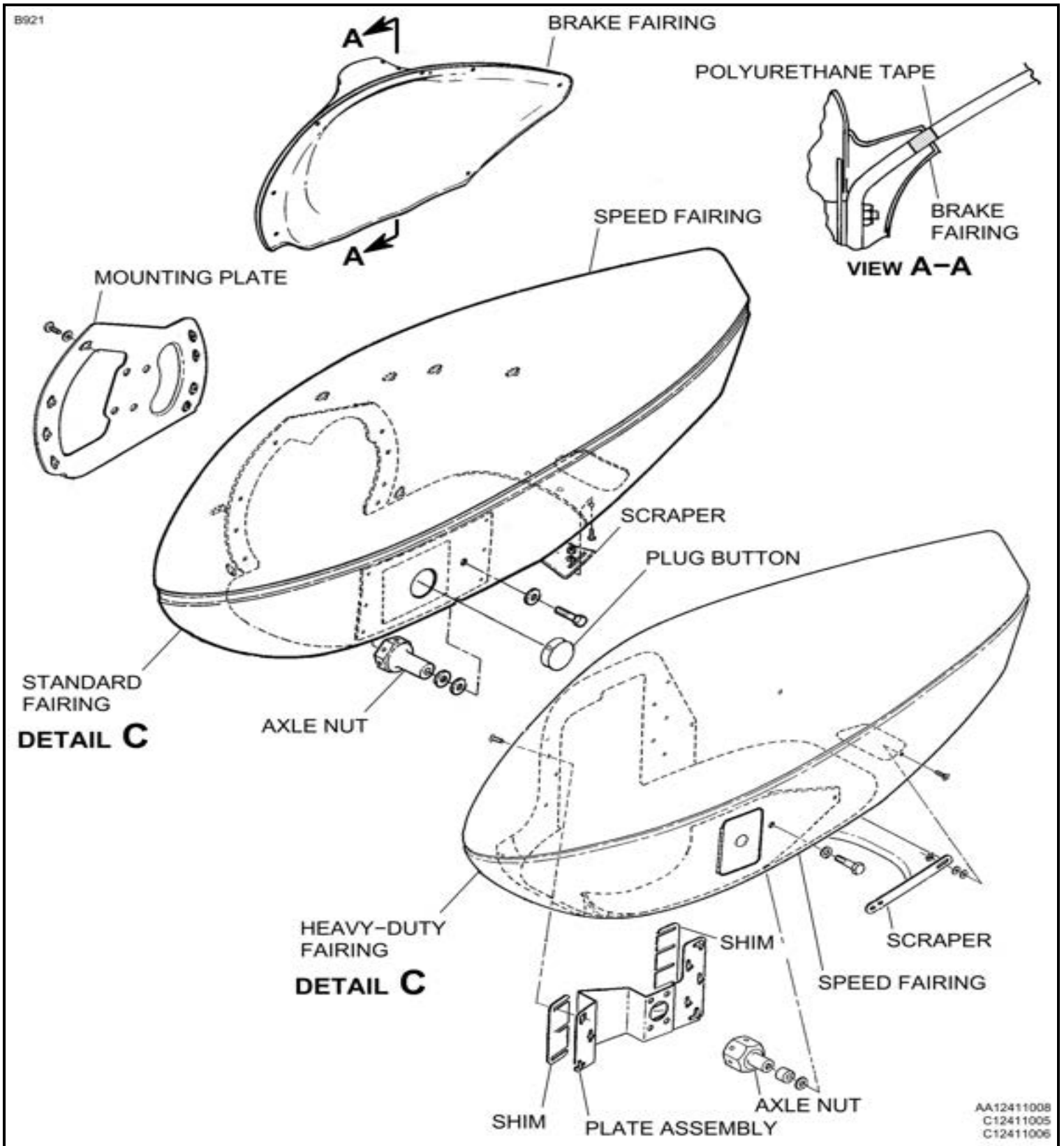


Figure 202 : Sheet 1 : Main Wheel Alignment Check

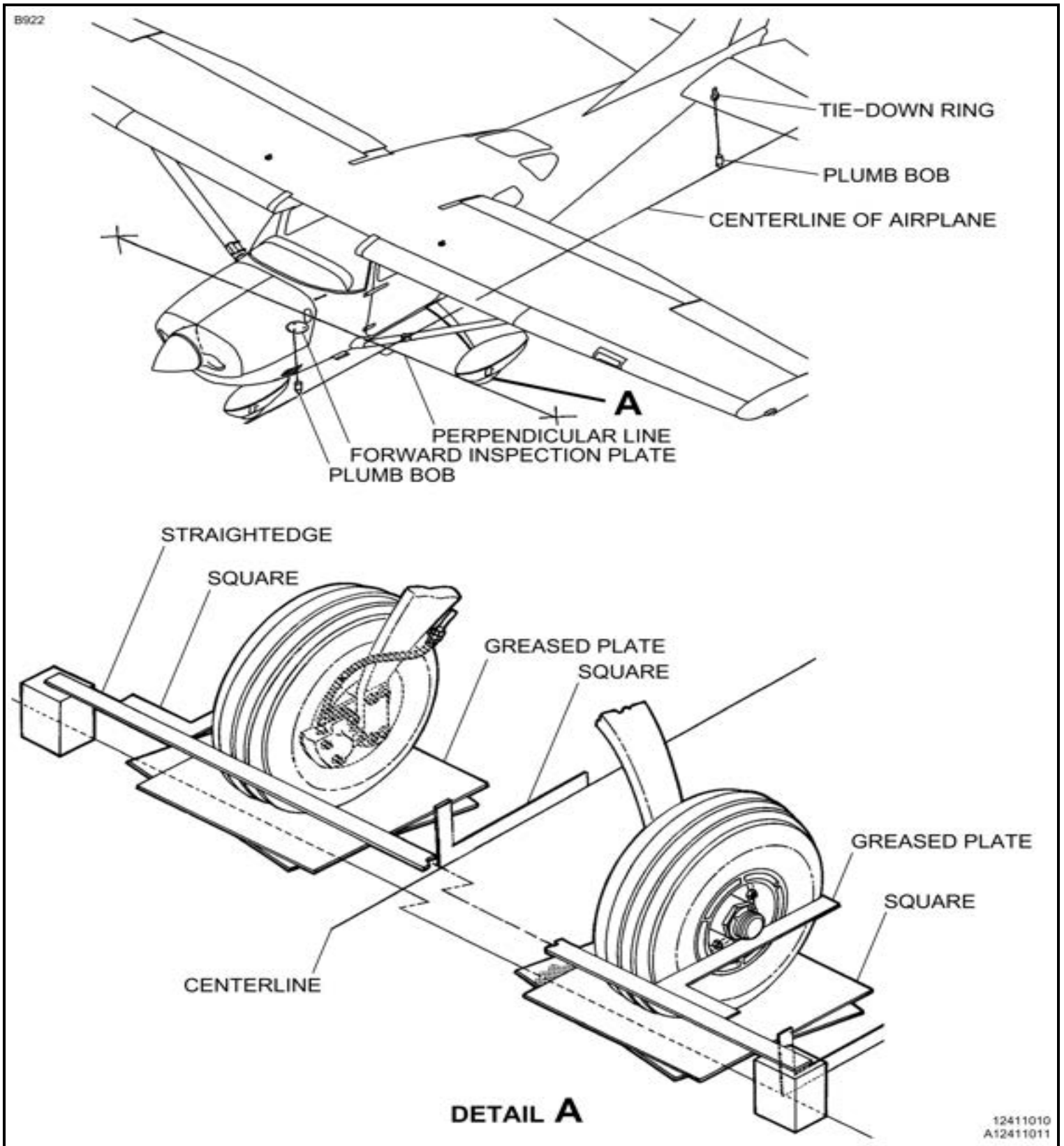
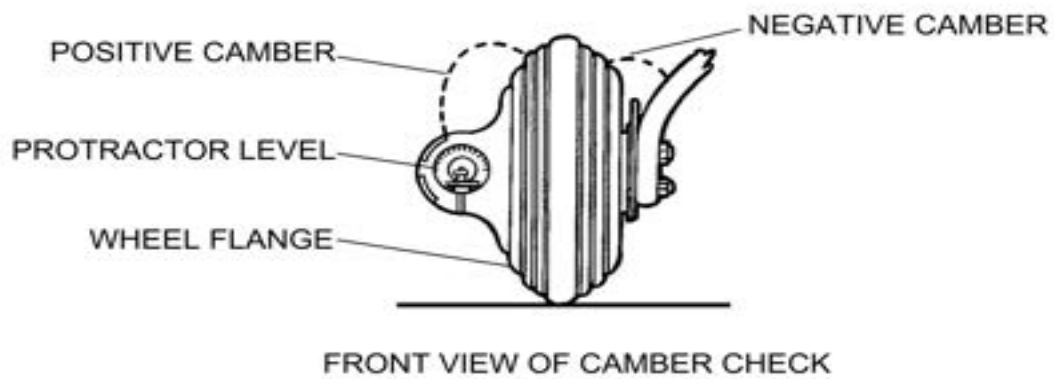
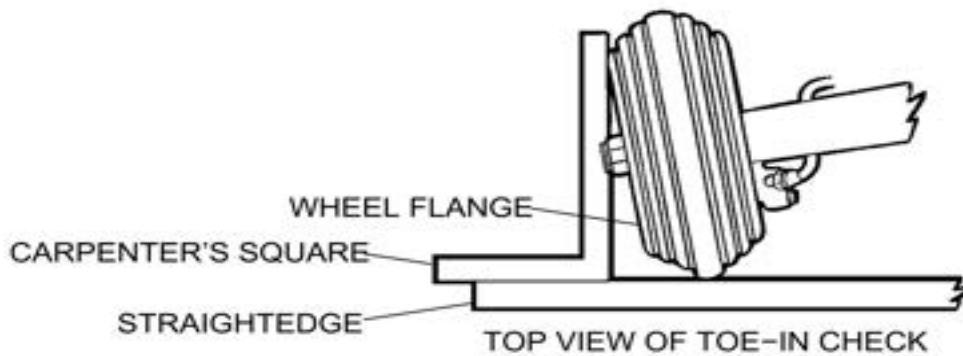


Figure 202 : Sheet 2 : Main Wheel Alignment Check

B923



12411012
12411013

Figure 1 : Sheet 1 : Cabin Floorboard Panels

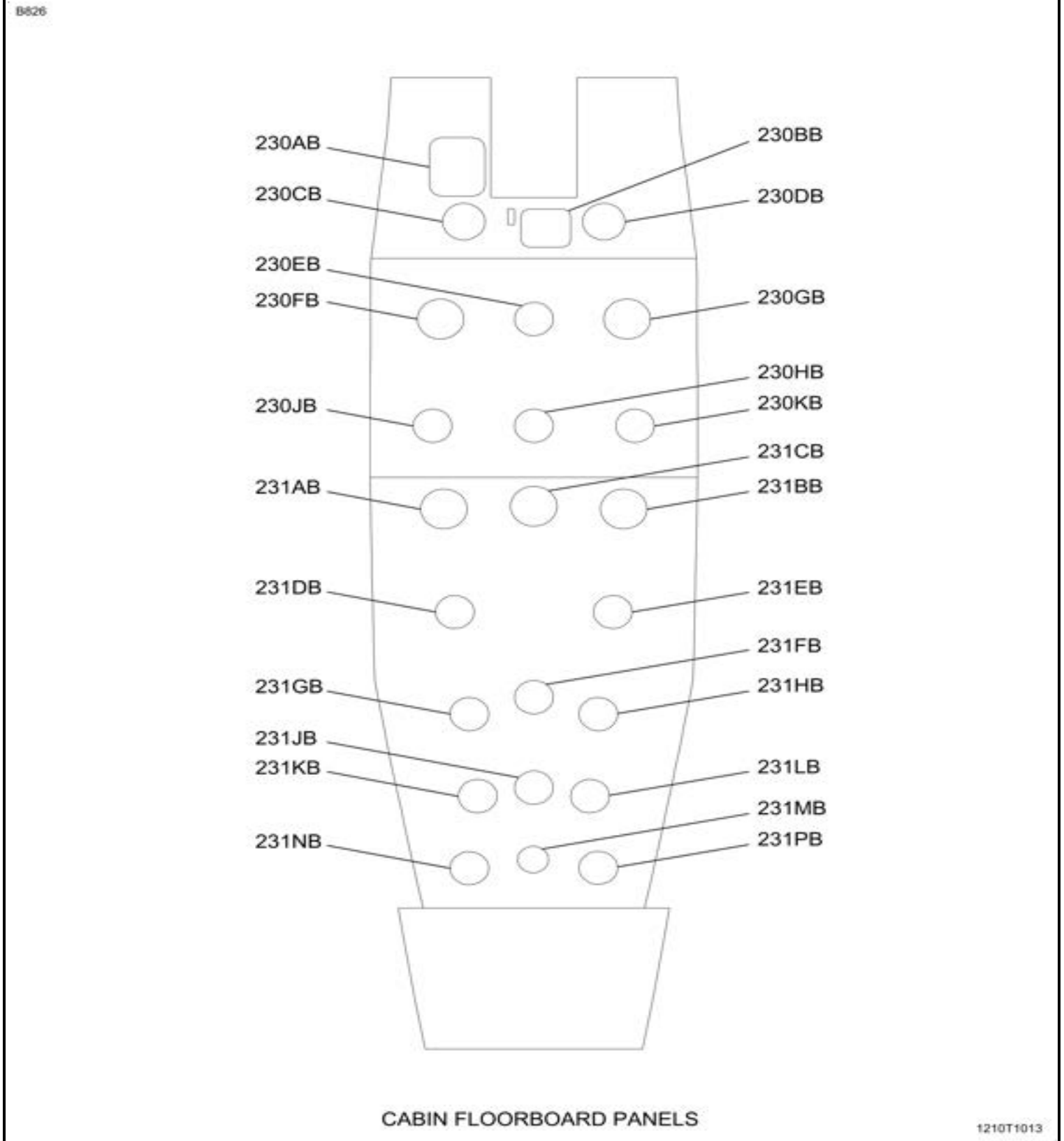
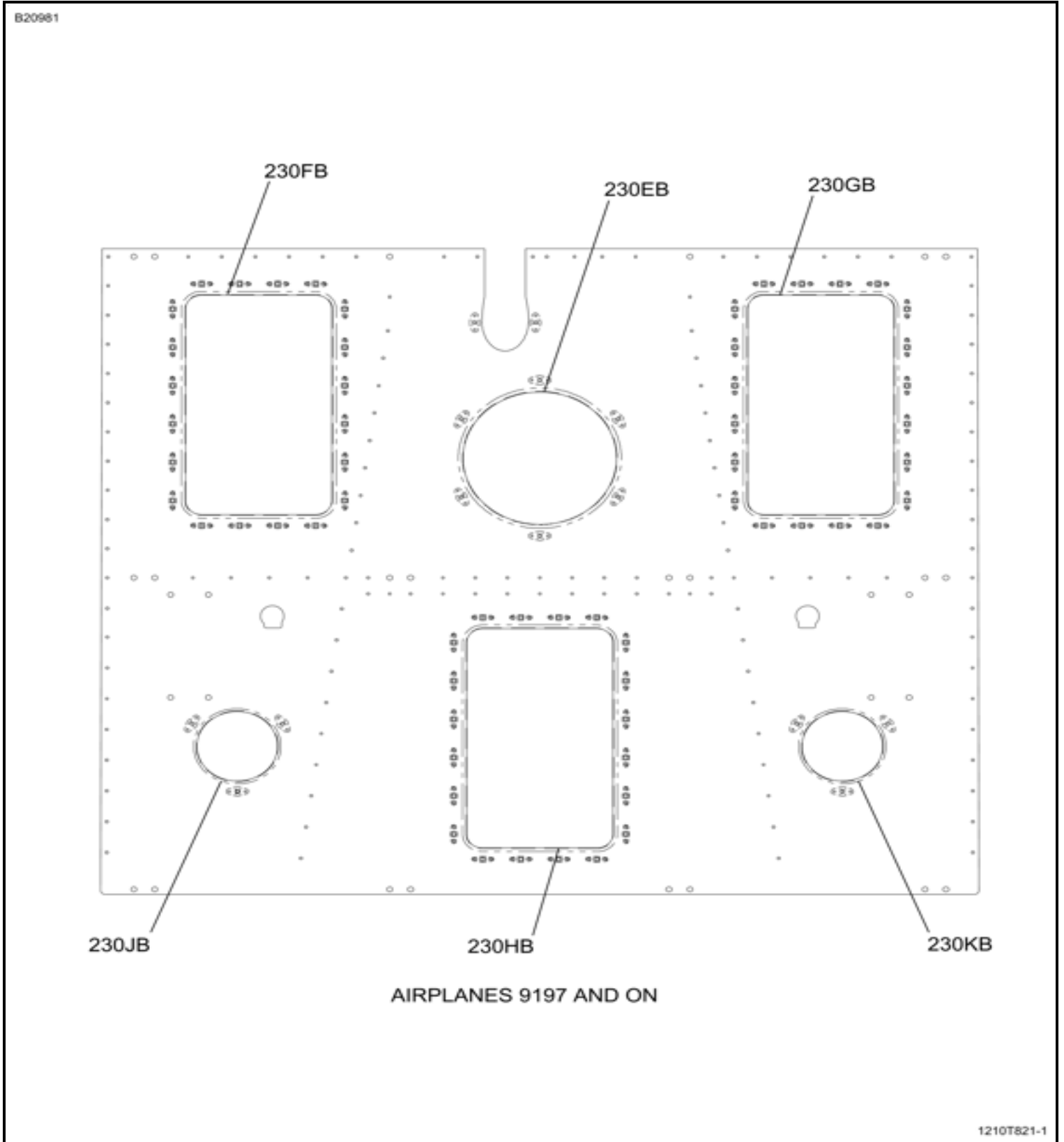


Figure 1 : Sheet 2 : Cabin Floorboard Panels



NOSE LANDING GEAR - TROUBLESHOOTING

1. General

- A. A troubleshooting chart has been provided to aid maintenance technician in system troubleshooting. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Nose Landing Gear Troubleshooting Chart

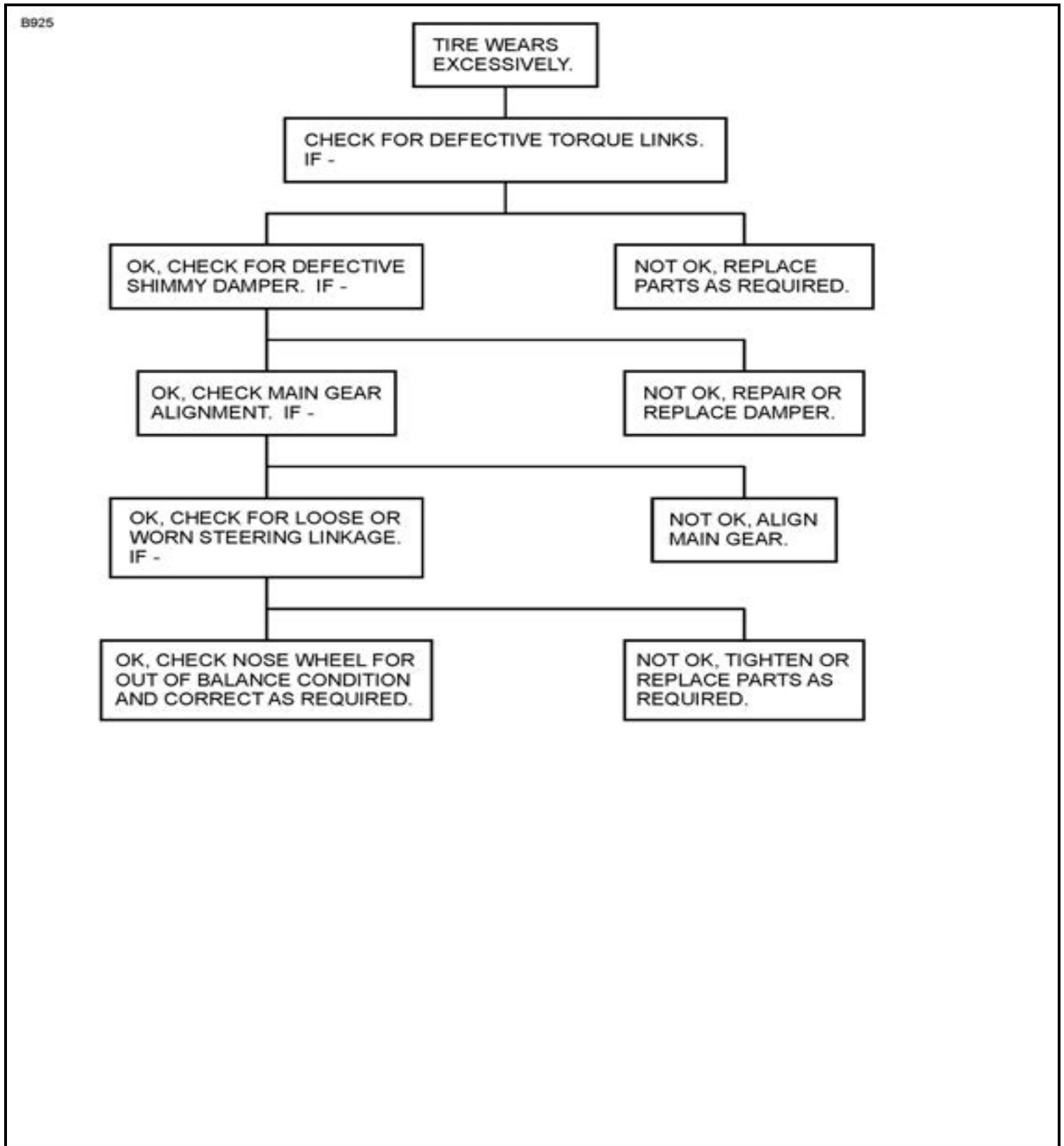


Figure 101 : Sheet 2 : Nose Landing Gear Troubleshooting Chart

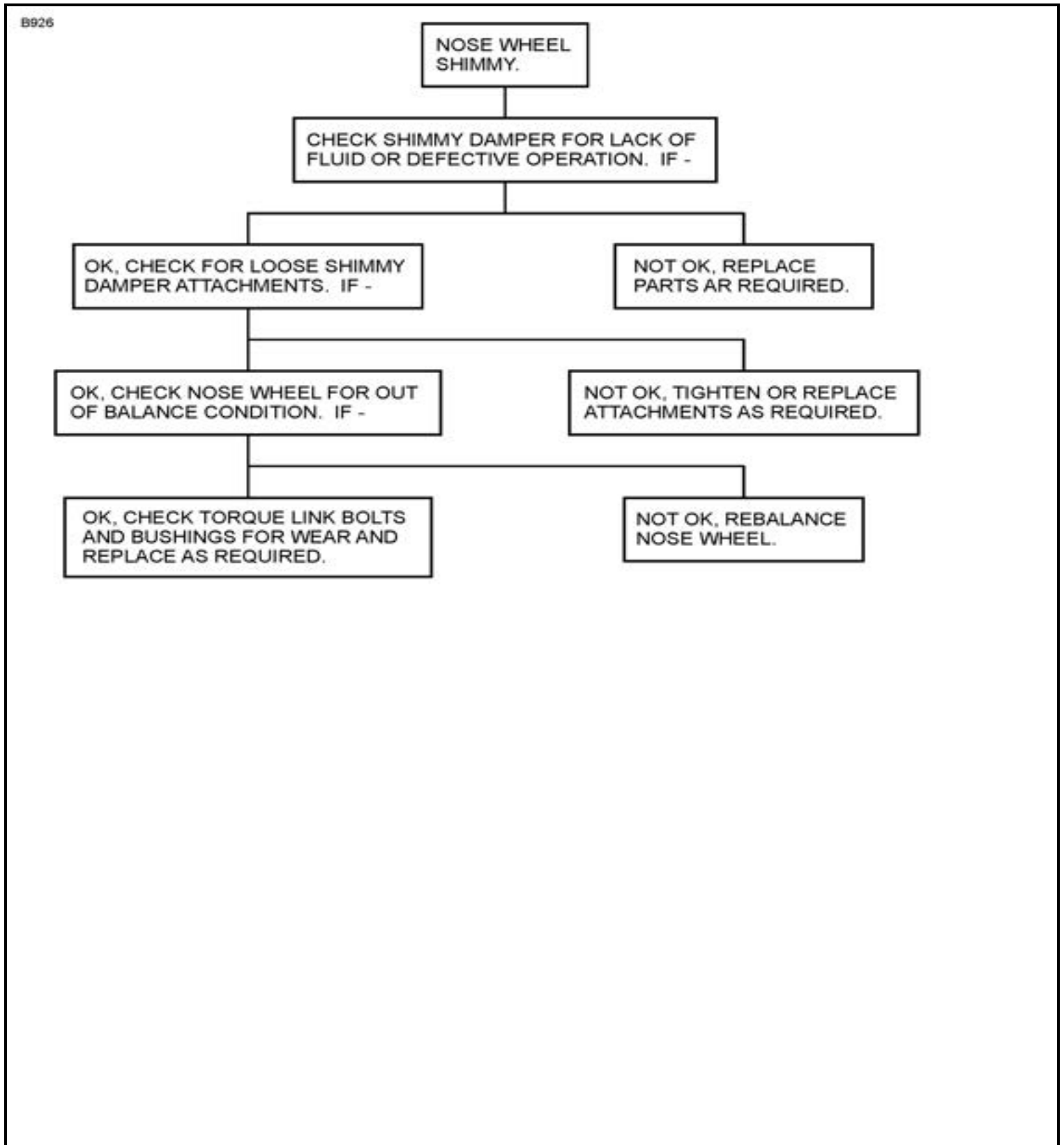
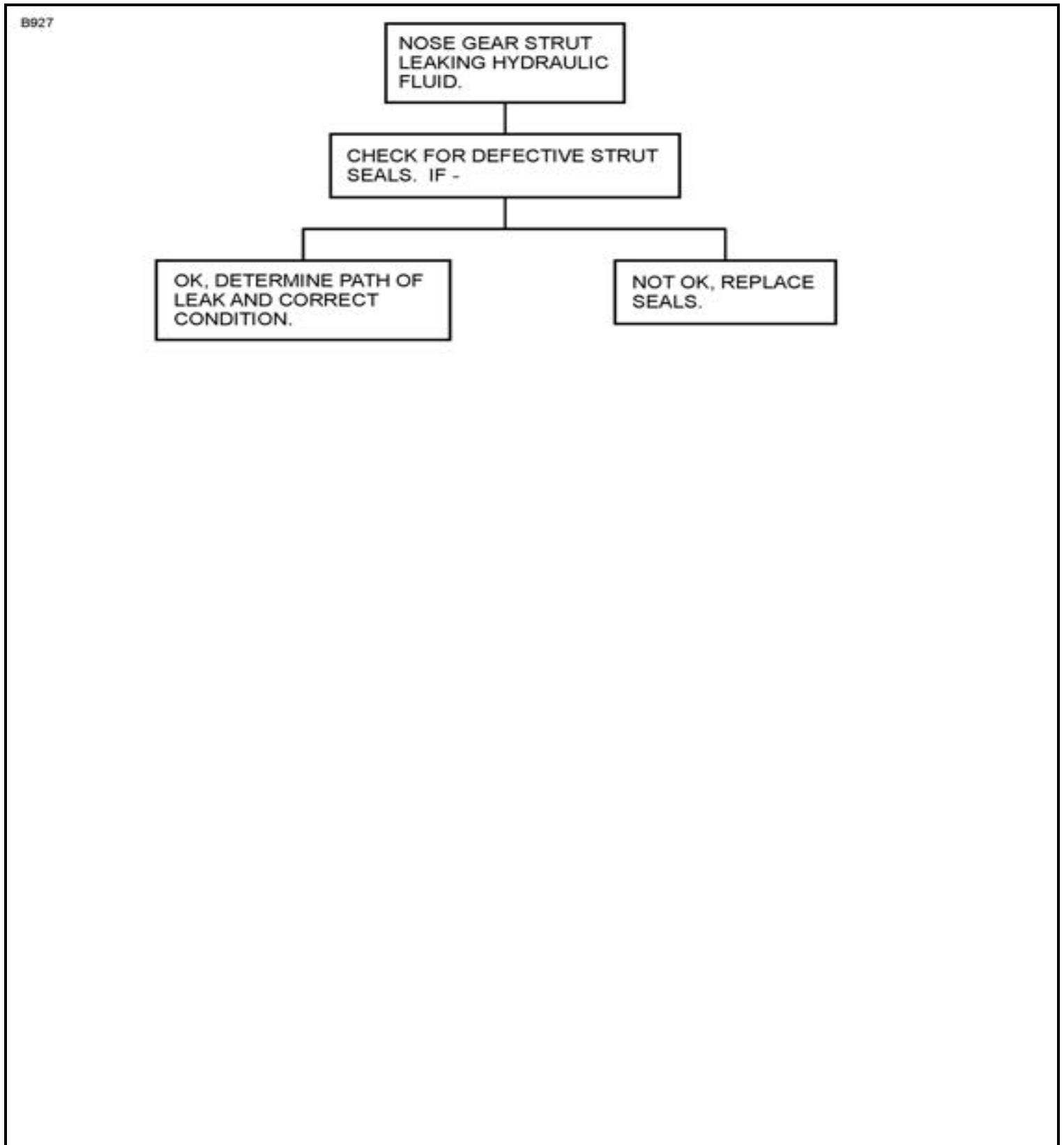


Figure 101 : Sheet 3 : Nose Landing Gear Troubleshooting Chart



NOSE LANDING GEAR - MAINTENANCE PRACTICES

1. General

- A. The nose landing gear is mounted in a fork that is attached to an air/oil (oleo) shock strut. The rudder pedals control the nose wheel. The nose wheel steering system links the rudder pedals to the nose wheel steering arm, affording steering control through the use of the rudder pedals and brakes. When the airplane is moved by hand, never turn the nose wheel more than 35 degrees from each side of the center. A nose wheel speed fairing can be installed.
- B. Torque links keep the lower strut aligned with the nose gear steering system and permit shock strut action.
- C. Shimmy Damper (for airplanes that do not have the Lord Shimmy Damper) - A hydraulic fluid-filled shimmy dampener is supplied to keep nose wheel shimmy to a minimum. The shimmy damper forces hydraulic fluid through small orifices in a piston to offer resistance to shimmy. The damper piston shaft is attached to the nose gear steering shaft, and the housing is attached to a bracket on the lower trunnion.
- D. 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 the nose gear steering shaft, and the housing is attached to a bracket on the lower trunnion.

2. Nosewheel Speed Fairing Removal/Installation

- A. Remove the Nose Wheel Speed Fairing (Refer to [Figure 201](#)).

(1) Weight or tie down tail of airplane to raise nose wheel from floor.

(2) Deflate the nose gear strut completely.

(3) Remove the nose wheel axle stud.

WARNING: Ensure strut is deflated completely before removing bolt that attaches speed fairing to strut or disconnecting torque link.

(4) Disconnect the lower torque link from the lower strut. Let the strut extend.

(5) Remove the bolt that attach the speed fairing, cover plate and tow bar spacers to the strut.

(6) Slide the speed fairing up and remove the nose wheel. Loosen the scraper as necessary.

(7) Turn the speed fairing 90 degrees to the center line of the airplane and move the fairing down over the fork to remove.

- B. Install the 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 ferrules.

(3) Install bolt, tow bar spacers, washers and nut attaching fairing and cover plate to strut.

(4) Connect lower torque link to lower strut.

(5) Install nose wheel axle stud.

(6) Tighten axle stud until a slight bearing drag is obvious when wheel is turned. Back off nut to the nearest castellation and install cotter pin.

CAUTION: Damage will result if correct clearance is not set between the tire and scraper. You must do a check of the clearance every time the scraper has been disturbed or the tire is changed and when you install the speed fairings. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct rotation. You must clean the scraper for correct tire rotation.

(7) Make sure the clearance between the tire and scraper is correct.

(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 (13.97 mm) to a maximum of 0.80 inch (20.32 mm).

(8) Lower the nose of airplane to floor.

(9) Inflate nose gear strut. Refer to Chapter 12, [Nose Landing Gear Shock Strut - Servicing](#).

CAUTION: Damage can result to the fairings if the tire pressure is not correct.

(10) Make sure of the correct tire pressure and adjust as necessary. Refer to Chapter 12, [Tires - Servicing](#).

- C. Remove the Heavy Duty Nose Wheel Speed Fairing (Refer to [Figure 201](#)).

(1) Weight or tie down tail of airplane to raise nose wheel from floor.

- (2) Remove nose wheel axle stud.

WARNING: Ensure strut is deflated completely before removing bolt that attaches speed fairing to strut or disconnecting torque link.

- (3) Deflate nose gear strut completely.
- (4) Disconnect lower torque link from aft fork fitting and allow strut to extend.
- (5) Remove bolt securing speed fairing, long spacer and tow bar spacers to forward fork fitting.
- (6) Slide speed fairing up and remove nose wheel. Loosen scraper as necessary.
- (7) Use a rod or long punch inserted through one ferrule to tap the opposite ferrule out of the fork. Remove both ferrules and remove nose wheel from fork.
- (8) Remove lock ring from inside of lower end of upper strut. A small hole is provided in the lock ring groove to facilitate removal. Refer to [Heavy-Duty Nose Gear Shock Strut Disassembly/Assembly](#).

NOTE: Hydraulic fluid will drain from strut as lower strut is pulled from upper strut.

- (9) Using a straight, sharp pull, remove lower strut from upper strut.
- (10) Remove speed fairing up over lower strut.

D. Install the Heavy-Duty Nose Wheel Speed Fairing (Refer to [Figure 201](#)).

- (1) Slide speed fairing down over lower strut.
- (2) Install upper strut over lower strut.
- (3) Install lock ring inside ring groove in lower end of upper strut. Refer to [Heavy-Duty Nose Gear Shock Strut Disassembly/Assembly](#).
- (4) When installing lock ring, position lock ring so that one end covers the small access hole in the lock ring groove.
- (5) Install nose wheel in fork and install ferrules.
- (6) Install long spacer between forward lugs of fork and speed fairing. Install tow bar spacers, washers, bolt, and nut.
- (7) Connect lower torque link to aft fork fitting.
- (8) Install nose wheel axle stud.
- (9) Tighten axle stud until a slight bearing drag is obvious when wheel is turned. Back off nut to nearest castellation and install cotter pin.

CAUTION: Damage will result if correct clearance is not set between the tire and scraper. You must do a check of the clearance every time the scraper has been disturbed or the tire is changed and when you install the speed fairings. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct rotation. You must clean the scraper for correct tire rotation.

- (10) Make sure the clearance between the tire and scraper is correct.
 - (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 (13.97 mm) to a maximum of 0.80 inch (20.32 mm).
- (11) Complete maintenance of the shock strut. Refer to Chapter 12, [Nose Landing Gear Shock Strut - Servicing](#).

CAUTION: Damage will result to the fairings if the tire pressure is not correct.

- (12) Make sure the tire pressure is correct and adjust it as necessary. Refer to Chapter 12, [Tires - Servicing](#).

3. Nose Landing Gear Removal/Installation

A. Remove the Nose Landing Gear (Refer to [Figure 201](#)).

- (1) Weight or tie down tail of airplane to raise nose wheel from floor.
- (2) Remove engine cowl. Refer to Chapter 71, [Cowl - Maintenance Practices](#).
- (3) Disconnect nose wheel steering bungee from steering arm.
- (4) Remove bolt and washers to disconnect drag link where it attaches to lower trunnion. Note position of washers during removal of bolt for reinstallation.
- (5) Remove carpet on each side of tunnel at firewall for access to upper trunnion bolts. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

(6) Remove bolts to disconnect upper trunnion from fittings in tunnel structure.

(7) Remove nose gear.

B. Install the Nose Landing Gear (Refer to [Figure 201](#)).

(1) Place nose gear in wheel well.

(2) Install bolts securing upper trunnion in fittings in tunnel structure.

(3) Install bolt and washers and connect drag link where it attaches to lower trunnion. Ensure washers are installed in positions from which they were removed.

(4) Connect nose gear steering bungee at steering arm.

(5) Install engine cowl.

(6) Install carpet to tunnel area. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

(7) Remove weights or tie-down from tail, and lower nose wheel to floor.

4. Standard Nose Gear Shock Strut Disassembly/Assembly

A. Disassemble the Standard Nose Gear Shock Strut (Refer to [Figure 201](#)).

(1) Remove nose wheel speed fairing. Refer to [Nose Wheel Speed Fairing](#).

(2) Remove nose gear. Refer to [Nose Landing Gear](#).

WARNING: Make sure the strut is fully deflated before removing bolt through collar and upper trunnion, lock ring from lower strut, or bolt securing fork to lower strut.

(3) Deflate strut completely.

(4) Remove torque links. Note position of washers, shims, spacers, and bushings.

(5) Remove shimmy damper. Refer to [Shimmy Damper Removal/Installation](#).

(6) Remove steering shaft by driving out roll pins, and removing steering arm.

(7) 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.

(8) Use a straight, sharp pull to separate upper and lower struts. Invert lower strut and drain remaining hydraulic fluid.

(9) Remove lock ring and bearing at top of lower strut.

(10) Slide packing support ring, scraper ring, lock ring and retaining ring from lower strut, noting relative position and top side of each ring, wire together if desired.

(11) Remove and discard O-Rings and backup rings from packing support ring.

(12) Remove bolt securing torque link fitting and remove torque link fitting from lower strut.

(13) 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.

(14) Remove bolt and tab washer from retaining collar.

(15) Unscrew retaining collar and remove shims, washers, and steering collar from upper strut.

(16) Remove clamp attaching filler extension valve to strut, and disconnect from filler valve at top of strut.

(17) Remove bolt at top of strut, and remove collar and orifice support. Remove O-ring and valve from orifice support.

(18) Bushings and bearings in lower trunnion, upper trunnion and collar may be replaced as required. Needle bearing in steering collar should not be replaced, replace entire steering collar if needle bearing is defective.

B. Assemble the Standard Nose Gear Shock Strut (Refer to [Figure 201](#)).

(1) Before you assembly the nose gear shock strut, all of the parts must be clean and examined. Refer to [Nose Gear Shock Strut Inspection/Repair](#).

(2) Lubricate needle bearings in steering collar. Refer to Chapter 12, [Landing Gear and Parking Brake - Lubrication](#).

(3) Lubricate the steering collar and retaining collar during installation with a layer of Petrolatum VV-P-236, hydraulic fluid MIL-PRF-5606 or Dow Corning DC-7.

(4) Install top washer, steering collar, shim(s), and retaining collar.

- (5) Install the retaining collar on the bottom end of the top strut.
- (6) Tighten the retaining collar until it is flush with the bottom end of strut.
- (7) 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.
- (8) 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:

Table 201. Shims

PART NUMBER	THICKNESS
1243030-5	0.006 INCH
1243030-6	0.012 INCH
1243030-7	0.020 INCH

- (9) Install O-ring on base plug.
- (10) Install O-ring on metering pin and install in base plug.
- (11) Install base plug assembly in lower strut fork assembly.
- (12) Install tow bar spacer under head of bolt and install bolt through holes in fork and base plug. Install tow bar spacer, washer, and nut on bolt.
- (13) Install scraper ring, lock ring and retaining ring, making sure they are installed in the same positions from which they were removed.

NOTE: Install backup rings with concave surface next to O-ring.

- (14) Install O-Rings and backup rings in packing support ring.
- (15) Install packing support ring, O-ring, bearing and lock ring at upper end of lower strut assembly. Note top side of bearing.

NOTE: Ensure that beveled edge of bearing is installed up next to lock ring.

- (16) Install upper strut assembly over lower strut assembly.
- (17) 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.
- (18) Install steering shaft up through hole in lower trunnion and hole in upper trunnion.
- (19) Install steering arm over steering shaft and secure with roll pins.
- (20) Install link to bottom of steering shaft and attach opposite end to steering collar.
- (21) If braces were removed, they should be installed, connecting upper trunnion and lower trunnion.
- (22) Attach lower torque link to torque link fitting and upper torque link to steering collar.
- (23) Install O-ring and filler valve in orifice piston support, and install orifice piston support in upper strut; install bolt.
- (24) Service shock strut. Refer to Chapter 12, [Nose Landing Gear Shock Strut - Servicing](#).
- (25) Install strut filler valve extension.

5. Nose Gear Shock Strut Inspection/Repair

- A. Inspect and Repair the Nose Gear Shock Strut (Refer to [Figure 201](#)).
 - (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 must be smoothed with No. 40 emery paper, then cleaned with solvent.

6. Heavy Duty Nose Gear Shock Strut Disassembly/Assembly

- A. Disassemble the Heavy Duty Nose Gear Shock Strut (Refer to [Figure 201](#)).
 - (1) Remove nose wheel speed fairing. Refer to [Remove Heavy Duty Nose Wheel Speed Fairing](#).
 - (2) Remove nose gear. Refer to [Nose Landing Gear](#).

WARNING: Make sure strut is fully deflated before removing bolt through collar and upper trunnion, lock ring from lower strut, or bolt securing fork to lower strut.

- (3) Deflate strut completely.

- (4) Remove torque links. Note position of washers, shims, spacers, and bushings.
- (5) Remove shimmy damper. Refer to [Shimmy Damper Removal/Installation](#).
- (6) Remove steering shaft by driving out roll pins and removing steering arm.
- (7) Remove steering shaft from upper and lower trunnion.
- (8) Remove lock ring from groove inside lower end of upper strut. A small hole is provided at the lock ring grove to facilitate removal of the lock ring.

NOTE: Hydraulic fluid will drain from strut as lower strut is pulled from upper strut.

- (9) Use a straight, sharp pull to separate upper and lower struts.
- (10) Invert lower strut and drain remaining hydraulic fluid.
- (11) Remove lock ring and bearing at top of lower strut.
- (12) Slide O-ring, packing support ring, scraper ring, lock ring, lock ring and retaining ring from lower strut, noting relative position and top side of each ring, wire together if desired.
- (13) Remove and discard O-Rings and backup rings from packing support ring.
- (14) Remove bolt securing tow bar spacers, base plug and metering pin.
- (15) Remove O-Rings and metering pin from base plug.
- (16) Remove bolt and tab washer from retaining collar.
- (17) Unscrew retaining collar and remove shims, washers, and steering collar from upper strut.
- (18) Remove clamp attaching filler extension valve to strut, and disconnect from filler valve at top of strut.

NOTE: Lower strut and fork are press fit, drilled on assembly. Separation of these parts is not recommended, except for installation of new parts.

- (19) Remove bolt at top of strut, and remove collar and orifice support from upper trunnion.
- (20) Remove O-ring and valve from orifice support.
- (21) Bushings and bearings in lower trunnion, upper trunnion and collar can be replaced as required. Do not replace the needle bearing in the steering collar. Replace entire steering collar if needle bearing is defective.

B. Assemble the Heavy-Duty Nose Gear Shock Strut. (Refer to [Figure 201](#)).

- (1) Lubricate needle bearings in steering collar. Refer to Chapter 12, [Landing Gear and Parking Brake - Lubrication](#).
- (2) Lubricate the steering collar and retaining collar during installation with a layer of Petrolatum VV-P-236, hydraulic fluid MIL-PRF-5606 or Dow Corning DC-7.
- (3) Install filler valve and O-ring on orifice support.
- (4) Insert orifice support in upper strut.
- (5) Install collar and secure orifice support, upper strut, and collar to upper trunnion.
- (6) Install top washer, steering collar, shim(s), and retaining collar.
- (7) Screw retaining collar on lower end of upper strut until it is flush with lower end of strut.
- (8) 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.
- (9) 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 202 lists part number and thickness of available shims:

Table 202. Shims

PART NUMBER	THICKNESS
1243030-5	0.006 INCH
1243030-6	0.012 INCH
1243030-7	0.020 INCH

- (10) Install O-ring on base plug.
- (11) Install O-ring on metering pin and install in base plug.
- (12) Install base plug assembly in lower strut fork assembly.

- (13) Install tow bar spacer under head of bolt and install bolt through holes in fork and base plug. Install tow bar spacer, washer, and nut on bolt.
- (14) Install scraper ring, lock ring and retaining ring down over lower strut. Make sure they are installed in the same positions as they were removed.
- (15) Install O-Rings and backup rings in packing support ring. The backup rings must be installed with the concave surface next to the O-ring.
- (16) Install packing support ring, O-ring, bearing and lock ring at upper end of lower strut assembly. Note top side of bearing.
NOTE: Ensure that beveled edge of bearing is installed up next to lock ring.
- (17) Install upper strut assembly over lower strut assembly.
- (18) 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.
- (19) Install steering shaft up through hole in lower trunnion and hole in upper trunnion.
- (20) Install steering arm over steering shaft and secure with roll pins.
- (21) Install link to bottom of steering shaft and attach opposite end to steering collar.
- (22) If braces were removed, they must be installed, connecting upper trunnion and lower trunnion.
- (23) Attach lower torque link to aft lugs of fork and upper torque link to steering collar.
- (24) Service shock strut. Refer to Chapter 12, [Nose Landing Gear Shock Strut - Servicing](#).
- (25) Install strut filler valve extension.
- (26) Install nose gear. Refer to [Nose Landing Gear](#).
- (27) Install nose wheel speed fairing. Refer to [Install Heavy-Duty Nose Wheel Speed Fairing](#).

7. Shimmy Damper Removal/Installation

A. Shimmy Damper Removal (Refer to [Figure 201](#)).

- (1) Remove cotter pin, nut, bolt, and washers from the damper piston rod end.
- (2) Remove the safety wire, bolts, and washers that attach the barrel to the nose wheel steering torque arm.
- (3) Remove the shimmy damper. For airplanes with the Lord Shimmy Damper installed, discard the Lord Shimmy Damper. Do not do a disassembly/assembly of 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 unwanted material 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 washers and the bolts to connect the shimmy damper to the steering torque. Refer to Chapter 20, Torque Data - Maintenance Practices, [Table 201](#).
- (3) Install 0.032-inch stainless steel safety wire. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
- (4) Connect the shimmy damper rod with the bolt, washers, and nut.
- (5) Install the cotter pin through the nut and the bolt.
- (6) To clean and service the shimmy damper, refer to Chapter 12, [Nose Landing Gear Shimmy Damper - Servicing](#).

8. Shimmy Damper Disassembly/Assembly (For airplanes that do not have the Lord Shimmy Damper)

A. Disassemble the Shimmy Damper (Refer to [Figure 202](#)).

NOTE: There is no inspection or overhaul requirement for the Lord Shimmy Damper.

- (1) Remove shimmy damper on nose landing gear. Refer to [Shimmy Damper](#).

- (2) Remove filler plug and drain hydraulic fluid from shimmy damper.
- (3) Remove setscrew, spring, and floating piston from rod assembly.

NOTE: Shop low pressure air applied to the filler port may be needed to force floating piston from rod assembly. Care must be exercised to prevent too much air being applied, shooting the piston out of the rod and creating a safety hazard. It is advisable to provide a means to catch or otherwise stop the piston before it completely exits the rod assembly.

- (4) Remove snap ring, head, and second snap ring from barrel.
- (5) Pull rod assembly from barrel.
- (6) Check all O-Rings and packing ring for serviceability.
- (7) Check piston, rod, and floating piston for serviceability.
- (8) Check inside surface of barrel.
- (9) Check backup ring and retainer ring for serviceability.
- (10) Replace any defective parts.

B. Assemble the Shimmy Damper (Refer to [Figure 202](#)).

- (1) Make sure there are no sharp edges that can damage the O-rings or packing rings before the assembly of the shimmy damper.
- (2) Lubricate the parts that follow during installation with hydraulic fluid MIL-PRF-5606.
- (3) Install the O-ring in the end of the barrel.
- (4) Install the O-ring and retainer ring on the piston.
- (5) Install the O-ring on the floating piston, then install the floating piston, spring, and setscrew in the rod.
- (6) Install the rod assembly in the barrel.
- (7) Install the packing and backup ring in the head if removed.
- (8) Install the O-ring on the head if removed.
- (9) Install the snap ring in the barrel.
- (10) Install the head assembly and outer snap ring.
- (11) Service shimmy damper, refer to Chapter 12, [Nose Landing Gear Shimmy Damper - Servicing](#).
- (12) Install shimmy damper on nose landing gear. Refer to [Shimmy Damper](#).

9. Nose Wheel Steering Removal/Installation

A. Remove the Nose Wheel Steering (Refer to [Figure 203](#)).

- (1) Remove pilot's and copilot's seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (2) Remove pedestal cover.
- (3) Loosen rudder trim chain on lower idler sprocket, on forward side of pedestal.
- (4) Remove nut, bolt, stop, and chain guard.
- (5) Remove cable guard from steering bungee sprocket.
- (6) Remove nut, washer, and bolt securing steering bungee to rudder bar arm.
- (7) Remove chain from steering bungee sprocket.
- (8) Remove clamp securing boot to steering bungee.
- (9) Remove nut, washer, and bolt securing bungee to nose gear steering arm and remove bungee.

B. Install the Nose Gear Steering (Refer to [Figure 203](#)).

- (1) Place steering bungee through boot on firewall.
- (2) Connect steering bungee to nose gear steering arm with bolt, washer and nut.
- (3) Place chain over steering bungee sprocket and connect steering bungee to rudder bar arm with bolt, do not install washer and nut at this time.
- (4) Rig nose gear steering. Refer to [Rigging Nose Wheel Steering](#).
- (5) Install nut, bolt, stop, and chain guard.

- (6) Install clamp on nose wheel steering bungee boot.
- (7) Install pedestal cover.
- (8) Install pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).

10. Rigging Nose Wheel Steering

A. Rig the Nose Wheel Steering (Refer to [Figure 203](#)).

- (1) Remove pedestal cover. Refer to Chapter 27, [Pedestal Cover Removal/Installation](#).
- (2) Remove pilot rudder bar shield.
- (3) Disconnect steering bungee rod end at rudder bar arm.
- (4) Tie down or weight tail to raise nosewheel free of ground.
- (5) Extend strut and ensure nose gear is centered against the external centering stop.
- (6) Loosen bolt securing idler sprocket, slide idler sprocket in the adjustment slot and disengage chain from sprocket.
- (7) Clamp rudder pedals in neutral position.

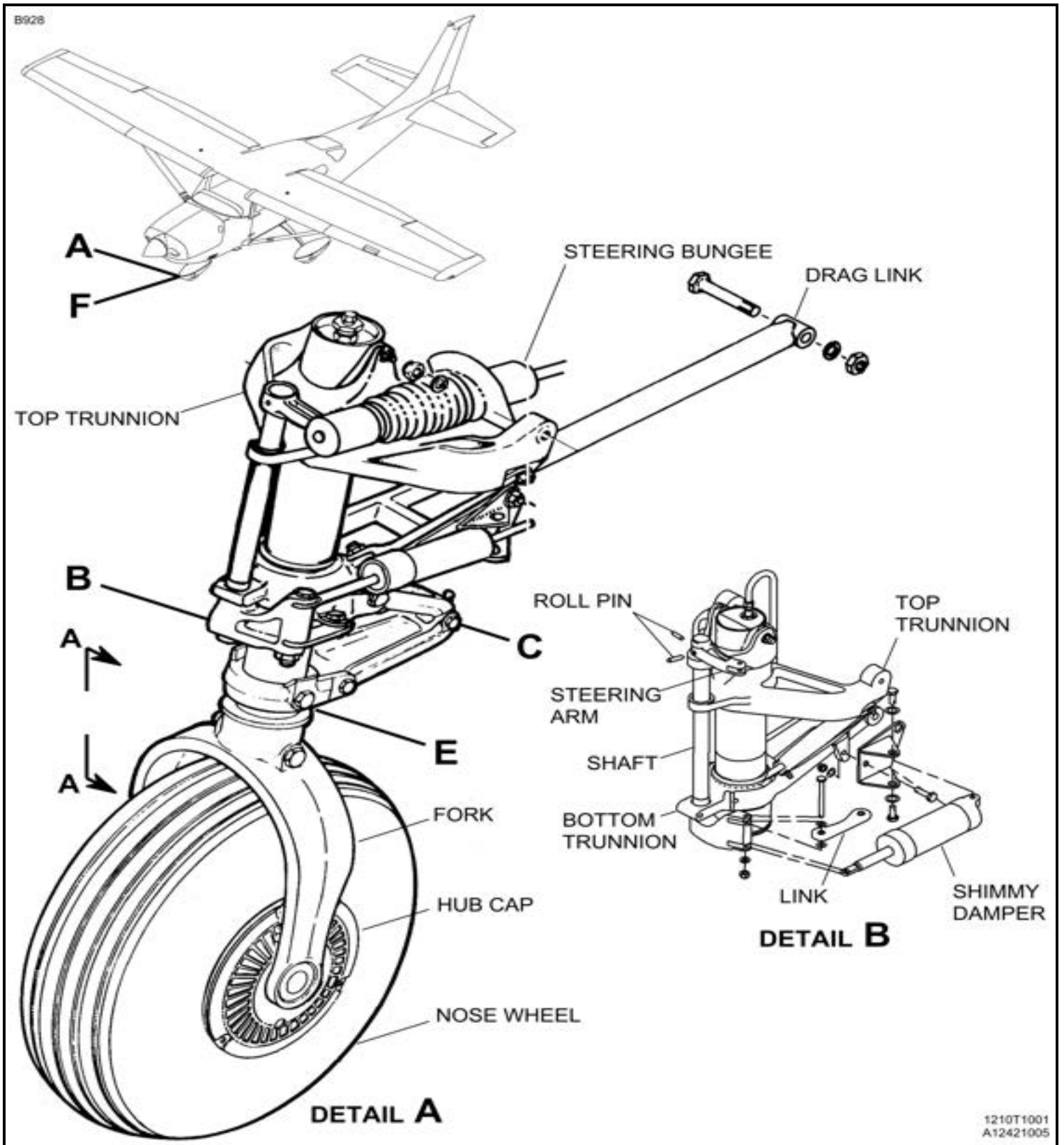
CAUTION: Rig the rudder control system before you rig the trim system.

- (8) Screw bungee sprocket in against bungee shaft, then screw rod end in against sprocket to obtain bungee shortest length.
- (9) Holding rod end to prevent turning, rotate sprocket until hole in rod end aligns exactly with attaching hole on rudder bar arm and connect.
- (10) Engage chain on sprockets and tighten idler sprocket so chain is taut but not tight.
- (11) Remove clamps and run trim wheel through its full range of travel, observing full indicator travel is reached before full bungee extension or contraction.

WARNING: Make sure rudder moves in the correct direction when you operate the trim wheel.

- (12) Lower nose gear to ground and install all parts removed for access.

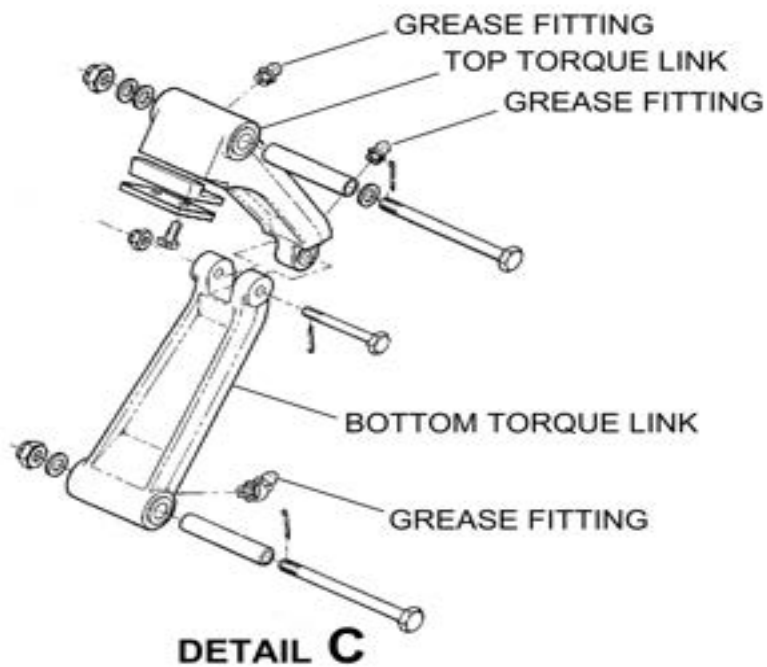
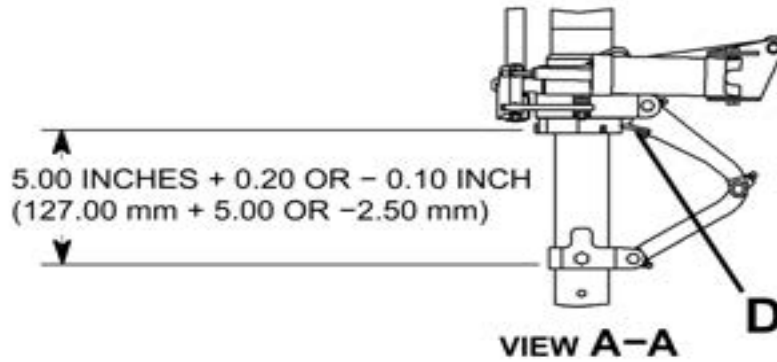
Figure 201 : Sheet 1 : Nose Landing Gear Installation



1210T1001
A12421005

Figure 201 : Sheet 2 : Nose Landing Gear Installation

B929



CENTERING STOP LUG

MATERIAL CAN BE REMOVED
FROM THIS AREA TO GET THE
SPECIFIED DIMENSION AT
FULL EXTENSION OF THE STRUT.

DETAIL D

1210T1001
AA12421013
C12421014
D12421010

Figure 201 : Sheet 3 : Nose Landing Gear Installation

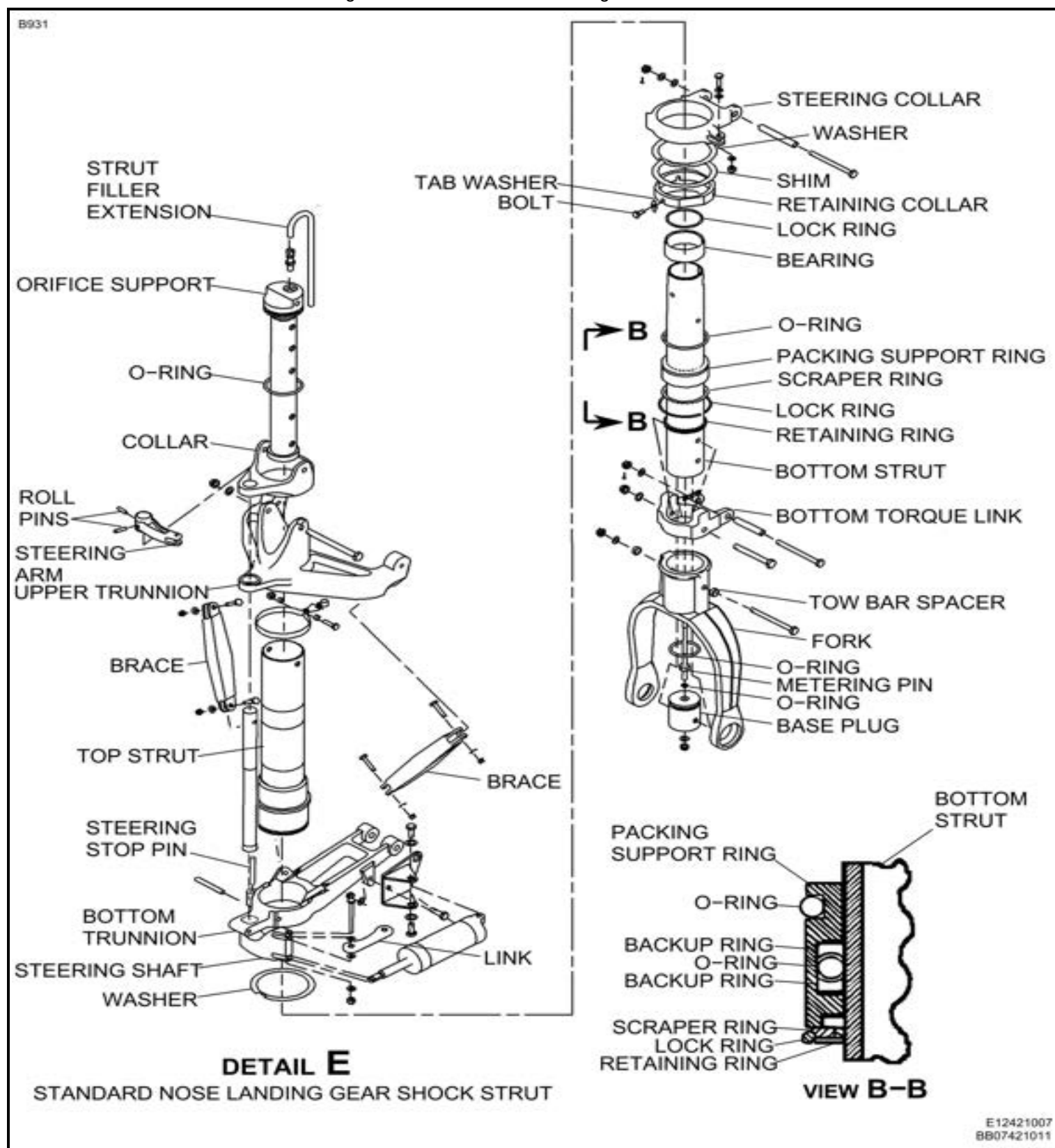


Figure 201 : Sheet 4 : Nose Landing Gear Installation

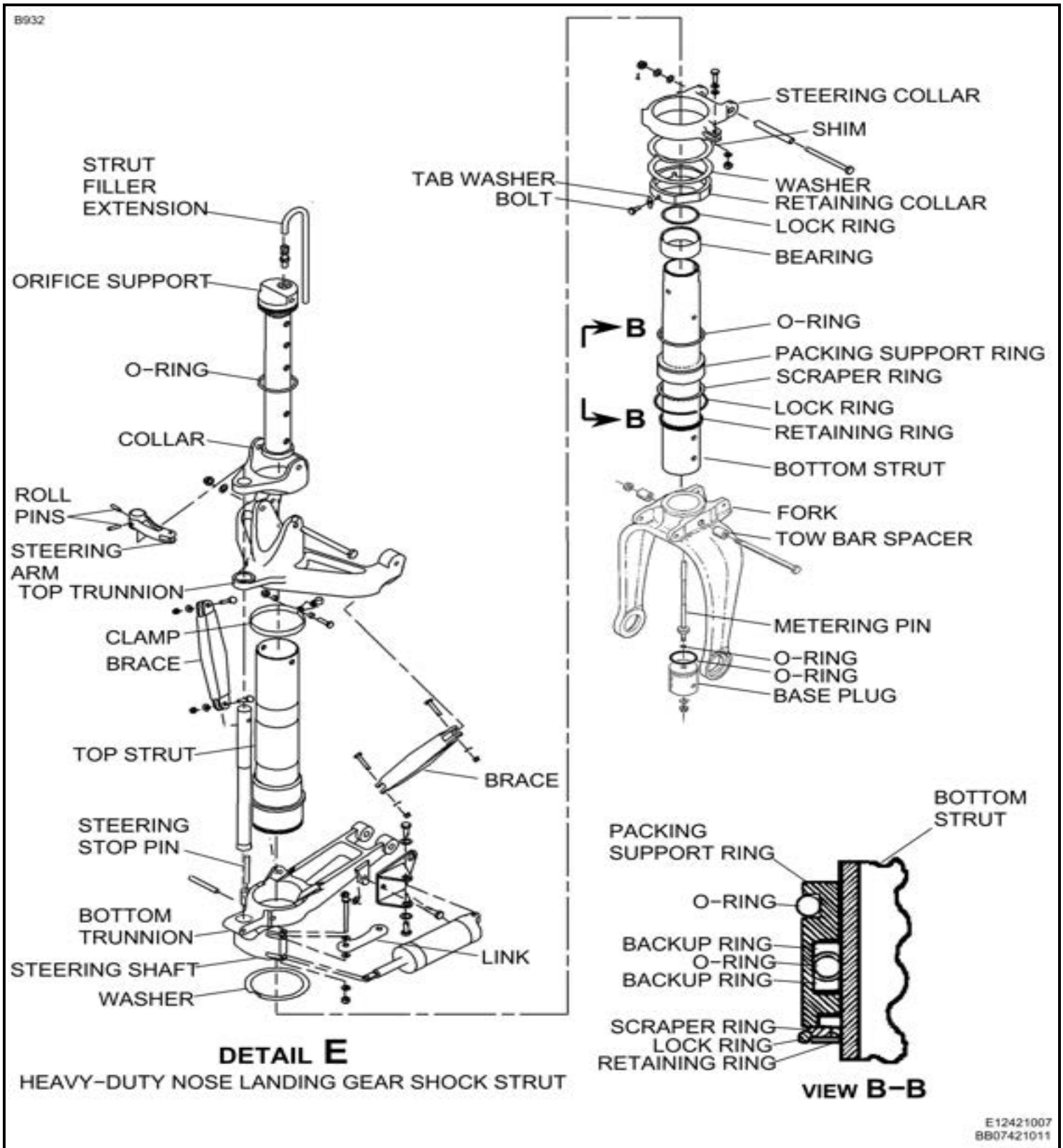


Figure 201 : Sheet 5 : Nose Landing Gear Installation

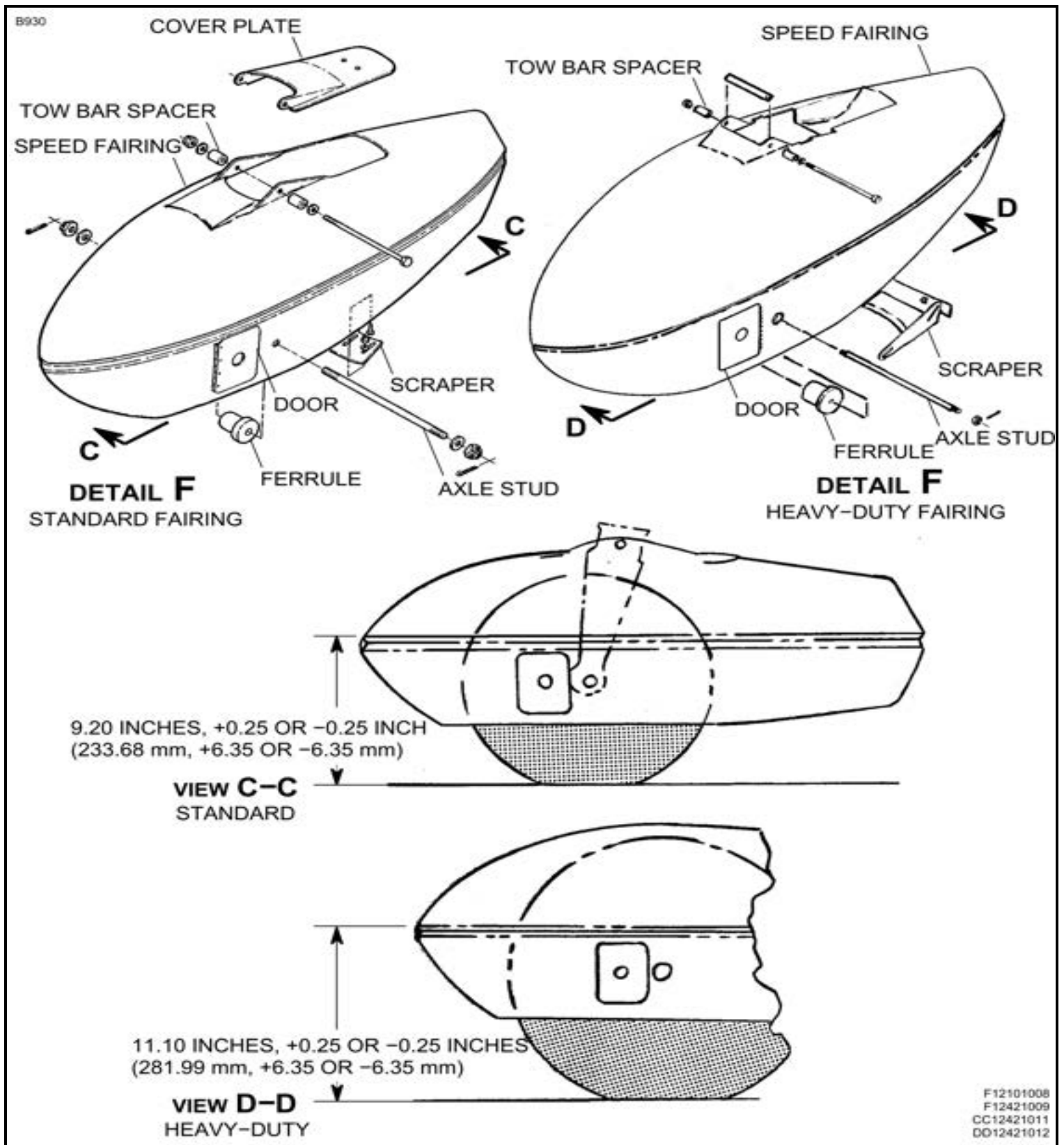


Figure 202 : Sheet 1 : Shimmy Damper

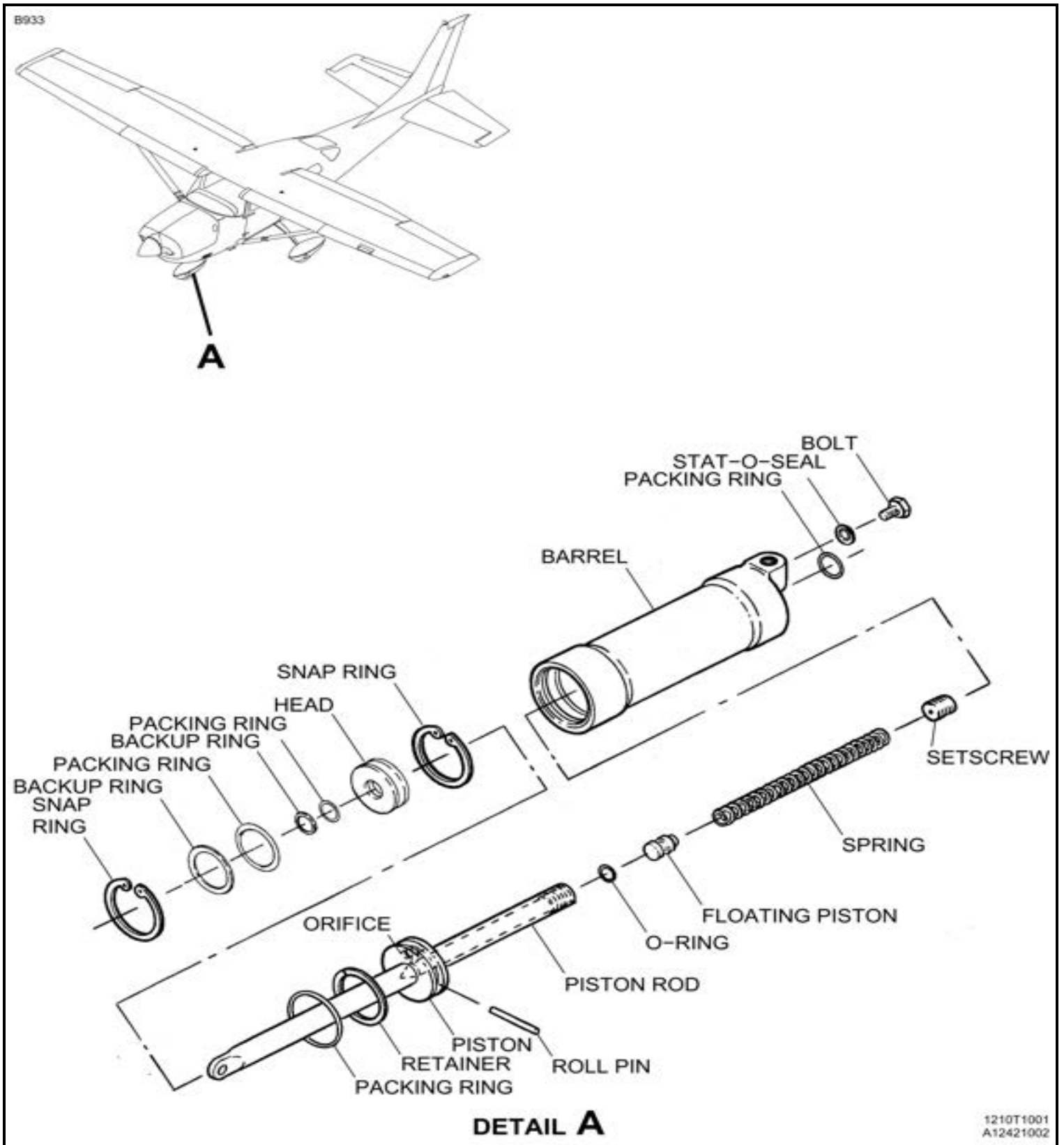
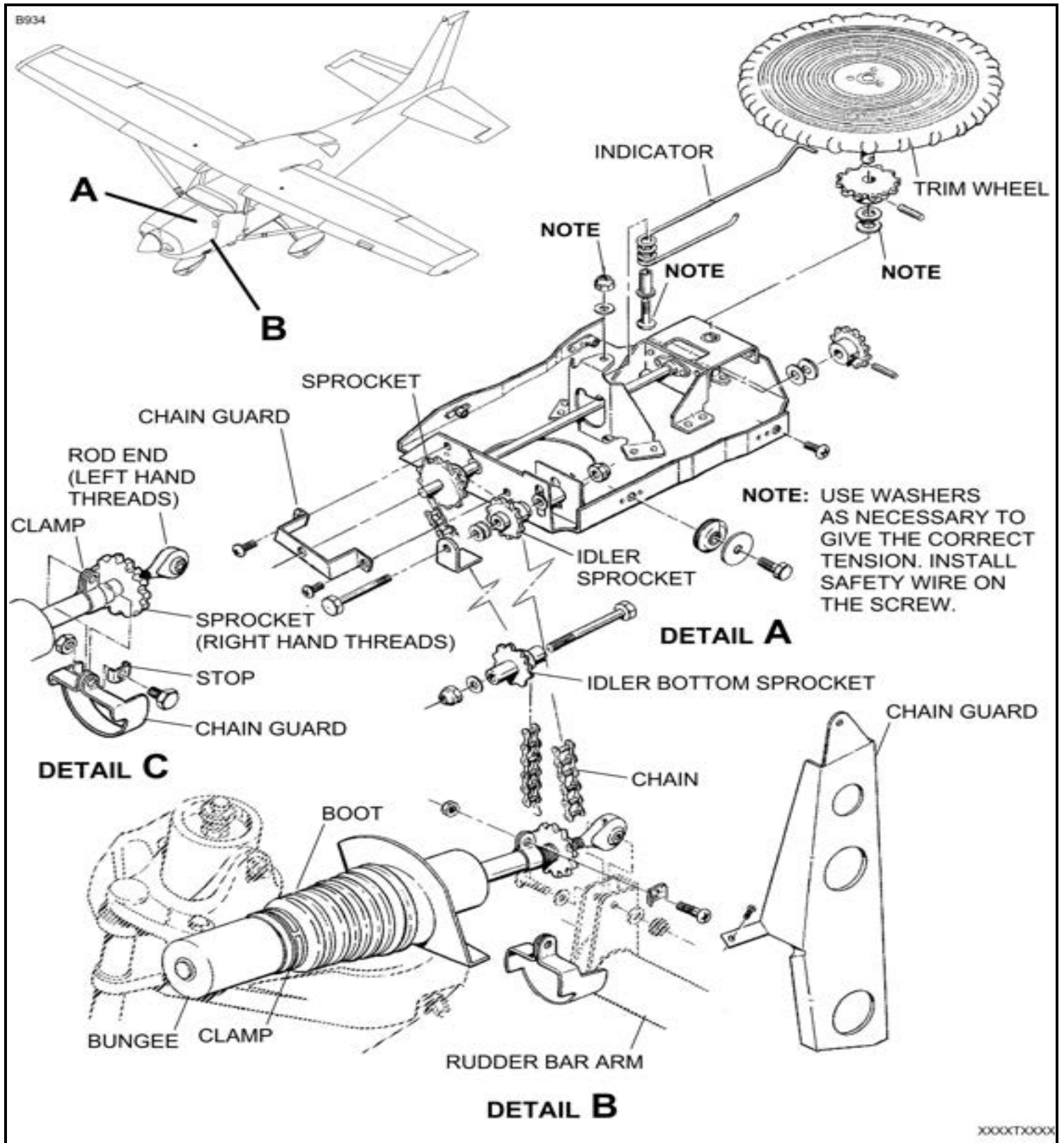


Figure 203 : Sheet 1 : Nose Wheel Steering Installation



MAIN LANDING GEAR WHEEL - MAINTENANCE PRACTICES

1. General

- A. The main landing gear wheel maintenance practices give removal/installation instructions for the left main wheel. Removal/installation for the right main wheel is typical unless otherwise noted.

2. Main Wheel Removal/Installation

NOTE: The wheel removal is not necessary to reline the brakes or to remove the brake parts, other than the brake disc on the torque plate.

- A. Remove the Main Wheel (Refer to [Figure 201](#)).
- (1) Jack the airplane. Refer to Chapter 7, [Jacking - Maintenance Practices](#).
 - (2) Remove the speed fairing if installed. Refer to [Main Landing Gear - Maintenance Practices](#).
 - (3) Remove the hub caps (if installed), cotter pin and axle nut.
 - (4) Remove the bolts that attach the brake back plate to the brake cylinder and remove the back plate.
 - (5) Pull the wheel from the axle.
- B. Install the Main Wheel (Refer to [Figure 201](#)).
- (1) Set the wheel assembly on the axle.
 - (2) Install the axle nut.
 - (3) Turn the wheel assembly on the axle and do as follows:
 - (a) Torque the axle nut from 150 to 200 inch-pounds (16.95 to 22.60 N-m) to seat the bearings.
 - (b) Loosen the axle nut to 0 inch-pounds (0 N-m).
 - (c) Torque the axle nut from 50 to 60 inch-pounds (5.65 to 6.78 N-m).
 - (d) Tighten the axle nut to the nearest lock position.
 - (4) Install the cotter pin.
 - (5) Set the brake back plate in position and install the bolts.
 - (6) Install the hub cap if it was originally installed.
 - (7) Install speed fairing if it was originally installed. Refer to [Main Landing Gear - Maintenance Practices](#).
 - (8) Lower the jacks and remove them from the airplane. Refer to Chapter 7, [Jacking - Maintenance Practices](#).

CAUTION: Damage will result if the correct clearance is not set between the tire and scraper. You must do a check of the clearance every time the scraper is disturbed, the tire is changed, or when you install the speed fairings. If any mud, snow or ice collects on the scraper, it will prevent the tire from correct rotation. You must clean the scraper for correct tire rotation.

- (9) Do a check of the clearance between the tire and scraper.
 - (a) Clean off any dirt or ice that is on the scraper.
 - (b) Adjust the clearance as necessary to have a minimum of 0.55 inch (13.97 mm) to a maximum of 0.80 inch (20.32 mm).

CAUTION: Damage can result to the fairings if the tire pressure is not correct.

- (10) Do a check of the tire pressure and adjust as necessary. Refer to Chapter 12, [Tires - Servicing](#).

3. Main Wheel Axle Removal/Installation

- A. Remove the Main Wheel Axle (Refer to [Figure 201](#)).
- (1) Jack the airplane. Refer to Chapter 7, [Jacking - Maintenance Practices](#).
 - (2) Remove the main wheel speed fairing and brake fairing. Refer to [Main Landing Gear - Maintenance Practices](#).
 - (3) Remove main landing gear wheel. Refer to [Main Wheel Removal/Installation](#).
 - (4) Disconnect, drain and put a cap or plug on the hydraulic brake line at the wheel brake cylinder.
 - (5) Write the number and position of the wheel alignment shims between axle and fitting when you remove the axle from the strut fitting.
 - (6) Mark the shims or tape together so they can be installed in the same position to make sure the wheel alignment is not disturbed.

- (7) Remove nuts, washers, and bolts that attach the shims, axle, brake components, and speed fairing mounting plate from the strut.

B. Install Main Wheel Axle (Refer to [Figure 201](#)).

NOTE: Make sure the wheel alignment shims are installed in the same position from where they were removed.

- (1) Install the shims, axle, brake components, and speed fairing mounting plate to strut.
- (2) Install the wheel on the axle. Refer to [Main Wheel Removal/Installation](#).
- (3) Connect the hydraulic brake line to the wheel brake cylinder.
- (4) Fill and bleed the hydraulic brake system. Refer to [Brake System - Maintenance Practices](#).
- (5) Install the main wheel speed fairing. Refer to [Main Landing Gear - Maintenance Practices](#).
- (6) Remove the airplane from the jacks. Refer to Chapter 7, [Jacking - Maintenance Practices](#).

4. Main Wheel Disassembly/Assembly

A. Disassemble the Main Wheel (Refer to [Figure 202](#)).

WARNING: Do not separate the wheel halves with the tire and tube inflated or serious injury will result.

CAUTION: You must be careful to prevent tire tool damage when you remove the tire from the wheel halves.

- (1) You must deflate the tire and tube and break loose tire bead.
- (2) Remove the thru-bolts hold wheel halves together.
- (3) Separate and remove the wheel halves from the tire and tube.
- (4) Remove the retaining rings, grease seal retainers, grease seal felts, grease seal ring and bearing cones from each wheel half.

CAUTION: Bearing cups (races) are a press fit in wheel halves, and must not be removed unless a new part is to be installed.

- (5) To remove the bearing cups, heat the wheel half in boiling water for 30 minutes or in an oven that is no more than 250°F (121°C).
 - (a) If available use an arbor press to press out the bearing cup and press in a new bearing cup while the wheel half is still hot.

B. Assemble the Main Wheel (Refer to [Figure 202](#)).

(1) If felt seals are used, lightly coat all surfaces of the felt with bearing grease. If rubber seals are used, lightly coat the rubber surfaces with bearing grease.

- (2) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt.
- (3) Install the bearing cone, grease seal ring, grease seal felt, grease seal retainer and retaining ring into each wheel half.
- (4) Install the tube in the tire. Make sure to align the index marks on the tire and tube.
- (5) Set the wheel half into the tire and tube (side opposite valve stem).
- (6) With the washer under the head of thru-bolt, install the bolt through the wheel half.
- (7) Set the other wheel half into the other side of the tire and tube. Make sure to align the valve stem in the valve slot.
 - (a) Make sure the tube is not pinched between the wheel halves before you torque the nuts.

CAUTION: Incorrect torque of the nuts will cause failure of the bolts and wheel.

CAUTION: Do not use impact wrenches on thru-bolts or nuts.

- (8) Install the washers and nuts on thru-bolts, and dry torque alternately to 150 inch-pounds (16.94 N.m).
- (9) Inflate tire to seat tire beads, deflate and inflate to 42 PSI (289 kPa) air pressure.

5. Main Wheel Inspection/Check

A. Complete an Inspection of the Main Wheel (Refer to [Figure 202](#)).

- (1) Clean all metal parts and the grease seal felts in solvent, and dry thoroughly.

NOTE: A soft bristle brush can be used to remove hardened grease, dust or dirt.

- (2) Inspect the wheel halves for cracks or damage.
- (3) Inspect the bearing cones, cups, retaining rings, grease seal retainers, grease seal felts and grease seal rings for wear or

damage.

- (4) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt.
- (5) Inspect the thru-bolts for cracks in the bolt head.
- (6) Replace the cracked or damaged wheel half.
- (7) Replace the damaged retainer rings and seals.
- (8) Replace the worn or damaged bearing cups and cones.
- (9) Replace any worn or damaged thru-bolts.
- (10) Remove any corrosion or small nicks.
- (11) Repair the reworked areas of the wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.
- (12) Pack the bearings with MIL-PRF-81322 wheel bearing grease.
- (13) Complete an inspection of the brakes. Refer to Chapter 5, [Inspection Time Limits](#).

6. Wheel Balance

- A. Incorrect tire wear is usually the cause of wheel unbalance. Replacement of the tire will usually correct this condition.

NOTE: The tire and tube manufacturing process tolerance lets a specified quantity of static unbalance.

- B. The light weight point of the tire is marked with a red dot on the tire sidewall and the heavy weight point of the tube is marked with a color line (usually near the inflation valve stem). When you install a new tire, set the marks adjacent to each other. If a wheel shows evidence of unbalance when servicing it can be statically balanced but not dynamically balanced.

Figure 201 : Sheet 1 : Main Landing Gear Wheel and Axle Installation

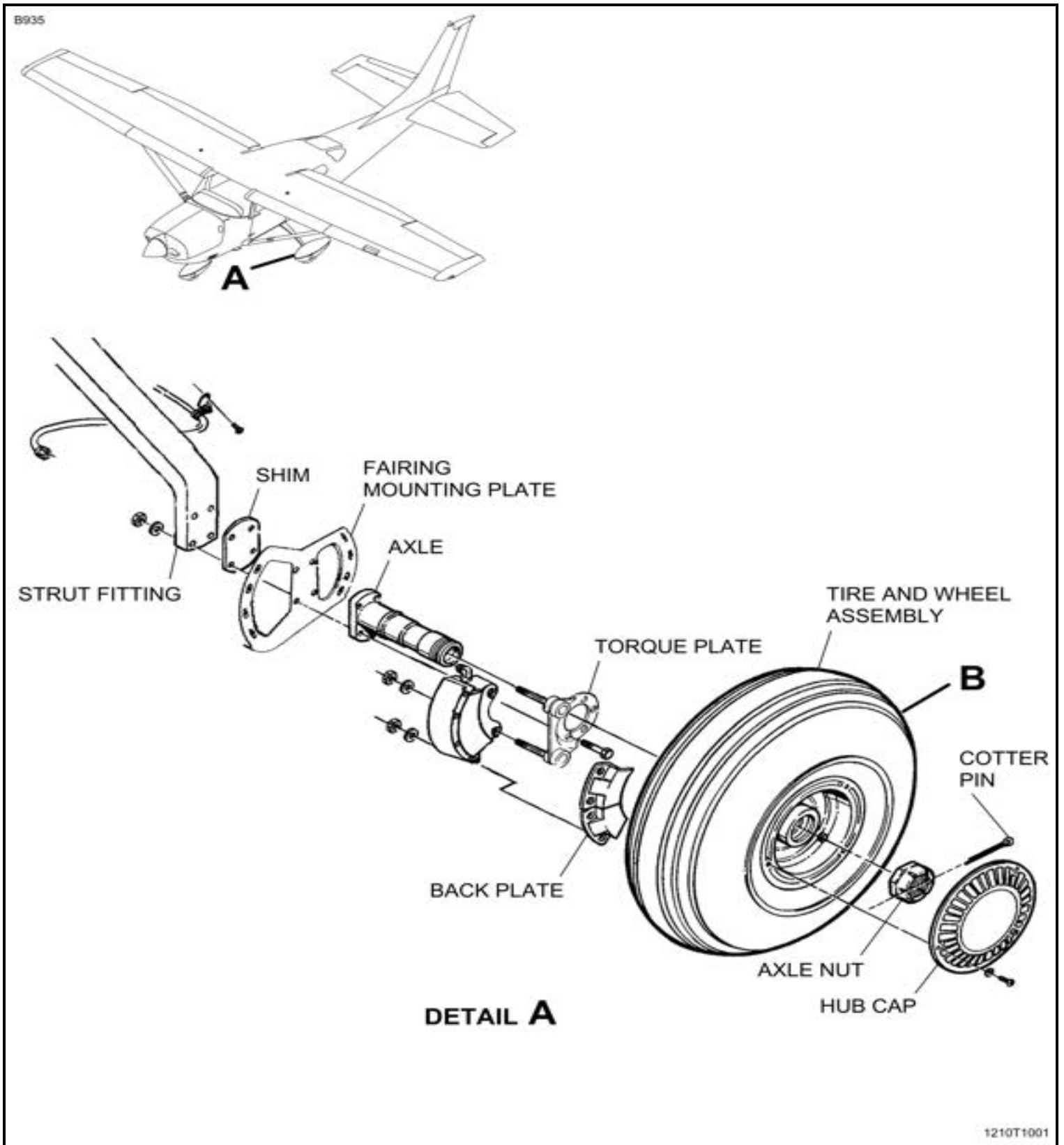
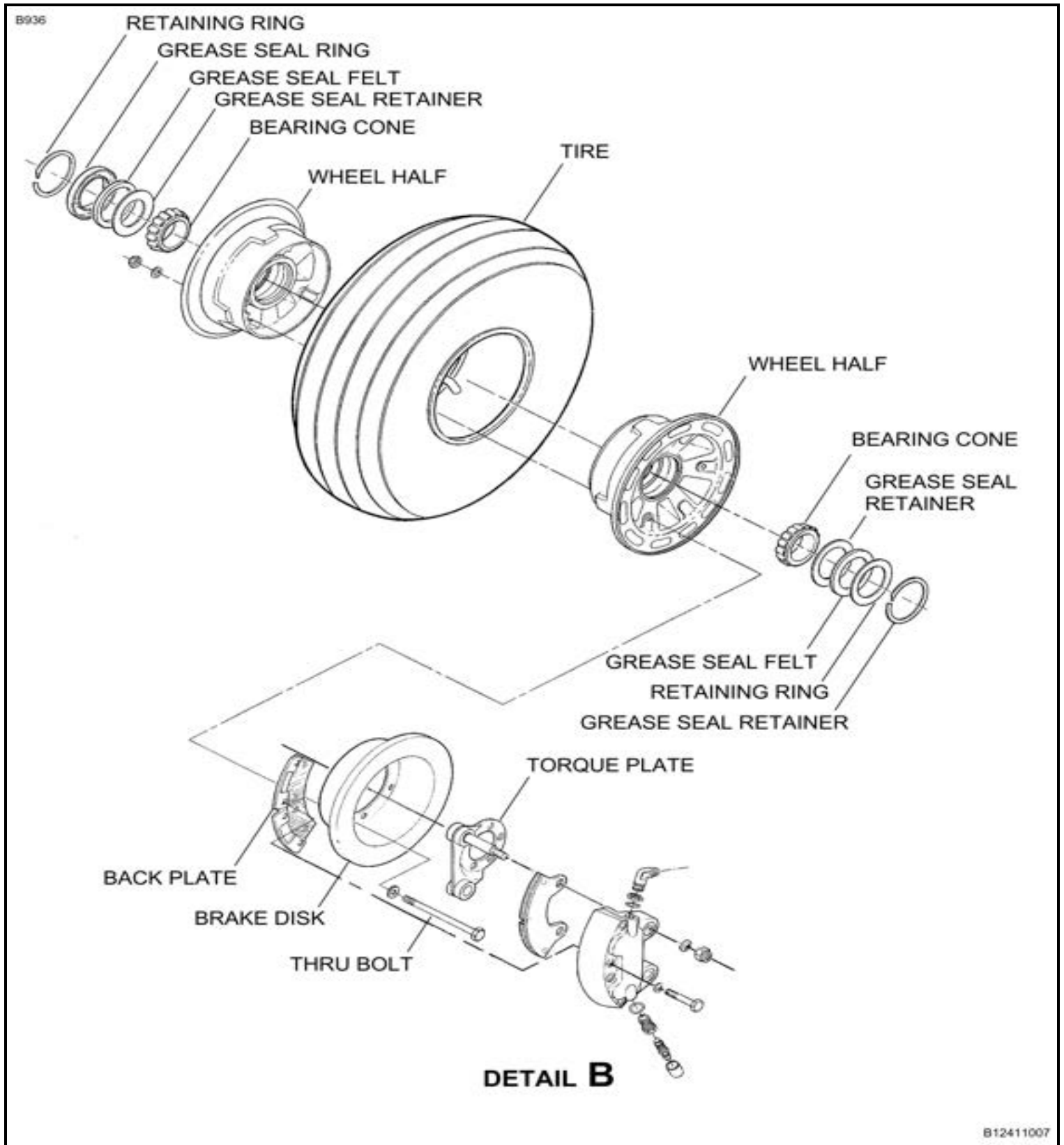


Figure 202 : Sheet 1 : Main Wheel Assembly



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) Airplanes equipped with speed fairing remove speed fairing. Refer to [Nose Wheel Speed Fairing Removal/Installation](#).
 - (3) Remove nose wheel axle stud.
 - (4) Remove furlers from nose wheel and pull nose wheel assembly from fork.
- B. Install Nose Landing Gear Wheel (Refer to [Figure 201](#)).
 - (1) Install nose wheel assembly in fork and install furlers.
 - (2) 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, install speed fairings. Refer to [Nose Wheel Speed Fairing Removal/Installation](#).

3. Nose Landing Gear Wheel Disassembly/Assembly

- A. Disassemble Nose Landing Gear Wheel (Refer to [Figure 201](#)).

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 beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.
 - (2) Remove nuts, 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 rings 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) Use grease to prepare the wheel bearing for installation. Refer to Chapter 12, [Lubricants - Description and Operation](#) for a list of greases.
 - (a) Fill the bearing cone with grease.
 - (b) Apply a small quantity of grease for lubrication on the felt grease seal.
 - (2) Apply a small quantity of SAE 10 oil for lubrication on the grease seal felt.
 - (3) Install bearing cones, grease seal retainers, felt grease seals, grease seal rings and retaining rings into both wheel halves.
 - (4) Insert tube in tire, aligning index marks on tire and tube.
 - (5) Place wheel half into tire and tube. With washer under head of thru bolt, insert bolt through wheel half.
 - (6) 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.

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.

 - (7) Insert washers and nuts on thru- bolts, and dry torque alternately to 145 inch-pounds, +5 or -5 inch-pounds (16.38 N.m, +0.56 or -0.56 N.m).
 - (8) 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.

Figure 201 : Sheet 1 : Nose Landing Gear Wheel Installation

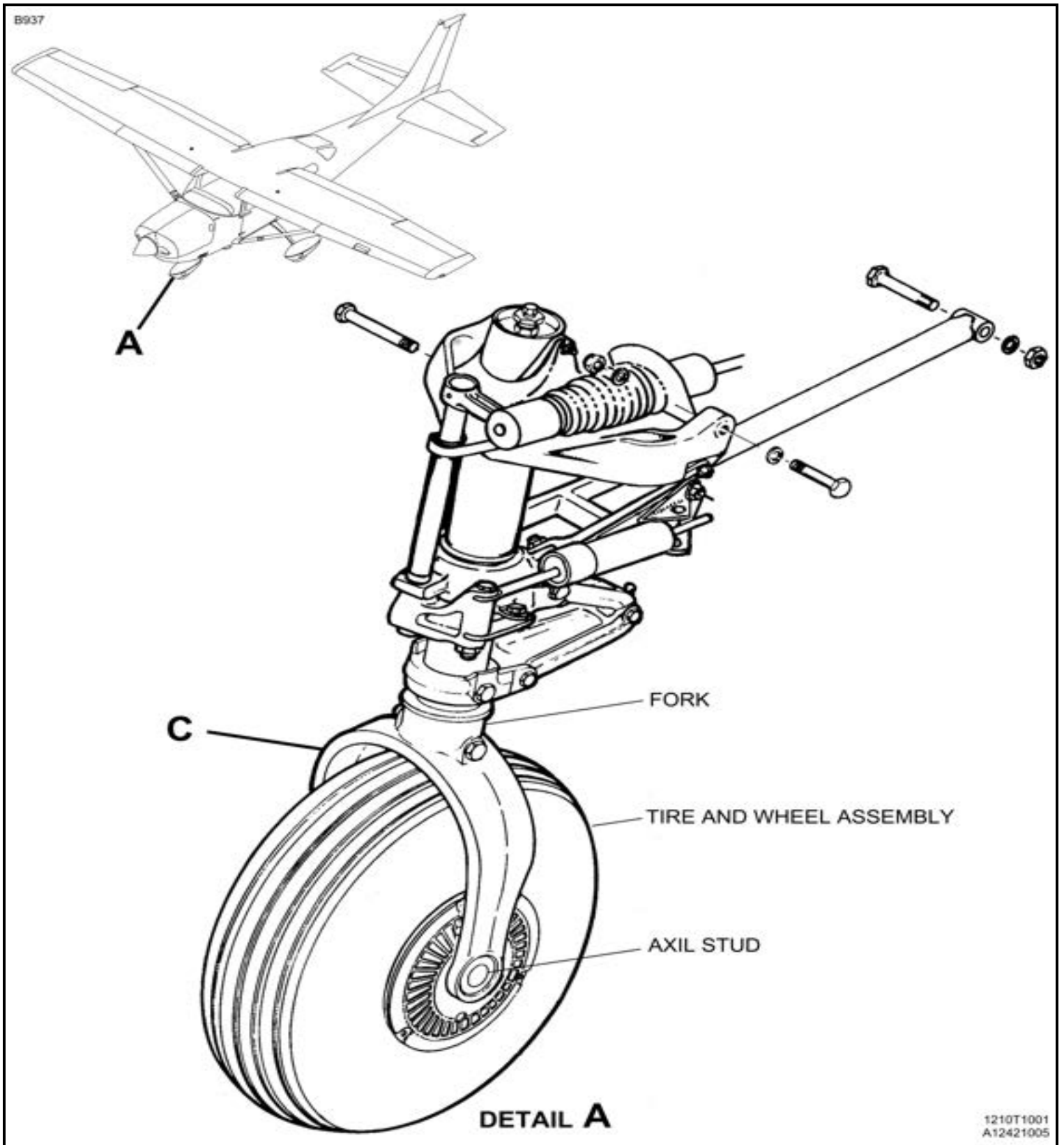
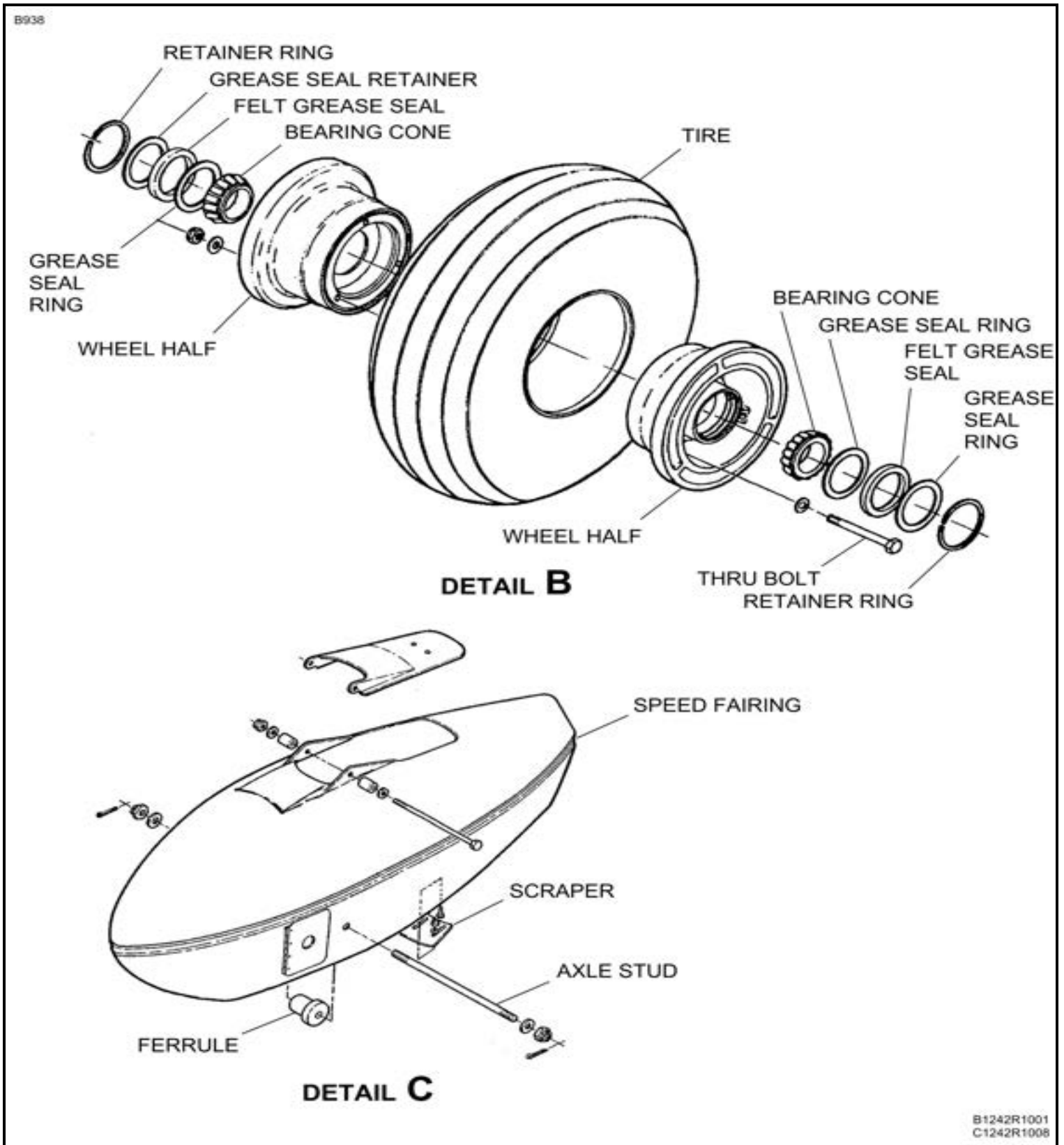


Figure 201 : Sheet 2 : Nose Landing Gear Wheel Installation



BRAKE SYSTEM - TROUBLESHOOTING

1. Troubleshooting

- A. A troubleshooting chart has been provided to aid the maintenance technician in system troubleshooting. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Brake System Troubleshooting Chart

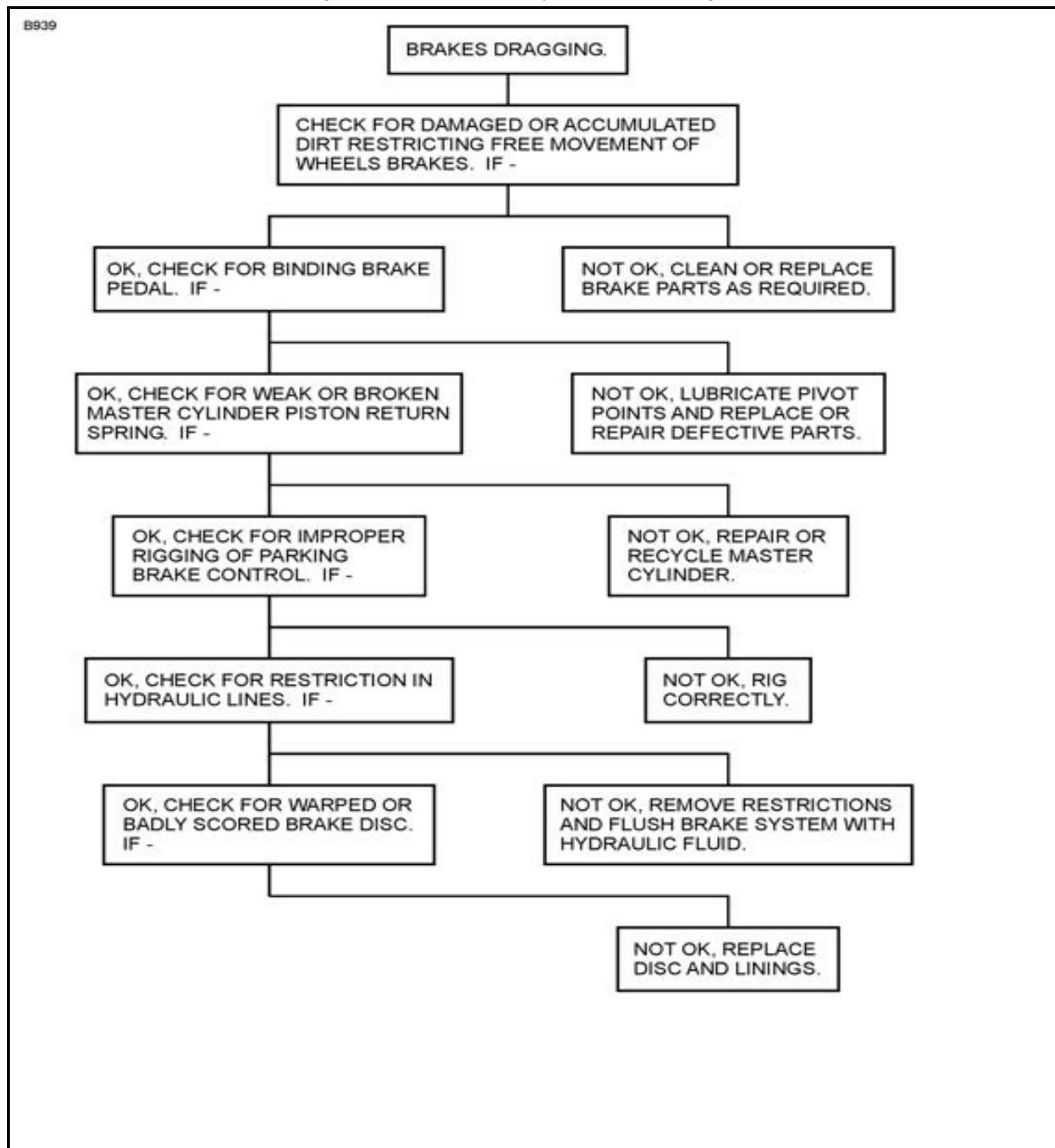


Figure 101 : Sheet 2 : Brake System Troubleshooting Chart

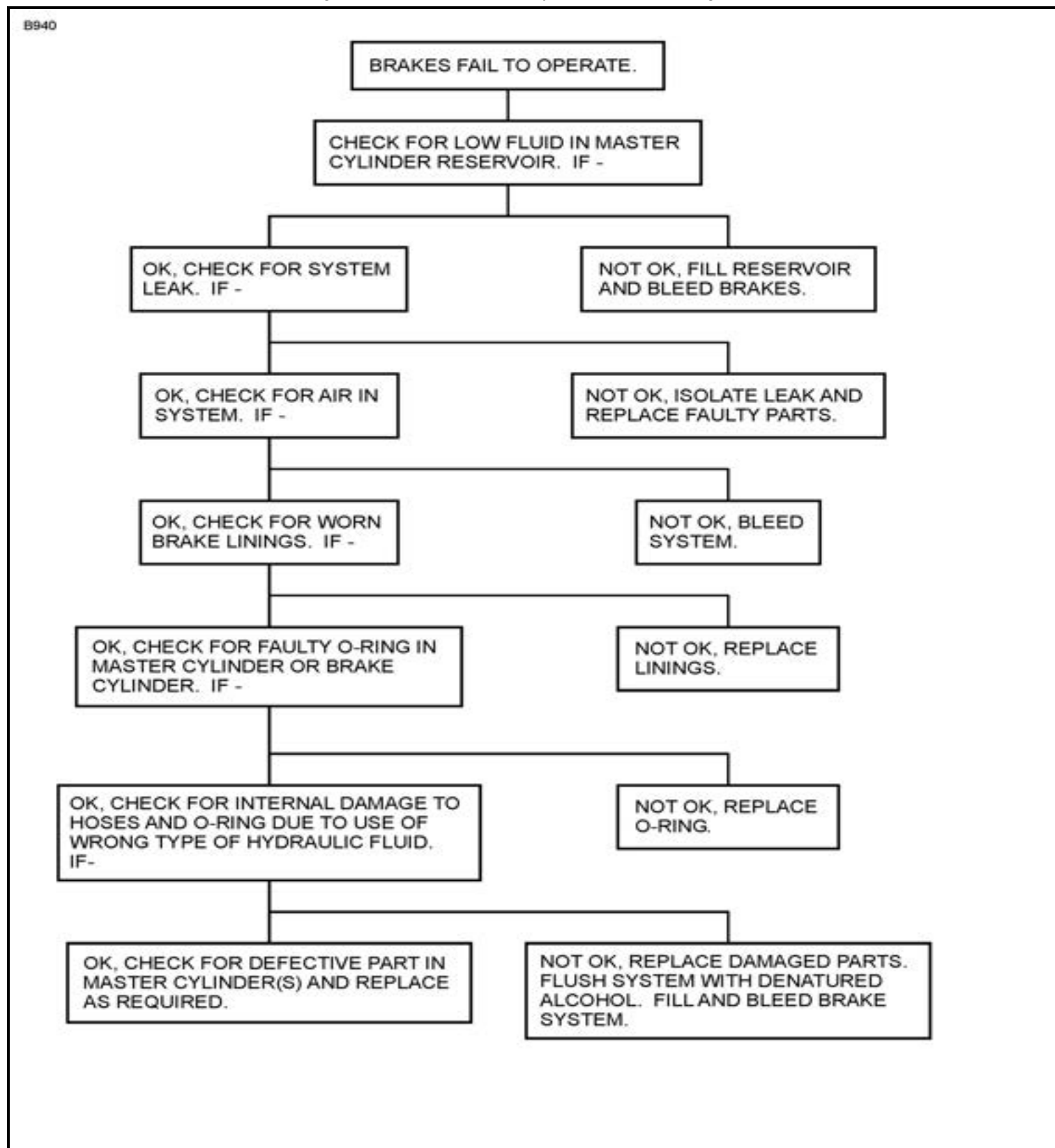
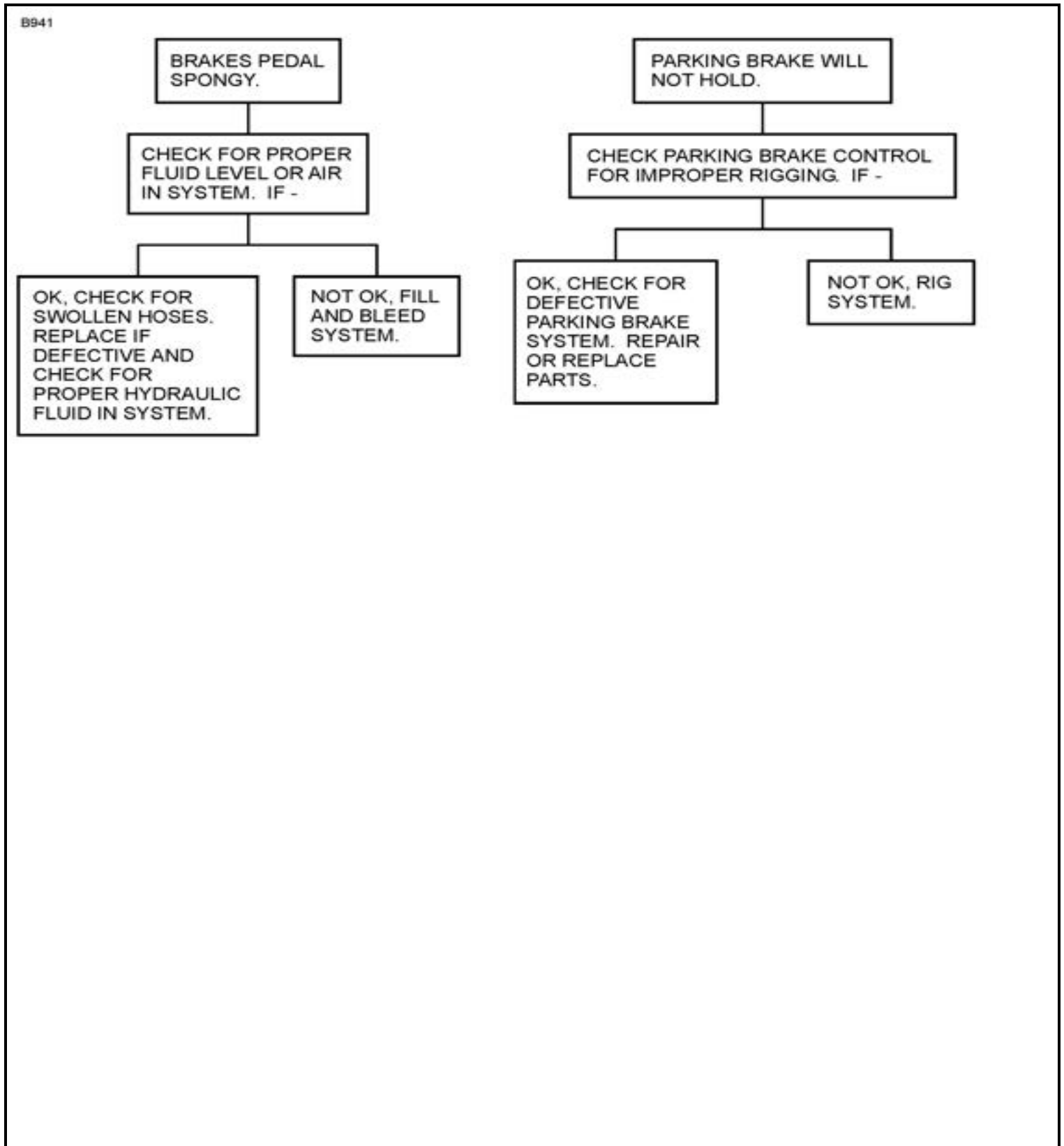


Figure 101 : Sheet 3 : Brake System Troubleshooting Chart



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.
NOTE: Brake assemblies described are normally for left hand-reverse fittings and torque plate bushings for right hand installation.
- B. The hydraulic brake system is comprised of two master 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. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.
- D. The parking brake system is essentially a ratchet held handle which depresses and holds the brake master cylinders in the compressed position.

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 pilot's seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
 - (4) Remove shield assembly from pilot's rudder pedals.
 - (5) Disconnect hoses from master cylinders and cap or plug hoses.
 - (6) Disconnect master cylinders at pilot's 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 the filler plug.
 - (5) Fill the brake master cylinders with MIL-PRF-5606 hydraulic fluid.
 - (6) Bleed brake system. Refer to [Brake System Bleeding](#).
 - (7) Install brake fairings.
 - (8) Install shield assembly on pilot's rudder pedals.
 - (9) Install pilot's 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.
- B. Assemble Brake Master Cylinder (Refer to [Figure 202](#)).
 - (1) Lubricate all parts with hydraulic fluid MIL-PRF-5606 before you assemble the parts that follow.
 - (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 (2.39 mm). A 3/32-inch (2.39 mm) 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 (3.58 mm) (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 plates with bolts and washers. Torque the bolts to 90 in-lbs (10.17 N.m).
 - (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.
 - (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 (457.2 m) 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 pilot's seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
 - (2) Remove shield assembly from pilot's rudder pedals.
 - (3) Disconnect spring from bellcrank.
 - (4) Remove cotter pin from positioning pin and remove pin and cable from rod.
 - (5) Remove nut, bolt, and pulley from lower end of bellcrank.
 - (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 bellcrank.
- 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 pilot's rudder pedals.
 - (10) Install pilot's seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#)
 - (11) Check park brake operation.

Figure 201 : Sheet 1 : Brake Master Cylinder Installation

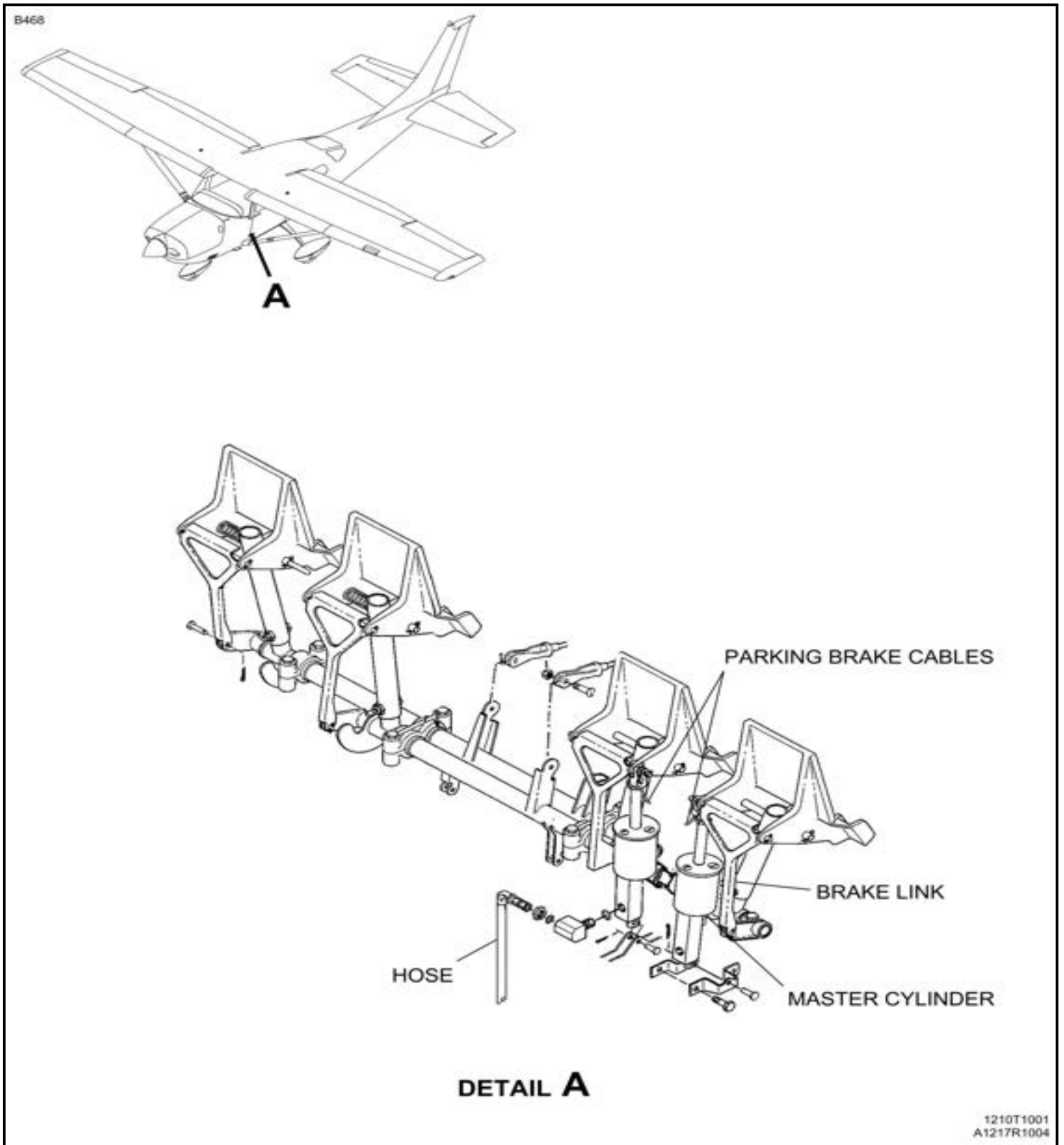


Figure 202 : Sheet 1 : Brake Master Cylinder Assembly

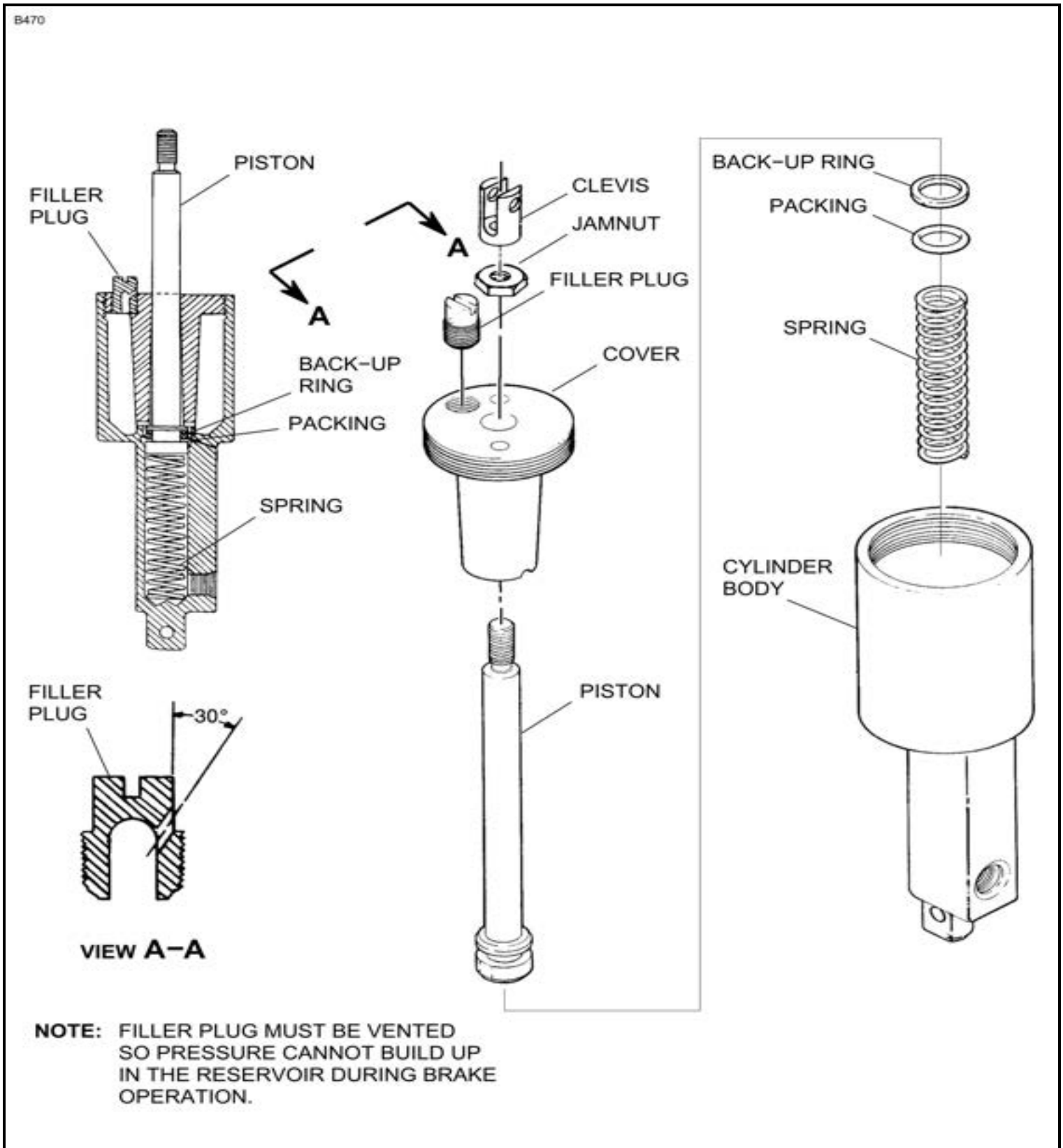
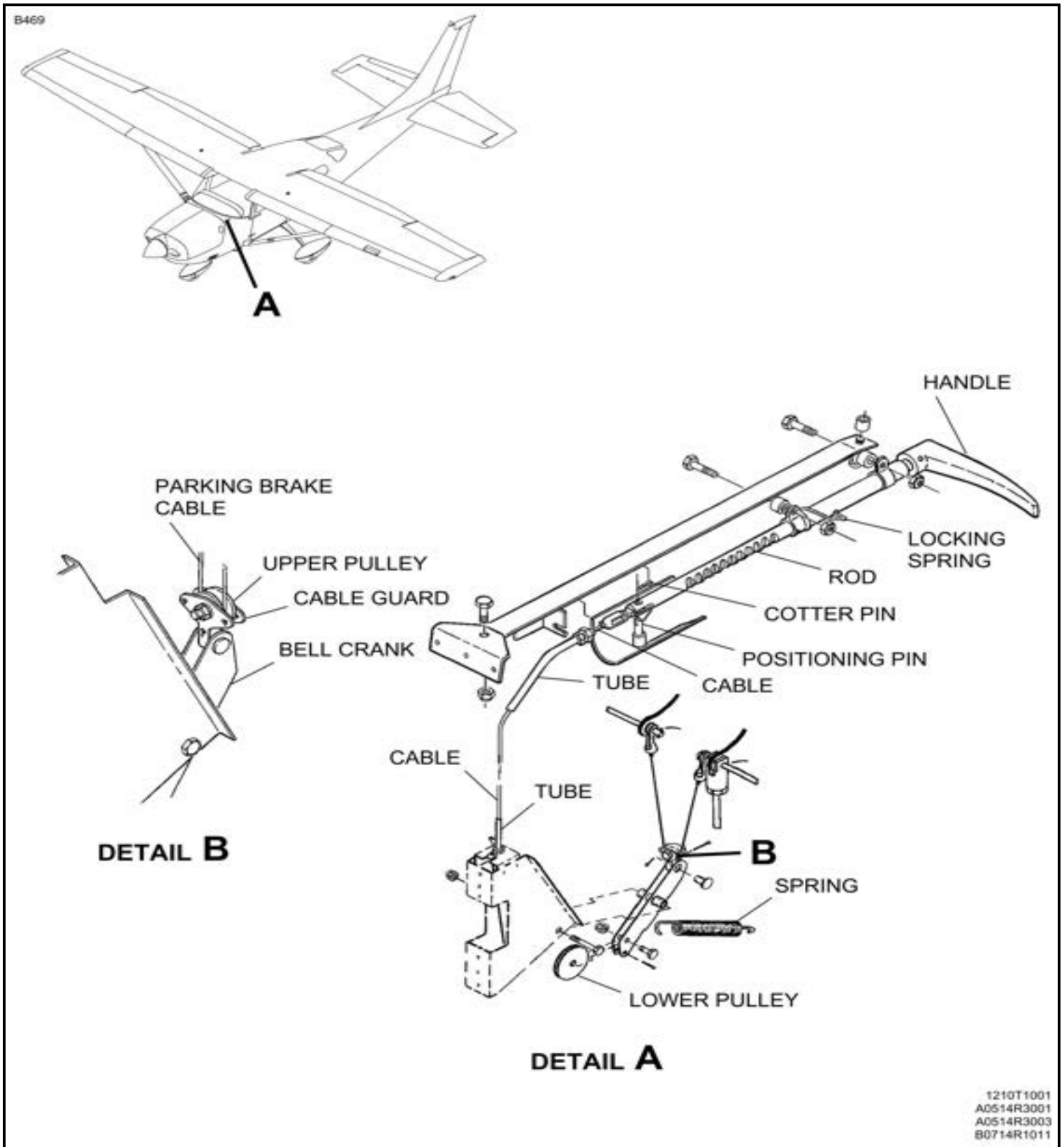


Figure 203 : Sheet 1 : Parking Brake Installation



OXYGEN - GENERAL

1. Scope

A. This chapter gives information on components related with the storage and distribution of oxygen to the crew and passengers.

2. Tools, Equipment and Materials

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

NAME	NUMBER	MANUFACTURER	USE
Teflon Lubricating Tape	S1465	Commercially Available	Lubrication of threads and fittings.
Trichloro-ethylene	ASTM D4070	Commercially Available	To clean oxygen lines.
Naptha	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-L-25567A)	Puritan Bennett	To leak test oxygen system.
		10800 Pflumm Rd. Lenexa, KS 66215	
Flowrater (0 to 10 Liters per Minute LPM)		Commercially Available	Check pressure flow to passenger mask.
Pressure Gage (0-100 PSIG)		Commercially Available	For an oxygen flow check.
Oxygen Outlet Adapter		Commercially Available	Used with an pressure gage.
Merthiolate		Commercially Available	To clean oxygen mask's and hose.
Snoop Liquid Leak Detector	MS-SNOOP-XXX	Commercially Available	To do a leak test of the oxygen system.

3. Definition

A. This chapter is divided into sections and subsections to help maintenance personnel to locate specific systems and information. To locate information within the chapter, refer to the Table of Contents at the beginning of the chapter.

OXYGEN - DESCRIPTION AND OPERATION

1. Description and Operation

- A. The system is comprised of an oxygen cylinder and regulator assembly, filler valve, pressure gage, pressure lines, outlets and mask assemblies. The oxygen cylinder is mounted aft of the baggage compartment. Locations of system components are shown in Figure 201. The pilot's mask supply line is designed to receive a greater flow of oxygen than the passengers. The pilot's mask is equipped with a microphone, keyed by a switch button on the pilot's control wheel. The filler valve is located on the tailcone on the left hand side.

WARNING: Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

- B. Oxygen flow to outlet ports is provided when the oxygen control valve knob, located in the overhead console, is placed in the ON position and mask hoses are plugged into the overhead oxygen ports.

NOTE: Each oxygen port contains a spring-loaded valve which prevents flow of oxygen until a mask hose is plugged in. Each mask hose contains an oxygen flow indicator for visual proof of oxygen flow.

- C. The following information is permanently stamped on the shoulder, neck, or top head of the oxygen cylinder to aid in proper identification.
- (1) Cylinder specification followed by service pressure such as ICC or DOT-E8162.
 - (2) Cylinder serial number is stamped below or directly following cylinder specification. The symbol of the purchaser, user, or maker, if registered with the Bureau of Explosives, may be located directly below or following the serial number. The cylinder serial number may be stamped in an alternate location on the cylinder top head.
 - (3) Inspectors official mark near serial number.
 - (4) Date of manufacture: This is the date of the first hydrostatic test (such as 6-98 for June 1998). The dash between the month and the year figures may be replaced with the mark of the testing or inspection agency (e.g., 6L98).
 - (5) Hydrostatic test date: The dates of subsequent hydrostatic tests shall be steel-stamped (month and year) directly below the original manufacturer date. the dash between month and year figures can be replaced with the mark of the testing agency.
 - (6) A Cessna identification placard is located near the center of the cylinder body.
 - (7) Halogen test stamp (if applicable): Halogen Tested, date of test (month, day, and year) inspector's mark appears directly underneath the Cessna identification placard.

OXYGEN - MAINTENANCE PRACTICES

1. General

- A. Before you complete maintenance on the oxygen system, you must read and understand the following instructions. Use care when you follow these instructions and it will help to maintain a trouble-free oxygen system.

2. Precautions

WARNING: Do not smoke tobacco or let open flame near the airplane while maintenance is performed on the oxygen system. Make sure the electrical power is disconnected and that the airplane is correctly grounded. Oils, grease, and solvents may burn or explode spontaneously when contacted with oxygen under pressure.

- A. Use care to make sure every port on the oxygen system is clean and does not contain any water, oil, grease, and solvent contamination.
- B. Put a cap on all openings immediately upon removal of any component. Do not use tape or caps which will let in moisture.
- C. The lines and fittings must be clean and dry. One of the following methods may be used to clean the lines.

CAUTION: A water-lubricated compressor must be used to blow the tubing clean only when nitrogen or argon are not available. The air must be clean, dry, and filtered. Most air compressors are oil-lubricated and a minimum amount of oil will be carried by the airstream into the system.

- (1) Wash with a vapor-degrease solution of stabilized trichloroethylene that agrees with ASTM D4080.
- (2) Blow the tube clean with a spray of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).
- (3) Flush with Naptha that agrees with Specification TT-N-95, then blow clean and dry with clean, dry filtered air.
- (4) Flush with anti-ice fluid that agrees with MIL-F-5566 or anhydrous ethyl alcohol. Fully rinse with fresh water and dry with a spray of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).
- (5) Flush with hot inhibited alkaline cleaner until it is free from oil and grease.
- (6) 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).
- (7) Put a cap on all the lines immediately after drying.
- (8) The lines must be replaced by part number with factory parts.
- (9) Make sure your hands are clean from dirt and grease before you install any oxygen tubes or fittings.

CAUTION: Do not place the control in the on position with outlet ports (low pressure) open to atmosphere with the oxygen bottle charged. Damage to regulator metering poppet will occur.

CAUTION: You must do a leak check and purge of the oxygen system when a component of the oxygen system is removed, installed, replaced, or the system has been disassembled.

- D. Use only S1465 Teflon lubricant tape on threads of male fittings. No lubricant tape is used on coupling sleeves or outside of flares. Use care to prevent contamination of the Teflon tape with oil, grease or other lubricants. The Teflon tape must be used in accordance with the instructions listed for the steps that follow.

- (1) Lay the tape on the threads close to the end of the fitting.

NOTE: Clockwise on standard threads, counter-clockwise on left-hand threads.

- (2) Apply sufficient tension when you apply the tape so the tape forms into the thread grooves.
- (3) Maintain the tension and tear the tape by pulling apart in the direction it was applied. Do not cut the tape.

NOTE: Resulted ragged end is the key to the tape staying in place. The tape may unwind if it is cut.

- (4) Press the tape down in the threads.
- (5) Make connections.

WARNING: Use only non-sparking tools.

- E. All tools used for installation of oxygen tubes or fittings must be free of dirt, grease and oils.

NOTE: A correct record of the number of charges must be maintained by the owner or his agent if the cylinder is charged an average of once every other day.

3. Component Replacement

- A. Removal, Disassembly, Assembly and Installation of the System Components (Refer to [Figure 201](#), [Figure 202](#) or [Figure 203](#)).

NOTE: Oxygen cylinder and regulator assemblies may not always be installed in the field exactly as illustrated.

Important points to remember are as follows.

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 removing cylinder, release low-pressure line by opening cabin outlets. Disconnect push-pull control cable, filler line, pressure gage line and outlet line from regulator.

WARNING: Cap all lines immediately.

- C. Remove the filler valve (Refer to [Figure 203](#)).
- (1) Remove line from quick-disconnect valve at the regulator.
 - (2) Disconnect chain, but do not remove cap from filler valve.
 - (3) Remove screws securing valve and disconnect pressure line.
 - (4) Cap pressure line and seat.
 - (5) Remove filler valve.
- D. Install the filler valve. (Refer to [Figure 203](#)).
- (1) Install filler valve.
 - (2) Uncap pressure line and seat.
 - (3) Secure valve with screws and connect pressure line.
 - (4) Connect chain.
 - (5) Connect line to quick-disconnect valve at the regulator.
- E. Pressure Gage Removal (Refer to [Figure 201](#) and [Figure 203](#)).
- (1) At the oxygen bottle, disconnect the capillary line from the regulator.
 - (2) Get access to the pressure gage through the center overhead console, headliner, and headliner trim. Refer to [Interior Upholstery - Maintenance Practices](#).
 - (3) Disconnect the pressure gage from the oxygen pressure line at the elbow.
 - (4) Remove the hex nuts from the pressure gage.
 - (5) Remove the u-clamp from the pressure gage.
 - (6) Remove the pressure gage from the airplane.
- F. Pressure Gage Installation (Refer to [Figure 201](#) and [Figure 203](#)).
- (1) Put the pressure gage in position in the console.
 - (2) Put the u-clamp in position on the pressure gage.
 - (3) Install the hex nuts on the pressure gage.
 - (4) Attach the pressure gage to the line at the elbow.
 - (5) Connect the capillary line to the regulator.
 - (6) Do the servicing of the oxygen system. Refer to [Oxygen - Maintenance Practices](#).
 - (7) Make sure that there are no oxygen leaks at the pressure gage and at the connection of the oxygen bottle regulator and the capillary line. Refer to [Oxygen - Maintenance Practices](#).
 - (8) Install the center overhead console, headliner trim, and headliner to the structure. Refer to [Interior Upholstery - Maintenance Practices](#).
- G. To remove the entire oxygen system, headliner must be lowered and soundproofing removed to expose lines. Refer to Chapter 25, [Equipment/Furnishings - Maintenance Practices](#).

4. Oxygen Cylinder Inspection Requirements

- A. Inspect the Oxygen Cylinder (Refer to [Figure 203](#)).
- (1) Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges, and strap chafing. See chart and steps 1 through 8.

DISCREPANCIES

DEPTH

CYLINDER CLASSIFICATION
DOT-3HT 1850

Isolated Pitting or Corrosion	0.010 Inches (0.254 mm)	Refer to steps 1 and 2 below
Local Pitting or Corrosion or Line Corrosion	0.005 Inches (0.127 mm)	Refer to steps 2 and 3 below
General Corrosion	Not Allowed	Refer to step 4 below
Cuts, Digs, Gouges	0.005 Inches (0.127 mm)	Refer to step 5 below
Dents	0.031 (0.7874 mm)	Refer to step 6 below
Fire Damage	Not Allowed	Refer to step 7 below
Bulges	Not Allowed	Refer to step 8 below

1. Isolated pits of small cross section involving loss of wall thickness by corrosive media. Small isolated pits with a maximum depth as shown are acceptable.
2. If depth exceeds figure shown, cylinder must be returned to the manufacturer for disposition.
3. Local pitting or corrosion or line corrosion involving loss of wall thickness by corrosive media with a pattern of pits which are connected to others in a band or line. A small area with a minimum depth as shown is applicable. Areas extending beyond 3 inches in diameter or 4 inches long must be considered general corrosion.
4. General corrosion (sometimes accompanied by pitting) involved loss of wall thickness by corrosive media covering a considerable area. Cylinder must be returned to the manufacturer for hydrostatic testing.
5. Deformations caused by contact with a sharp object cutting or upsetting the material of the cylinder, decreasing the wall thickness. Maximum defect permissible without corrective action. If this depth is exceeded, the cylinder must be returned to the manufacturer for removal of defects and verification of cylinder strength by hydrostatic testing.
6. Deformations caused by contact with blunt objects in such a manner that the thickness of the metal is not impaired. The major diameter of the dent must be equal to or greater than 32 times the depth of the dent. Sharper dents (or deeper dents) than this are considered too abrupt and must be returned to the cylinder manufacturer for disposition.
7. Fire damage is indicated by charred or burned metal, charred or burned paint, distortion of the cylinder, functioned safety relief devices, melting of valve parts, etc. Cylinders must be returned to the cylinder manufacturer for disposition.
8. Bulged cylinders are not acceptable. Cylinders must be returned to the cylinder manufacturer for disposition.

NOTE: The above data may be used to determine that oxygen cylinders are acceptable for service. This criteria must be used prior to charging cylinders.

- (2) Examine the neck of cylinder for cracks, distortion, or damaged threads.
- (3) Check the cylinders to determine if markings are legible.
- (4) Check the date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.
- (5) Inspect the cylinder mounting bracket, bracket hold-down bolts, and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.
- (6) In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing, deformation, or deterioration.

5. Oxygen Mask and/or Cannula Inspection

- A. Inspect the Oxygen Mask and/or Cannula (Refer to [Figure 201](#)).
 - (1) Examine the oxygen masks and/or cannula for cracks and rough face seals.
 - (2) Flex the hose gently all over and check for signs of deterioration or dirt.
 - (3) Examine the mask and/or cannula and hose storage for cleanliness and general condition.

6. Oxygen Mask and/or Cannula Maintenance

- A. Oxygen Mask and/or Cannula Cleaning and Care (Refer to [Figure 201](#)).
 - (1) Clean and disinfect the mask or cannula assemblies after use, as applicable.

- (a) Be careful while you clean and disinfect the mask assemblies to avoid damage to the microphone assembly.
- (2) Wash the mask or cannula and the hose with a mild soap solution and rinse it with clean water.
- (3) To sterilize, rub the mask or cannula and hose with a gauze or sponge soaked in a water and merthiolate solution.
NOTE: This solution must contain 1/5 teaspoon of merthiolate per one quart of water.
- (4) Wipe the mask and hose with a clean cloth and air dry.
- (5) Make sure that each breathing tube end is free of nicks.
- (6) Make sure the breathing tube end will fit into the cabin oxygen receptacle easily and does not leak.
- (7) If a mask or cannula assembly has a leak, it cannot be breathed through, or has a damaged microphone, return the mask assembly to the manufacturer or a repair station.
- (8) Replace the hose if it shows signs of deterioration.

7. Precise Flight Oxygen Flow Meter Antistatic Treatment

NOTE: The Precise Flight Oxygen Flow Meter can become static charged because of friction. This charge does not let the ball move freely inside the flow meter. This treatment will remove the static charge.

A. Do the Antistatic Treatment.

- (1) Disconnect the mask or cannula from the hose.
- (2) Put some drops of a mixture of deionized water and breathing safe detergent or Snoop Liquid Leak Detector into the end of the hose.
- (3) Let the drops get to the flow meter.
- (4) Connect the flow meter inlet to a source of aviation oxygen.
- (5) Dry the flow meter with the oxygen.
- (6) Make sure the flow meter operates smoothly.

8. Oxygen System Functional Testing

A. Whenever the regulator and cylinder assembly has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

- (1) Fully charge oxygen system in accordance with procedures outlined in this section.
- (2) Disconnect line and fitting assembly from pilot's mask and line assembly. Insert outlet end of line and fitting assembly into cabin outlet and attach opposite end of line to a pressure gage (gage must be calibrated in one-pound increments from 0 to 100 PSI). Place control lever in ON position. Gage pressure must read 75 ± 10 PSI.
- (3) Insert mask and line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, test gage pressure must still be 75 ± 10 PSI.
- (4) Place oxygen control lever in OFF position and allow test gage pressure to fall to 0 PSI. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE: If pressure specified in the foregoing procedures is not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

- (5) Connect mask and line assemblies to each cabin outlet and check each mask for proper operation.
- (6) Check pilot's mask microphone and control wheel switch for proper operation. After checking, return all masks to mask case.
- (7) Recharge oxygen system in accordance with procedures outlined in this section.

9. System Leak Test

- ### A. When oxygen is being lost from a system through leakage, a sequence of steps may be necessary to locate the opening. Leakage may often be detected by listening for the distinct hissing of escaping gas. If this check proves negative, it will be necessary to soap-test all lines and connections with a castile soap and water solution or specially compounded leak-test material. Make the solution thick enough to adhere to the contours of the fittings. At the completion of the leakage test, remove all traces of the leak detector or soap and water solution.

CAUTION: Do not attempt to tighten any connections while the system is charged.

10. Oxygen System Charging

- A. Charge Oxygen System (Refer to Figure 201, 202 and 203).

NOTE: Use only aviator's breathing oxygen per MIL-0-27210.

WARNING: Be sure to ground aircraft and ground servicing equipment before charging oxygen system.

- (1) Do not attempt to charge oxygen cylinders if servicing equipment fittings or filler valve are corroded or contaminated. If in doubt, clean with stabilized trichloroethylene and let air dry. Do not allow solvent to enter any internal parts.
- (2) If cylinder is completely empty, do not charge, as the cylinder must then be removed, inspected and cleaned.

CAUTION: A cylinder which is completely empty may 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 any other foreign material, as well as ordinary air in large quantities. If a gage line or filler line is disconnected and the fittings capped immediately, the cylinder will not become contaminated unless temperature variation has created a suction within the cylinder. Ordinary air contains water vapor which could condense and freeze. Since there are very small orifices in the system, it is very important that this condition not be allowed to occur.

- (3) Connect charging cylinder line from oxygen service cart to filler valve.
- (4) Slowly open valve on oxygen service cart and charge airplane oxygen bottle to correct pressure. Refer to Table 1 for charging pressures at different temperatures.
- (5) 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 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

Example: If ambient temperature is 70°F, fill aircraft cylinders to approximately 1,975 PSI or as close to this pressure as the gage may read. Upon cooling, cylinders must have approximately 1,850 PSI of pressure.

Figure 201 : Sheet 1 : Oxygen Controller Installation

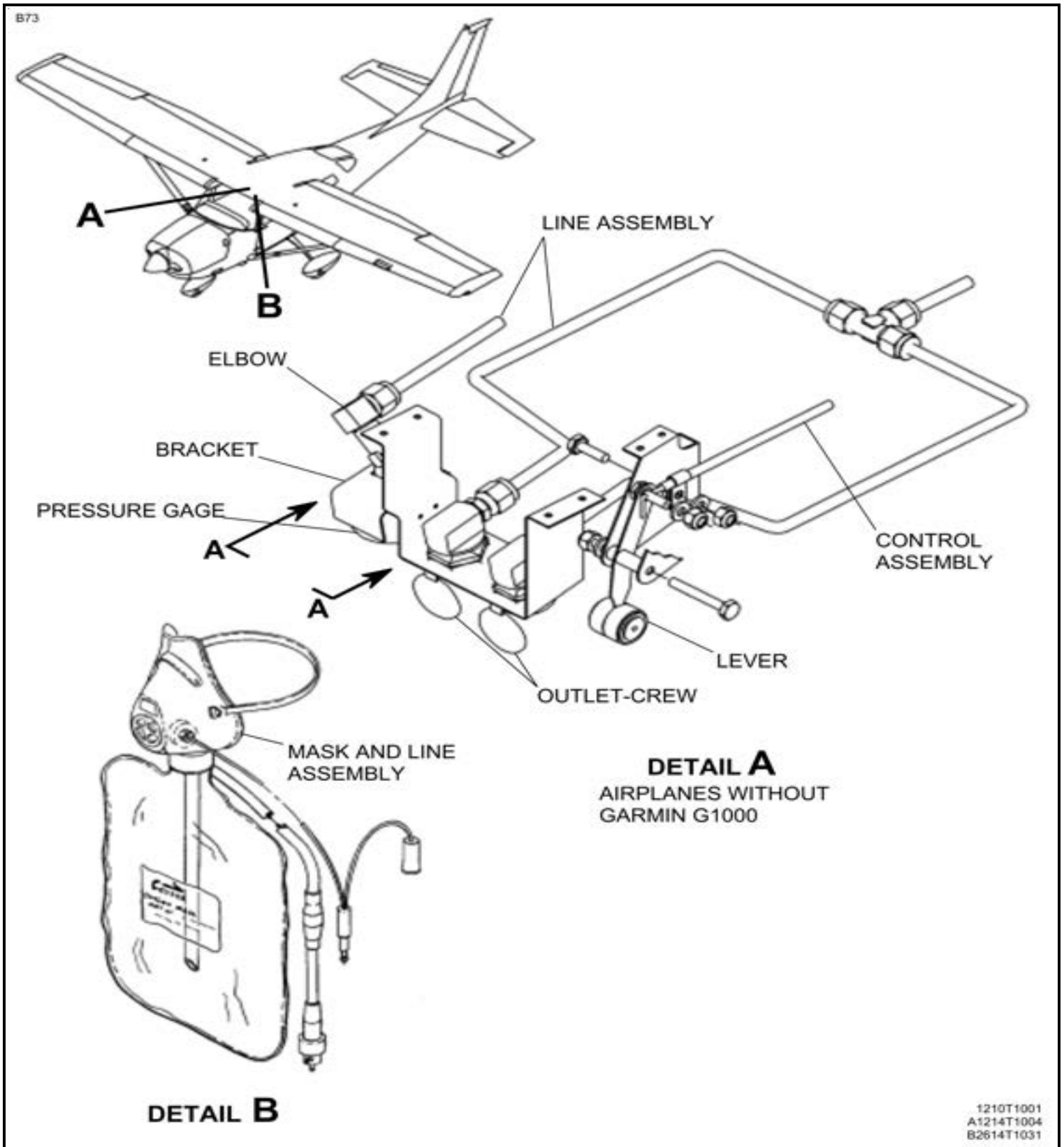


Figure 201 : Sheet 2 : Oxygen Controller Installation

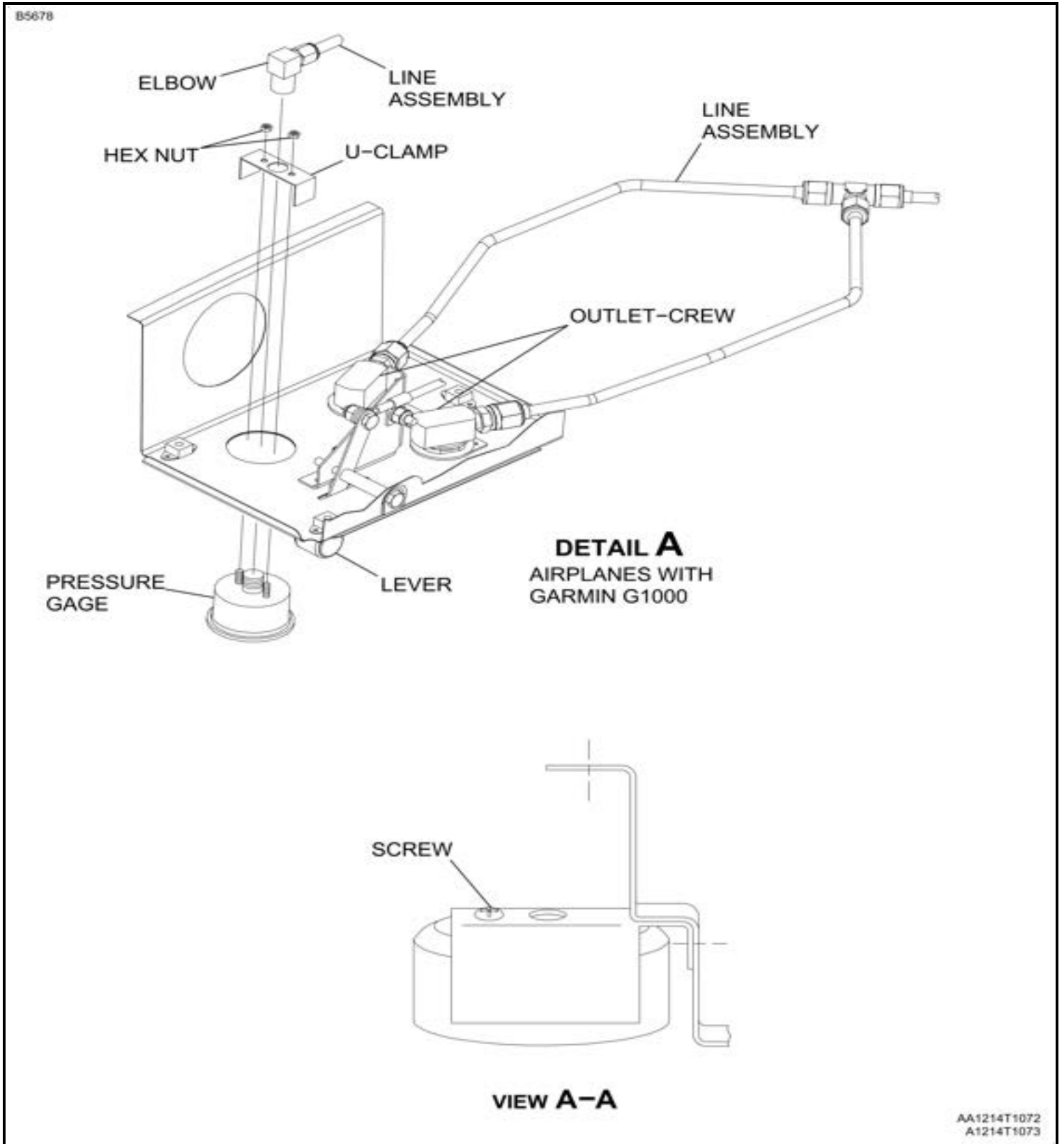


Figure 202 : Sheet 1 : Oxygen Distribution System

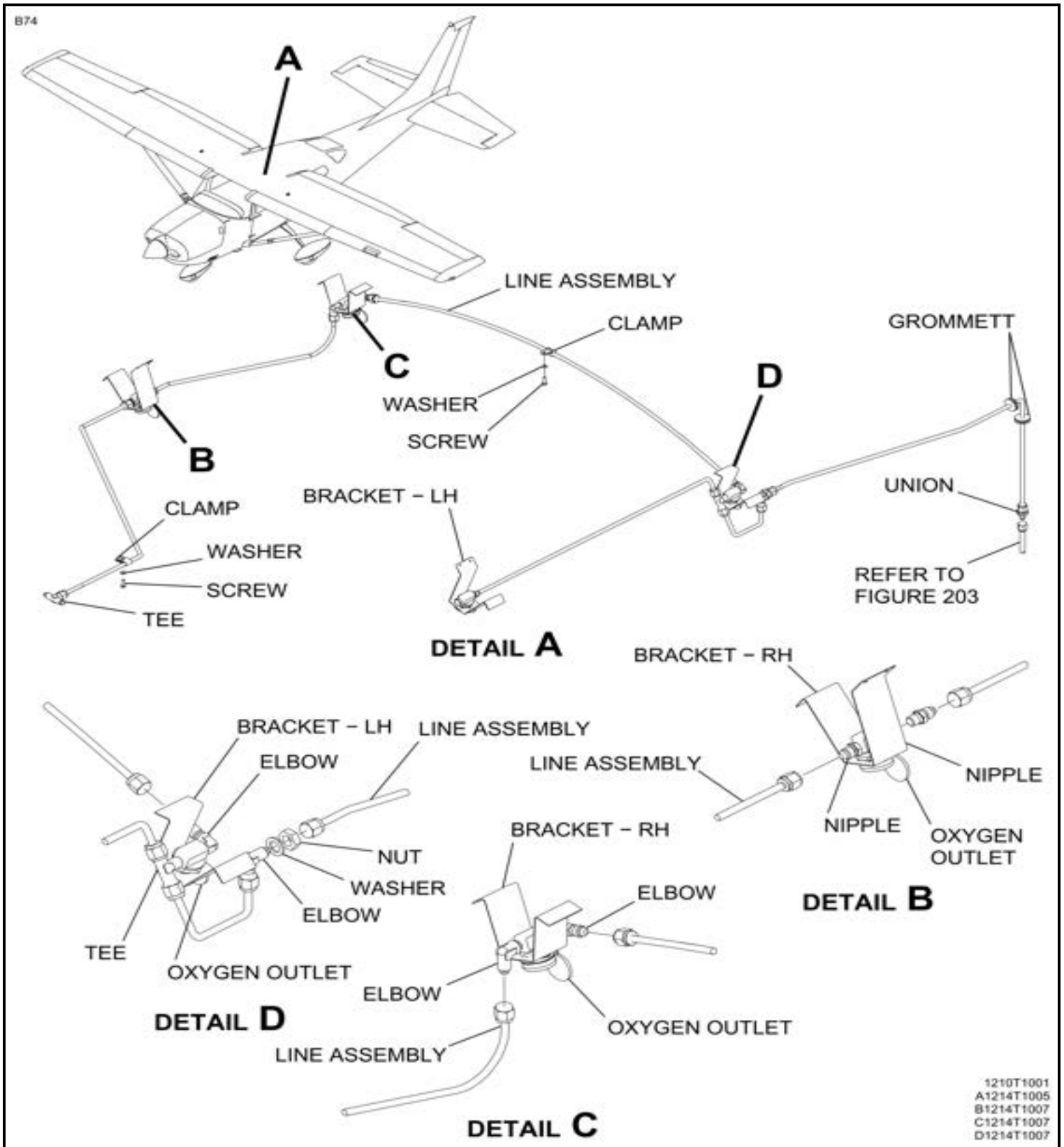
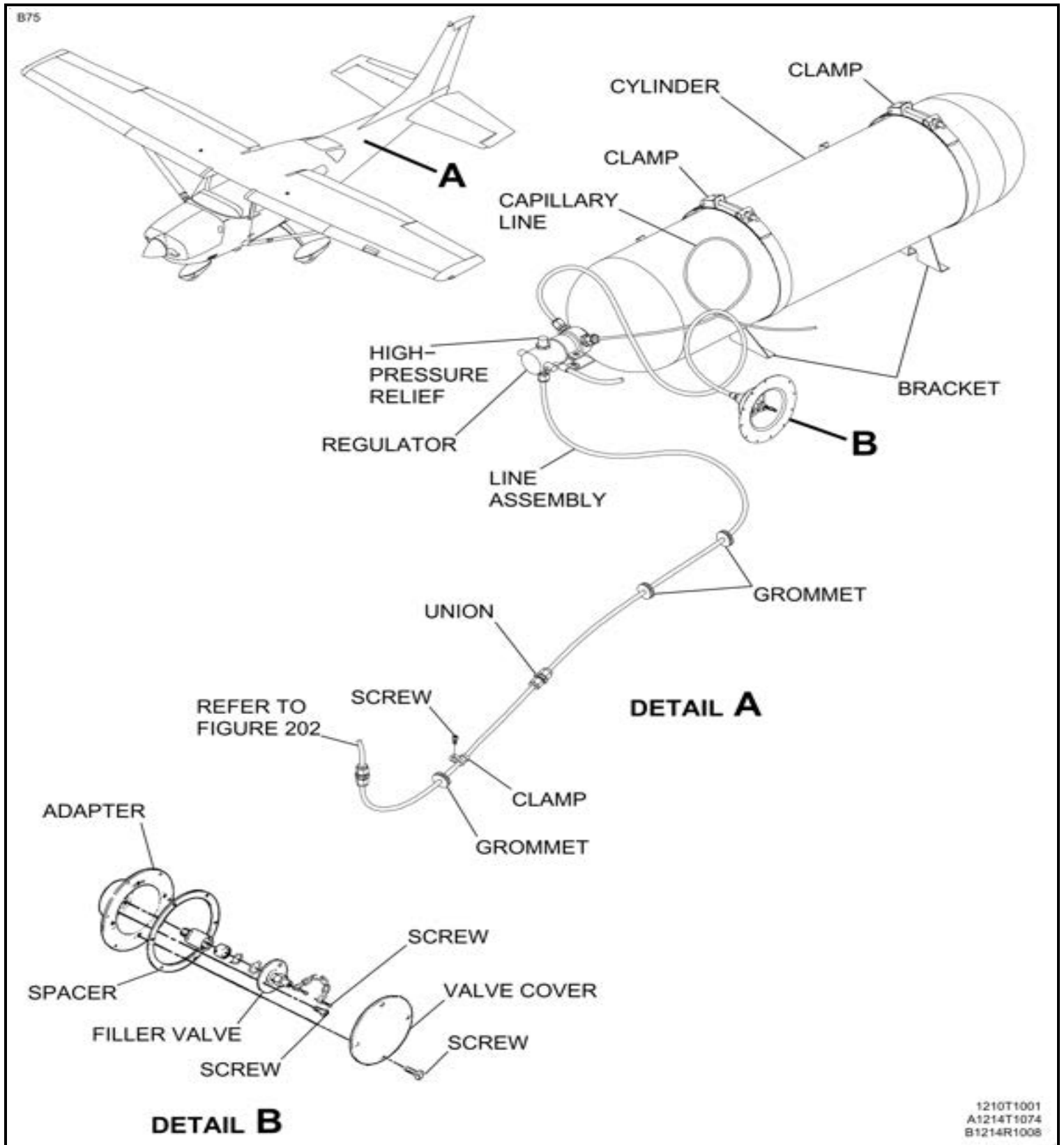


Figure 203 : Sheet 1 : Oxygen Cylinder Installation



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.

VACUUM SYSTEM - TROUBLESHOOTING

1. General

- A. A troubleshooting chart has been provided to aid the maintenance technician in system troubleshooting. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Vacuum System Troubleshooting Chart

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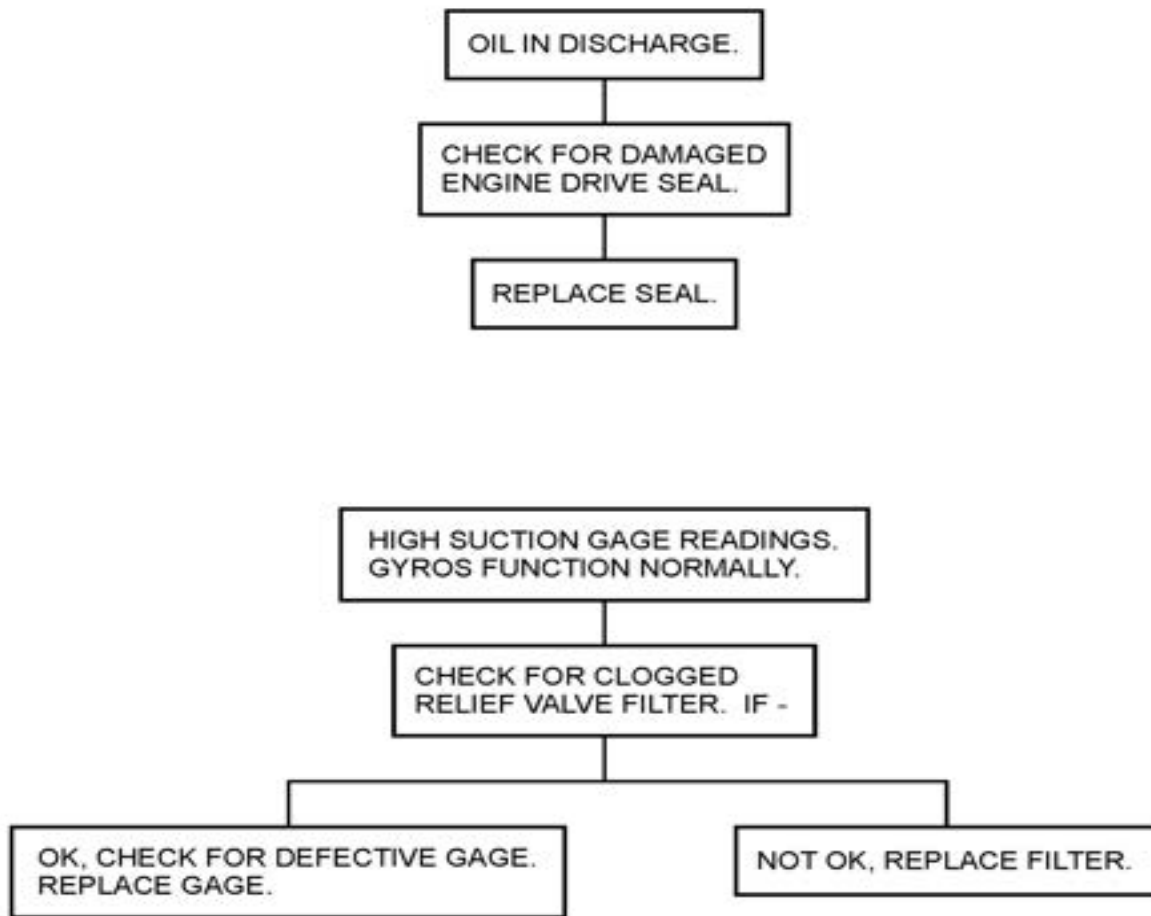
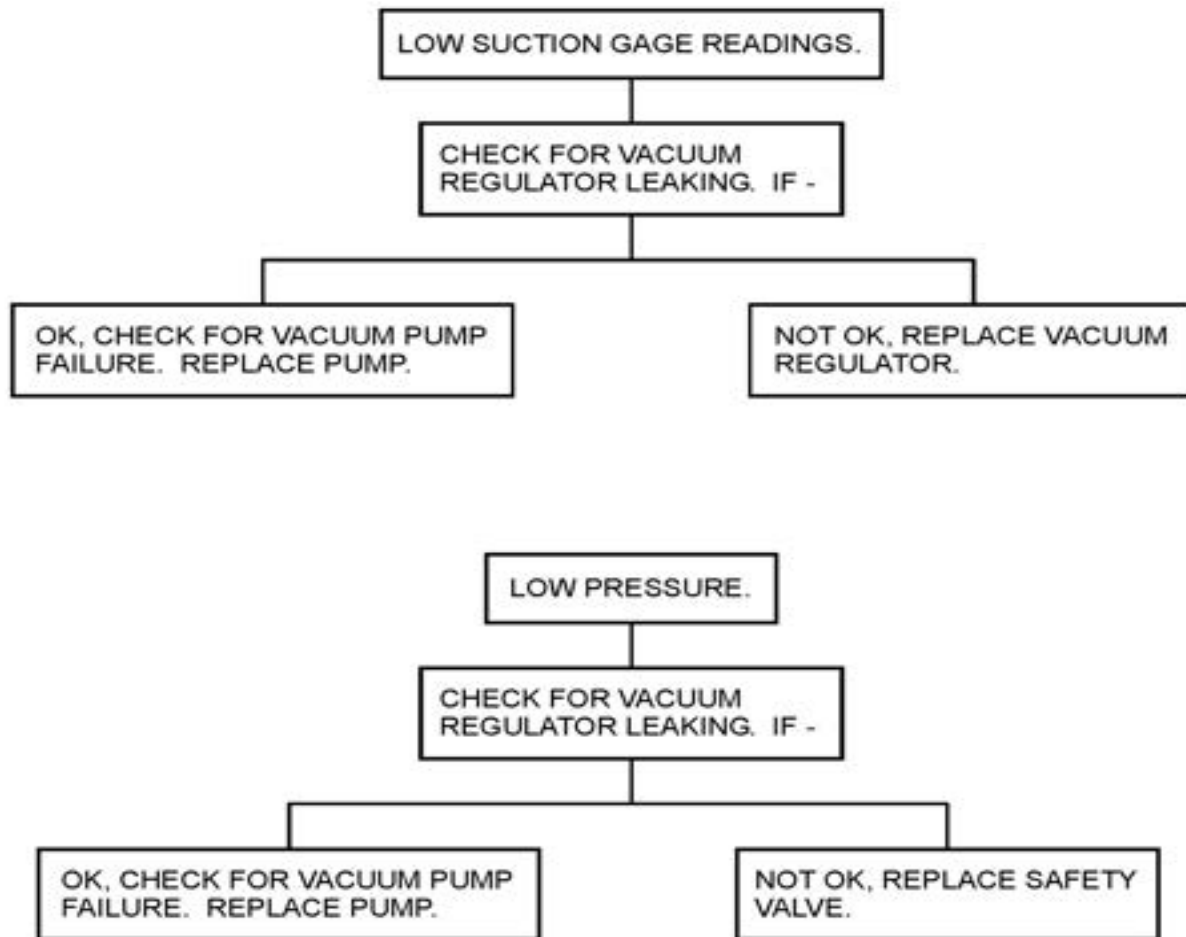


Figure 101 : Sheet 2 : Vacuum System Troubleshooting Chart

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VACUUM SYSTEM - MAINTENANCE PRACTICES

1. Description and Operation

A. Description and Operation

- (1) 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.
- (2) 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.
- (3) 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.
 - (a) The vacuum gage gives a direct indication of the system vacuum in inches of mercury (In. Hg.).
 - (b) The low vacuum annunciator switches are part of the panel annunciator warning system.
 - 1 If the left vacuum switch (SN012) senses a vacuum below 3.0 In. Hg., the VAC annunciator will show L VAC.
 - 2 If the right vacuum switch (SN011) senses a vacuum below 3.0 In. Hg., the VAC annunciator will show VAC R.
 - 3 If both switches sense a vacuum below 3.0 In. Hg., the VAC annunciators will show L VAC R.
 - (c) For more information on the maintenance practices for the panel-mounted annunciator (UI005), refer to Chapter 31, [Annunciator Panel - Maintenance Practices](#).
- (4) 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: The removal/installation is typical for each vacuum pump.

A. Remove the Vacuum Pump (Refer to [Figure 201](#) and [Figure 202](#)).

- (1) Remove the engine cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
- (2) Disconnect the hoses from the inlet and outlet ports of the vacuum pump.
- (3) Cap the hoses and vacuum pump ports to keep out foreign material.
- (4) Remove the nuts, lock washers, and flat washers that attach the shroud and vacuum pump to the engine.
- (5) Remove the shroud and vacuum pump from the studs on the engine.
- (6) Remove the elbow from the pump.
- (7) Discard any damaged fittings or nuts with rounded corners.

B. Install the Vacuum Pump (Refer to [Figure 201](#)).

- (1) Before you install a new vacuum pump, purge the vacuum pump hoses in the system to remove foreign particles that may have been deposited in the hoses by the previous vacuum pump.

CAUTION: Do not set the pump directly in a vise. If you clamp the vise across the center, the carbon rotor in the pump can be damaged. Protect the pump mount flange with soft metal or wood. Never install a vacuum pump that has been dropped.

- (2) Use a jaw protected vise to set the vacuum pump in a position with the drive coupling turned down.

CAUTION: Do not use Teflon tape, pipe dope, or thread lubricants of any type.

- (3) Install the elbow fitting in the pump hand tight.

CAUTION: Do not turn the elbow fitting more than 1.5 turns beyond the hand tight position.

- (4) Use only a box end wrench to tighten fittings to desired position.

CAUTION: Do not use any cork-type gaskets when you install the vacuum pump.

- (5) Set the new mount pad gasket on the studs.
- (6) Make sure the surfaces are clean and free of any old gasket material.

- (7) Set the vacuum pump and shroud on the studs.

CAUTION: Do not apply grease to the splines of the vacuum pump.

- (8) Make a torque wrench to install the pump and shroud to the engine.
 - (a) The wrench length must be 2.25 inches (57.15 mm) from the center of the box end to the center of the socket.
 - (b) Weld a 0.375 inch (9.525 mm) drive to a 0.4375 inch (11.1125 mm) wrench with a 12 point cut-out in the box end of the wrench.
- (9) Install the pump and shroud to the engine with the flat washers, new lockwashers, and nuts.
- (10) Use the torque wrench adapter and torque the mount nuts in a cross pattern to 70 inch-pounds, +10 or -10 inch-pounds (6.8 N.m, +1.1 or -1.1 N.m).
- (11) Connect the hoses to the inlet and outlet ports of the vacuum pump.
- (12) Connect the drain hose to the elbow.
- (13) Set the tube in a position so the exhaust is not directed toward the magnetos or electrical wires.
- (14) Operate the engine and examine the indication on the vacuum gage. Refer to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
- (15) Adjust the indication on the vacuum gage, if necessary. Refer to the vacuum pressure adjustment/test.
- (16) Install the upper engine cowls. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

3. Vacuum Manifold Removal/Installation

NOTE: The procedures that follow are for airplanes with standard avionics.

- A. Remove the Vacuum Manifold (Refer to [Figure 201](#)).
 - (1) Remove the engine cowls. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (2) Remove the hoses from the vacuum manifold.
 - (3) Identify with a tag and disconnect electrical connectors from vacuum manifold.
 - (4) Loosen the nut that attaches the vacuum manifold to the nipple in the firewall.
 - (5) Remove the vacuum manifold from the airplane.
- B. Install the Vacuum Manifold (Refer to [Figure 201](#)).
 - (1) Set the vacuum manifold on the nipple in the firewall and attach it with the nut.
 - (2) Connect the electrical connectors to the vacuum manifold.
 - (3) Connect the hoses to the vacuum manifold and attach it with the clamps.
 - (4) Install the upper engine cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

4. Vacuum Regulator Filter Removal/Installation

- A. Remove the Filter to the Vacuum Regulator (Refer to [Figure 201](#)).
 - (1) Remove the pilot seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
 - (2) Reach behind the radio stack and stretch the foam element over the top retaining bezel to remove the filter.
 - (3) Remove the filter from the airplane.
- B. Install the Vacuum Regulator Filter (Refer to [Figure 201](#)).
 - (1) Reach behind the radio stack and stretch the foam element over the top of the retaining bezel to install the filter.
 - (2) Make sure that the foam element is installed correctly on the retaining bezel.
 - (3) Install the pilot seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).

5. Gyro Filter Removal/Installation

- A. Remove the Gyro Filter (Refer to [Figure 201](#)).
 - (1) Remove the bolt and retainer from the mount.
 - (2) Remove the gyro filter.
- B. Install the Gyro Filter (Refer to [Figure 201](#)).
 - (1) Set the gyro filter and retainer on the mount and install the bolt.

6. Vacuum Gage Removal/Installation

NOTE: The procedures that follow are for airplanes with standard avionics.

NOTE: The vacuum gage and ammeter are incorporated into a single instrument.

- A. Remove the Vacuum Gage (Refer to [Figure 201](#)).
 - (1) Disconnect the vacuum and air hoses from the vacuum gage.
 - (2) Disconnect the electrical connector from the ammeter.
 - (3) Remove the screws that attach the vacuum gage to the instrument panel and remove the vacuum gage.
- B. Install the Vacuum Gage (Refer to [Figure 201](#)).
 - (1) Install vacuum gage to the instrument panel and attach with screws.
 - (2) Connect the electrical connector to the ammeter.
 - (3) 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. Remove the Vacuum Transducer (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. Install the Vacuum Transducer (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](#).

8. 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 annunciations 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.
- (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.

Figure 201 : Sheet 1 : Vacuum System Installation

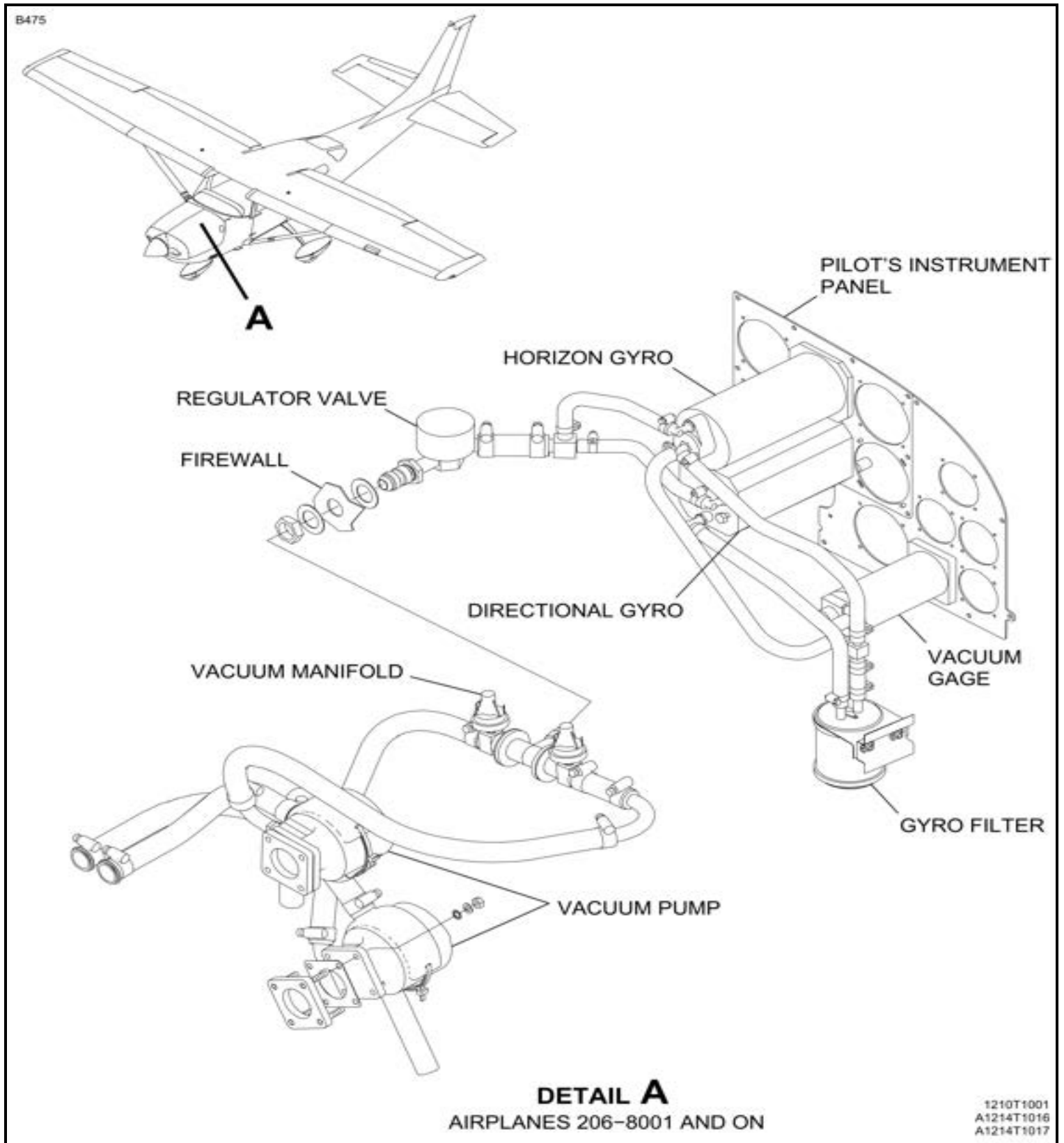


Figure 201 : Sheet 2 : Vacuum System Installation

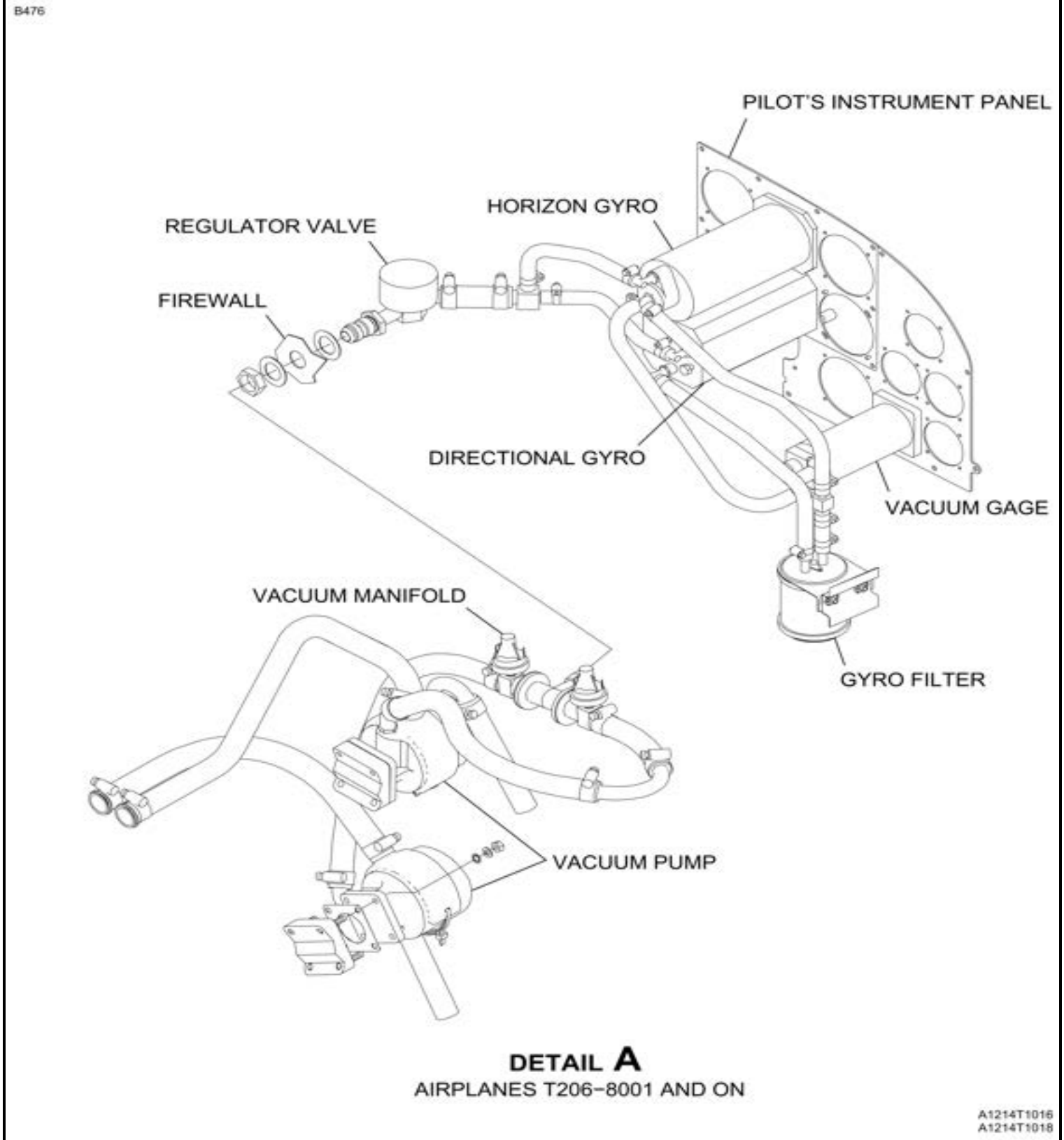


Figure 201 : Sheet 3 : Vacuum System Installation

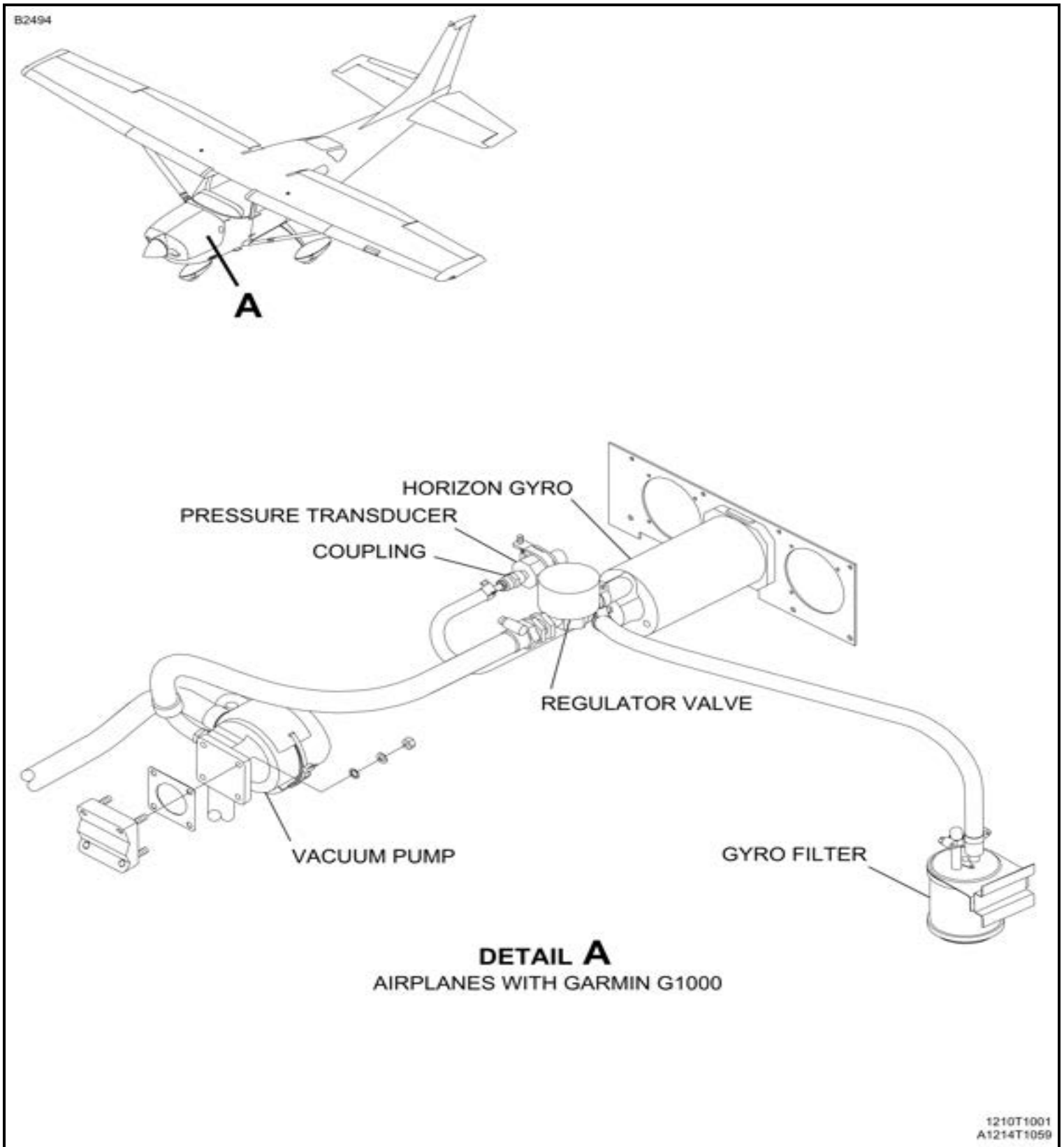
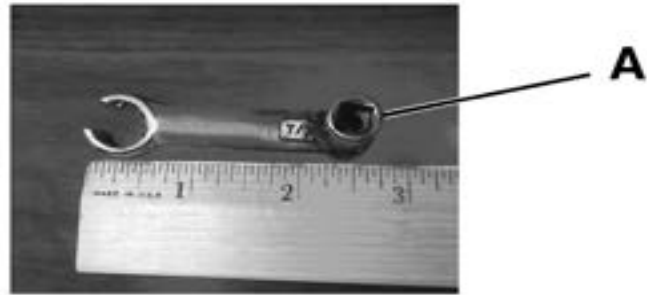
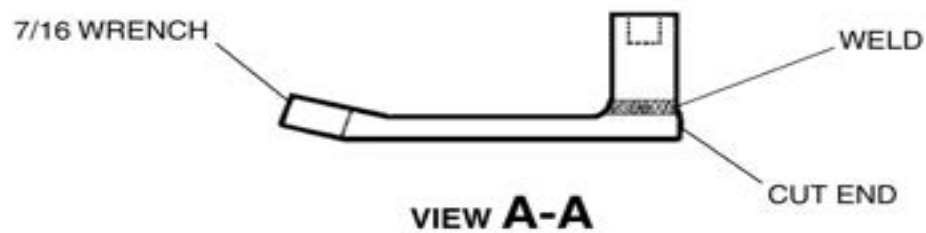
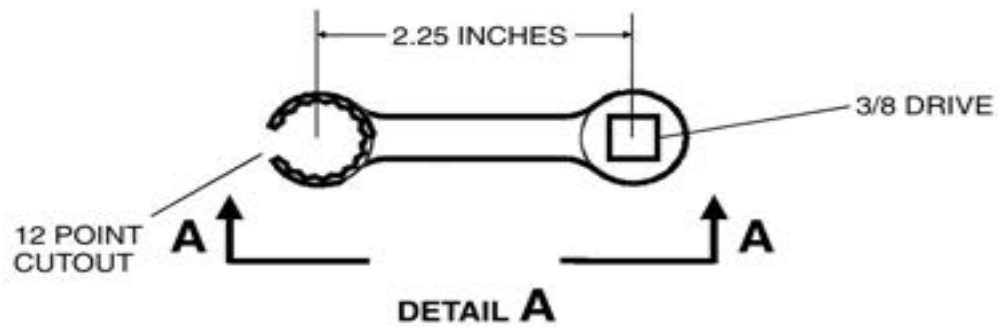


Figure 202 : Sheet 1 : Vacuum Pump Torque Wrench Adapter

8294



FABRICATED TORQUE WRENCH
ADAPTOR



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, 172, 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) For a general description of corrosion characteristics, types of corrosion and typical corrosion areas, refer to the Single Engine Models 172, 182, 206, and T206 1996 and On Structural Repair Manual, Chapter 51, [Corrosion and Corrosion Control - General](#).

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 clad aluminum alloy which, after forming, is heat treated to a 2024-T42 condition and painted with corrosion resistant 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, semimonocoque 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 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 cowlings consist of upper formed aluminum sections. The upper section includes an oil inspection door.

CORROSION - DESCRIPTION AND OPERATION

1. General

- A. This section describes corrosion to assist maintenance personnel in identification of various types of corrosion and application of preventative measures to minimize corrosion activity.
- B. Corrosion is the deterioration of a metal by reaction to its environment. Corrosion occurs because most metals have a tendency to return to their natural state.

2. Corrosion Characteristics

- A. Metals corrode by direct chemical or electrochemical (galvanic) reaction to their environment. The following describes electrochemical reaction:
 - (1) Electrochemical corrosion can best be compared to a battery cell. Three conditions must exist before electrochemical corrosion can occur:
 - (a) There must be a metal that corrodes and acts as the anode (+ positive).
 - (b) There must be a less corrodible metal that acts as the cathode (- negative).
 - (c) There must be a continuous liquid path between the two metals, which acts as the electrolyte. This liquid path may be condensation or, in some cases, only the humidity in the air.
 - (2) Elimination of any one of the three conditions will stop the corrosion reaction process.
 - (3) A simple method of minimizing corrosion is adding a layer of pure Aluminum to the surface. The pure Aluminum is less susceptible to corrosion and also has a very low electropotential voltage relative to the remainder of the alloyed sheet. This process is conducted at the fabricating mill and the product is called Alclad. Model 206 airplanes had sheet metal parts constructed of Alclad sheet.
 - (4) One of the best ways to eliminate one of the conditions is to apply an organic film (such as paint, grease or plastic) to the surface of the metal affected. This will prevent electrolyte from connecting the cathode to the anode so current cannot flow and therefore, prevent corrosive reaction and was not available for production Model 206 airplanes.
 - (5) Other means employed to prevent electrochemical corrosion include anodizing and electroplating. Anodizing and other passivating treatments produce a tightly adhering chemical film which is much less electrochemically reactive than the base metal. Because the electrolyte cannot reach the base metal, corrosion is prevented. Electroplating deposits a metal layer on the surface of the base material, which is either less electrochemically reactive (Example: chrome on steel) or is more compatible with the metal to which it is coupled (Example: cadmium plated steel fasteners used in aluminum).
 - (6) At normal atmospheric temperatures, metals do not corrode appreciably without moisture. However, the moisture in the air is usually enough to start corrosive action.
 - (7) 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 surfaces. This film tends to protect the metal underneath.
 - (8) When components and systems constructed of many different types of metals must perform under various climatic conditions, corrosion becomes a complex problem. The presence of salts on metal surfaces (sea or coastal operations) greatly increases the electrical conductivity of any moisture present and accelerates corrosion.
 - (9) Other environmental conditions that 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. The common types of corrosion that are encountered in airplane maintenance are described in this section. In many instances more than one form of corrosion may exist at the same time. While this makes it difficult to determine the exact type of corrosion, it should still be possible to determine that a corrosive process is taking place. If it is impractical to replace an assembly or component, contact an authorized repair shop.
- B. Direct Chemical Attack.
 - (1) Direct chemical attack may take place when corrosive chemicals, such as battery electrolyte, caustic cleaning solutions or residual flux deposits are allowed to remain on the surface or become entrapped in cracks or joints. Welding or soldering flux residues are hygroscopic and will tend to cause severe pitting. Any potentially corrosive substance should be carefully and completely removed whenever such spillage occurs.
- C. Pitting Corrosion.

- (1) The most common effect of corrosion on polished aluminum parts is called pitting. It is first noticeable as a white or gray powdery deposit, similar to dust, which blotches the surface (Refer to [Figure 1](#)).
- (2) When the deposit is cleaned away, tiny pits can be seen in the surface. Pitting may also occur in other types of metal alloys.

D. Intergranular Corrosion.

- (1) Intergranular corrosion (Refer to [Figure 1](#)) takes place because of the nature of the structure of metal alloys. As metals cool from the molten state, a granular structure is formed. The size and composition of the grains and the material in the grain boundaries depend on several factors including the type of alloy and rate of cooling from the molten state or cooling after heat-treating. The grains differ chemically and may differ electrochemically from the boundary material. If an electrolyte comes in contact with this type of structure, the grains and boundary material will act as anode and cathode and undergo galvanic corrosion. The corrosion proceeds rapidly along the grain boundaries and destroys the solidity of the metal.

E. Exfoliation gives the appearance of sheets of very thin metal separated by corrosion products. It is a form of intergranular corrosion. Since the corroded products are thicker than the uncorroded aluminum, exfoliation shows itself by “lifting up” the surface grains of a metal by the force of expanding corrosion. This type of corrosion is most often seen on extruded sections, where the grain thicknesses are usually less than in rolled alloy form.

F. Dissimilar Metal Corrosion. (Refer to [Figure 1](#))

- (1) Dissimilar metal corrosion occurs when dissimilar metals are in contact in the presence of an electrolyte. A common example of dissimilar metal contact involves the attachment of aluminum parts by steel fasteners.

G. Concentration Cell Corrosion. (Refer to [Figure 1](#))

- (1) Concentration cell corrosion occurs when two or more areas of the same metal surface are in contact with different concentrations of the same solution, such as moist air, water and chemicals.
- (2) The general types of concentration cell corrosion are identified as metal ion cells and oxygen cells. Refer to [Figure 1](#).

H. Filiform Corrosion.

- (1) Filiform corrosion is a “concentration cell” corrosion process. When a break in the protective coating over aluminum occurs, the oxygen concentration at the back or bottom of the corrosion cell is lower than that at its open surface. The oxygen concentration gradient thus established, causes an electric current flow and corrosion results. Filiform corrosion results when this happens along the interface between the metal and the protective coating and appears as small worm-like tracks. Filiform corrosion generally starts around fasteners, holes and countersinks and at the edge of sheet metal on the outer surface of the airplane. Filiform corrosion is more prevalent in areas with a warm, damp and salty environment.

- (2) To help prevent filiform corrosion development, the airplane should be:

- (a) Spray washed at least every two to three weeks (especially in a warm, damp environment).
- (b) Waxed with a good grade of water repellent wax to help keep water from accumulating in skin joints and around countersinks.

NOTE: Wax only clean surfaces. Wax applied over salt deposits will almost guarantee a trapped salt deposit, which is capable of accumulating moisture and developing into filiform corrosion.

- (c) Keep the airplane hangared to protect it from the atmosphere.
- (d) Fly the airplane to promote aeration of enclosed parts.
- (e) Ensure all vent/drain holes are open to ventilate the interior of airplane.

- (3) To remove filiform corrosion once it has been discovered:

- (a) Remove paint from corroded area.
- (b) Remove corrosion by sanding area to metal surface, using either a ScotchBrite pad or 320 grit sandpaper (aluminum oxide or silicone carbide grit).
- (c) Clean and refinish surface.

I. Stress Corrosion Cracking.

- (1) This corrosion is caused by the simultaneous effects of tensile stress and corrosion. The stress may be internal or applied. Internal stresses are produced by nonuniform shaping during cold working of the metal, press and shrink fitting general hardware and those induced when pieces, such as rivets and bolts, are formed. The amount of stress varies from point to point within the component. Stress corrosion is most likely to occur at points of highest stress, which are also subject to corrosion influence.

J. Fatigue Corrosion.

- (1) Fatigue corrosion is a special case of stress corrosion caused by the combined effects of cyclic stress and corrosion.

4. Typical Corrosion Areas

- A. Aluminum appears high in the electrochemical series of elements and its position indicates that it should corrode very easily. However, the formation of a tightly adhering oxide film offers increased resistance under mild corrosive conditions. Most metals in contact with aluminum form couples, which undergo galvanic corrosion attack. The alloys of aluminum are subject to pitting, intergranular corrosion and intergranular stress corrosion cracking.

B. Battery Electrolyte.

- (1) Battery electrolyte used in lead acid batteries is composed of 35% sulfuric acid and 65% water. When electrolyte is spilled, it should be cleaned up immediately. A weak boric acid solution may be applied to the spillage area followed by a thorough flushing with clean, cold running water. If boric acid is not available, flush the area with clean, cold water.
- (2) If corrosion appears, use an approved repair method to repair the structure.

C. Steel Control Cable.

- (1) Checking for corrosion on a control cable is normally accomplished during the preventative maintenance check. During preventative maintenance, broken wire and wear of the control cable are also checked.
- (2) 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.

CAUTION: Do not use metallic wools or solvents to clean installed cables. Metallic wools 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.

- (3) After thorough cleaning of exterior cable surfaces, if the cable appears dry, the lubrication originally supplied on the cable has probably oxidized and needs to be replaced with a light oil (5w motor oil, "3 in 1" oil, LPS-2, WD-40 or Diesel Fuel). Apply the oil with a cloth and then rub the cable with the cloth to coat the cable with a thin layer of oil. Excessive oil will collect dust and be as damaging to the cable as no lubrication.

D. Piano Type Hinges.

- (1) The construction of piano type hinges forms moisture traps as well as the dissimilar metal couple between the steel hinge pin and the aluminum hinge. Solid film lubricants are often applied to reduce corrosion problems.
- (2) Care and replacement of solid film lubricants require special techniques peculiar to the particular solid film being used. Good solid film lubricants are lubricants conforming to Specification MIL-PRF-81322.
 - (a) Solid film lubricants prevent galvanic coupling on close tolerance fittings and reduce fretting corrosion. Surface preparation is extremely important to the service or wear life of solid film lubricants.
 - (b) Solid film lubricants are usually applied over surfaces coated with other films, such as anodize and phosphate. They have been successfully applied over organic coatings such as epoxy primers.

CAUTION: Solid film lubricants containing graphite, either alone or in mixture with any other lubricants, should not be used since graphite is cathodic to most metals and will cause galvanic corrosion in the presence of electrolytes.

E. Requirements peculiar to faying surfaces of airframes, airframe parts and attaching surfaces of equipment, accessories and components.

- (1) When repairs are made on equipment or when accessories and components are installed, the attaching surfaces of these items should be protected. The following requirements are peculiar to faying surfaces on airframes, airframe parts and attaching surfaces of equipment, accessories and components:
- (2) Surfaces of similar or dissimilar metals.
 - (a) All faying surfaces, seams and lap joints protected by sealant must have the entire faying surface coated with sealant. Excess material squeezed out should be removed so that a fillet seal remains. Joint areas, which could hold water, should be filled or coated with sealant.
- (3) Attaching Parts.
 - (a) Attaching parts, such as nuts, bushings, spacers, washers, screws, self-tapping screws, self-locking nuts and clamps, do not need to be painted in detail except when dissimilar metals or wood contact are involved in the materials being

joined. Such parts should receive a wet or dry coat of primer.

NOTE: Corrosion inhibiting solid film lubricants, Specification MIL-PRF-46010 and/or MIL-L-46147, may be used to protect attaching parts from corrosion.

- (b) All holes drilled or reworked in aluminum alloys to receive bolts, bushings, screws, rivets and studs should be treated before installation of fasteners or bushings.
- (c) All rivets used to assemble dissimilar metals should be installed wet, with sealant, conforming to Specification MIL-PRF-81733 Corrosion inhibiting sealer (Type X).
- (4) Close tolerance bolts passing through dissimilar metals should be coated before installation, with a corrosion inhibiting solid film lubricant conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
- (5) Washers made of aluminum alloy of suitable design should be used under machine screws, countersunk fasteners, bolt heads and nuts.
- (6) Adjustable parts threads such as tie rod ends, turnbuckles, etc., should be protected with solid film lubrication conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
- (7) Slip fits should be assembled using wet primer conforming to Specification MIL-PRF-23377G or later, non-drying zinc chromate paste or solid film lubricant conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
- (8) Press fits should be accomplished with oil containing material conforming to Specification MIL-C-11796, Class 3 and/or MIL-C-16173, Class 1 or with other suitable material that will not induce corrosion.

F. Electrical.

- (1) Bonding and ground connections should be as described by the installation procedure.
- (2) Potting compounds are used to safeguard against moisture. Corrosion in electrical systems and resultant failure can often be attributed to moisture and climatic condition.
- (3) Corrosion of metal can be accelerated because of the moisture absorbed by fungi. Fungi can create serious problems since it can act as an electrolyte, destroying the resistance of electrical insulating surfaces. Specification ASTM D3955 or ASTM D295-58 outlines moisture and fungus resistant varnish to be used.

5. General Corrosion Repair

A. This section provides general guidance on the repair of corroded area. The procedure presented is:

- (1) Gain access to the entire corroded area.
- (2) Mechanically remove the corrosion products
- (3) Determine the extent of the corrosion damage
- (4) Repair or replace the damaged components
- (5) Finish the new or repaired parts.
- (6) Replace removed components

B. Gain access to the entire corroded area.

- (1) Corrosion products typically retain moisture. If those products are not removed, corrosion will continue. Corrosion can take place within layered construction or under (behind) equipment fastened in place.

C. Mechanically remove the corrosion.

- (1) Chemicals will not remove corrosion. The best chemicals can do is interrupt the corrosion cell by either displacing water or shielding corrosion products from oxygen. In either case, the effect is temporary and will need to be renewed.
- (2) Sand mild corrosion.
- (3) Use rotary files or sanding disks for heavier corrosion. Finish up with fine sand paper.

NOTE: Do not use metallic wool. Metal particles will be embedded in the surface, which will initiate additional corrosion.

D. Determine the extent of corrosion damage.

- (1) Direct measurement is simplest.
- (2) Indirect measurement may be necessary
 - (a) Eddy Current or ultrasound tools can be used for thickness measurement away from part edges.

E. Repair or replace corrosion damaged components

- (1) Replace damaged or corroded steel or aluminum fasteners.
 - (2) If the material is sheet or plate, the thickness is allowed to be as little as 90% of the nominal thickness.
 - (3) This general allowance is not allowed if:
 - (a) The area of the part contains fasteners.
 - (b) The reduced thickness compromises the fit or function of a part.
- F. Finish the new or repaired parts
- (1) Apply Alodine or similar anticorrosion compounds to new or repaired parts or
 - (2) Apply zinc chromate or
 - (3) Apply epoxy fuel tank primer.
 - (4) Paint the exterior or visible interior parts according to Section 19 of the applicable Model 206 Service Manual.
- G. Replace Removed Components.

6. Corrosion Severity Maps

- A. This section contains maps which define the severity of potential corrosion on airplane structure.
- B. Corrosion severity zones are affected by atmospheric and other climatic factors. The maps provided in this section are for guidance when determining types and frequency of required inspections and other maintenance. Refer to [Figure 2](#), [Figure 3](#), [Figure 4](#), [Figure 5](#), [Figure 6](#) and [Figure 7](#).

Figure 1 : Sheet 1 : Corrosion

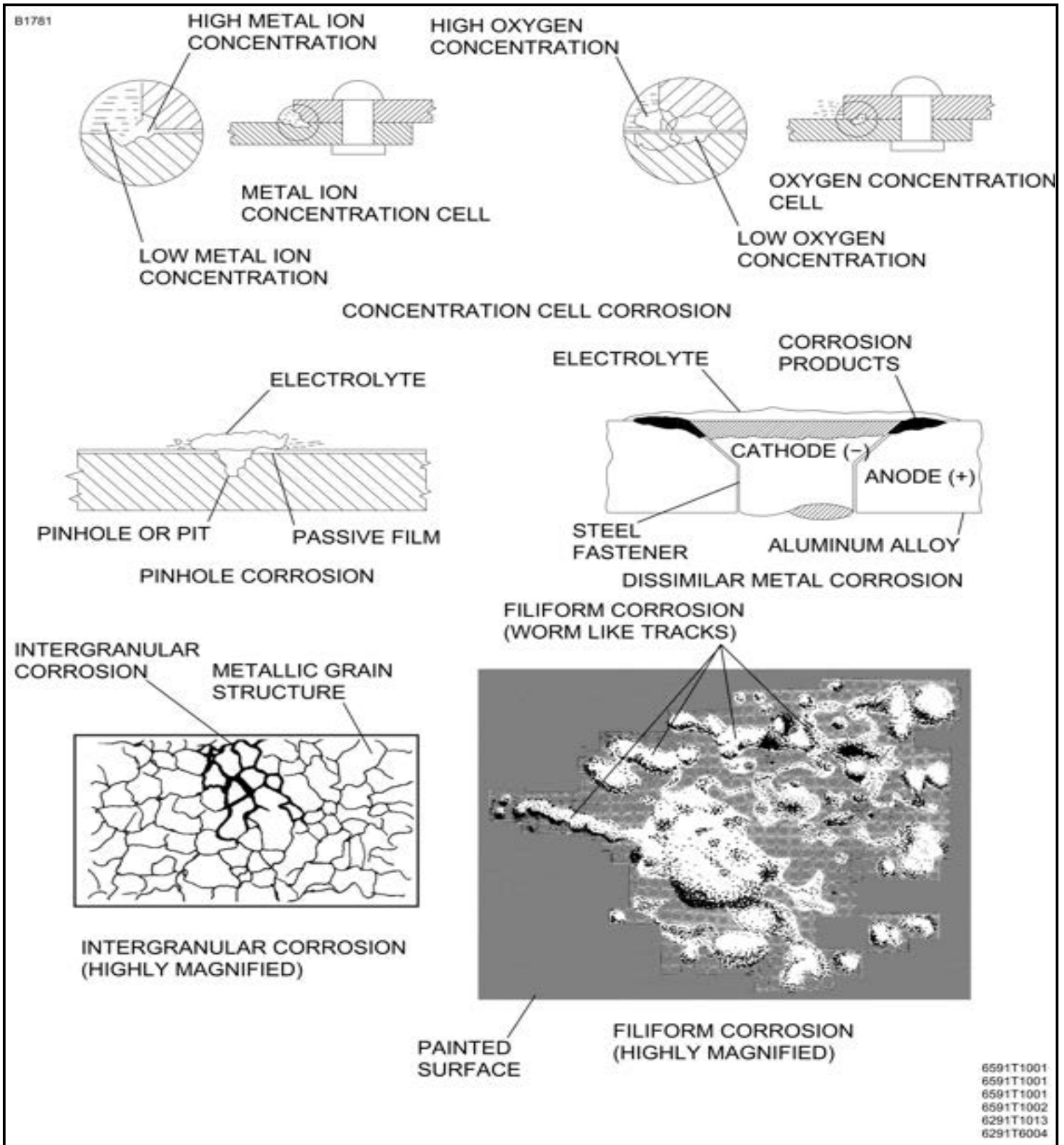


Figure 2 : Sheet 1 : North America Corrosion Severity Map

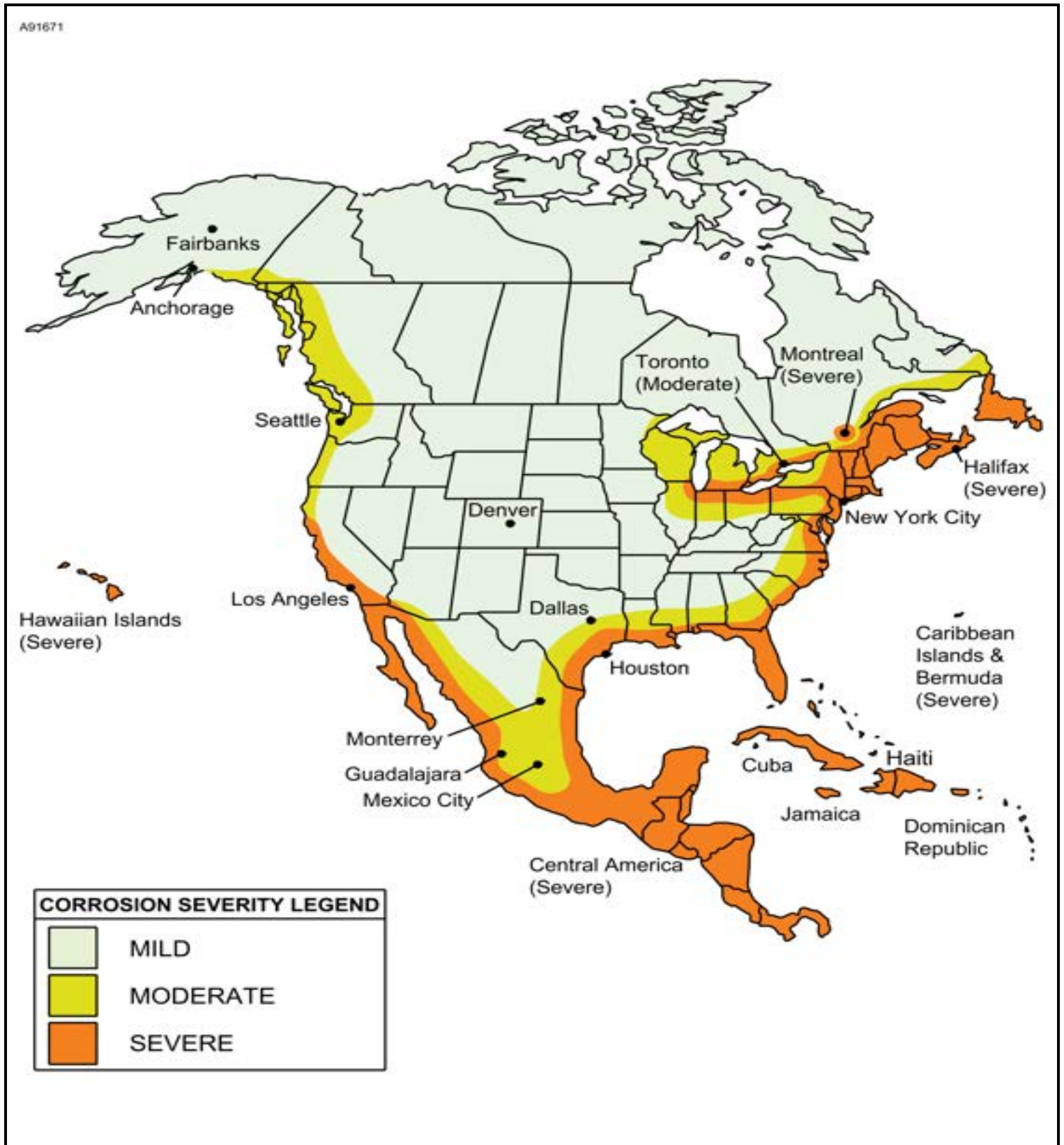


Figure 3 : Sheet 1 : South America Corrosion Severity Map

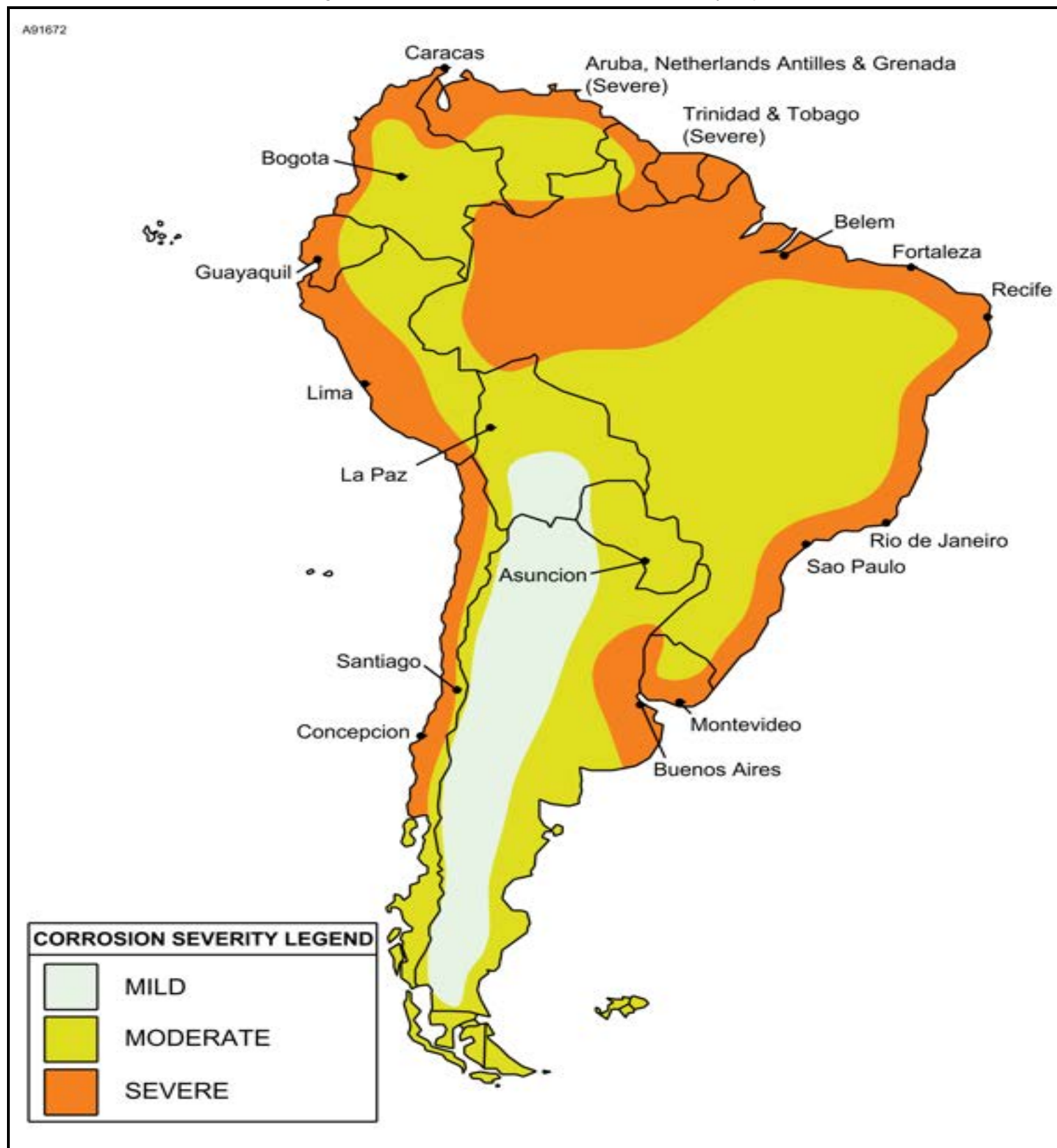


Figure 4 : Sheet 1 : Africa Corrosion Severity Map

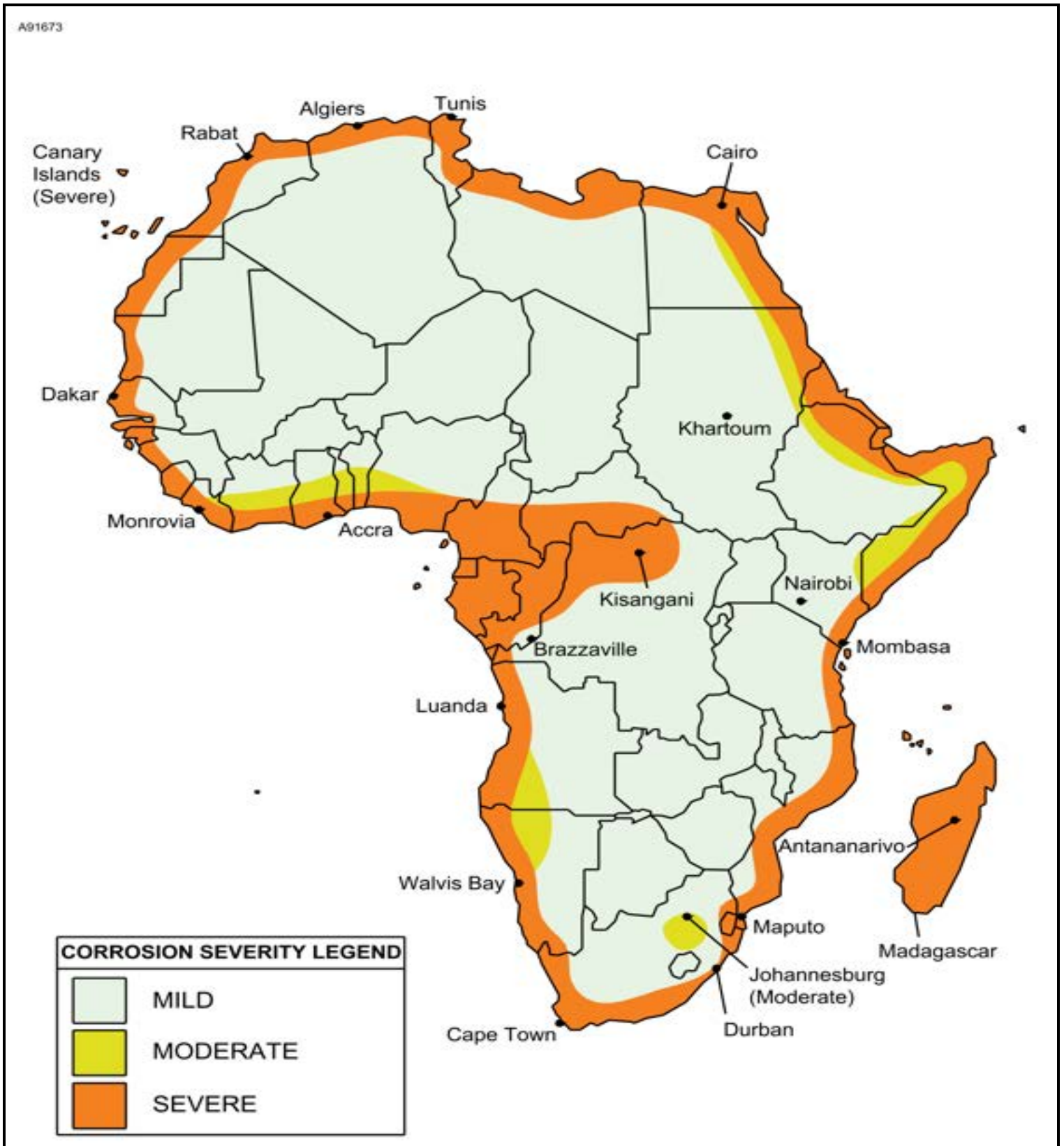


Figure 5 : Sheet 1 : Asia Corrosion Severity Map

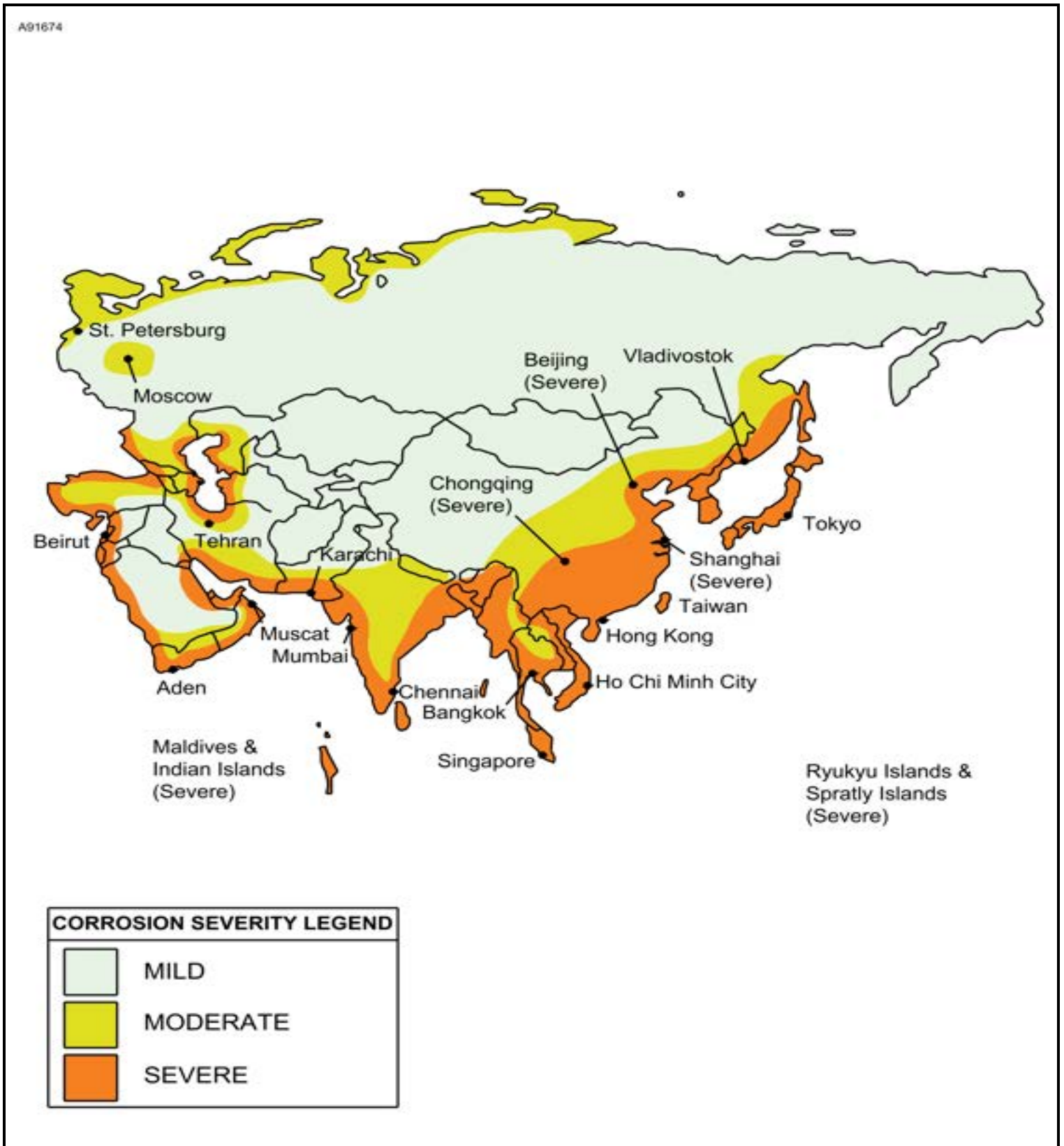


Figure 6 : Sheet 1 : Europe and Asia Minor Corrosion Severity Map

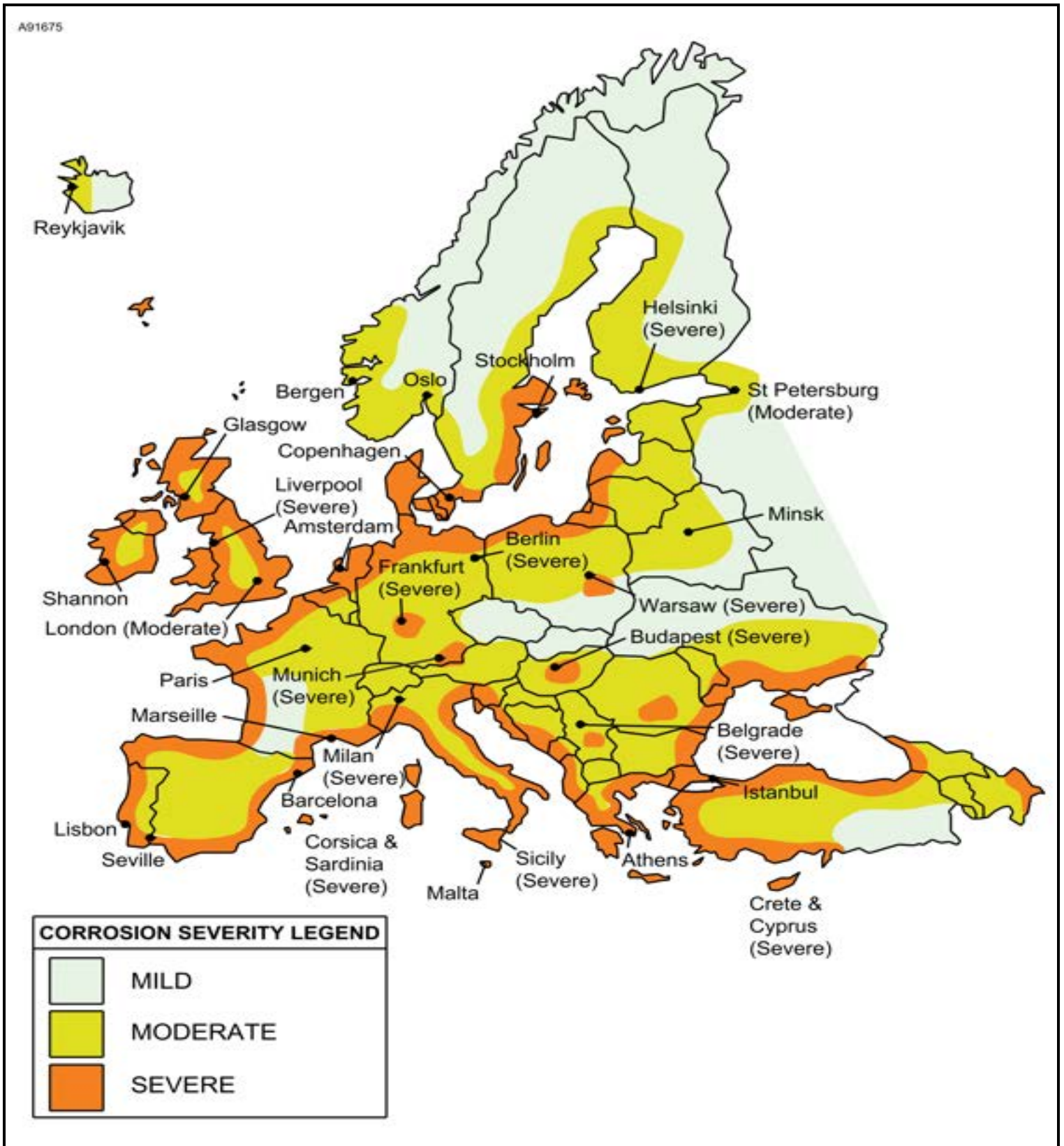
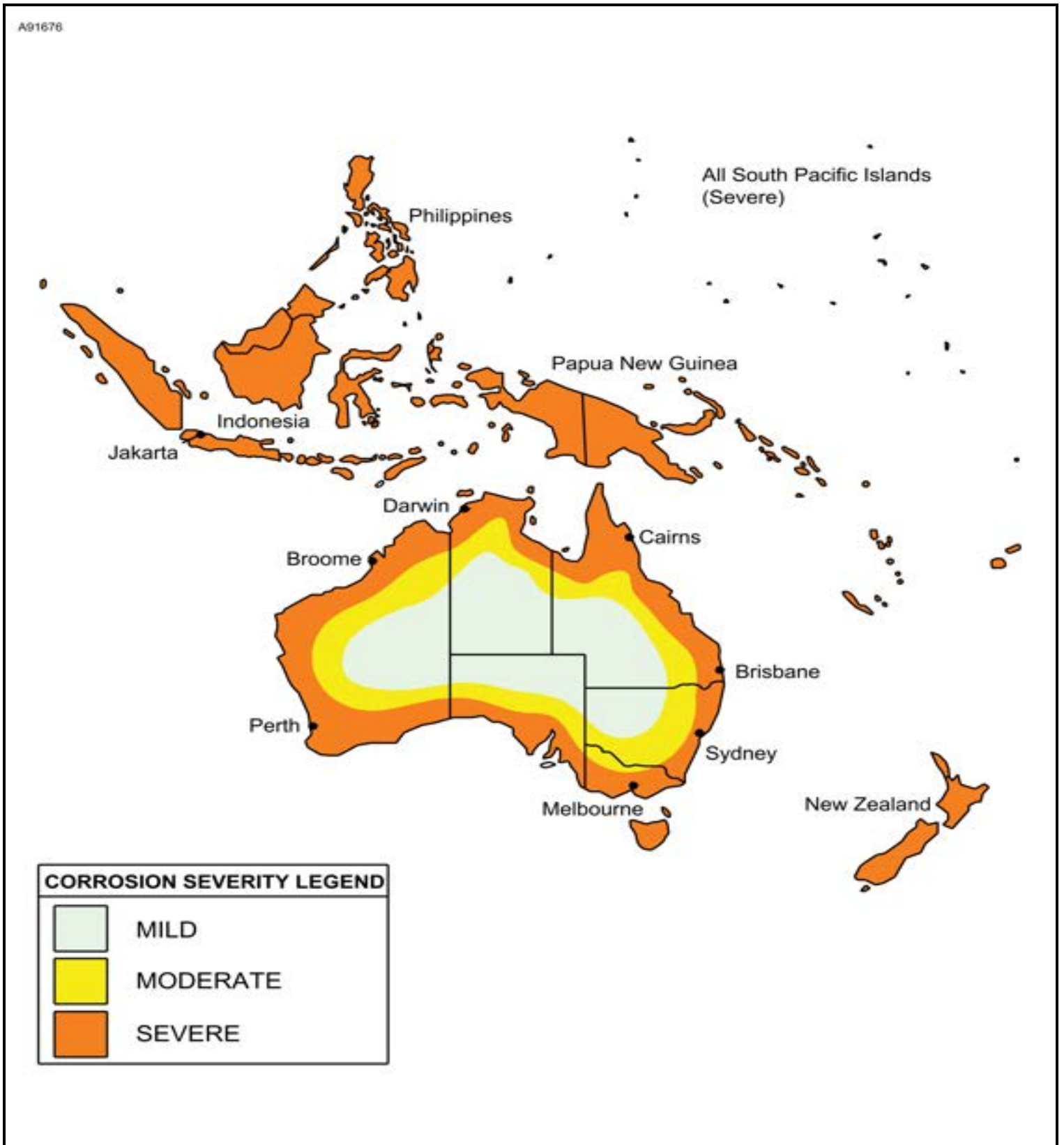


Figure 7 : Sheet 1 : South Pacific Corrosion Severity Map



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.
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.

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.

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.
- B. The windshield and windows are single-piece, acrylic panels, set in sealing strips and held by formed retaining strips, secured to the fuselage with screws and rivets.

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 n-propyl ketone, acetone, carbon tetrachloride, lacquer thinners, 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 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 or 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 windshield and window surfaces during any painting, powerplant cleaning or other procedures that call for the 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 thinners, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
- (5) Do not leave sun visors 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.
- (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 verses 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 to hole diameter ratio is greater than 3.0 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 beading of the windshield during rain. Apply in accordance with manufacturer's instructions.

WINDSHIELD - MAINTENANCE PRACTICES

1. General

- A. This section provides instructions for removal and installation of the windshield 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 magnetic compass. Refer to Chapter 34, [Compass Installation - Maintenance Practices](#).
- (3) Remove air vent tubes. Refer to Chapter 21, [Fresh Air Distribution - Maintenance Practices](#).
- (4) Drill out rivets securing front retainer strip.

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) Carefully position bottom edge of windshield into lower retainer.
- (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) Tighten or install windshield retainers as required.
- (8) Install air vent tube. Refer to Chapter 21, [Fresh Air Distribution - Maintenance Practices](#).
- (9) Install magnetic compass. Refer to Chapter 34, [Compass Installation - Maintenance Practices](#).
- (10) Install wing fairings.

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 side 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.

Figure 201 : Sheet 1 : Windshield Installation

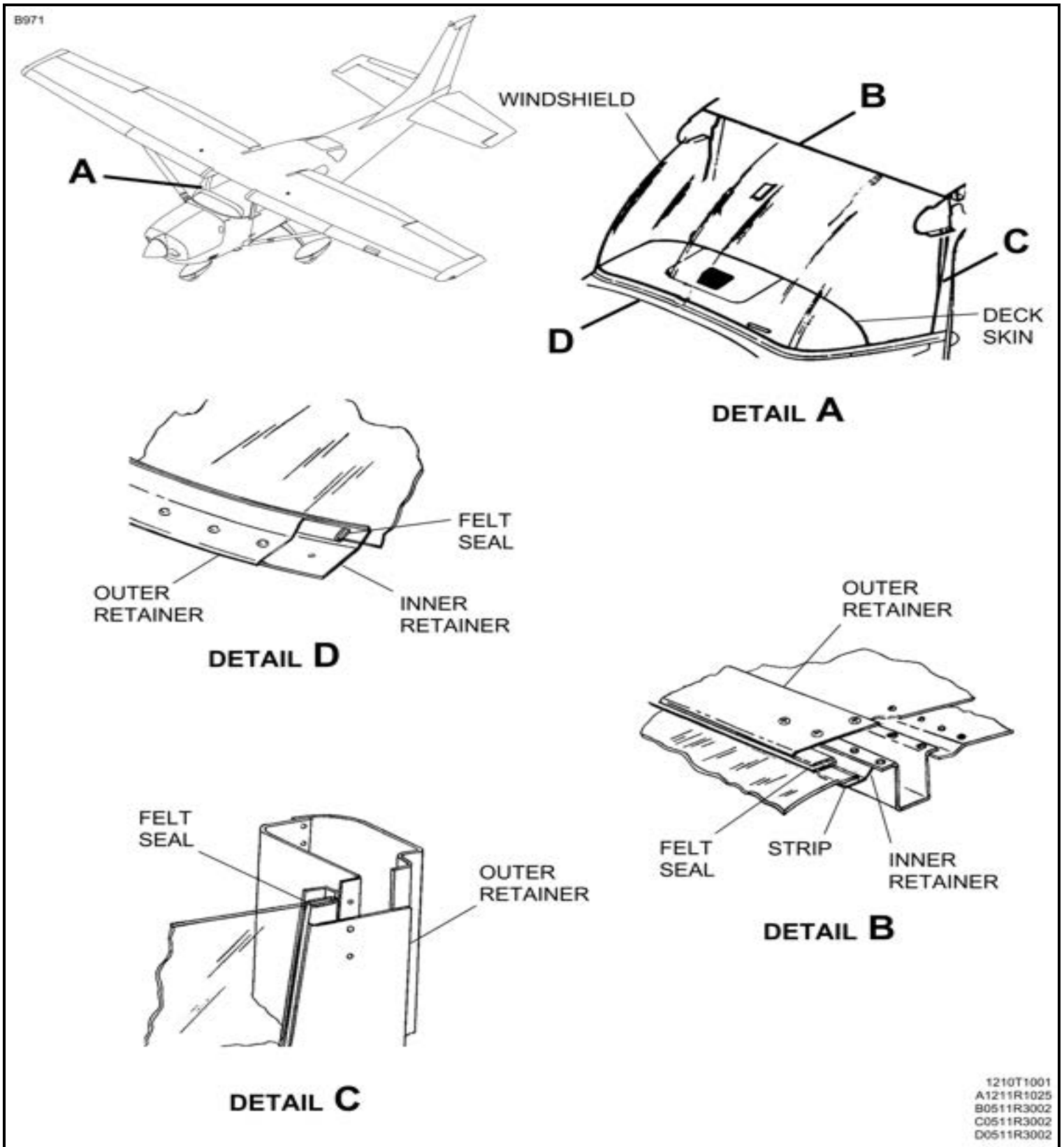
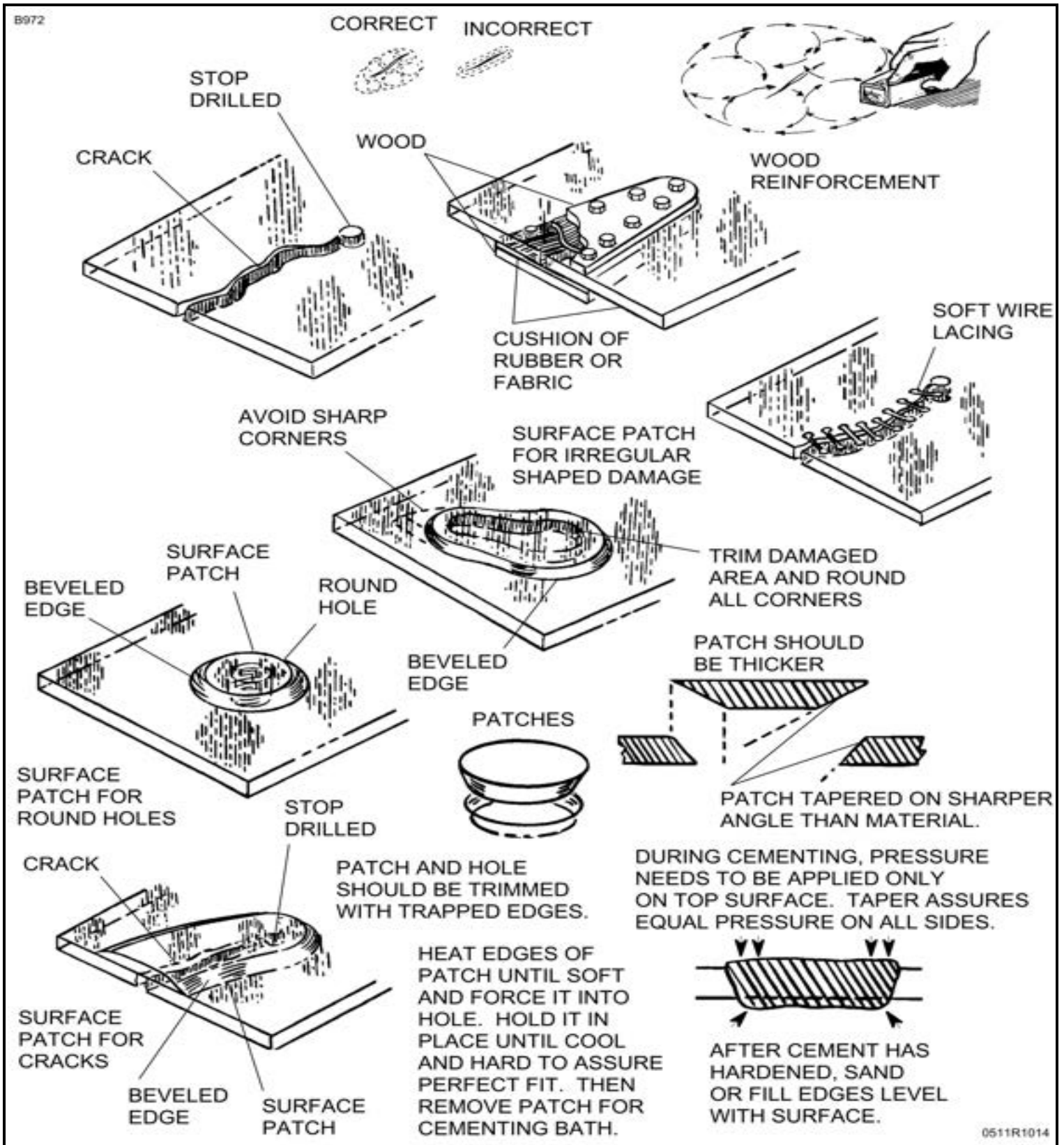


Figure 202 : Sheet 1 : Windshield/Window Repair



CABIN WINDOWS - MAINTENANCE PRACTICES

1. General

- A. The airplane is equipped with two side windows and a rear window, all located in the rear cabin area. Maintenance practices are limited to removal and installation of the windows. For instructions on temporary repair, refer to [Windshield - Maintenance Practices](#).

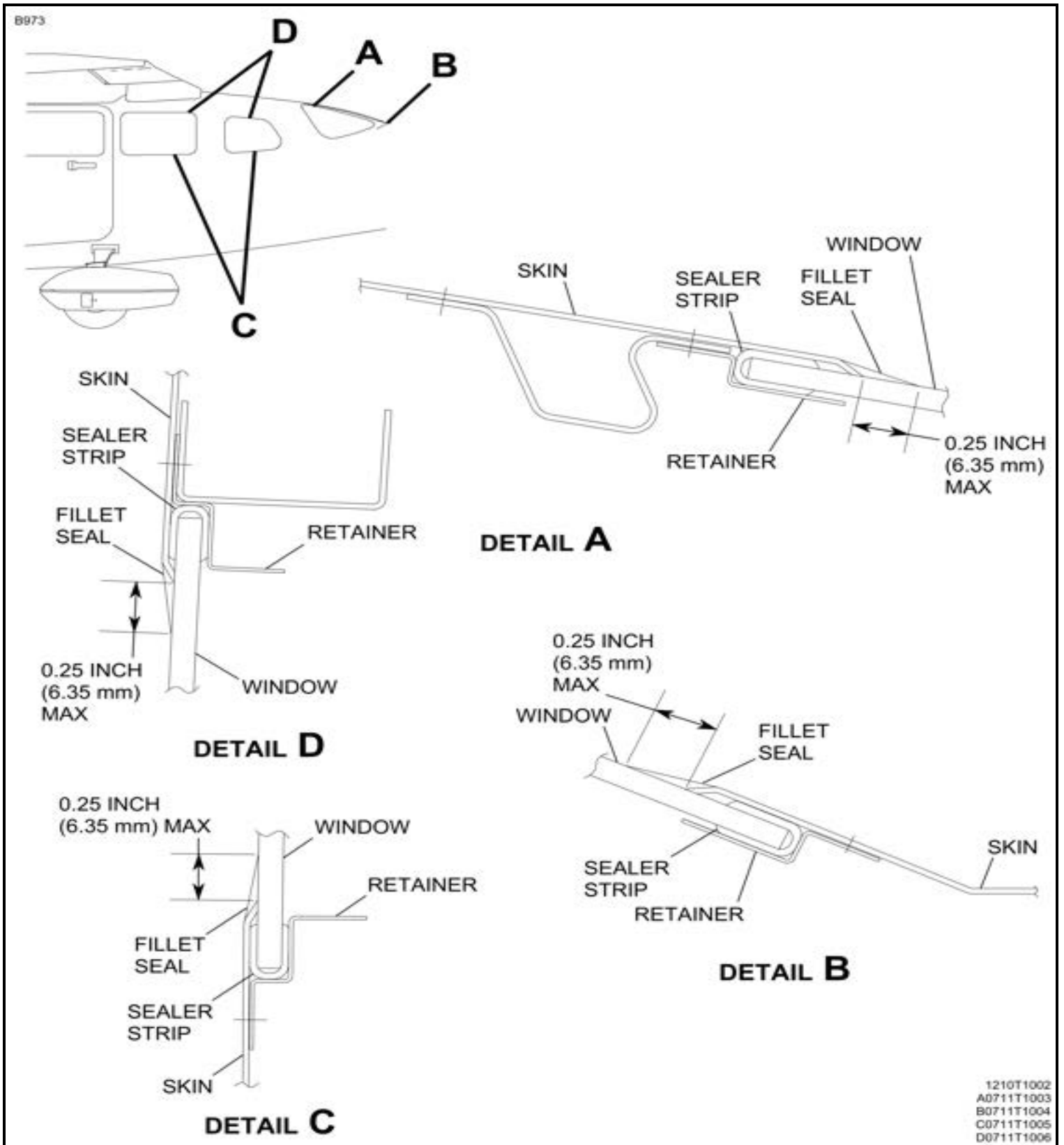
2. Rear Window Removal/Installation

- A. Remove Rear Window (Refer to [Figure 201](#)).
- (1) Remove upholstery as necessary to expose retainer strips inside cabin. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (2) Remove the fillet seal around the exterior edges of the window. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
 - (3) Remove rivets as necessary to remove outer retainer strip along aft edge of window.
 - (4) Remove window by lifting aft edge and pulling window aft. If difficulty is encountered, rivets securing retainer strips inside cabin may also be drilled out and retainer strips loosened or removed.
- B. Install Rear Window (Refer to [Figure 201](#)).
- (1) If old window is being reinstalled, remove all traces of old sealant from window.
 - (2) Clean out channels and retainers to remove all traces of old sealant.
 - (3) Make sure that the window fits correctly, and carefully grind off unwanted plastic.
 - (4) Apply the felt strip around the edge of the window and fay seal using Type VI sealant. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
 - (5) Install rear window to airplane and secure using retainer strips and rivets.
 - (6) Brushcoat screw heads with Type I class A sealant during installation. Apply Type I, Class B sealant to make a fillet seal around all exterior edges of the window to prevent leaks. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
- NOTE:** The fillet seal should be done after the airplane has been painted, if applicable.
- (7) Install upholstery. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

3. Side Window Removal/Installation

- A. Remove Side Window (Refer to [Figure 201](#)).
- (1) Remove upholstery as required to gain access to retainer strips inside cabin. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (2) Remove the fillet seal around the exterior edges of the window. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
 - (3) Remove the rivets securing retainer strips to the airplane.
 - (4) Remove the window from the airplane.
- B. Install Side Window (Refer to [Figure 201](#)).
- (1) If old window is being reinstalled, remove all traces of old sealant from window.
 - (2) Clean out channels and retainers to remove all traces of old sealant.
 - (3) Make sure that the window fits correctly, and carefully grind off unwanted plastic.
 - (4) Apply the felt strip around the edge of the window and fay seal using Type VI sealant. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
 - (5) Install rear window to airplane and secure using retainer strips and rivets.
 - (6) Brushcoat screw heads with Type I class A sealant during installation. Apply Type I, Class B sealant to make a fillet seal around all exterior edges of the window to prevent leaks. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
- NOTE:** The fillet seal should be done after the airplane has been painted, if applicable.
- (7) Install upholstery. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

Figure 201 : Sheet 1 : Cabin Windows Installation



CABIN DOOR WINDOWS - MAINTENANCE PRACTICES

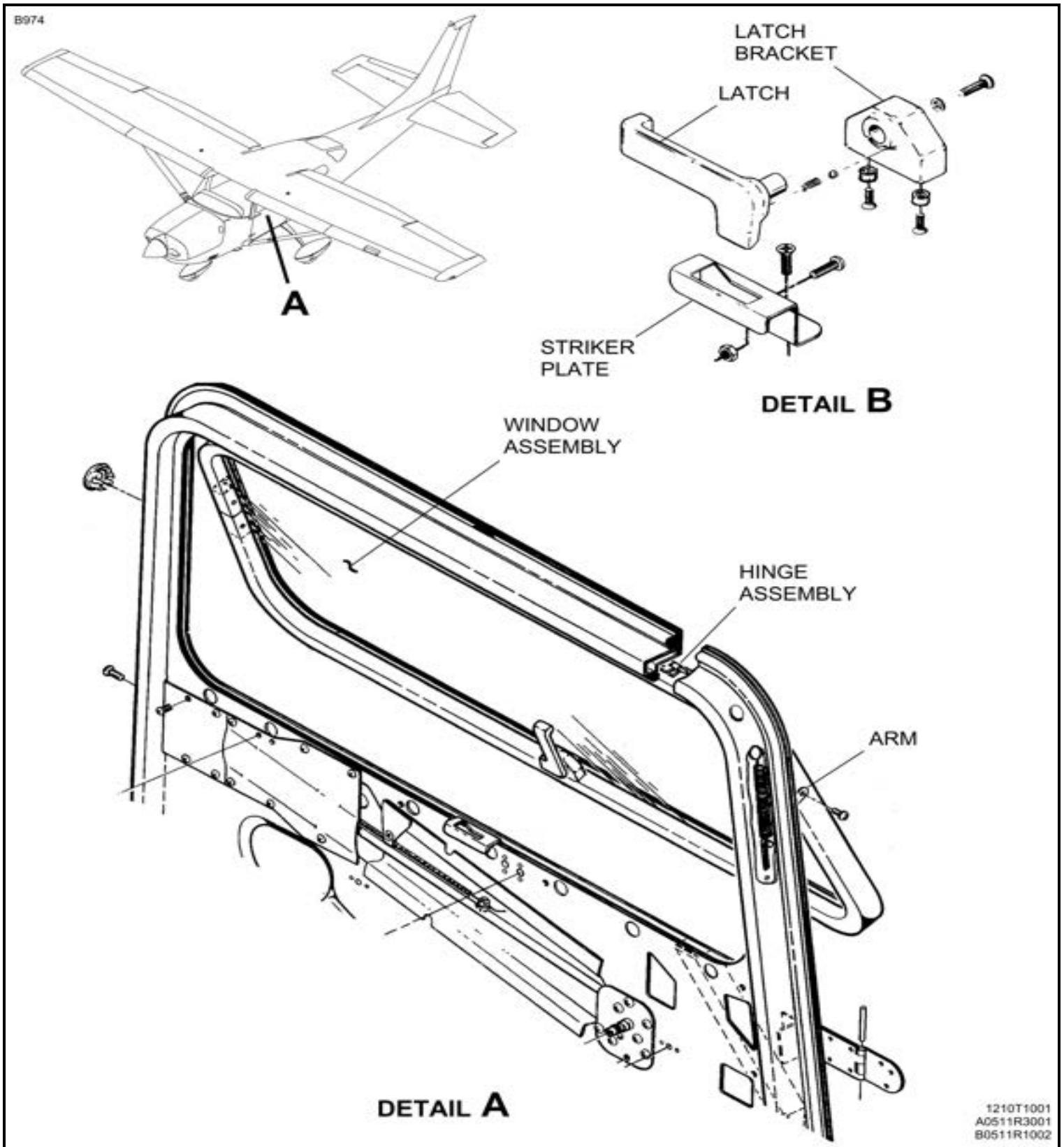
1. General

- 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.
- B. Install Cabin Door Window (Refer to [Figure 201](#)).
 - (1) Position window assembly to door.
 - (2) Secure window assembly to hinge using hinge pin.

Figure 201 : Sheet 1 : Cabin Door Window Installation



POWER PLANT - GENERAL

1. Scope

- A. This chapter contains maintenance information on the power plant 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 power plant 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 shock mounts.
 - (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.

ENGINE - DESCRIPTION AND OPERATION**1. Description and Operation**

- A. The Textron Lycoming IO-540-AC1A5 is a direct drive, six cylinder, fuel injected, horizontally opposed, air cooled engine. The TIO-540-AJ1A is a turbocharged version of the same design. 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](#).
- 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-AC1A5 Technical Description

Rated Horsepower at 2700 RPM	300
Number of Cylinders	6 Horizontally Opposed
Displacement	541.5 Cubic Inches (7.87 l)
Bore	5.125
Stroke	4.376
Compression Ratio	8.9:1
Firing Order	1-4-5-2-3-6
Magnetos:	
Right Magneto	Slick Model No. 6351 (fires at 20° BTDC)
Left Magneto	Slick Model No. 6351 (fires at 20° BTDC)
Spark Plugs	18MM
Torque	420 Inch-pounds
Valve Rocker Clearance (hydraulic tappets collapsed)	0.028 to 0.080 inch (0.7 to 2.0 mm)
Fuel Injector	PAC RSA-10ED1
Tachometer	Mechanical Drive
Oil Capacity	11.0 Quarts (10.41 l)
Oil Pressure	Minimum 25 PSI Normal 55 to 95 PSI Maximum 115 PSI
Oil Temperature	Normal 165 to 200°F (74 to 93.3°C) Maximum 245°F (118.3°C)
Dry Weight - with accessories	454 Lbs (205.93 kg)

Table 1: TIO-540-AJ1A Technical Description

Rated Horsepower at 2500 RPM	310
Number of Cylinders	6 Horizontally Opposed
Displacement	541.5 Cubic Inches (8.87 l)
Bore	5.125
Stroke	4.375
Compression Ratio	7.3:1

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 (0.7 to 2.0 mm)
Fuel Injector	PAC RSA-10ED1
Tachometer	Mechanical Drive
Oil Capacity	11.0 Quarts (10.41 l)
Oil Pressure	Minimum 25 PSI Normal 55 to 95 PSI Maximum 115 PSI
Oil Temperature	Normal 165 to 200°F (74 to 93.3°C) Maximum 245°F (118.3°C)
Dry Weight - with accessories	529 Lbs (239.95 kg)

Figure 1 : Sheet 1 : Engine Installation

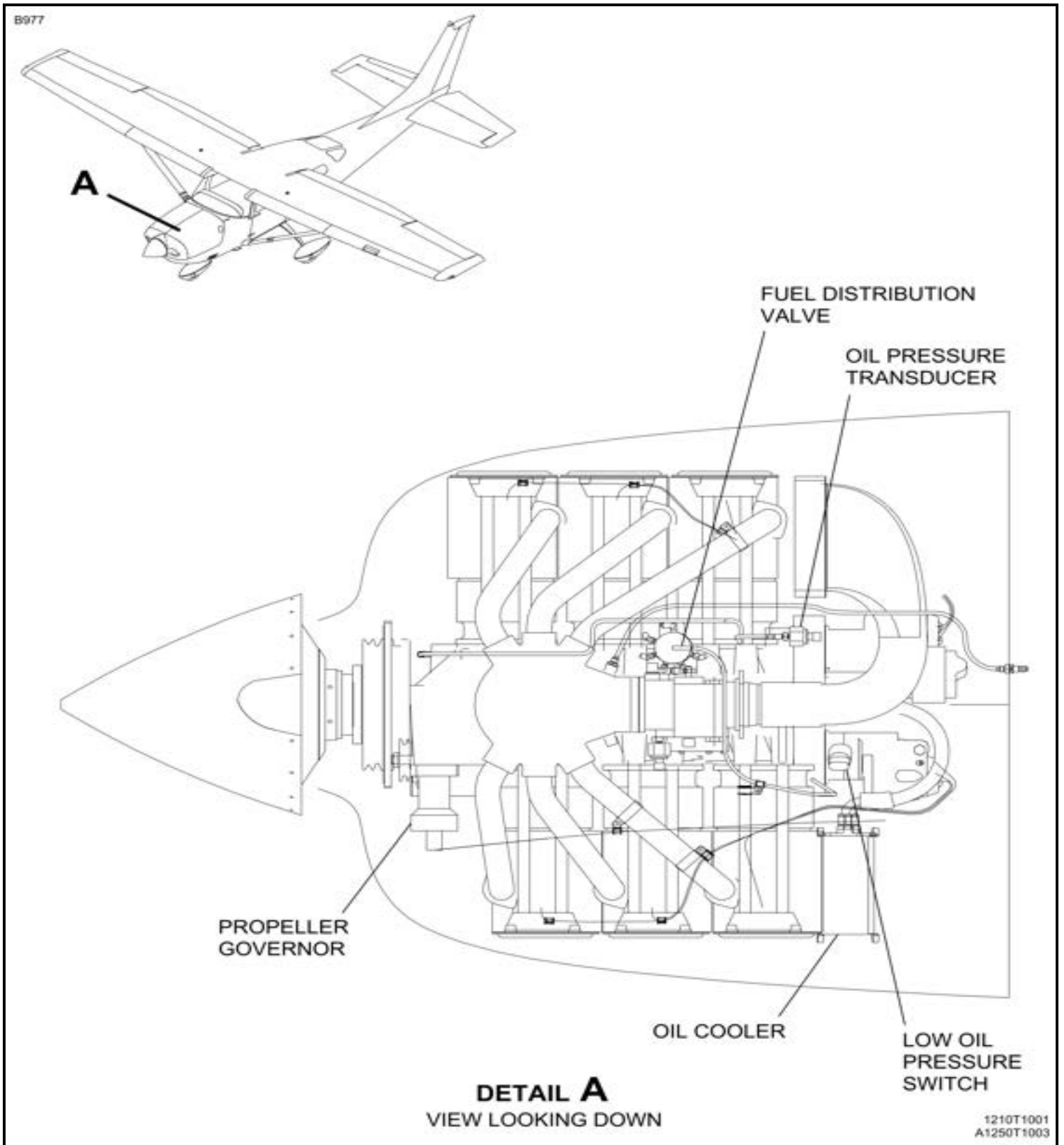


Figure 1 : Sheet 2 : Engine Installation

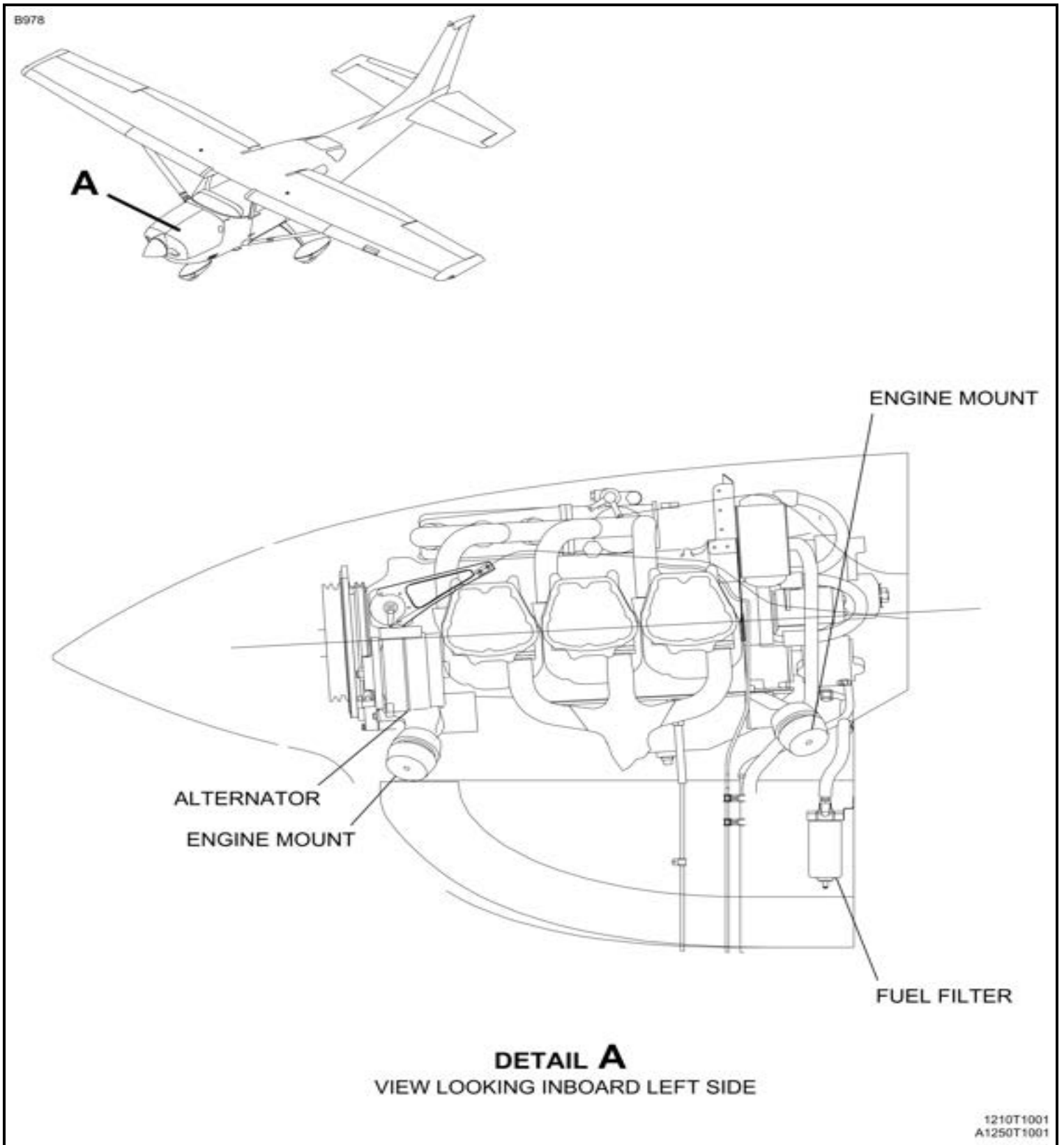
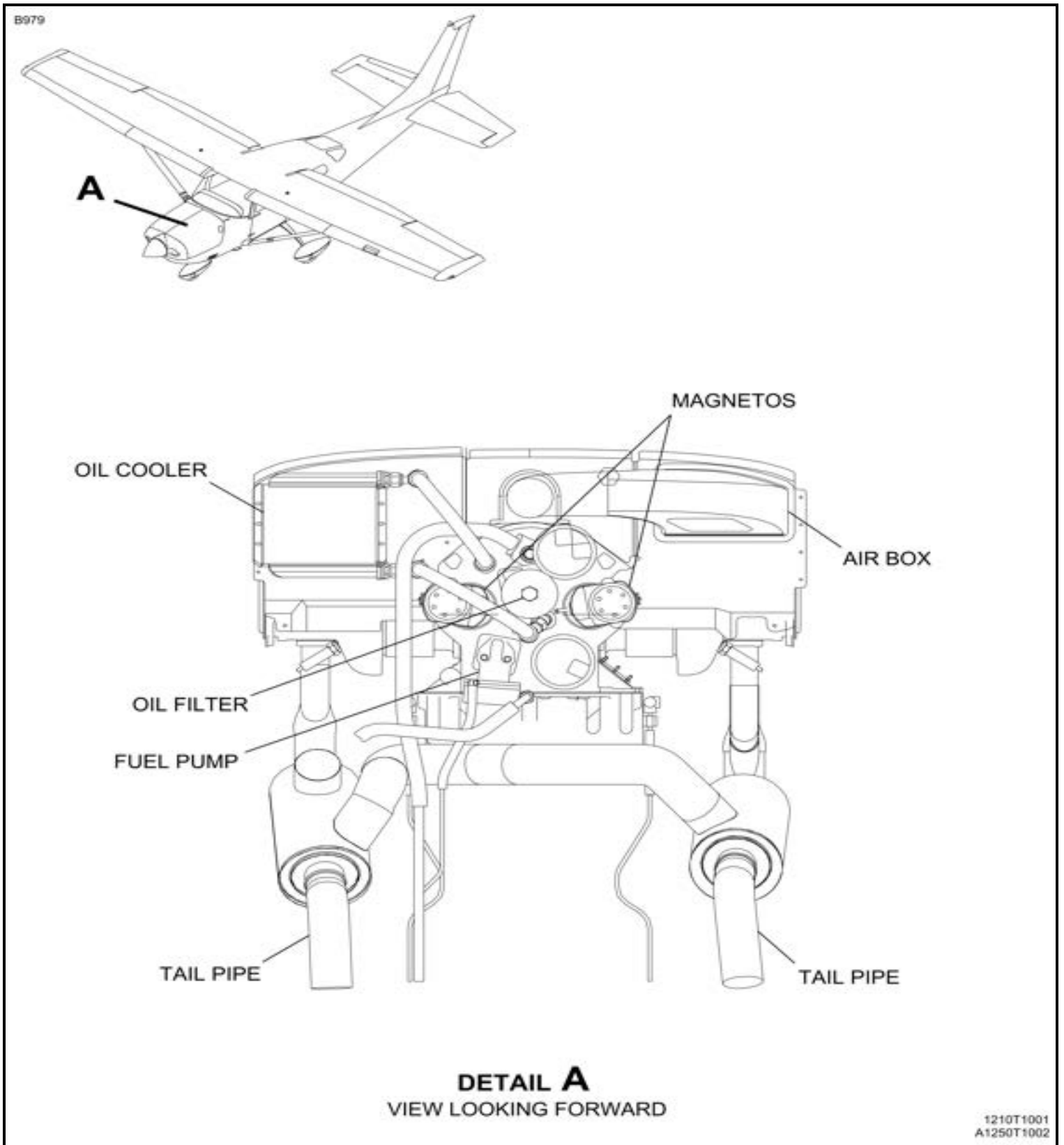


Figure 1 : Sheet 3 : Engine Installation



ENGINE - TROUBLESHOOTING

1. Troubleshooting Chart

- A. The following [chart](#) has been provided to aid maintenance technicians in system troubleshooting. This chart should be used in conjunction with Chapter 74, [Ignition System - Troubleshooting](#), to provide a comprehensive look at solutions to engine problems. For information beyond the scope of this chapter, refer to applicable engine manuals and publications listed in Introduction, List of Manufacturers Technical Publications.

NOTE: If low power is suspected, the following static runup procedures may be used in conjunction with the troubleshooting chart to develop a diagnosis:

- B. Static Runup Procedures.

- (1) Align airplane 90 degrees to the right of wind direction.
- (2) Run up engine at full throttle in accordance with procedures outlined in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
- (3) Record RPM.
- (4) Realign airplane 90 degrees to the left of wind direction and perform second runup.
- (5) Record RPM from second runup.
- (6) Average the results of the RPM obtained on the two runups. RPM should be within 50 RPM of 2675 RPM (206) and within 50 RPM of 2475 RPM (T206).

NOTE: Variances in atmospheric pressure, temperature and humidity can have a significant impact on runup RPM. Low static runup RPM information should be used only in conjunction with other troubleshooting procedures to determine if a problem actually exists.

- (7) If runup indicates low power, check the following items:
 - (a) Check operation of alternate air door and ensure door remains closed in normal operation.
 - (b) Check magneto timing, spark plugs and ignition harness for settings and condition.
 - (c) Check fuel injection nozzles for restriction and check for correct unmetered fuel flow.
 - (d) Check condition of induction air filter. Clean or replace as required.
 - (e) Perform engine compression check.

Figure 101 : Sheet 1 : Engine Troubleshooting Chart

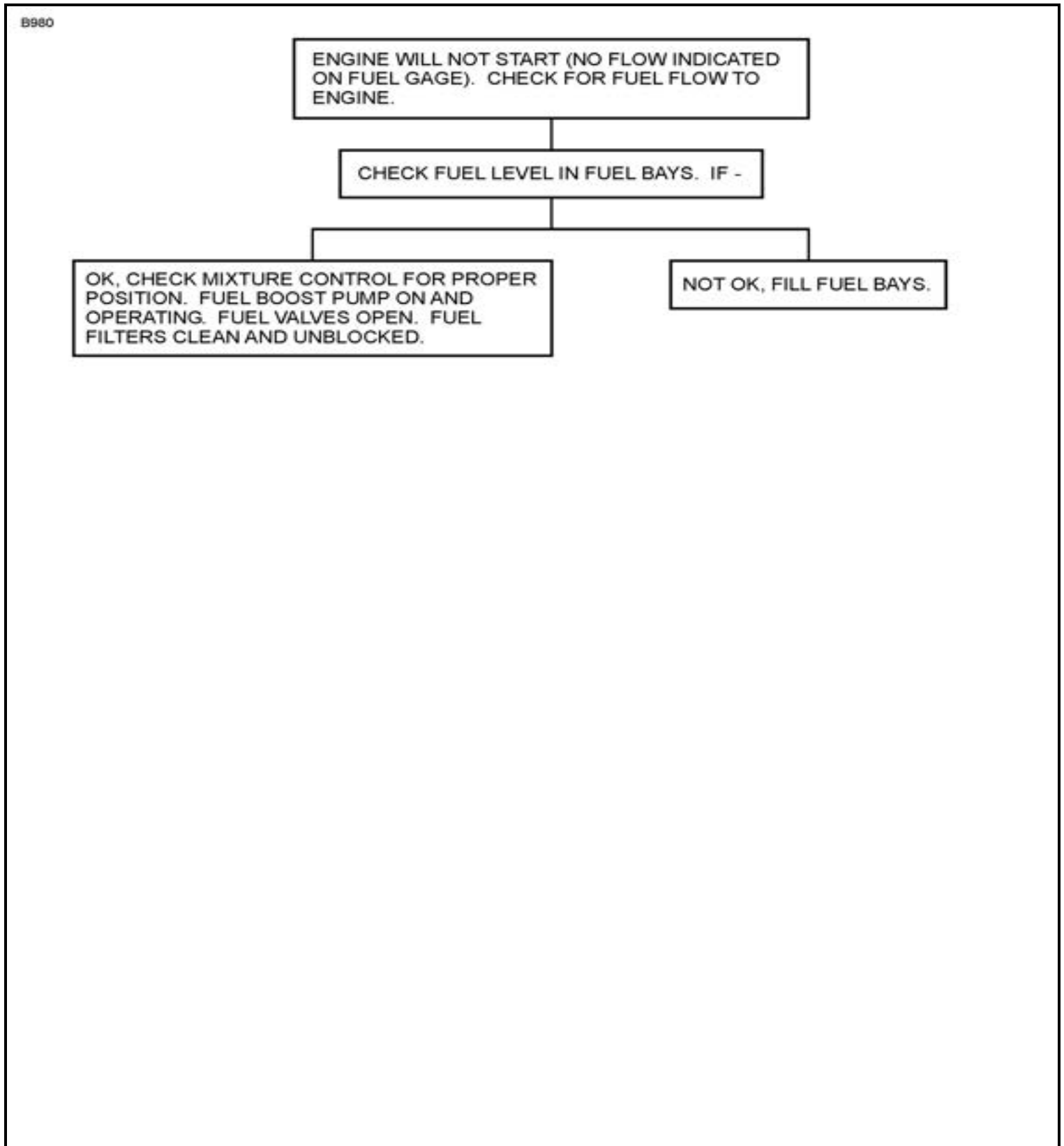


Figure 101 : Sheet 2 : Engine Troubleshooting Chart

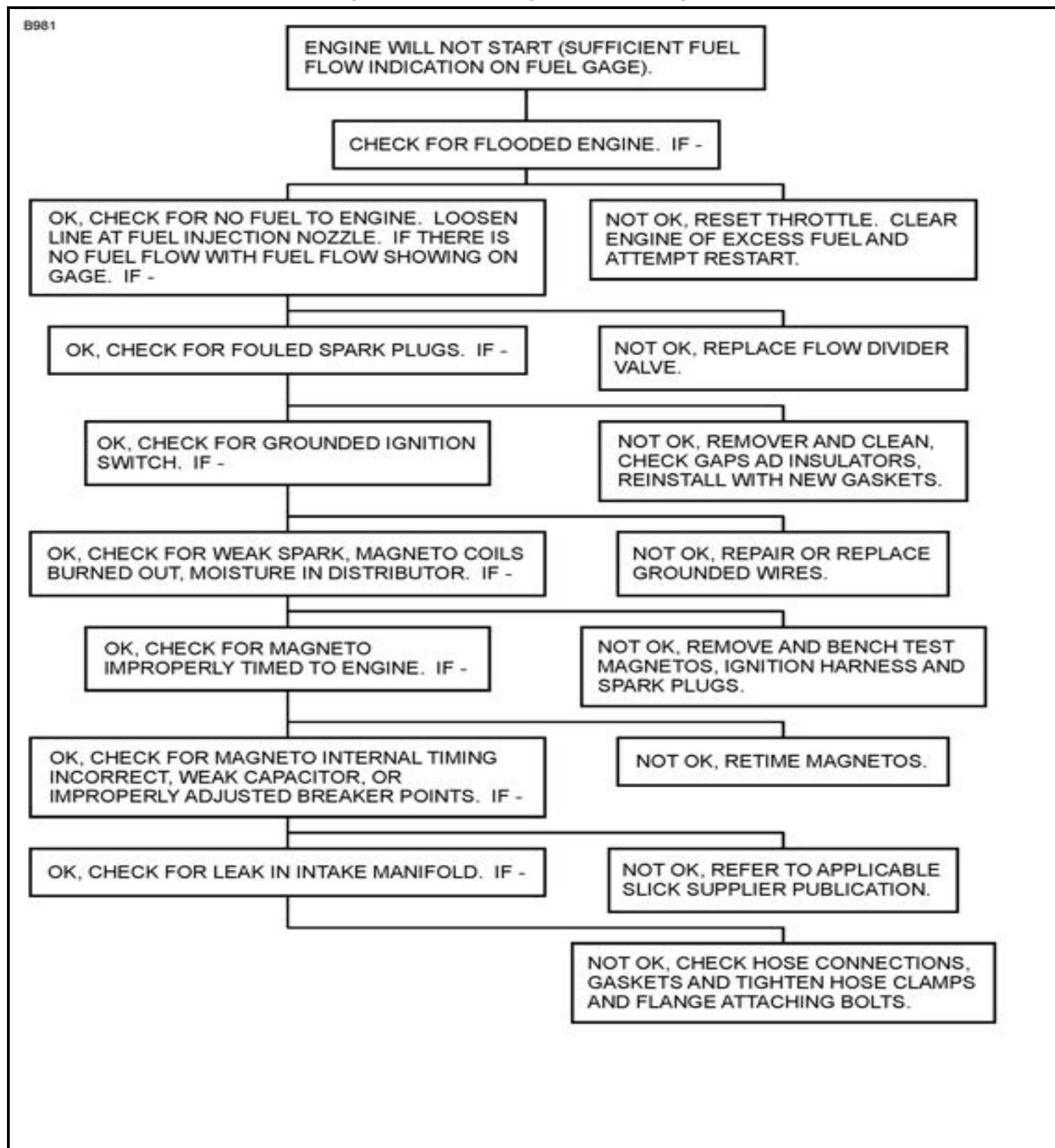


Figure 101 : Sheet 3 : Engine Troubleshooting Chart

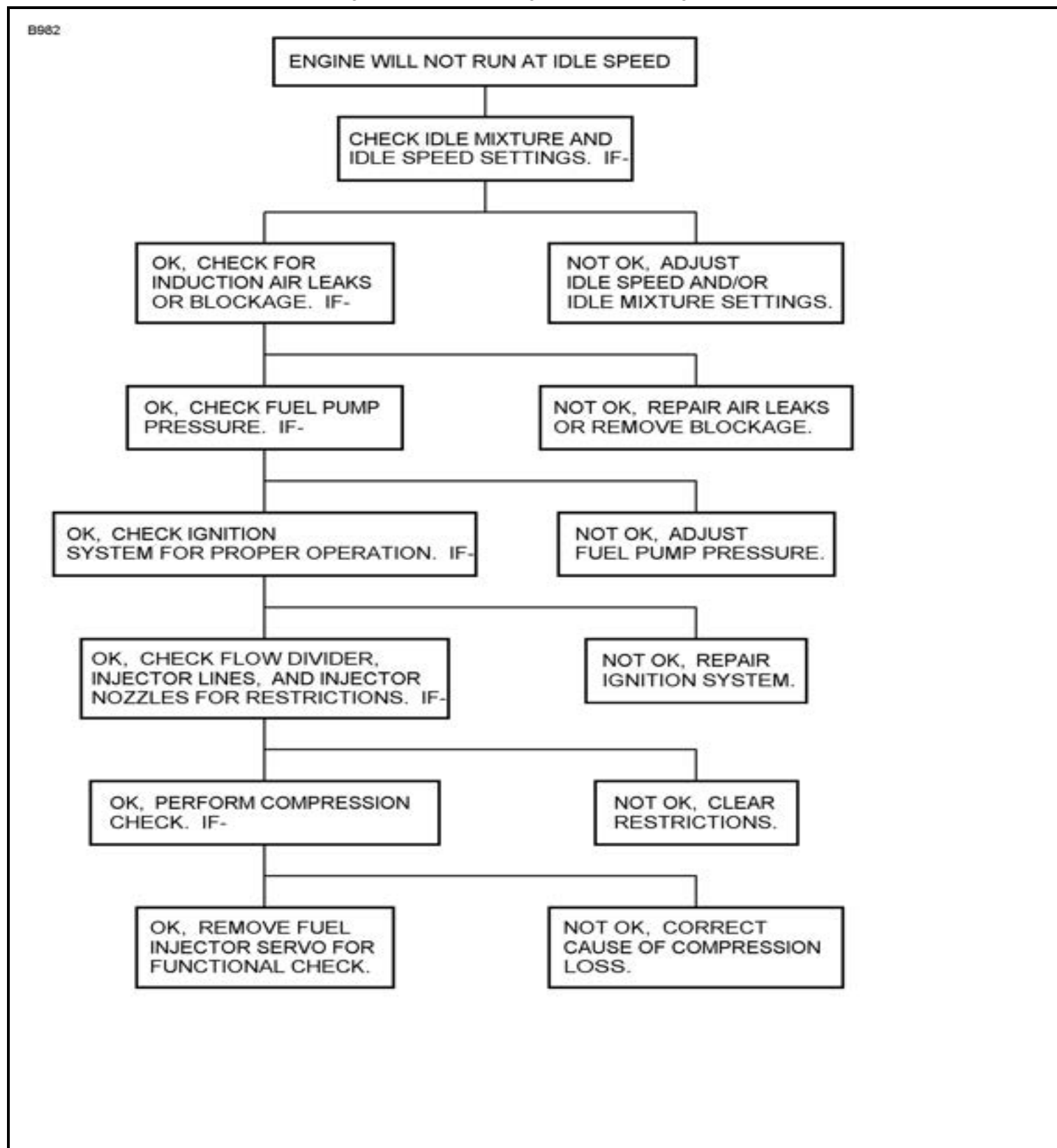


Figure 101 : Sheet 4 : Engine Troubleshooting Chart

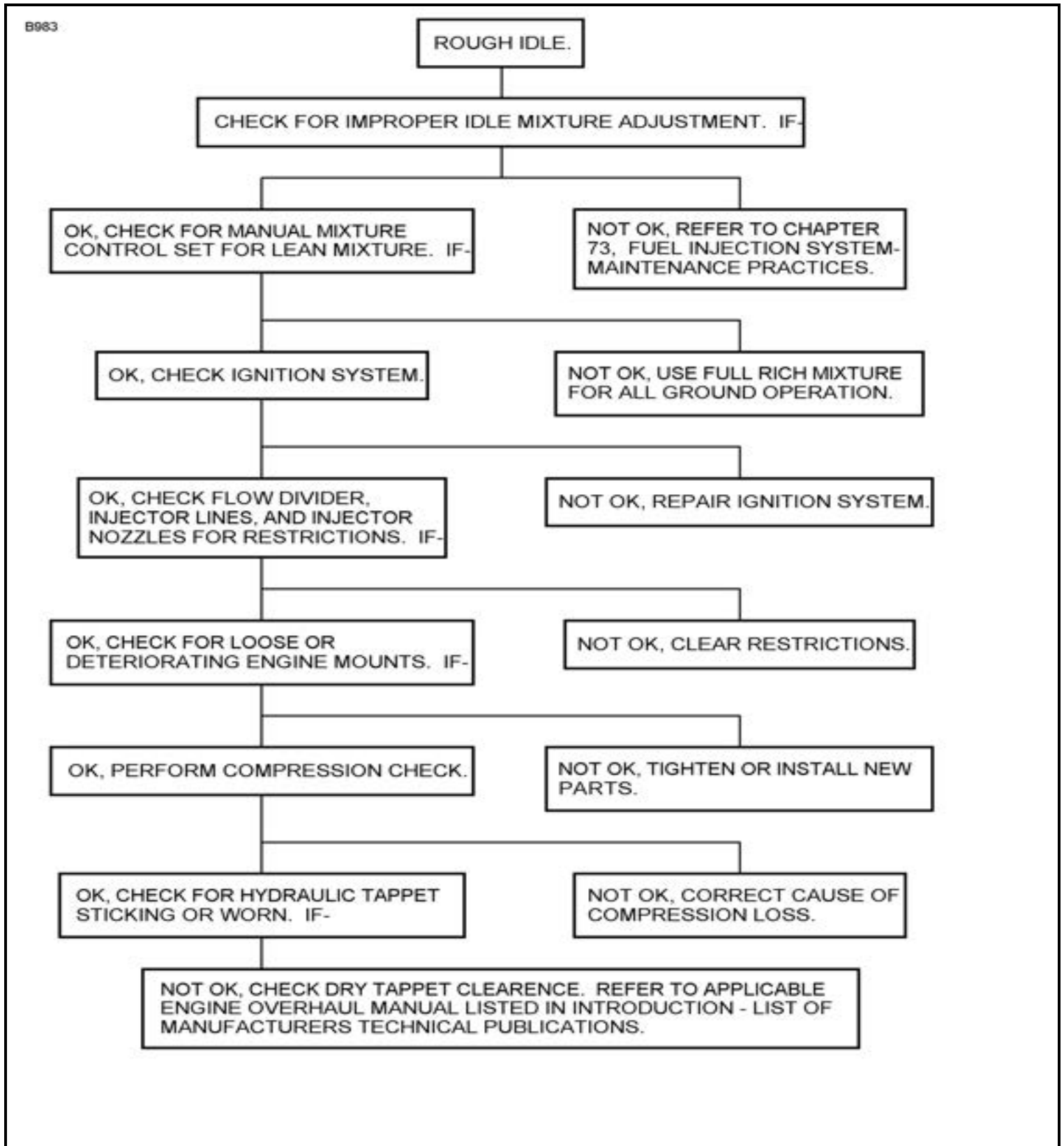


Figure 101 : Sheet 5 : Engine Troubleshooting Chart

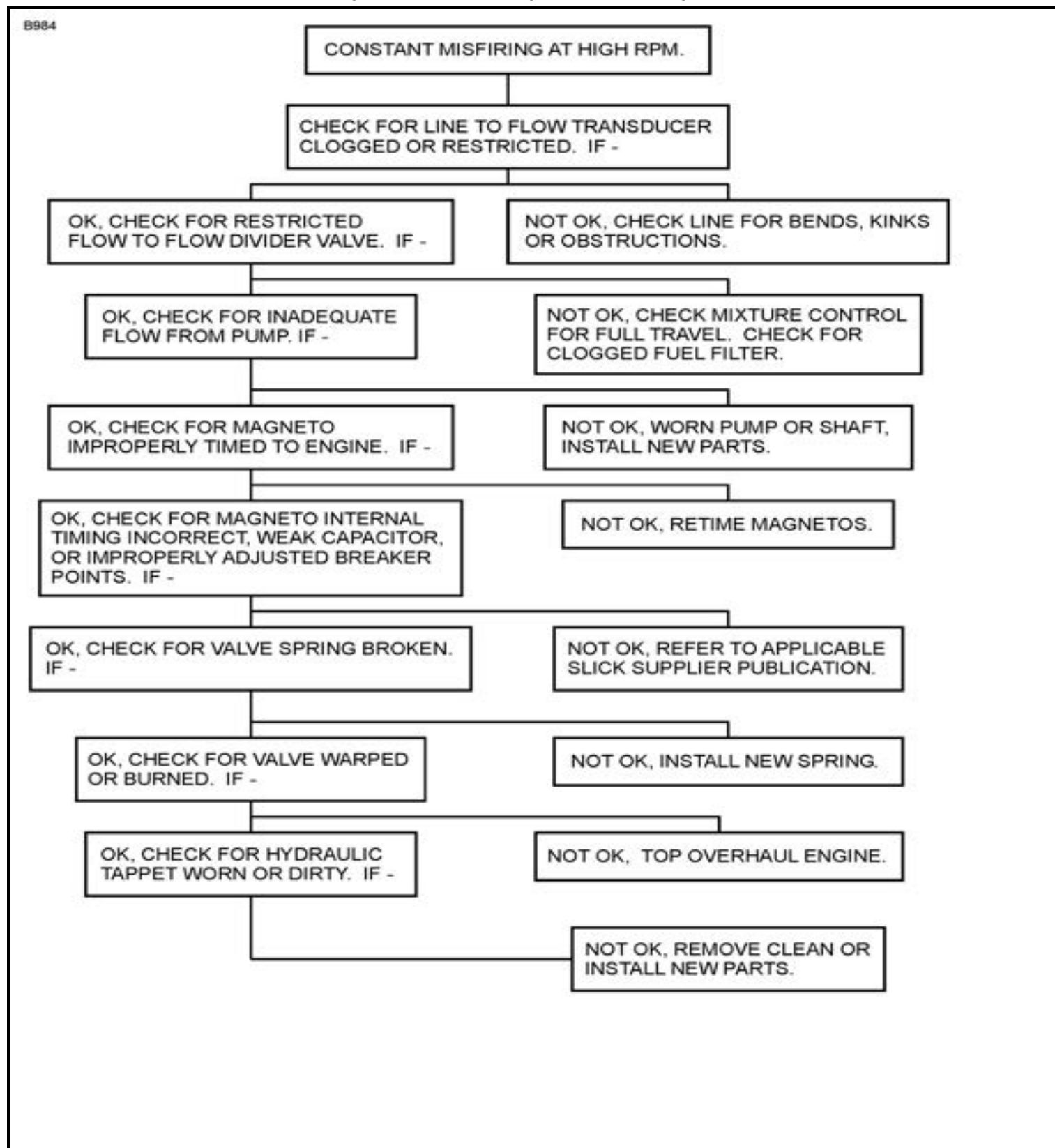


Figure 101 : Sheet 6 : Engine Troubleshooting Chart

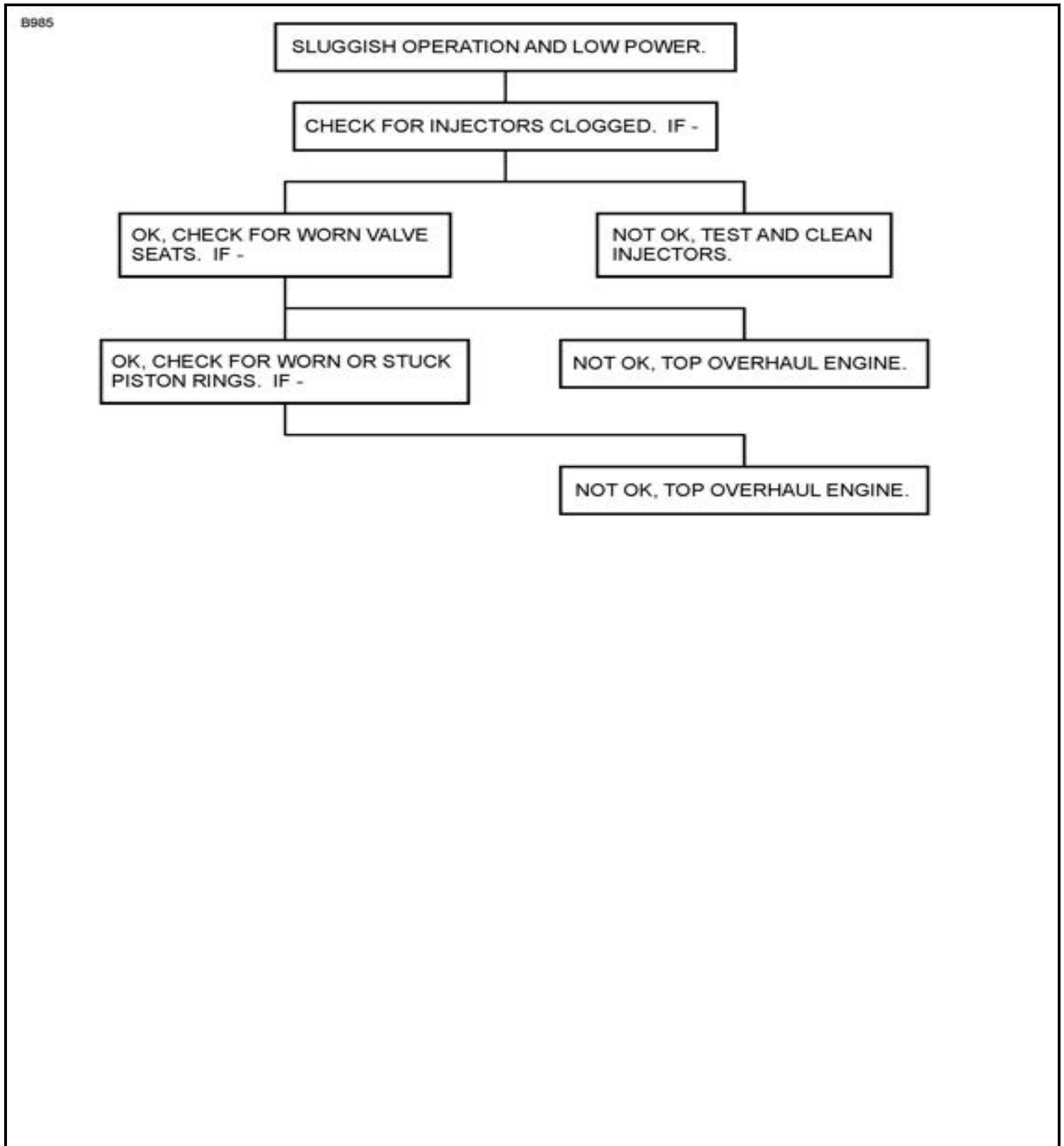


Figure 101 : Sheet 7 : Engine Troubleshooting Chart

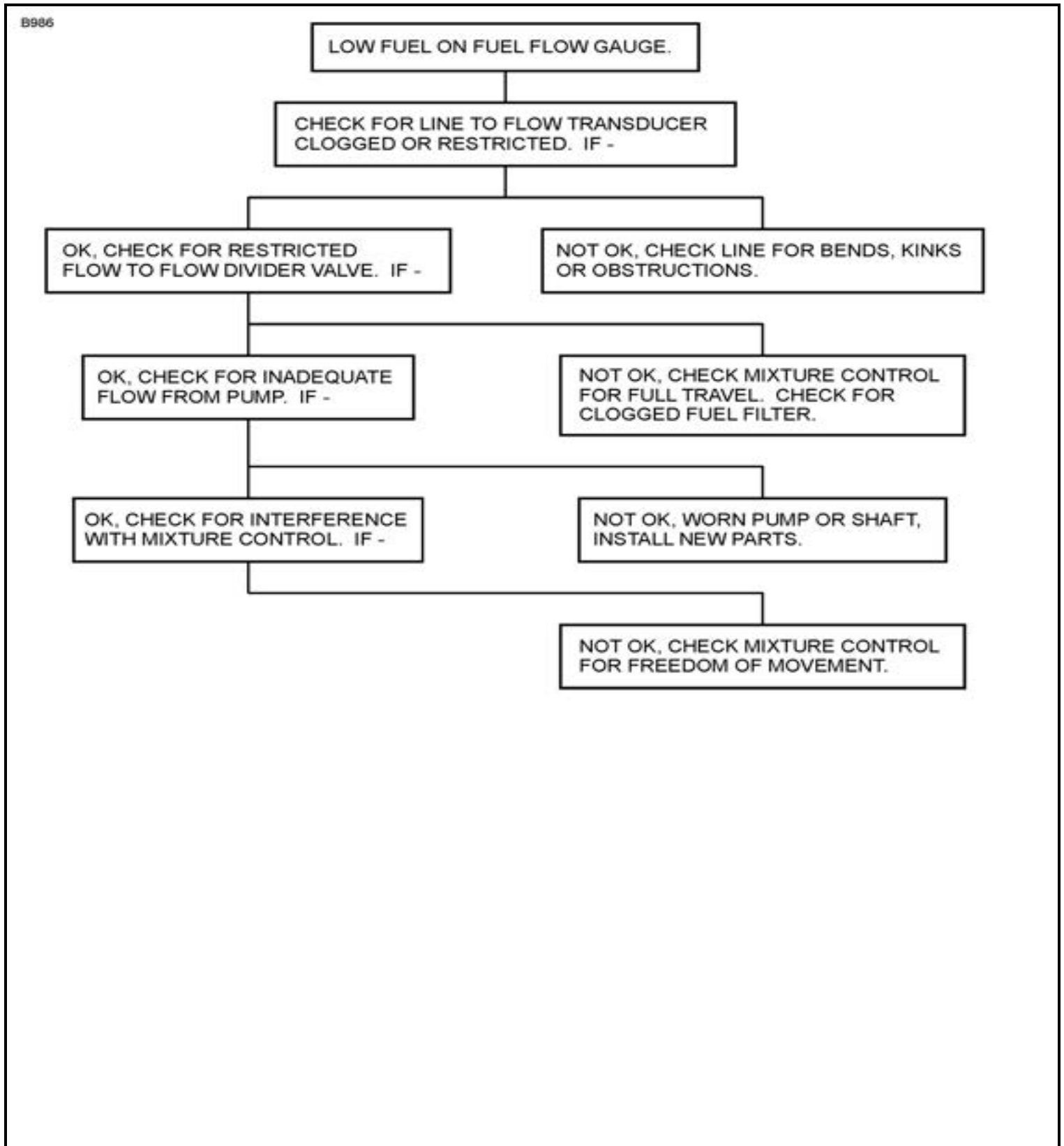


Figure 101 : Sheet 8 : Engine Troubleshooting Chart

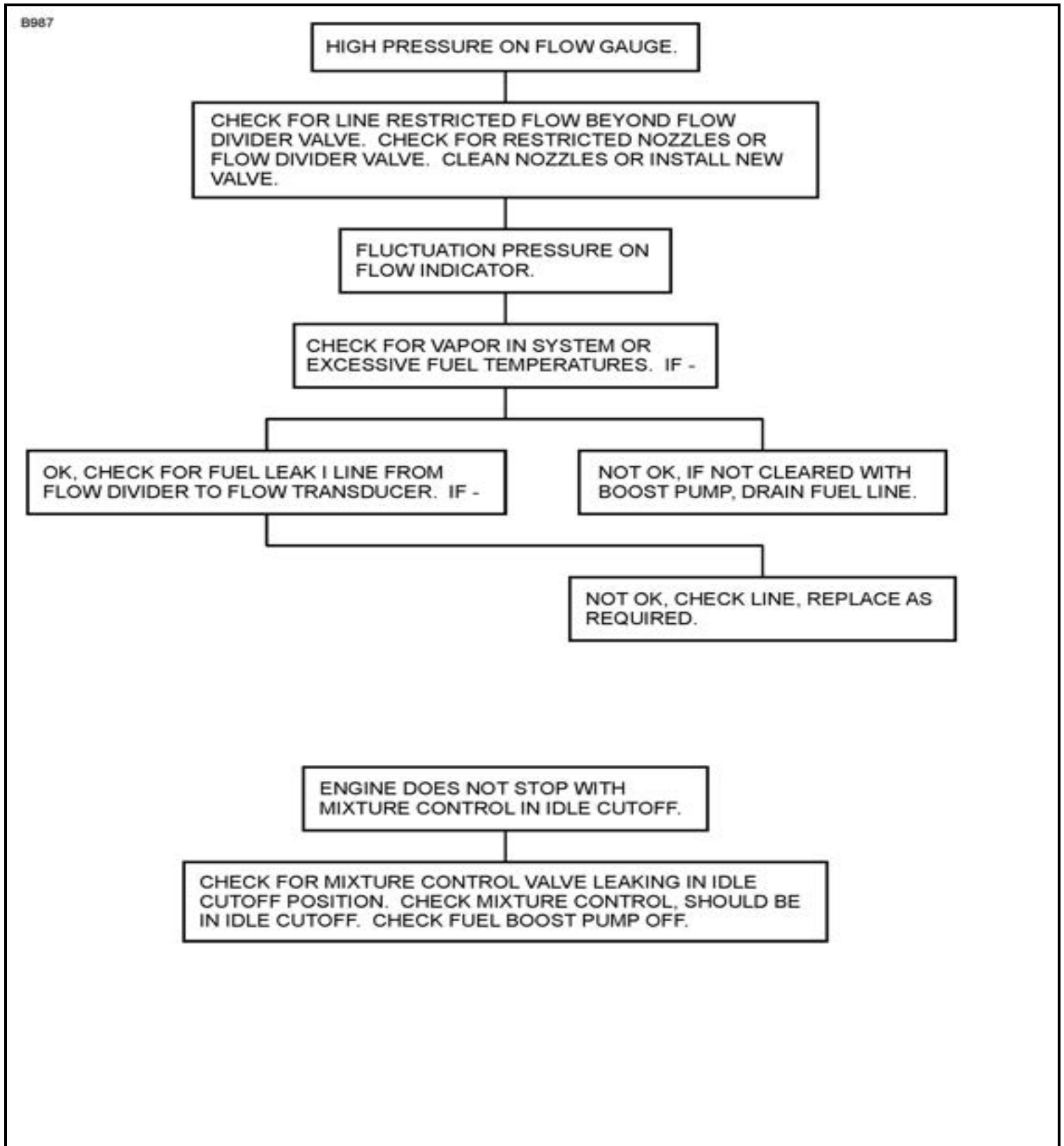


Figure 101 : Sheet 9 : Engine Troubleshooting Chart

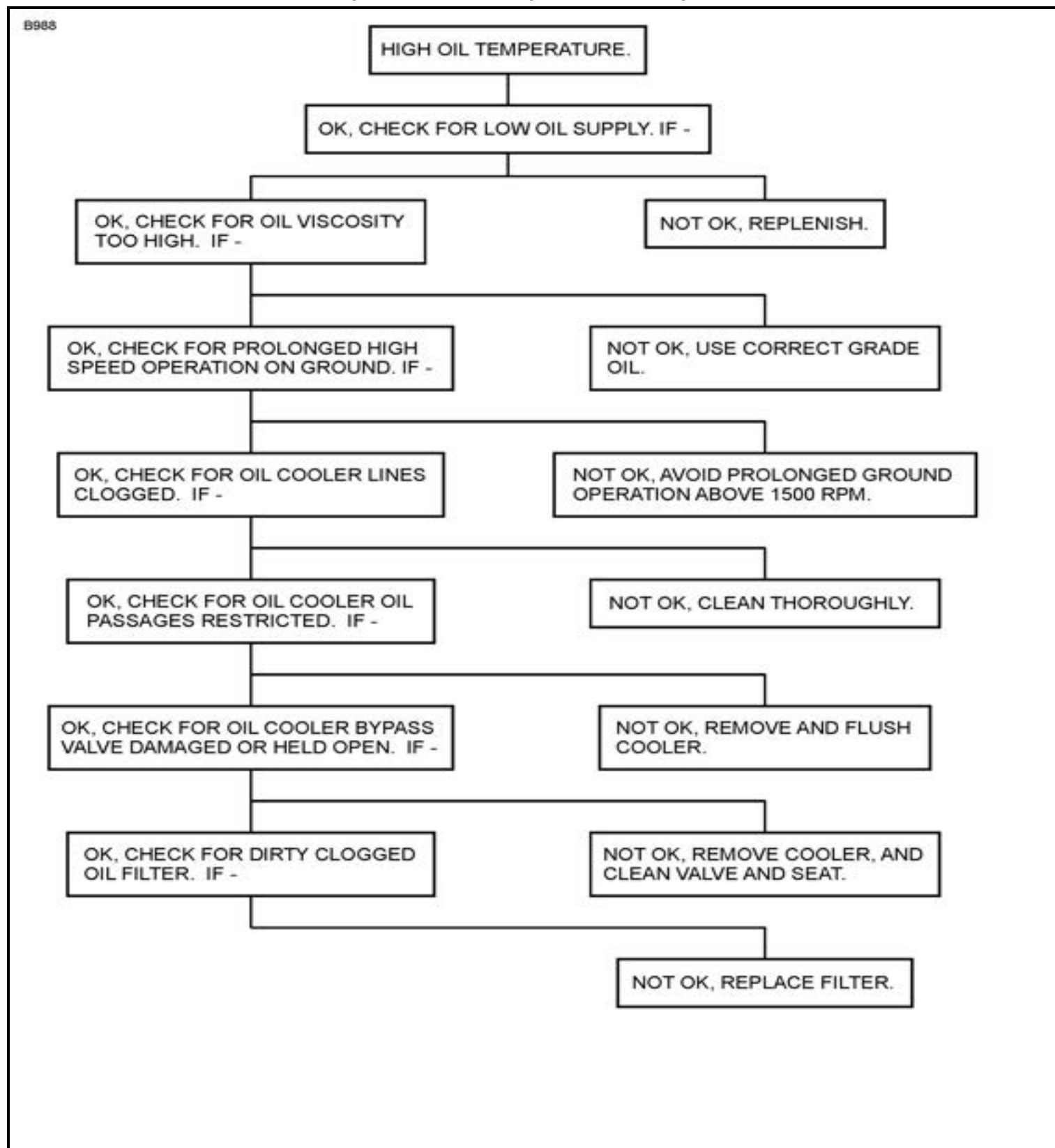


Figure 101 : Sheet 10 : Engine Troubleshooting Chart

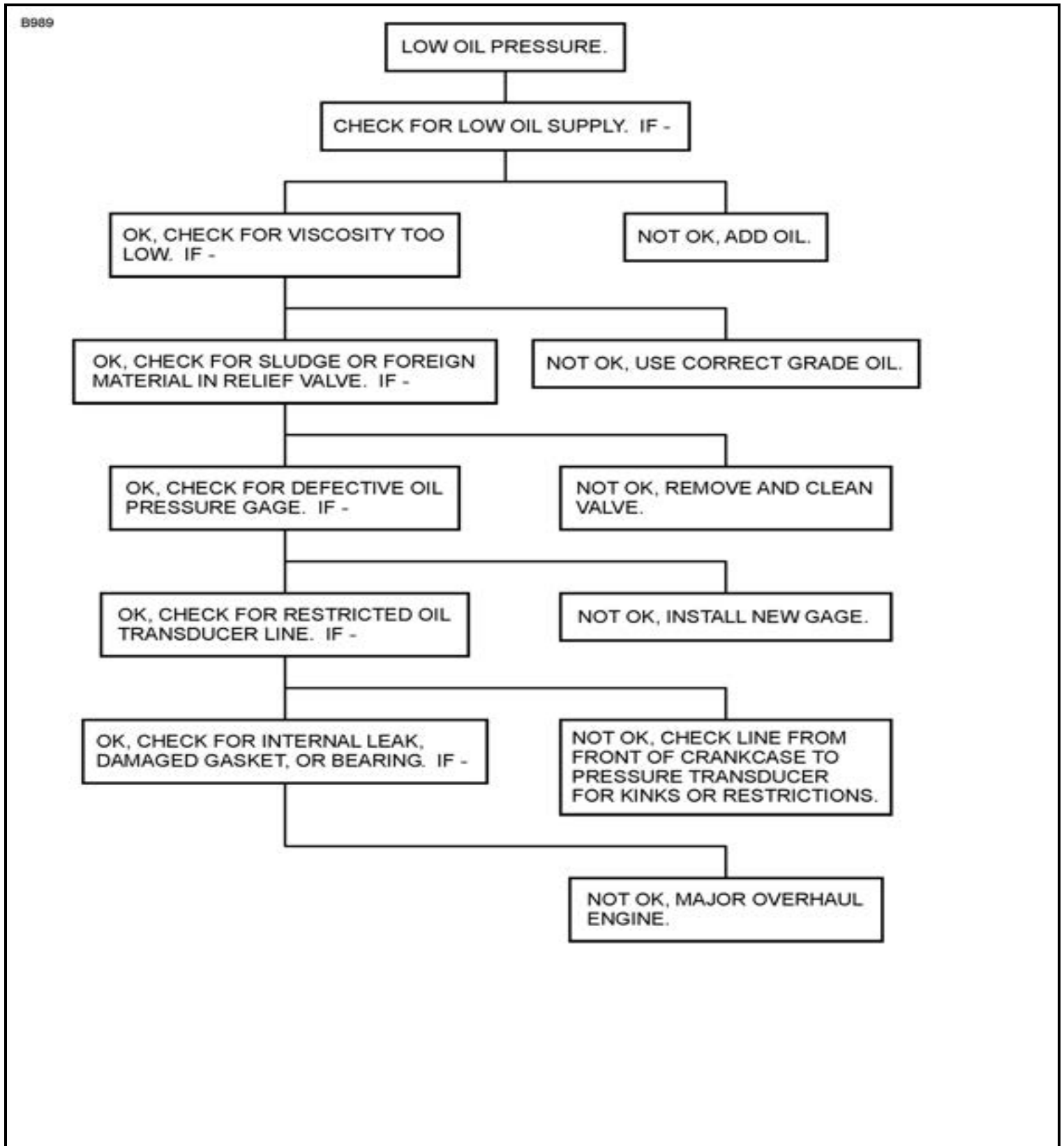


Figure 101 : Sheet 11 : Engine Troubleshooting Chart

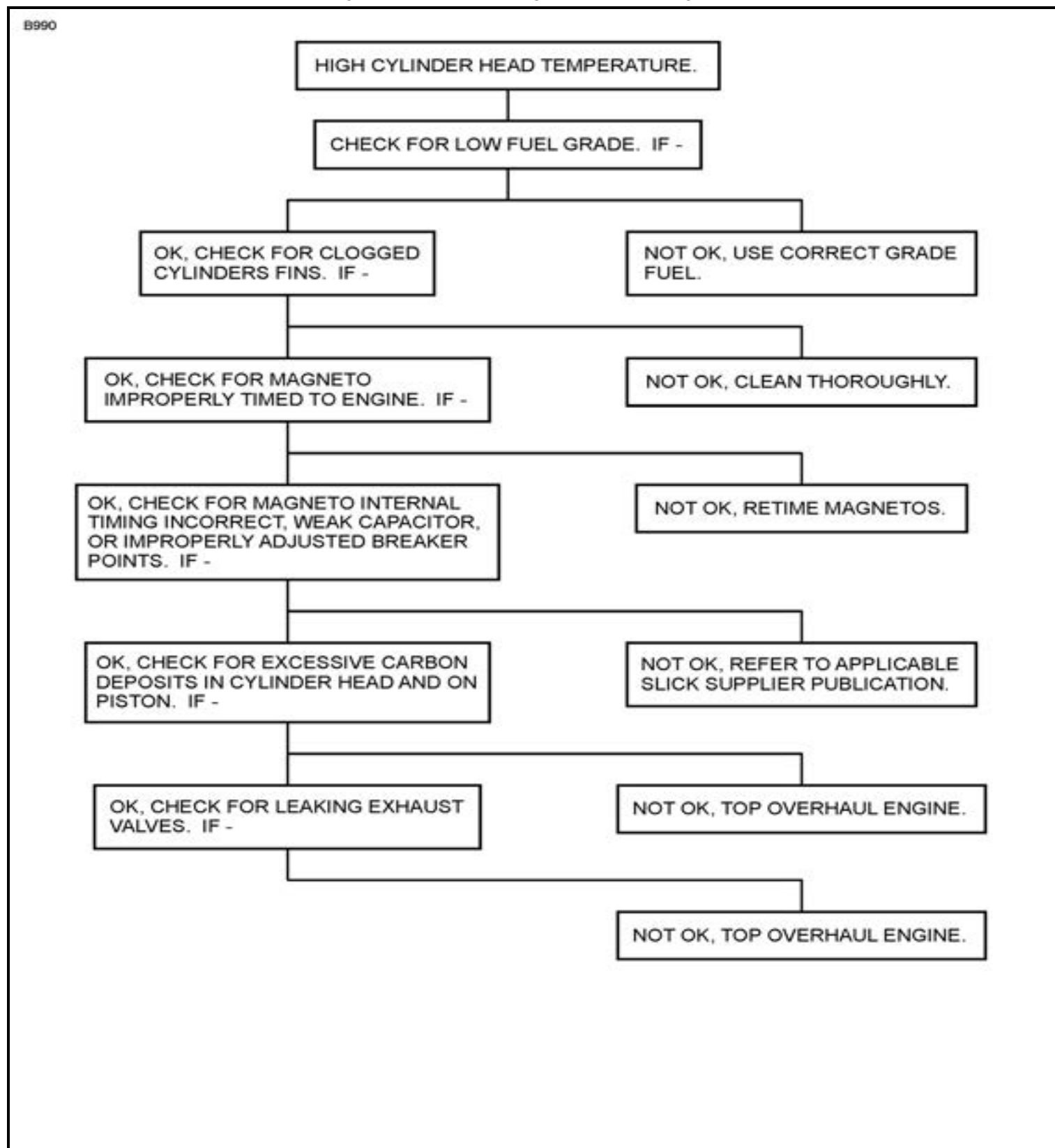
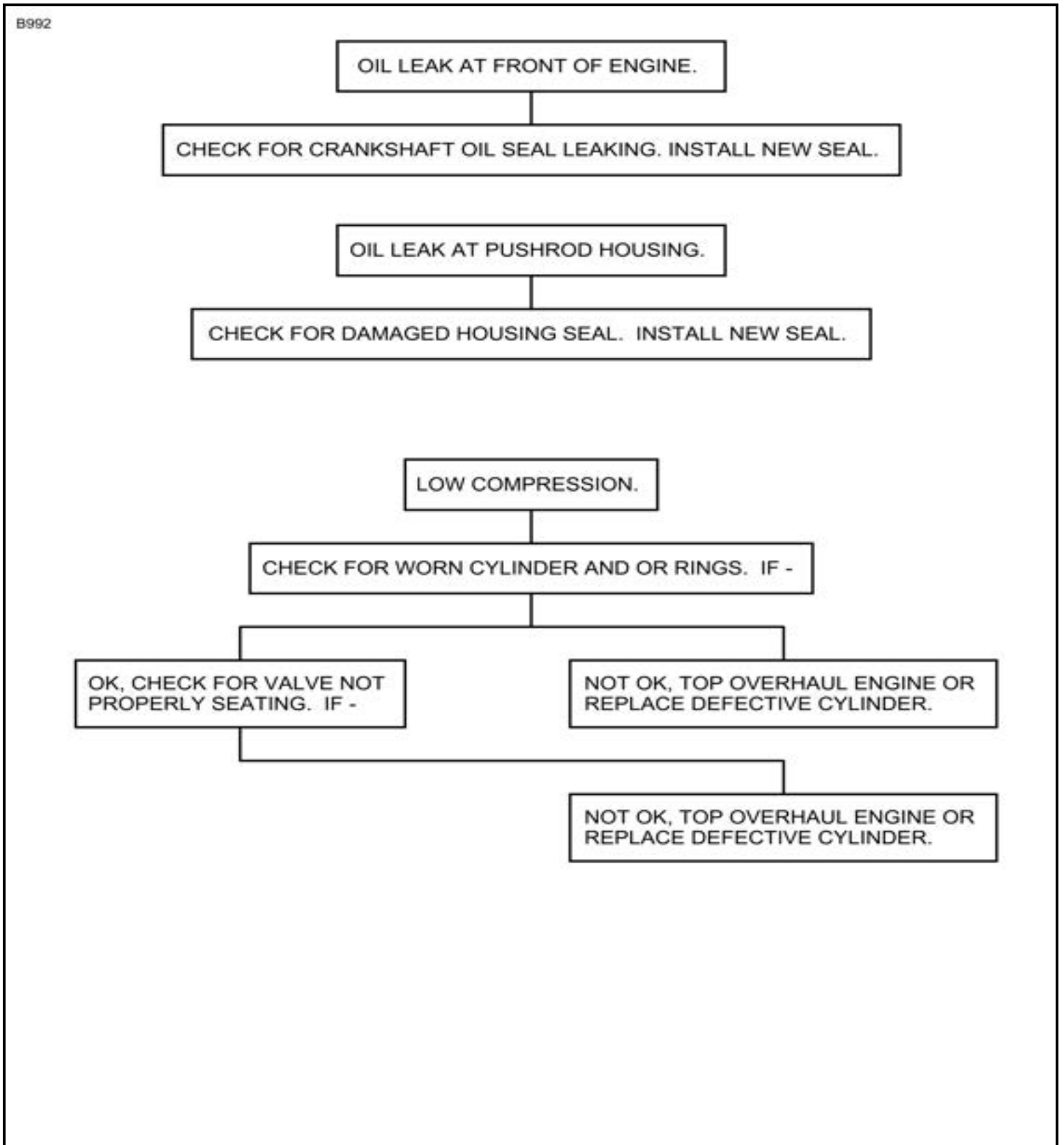


Figure 101 : Sheet 12 : Engine Troubleshooting Chart



Figure 101 : Sheet 13 : Engine Troubleshooting Chart



ENGINE - MAINTENANCE PRACTICES

1. General

- A. This section provides instructions to remove and install the engine. For maintenance beyond the scope of this chapter, refer to applicable engine publications which are listed in Introduction - List of Manufacturers Technical Publications.

2. Engine Removal/Installation

- A. Remove Engine.

- (1) Place all cabin switches and the fuel shutoff valve in the OFF position.
- (2) Remove engine cowling.
- (3) Disconnect positive and negative battery leads from battery.
- (4) Loosen C-clamp securing flexible duct to nose cap. Remove flexible duct from nose cap.
- (5) Loosen C-clamp securing flexible duct to firewall-mounted heater valve. Remove flexible duct from heater valve.
- (6) On turbocharged airplanes, loosen clamp securing induction duct to turbocharger. Remove duct from turbocharger.
- (7) Remove the propeller. Refer to Chapter 61, Propeller - Maintenance Practices, [Propeller Removal/Installation](#).

WARNING: Disconnecting the P-lead wire from the magnetos will remove the electrical ground from the magneto circuit, resulting in hot magnetos. A separate ground wire must be run to the magnetos or the high tension wires removed from the spark plugs to prevent accidental engine start when the propeller is rotated.

- (8) Disconnect P lead wires on magnetos.
- (9) Remove propeller governor. Refer to Chapter 61, [Propeller Governor - Maintenance Practices](#).
- (10) For airplanes with standard avionics, disconnect the electrical connector from the EGT Probe (on non-turbocharged airplanes) or disconnect the electrical connector from the TIT Probe (on turbocharged airplanes).
- (11) For airplanes with standard avionics, disconnect the electrical terminal from the CHT probe.
- (12) For airplanes with Garmin G1000 avionics, disconnect the EGT and the CHT thermocouple connectors.
- (13) Disconnect fuel outlet line at the fuel strainer.
- (14) Disconnect throttle and mixture cables at fuel/air control unit. Note position of washers and spacers for later reassembly.
- (15) Disconnect throttle and mixture cables from cable attach bracket by removing screws, washers and nuts securing retaining clamps.
- (16) On turbocharged airplanes, disconnect and cap oil lines from controller assembly.
- (17) Disconnect drain lines and vent tubes.
- (18) Disconnect vacuum hose at firewall connection.
- (19) Disconnect manifold pressure line at firewall.
- (20) On turbocharged airplanes, disconnect manifold pressure line (from induction plenum) and upper deck pressure line (from induction elbow) from the controller assembly.
- (21) If installed, disconnect and label electrical wires on vacuum switches.
- (22) For airplanes with standard avionics, loosen and remove tachometer drive cable clamps in engine area. Disconnect tachometer drive cable from rear of accessory case.
- (23) For airplanes with Garmin G1000 avionics, remove the tachometer sending unit. Refer to Chapter 77, [Tachometer - Maintenance Practices](#).
- (24) Cut tie wraps (sta straps) securing the various wire bundles to the engine.
- (25) Loosen and remove clamp securing starter and alternator wires to forward baffle.
- (26) Remove starter wires from starter.
- (27) Remove alternator wires from alternator.
- (28) Loosen and remove clamp securing starter and alternator wires to forward baffle.
- (29) Disconnect ground wire from engine mount.
- (30) Disconnect electrical connector from fuel pressure transducer (on non-turbocharged airplanes) or disconnect electrical connector from fuel flow transducer and electrical connector from upper deck pressure transducer (on turbocharged

airplanes).

- (31) Disconnect electrical connector from low oil pressure switch.
- (32) Disconnect electrical connector from oil pressure transducer.
- (33) Disconnect electrical terminal from oil temperature sensor.
- (34) Place stand under tail tie-down to allow for tail heavy condition, which will occur when engine is removed from airframe.
- (35) Attach hoist to lifting strap on top of engine. Begin to take up engine weight using hoist.
- (36) Remove bolts attaching engine shock mounts to engine mount assembly. Slowly raise engine using hoist until engine is free of structure.

B. Install Engine and Mount.

- (1) Hoist engine into position and secure using hardware removed in above steps. Refer to [Engine Mount - Maintenance Practices](#).
- (2) Torque engine shock mount nuts from 450 to 500 inch- pounds.
- (3) Remove stand from under tail tie-down.
- (4) Connect electrical terminal to oil temperature sensor.
- (5) Connect electrical connector to oil pressure transducer.
- (6) Connect electrical connector to low oil pressure switch.
- (7) Connect electrical connector to fuel pressure transducer, or on turbo charged airplanes connect electrical connector to fuel flow transducer and electrical connector to upper deck pressure transducer.
- (8) Connect ground wire to engine mount.
- (9) Secure starter wires and alternator wires to forward baffle using clamp.
- (10) Install alternator wires to alternator.
- (11) Install starter wires to starter.
- (12) Secure various wire bundles to engine using tie wraps (sta straps).
- (13) For airplanes with standard avionics, connect the tachometer drive cable to the back of the accessory case. Torque the drive shaft to 100 inch-pounds.
 - (a) Install the tachometer drive cable clamps in engine area.
- (14) For airplanes with Garmin G1000 avionics, install the tachometer sending unit. Refer to Chapter 77, [Tachometer - Maintenance Practices](#).
- (15) If installed, reconnect tagged wires to respective vacuum switches.
- (16) Reconnect vacuum line to firewall connection.
- (17) Reconnect manifold pressure line at firewall.
- (18) On turbocharged airplanes, connect manifold pressure (from induction plenum) and upper deck pressure (from induction elbow) lines from the controller assembly.
- (19) Position throttle and mixture control cables on cable attach bracket. Install retaining clamp and secure, using screws, washers and nuts.
- (20) Connect throttle and mixture control cables to fuel/air control unit.
 - (a) Adjust the throttle control as necessary. Refer to Chapter 76, [Throttle Control Adjustment/Test](#).
 - (b) Adjust the mixture control as necessary. Refer to Chapter 76, [Fuel Mixture Control Adjustment/Test](#).
- (21) Reconnect fuel outlet line at the fuel strainer.
- (22) For airplanes with standard avionics, connect the electrical connector to the EGT Probe (on non- turbocharged airplanes) or connect the electrical connector to the TIT Probe (on turbocharged airplanes).
- (23) For airplanes with standard avionics, connect the electrical terminal to the CHT probe.
- (24) For airplanes with Garmin G1000 avionics, connect the EGT and the CHT thermocouple connectors.
- (25) Install propeller governor. Refer to Chapter 61, [Propeller Governor - Maintenance Practices](#).
- (26) Reconnect P leads to magnetos. If required, reconnect high tension wires to spark plugs.
- (27) Connect flexible duct to firewall-mounted heater valve.

- (28) Connect flexible duct to nose cap inlet.
- (29) On turbocharged airplanes, install clamp securing induction duct to turbocharger.
- (30) Check all controls and lines for security of installation and freedom of movement. Ensure all fuel fittings are tight and leak-free.
- (31) Install the propeller. Refer to Chapter 61, Propeller - Maintenance Practices, [Propeller Removal/Installation](#).
- (32) Reconnect positive and negative leads to battery.
- (33) Do the [Idle Speed and Mixture Adjustment](#) and the [Engine Driven Fuel Pump Pressure Setting \(T206\)](#). Refer to Chapter 73, Fuel Injection System - Maintenance Practices.
- (34) Reinstall engine cowling.

3. Engine Cleaning

- A. The engine may be cleaned using stoddard solvent or equivalent chemicals. Care should be taken to ensure that all openings are capped or plugged to prevent solvent entry into engine. All electrical accessories (starters, alternators, etc.) should be covered before cleaning solvent is applied.

4. Engine Storage

- A. If the engine is being removed for storage purposes, it may need to be preserved. Refer to Chapter 10, [Storage - Description and Operation](#), for preservation techniques.

COWLS - MAINTENANCE PRACTICES

1. Description and Operation

- A. The engine cowl consists of upper sheet metal halves (also, on turbocharged airplanes, a removable lower right side cowl) and left and right composite nose cap. The cowl is attached using quick-release, quarter turn fasteners to allow for easy removal and installation. The nose pieces are attached to each other using screws and nutplates.

2. Cowl Removal/Installation

- A. Remove Cowl (Refer to [Figure 201](#)).
 - (1) Release quick-release fasteners around perimeter of left and right upper cowl.
 - (2) Remove left and right upper cowls.
 - (3) Remove screws securing left nose cap assembly from right nose cap assembly.
 - (4) Remove screws securing left and right nose cap assemblies to lower cowl.
 - (5) Remove nose cap assemblies.
 - (6) On turbocharged airplanes, remove screws around sides and bottom of lower right cowl.
 - (7) Remove lower right cowl.
- B. Install Cowl (Refer to [Figure 201](#)).
 - (1) On turbocharged airplanes, install lower right cowl to engine area and secure using screws.
 - (2) Attach left nose cap to right nose cap and lower cowl using screws.
 - (3) Install left and right upper cowls to engine area and secure using quick-release fasteners.

3. Cowl Repair

- A. For repair procedures to the cowl, refer to the Single Engine Models 172,172, 206H/T206H 1996 and On Structural Repair Manual, Chapter 71, [Engine Cowling Repairs](#).

4. Cowl Flap Removal/Installation

- A. Remove Cowl Flap (Refer to [Figure 202](#)).
 - (1) Place cowl flap control lever in the OPEN position.
 - (2) Disconnect cowl flap control clevises from cowl flap shock mounts.
 - (3) Remove safety wire securing hinge pins to cowl flaps, pull hinge pins and remove cowl flaps.
- B. Install Cowl Flap (Refer to [Figure 202](#)).
 - (1) Install cowl flaps using hinge pins. Secure hinge pins to cowl flaps using safety wire.
 - (2) Connect cowl flap control clevises to cowl flap shock mounts.
 - (3) Rig cowl flaps, if necessary.

5. Cowl Flap Rigging (206H)

- A. Rig Cowl Flap (Refer to [Figure 202](#)).
 - (1) Disconnect cowl flap control clevises from cowl flap shock mounts.
 - (2) Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.
 - (3) Place cowl flap control lever in the CLOSED position. If the control lever cannot be placed in the closed position, adjust controls at upper clevis to position control lever in bottom hole of position bracket.
 - (4) With the control lever in CLOSED position, hold one cowl flap closed, streamlined with trailing edge of lower cowl. Loosen jam nut and install bolt through clevis and shock-mount.
NOTE: Be sure threads are visible in clevis inspection holes.
 - (5) Repeat the preceding step for the opposite cowl flap.
 - (6) When cowl flaps are lowered they should be open 5.50 inches (minimum), and flush closed when measured in a straight line from the aft edge of cowl flap to lower edge of firewall.
 - (7) Check that all clamps and jam nuts are tight.
 - (8) Check for ease of operation.

6. Cowl Flap Rigging (T206H)

A. Rig Cowl Flap (Refer to [Figure 202](#)).

- (1) Disconnect cowl flap control clevises from cowl flap shock mounts.
- (2) Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.
- (3) Place cowl flap control lever in the OPEN position. If the control lever cannot be placed in the open position, adjust controls at upper clevis to position control lever in top hole of position bracket.
- (4) Adjust clevis at lower end of control to open cowl flap 7.0 inches (minimum) when in the open position and to remain open 1.0 inches in the closed position. This measurement is made in a straight line from centerline of the aft edge of the cowl flap to the lower edge of the firewall.
- (5) Repeat the preceding step for the opposite cowl flap.
- (6) If either control needs to be lengthened or shortened, the lower clamp may be loosened and housing slipped in the clamp, or lower clevis may be adjusted.

NOTE: Maintain sufficient thread engagement of clevis.

- (7) Check that all clamps and jam nuts are tight.
- (8) Check for ease of operation.

NOTE: In all cases, the flexible controls must reach their internal stops in each direction to assure full travel of the controls.

Figure 201 : Sheet 1 : Engine Cowl Installation

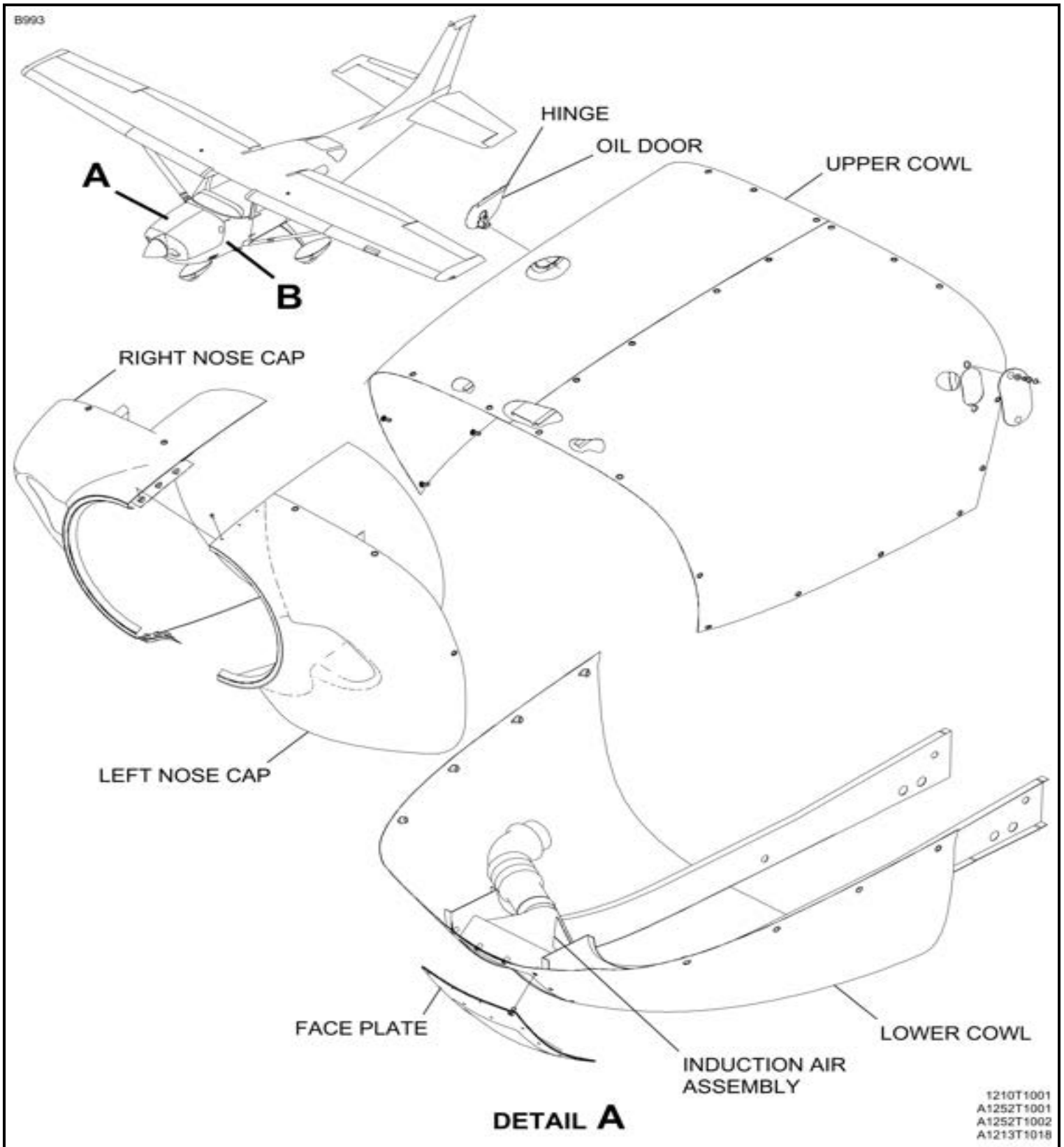


Figure 201 : Sheet 2 : Engine Cowl Installation

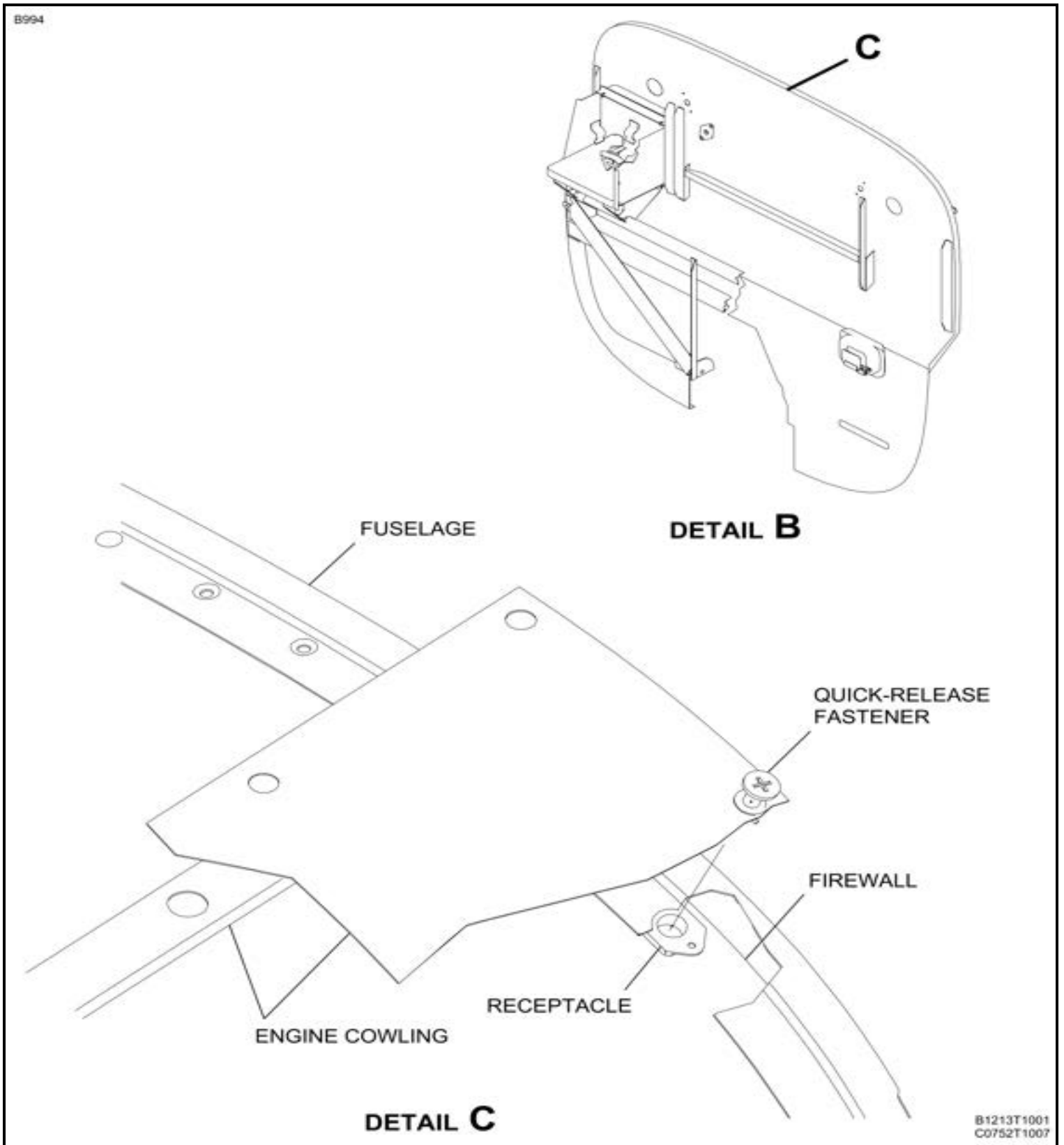
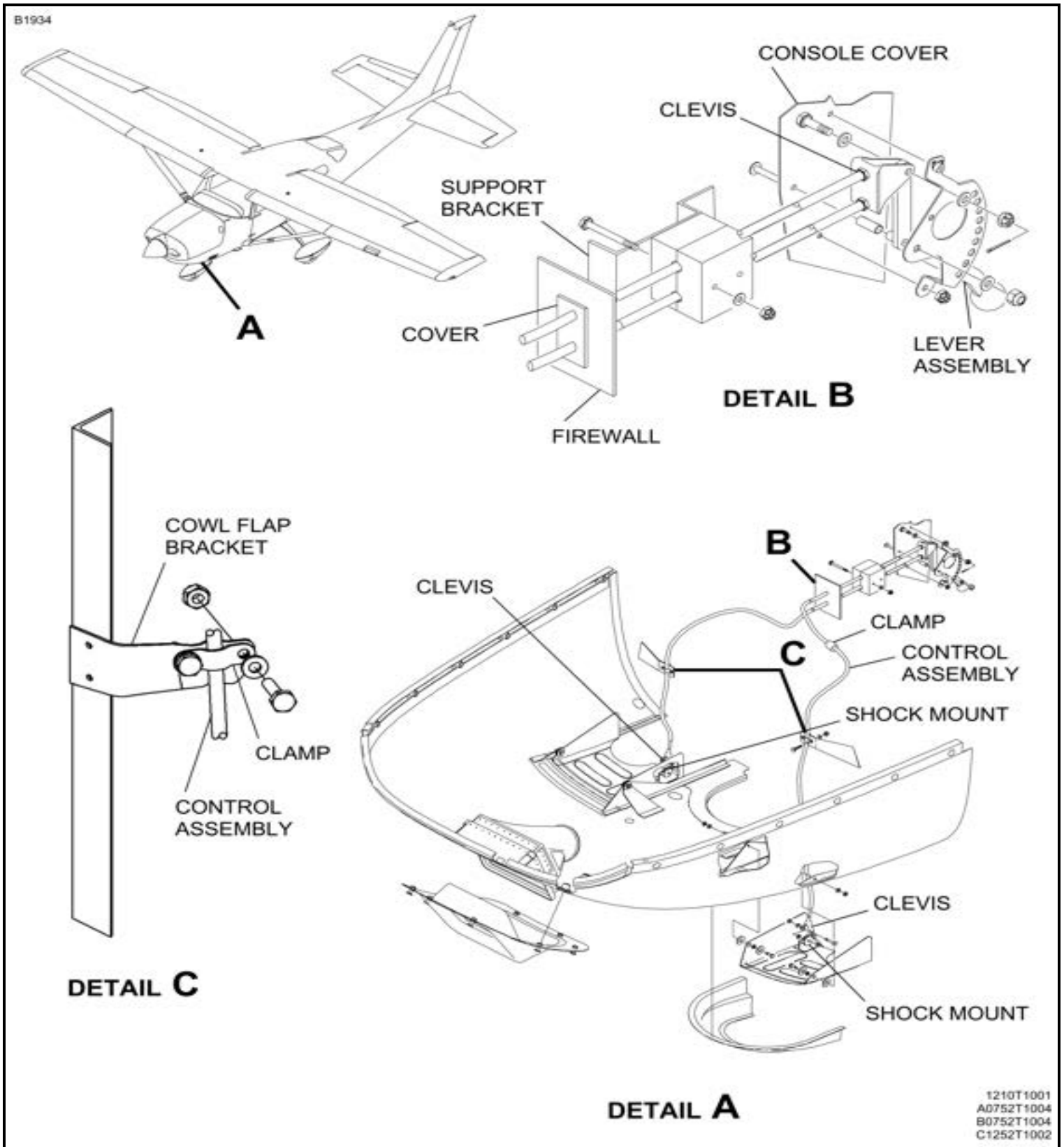


Figure 202 : Sheet 1 : Engine Cowl Installation



ENGINE MOUNT - MAINTENANCE PRACTICES

1. Description and Operation

- A. The engine mount assembly uses four rubber mounts to isolate engine noise and vibration from the engine mount assembly.

2. Engine Mount Procedures

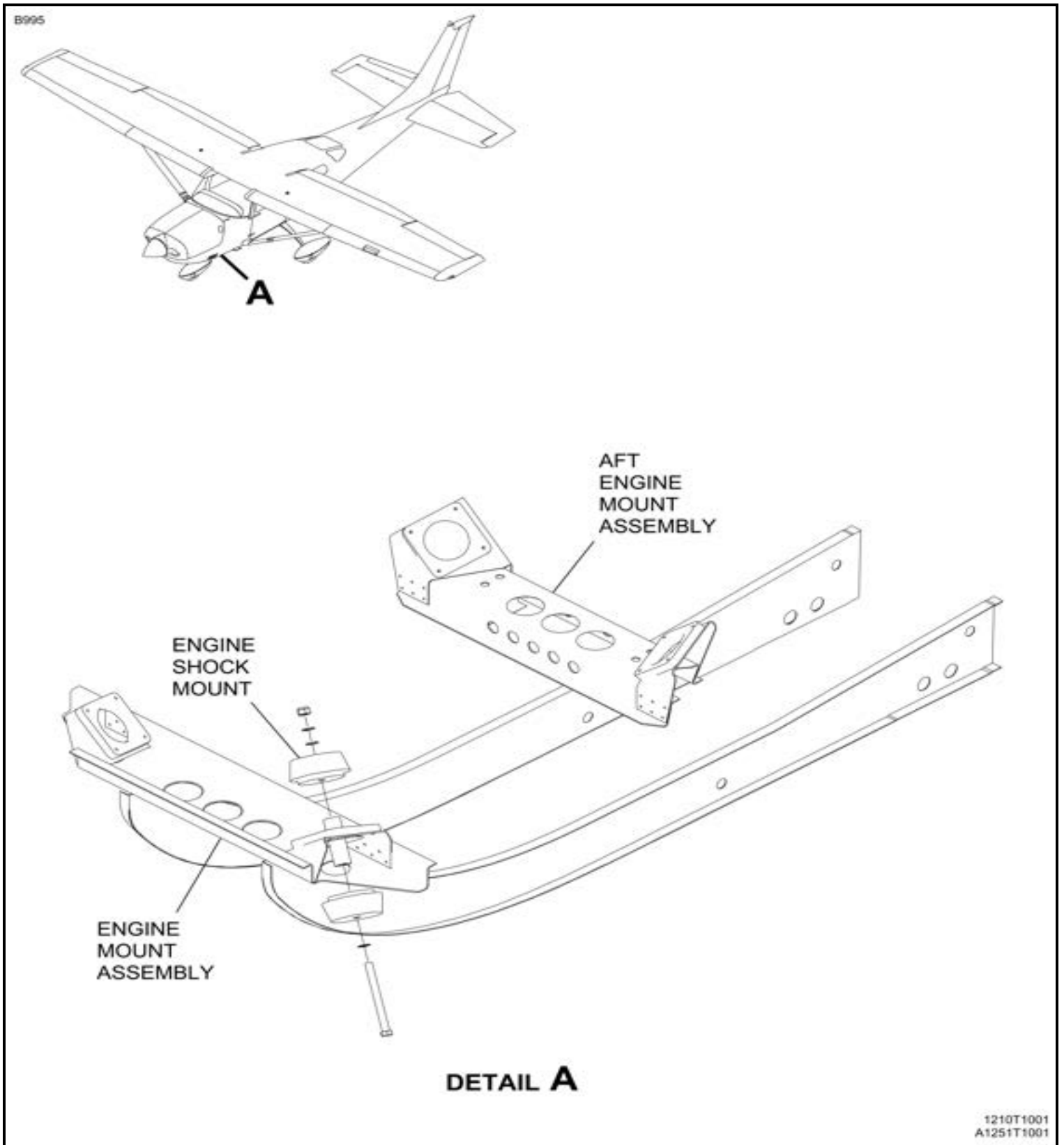
- A. Shock Mount Procedures (Refer to [Figure 201](#)).

- (1) The shock mounts, which connect the engine to the engine mount assembly, are of rubber and metal construction and are assembled in a sandwich to isolate noise and vibration from the cabin area. Shock mounts should be assembled as illustrated in Figure 201. Nuts should be torqued from 450 to 500 inch-pounds upon installation.

NOTE: Take caution to ensure that the bolts are not shanked out.

- (2) The shock mounts should never be cleaned with any type of solvent. If shock mounts need cleaning, use a clean, dry cloth.
 - (3) Shock mounts should be inspected when removed. Metal components should be inspected for cracks and excessive wear due to aging and deterioration. Rubber components should be inspected for separation, swelling, cracking or a pronounced set of the pad. Shock mounts showing any of these signs should be replaced.

Figure 201 : Sheet 1 : Engine Shock Mount Installation



AIR INDUCTION SYSTEM - MAINTENANCE PRACTICES

1. Description and Operation

- A. Ram air to the engine enters the induction air box through the induction air filter, located on the upper right side of the engine. 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 (Turbocharged)

- A. Remove System Components (Refer to [Figure 201](#)).
 - (1) Loosen the fasteners that attach the air filter faceplate to lower cowl.
 - (a) Remove the air filter faceplate and air filter.
 - (2) Remove the right lower cowl. Refer to [Cowls - Maintenance Practices](#).
 - (3) Loosen the clamps on the duct to disconnect from the air filter housing.
- B. Install System Components (Refer to [Figure 201](#)).
 - (1) Use the clamps to attach the duct to the air filter housing.
 - (2) Install right lower cowl. Refer to [Cowls - Maintenance Practices](#).
 - (3) Attach the air filter and air filter bracket to the lower cowl using fasteners.
 - (a) Put the air filter in position in the air filter housing.
 - (b) Use fasteners to attach the air filter faceplate to the lower cowl.

3. Air Induction System Removal/Installation (Non-Turbocharged)

- A. Remove System Components (Refer to [Figure 202](#)).
 - (1) Remove right side of upper cowling. Refer to [Cowls - Maintenance Practices](#).
 - (2) Remove bolts securing air filter to air box assembly. Remove air filter.
 - (3) Loosen clamps on induction air box duct to disconnect induction air box from induction air manifold.
- B. Install System Components (Refer to [Figure 202](#)).
 - (1) Position induction air box duct to induction manifold and secure using clamps.
 - (2) Secure air filter to air box assembly using bolts.
 - (3) Install right side of upper cowling. Refer to [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Induction Air System

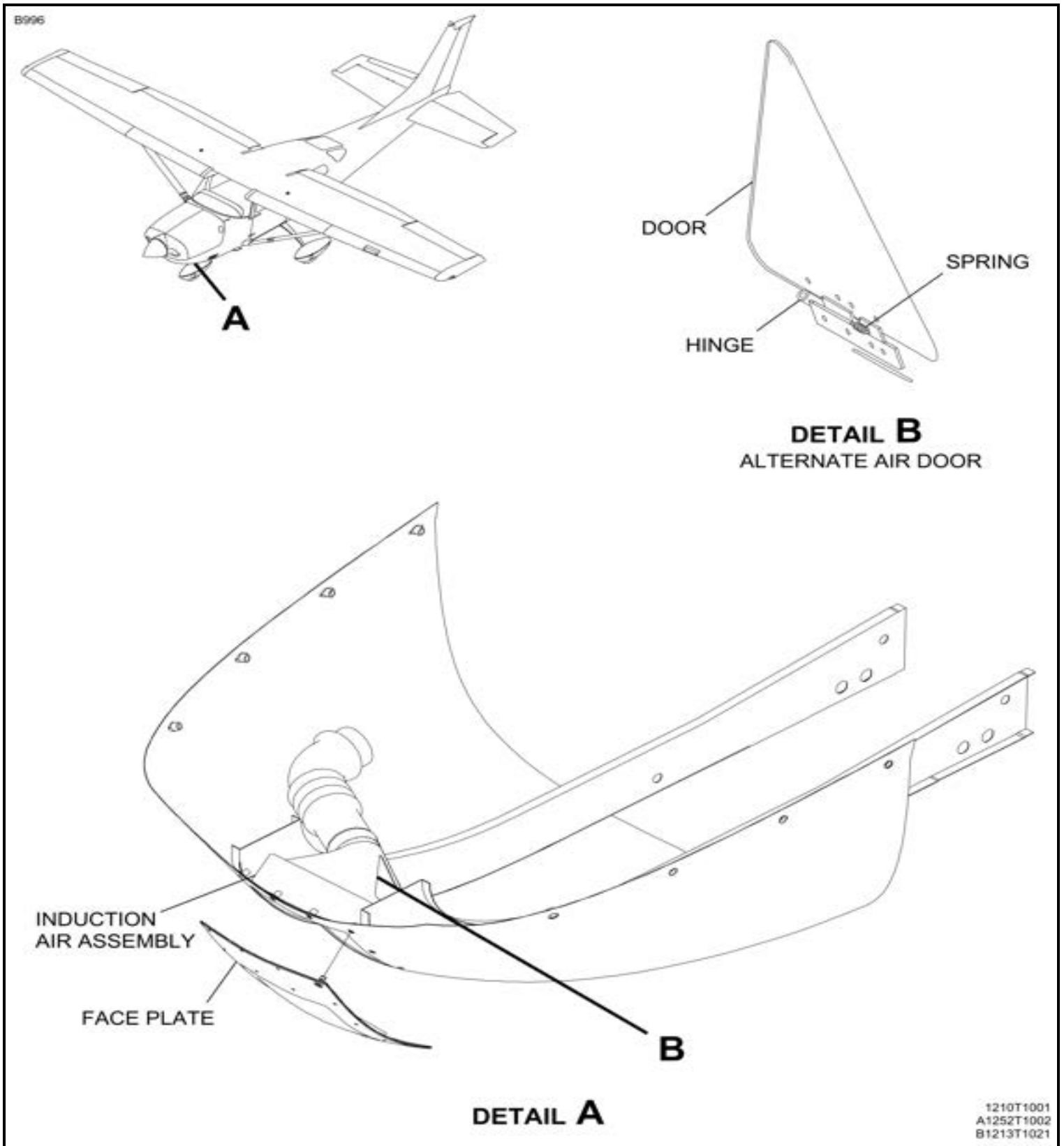
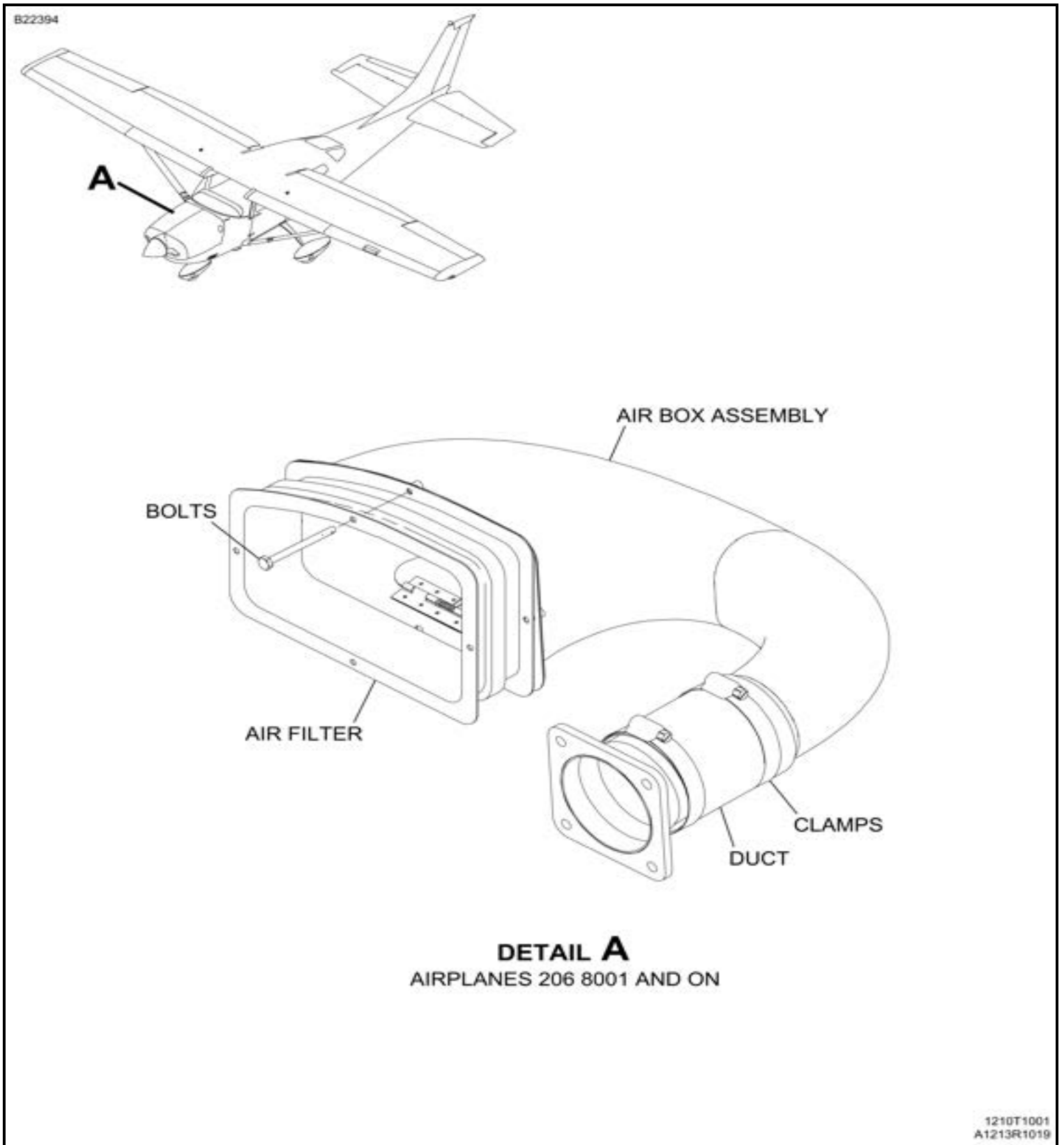


Figure 202 : Sheet 1 : Induction Air System



DRAIN LINES - MAINTENANCE PRACTICES

1. Description and Operation

- A. Different components in the engine compartment has drain lines to let fluid and/or fumes escape. The drain lines are attached with hose clamps and fittings. The routing of the drain lines are on the left and right sides of the lower cowl. Line removal and installation have clamps, fittings and hoses that are connected together to make the routing. You must examine the drain lines to make sure of the correct routing and condition when you remove and install the components. Some airplanes have an optional cylinder drain can installed. The cylinder drain can is designed to catch the fuel that drains from the engine cylinders at shut down. If a cylinder drain can has not been installed and you want to install one, you must obtain MK206-71-02 for instructions.

2. Drain Line Removal/Installation

NOTE: A non-turbocharged airplane installed with a cylinder drain can, will have one cylinder drain that extends out of the lower left cowl.

- A. Remove the Drain Lines (Refer to [Figure 201](#), [Figure 202](#), [Figure 203](#) or [Figure 204](#)).
- (1) Remove the cowls. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (2) Remove the applicable clamps, fittings and drain line.
- B. Install the Drain Lines.
- (1) Attach the drain lines with the fittings and clamps.
 - (a) Make sure of the correct routing and installation of drain lines.
 - (2) Install the cowls. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

3. Cylinder Drain Can Removal/Installation

- A. Remove the Cylinder Drain Can (Refer to [Figure 202](#) for Non-Turbocharged Airplanes or [Figure 204](#) for Turbocharged Airplanes).
- (1) Remove the cowls to get access to the cylinder drain line. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (2) Remove the upper and lower clamps that attach the cylinder drain lines to the cylinder drain can.
 - (3) Remove the two bolts that attach the cylinder drain can to the engine compartment and remove the cylinder drain can from the airplane.
- B. Install the Cylinder Drain Can.
- (1) Install with the two bolts the cylinder drain can to the engine compartment.
 - (2) Connect the with the two clamps the upper and lower cylinder drain lines to the cylinder drain can.
 - (3) Install the cowls. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Non-Turbocharged Engine Drain Line Assembly

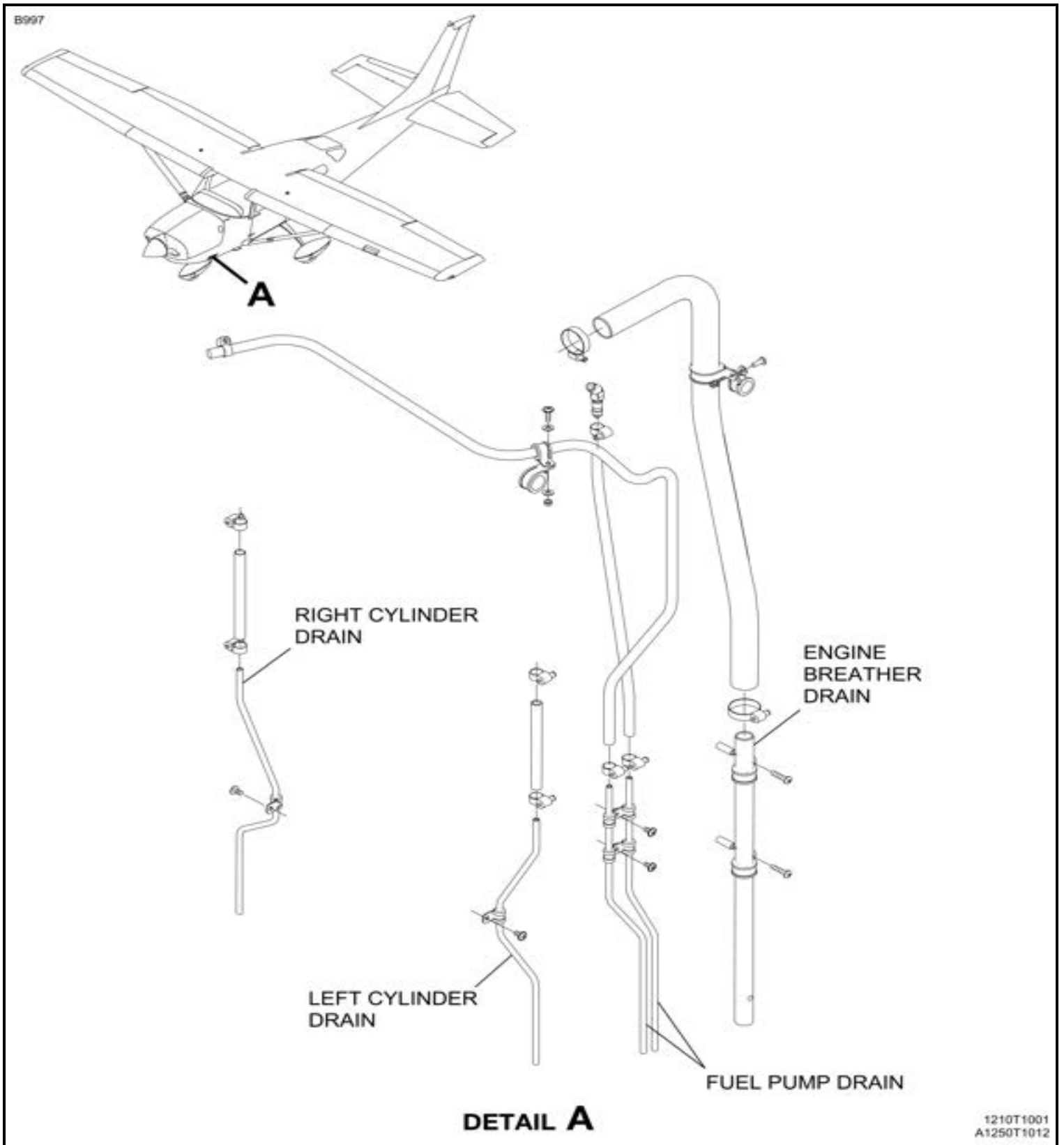


Figure 202 : Sheet 1 : Non-Turbocharged Drain Line Assembly

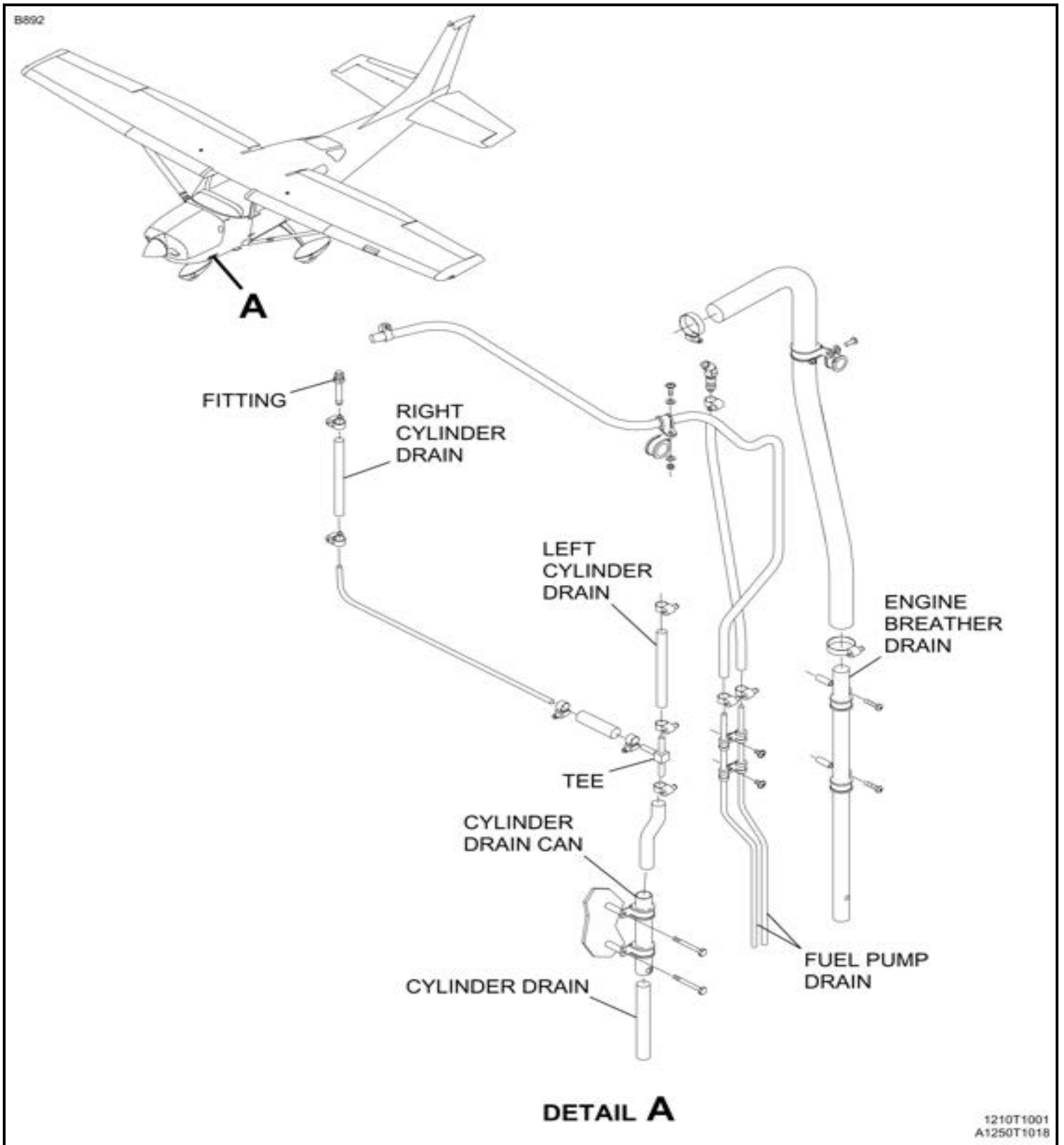


Figure 203 : Sheet 1 : Turbo-Charged Drain Line Assembly

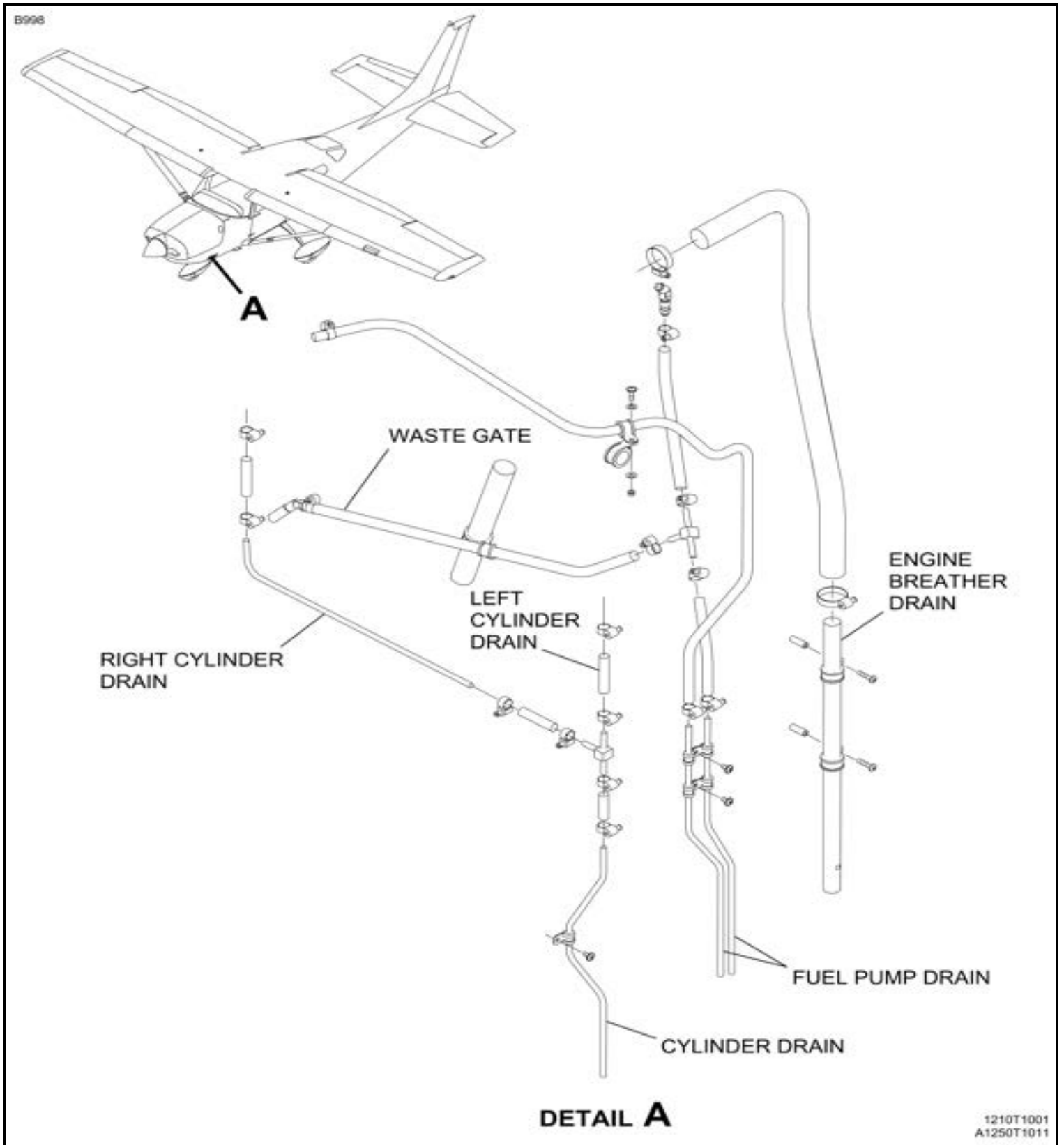
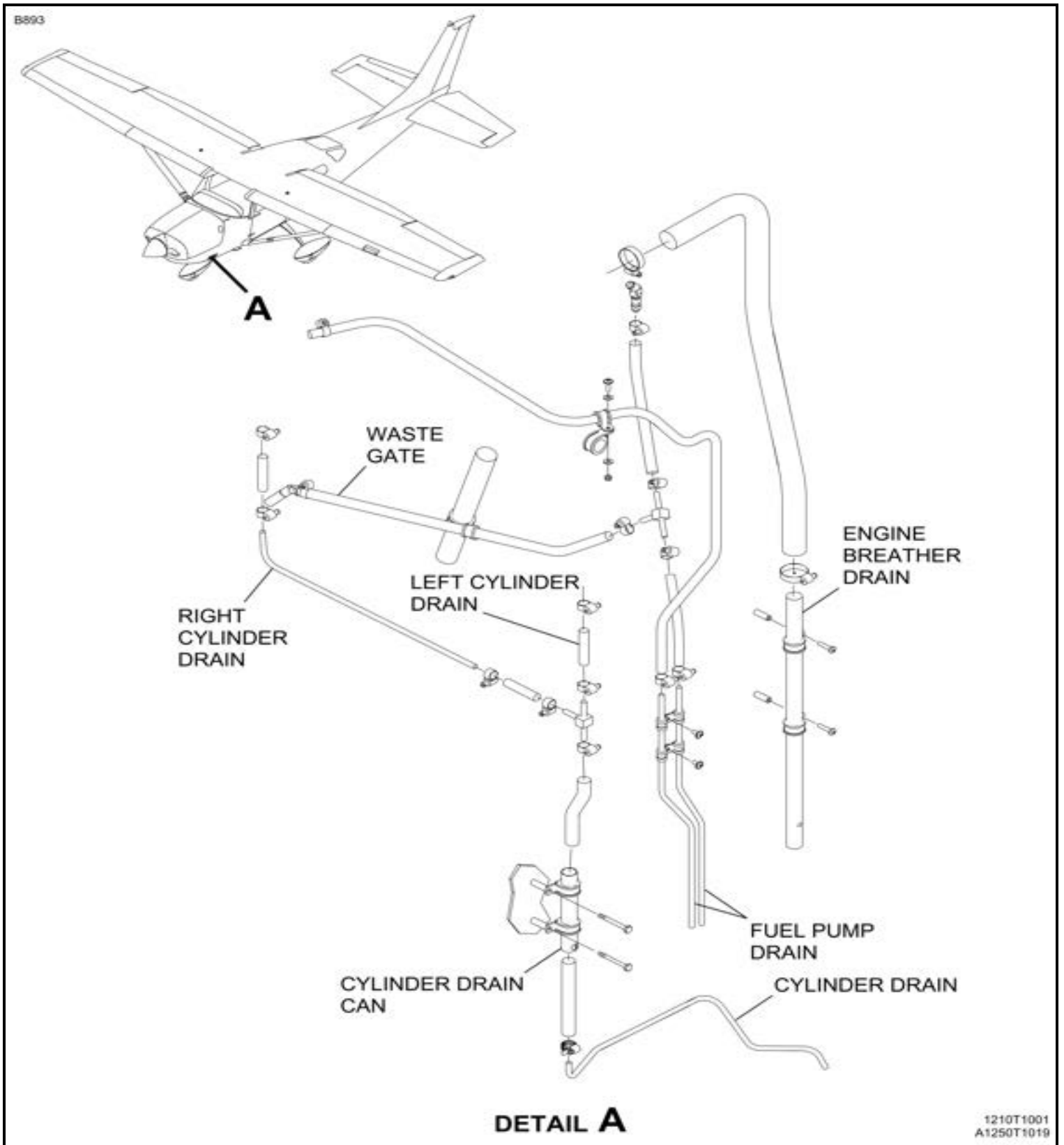


Figure 204 : Sheet 1 : Turbo Charged Drain Line Assembly



IGNITION SYSTEM - GENERAL

1. Scope

- A. This chapter covers the ignition systems used on the IO-540-AC1A5 and TIO-540-AJ1A 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
Ignition Switch Parts Kit	A3770	Cessna Aircraft	To rebuild 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.

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.

Figure 101 : Sheet 1 : Ignition System Troubleshooting Chart

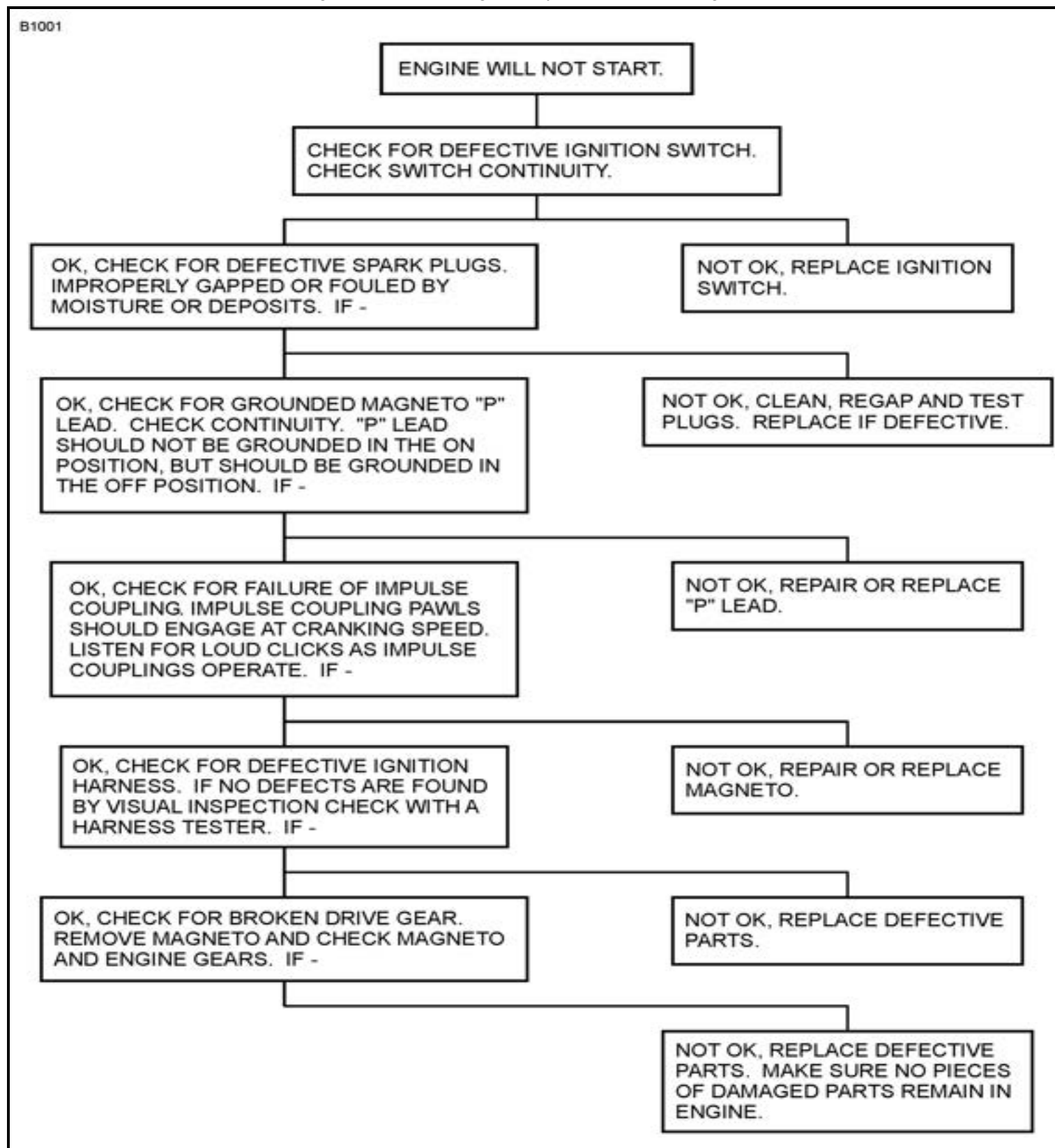
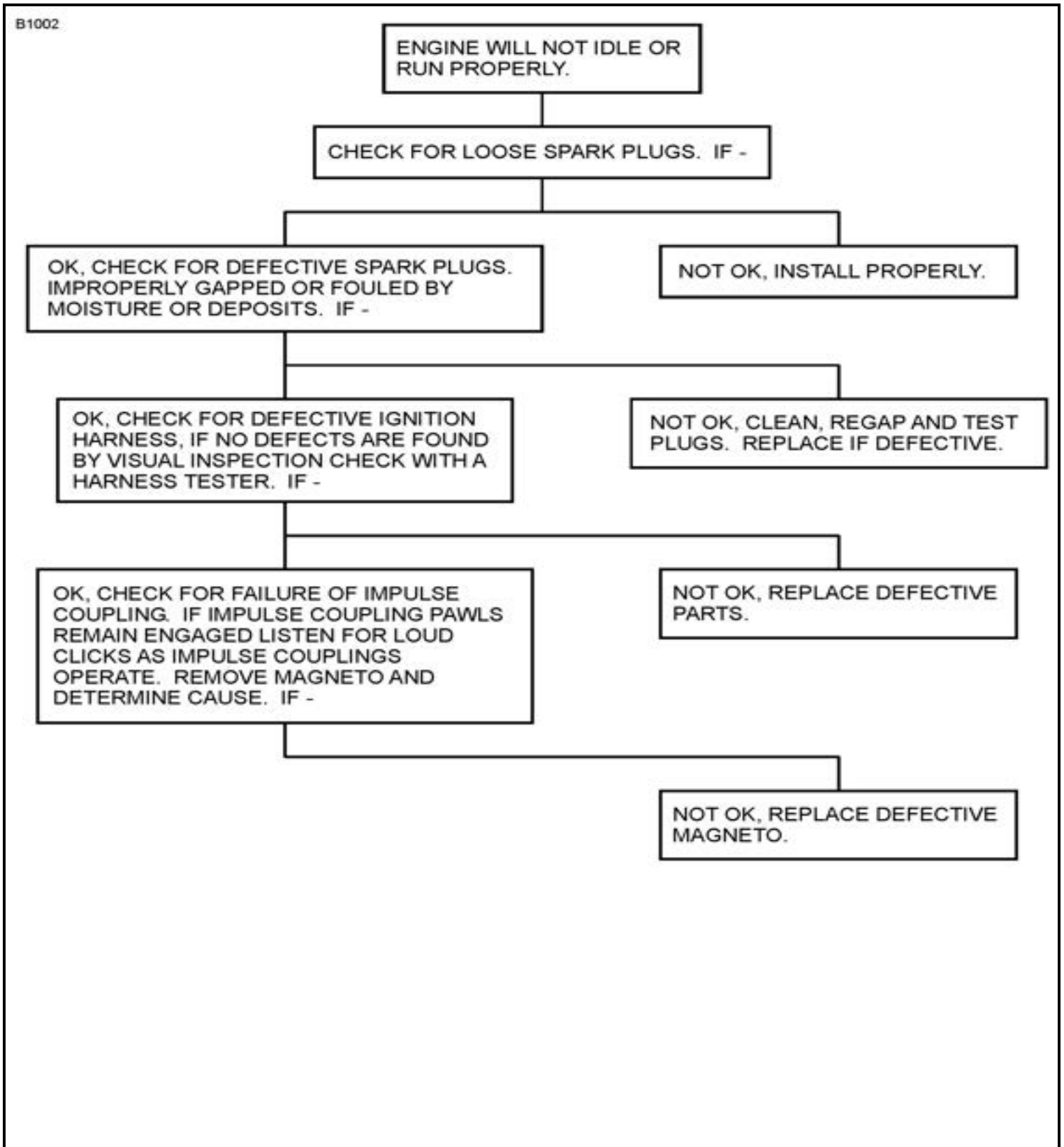


Figure 101 : Sheet 2 : Ignition System Troubleshooting Chart



IGNITION SYSTEM - MAINTENANCE PRACTICES

1. Description and Operation

- A. The IO-540-AC1A5 engine (non-turbocharged) utilizes two Slick 6351 series magnetos, the TIO-540-AJ1A engine (turbocharged) utilizes two Slick 6361 series (pressurized) magnetos, impulse coupled to fire dual plugs in each cylinder. Maintenance of the magnetos is limited to removal, installation and engine-to-magneto timing.
- 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 procedures for each magneto are 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 to 20 degrees BTDC for the 206, or 20 degrees BTDC for T206 on the number one cylinder compression stroke.
 - (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](#)).

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 nut is 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 opposite of the 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 has not moved and is still set in position with the number one cylinder at 20 degrees BTDC (Before Top Dead Center).
- (6) If the propeller has 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) With the number one cylinder at 20 degrees BTDC on the compression stroke, do the steps that follow.

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 (1.5 to 1.7 N-m).
- 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: It is possible to adjust the Magneto-to-Engine timing 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) Index the magneto and accessory case as necessary to monitor external timing adjustments before the first field adjustment of external timing.
 - (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 at 20 degrees BTDC (Before Top Dead Center) on the compression stroke.
- (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 luminated, 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.
- (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 lights 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.

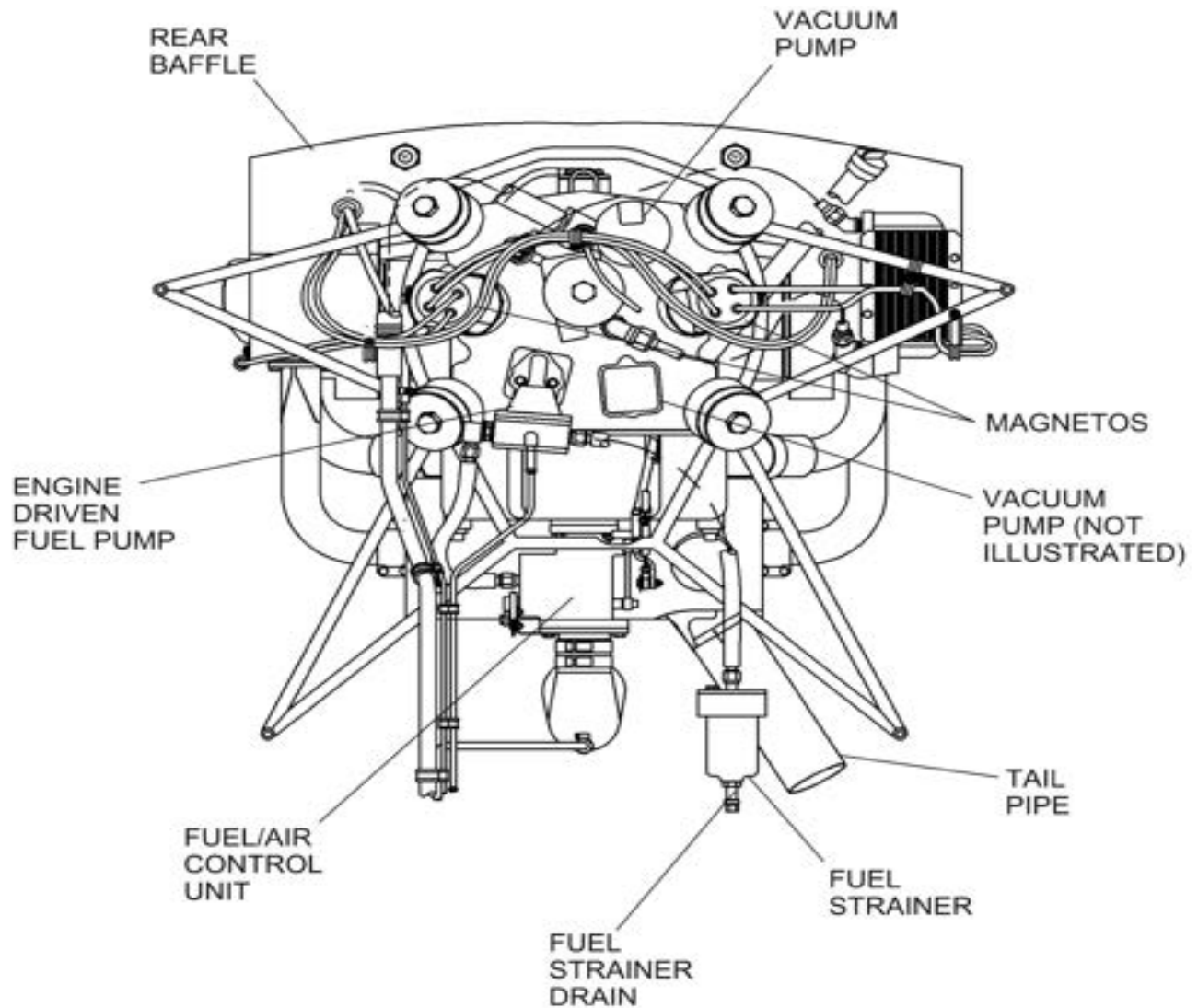
NOTE: You will hear a click sound from the impulse couplings when they release.

- (7) Turn the propeller in the opposite direction of normal movement to approximately 25 degrees BTDC (Before Top Dead Center), then slowly forward to 20 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 indicate points open at 20 degrees BTDC, with the number one cylinder on the compression stroke.

- (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 an engine preflight operational check of the ignition system. Refer to the pilot's operating handbook.

Figure 201 : Sheet 1 : Magneto Installation



0550T1007

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.

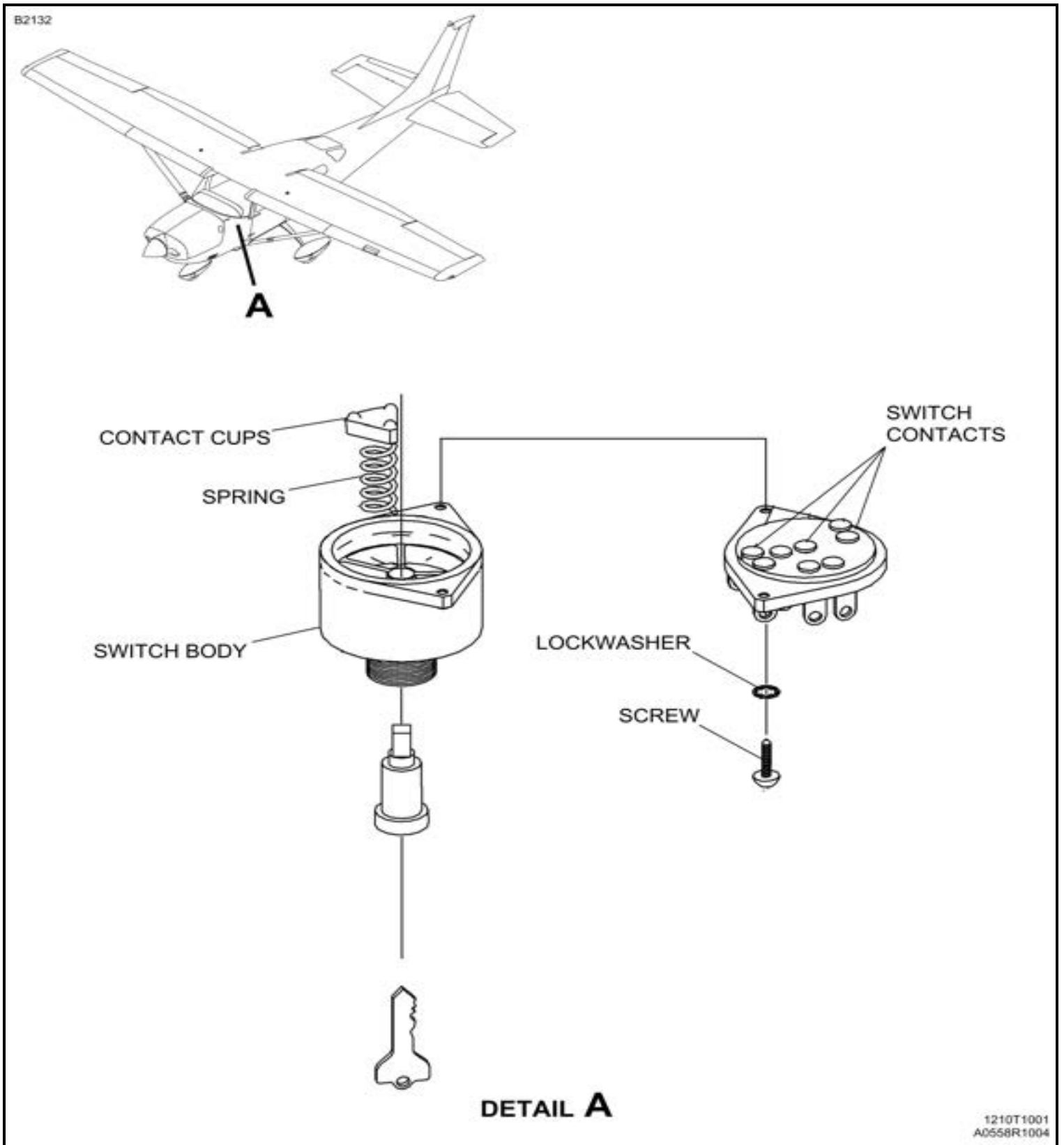
- E. Switch Reassembly.

- (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 206 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.

Figure 601 : Sheet 1 : ACS Ignition Switch Inspection/Lubrication



ENGINE CONTROLS - GENERAL

1. Scope

- A. This chapter describes those controls used to regulate engine power.

2. 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.

THROTTLE CONTROL - MAINTENANCE PRACTICES**1. General**

- A. The throttle control is a push-pull type that incorporates a knurled friction knob, which prevents vibration induced “creeping” of the control. The ball bearing type rod end on the throttle is secured to the engine with a predrilled steel AN bolt, castellated nut and cotter pin.

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 AN bolts are not to be used in this application.

- B. When adjusting the throttle control, it is important to check that throttle control slides smoothly throughout its full range of travel, that it locks securely with the friction lock and the throttle arm operates through its full arc of travel. Do not lubricate throttle control. If excessive binding is noticed, replace throttle control.
- C. Whenever engine controls are being disconnected, pay particular attention to the exact position, size and number of attaching parts for reconnecting controls.

2. Throttle Control Removal/Installation

- A. Remove Throttle Control (Refer to [Figure 201](#)).

- (1) Remove engine cowl. Refer to Chapter 71, [Cowl - Removal/Installation](#).
- (2) Remove cotter pin, castellated nut, bolt, and washers securing throttle control rod end to fuel/air control unit throttle arm. Discard cotter pin.
- (3) Remove rod end and jamnut from throttle control.
- (4) Remove nuts, bolts, and clamp securing throttle control cable to cable bracket.
- (5) Remove throttle control jamnut and lock washer from forward side of firewall.
- (6) Inside the cockpit/cabin area, loosen throttle control jamnuts and lockwashers from forward side of instrument panel and aft side of firewall.
- (7) Carefully pull throttle control through firewall and instrument panel removing lock washers and jamnuts, and remove from airplane.

- B. Install Throttle Control (Refer to [Figure 201](#)).

NOTE: When installing throttle control, ensure that control is routed exactly as previously installed. Ensure that no binding or preloading occurs from a too small bend radius.

- (1) Inside the cockpit/cabin area, carefully route throttle control through instrument panel and then place lockwashers and jamnuts over throttle control.
- (2) Route throttle control through firewall and position throttle control in instrument panel.
- (3) Secure throttle control in instrument panel by tightening jamnut against lock washer at instrument panel.
- (4) Position lockwasher and locknut on throttle control on aft side of firewall.
- (5) In the engine compartment, place lockwasher and jamnut over throttle control and secure against firewall.
- (6) Install jamnut and rod end on throttle control.
- (7) Attach throttle control rod end to fuel/air control unit throttle arm with bolt, washers, castellated nut and new cotter pin.
- (8) Install nuts, bolts, and clamp securing throttle control cable to cable bracket.
- (9) Adjust throttle control as required. Refer to [Throttle Control Adjustment/Test](#).
- (10) Install engine cowl. Refer to Chapter 71, [Cowls - Removal/Installation](#).

3. Throttle Control Adjustment/Test

- A. Check Throttle Control (Refer to [Figure 201](#)).

- (1) Pull throttle control knob full out and check that idle stop on throttle body is contacted.
- (2) Push throttle control knob full in and check that full power stop on throttle body is contacted.
- (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 throttle control in and out several times to check for binding.

- B. Adjust Throttle Control (Refer to [Figure 201](#)).

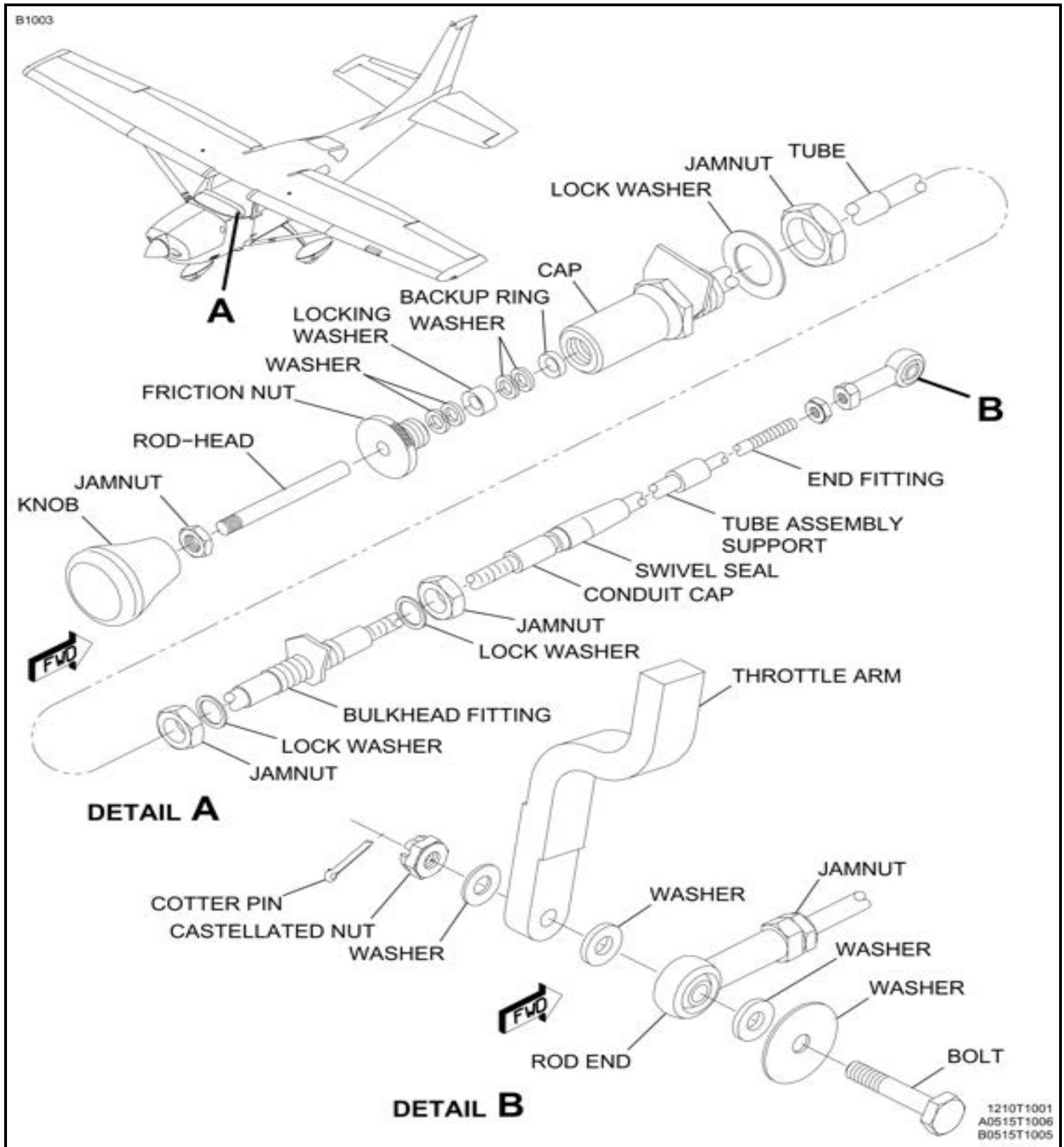
- (1) Disconnect throttle control rod end from the throttle arm.
- (2) Loosen jamnut and adjust throttle control rod end to obtain desired setting.
- (3) Tighten jamnut.
- (4) Connect throttle control rod end to throttle arm. Torque nut to 30 inch-pounds then continue tightening nut until cotter pin hole lines up with castellations in nut. Do not exceed 50 inch-pounds. Install cotter pin.

4. Throttle Control Inspection/Check

A. Inspection of Throttle Control.

- (1) The throttle control attachment to throttle body should be inspected in accordance with time limits established in Chapter 5, Inspection Time Limits. Do a check of the bolt, castellated nut, cotter pin, rod end, and rod end jam nut for security and condition.
- (2) Do a check of the rod end witness hole for proper rod end engagement with the throttle control.
- (3) Do a check to make sure that the throttle control slides smoothly throughout its full range of travel, that it locks securely with the friction lock, and that the throttle arm operates through its full arc of travel.

Figure 201 : Sheet 1 : Throttle Control Installation



FUEL MIXTURE CONTROL - MAINTENANCE PRACTICES**1. General**

- A. The mixture control is a push-pull type that incorporates a knurled friction knob, which prevents vibration induced “creeping” of the control. The ball bearing type rod end on the throttle is secured to the engine with a predrilled steel AN bolt, castellated nut and cotter pin.

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 adjusting the fuel mixture control, it is important to check that fuel mixture control slides smoothly throughout its full range of travel, that it adjusts through its full vernier range and the mixture arm operates through its full arc of travel. Do not lubricate fuel mixture control. If excessive binding is noticed, replace fuel mixture control.
- C. Whenever engine controls are being disconnected, pay particular attention to the exact position, size and number of attaching parts for reconnecting controls.

2. Fuel Mixture Control Removal/Installation

- A. Remove Fuel Mixture Control (Refer to [Figure 201](#)).

- (1) Remove engine cowl. Refer to Chapter 71, [Cowls - Removal/Installation](#).
- (2) Remove cotter pin, nut, bolt and washers securing mixture control rod end to fuel/air control unit mixture arm. Discard cotter pin.
- (3) Remove rod end, nut and jamnut from fuel mixture control.
- (4) Remove nuts, bolts, and clamp securing fuel mixture control cable to cable bracket.
- (5) Remove fuel mixture control nut and washer from forward side of firewall.
- (6) In the cockpit/cabin area, remove fuel mixture control nuts and washers from forward side of instrument panel and aft side of firewall.
- (7) Carefully pull fuel mixture control through firewall and instrument panel and remove from airplane.

- B. Install Fuel Mixture Control (Refer to [Figure 201](#)).

NOTE: When installing fuel mixture control, ensure that control is routed exactly as previously installed. Ensure that no binding or preloading occurs from a too small bend radius.

- (1) In the cabin/cockpit area, carefully route fuel mixture control through instrument panel, and then place washers and nuts over fuel mixture control.
- (2) Route fuel mixture control through firewall.
- (3) Secure fuel mixture control to instrument panel by tightening nut against washer at instrument panel.
- (4) Position washer and nut on fuel mixture control on the aft side of firewall.
- (5) In the engine compartment, place washer and nut over fuel mixture and secure against firewall.
- (6) Install jamnut, nut, and rod end on fuel mixture control and tighten.
- (7) Attach mixture control rod end to fuel/air control unit mixture arm with bolt, washers, nut. Torque nut to 30 inch-pounds and then continue tightening nut until cotter pin hole lines up with castellations in nut. Do not exceed 50 inch-pounds. Install new cotter pin.
- (8) Install nuts, bolts, and clamp securing fuel mixture control cable to cable bracket.
- (9) Check mixture control adjustment. Refer to [Fuel Mixture Control Adjustment/Test](#).
- (10) Install engine cowl. Refer to Chapter 71, [Cowls - Removal/Installation](#).

3. Fuel Mixture Control Adjustment/Test

- A. Check Fuel Mixture Control.

- (1) Push fuel mixture control full in and verify that mixture arm on fuel/air control unit is fully open (rich).
- (2) Pull fuel mixture control full out and verify that mixture arm on 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 fuel mixture control in and out several times to check for binding.

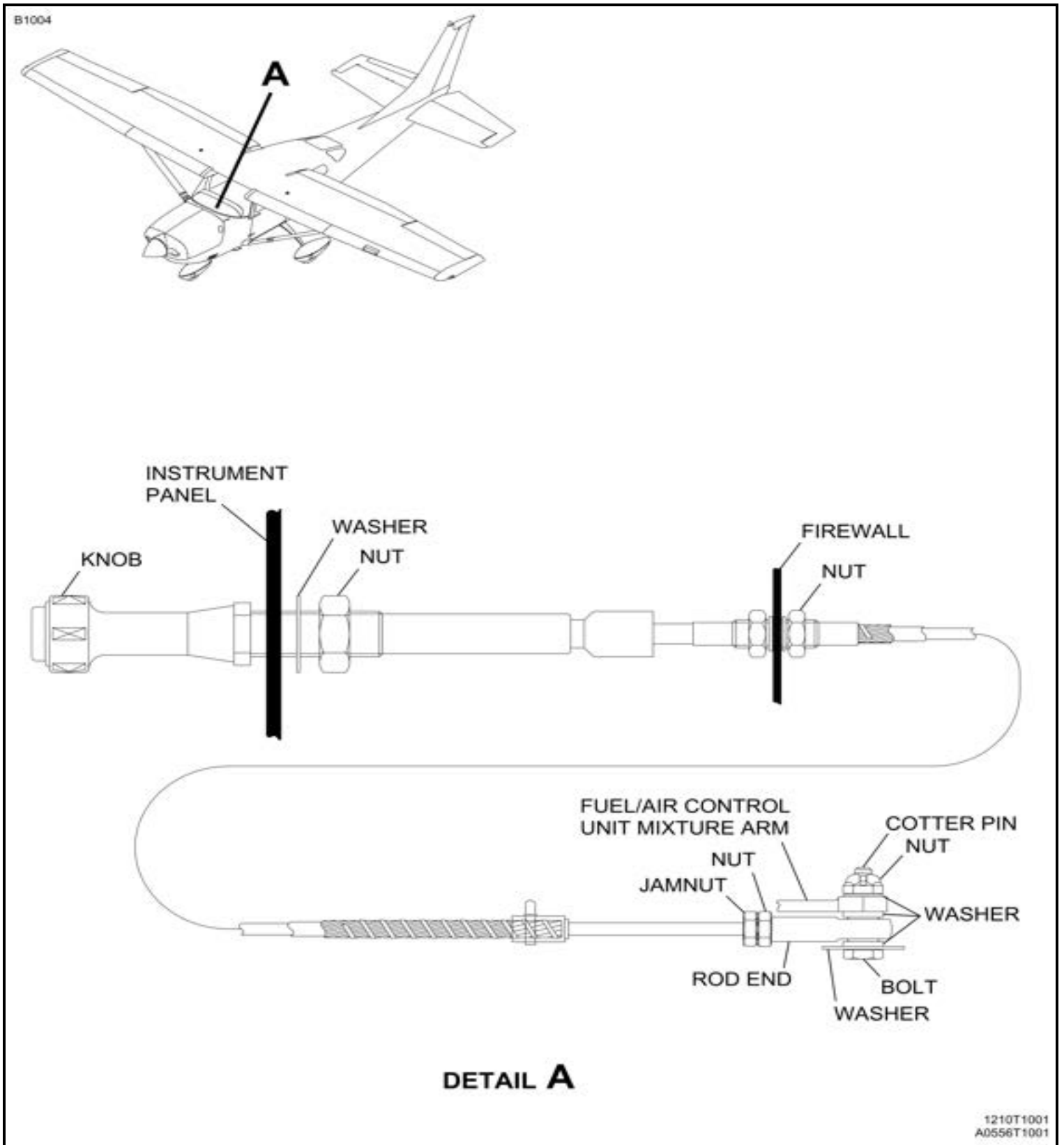
B. Adjust Fuel Mixture Control.

- (1) Disconnect fuel mixture control rod end from 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 jamnut.
- (4) Connect rod end to fuel/air control unit. If necessary, you can reposition the mixture control housing in the mixture control bracket clamp. Torque nut to 30 inch-pounds and then continue tightening nut until cotter pin hole lines up with castellations in nut. Do not exceed 50 inch-pounds. Install cotter pin.

4. Fuel Mixture Control Inspection/Check**A. Inspect Fuel Mixture Control.**

- (1) Check fuel mixture control attachment to throttle body. Check bolt, castellated nut, cotter pin and rod end for security and condition. The witness hole in the rod end must be covered with the mixture cable threads. Check that fuel mixture control slides smoothly throughout its full range of travel, that it adjusts through its full vernier range and the mixture arm operates through its full arc of travel.

Figure 201 : Sheet 1 : Fuel Mixture Control



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 gauges, transducers and switches used to indicate oil temperature and pressure.

OIL COOLER - MAINTENANCE PRACTICES

1. General

A. This section gives maintenance instructions for the removal and installation of the externally installed oil cooler.

2. Oil Cooler Removal/Installation

A. Remove the oil cooler. Refer to [Figure 201](#).

- (1) Remove the upper cowling. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
- (2) Put a label on and disconnect the inlet and outlet hoses that are connected to the oil cooler. Put caps on the ends of the hoses.
- (3) For airplanes that do not have a turbocharger, remove the bolts, washers, and spacers that attach the oil cooler to the back of the engine baffle.
- (4) For airplanes that have a turbocharger, remove the bolts, washers, and spacers that attach the oil cooler to the air duct assembly.
- (5) Remove the oil cooler from the airplane.

B. Install the oil cooler. Refer to [Figure 201](#).

- (1) Install an S2179 seal on the aft side of the baffle (top and bottom of the cutout) before the installation of the oil cooler.
- (2) For airplanes that have a turbocharger, install the oil cooler to the air duct assembly with bolts, washers, and spacers.
- (3) For airplanes that do not have a turbocharger, install the oil cooler to the rear of the engine baffle with bolts, washers, and spacers.

NOTE: Add or remove washers as required so that the oil cooler flanges do not bend during installation.

- (4) Attach the inlet and outlet hoses to the oil cooler.
- (5) Install the upper cowling. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Oil Cooler Installation

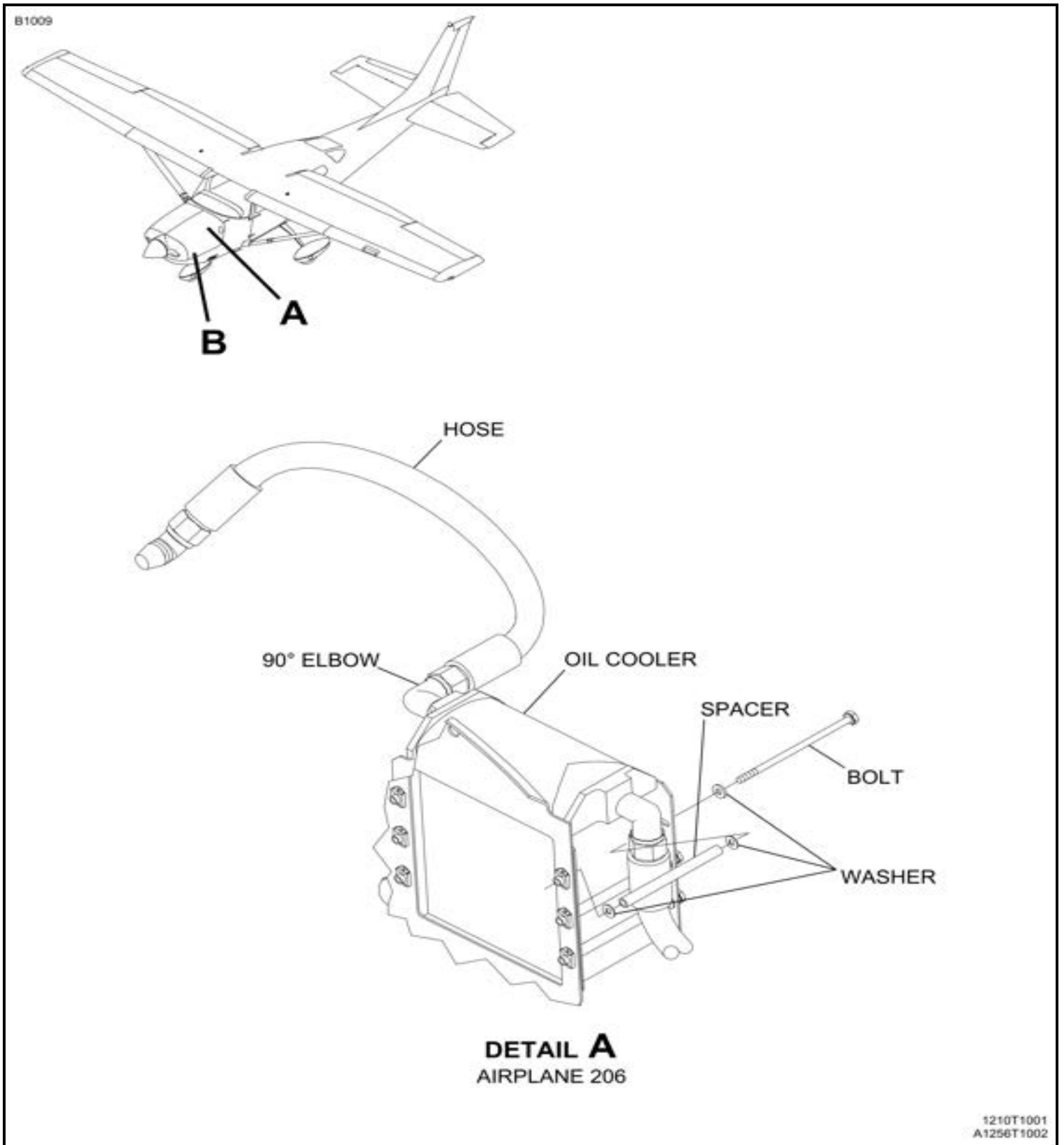
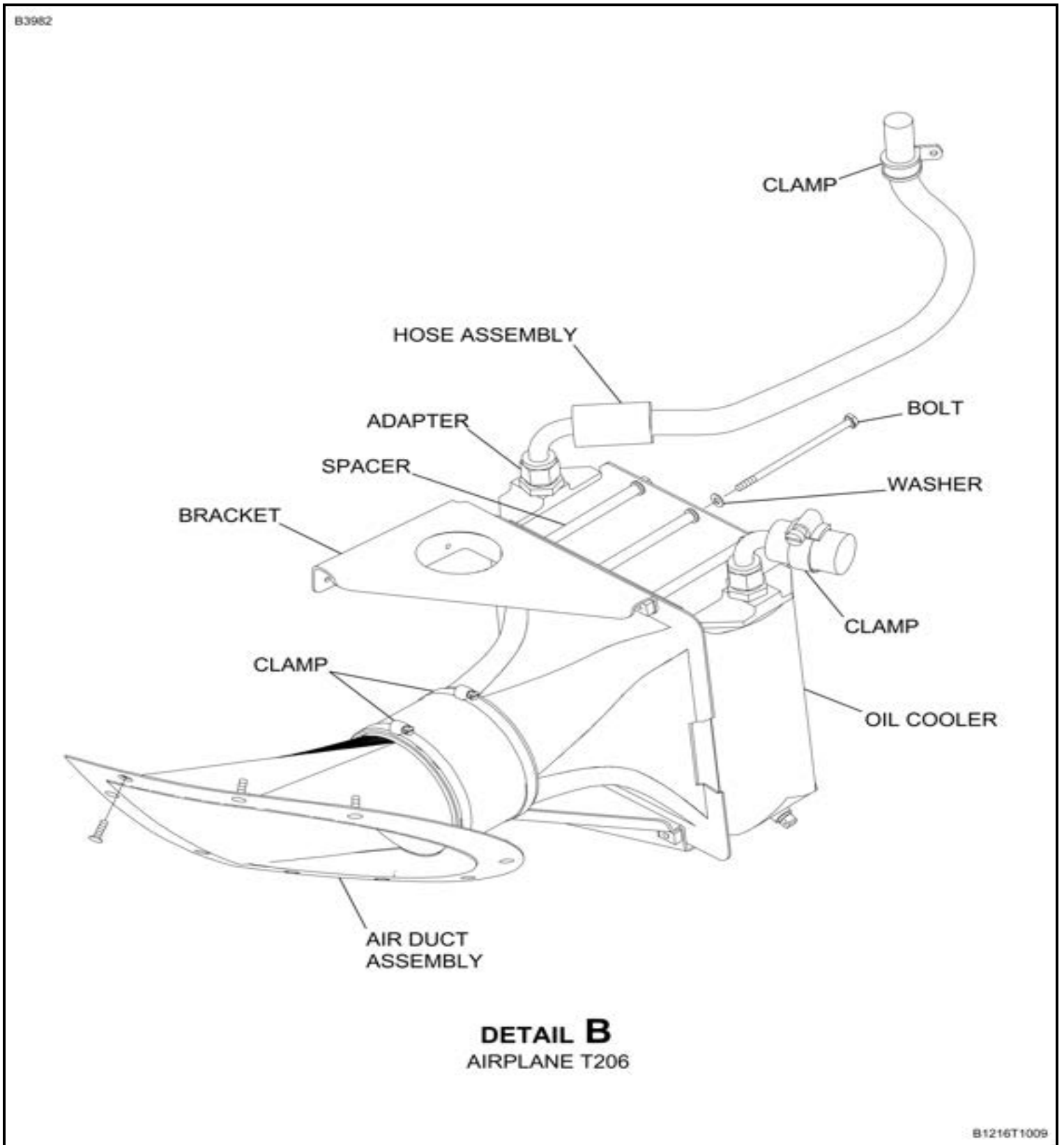


Figure 201 : Sheet 2 : Oil Cooler Installation



AIR/OIL SEPARATOR ASSEMBLY - MAINTENANCE PRACTICES

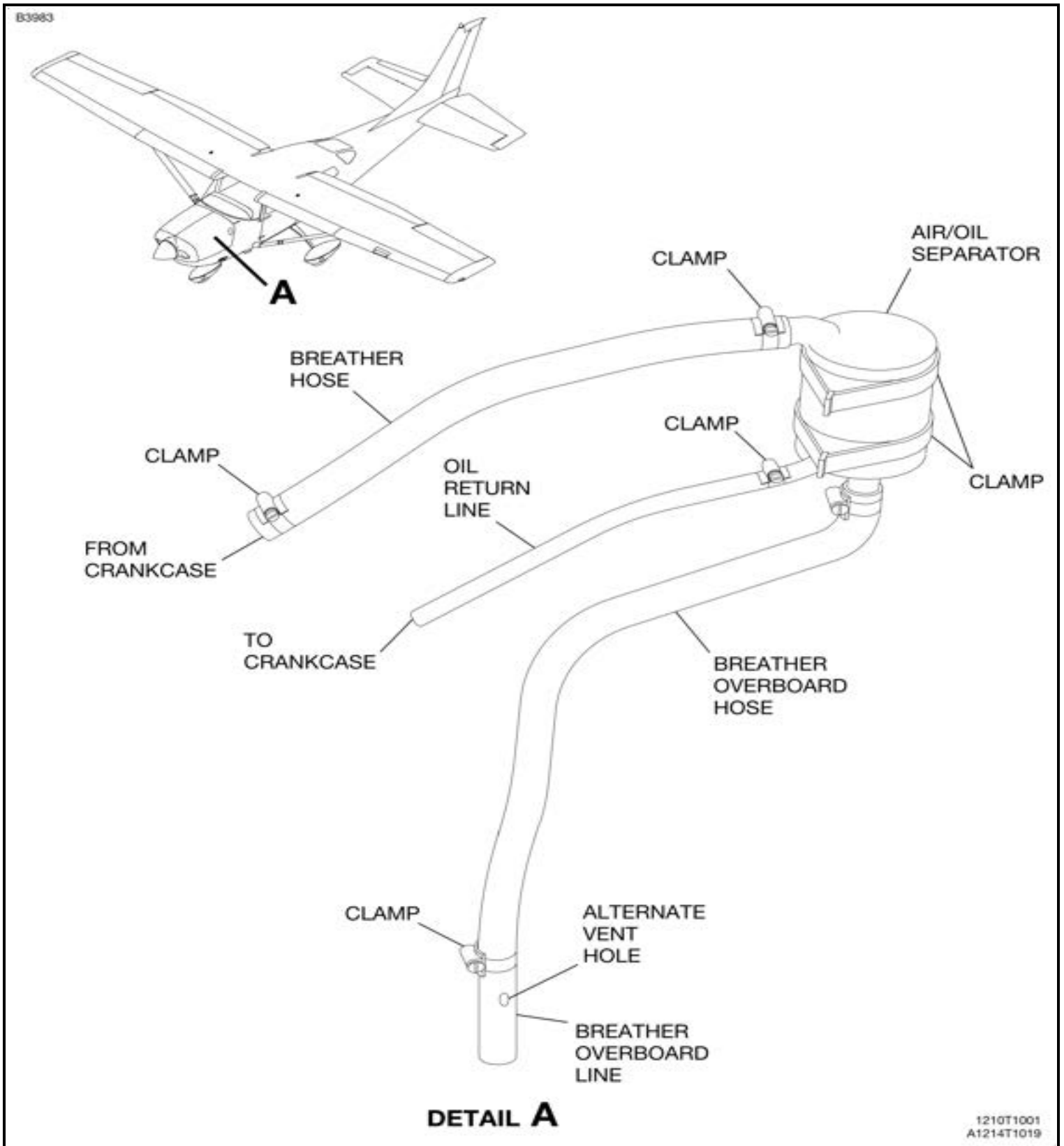
1. General

- A. Turbocharged airplanes have an oil/air 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. Remove the Air/Oil Separator Assembly. Refer to [Figure 201](#).
- (1) Remove the upper cowl to get access to the engine compartment. Refer to Chapter 71, [Cowls - 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. Install the Air/Oil Separator Assembly. 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 cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Air/Oil Separator Assembly Installation



OIL PRESSURE INDICATORS - MAINTENANCE PRACTICES

1. Description and Operation

- A. Oil pressure is measured at two points on the engine. One point gives the oil pressure indicator reading and one gives the low oil pressure annunciation.
 - (1) The oil pressure indicator system has three components: an oil pressure line, a transducer and a cockpit-mounted combination pressure/temperature indicator. The system gets oil from the top right side of the case. The oil flows through a rigid line, to a transducer found on the rear baffle area. The transducer makes an electrical signal which is sent to the pressure-side of the cockpit-mounted oil pressure/oil temperature indicator.
 - (2) The low oil pressure annunciation system has a pressure switch and the related wiring. The switch is installed on the top rear side of the engine case. It is set so that when oil pressure is less than 20 PSI, a ground is supplied to the instrument panel-mounted annunciator. This causes the OIL PRESS light on the annunciator to come on. When oil pressure is more than 20 PSI, the ground connects and starts the hobbs meter and extinguishes the OIL PRESS light.
- B. Airplanes with the Garmin G1000 system use the same oil pressure transducer and oil pressure switch as standard equipped airplanes.

2. Oil Pressure Indicator and Transducer Removal/Installation

- A. Remove the Oil Pressure Indicator (Refer to [Figure 201](#)).
 - (1) Make sure that electrical power to airplane is off.
 - (2) Remove the screws that attach the indicator to the instrument panel.
 - (3) Remove the electrical connector from back of the indicator.
 - (4) Carefully remove the indicator from back of the instrument panel.
- B. Install the Oil Pressure Indicator (Refer to [Figure 201](#)).
 - (1) Connect the electrical connector to the back of the indicator.
 - (2) Install the indicator to the instrument panel.
 - (3) Attach the indicator to the panel with screws.
- C. Remove the Transducer (Refer to [Figure 201](#)).
 - (1) Remove the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (2) Disconnect and put caps on the oil pressure line at the transducer.
 - (3) Disconnect the electrical connector from the transducer.
 - (4) Remove the nut that connects the transducer to the rear of the baffle and remove the transducer.
- D. Install the Transducer (Refer to [Figure 201](#)).
 - (1) Install the transducer to the rear baffle and attach with the nut.
 - (2) Connect the electrical connector to the transducer.
 - (3) Remove the caps and connect the oil pressure line at the transducer.
 - (4) Install the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

3. Low Oil Pressure Switch Removal/Installation

- A. Remove the Switch (Refer to [Figure 201](#)).
 - (1) Make sure that electrical power to airplane is off.
 - (2) Remove the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (3) Disconnect the electrical connector from the switch.
 - (4) Remove the switch from the engine case.
- B. Install the Switch (Refer to [Figure 201](#)).
 - (1) Tighten by hand the new switch with U544006 sealant (or equivalent) on the threads.
CAUTION: Do not use Teflon tape.
CAUTION: Clean any sealer or other debris from the switch fitting before installation. Make sure that 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 the switch approximately 1 to 1 1/2 turns (not to exceed 60 inch pounds) tighter than by

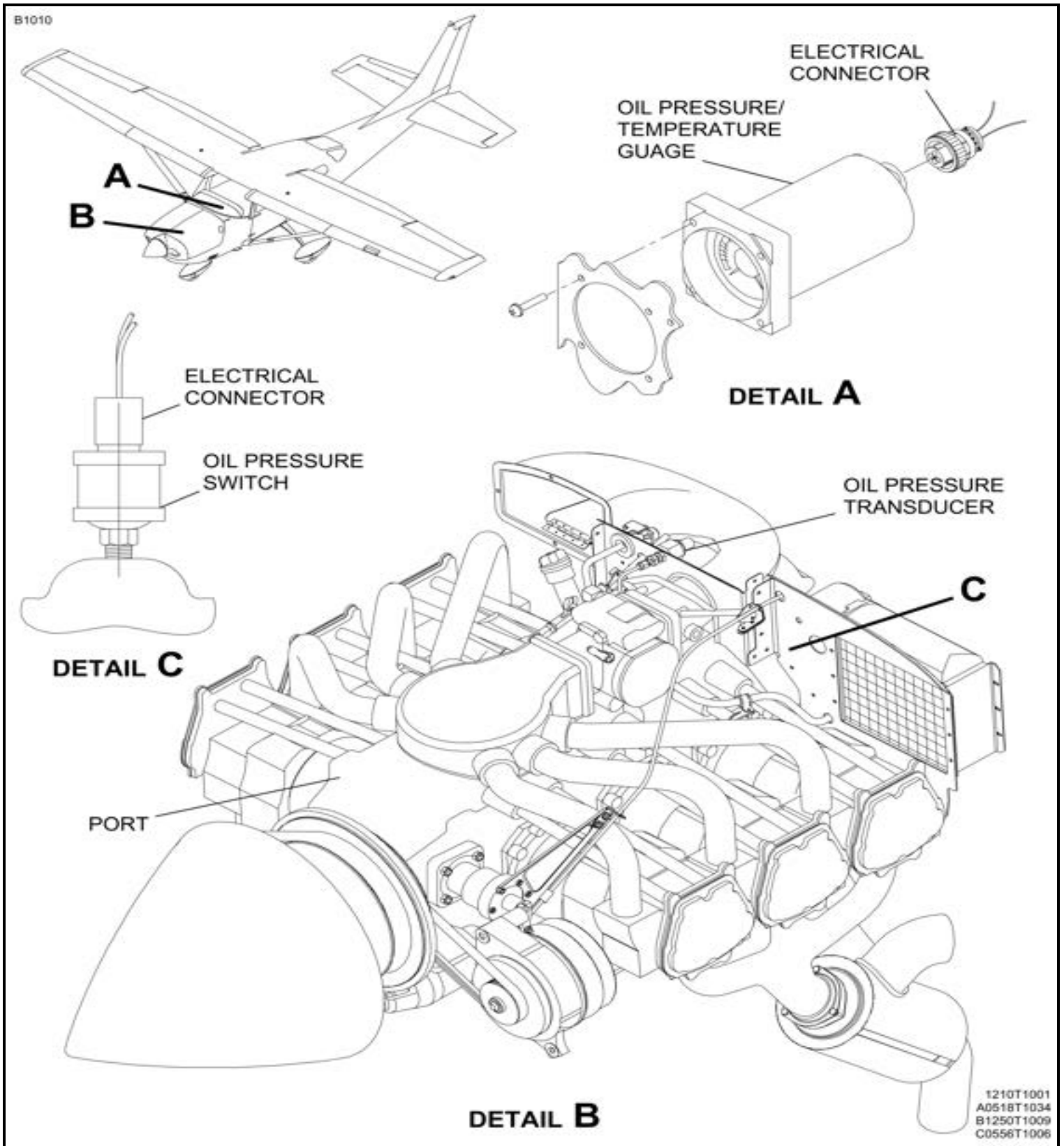
hand.

CAUTION: Do not use too much torque on the plastic switch connection housing when you tighten by hand.

CAUTION: Use only the hex fitting to tighten. Too much torque will cause damage to the switch.

- (3) Connect the electrical connector to the switch.
- (4) Install the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Oil Pressure Indication Installation



OIL TEMPERATURE INDICATOR - MAINTENANCE PRACTICES

1. Description and Operation

- A. The oil temperature system has three core components: a sending unit, a combination oil temperature/oil pressure indicator and a wire that connects the two components. Oil temperature is measured in the accessory case area and gives cockpit readings in degrees Fahrenheit (°F).
- B. Airplanes with the Garmin G1000 system use the same oil temperature sending unit as standard equipped airplanes.

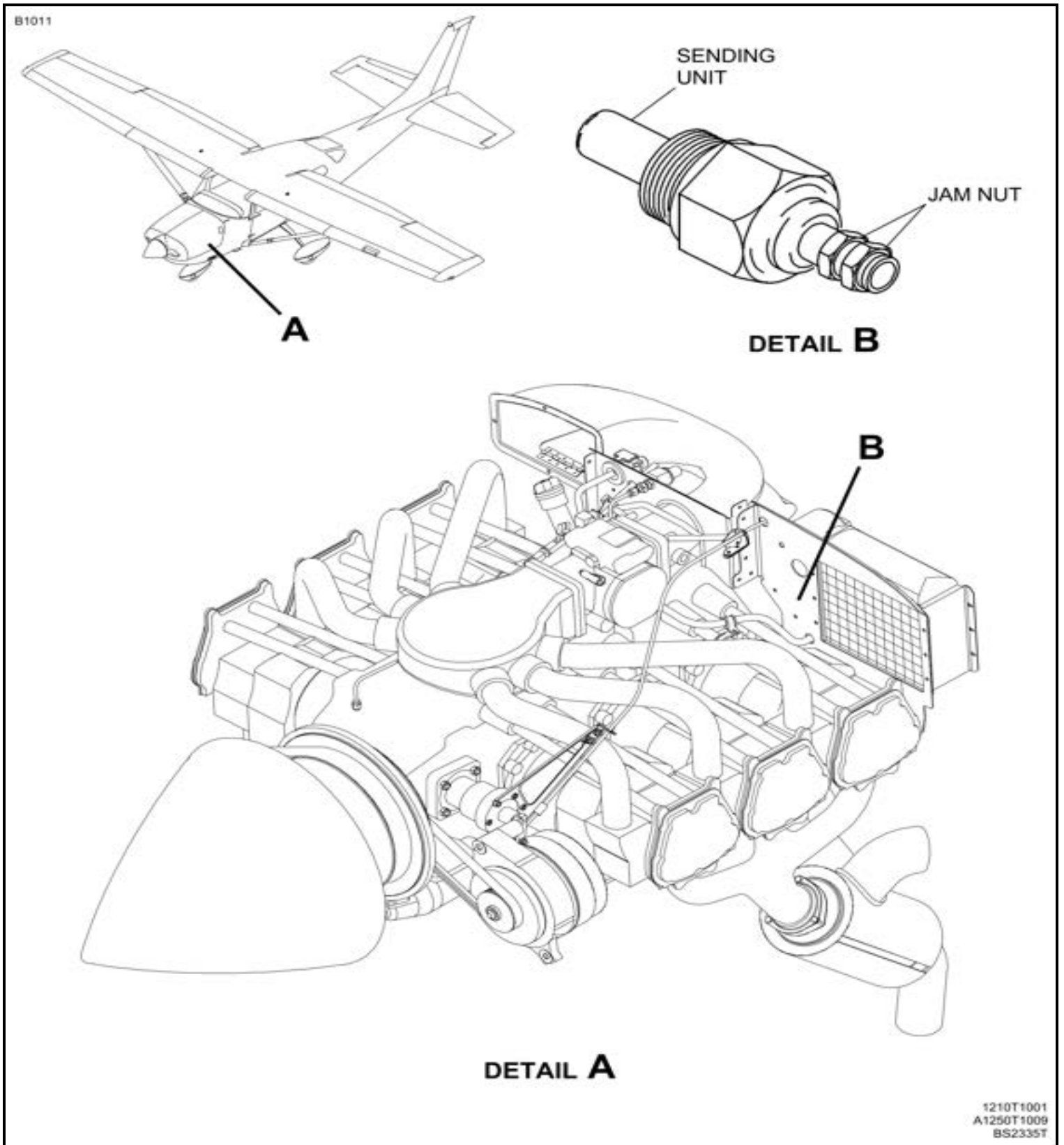
2. Sending Unit Removal/Installation

- A. Remove the Sending Unit (Refer to [Figure 201](#)).
 - (1) Remove the upper engine cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
 - (2) Disconnect the ring terminal wiring at the sending unit.
 - (3) Loosen and remove the sending unit from the accessory case.
- B. Install the Sending Unit (Refer to [Figure 201](#)).
 - (1) Install the sending unit to the accessory case.
 - (2) Attach the ring terminal wire to the sending unit. Torque the jam nut to 20 inch-pounds, maximum.
 - (3) Install the 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](#).

Figure 201 : Sheet 1 : Oil Temperature Installation



DIMENSIONS AND AREAS - GENERAL

1. Scope

- A. This chapter includes statistical information and illustrations concerning the Model 206/T206 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 206/T206 airplane.
 - (3) This section provides illustrations of all airplane zones and is used in conjunction with the Model 206/T206 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.

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

Length (Overall)	27.97 Feet
Height (Maximum)	7.35 Feet
Wing Span (Overall)	36.00 Feet
Tail Span	13.03 Feet
Landing Gear Track Width	97.40 Inches

FUSELAGE DIMENSIONS

Cabin Width (Maximum Sidewall to Sidewall)	42.0 Inches
Cabin Height (Floorboard to Headliner)	48.5 Inches

MAXIMUM WEIGHT

Ramp (206)	3614 Pounds
Ramp (T206)	3617 Pounds
Takeoff	3600 Pounds
Landing	3600 Pounds

FUEL CAPACITY

Total	92.0 Gallons
Usable	88.0 Gallons

ENGINE DATA

Type (206)

Lycoming IO-540-AC1A5

Oil Capacity	11.0 Quarts
RPM (Maximum)	2700 RPM
Horsepower	300 HP

Type (T206)

Lycoming TIO-540-AJ1A

Oil Capacity	11.0 Quarts
RPM (Maximum)	2500 RPM
Horsepower	310 HP

PROPELLER

Type	McCauley B3D36C432/80VSA-1, 3-Blade
Diameter (Maximum to Minimum)	79.0 to 77.5 Inches
Pitch Range (High to Low)	30.0 to 12.6 Degrees (206)
Pitch Range (High to Low)	33.8 to 16.9 Degrees (T206)

TIRE, STRUT AND WHEEL ALIGNMENT DATA

Main Tire Pressure (6.00 X 6, 6-Ply Rating)	42.0 ±2 PSI

Main Tire Pressure (8.00 X 6, 6 Ply Rating)	35.0 ±3 PSI
Nose Tire Pressure (5.00 X 5, 6-Ply Rating)	49.0 ±3 PSI
Nose Tire Pressure (6.00 X 6, 4-Ply Rating)	29.0 ±3 PSI
Nose Gear Strut Pressure (Strut Extended)	80 PSI
Camber (Measured With Airplane Empty)	4 Degrees +1 or -1 Degree 30 Minutes
Toe-In (Measured With Airplane Empty)	0.00 to 0.06 Inch

CONTROL SURFACE TRAVELS/CABLE TENSION SETTINGS

AILERONS

Aileron Up Travel	21 Degrees +2 or -2 Degrees
Aileron Down Travel	14 Degrees 30 Minutes +2 or -2 Degrees
Aileron Cable Tension	40 Pounds +10 or -10 Pounds

RUDDER

Rudder Travel (Measured Parallel to Water Line)

Right	24 Degrees +1 or -1 Degree
Left	24 Degrees +1 or -1 Degree

Rudder Travel (Measured Perpendicular to Hinge Line)

Right	27 Degrees 13 Minutes +1 or -1 Degree
Left	27 Degrees 13 Minutes +1 or -1 Degree
Rudder Cable Tension	20 to 40 Pounds

ELEVATOR

Up Travel (Relative to Stabilizer)	21 Degrees
Down Travel (Relative to Stabilizer)	17 Degrees +1 or -1 Degree
Cable Tension	20 to 40 Pounds

ELEVATOR TRIM TAB

Up Travel	25 Degrees +1 or -0 Degrees
Down Travel	5 Degrees +1 or -0 Degrees

FLAPS

Flap Setting:

0 Degrees
10 Degrees
20 Degrees
FULL

0 Degrees
10 Degrees, +2 or -2 Degrees
20 Degrees, +2 or -2 Degrees
40 Degrees, +1 or -2 Degree

Figure 1 : Sheet 1 : Airplane Dimensions and Areas

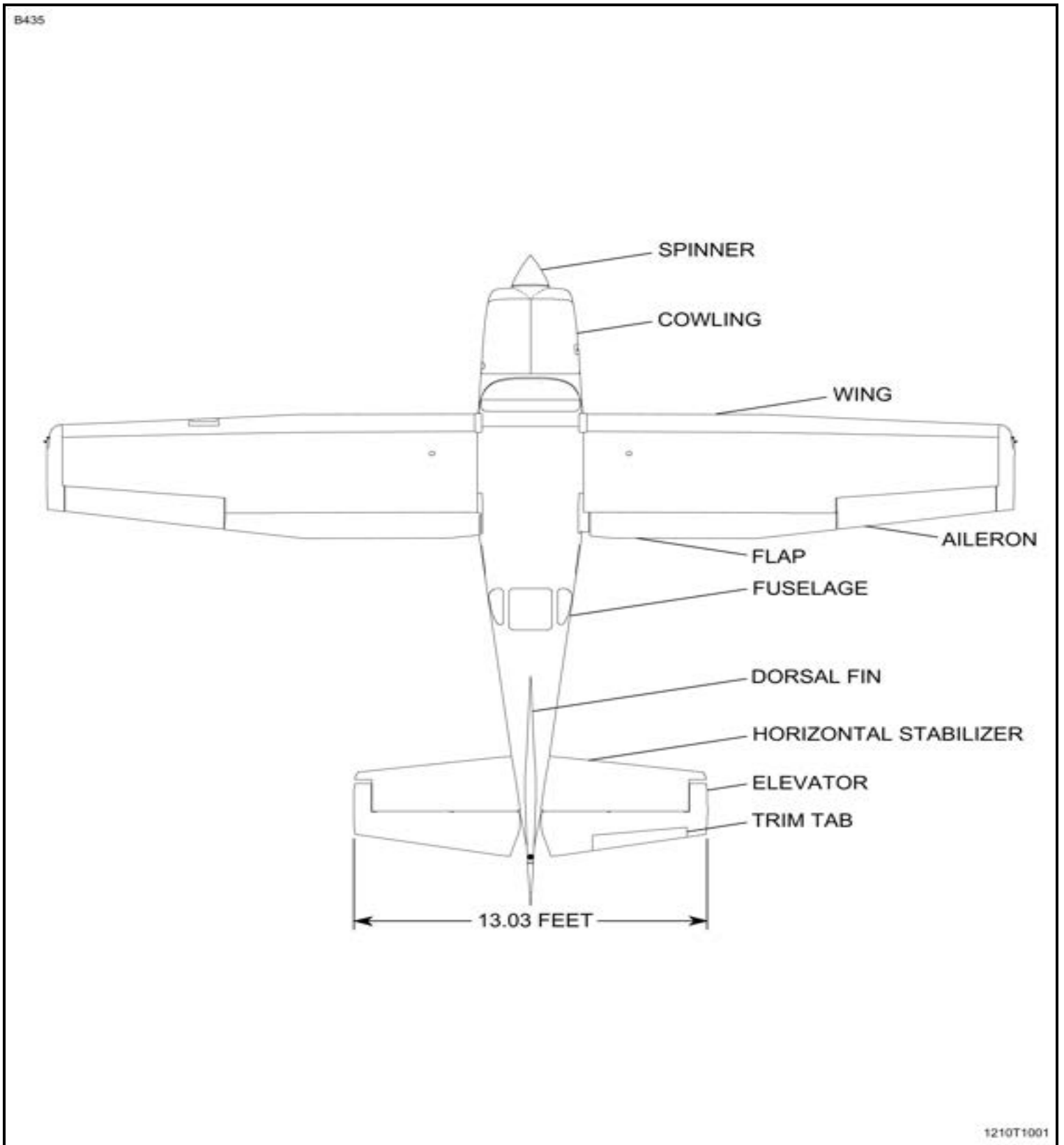
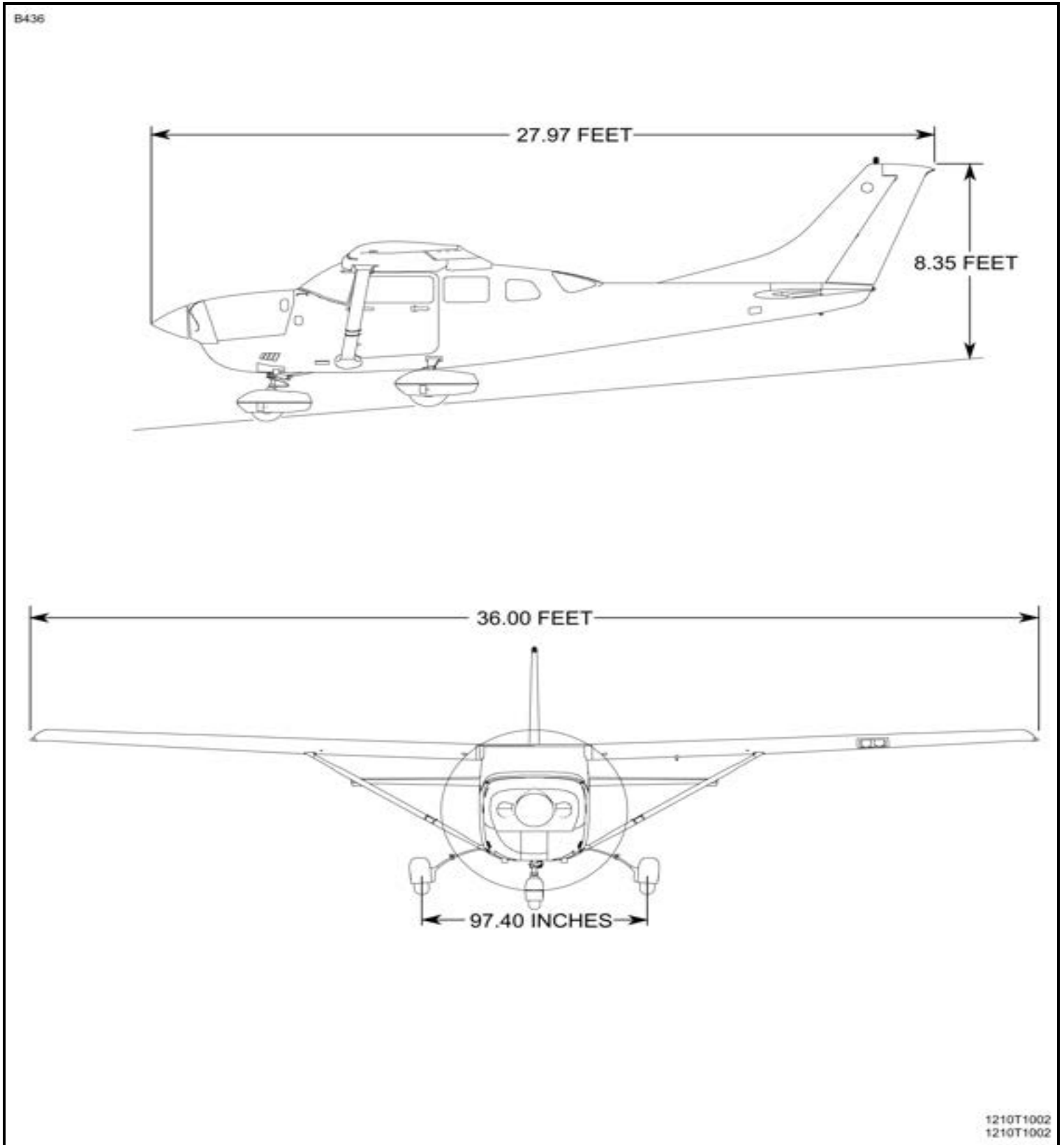


Figure 1 : Sheet 2 : Airplane Dimensions and Areas



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 230.17). 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](#).

Figure 1 : Sheet 1 : Fuselage Stations

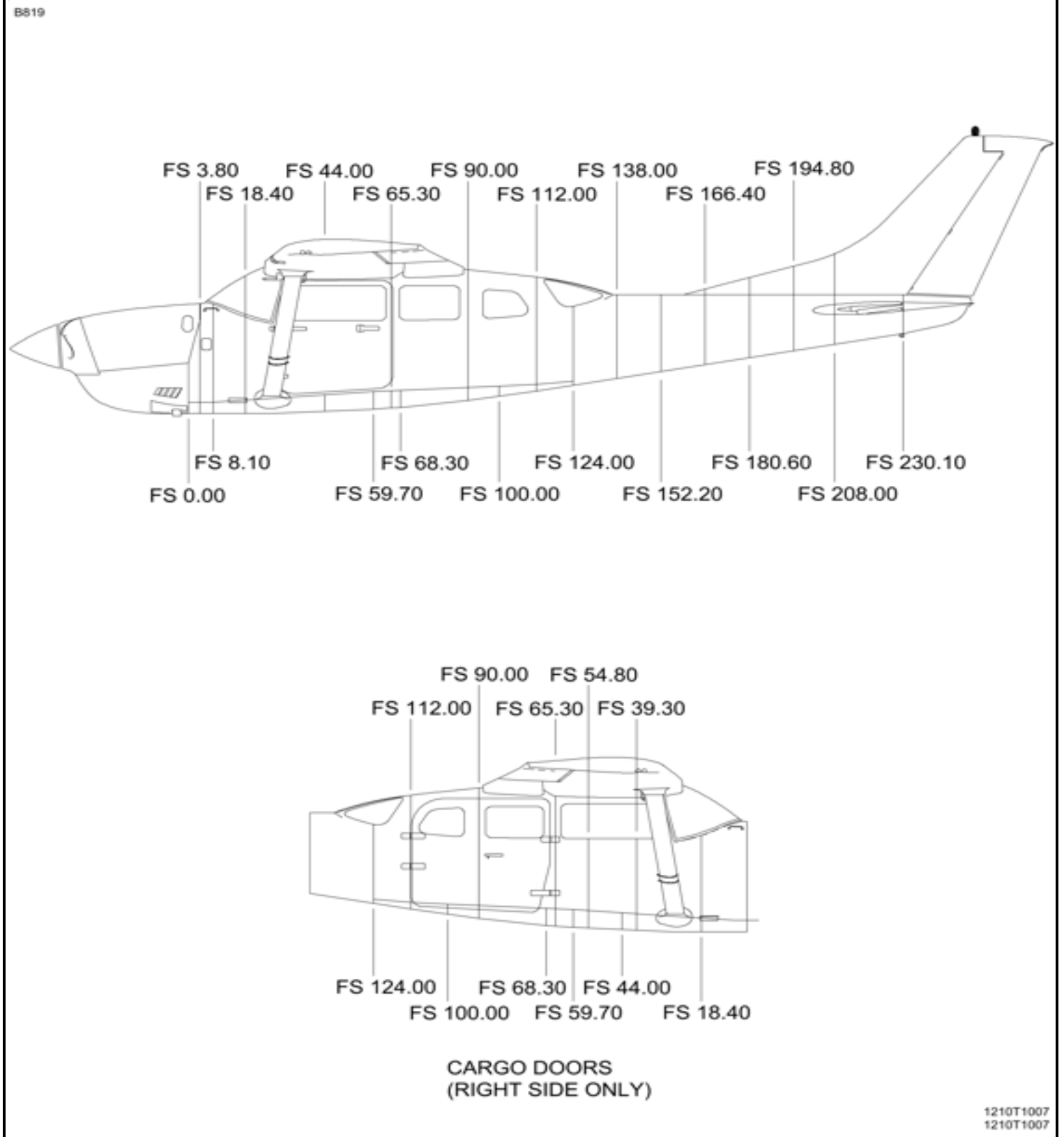
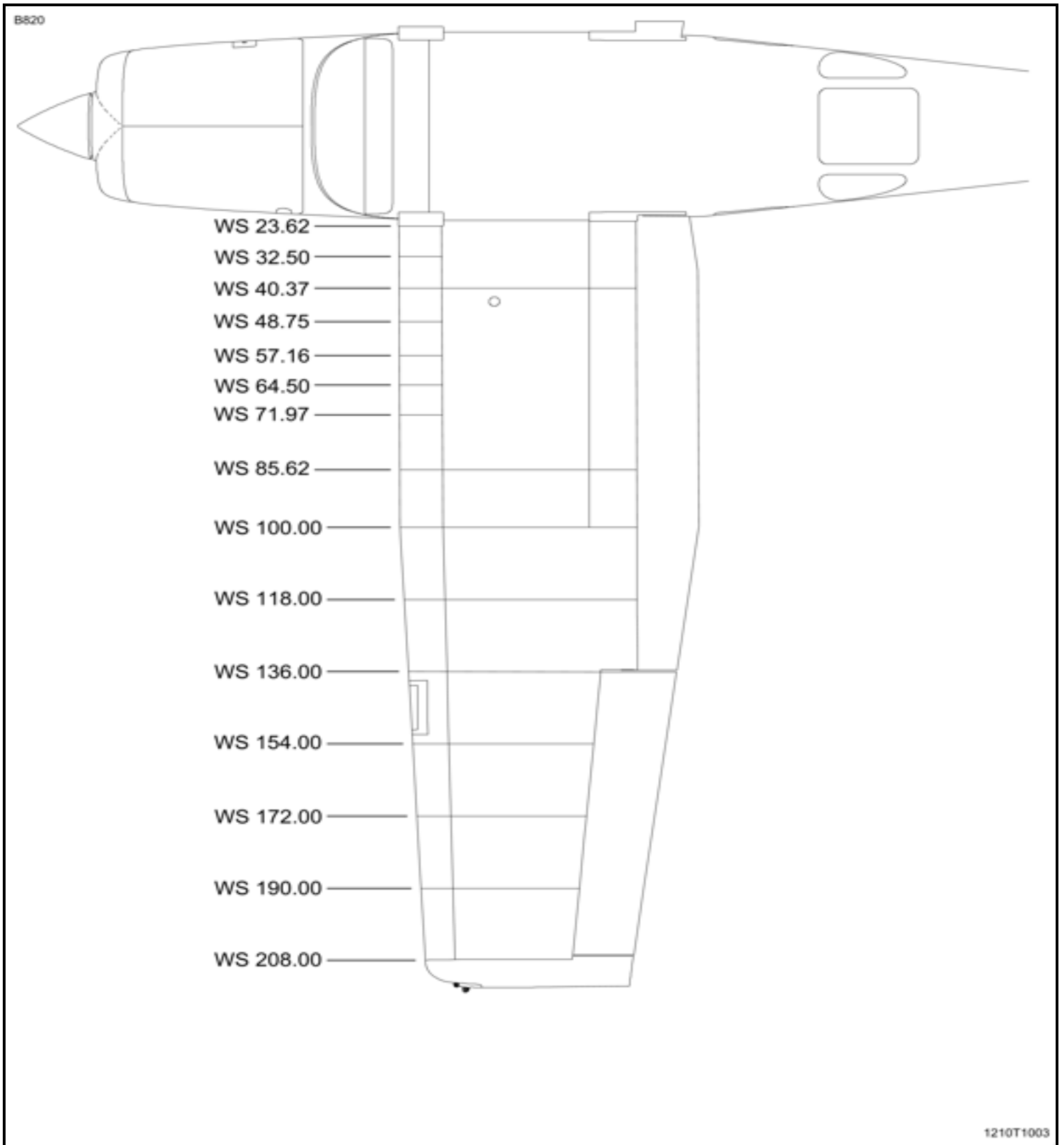


Figure 2 : Sheet 1 : Wing Stations



AIRPLANE ZONING - DESCRIPTION AND OPERATION

1. General

- A. The Model 206/T206 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)).

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- 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](#).

Figure 1 : Sheet 1 : Airplane Zones

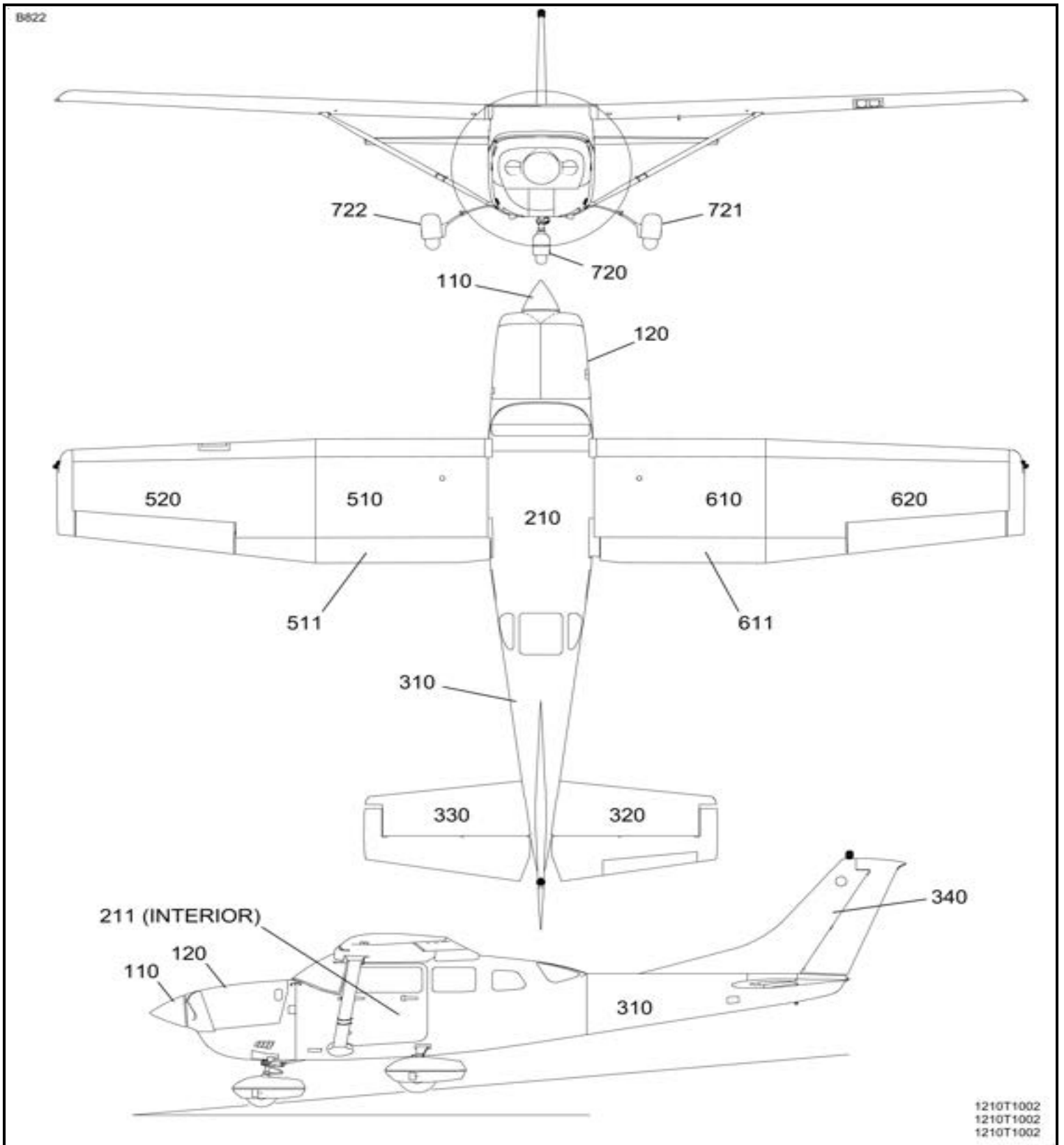
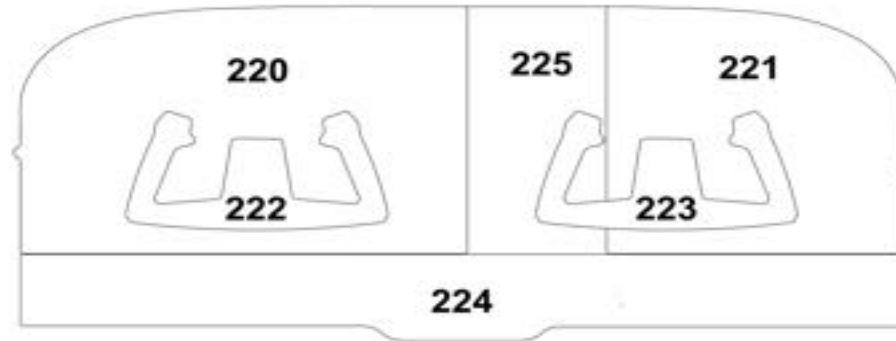
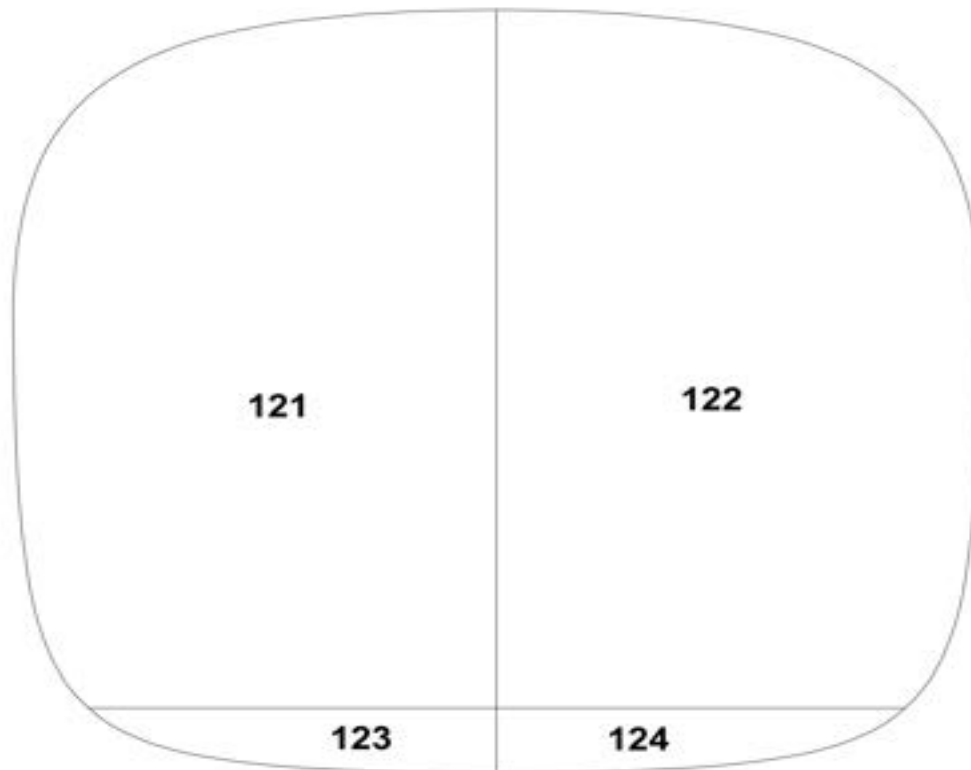


Figure 1 : Sheet 2 : Airplane Zones

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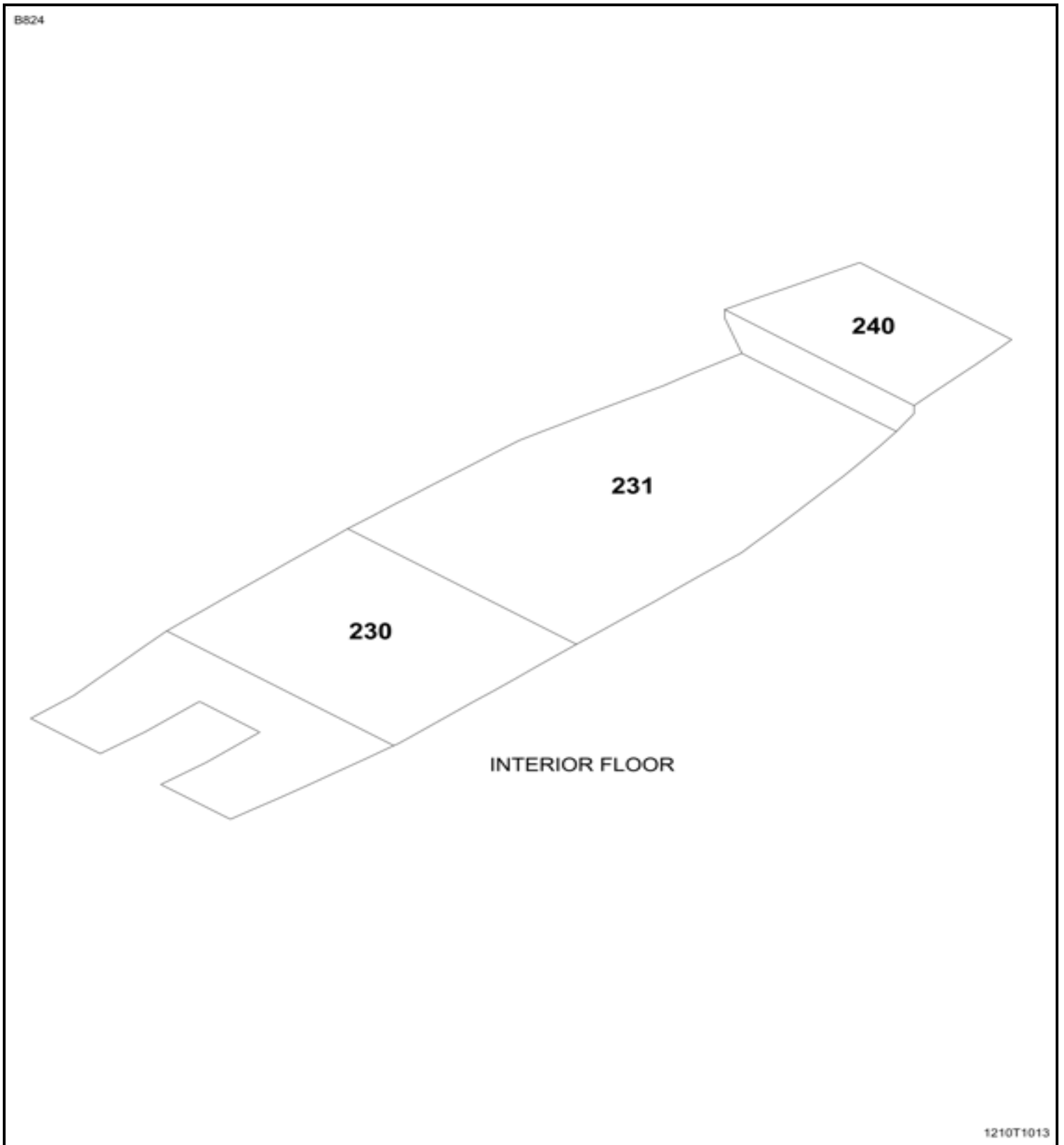
INSTRUMENT PANEL



FIREWALL LOOKING FORWARD

0513T1003
0710T1004

Figure 1 : Sheet 3 : Airplane Zones



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.

Table 1. Cabin Floorboard Panels

Panel	Equipment Located In Area (Refer to Figure 1)
230AB	Fuel Pump
230BB	Fuel Selector
230CB	Fuel Reservoir
230DB	Fuel Reservoir
230EB	Rudder Cables, Elevator Cables, Elevator Trim Cables
230FB	Fuel Line
230GB	Fuel Line
230HB	Rudder Cables, Elevator Cables, Elevator Trim Cables
230JB	Fuel Line And Landing Gear
230KB	Fuel Line And Landing Gear
231AB	Structure
231BB	Structure
231CB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231DB	Structure
231EB	Structure
231FB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231GB	Structure
231HB	Structure
231JB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231KB	Structure

231LB	Structure
231MB	Rudder Cables, Elevator Cables, Elevator Trim Cables
231NB	Structure
231PB	Structure

Table 2. Fuselage Panels

Panel	Equipment Located In Area (Refer to Figure 2)
210AB	Landing Gear
210BB	Landing Gear
310AB	Elevator Bellcrank Assembly, Elevator Cable Turnbuckles, Elevator Push/Pull Tube
310AR	Elevator Bellcrank
310BB	Elevator Bellcrank
310CB	Elevator Trim Actuator
340AL	Elevator Trim Cables
340AR	Elevator Trim Cables
340BL	Antenna

Table 3. Wing Access Panels

Panel	Equipment Located In Area (Refer to Figure 3)
510AB	Aileron Cable, Aileron Cable Pulley
510BB	Navigation Light Wiring, Landing Light Wiring
510CB	Wing Structure
510DB	Flap Bellcrank
510EB	Aileron Pulley
510FB	Courtesy Light
510GB	Wing Strut
510HB	Wing Structure
510JB	Aileron Pulley
510KT	Fuel Bay Access
510LB	Wing Structure
510MB	Pitot Tube
510NB	Flap Bellcrank, Courtesy Light
510PT	Fuel Bay Access
510QB	Wing Structure
510RB	Aileron Cable, Electrical Wiring
510SB	Wing Structure
510TT	Fuel Bay Access
510UB	Aileron Cable, Electrical Wiring, Pitot Line
510VT	Fuel Bay Access
510WB	Wing Structure
510XB	Aileron Cable, Electrical Wiring, Pitot Line, Fresh Air Duct
520AB	Aileron Bellcrank

520BB	Aileron Bellcrank
520CB	Aileron Cable, Aileron Cable Pulley
520DB	Aileron Turnbuckle, Magnetometer
610AB	Aileron Cable, Aileron Cable Pulleys
610BB	Navigation Light Wiring
610CB	Wing Structure
610DB	Flap Bellcrank
610EB	Aileron Pulley
610FB	Courtesy Light
610GB	Wing Strut
610HB	Wing Structure
610JB	Flap Motor
610KT	Fuel Bay Access
610LB	Wing Structure
610MB	Aileron Cable, Electrical Wiring
610NB	Flap Bellcrank, Courtesy Light
610PT	Fuel Bay Access
610QB	Wing Structure
610RB	Aileron Cable, Electrical Wiring
610SB	Wing Structure
610TT	Fuel Bay Access
610UB	Aileron Cable, Electrical Wiring
610VT	Fuel Bay Access
610WB	Wing Structure
610XB	Aileron Cable, Fresh Air Duct, Electrical Wiring
620AB	Aileron Bellcrank
620BB	Aileron Bellcrank
620CB	Aileron Cable And Pulley
620DB	Aileron Turnbuckle

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
511ET	Flap Access
611AT	Flap Access
611BT	Flap Access
611CT	Flap Access
611DT	Flap Access
611ET	Flap Access

Figure 1 : Sheet 1 : Cabin Floorboard Panels

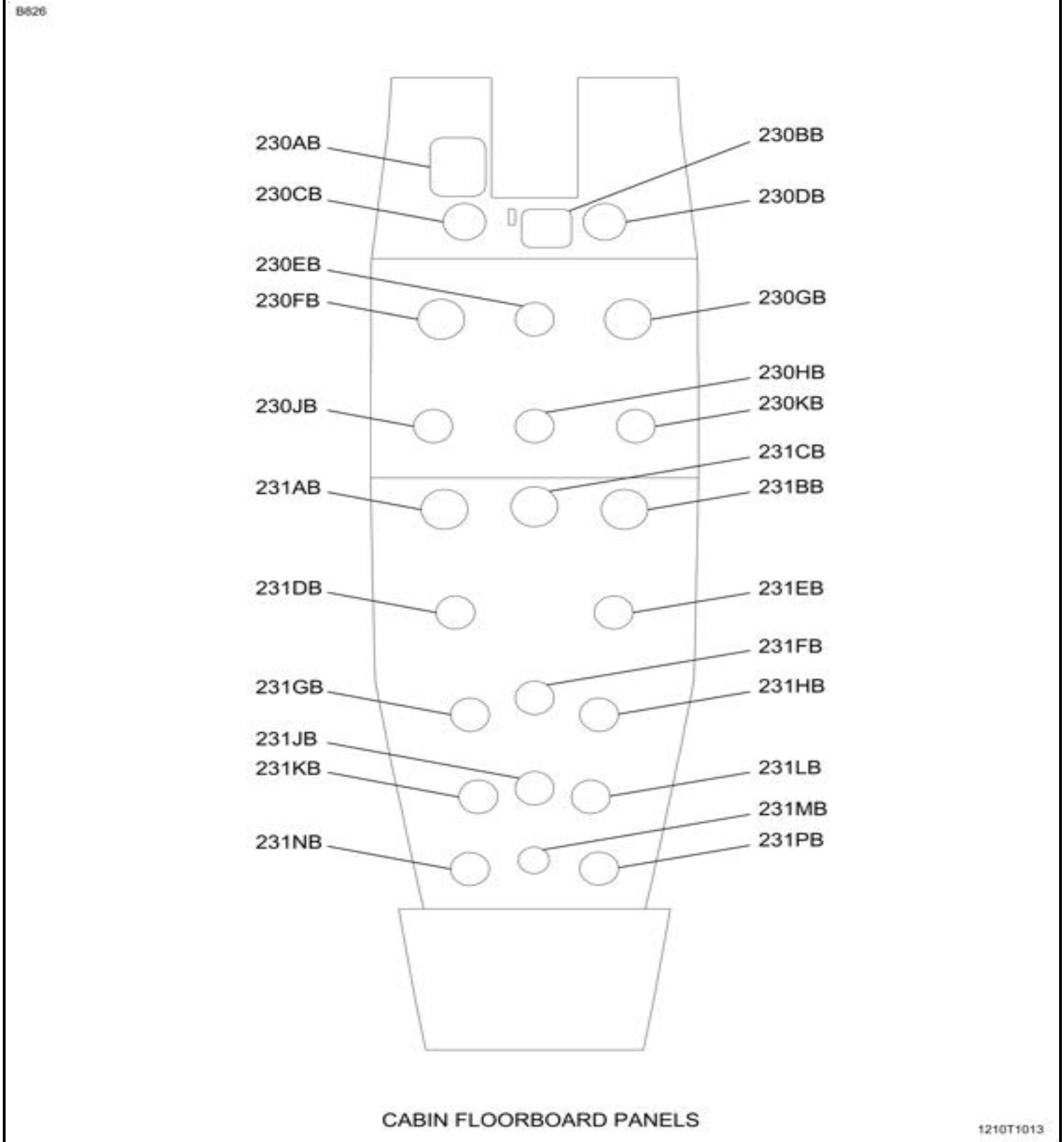


Figure 1 : Sheet 2 : Cabin Floorboard Panels

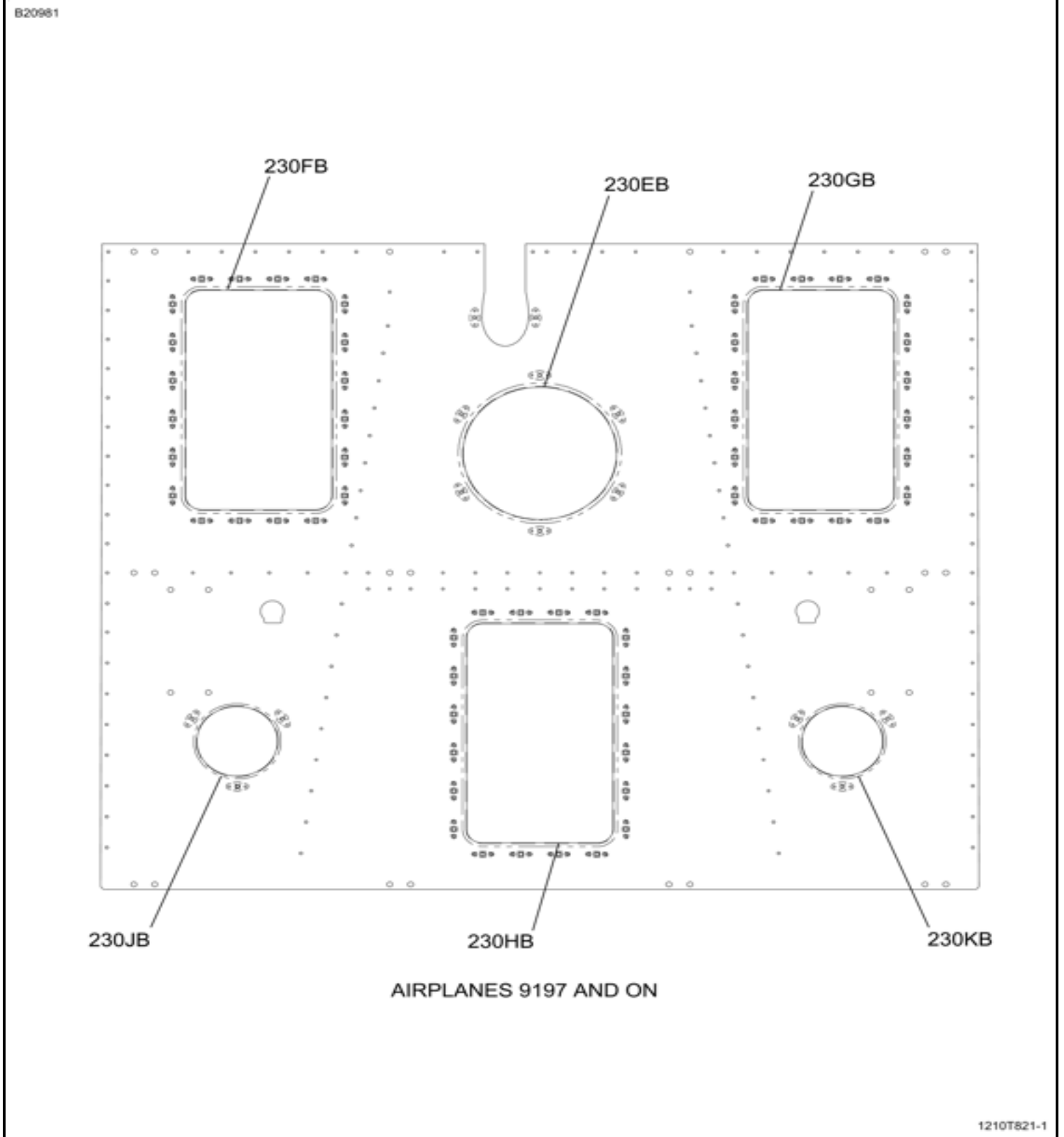


Figure 2 : Sheet 1 : Fuselage Panels

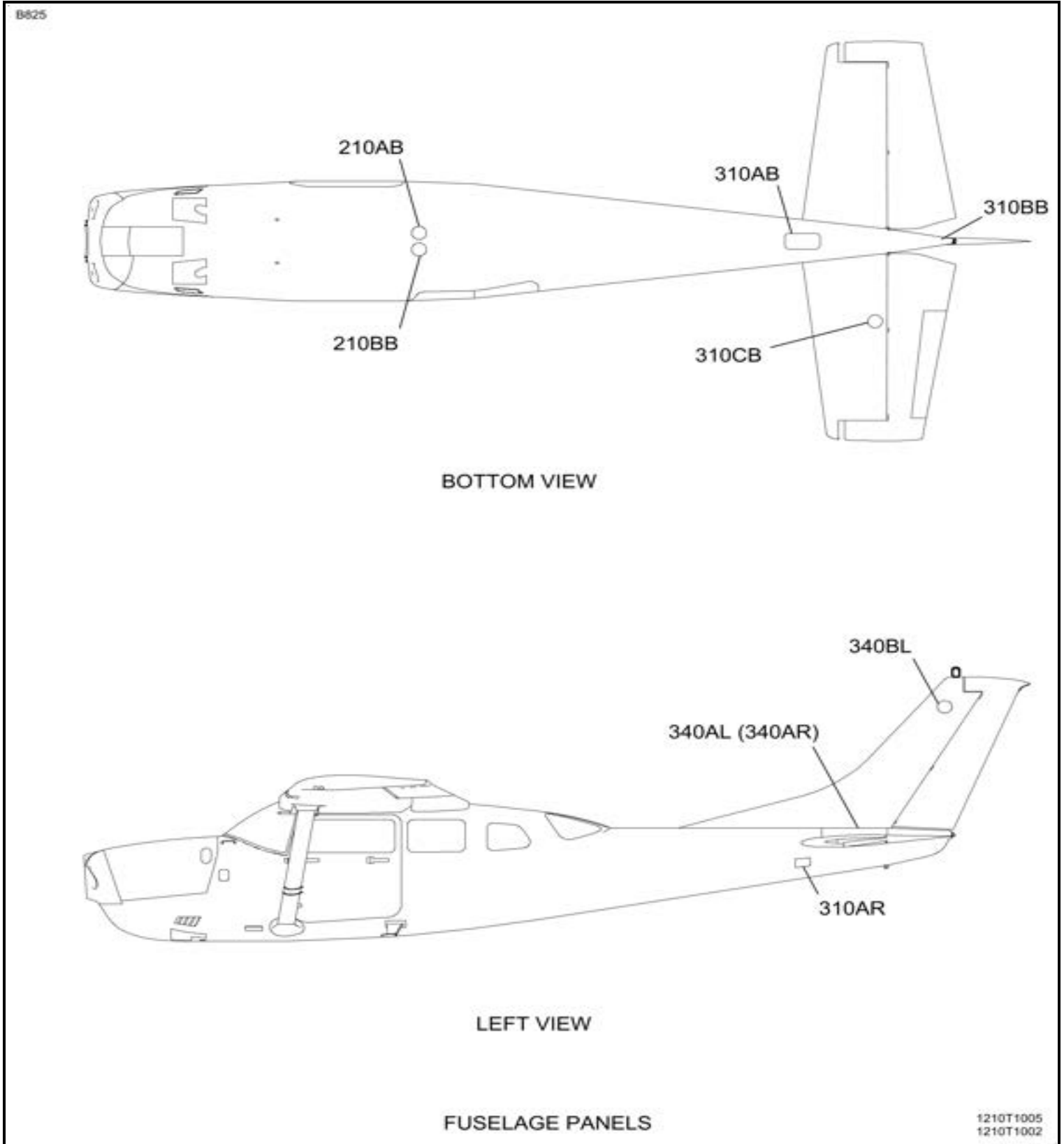


Figure 3 : Sheet 1 : Wing Access Panels

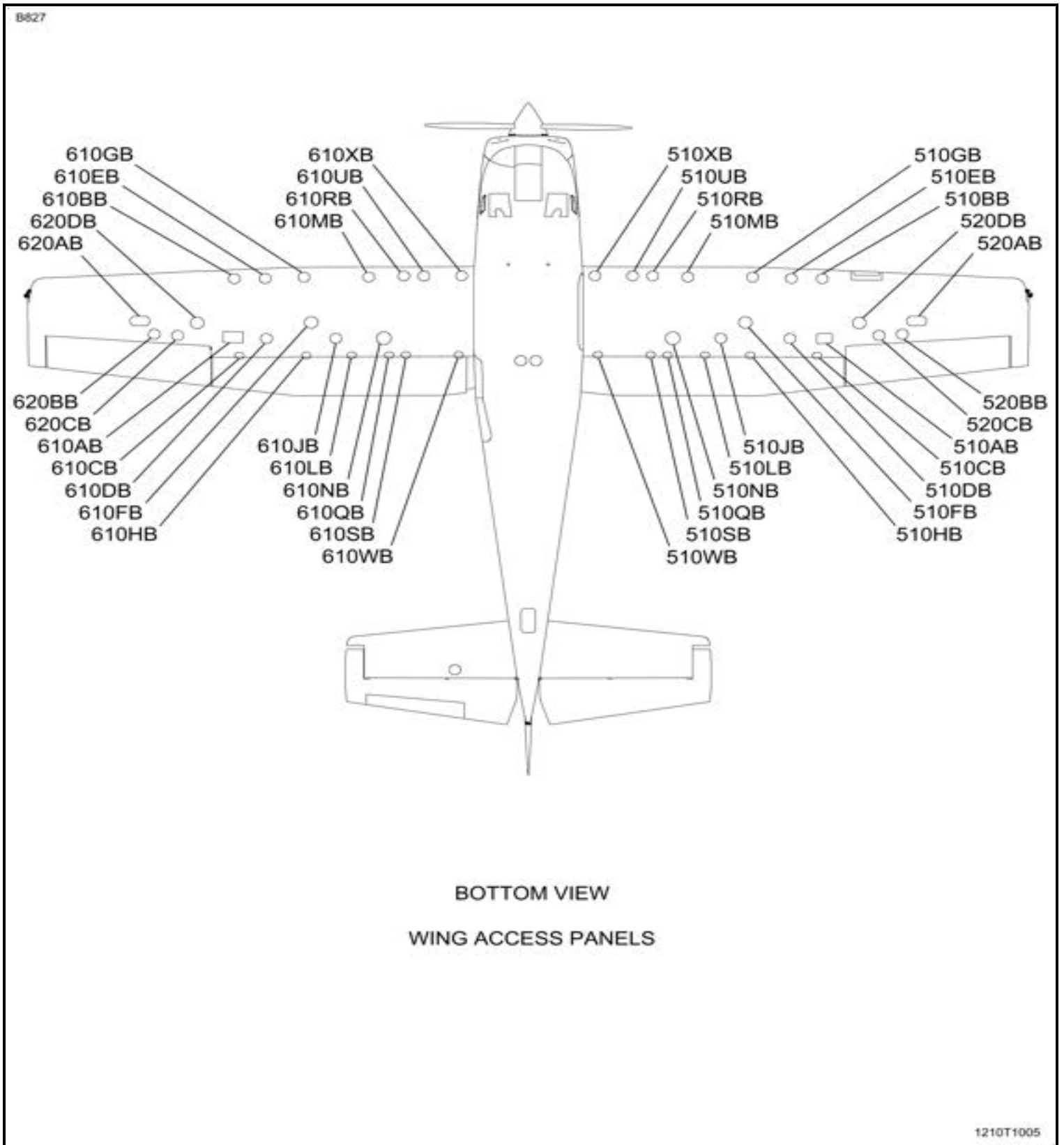


Figure 3 : Sheet 2 : Wing Access Panels

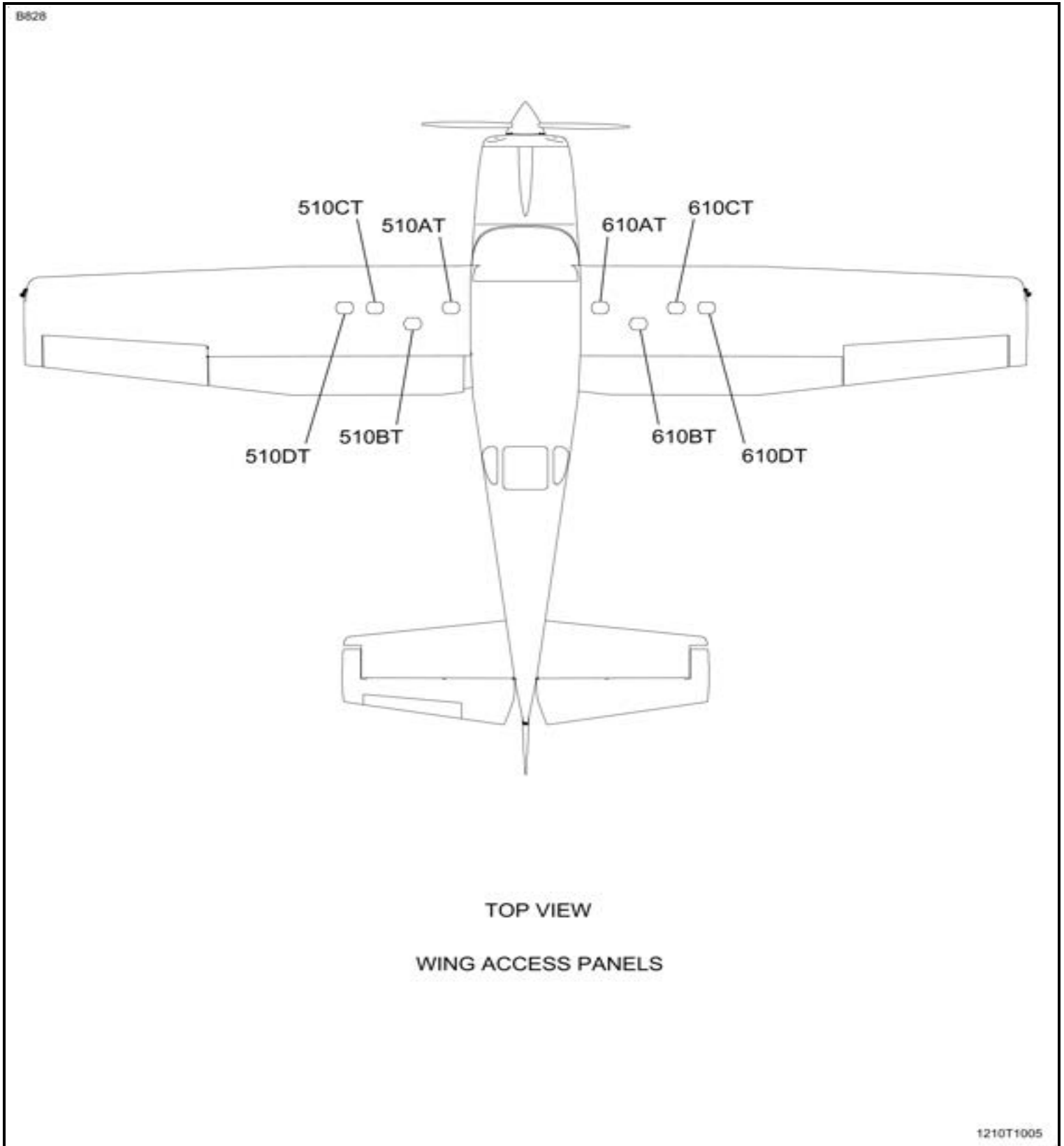
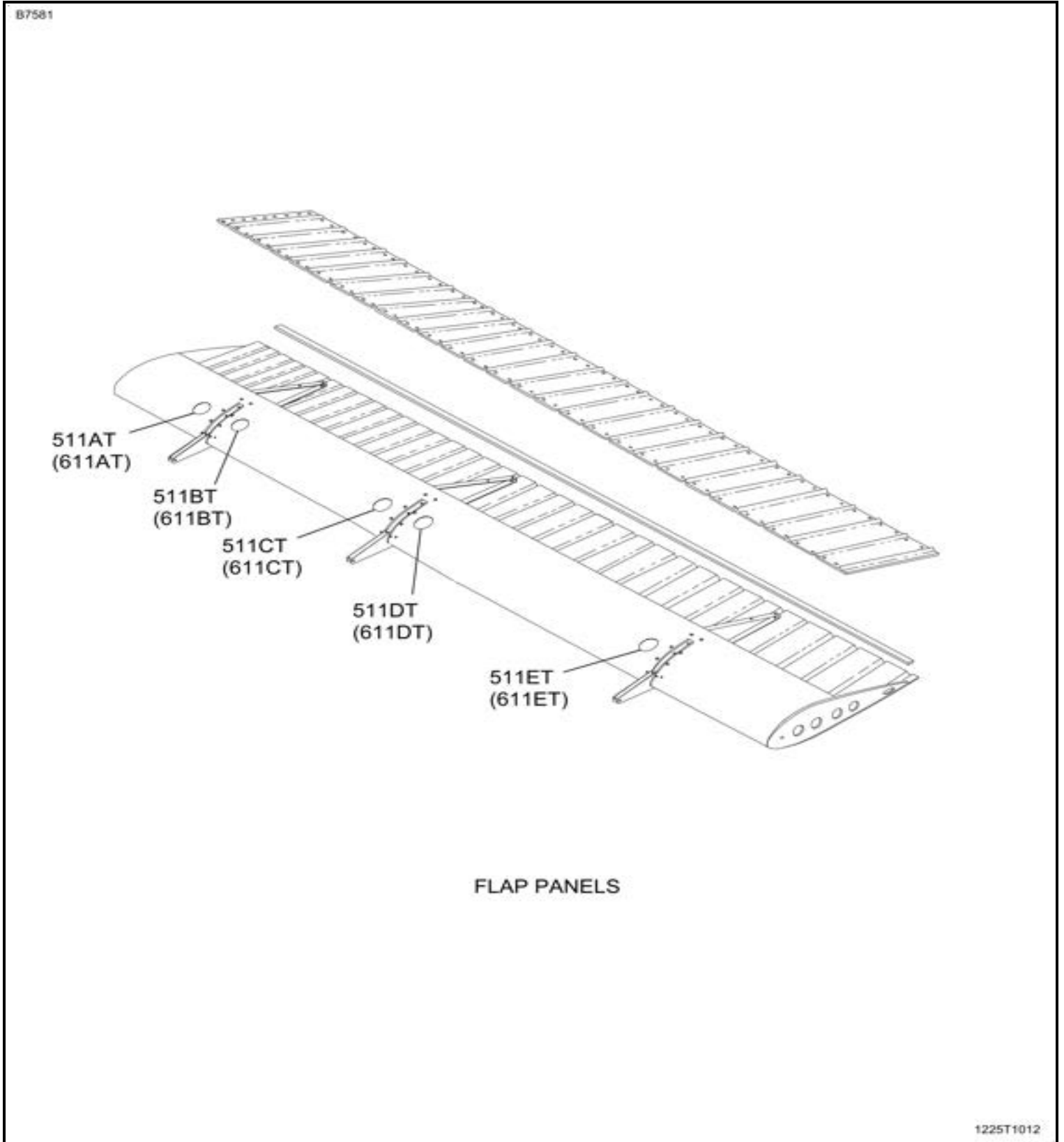


Figure 4 : Sheet 1 : Flap Panels



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 have a second battery known as the 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 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 front-right side of the firewall. A heavy-duty main battery is installed in airplanes with propeller heat systems installed. 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:

NAME	NUMBER	MANUFACTURER	USE
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.

ALTERNATOR - 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](#).

Figure 101 : Sheet 1 : Alternator System Troubleshooting Chart

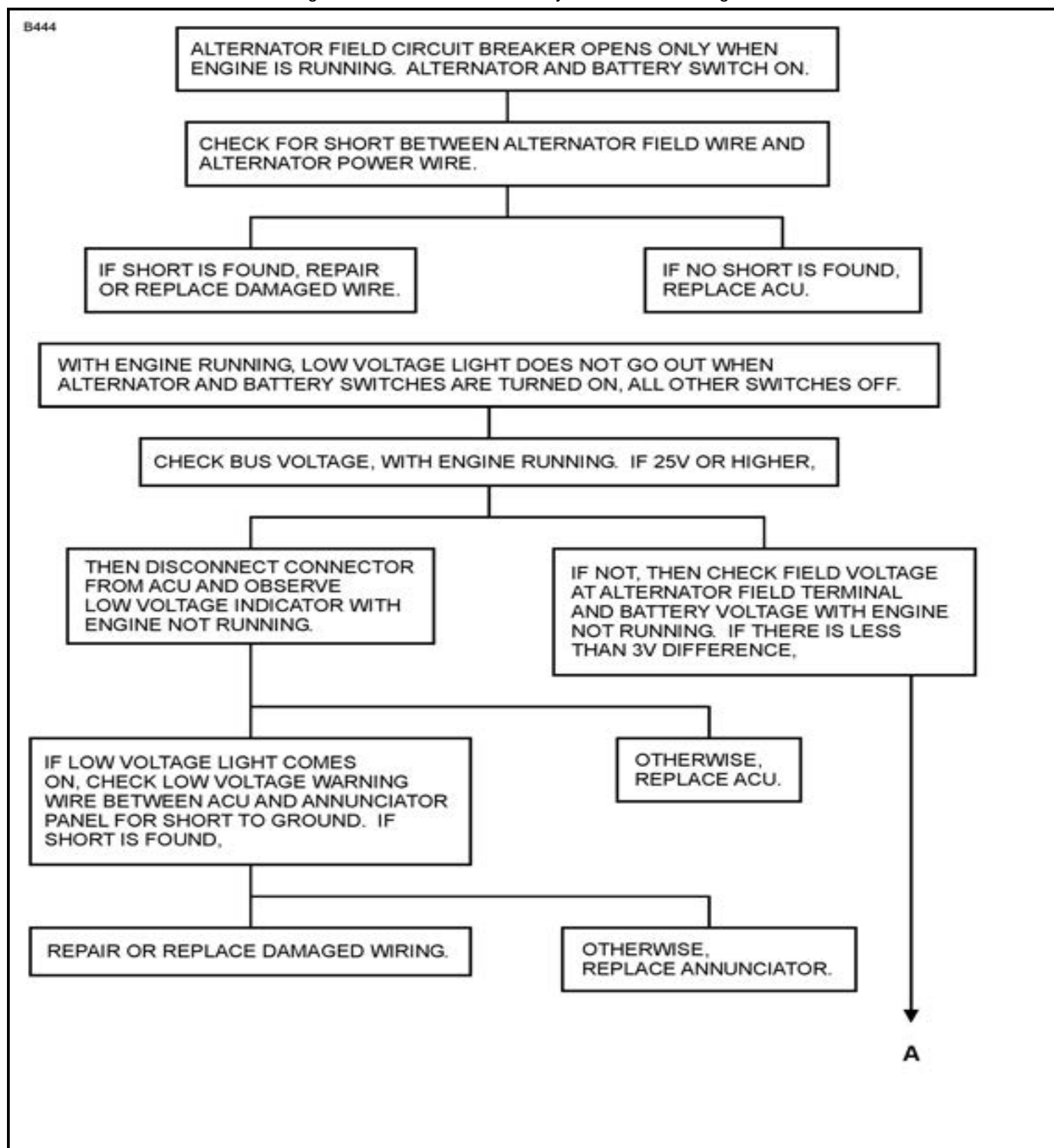


Figure 101 : Sheet 2 : Alternator System Troubleshooting Chart

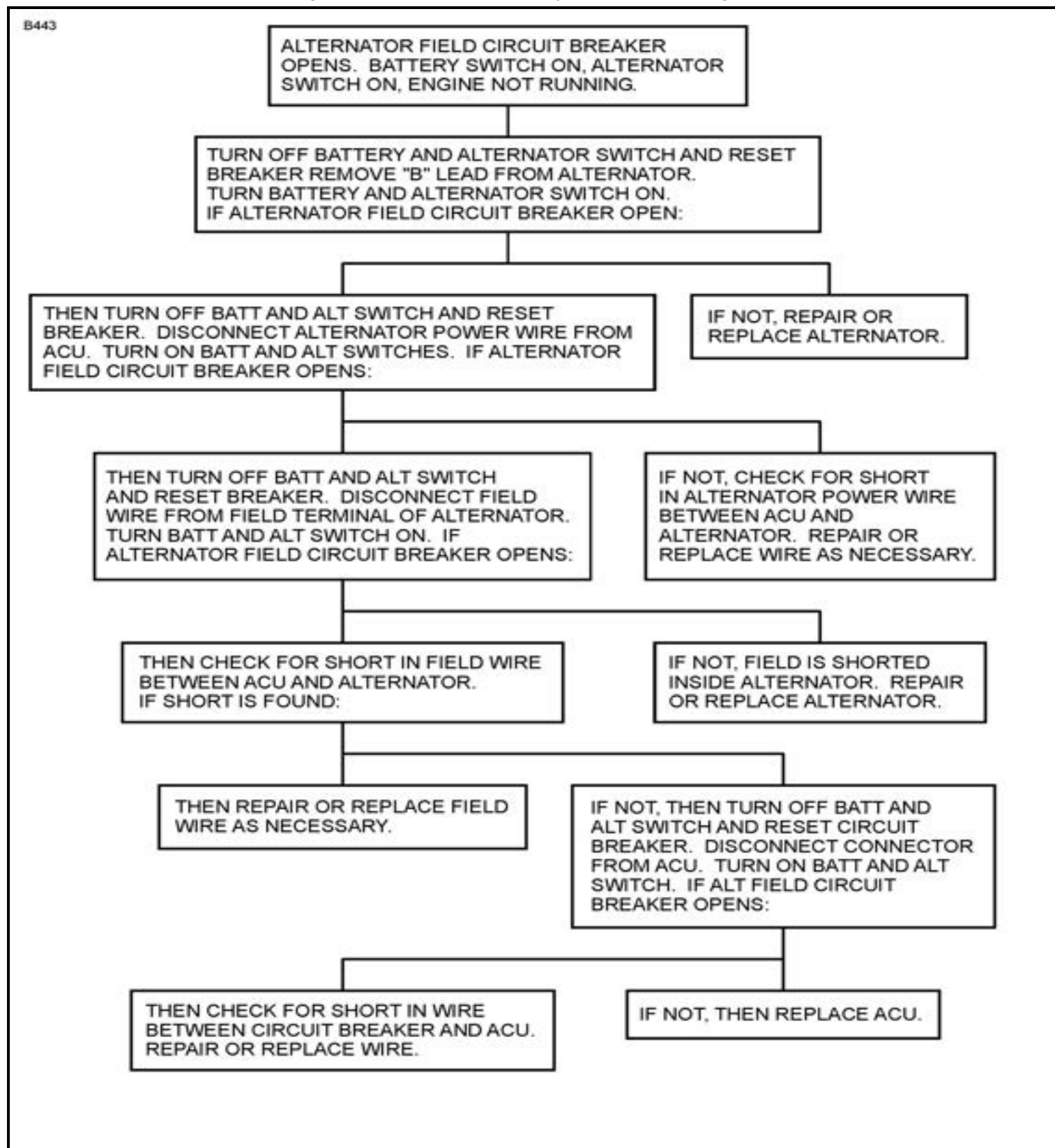


Figure 101 : Sheet 3 : Alternator System Troubleshooting Chart

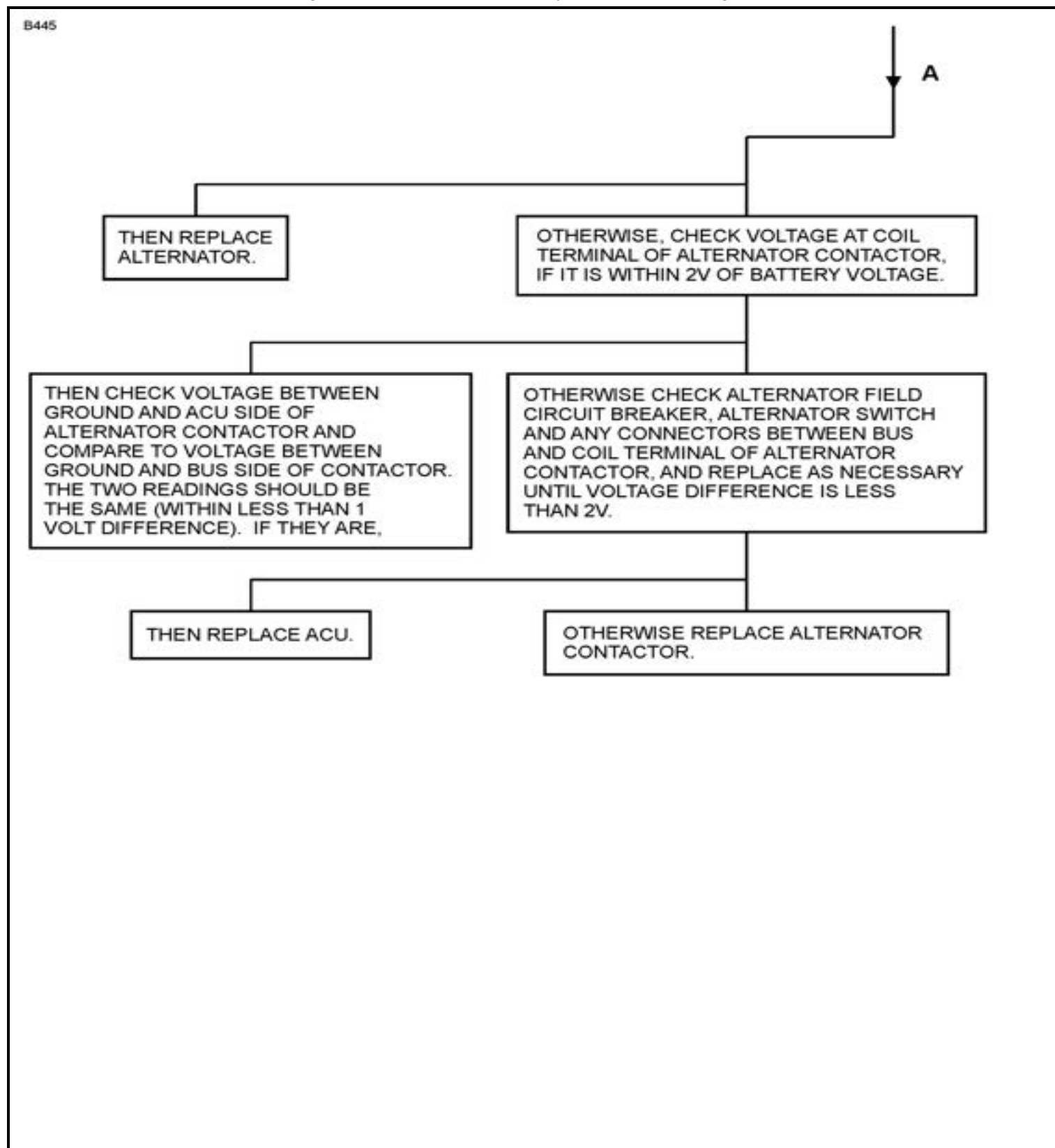
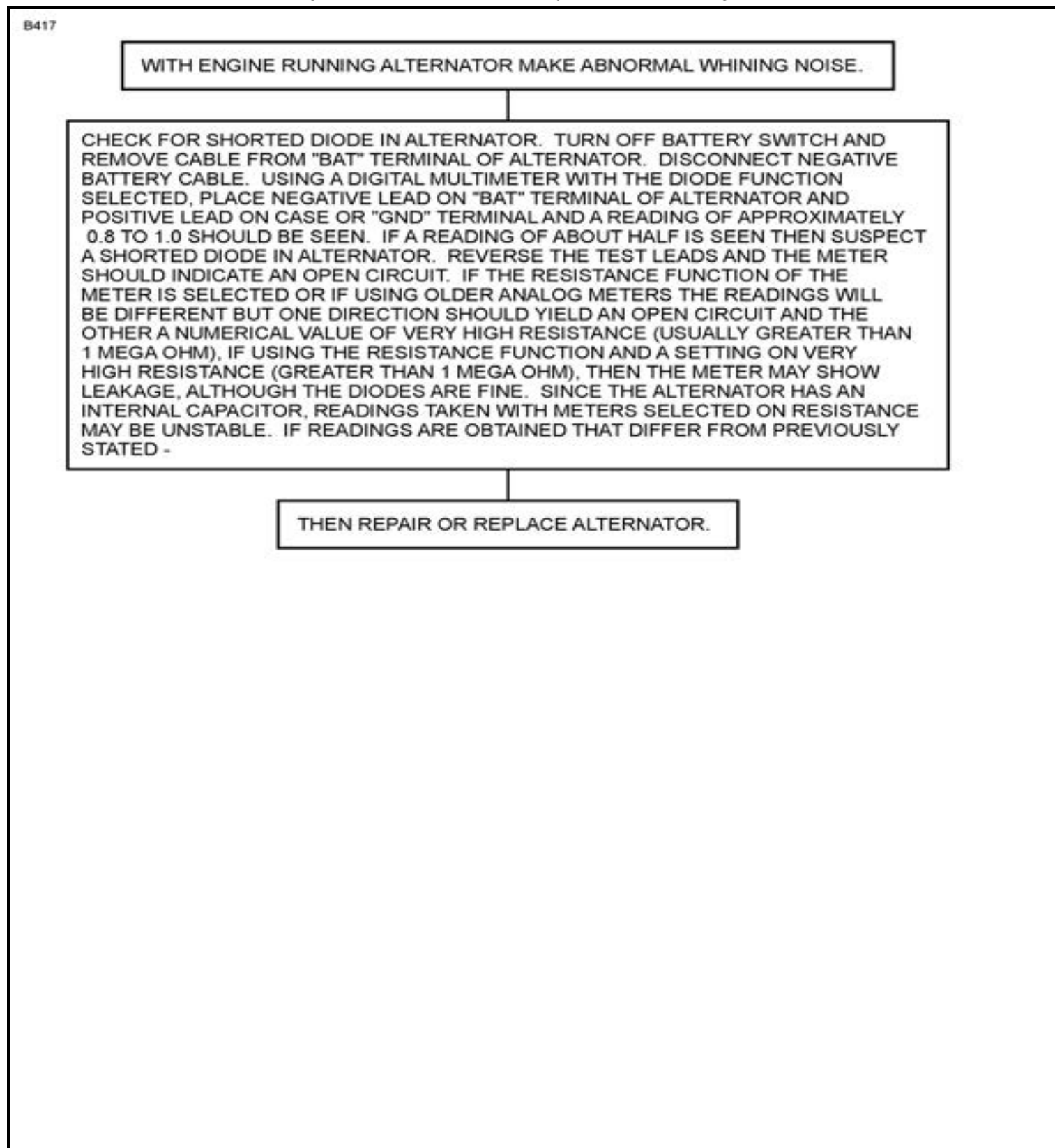


Figure 101 : Sheet 4 : Alternator System Troubleshooting Chart



ALTERNATOR - MAINTENANCE PRACTICES

1. General

A. Either a 60-amp or a 95-amp alternator is installed on the forward left side of the engine.

2. Alternator Removal/Installation

CAUTION: Make sure that you are careful when you remove and install the power and ground ring terminals.

- Do not bend or twist the terminals.
- If possible, always remove the terminals from the alternator before you remove the alternator.
- If possible, always install the terminals to the alternator after you install the alternator.
- If you must remove or install the alternator with the terminals installed, make sure that the terminals do not bend or twist.
- After the terminals are installed, make sure that the cables do not apply a load to the terminals that can cause them to bend or twist.

A. Alternator Removal (Refer to [Figure 201](#)).

- (1) Remove the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
- (2) Disconnect the battery cables. Refer to [Battery - Maintenance Practices](#).
- (3) Disconnect the electrical connectors from the alternator.
- (4) Remove the safety wire from the adjustment bolt. Loosen the bolt.
- (5) Loosen the alternator mounting bolt.
- (6) Rotate the alternator and remove the drive belt from the alternator pulley.
- (7) Remove the adjustment bolt and the mounting bolt, and remove the alternator from the airplane.

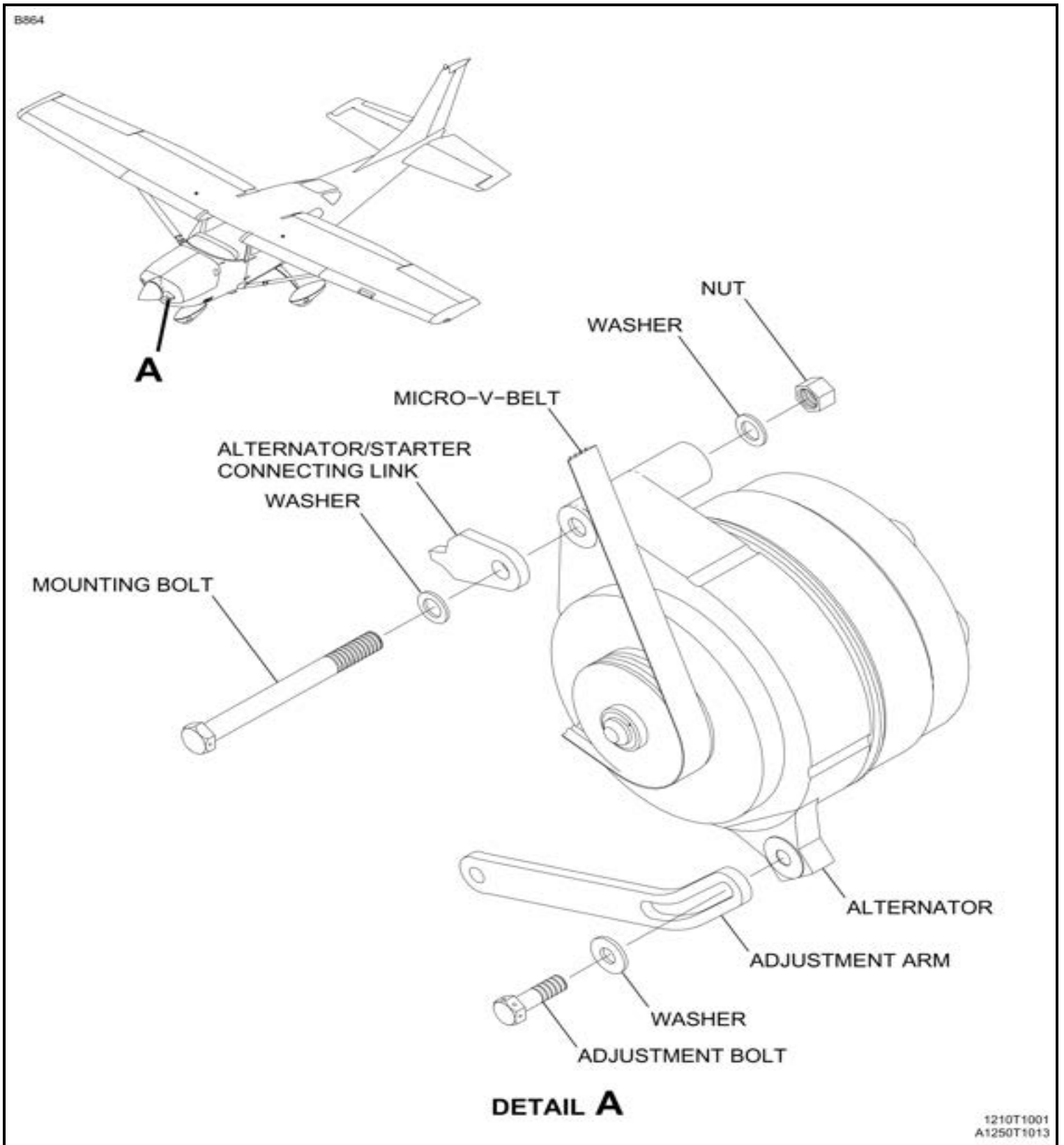
B. Alternator Installation (Refer to [Figure 201](#)).

- (1) Put the alternator in position on the mounting bracket and install the mounting bolt and the nut. Do not tighten at this time.
- (2) Put the drive belt on the alternator pulley.
- (3) Install the adjustment bolt.

CAUTION: On airplanes with a new alternator belt installed and on new airplanes, do a check of the belt tension again in the first 10 to 25 hours of operation.

- (4) Apply a torque wrench to the nut on the alternator pulley and adjust the belt tension so the belt slips at 7 to 9 foot-pounds (9.49 to 12.20 Nm) of torque with a used belt, or 11 to 13 foot-pounds (14.91 to 17.62 Nm) of torque with a new belt.
- (5) Tighten and safety the wire adjusting bolt.
- (6) Tighten the alternator mounting bolt.
- (7) Connect the electrical connectors to the alternator.
- (8) Install the upper cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).

Figure 201 : Sheet 1 : Alternator Installation



BATTERY - TROUBLESHOOTING

1. General

- A. A troubleshooting chart is included to aid in maintenance of the battery system. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Battery Troubleshooting Chart

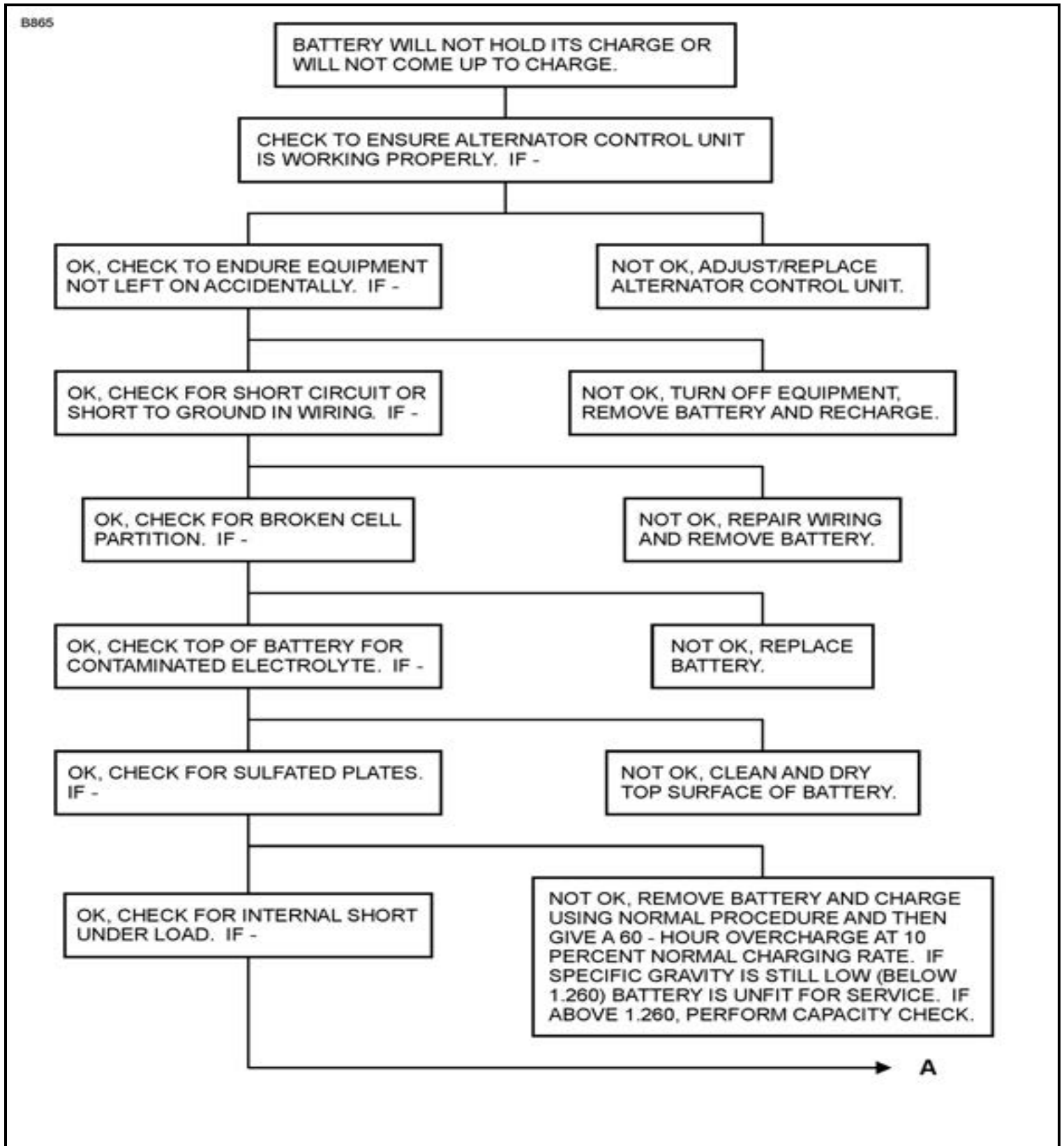


Figure 101 : Sheet 2 : Battery Troubleshooting Chart

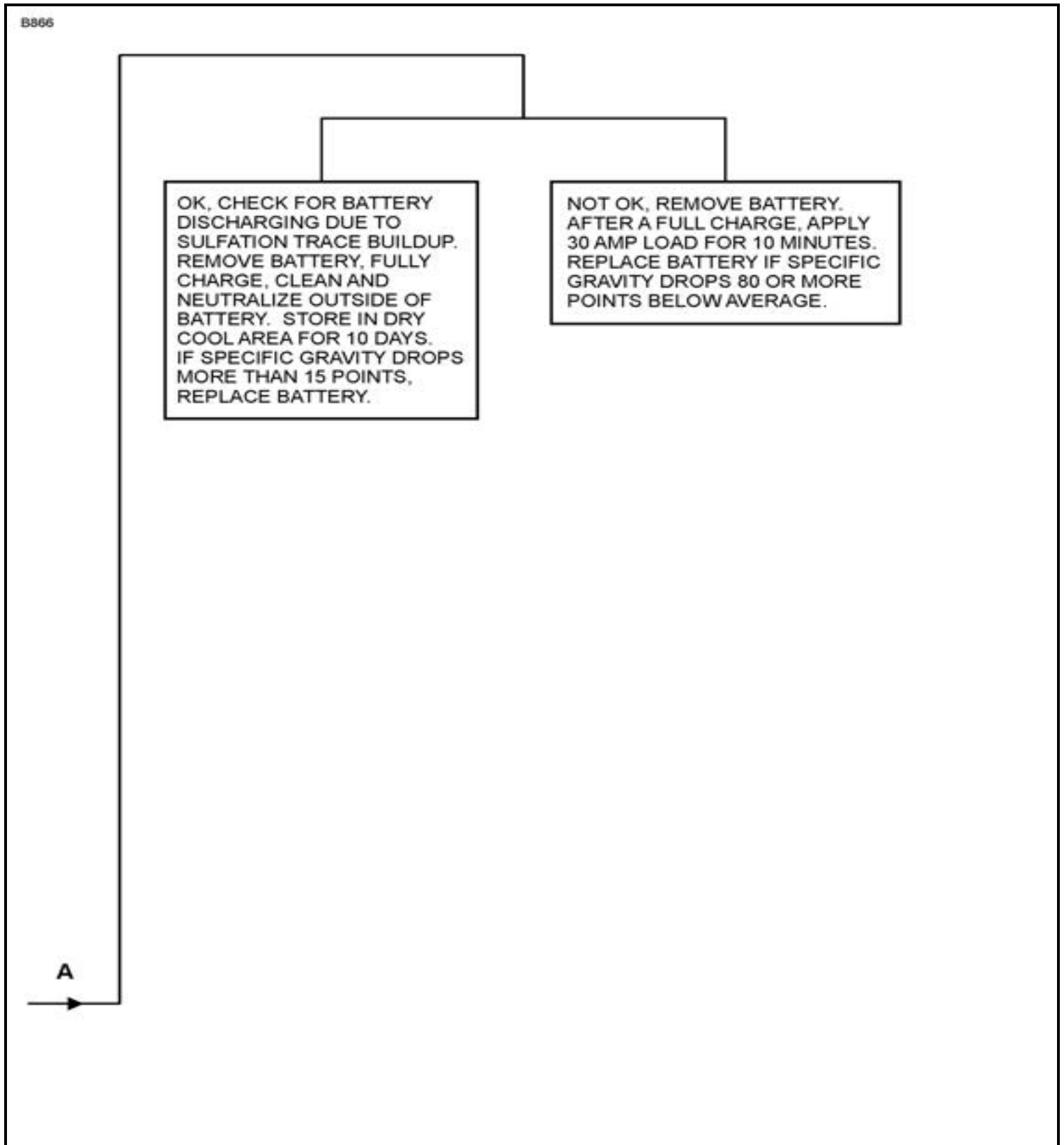


Figure 101 : Sheet 3 : Battery Troubleshooting Chart

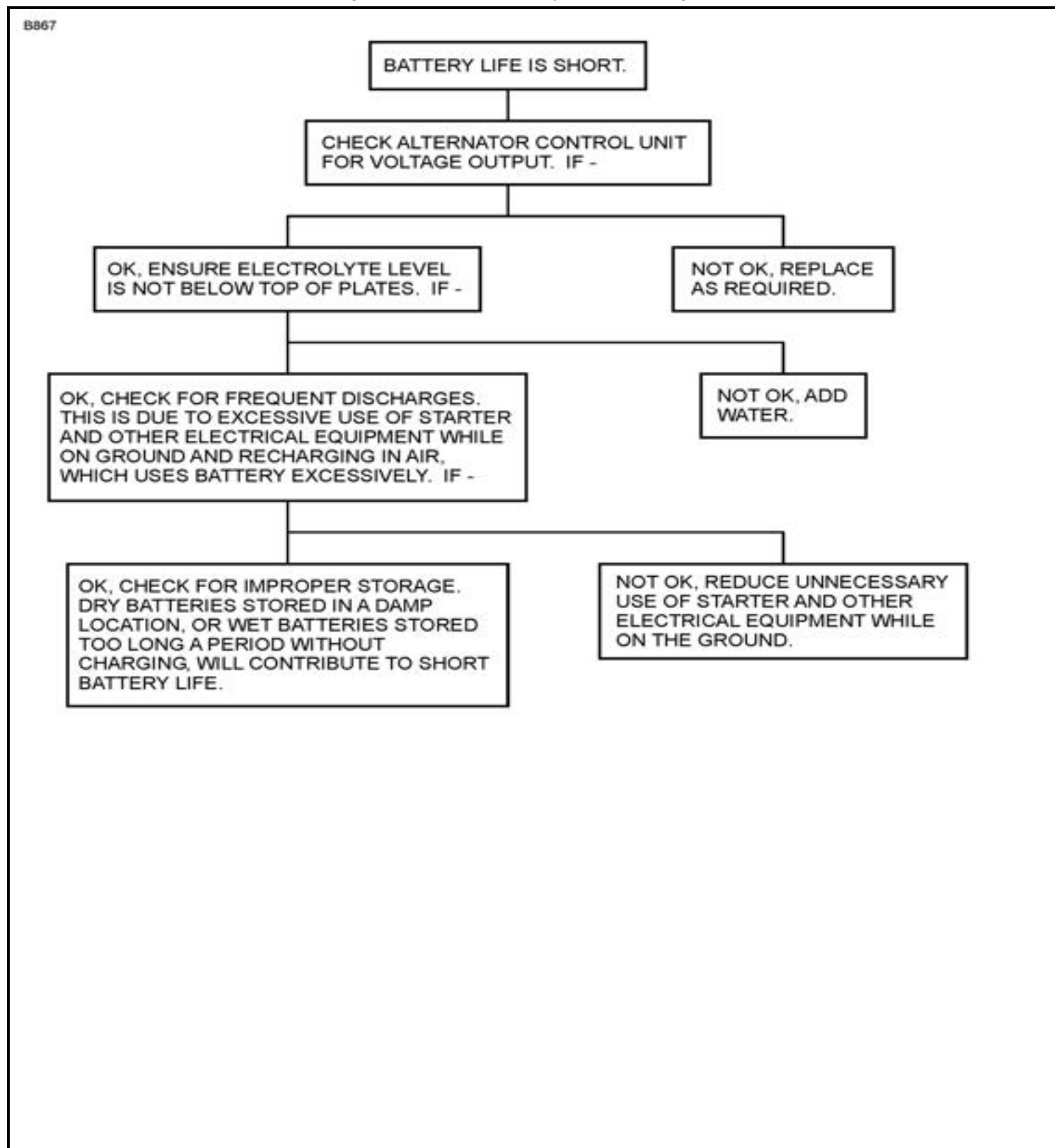


Figure 101 : Sheet 4 : Battery Troubleshooting Chart

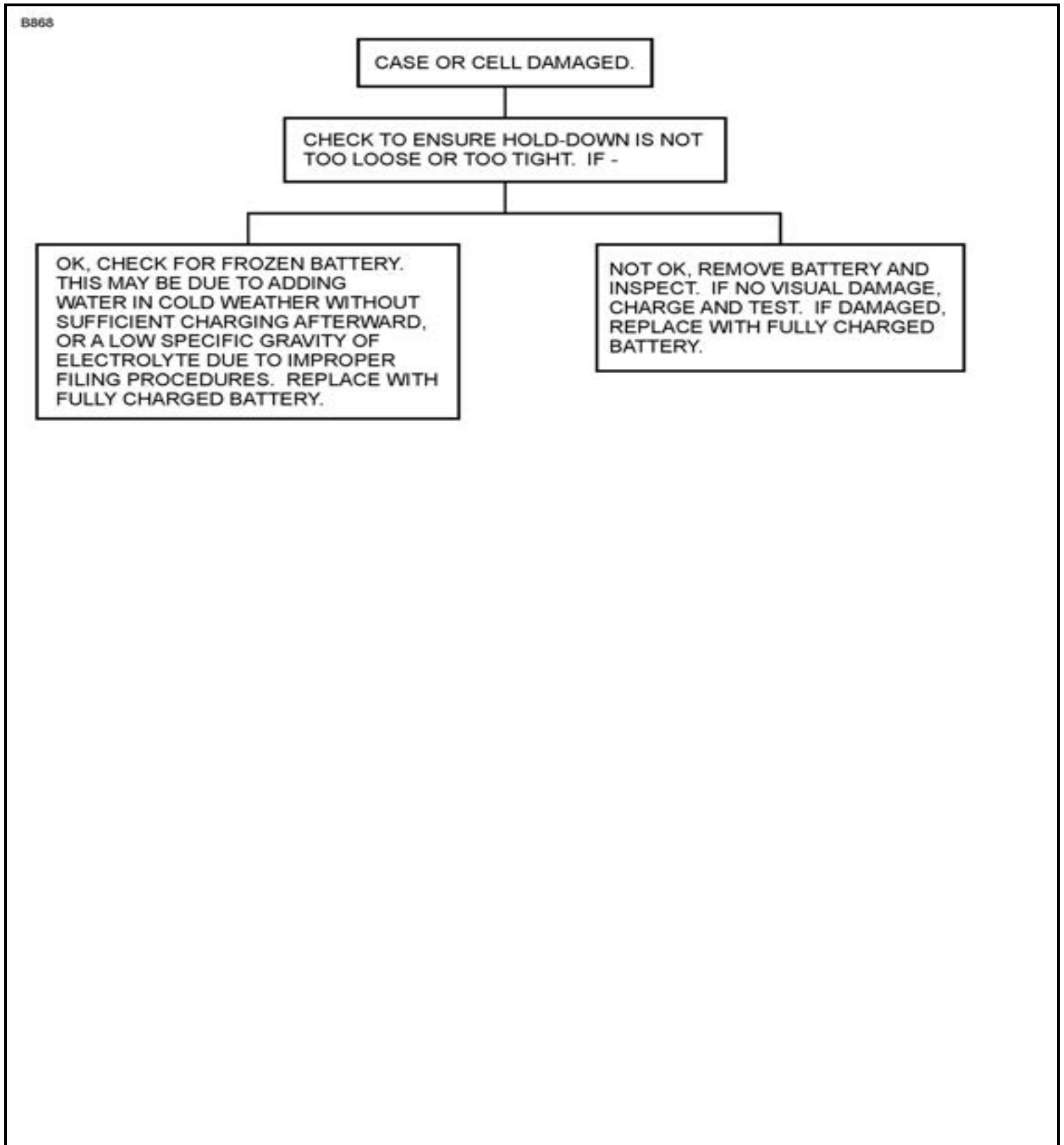


Figure 101 : Sheet 5 : Battery Troubleshooting Chart

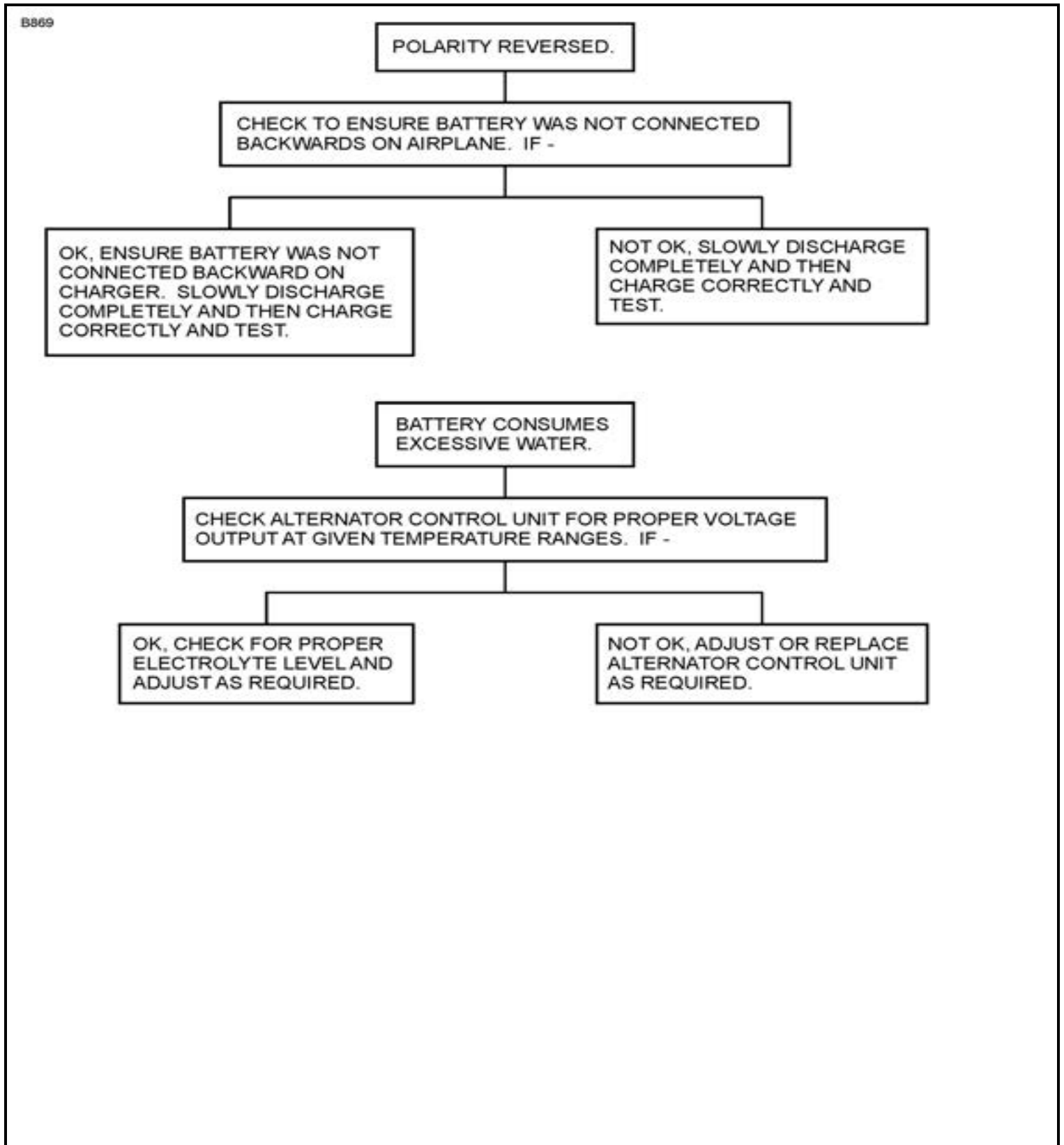
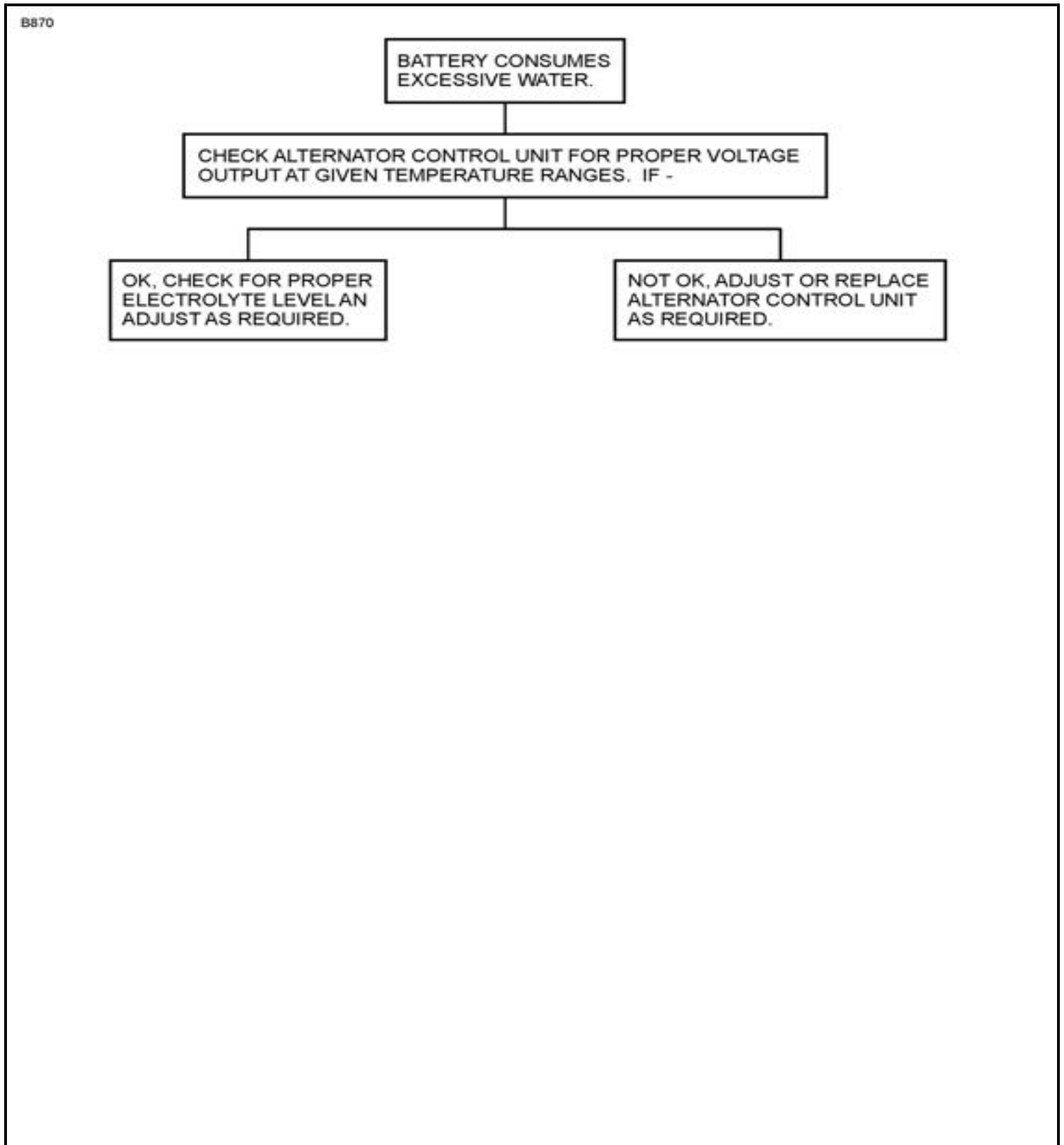


Figure 101 : Sheet 6 : Battery Troubleshooting Chart



BATTERY - MAINTENANCE PRACTICES

1. General

- A. The battery is a 24-Volt, 8.0 Amp-hour, flooded lead-acid type or an optional 13.6 Amp-hour sealed type. It is installed in the battery box on the front-right side of the firewall. In airplanes with the optional propeller heat, the battery is a heavy duty 24-Volt, 10.0 Amp-hour, lead-acid type or the optional 13.6 Amp-hour sealed type.

NOTE: The Amp-hour rate is based on a one hour discharge rate.

2. Battery Removal/Installation

- A. Remove the Battery (Refer to Figure 201).

- (1) Remove the upper right cowl. Refer to Chapter 71, [Cowls - Maintenance Practices](#).
- (2) Remove the battery box top cover.

CAUTION: Disconnect the negative battery cable first, then the positive cable. This will prevent an accidental short of the battery from hand tools.

- (3) Disconnect the negative and positive cable from the battery.
- (4) Remove the battery from the airplane.

- B. Install the Battery (Refer to Figure 201).

CAUTION: Do not tighten the hold-down bolts too much or you will damage the hold-down strap.

- (1) Place the battery in the battery support assembly.

CAUTION: Connect the positive battery cable first, then the negative cable. This will prevent an accidental short of the battery from hand tools.

- (2) Connect the positive and negative battery cables. Use bolts or nuts provided with battery and torque to battery manufacture requirements. Refer to battery label or manufactures instructions.

- (3) Install the top cover to the battery support assembly.
- (4) Install the upper right cowl, refer to Chapter 71, [Cowls - Maintenance Practices](#).

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.
- (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) For flooded battery type - 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) For sealed battery type - Do an open circuit battery voltage check. The battery voltage must be 25.5 +0.5 or -0.5 volts.
- (3) To charge a new battery, use the manufacturer's instructions supplied with the battery.
- (4) Before you install the battery, clean the battery box. Refer to Chapter 12, [Battery - Servicing](#).
- (5) 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.

- (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.

(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](#).

C. For a sealed Concord RG series battery, do the instructions that follow. For further information, refer to the Concord RG series charging instructions.

NOTE: Constant Potential charging is the preferred method of charging the battery.

(1) Remove the battery from the airplane and place it in a well ventilated area to charge. Refer to [Battery Removal/Installation](#).

(2) Connect the battery terminals to the constant potential charging equipment. Care must be taken to insure proper polarity of terminals.

(3) Apply a constant potential of 28.25 ± 0.25 volts with a current capability of at least 3.0 amperes.

(4) Continue charging until the charge current remains constant, within 10%, for 3 consecutive hourly readings.

(5) Disconnect and remove the battery from the charger.

(6) Install the battery in the airplane. Refer to [Battery Removal/Installation](#).

6. Battery Test

A. Battery Test - Gill Flooded Series

(1) Complete a Specific Gravity Check. Refer to [Table 201](#) and [Table 202](#).

(a) 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.

(b) The battery condition for various hydrometer values with an electrolyte temperature of 80°F (27°C) is shown in [Table 201](#).

1. 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.

(c) 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

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

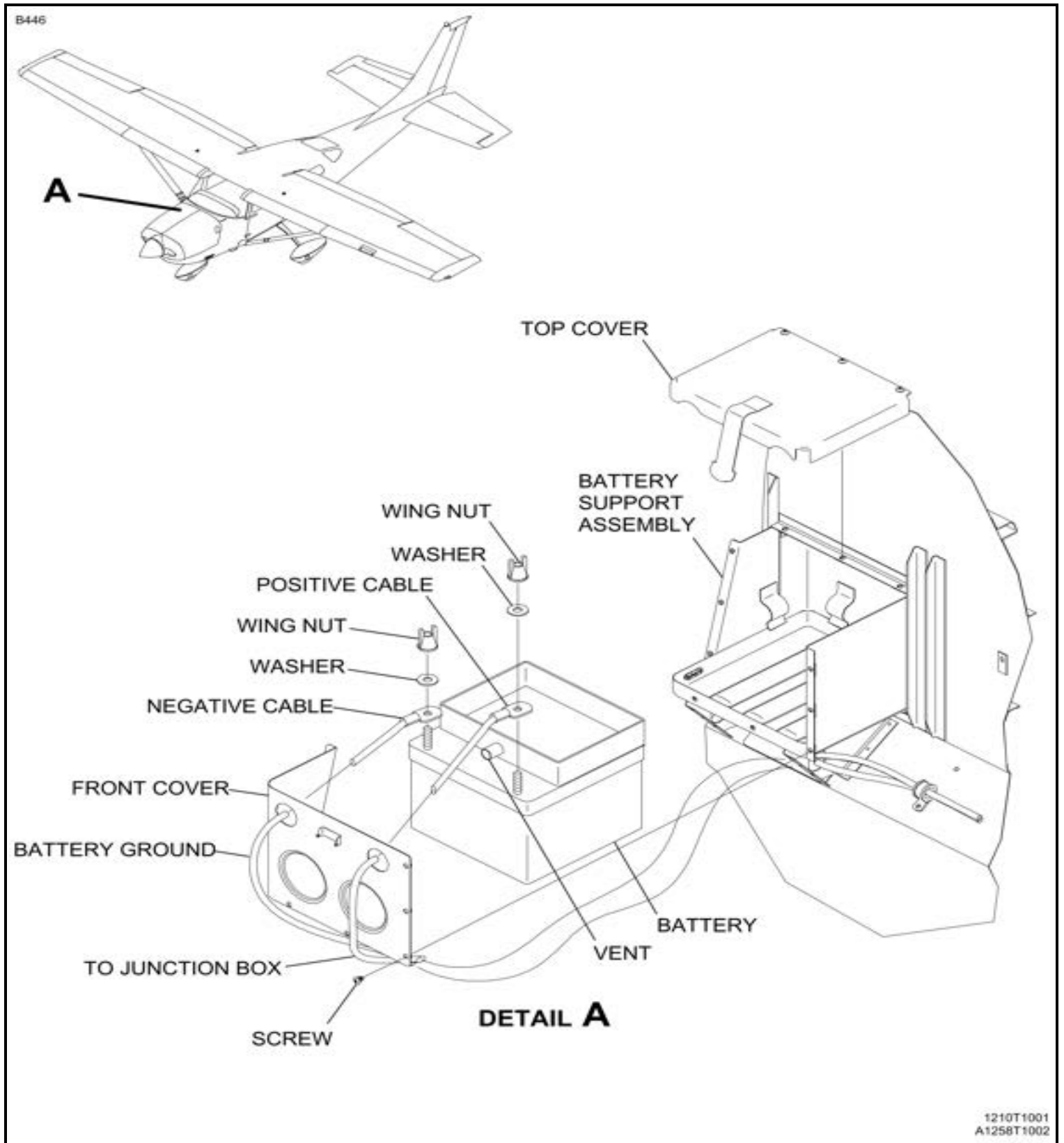
B. Battery Test - Sealed Concord RG Series

- (1) Charge battery. Refer to [Battery Charging](#).
- (2) After charging allow battery temperature to stabilize to ambient temperature. Measure open circuit voltage. Record the value.
- (3) Replace the battery if the following conditions are not true:
 - (a) The open circuit voltage must be 25.5 +0.5 or -0.5 volts.
 - (b) The battery must give sufficient power to crank the engine with the starter.

7. Concord RG Series Battery Storage

- A. To prolong shelf life, the aircraft main battery should be stored in a cool location, ideally below 68°F (20°C).
- B. The open circuit voltage (OCV) of a fully charged battery is approximately 25.5 to 26.0 volts. As the battery state of charge drops due to shelf-discharge, its voltage also declines. The battery should be boost charged as required when the OCV declines to 25.0 volts. (Refer to Battery Charging). A monthly OCV check and boost charge is recommended to prolong shelf life of battery.

Figure 201 : Sheet 1 : Battery Installation



STANDBY BATTERY - MAINTENANCE PRACTICES

1. General

- A. The maintenance procedures that follow have information for the removal and installation of the standby battery, which is installed behind the Primary Flight Display. If there is no primary power source, the standby battery has been shown to give power to the essential bus for at least 30 minutes. The standby battery PC board is installed on the forward side 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 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 washer from the bracket.
 - (6) Loosen the forward nut 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 bracket in position on the top of the battery and install the washer and nut.
NOTE: If necessary, washers can be installed in the gap between the bracket and the bracket assembly. The combined thickness of the washers can not be more than 0.25 inch.
 - (3) Attach the safety wire to the nut.
 - (4) Connect the electrical connection to the battery.
 - (5) Do a check of the battery to make sure the battery will not move.
 - (6) Install the Primary Flight Display. Refer to Chapter 34, [Control Display Unit - Maintenance Practices](#).
 - (7) Put the STDBY BATT 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 PC Board Removal/Installation

- A. Remove the Standby Battery PC Board. Refer to [Figure 202](#).
- CAUTION: Make sure you use a wrist strap when the standby battery pc board is removed. The standby battery pc board is sensitive to electrostatic discharge.**
- (1) Make sure 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 PC board from electrical connector.
 - (6) Remove the screws that attach the board to the extrusion.
 - (7) Carefully remove the board from the extrusion.
 - (8) If applicable, put the PC board in an electrostatic safe bag.
- B. Install the Standby Battery PC Board (Refer to [Figure 202](#)).
- CAUTION: Make sure 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 standby battery controller/monitor PC board in the extrusion.
 - (3) Install the screws that attach the board to the extrusion.
 - (4) Connect the board to the electrical connector.
 - (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 [Standby Battery - Removal/Installation](#).
- (2) Connect the battery to the charger with the black, round Standby Battery Connector (P1). A mating connector (JC032) can be purchased through Cessna. Refer to the Model 206/T206 Wiring Diagram Manual - Chapter 24, Electrical Power.

NOTE: To charge the standby battery, a constant voltage charger, constant current charger or a modification of both can be 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. A "float" charge can be done with a charger that has a DC voltage between 27.2 and 28.2.

CAUTION: Never set the charger to a level that is higher than 30.0 volts or you can cause damage to the battery.

- (3) For a constant current charger, charge the battery. Refer to 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. 8 Amp-hour is the battery's capacity at a 10-hour rate.
- (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: If the state of charge of the battery is satisfactory, charge times of less than 16 hours are possible. The battery is completely charged if the charge current stays stable (approximately .1 to .2 amps) for a minimum of one hour. Charge times greater than 16 hours can be done if the charge voltages are kept between the recommended float charge range of 27.2 to 28.2.
- (5) Install the battery. Refer to [Standby Battery - Removal/Installation](#).
- (6) Do the Standby Battery Energy Level Test described in the Pilot's Operating Handbook, Chapter 4 - Starting Engine Procedures. Make sure the green standby battery test light comes on and stays on for the described time period.

5. Standby Battery Storage

- A. For the best battery life, the standby battery must be kept 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 any 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 standby battery in a temperature environment greater than approximately 25°C for long periods. 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.

6. Standby Battery Capacity Test

- A. The battery capacity must be tested according to the time limits set forth in 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 an unintentional deep discharge.
- B. On Aircraft Standby Battery Capacity Test
 - (1) Make sure that the standby battery is fully charged before the capacity test is started. If the charge condition is unknown, charge the battery. Refer to [Standby Battery Charging](#).
 - (2) Put the airplane in an area where there are high cabin light levels. Use sunlight or a well-lit hangar facility.
NOTE: It is important that the photocell on the PFD controls the PFD light level to FULL BRIGHT. The manual AVIONICS rheostat is not operational with the primary alternator and main battery power turned off.
 - (3) Turn the STDBY IND rheostat to the full clockwise position.
NOTE: A stopwatch will be necessary in the following steps to measure the time of the standby battery discharge.
 - (4) With the MASTER ALT BAT 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 will operate 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 5 thru 7 do not occur, 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 will be between 2.1 and 3.1 amps as shown on the PFD standby battery ammeter. The essential bus initial voltage will be 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 standby battery capacity is satisfactory if the bus voltage stays more than 20.0 volts for 55 minutes.

- (9) Set the STDBY BATT switch to OFF if the essential bus decreases to 20.0 volts or after a minimum of 55 minutes.

CAUTION: Do not let the essential bus voltage decrease below 20.0 volts or the standby battery can be damaged. Set the STDBY BATT switch to the OFF position before the voltage decreases to less than 20.0 volts. Voltage values less than 22.5 volts can decrease quickly so monitor the voltage closely. If the voltage decreases to less than 20.0 volts, charge the battery immediately and do the test again.

NOTE: If the standby battery voltage does not stay more than 20.0 volts for 55 minutes during the on aircraft standby battery capacity test, the battery is not acceptable for return to service.

- (10) Charge the battery. Refer to [Standby Battery Charging](#).

C. Bench Battery Capacity Test

NOTE: This test requires a 24-volt aircraft battery capacity tester.

- (1) Remove the battery from the airplane and put it in a well ventilated area. Refer to [Standby Battery - Removal/Installation](#).

- (2) Make sure that the battery is fully charged before the capacity test is started.

(a) If the charge condition is unknown, charge the battery. Refer to [Standby Battery Charging](#).

(b) After charging is complete, allow a minimum of 1 hour for battery stabilization the test is continued.

- (3) Connect the battery to the capacity tester with the black, round Standby Battery Connector (P1). A mating connector (JC032) is available from Cessna Aircraft Company. Refer to the Model 206H/T206H Wiring Diagram Manual, Chapter 24 Electrical Power - Battery System.

NOTE: A stopwatch will be necessary in the following steps to time the battery discharge. Some aircraft capacity testers have a built-in timer which may be used instead of a stopwatch.

- (4) With no load on the battery, make sure that the battery voltage is at least 24.0 volts.

(a) If the voltage is low, charge the battery again. Refer to [Standby Battery Charging](#).

(b) Connect the battery to the capacity tester.

(c) If the voltage is still low, replace the battery.

- (5) Refer to the tester instructions and set the tester to discharge at a constant current of 3.5 amps.

- (6) Refer to the tester instructions to start the discharge of the battery and immediately start stopwatch if required.

- (7) Periodically monitor the battery voltage during the discharge.

NOTE: The battery capacity is satisfactory if the battery voltage stays more than 20.0 volts for 60 minutes.

- (8) Refer to the tester instructions and stop the discharge of the battery if the battery voltage decreases to 20.0 volts or after 60 minutes.

CAUTION: Do not let the battery voltage decrease below 20.0 volts or the standby battery can be damaged. Set the tester to stop discharge before the voltage drops to less than 20.0 volts. Voltage values less than 22.5 volts can decrease quickly, so monitor the voltage closely. If the voltage drops to less than 20.0 volts, charge the battery immediately and do the test again.

NOTE: If the standby battery does not stay more than 20.0 volts for 60 minutes during the bench capacity test, the battery is not acceptable for return to service.

- (9) Charge the battery. Refer to [Standby Battery Charging](#).
- (10) Install the battery in the airplane. Refer to [Standby Battery - Removal/Installation](#).

Figure 201 : Sheet 1 : Standby Battery Installation

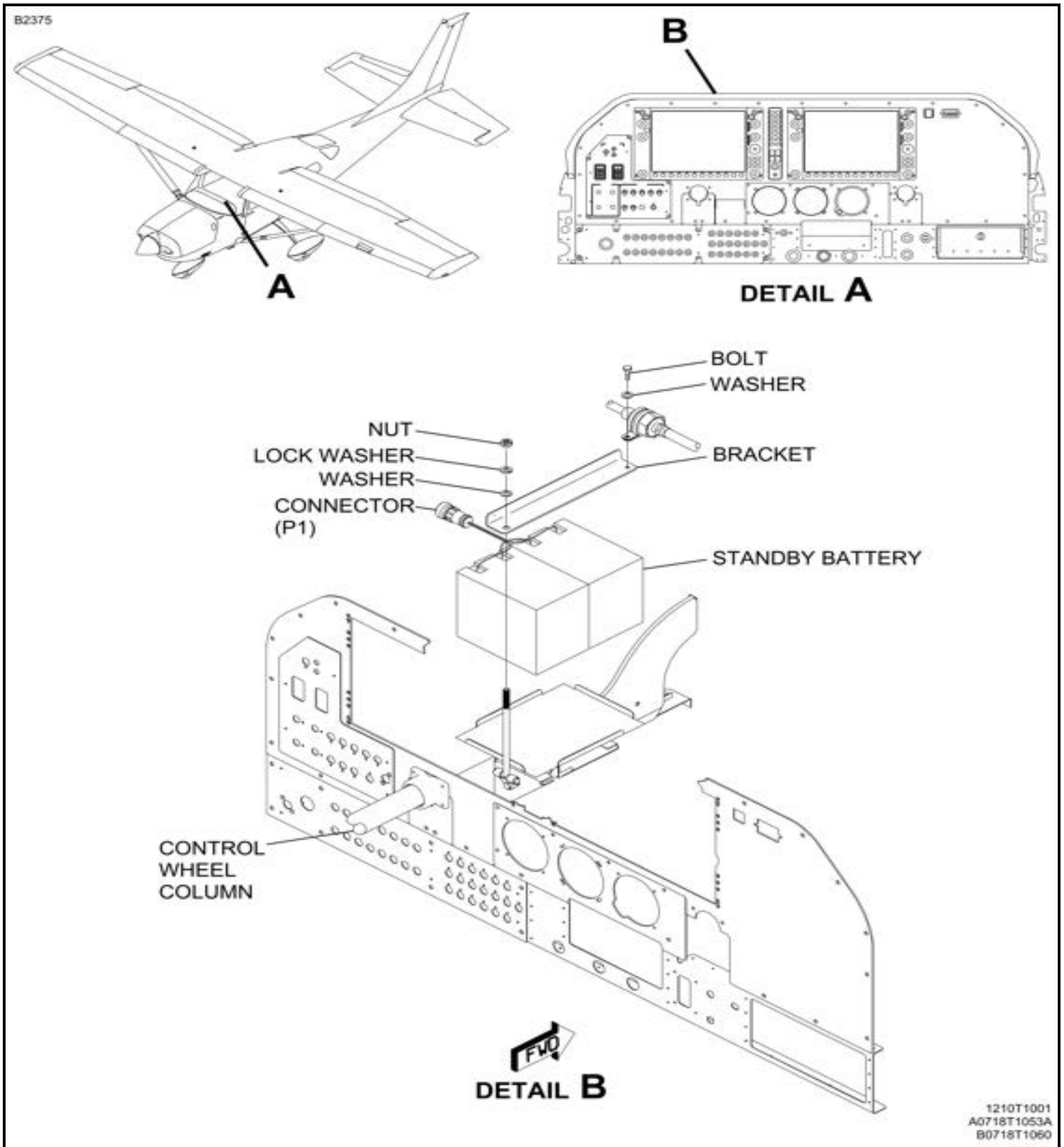
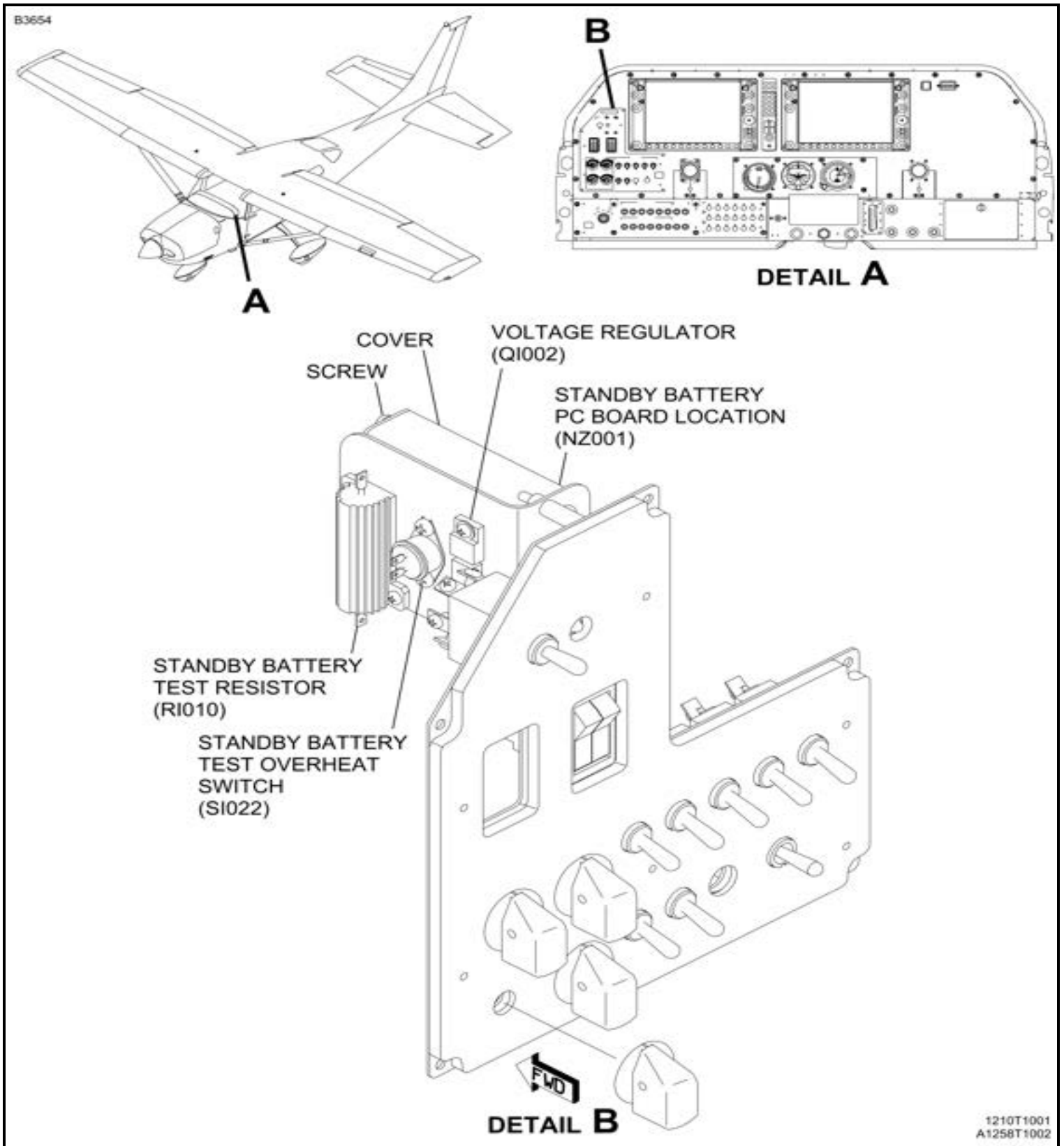


Figure 202 : Sheet 1 : Standby Battery PC Board Installation



GARMIN GI 275 STANDBY BATTERY - MAINTENANCE PRACTICES

1. Description and Operation

A. Description

- (1) This section gives the maintenance procedures and checks for the GI 275 Standby Battery.
- (2) The GI 275 Standby Battery is a rechargeable lithium-ion battery pack that is installed inside the Garmin GI 275 Attitude and Direction Indicator (ADI). The battery is encased in a metal compartment in the GI 275 Standby ADI unit, and held in place by a cover plate and screws.

B. Operation

- (1) In the event of loss of aircraft power, the GI 275 Standby ADI will switch to the internal GI 275 Standby Battery for instrument operations. The battery provides 60 minutes of power to the instrument. The battery charges off the crossfeed electrical bus during normal aircraft operation.

2. Garmin GI 275 Standby Battery Removal/Installation

A. Removal, refer to [Figure 201](#).

- (1) Put the MASTER and AVIONICS switches in the OFF position.
- (2) Remove the screws that secure the GI 275 Standby ADI to the center instrument panel.
- (3) Carefully push the GI 275 Standby ADI away from the center instrument panel and toward the bottom of the main instrument panel to gain access to the top of the GI 275 unit.
- (4) Remove the screws that secure the battery cover plate to the top of the GI 275 Standby ADI.
- (5) Remove the battery cover plate from the instrument.
- (6) Remove the battery from the battery compartment.

B. Installation, refer to [Figure 201](#).

- (1) Put the battery in its place inside the battery compartment.
- (2) Put the battery cover plate in its place on the instrument.
- (3) Install the screws to secure the battery cover plate to the GI 275 Standby ADI.
- (4) Carefully put the GI 275 Standby ADI in its place on the center instrument panel.
- (5) Install the screws that secure the GI 275 to the center instrument panel.
- (6) If the GI 275 Standby Battery was replaced with a new one, allow the battery to fully charge. Then, do the Garmin GI 275 Standby Battery Rundown Test in this document.

3. Garmin GI 275 Standby Battery Rundown Test

NOTE: The Battery Rundown Test is required during the initial installation of a new GI 275 Standby ADI unit or GI 275 Standby Battery on the airplane. The Battery Rundown Test is not required if you reload the software on an existing GI 275 Standby ADI unit.

NOTE: This test must be completed if you reload the full configuration on the GI 275 Standby ADI unit.

A. Do the GI 275 Standby Battery Rundown Test.

NOTE: The GI 275 Standby ADI is a touch screen instrument.

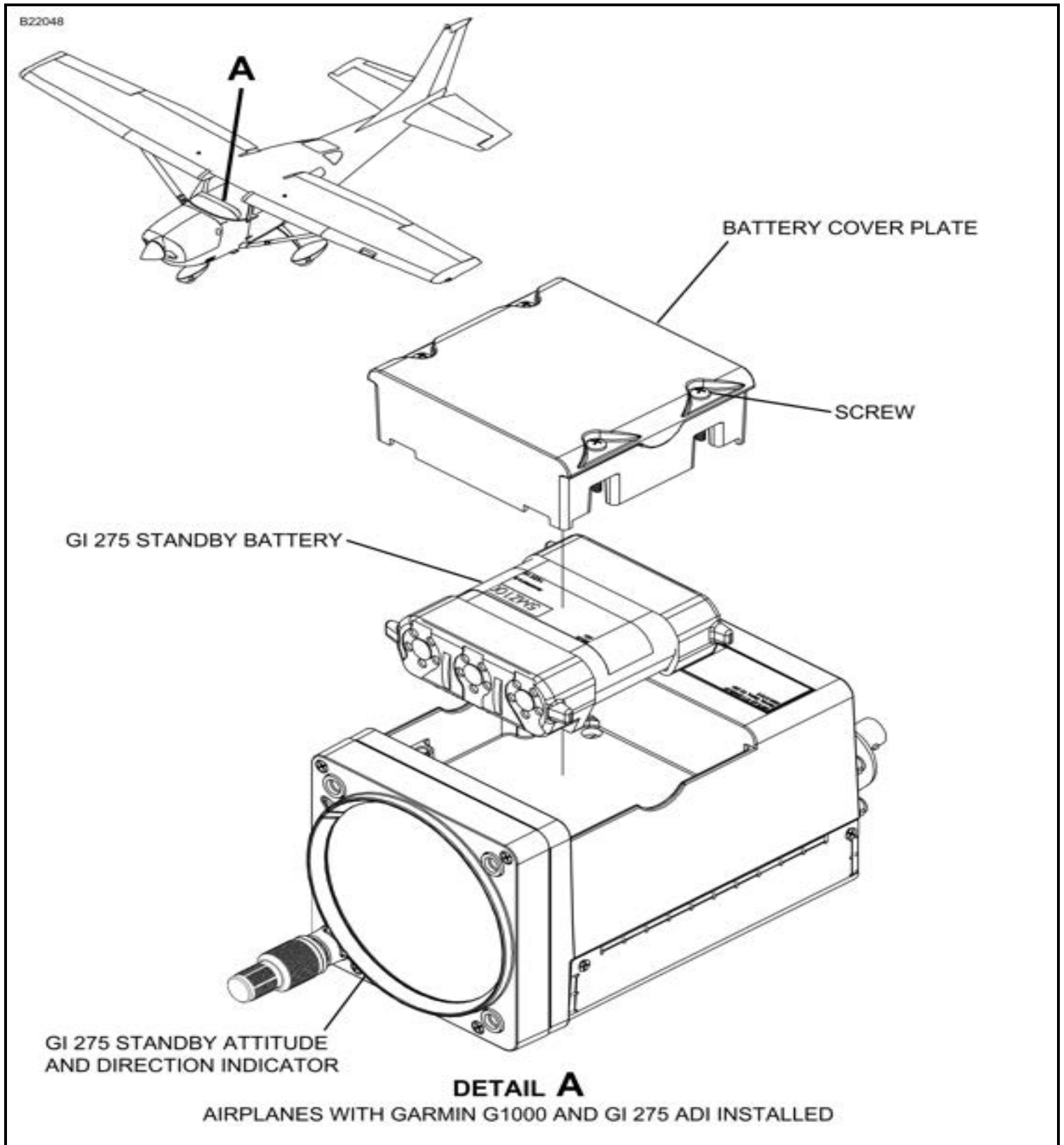
- (1) Power on the GI 275 Standby ADI in configuration mode.
 - (a) Push and hold down the inner encoder knob on the GI 275 Standby ADI instrument.
 - (b) Put the MASTER switch in the ON position.
 - (c) Release the inner encoder knob when the configuration mode splash screen displays on the GI 275 Standby ADI.
 - (d) Touch ACCEPT on the configuration mode splash screen when prompted.

NOTE: If you do not acknowledge the configuration mode splash screen within 60 seconds, the unit will restart in normal mode.

- (2) Scroll through the menu options and touch the CALIBRATION/TEST option.
- (3) Touch the BACKUP BATTERY TEST option.
- (4) Do the Before Test Checklist.
 - (a) Touch the BEFORE TEST CHECKLIST option.

- (b) Make sure the current date is selected under the CHECKLIST page.
 - (c) Make sure the BATTERY STATE is fully charged.
 - (d) Touch ENTER TODAY'S DATE option and make sure today's date is filled in.
 - (e) Touch FULLY CHARGE BATTERY option and make sure a green checkmark is present.
 - (f) Touch the BACK option.
- (5) Touch the START TEST option.
- (6) Pull the STBY ADI circuit breaker on the circuit breaker panel when the GI 275 Standby ADI prompts you to SWITCH AIRCRAFT BATTERY MASTER TO OFF.
- (7) Allow the GI 275 Standby ADI unit to run the battery test until complete.
- (a) Make sure the battery runs the GI 275 Standby ADI for at least 60 minutes.
 - (b) The test can take up to 150 minutes with a new battery.
 - (c) The GI 275 Standby ADI will automatically record the results of the test to memory when the standby battery runs out of power.
- (8) Push in the STBY ADI circuit breaker on the circuit breaker panel. The GI 275 Standby ADI will start in normal mode.
- (9) Apply external power to the airplane.
- (10) Allow the GI 275 Standby Battery to recharge until the battery indication is at least amber.
- (11) Check the Battery Rundown Test results.
- (a) Power on the GI 275 Standby ADI in configuration mode.
 - (b) Scroll through the menu and touch the CALIBRATION/TEST option.
 - (c) Touch the BACKUP BATTERY TEST option.
 - (d) Touch the TEST RESULTS option.
 - (e) Make sure the test result is at least 60 minutes or greater.
 - (f) If the test result is less than 60 minutes, repeat the test with a fully charged battery at ambient temperatures of at least 23°C.
 - (g) If the test result still does not meet the 60 minute requirement, replace the battery pack with a new one. Refer to the Garmin GI 275 Standby Battery Removal/Installation in this document.
 - (h) Restart the GI 275 Standby ADI in normal mode.
- (12) Remove external power from the airplane.

Figure 201 : Sheet 1 :



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 upper cowl, refer to Chapter 71, [Cowls - Maintenance Practices](#).
- (2) Disconnect the battery cables, refer to [Battery - Maintenance Practices](#).
- (3) Remove the cover from the power junction box.
- (4) Disconnect the electrical connectors, cables, and ground strap from the power junction box.
- (5) Remove the cooling shield.

NOTE: Turbocharged airplanes do not have a cooling shield installed on the power junction box.

- (a) Remove the bolts that connect the cooling shield to the power junction box.
- (b) Disconnect the cooling shield from the power junction box.
- (6) Remove the bolts that connect the power junction box to the firewall.
- (7) Remove the power junction box from the airplane.

- B. Install the Power Junction Box. (Refer to [Figure 201](#)).

- (1) Put the power junction box on the firewall and attach it with bolts.
- (2) Connect the electrical connectors, cables, and ground strap to the power junction box.
- (3) Install the cover on the power junction box.

(a) For airplanes 20608001 thru 20608328 and T20608001 thru T20609021, install the electrical connector cover on the junction box electrical connector (J-5) that is not used.

- (4) Install the cooling shield.

NOTE: Turbocharged airplanes do not have a cooling shield installed on the power junction box.

- (5) Connect the battery cables, refer to [Battery - Maintenance Practices](#).
- (6) Install the upper cowl, refer to Chapter 71, [Cowls - Maintenance Practices](#).

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 do work on power junction box components.

- (1) Components such as relays, current sensors and the alternator control unit can be replaced when necessary. Refer to the Model 206H/T206H Illustrated Parts Catalog for replacement part numbers.
- (2) Before disconnecting wires, identify and put a label on them for installation.
- (3) Torque values for ground and conductive 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.

Figure 201 : Sheet 1 : Power Junction Box Installation

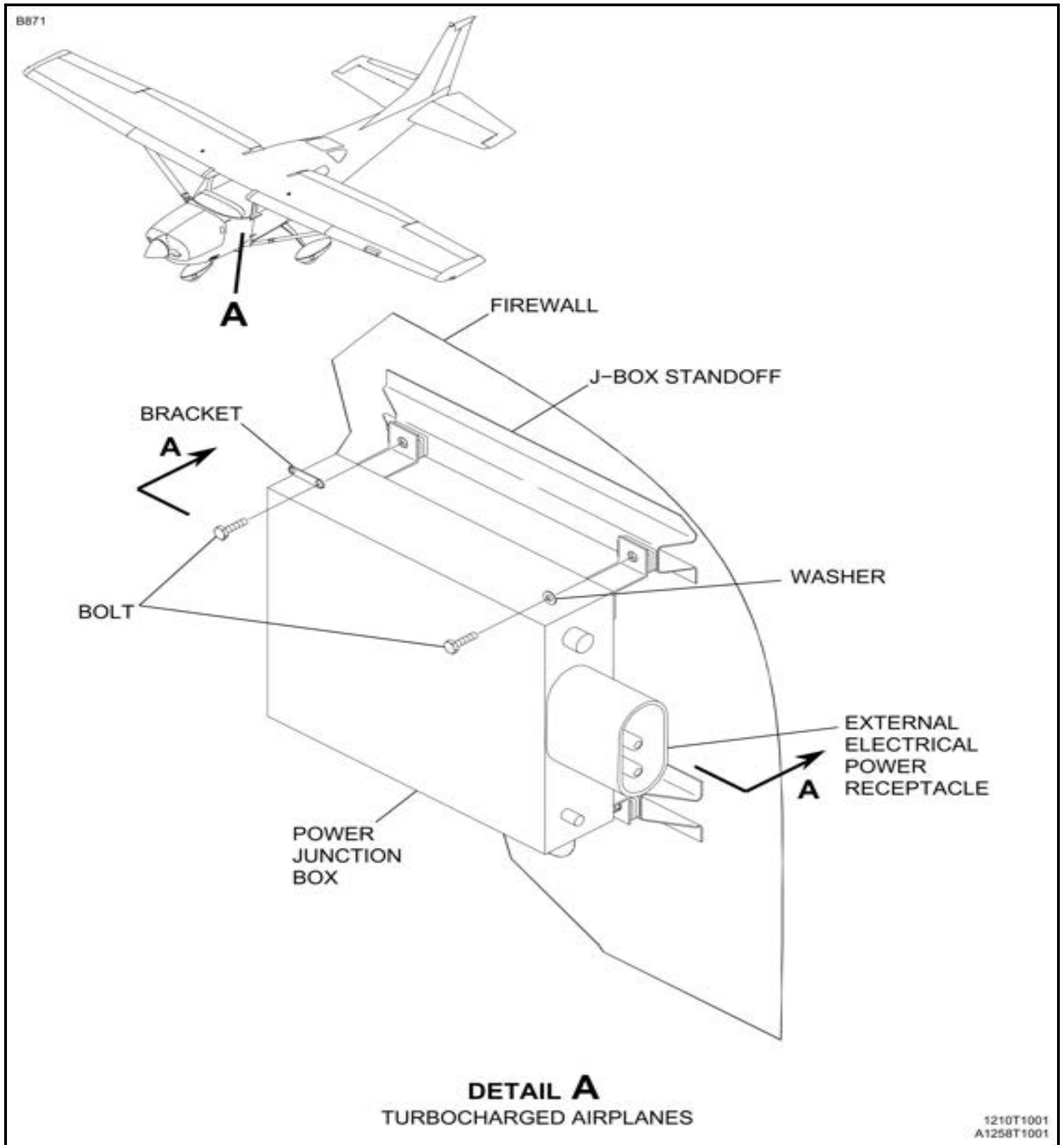


Figure 201 : Sheet 2 : Power Junction Box Installation

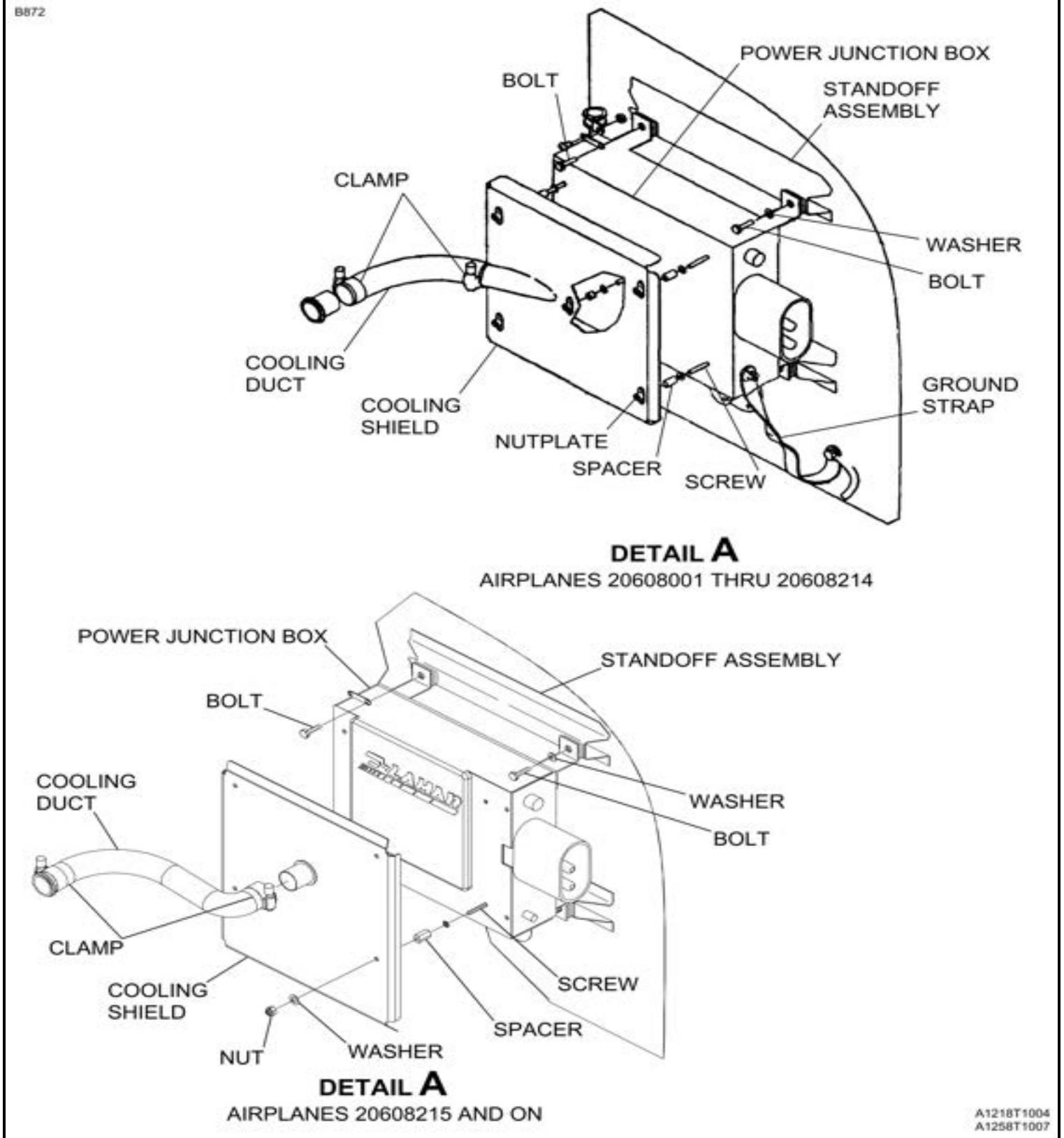


Figure 201 : Sheet 3 : Power Junction Box Installation

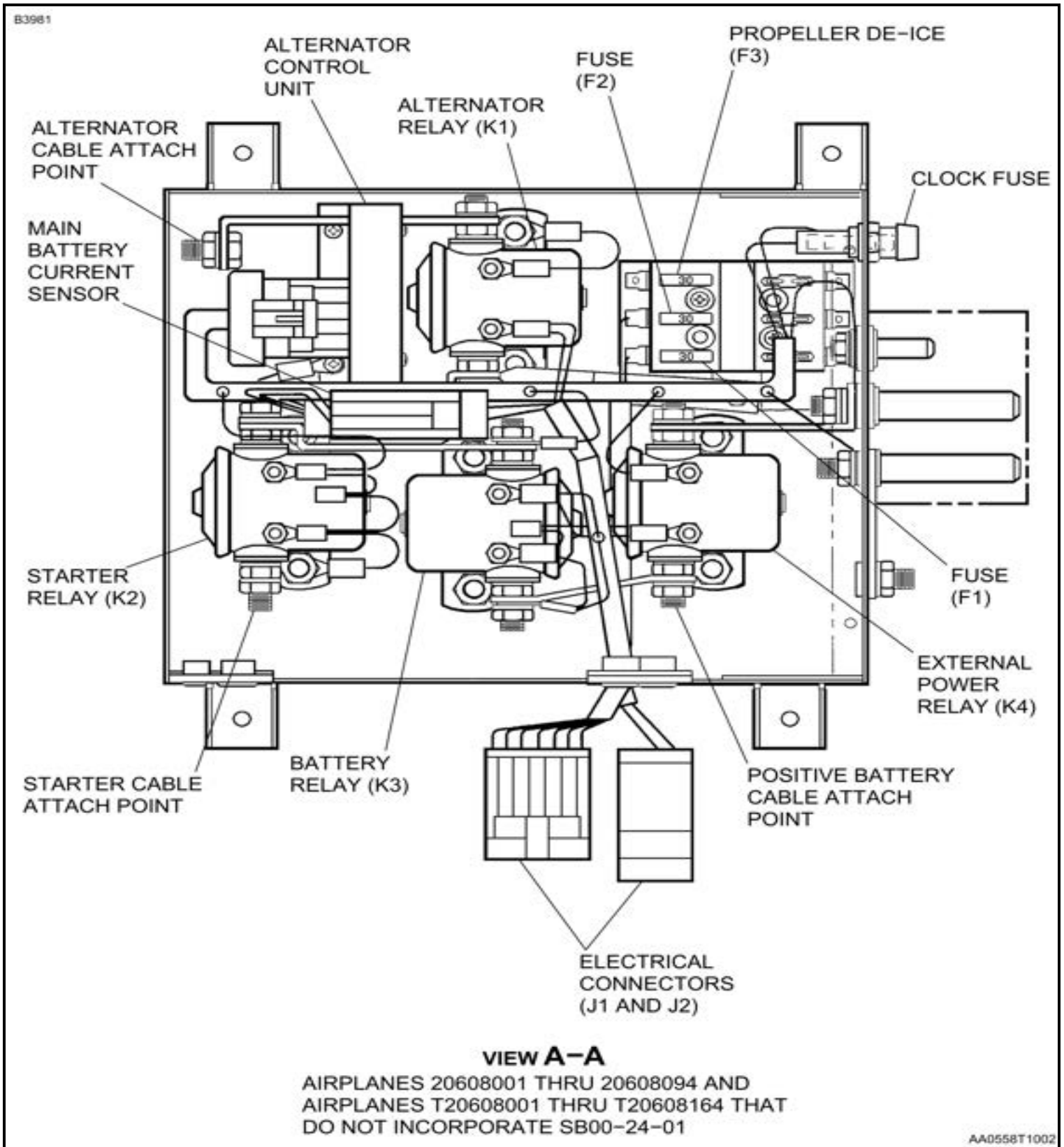
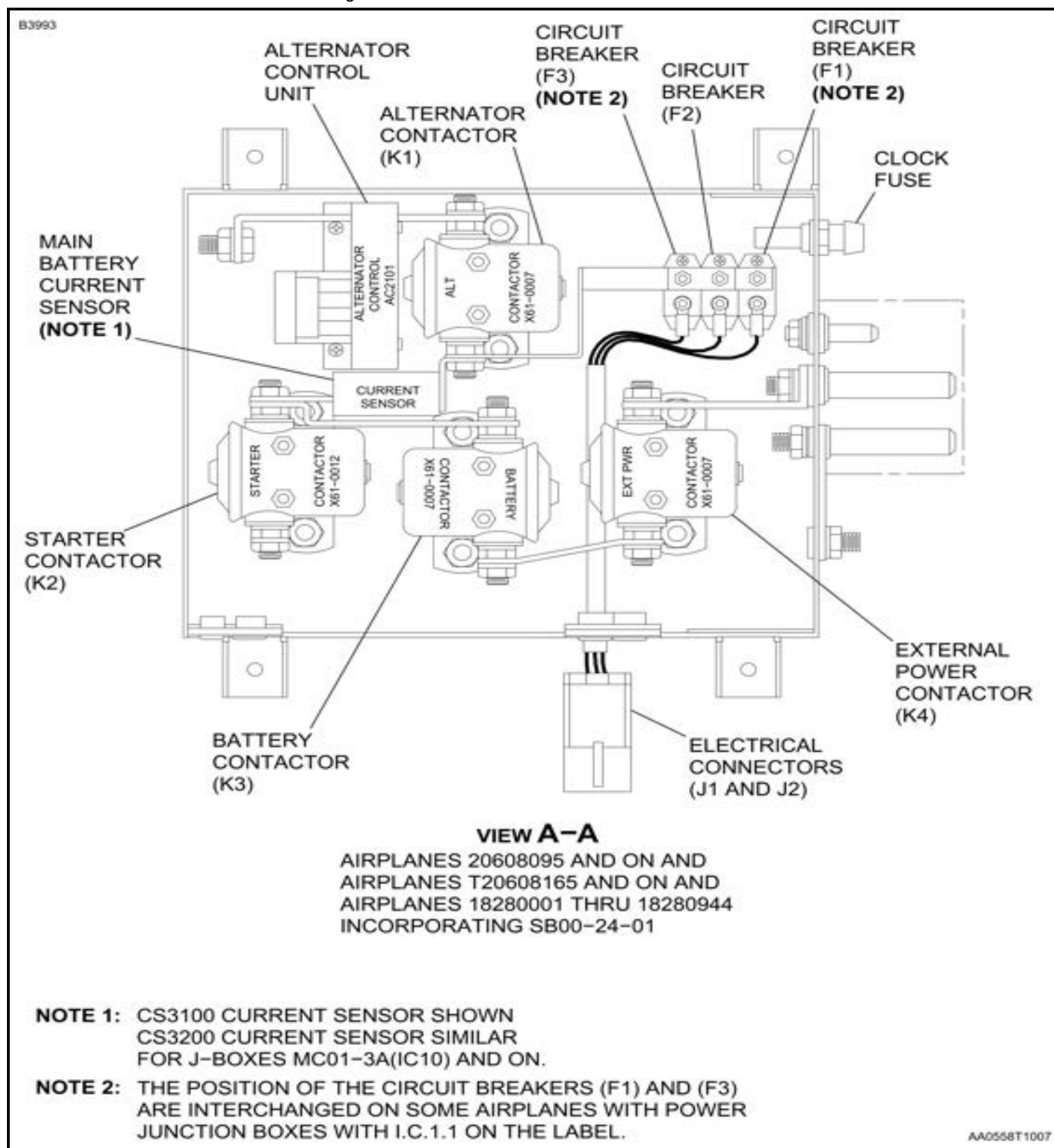


Figure 201 : Sheet 4 : Power Junction Box Installation



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.

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, [Cowls – 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.

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.

Figure 201 : Sheet 1 : Over-Voltage Protection Circuit Test with External Batteries

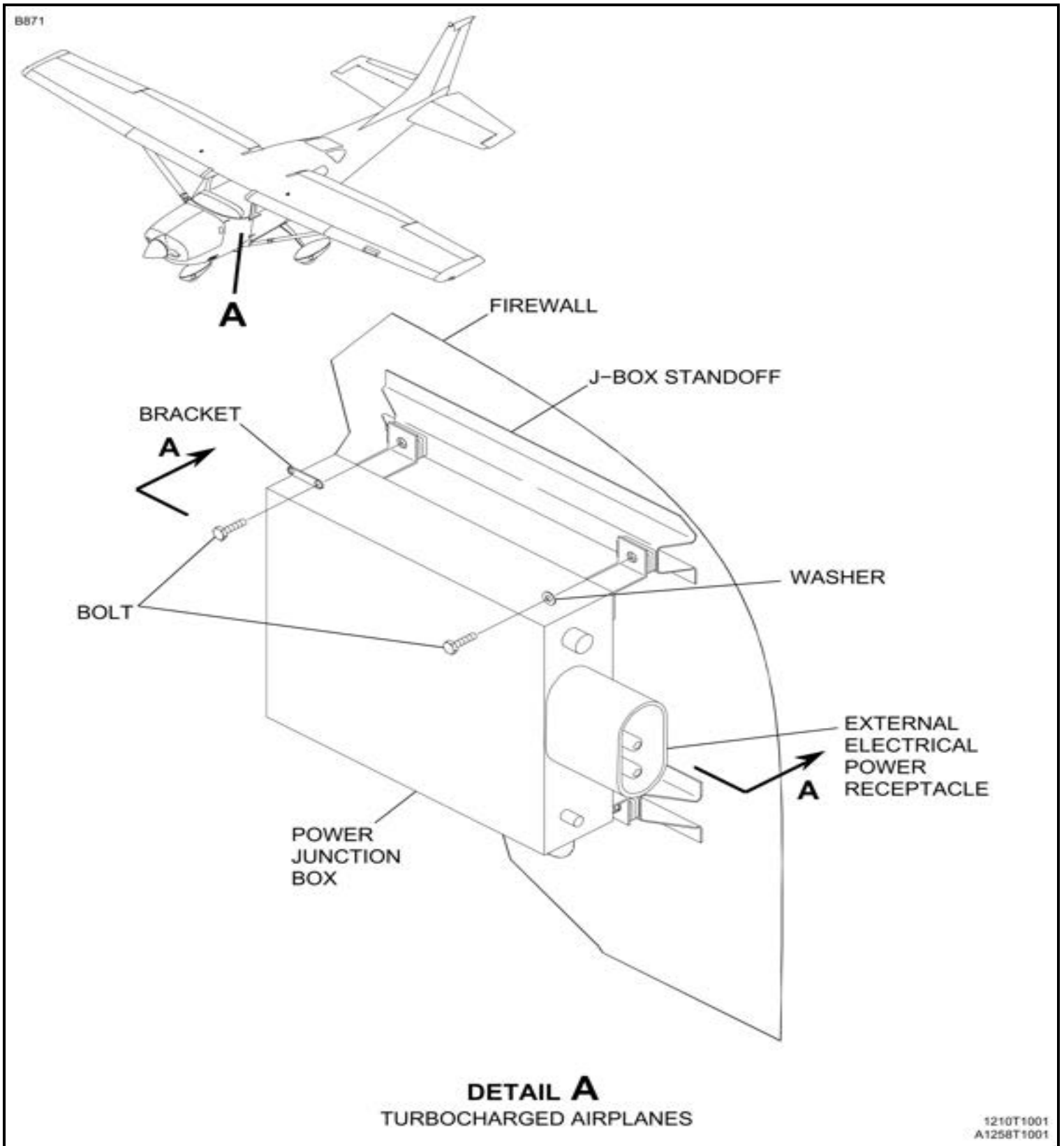


Figure 201 : Sheet 2 : Over-Voltage Protection Circuit Test with External Batteries

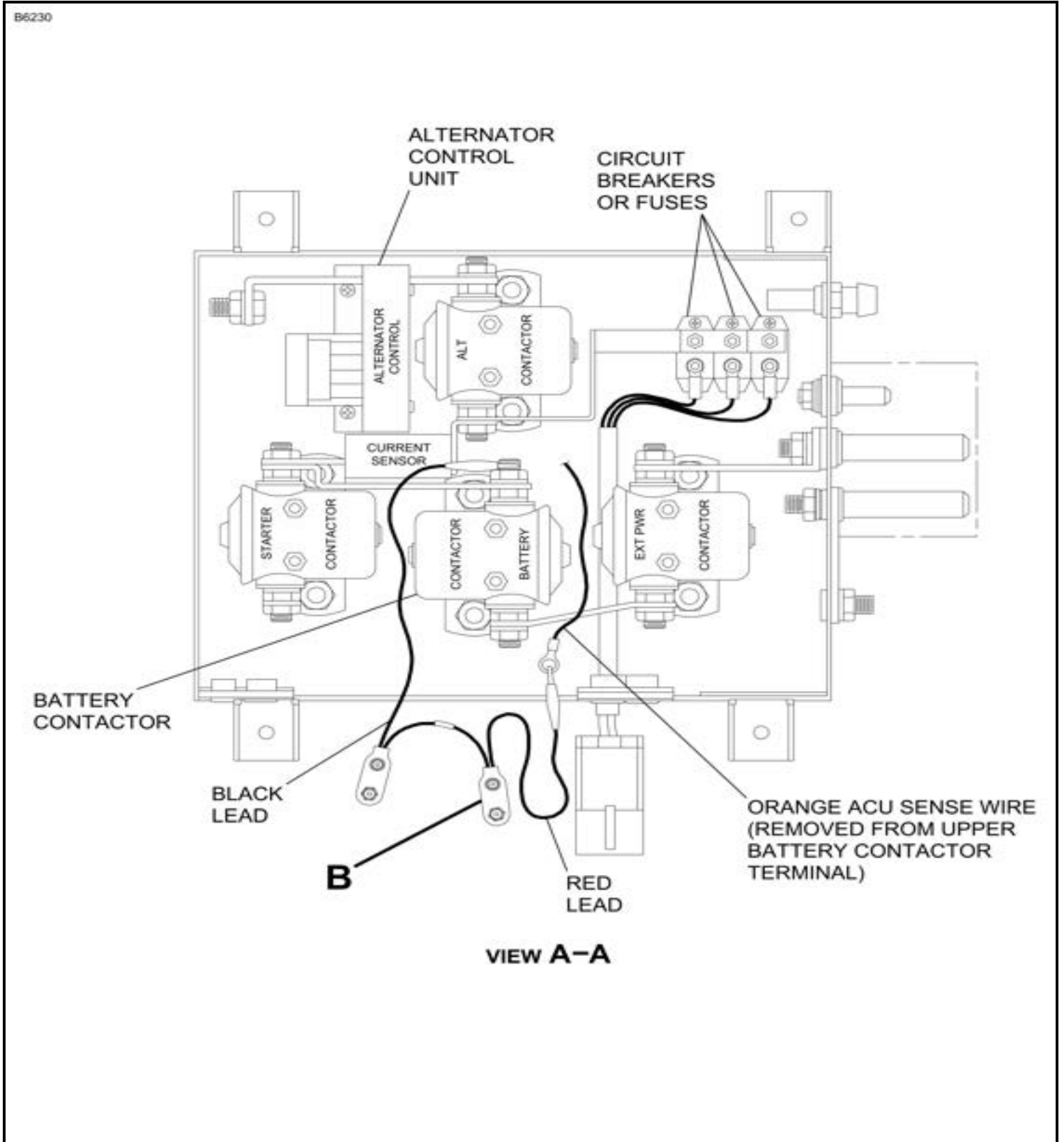
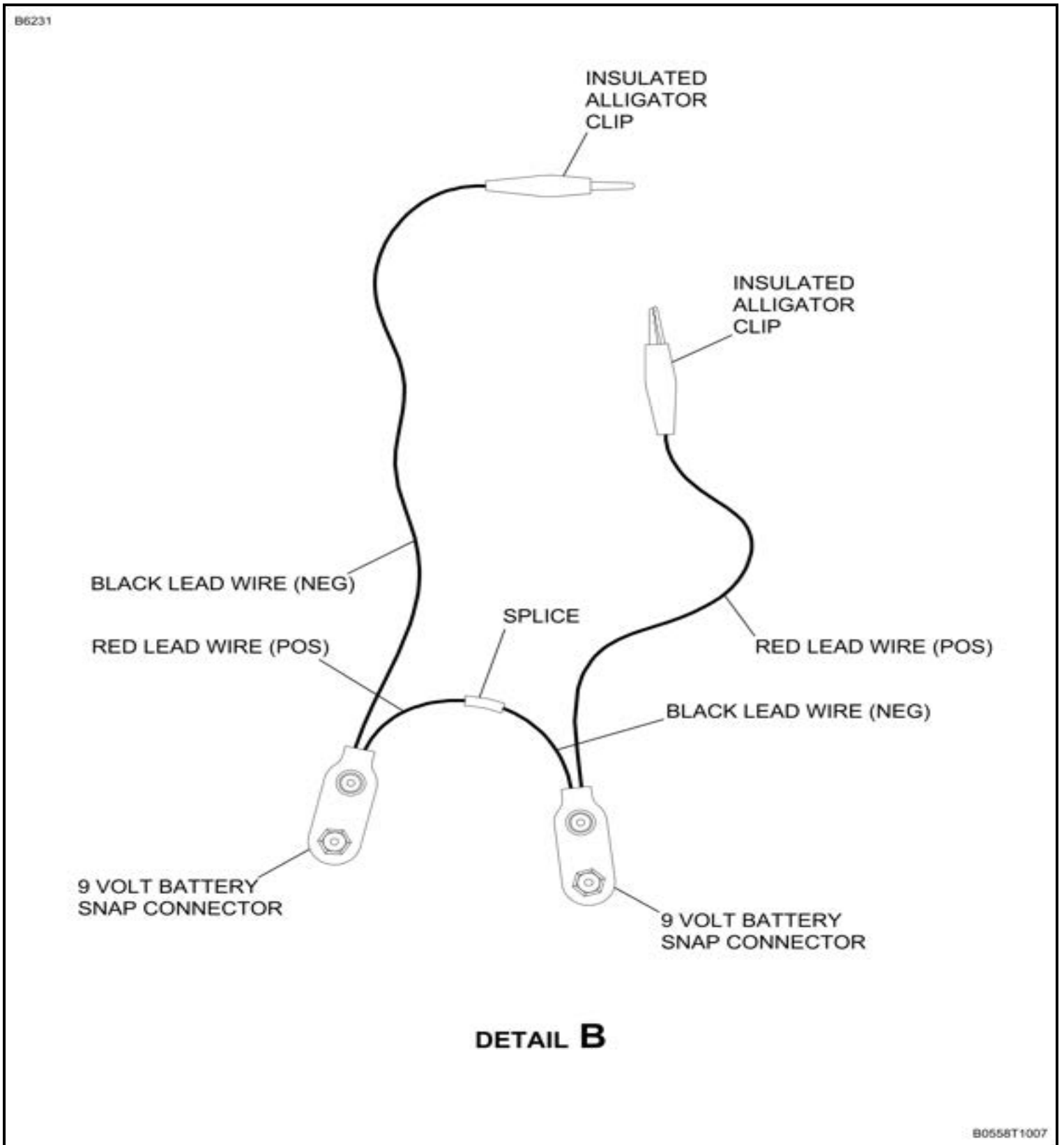


Figure 201 : Sheet 3 : Over-Voltage Protection Circuit Test with External Batteries



12-VOLT CABIN POWER SYSTEM - TROUBLESHOOTING

1. General

- A. The 12-volt cabin power outlet on the pedestal uses a power converter in the tailcone to convert 28-volt DC input power to 13.8-volt DC output power. The converter output can be used to power other electrical devices that require a 12-volt power input. The electrical connections are made with the use of a terminal block that is located on the side of the converter. The converter output can be turned on and off with the ON/OFF signal terminal located on the converter terminal block. When 28-VDC is applied to this terminal, the converter will turn the output on. No connection to the terminal will turn the output off.
- B. The 12-volt cabin power outlet behind the copilot seat and forward of the aft 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. Airplanes T20609622 and On, with the NAV III option have a USB cabin power interface installed in the pedestal in place of the 12-Volt cabin power interface. The USB interface is a self-contained, DC-DC power converter with USB type A and type C outlets that are used to supply USB compatible electronic devices with power. The USB power interface obtains 28 VDC of current through the CABIN LTS/PWR (HI056) circuit breaker and does not connect directly to the power converter.
- D. Airplanes T20609742, T20609757 and On with the NAV III option have USB power interfaces installed in the sidewalls adjacent to the headset plugs at each seat, in addition to USB cabin power interface installed in the pedestal. The USB interface is a self-contained, DC-DC power converter with USB type A and type C outlets that are used to supply USB compatible electronic devices with power. The USB power interface obtains 28 VDC of current through the CABIN LTS/PWR (HI056) circuit breaker.

2. Cabin Power Interface

- A. Test 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 20608001 thru 20608189 and T20608001 thru T20608387, you will have to 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 indicates 13.4 +0.9 or -0.9 volts at the cabin power interface.
 - (4) If the correct voltage is not indicated, troubleshoot the Power Converter.

3. Power Converter

- A. Test the Power Converter (Refer to [Figure 102](#) and to the Model 206/T206 Wire Diagram Manual, Chapter 24, Power Interface).
 - (1) Disconnect the connector (J1).
 - (2) Test for approximately 24 Volts between VI+ and VI- at the aircraft side of the connector (J1).
 - (3) Test for approximately 24 Volts between the ON/OFF and VI- at the aircraft side of the connector (J1).
 - (4) If there is no voltage, exam the wiring from the power convertor to the connector (J1) for damage or bad connections.
 - (a) Repair or replace the connector (J1) or the wiring as necessary.
 - 1 Attach the connector (J1).
 - 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- at the converter for an output of 13.4 +0.9 or -0.9 volts.
 - (a) If the correct voltage is supplied, do a check of the continuity from the aircraft side of the connector (J1) to the cabin power interface (JC022 automotive style) or (JC008 airline style).
 - 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.

4. USB Power Interface Removal/Installation (Airplanes T20609622 and On with NAV III Option)

- A. Remove the USB Power Interface (Refer to [Figure 101](#)).
 - (1) Get access to the USB Power Interface wire bundle. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (a) Remove the pedestal cover or applicable Headset/USB cover assembly.

- (2) Disconnect electrical connector from the ship-side connector. Refer to 24-50-01, Figure 05 and Figure 06 in the Model 206 (Series 1998 and On) Wiring Diagram Manual.
- (3) Remove the screws that secure the USB Power Interface to the panel or cover assembly.
- (4) Remove the USB Power Interface from the panel or cover assembly.
- B. Install the USB Power Interface (Refer to [Figure 101](#)).
 - (1) Put the USB Power Interface in its place on the panel or cover assembly.
 - (2) Install the screws that secure the USB Power Interface to the panel or cover assembly.
 - (3) Connect the electrical connector to the ship-side connector. Refer to 24-50-01, Figure 05 and Figure 06 in the Model 206 (Series 1998 and On) Wiring Diagram Manual.
 - (4) Install the panel or cover assembly in its place on the airplane. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

5. USB Cabin Power System Test (Airplanes T20609622 and On with NAV III Option)

- A. Complete a test of the Cabin Power System.
 - (1) Turn on aircraft power.
 - (2) Locate the USB Cabin Power Interface.
 - (3) Obtain a personal electronic device (PED) and charger cable that are USB compatible.
 - (4) Insert the USB charger cable into the applicable ports on the PED and the USB cabin power interface.
 - (a) The PED should indicate that it is charging.
 - (b) If the PED does not indicate that it is charging, troubleshoot the USB cabin power interface. Refer to the USB Cabin Power Interface Troubleshooting in this document.
 - (5) Locate and disengage the CABIN LTS/PWR (HI506) circuit breaker on the circuit breaker panel.
 - (a) The PED should indicate that it is not charging.
 - (6) Engage the CABIN LTS/PWR circuit breaker.
 - (7) Disconnect the PED and charger cable from the USB cabin power interface.
 - (8) Turn off aircraft power.

6. Pedestal USB Cabin Power Interface Troubleshooting (Airplanes T20609622 and On with NAV III Option)

- A. Complete the USB Cabin Power Interface Troubleshooting.
 - (1) Turn on aircraft power.
 - (2) Check the CABIN LTS/PWR (HI056) circuit breaker as follows:
 - (a) Make the circuit breaker is engaged.
 - (b) Check the USB cabin power interface for proper operation with a USB compatible PED and charger cable. Refer to the USB Cabin Power System test in this document.
 - 1 If the USB cabin power interface indicates proper operation, return the airplane to service.
 - 2 If the USB cabin power interface does not indicate proper operation with an engaged circuit breaker, go to the next step of the troubleshooting.
 - (3) Check for proper electrical voltage as follows:
 - (a) Get access to the USB Cabin Power Interface wire bundle. Remove the pedestal cover assembly. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (b) Disconnect electrical connector JC024 from the ship-side connector PC024. Refer to 24-50-01, Figure 05 in the Model 206 (Series 1998 and On) Wiring Diagram Manual.
 - (c) With a voltmeter, check Pin 1 on ship-side electrical connector PC024 for 28 VDC.
 - 1 If there is 28 VDC, replace the USB cabin power interface. Refer to the USB Cabin Power Interface Removal/Installation in this document. Go to the last step of the troubleshooting.
 - 2 If there is no 28 VDC, check the wiring for damage or kinks. Repair or replace any damaged wiring and proceed to the next step.
 - (d) If you repaired wiring for damage/kinks, check Pin 1 on PC024 for 28 VDC.

- 1 If Pin 1 has 28 VDC, reconnect electrical connectors PC024 and JC024 and go to the next step.
 - 2 If Pin 1 does not have 28 VDC, replace the CABIN LTS/PWR (HI506) circuit breaker and go to the next step.
Refer to Chapter 24, [Circuit Breaker - Maintenance Practices](#).
- (4) Check the USB cabin power interface for proper operation with a USB compatible PED and charger cable. Refer to the USB Cabin Power System test in this document.
- (a) If the USB cabin power interface indicates proper operation, install the pedestal cover assembly as needed. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (b) If the USB cabin power interface does not indicate proper operation, contact Textron Aviation Customer Support.

7. USB Power Interface Troubleshooting (Airplanes T20609742, T20609757 and On with NAV III Option)

A. Complete the USB Power Interface Troubleshooting.

- (1) Check the CABIN LTS/PWR (HI056) circuit breaker as follows:
 - (a) Make the circuit breaker is engaged.
 - (b) Check the USB power interface for proper operation with a USB compatible PED and charger cable. Refer to the USB Cabin Power System test in this document.
 - 1 If the USB power interface indicates proper operation, return the airplane to service.
 - 2 If the USB power interface does not indicate proper operation with an engaged circuit breaker, go to the next step of the troubleshooting.
- (2) Check for proper electrical voltage as follows:
 - (a) Get access to the USB Power Interface wire bundle. Remove the applicable Headset/USB cover assembly. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (b) Disconnect electrical connector from the ship-side connector. Refer to 24-50-01, Figure 06 in the Model 206 (Series 1998 and On) Wiring Diagram Manual.
 - (c) With a voltmeter, check Pin 1 on the ship-side electrical connector for 28 VDC.
 - 1 If there is 28 VDC, replace the USB power interface. Refer to the USB Cabin Power Interface Removal/Installation in this document. Go to the last step of the troubleshooting.
 - 2 If there is no 28 VDC, check the wiring for damage or kinks. Repair or replace any damaged wiring and proceed to the next step.

NOTE: If troubleshooting USB power interfaces for aft passenger seats, check connector PC054/JC054 located under the mid cabin floorboard 231EB.
 - (d) If you repaired wiring for damage/kinks, check Pin 1 on the ship side connector for 28 VDC.
 - 1 If Pin 1 has 28 VDC, reconnect electrical connectors and go to the next step.
 - 2 If Pin 1 does not have 28 VDC, replace the CABIN LTS/PWR (HI506) circuit breaker and go to the next step.
Refer to Chapter 24, [Circuit Breaker - Maintenance Practices](#).
- (3) Check the USB power interface for proper operation with a USB compatible PED and charger cable. Refer to the USB Cabin Power System test in this document.
 - (a) If the USB power interface indicates proper operation, install the Headset/USB cover assembly as needed. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (b) If the USB power interface does not indicate proper operation, contact Textron Aviation Customer Support.

Figure 101 : Sheet 1 : Cabin Power Interface

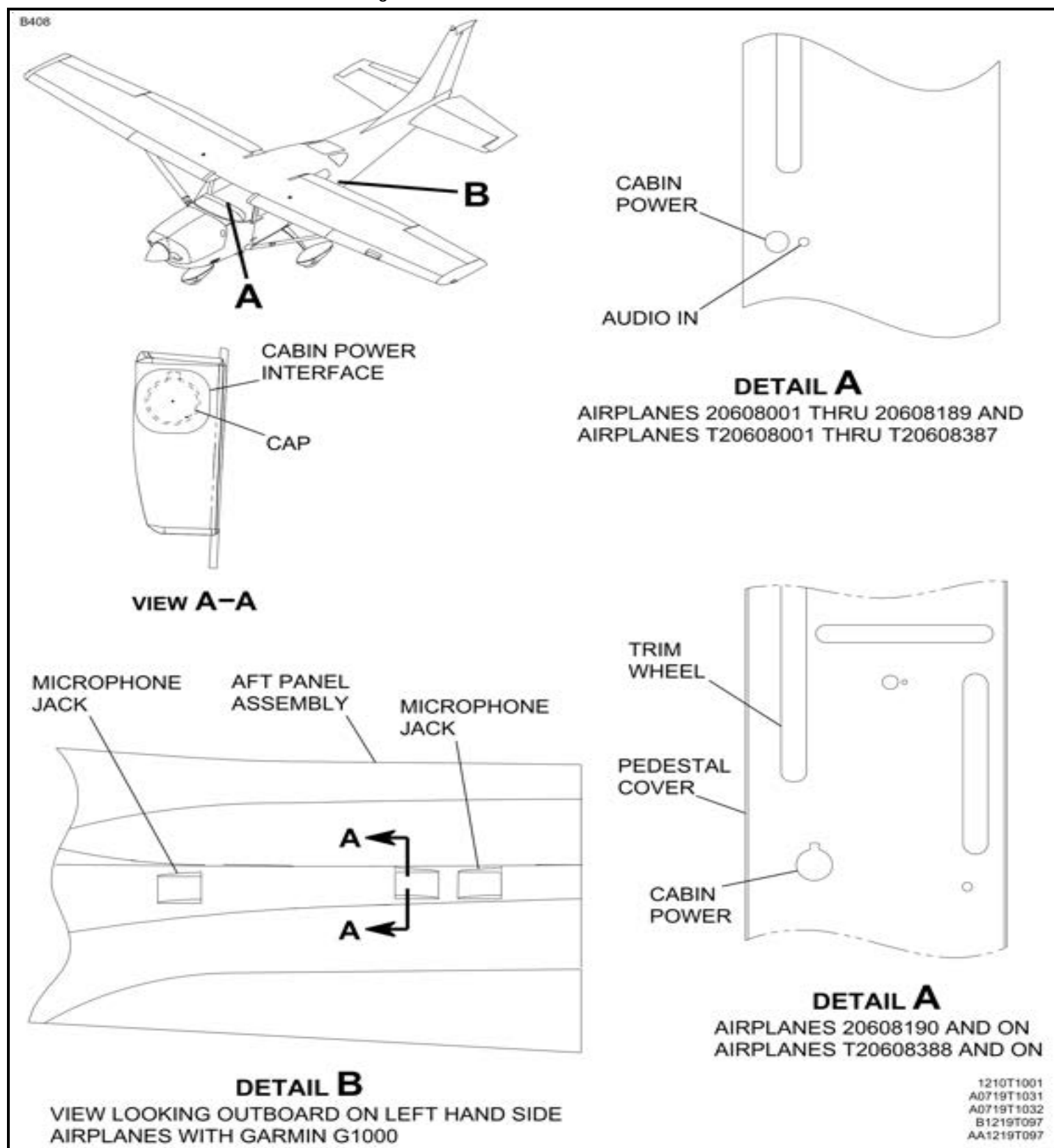


Figure 101 : Sheet 2 : Cabin Power Interface

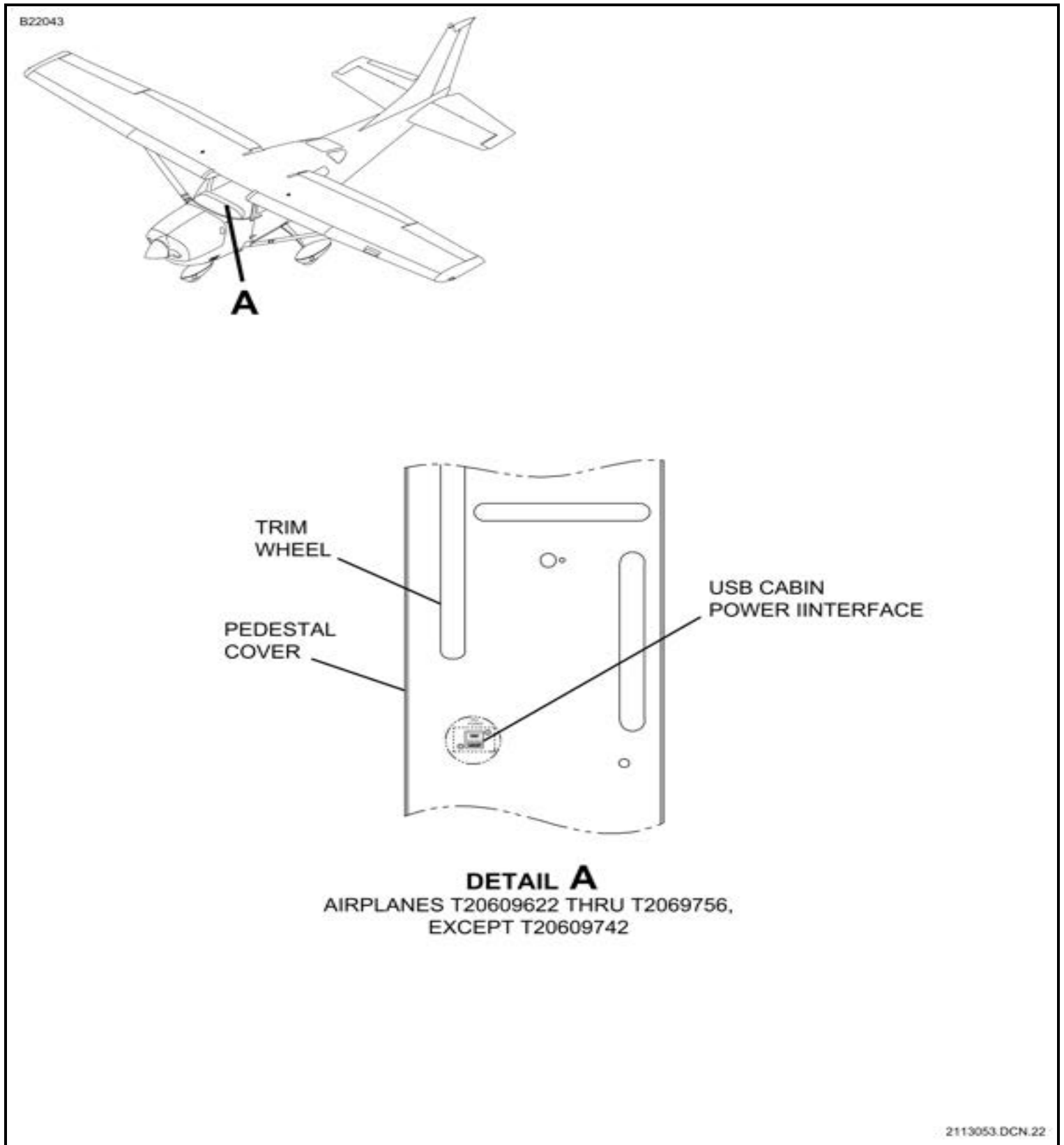


Figure 101 : Sheet 3 : Cabin Power Interface

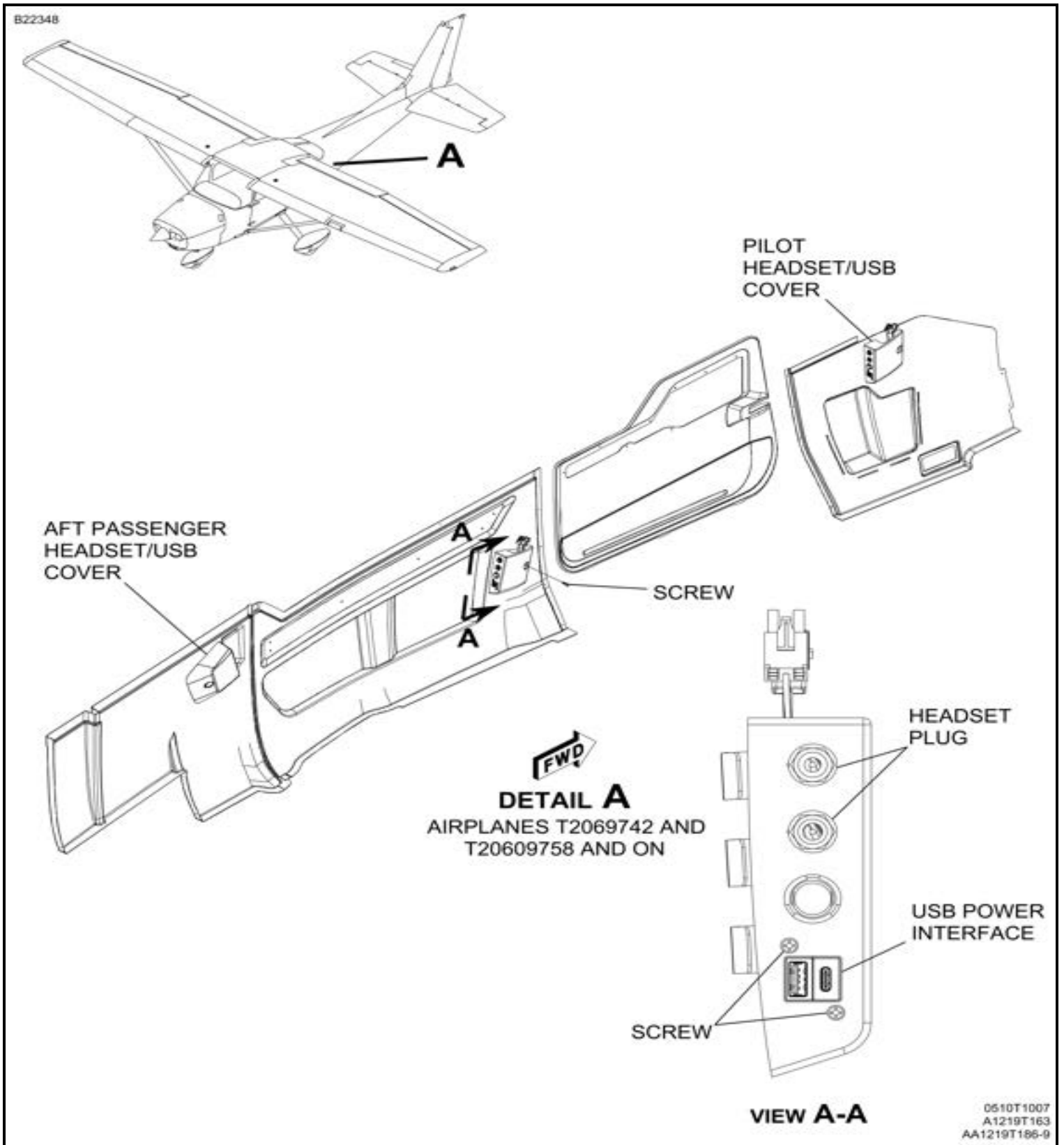
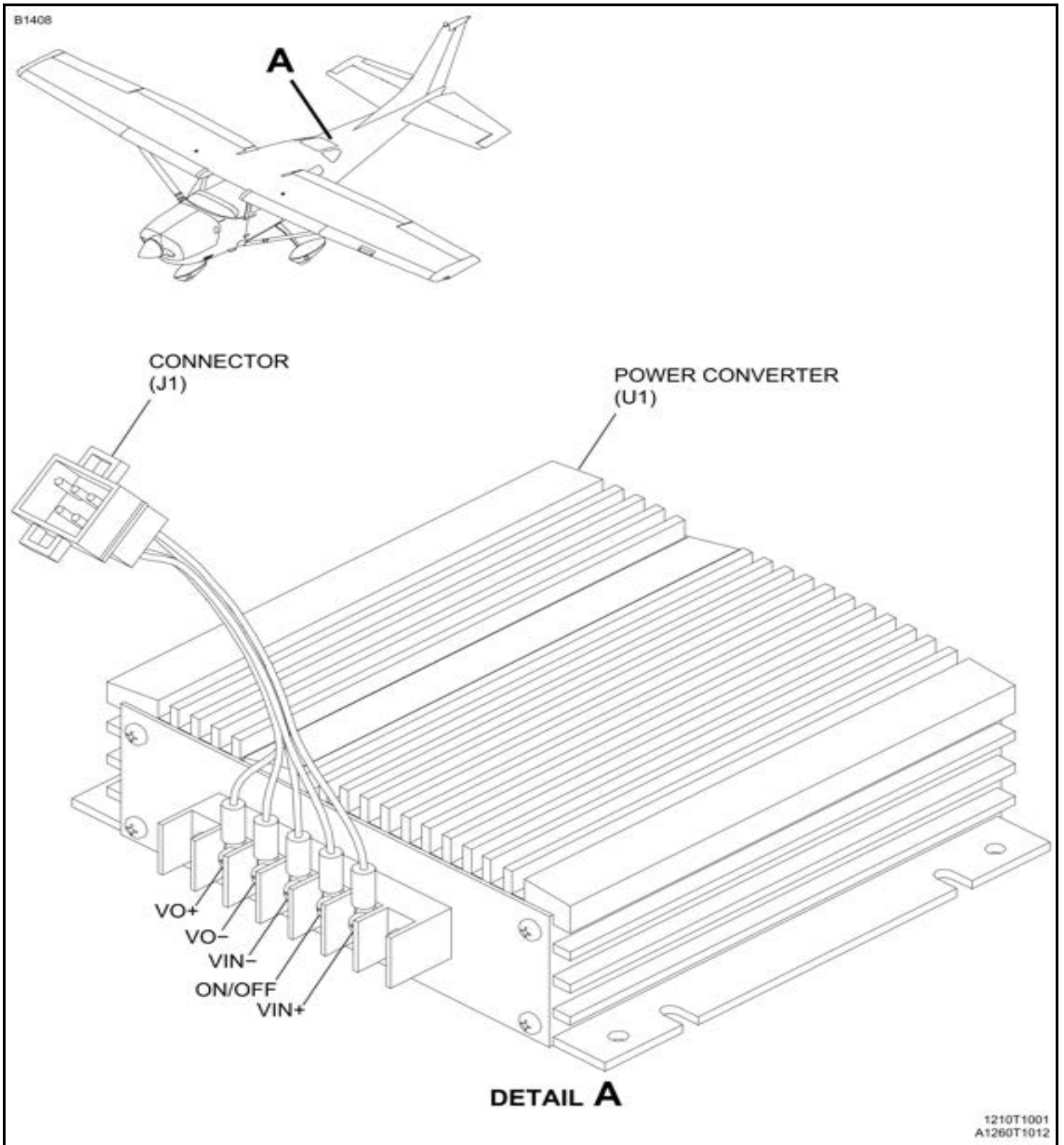


Figure 102 : Sheet 1 : Power Converter



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 for airplanes with Garmin G1000 holds the electrical circuit breakers and the magneto switches. The circuit breaker panel for airplanes without Garmin G1000 also holds the MASTER ALT BAT switch, AVIONICS master switch and the panel lighting controls.

2. Circuit Breaker Removal/Installation

- A. Remove the Circuit Breaker (Refer to [Figure 201](#), [Figure 202](#), or [Figure 203](#)).

- (1) Remove the top right cowl. Refer to Chapter 71, [Cowl - Maintenance Practices](#).
- (2) Disconnect the battery cables. Refer to [Battery - Maintenance Practices](#).
- (3) Remove the screws that attach the circuit breaker panel to the bottom instrument panel.
- (4) Remove the circuit panel.
- (5) Identify with a label the wires for the circuit breaker and disconnect them.
- (6) Remove the nut and washer that attach the circuit breaker to the circuit breaker panel.
- (7) Remove the circuit breaker.

- B. Install the Circuit Breaker (Refer to [Figure 201](#), [Figure 202](#), or [Figure 203](#)).

NOTE: To install or align the circuit breaker cover, it is permitted to add an additional nut between each circuit breaker and circuit breaker panel.

- (1) Put the circuit breaker in the circuit breaker panel and attach it with a washer and nut.
- (2) Connect the wire to the circuit breaker and remove the identification label.
- (3) Install the circuit breaker panel.
 - (a) Put three ground straps between the circuit breakers and the panel.
 - (b) Put the circuit breaker cover over the circuit breakers. Make sure you put the main power bus wires and the circuit panel wire bundle out through the left side of the cover.

NOTE: The flanges on the cover fit between the circuit breakers and the panel. Indentions in the cover must match screw holes in panel.

- (c) Tie down the cover with the three ground straps installed.
- (4) Install the circuit breaker panel on the bottom instrument panel and attach with screws.
- (5) Connect the battery cables, refer to [Battery - Maintenance Practices](#).
- (6) Install the top right cowl, refer to Chapter 71, [Cowl - Maintenance Practices](#).

Figure 201 : Sheet 1 : Circuit Breaker Panel Installation

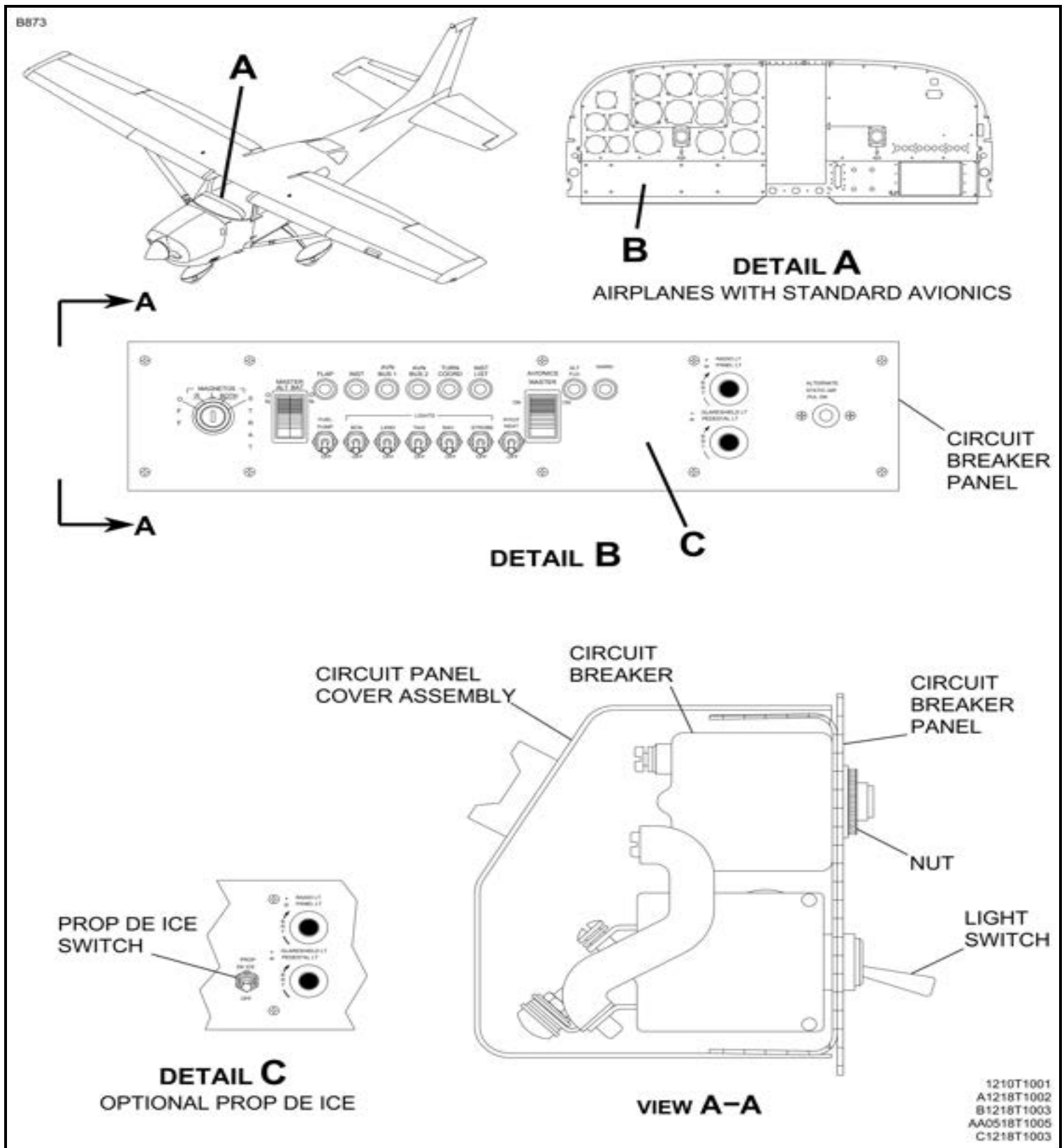


Figure 202 : Sheet 1 : Circuit Breaker Panel Installation

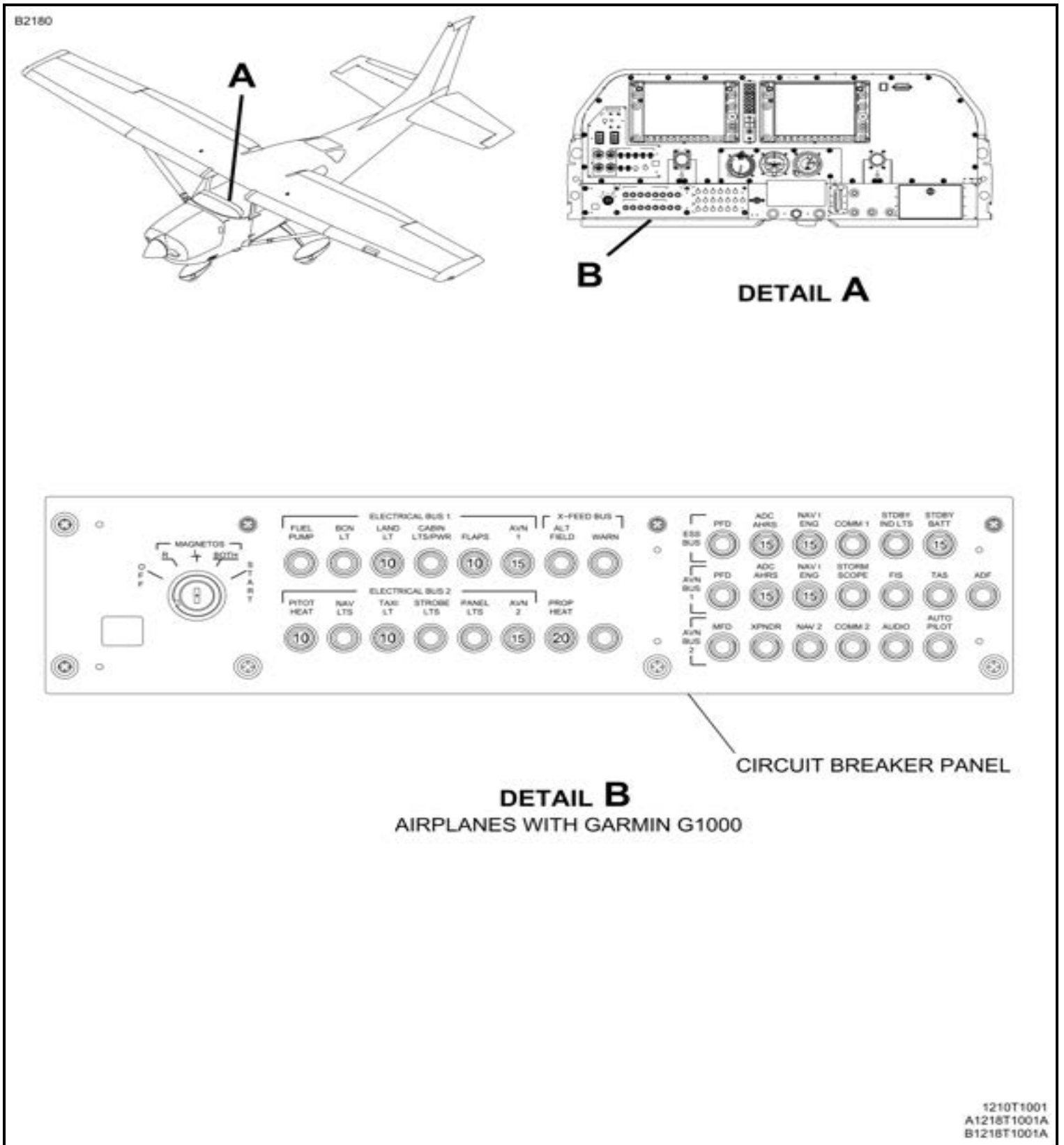
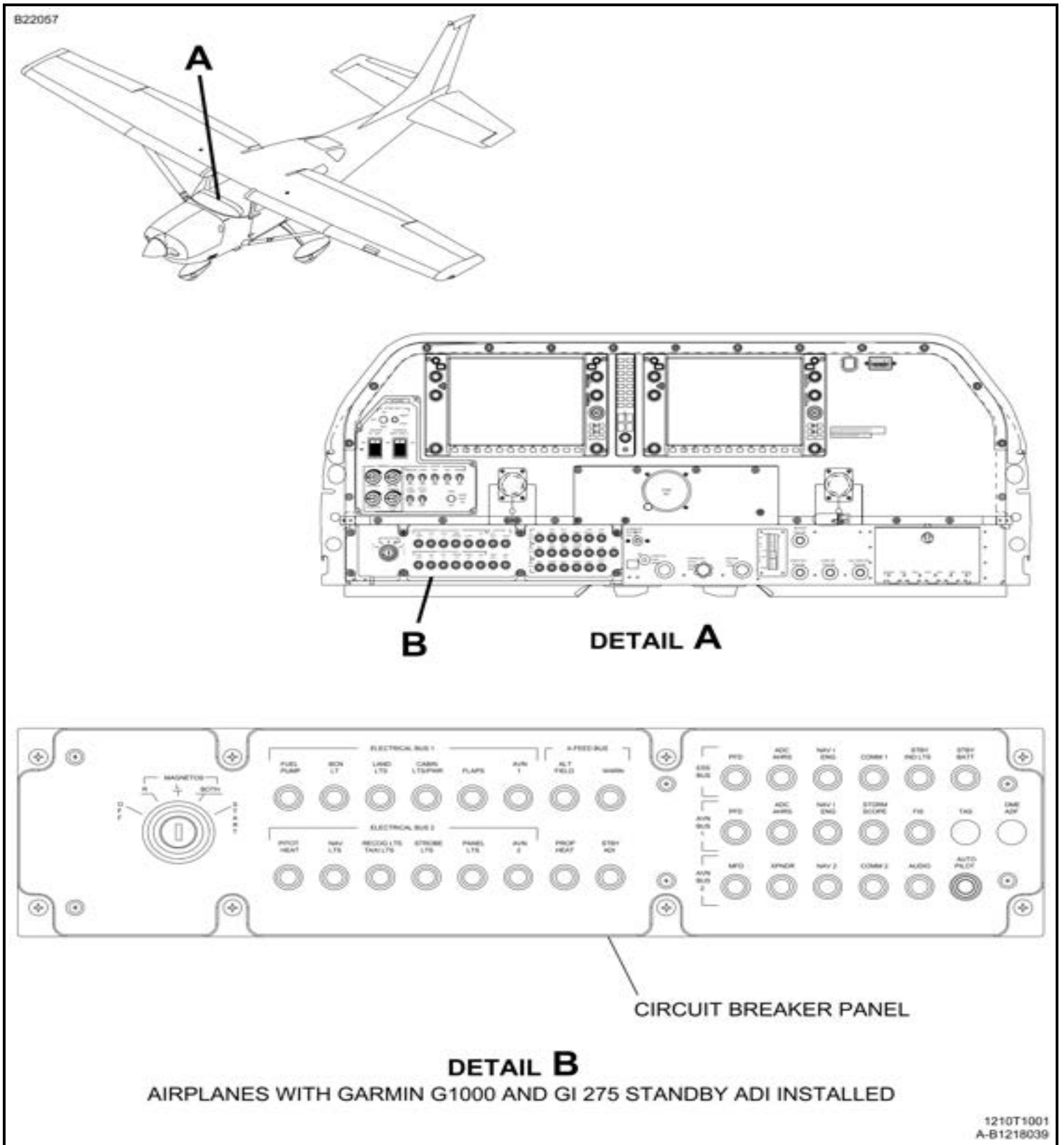


Figure 203 : Sheet 1 :



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 will 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 buses from the two primary buses and at the same time isolate the two primary buses.
- C. For maintenance data on the power junction box, refer to [Power Junction Box - Maintenance Practices](#).

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 [Circuit Breaker - Maintenance Practices](#).
 - (2) Carefully remove the heat shrinkable tubing from the diode. Refer to the 206H/T206H 1997 and On Wiring Diagram Manual, Chapter 20, Heat Shrinkable Tubing - Maintenance Practices.
 - (3) Remove the solder from the wire and from the diode. Refer to the Model 206H/T206H 1997 and On Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
 - (4) Remove the nut and 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 washer to the circuit breaker panel.
 - (3) Install the heat shrinkable tubing over the wire. Refer to the 206H/T206H 1997 and On Wiring Diagram Manual, Chapter 20, Heat Shrinkable Tubing - Maintenance Practices.
 - (4) Add solder to attach the wire to the diode. Refer to Model 206H/T206H 1997 and On Wiring Diagram Manual, Chapter 20, Soldering - Maintenance Practices.
 - (5) Apply heat to the heat shrinkable tubing with a heat gun until the tubing has a tight fit around the wire and diode. Refer to the 206H/T206H 1997 and On Wiring Diagram Manual, Chapter 20, Heat Shrinkable Tubing - Maintenance Practices.
 - (6) Install the circuit breaker panel. Refer to [Circuit Breaker - Maintenance Practices](#).

3. Essential and Crossfeed Bus Diode Inspection

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. Do inspections of the essential and crossfeed bus diodes in accordance with the time limits shown in Chapter 5, [Inspection Time Limits](#).

NOTE: Airplanes 20608095 and ON, Airplanes T20608165 and ON, and Airplanes incorporating SB00-24-01 do not use fuses in the power junction box.

CAUTION: Do not remove 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 annunciation 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 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.
- (8) Make sure that the landing light and oil pressure annunciation come on. If the taxi light comes on or the oil pressure annunciation 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) in the power junction box. 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 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 annunciation come on. If the landing light comes on or the oil pressure annunciation 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) in the power junction box. 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 thinner blades.
 - (16) If the diodes are replaced, do this test again to make sure that all diodes operate correctly.
 - (17) 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 Garmin G1000 avionics.

CAUTION: Do not remove bus wires from the circuit breakers with 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 annunciation 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 nuts and the lock washers that connect the bus wires to the circuit breakers (F1) and (F3). (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
 - (7) Remove the wire terminals from the (F1) and the (F3) circuit breaker studs that have a label of AUX and isolate the ends of the bus wires.
 - (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 annunciation come on. If the taxi light comes on, or the oil pressure annunciation 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 wires to the circuit breakers (F1) and (F3) terminals with the hex nuts and the washers that were removed.
 - (12) Torque the nuts from 20 inch-pounds to 25 inch-pounds (2.3 N-m to 2.8 N-m).
 - (13) Remove the hex nut and lock washer that connect the bus wire to the circuit breaker (F2). (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
 - (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 oil pressure annunciation come on. If the landing light comes on or the oil pressure annunciation 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 circuit breaker (F2) terminal. Use the same hex nut and washer that were removed. (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
 - (19) Torque the nut from 20 inch-pounds to 25 inch-pounds (2.3 N-m to 2.8 N-m).
 - (20) If the diodes are replaced, do this test again to make sure that all diodes operate correctly.
 - (21) 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 Garmin G1000 avionics.

CAUTION: Do not remove bus wires from the circuit breakers with the MASTER BAT or the STDBY BATT switches in the ON position.

- (1) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (2) Make sure that the STDBY BATT and the AVIONICS master switches 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 buses. The GEA-71 must be on to show the voltage of the crossfeed bus. If there are no red X's on the engine indications, 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 nuts and the lock washers that connect the bus wires to the circuit breakers (F1) and (F3). (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
- (9) Remove the wire terminals from the (F1) and the (F3) circuit breaker studs that have a label of AUX and isolate the ends of the bus wires.
- (10) Set the 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 primary flight display (PFD). If the taxi light comes on or 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 wires to the circuit breaker (F1) and (F3) terminals with the same hex nuts and washers that were removed. (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
- (14) Torque the nuts from 20 inch-pounds to 25 inch-pounds (2.3 to 2.8 N-m).
- (15) Remove the hex nut and lock washer that connects the bus wire to the circuit breaker (F2). (Refer to [Power Junction Box - Maintenance Practices, Figure 201](#)).
- (16) Remove the wire terminal from the circuit breaker (F2) stud and isolate the end of the bus wire.
- (17) Set the MASTER BAT, TAXI LIGHT, and LAND LIGHT switches to the ON position.
- (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 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](#)).
 - (a) Tighten the nut to a torque of 20 inch-pounds to 25 inch-pounds (2.3 to 2.8 N-m).
- (21) If the diodes are replaced, do this test again to make sure that all diodes operate correctly.
- (22) Install the 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/crossfeed diodes is an alternative to the test procedure that follows.

A. Do a test of the essential/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 shrink or 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](#).
- (6) When the diodes are replaced, do the applicable essential/crossfeed diode inspection (3A, 3B, or 3C) again to make sure that all diodes operate correctly.
- (7) Install the circuit breaker panel. Refer to [Circuit Breaker - Maintenance Practices](#).

Figure 201 : Sheet 1 : Essential and Crossfeed Bus Diode Installation

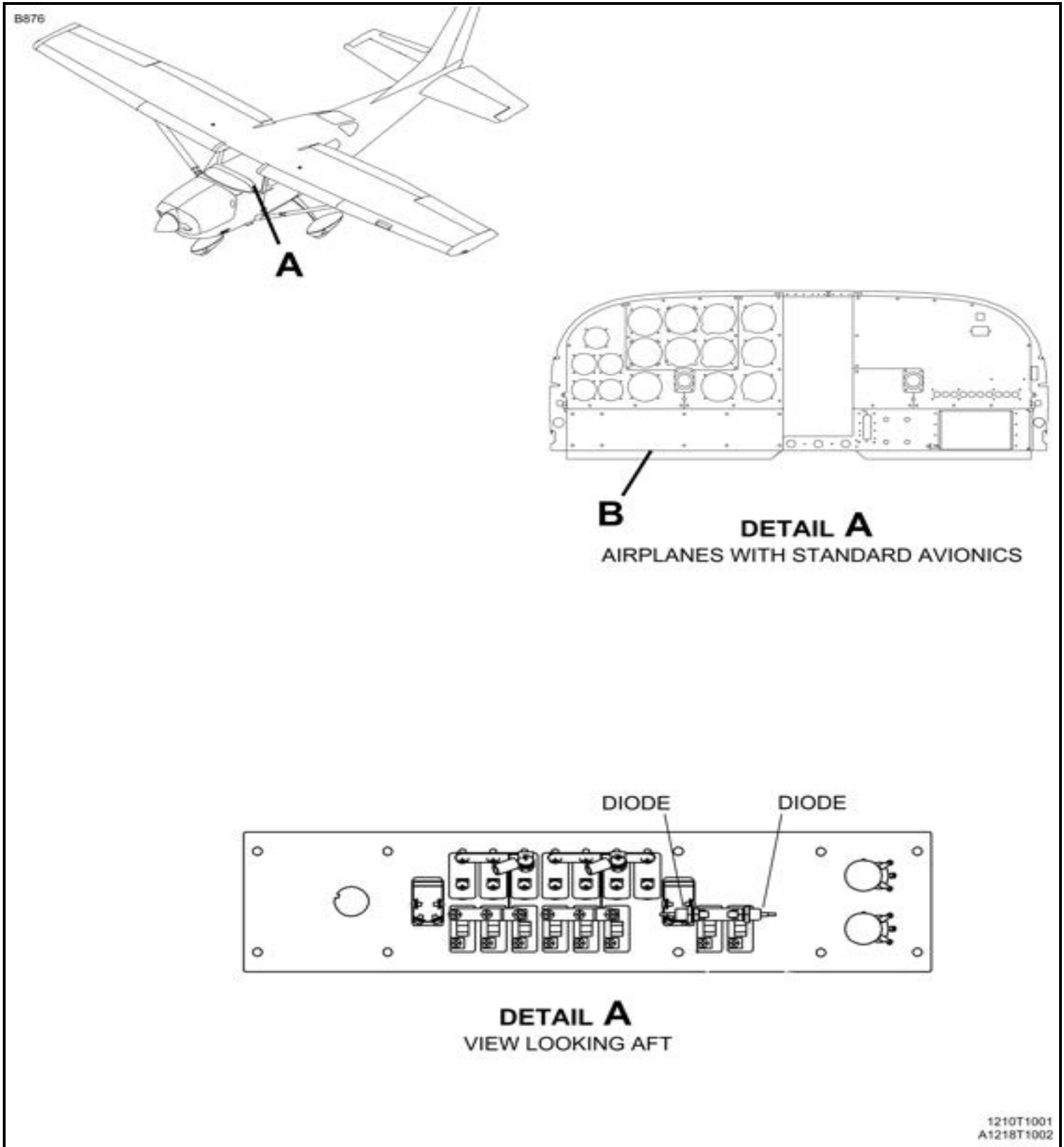


Figure 201 : Sheet 2 : Essential and Crossfeed Bus Diode Installation

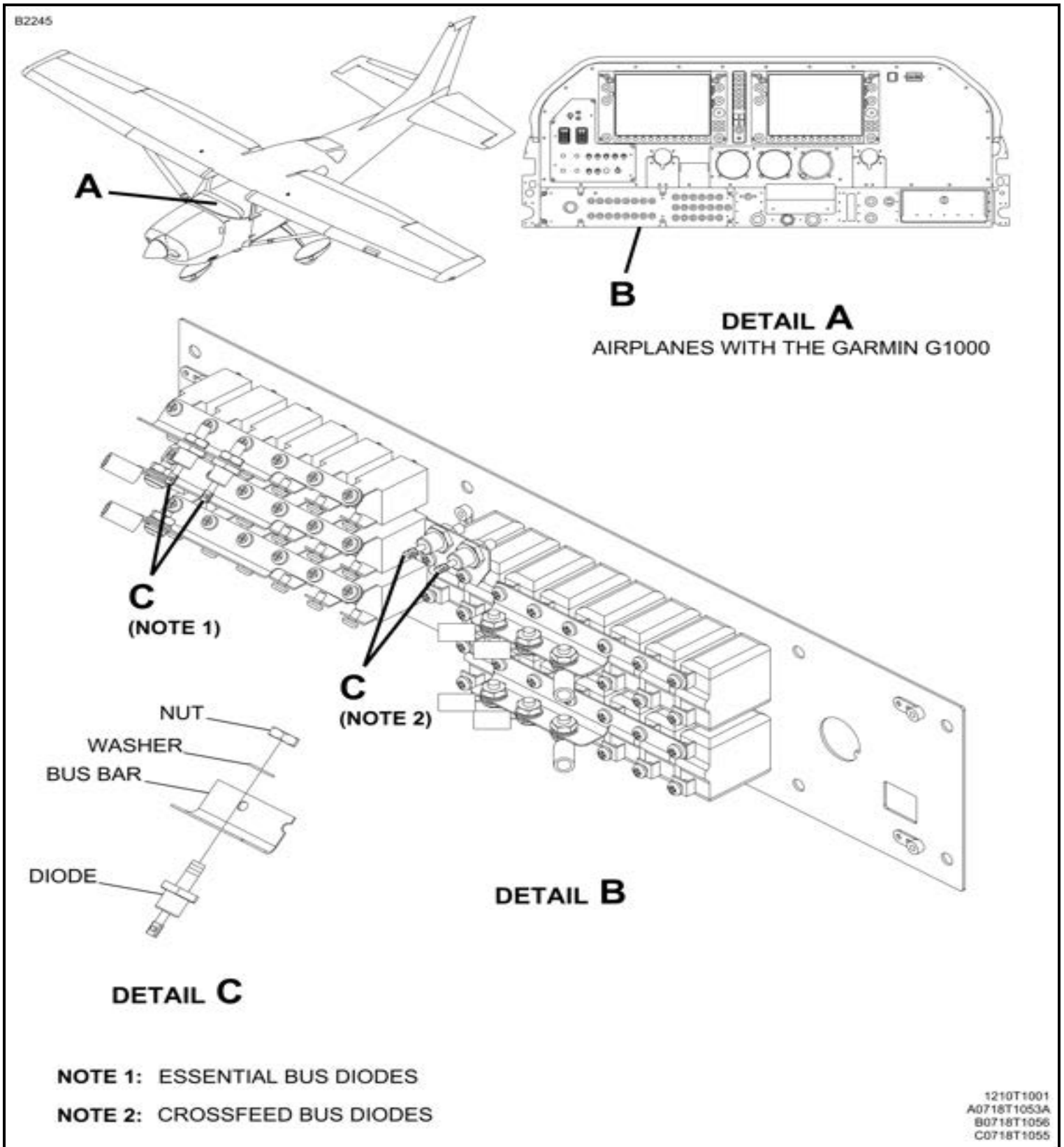


Figure 201 : Sheet 1 : Power Junction Box Installation

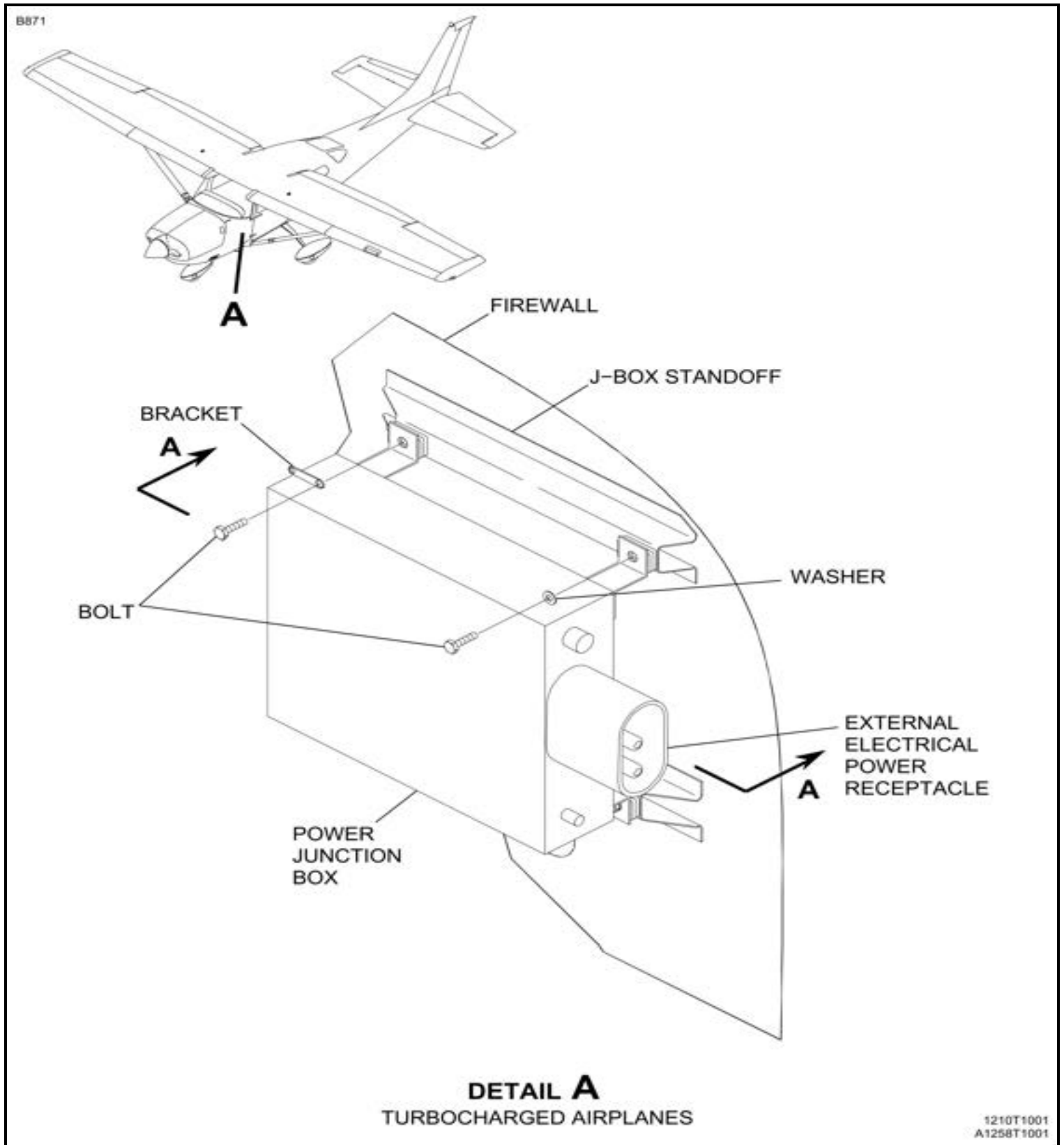


Figure 201 : Sheet 2 : Power Junction Box Installation

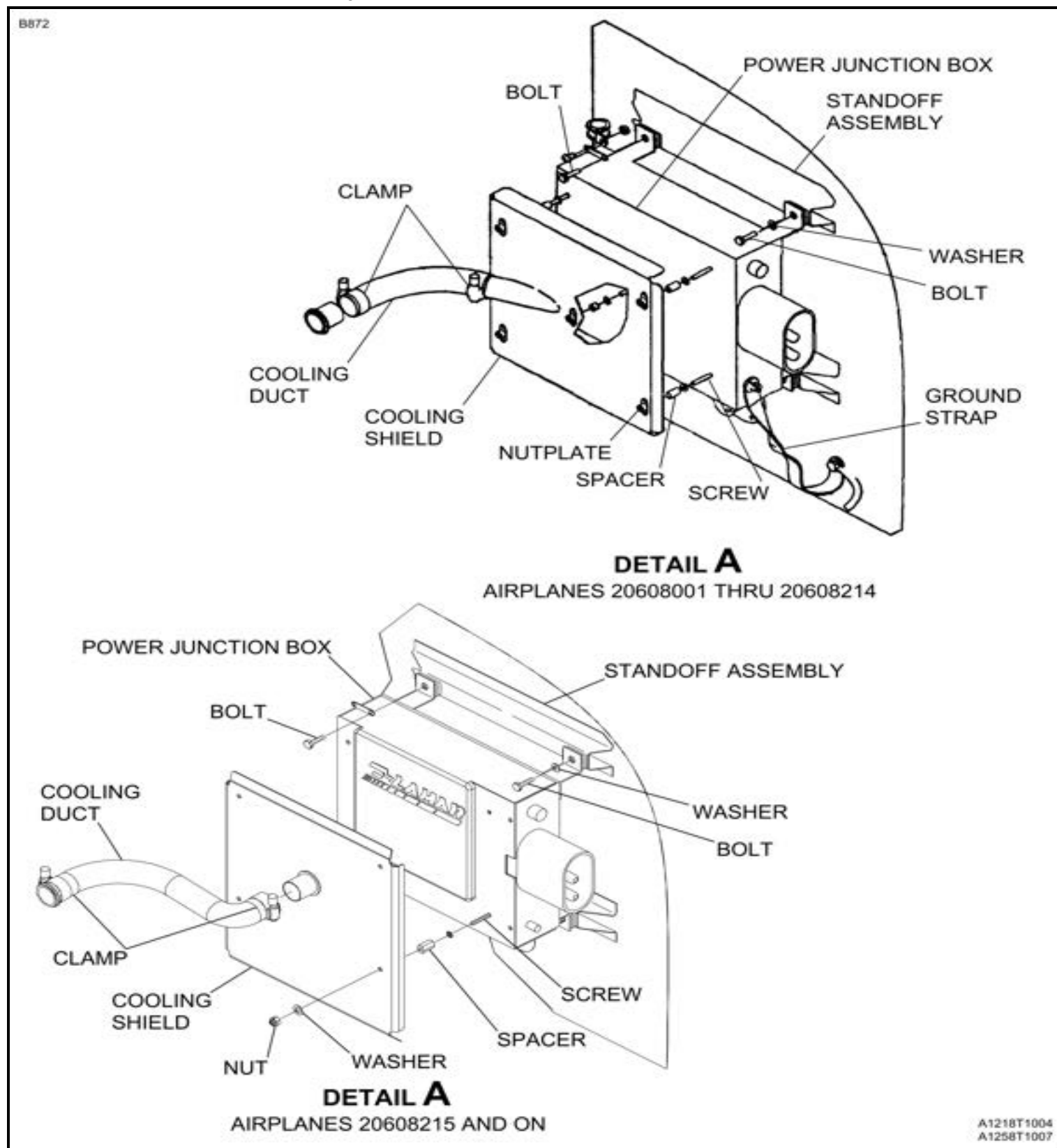


Figure 201 : Sheet 3 : Power Junction Box Installation

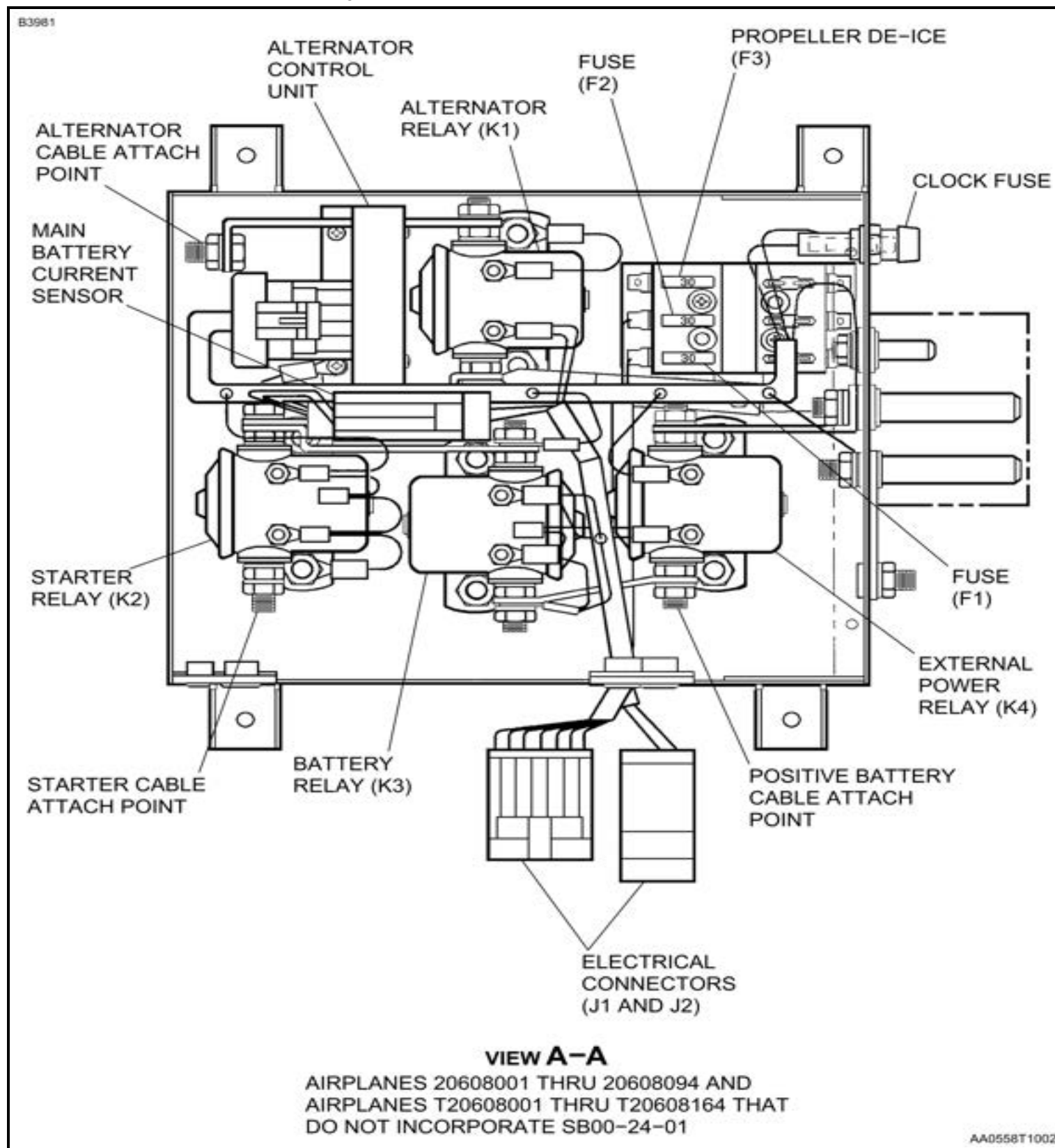
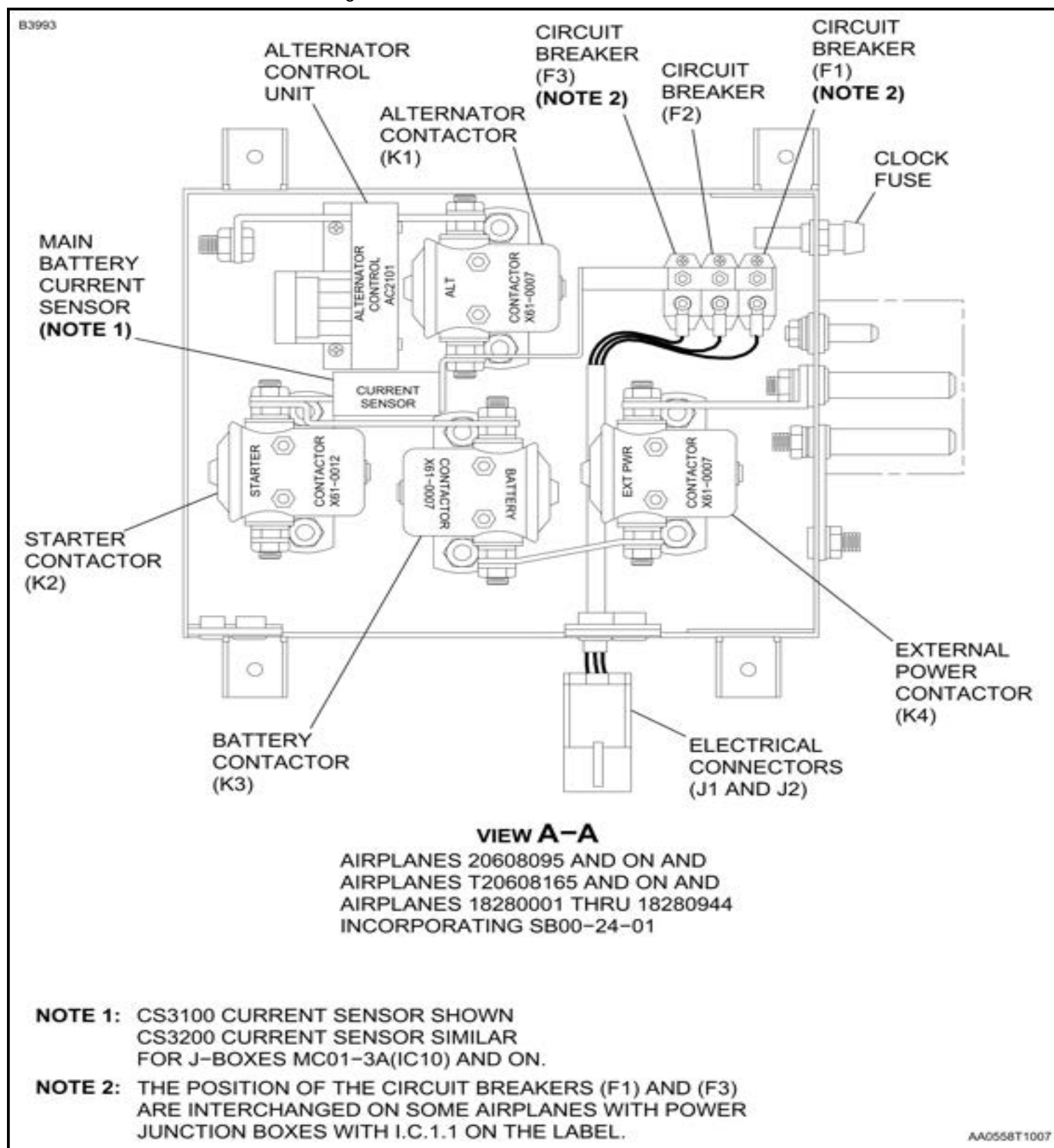


Figure 201 : Sheet 4 : Power Junction Box Installation



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

Component	Draw at 24 VDC (Amperes)	Draw at 28 VDC (Amperes)
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	3.10
Navigation Lights (LED)	0.90	0.90
Standby Indicator Light - Compass (LED)	0.01	0.02
Wing Anti-collision Lights (average value) (Qty. 2)	1.98	1.70
Beacon Light (peak value)	1.07	1.25
Beacon Light (LED) (peak value)	0.225	0.225
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) (Qty. 2)	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 Lights (Qty 2)	0.02	0.02
Pedestal Lights (Qty. 3)	0.12	0.15
Flap Motor	2.06	2.40
Fuel Pump	2.74	3.20
Pitot Heat	3.33	3.89
Stall Warning Heat	1.46	1.70
Stall Warning Horn	0.40	0.35
Prop Heat	13.3	15.5
12V Cabin Power Converter (Peak 10A out)	6.33	5.42
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	1.90

ACU Bus Sense	0.02	0.02
Start Motor	100	N/A
Stormscope (WX-500)	0.93	0.80
ADF Receiver (KR 87)	0.60	0.52

Table 2. Components used only on airplanes that do not have Garmin G1000 installation.

Component	Draw at 24 VDC (Amperes)	Draw at 28 VDC (Amperes)
Glareshield Light (Fluorescent)	0.86	1.00
Glareshield Light (LED)	0.17	0.20
Radio Lights	0.17	0.20
Annunciator Panel (All annunciations on)	0.35	0.30
Avionics Fan	0.43	0.50
Engine and Fuel Gauges	0.38	0.45
Audio Panel (KMA-26) (Maximum)	1.50	1.29
Audio Panel (KMA-28) (Maximum)	1.50	1.29
MFD (KMD-550)	0.93	0.80
GPS (KLN 89/89B)	1.45	1.25
GPS (KLN 94)	1.40	1.20
Transponder (KT 73) (Maximum)	1.07	1.25
Transponder (KT 76) (Maximum)	0.60	0.70
Altitude Encoder (SSD120)	0.20	0.23
HSI (KCS 55A) (Maximum)	1.46	1.25
HIS (NSD 1000) (Maximum)	1.20	1.03
#1 Nav/Comm (KX 155A) (Receive)	0.80	0.69
#1 Nav/Comm (KX 155A) (Transmit) (Maximum)	6.00	6.00
#2 Nav/Comm (KX 165A) (Receive)	0.80	0.69
#2 Nav/Comm (KX 165A) (Transmit) (Maximum)	6.00	6.00
Autopilot Computer (KAP 140)	0.58	0.50
Pitch Servo & Clutch (KAP 140)	0.58	0.50
Pitch Trim Servo & Clutch (KAP 140)	0.58	0.50
Roll Servo & Clutch (KAP 140)	0.53	0.45
Turn Coordinator (Blind) (KAP 140)	0.27	0.33

Table 3. Components used only on airplanes that have Garmin G1000 installation.

Component	Draw at 24 VDC (Amperes)	Draw at 28 VDC (Amperes)
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	0.20
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	2.00	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	0.80
#2 Nav (GIA 63)	0.94	0.80
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)	0.20	0.17
Transponder (GTX 33)	1.17	1.00
Audio Panel (GMA 1347)	1.58	1.36
FIS (GDL 69A)	0.42	0.36
TAS (KTA 870)	1.34	1.15
Autopilot Computer (KAP 140)	0.58	0.50
Pitch Servo & Clutch (KAP 140)	0.58	0.50
Pitch Trim Servo & Clutch (KAP 140)	0.58	0.50
Roll Servo & Clutch (KAP 140)	0.53	0.45
Blind Turn Coordinator (KAP 140)	0.27	0.33
Pitch Servo & Clutch (GFC 700)	1.00	0.86
Pitch Trim Servo & Clutch (GFC 700)	1.13	0.96
Roll Servo & Clutch (GFC 700)	1.46	1.25
CAN Bus Fuel Level Sensors	0.10	0.09
GI275 Standby Flight Display	1.17	1.00

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 Cessna Parts Distribution Department 701, CPD 2 5800 East Pawnee Road Wichita, KS 67218-5590	To measure control surface travel.
Polyurethane Tape	Y8671	3M 3M Center Minneapolis, MN 55144	To prevent flap chafing.
Loctite	242	Loctite Corp. 705 N. Mountain Rd. Newington, CT 06111	For aileron system bolt installation.

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.
 - (5) Refer to Chapter 34, for the [Stall Warning System](#) and the [Optional Angle of Attack System](#).

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](#).

Figure 101 : Sheet 1 : Aileron System Troubleshooting Chart

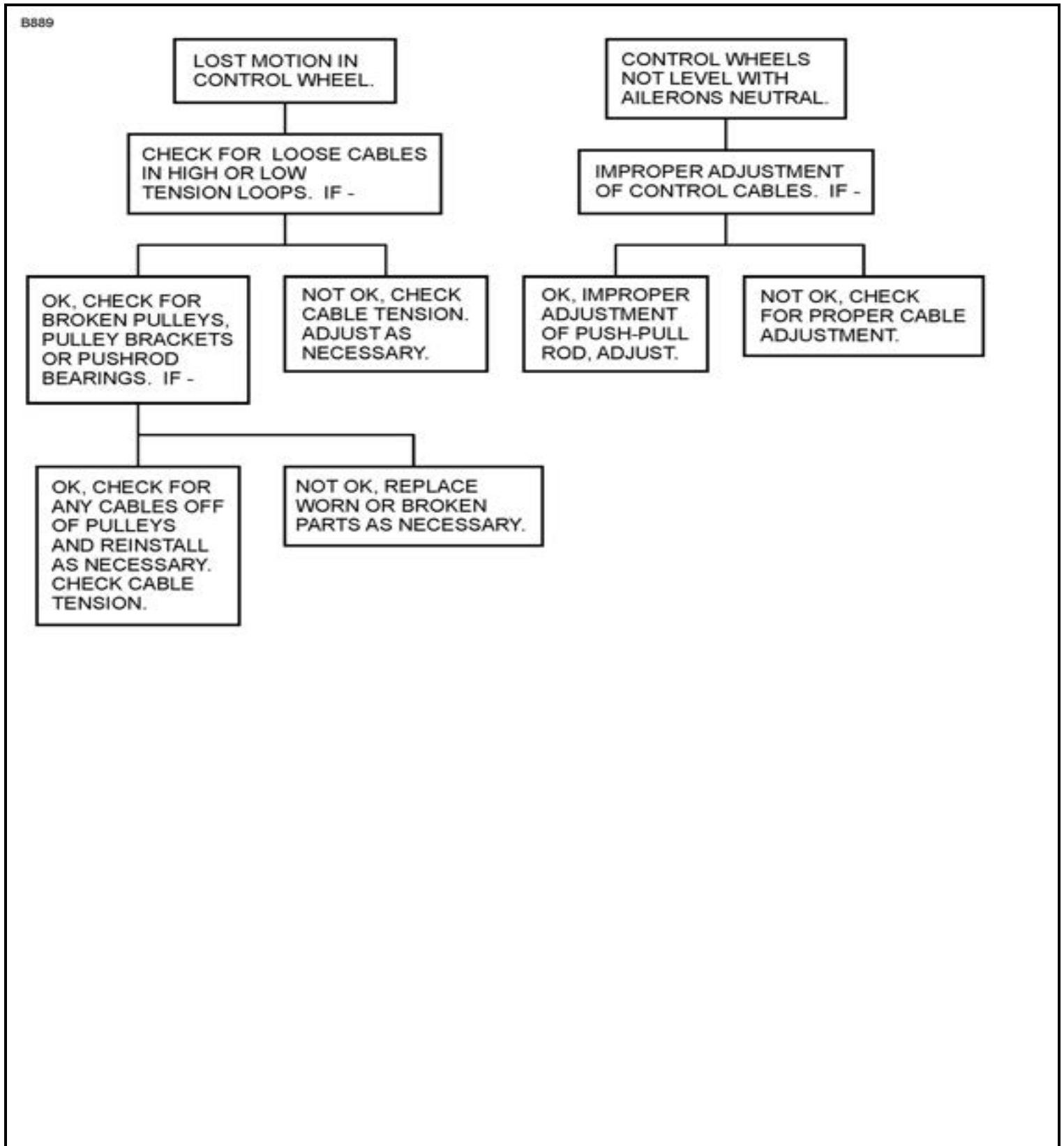
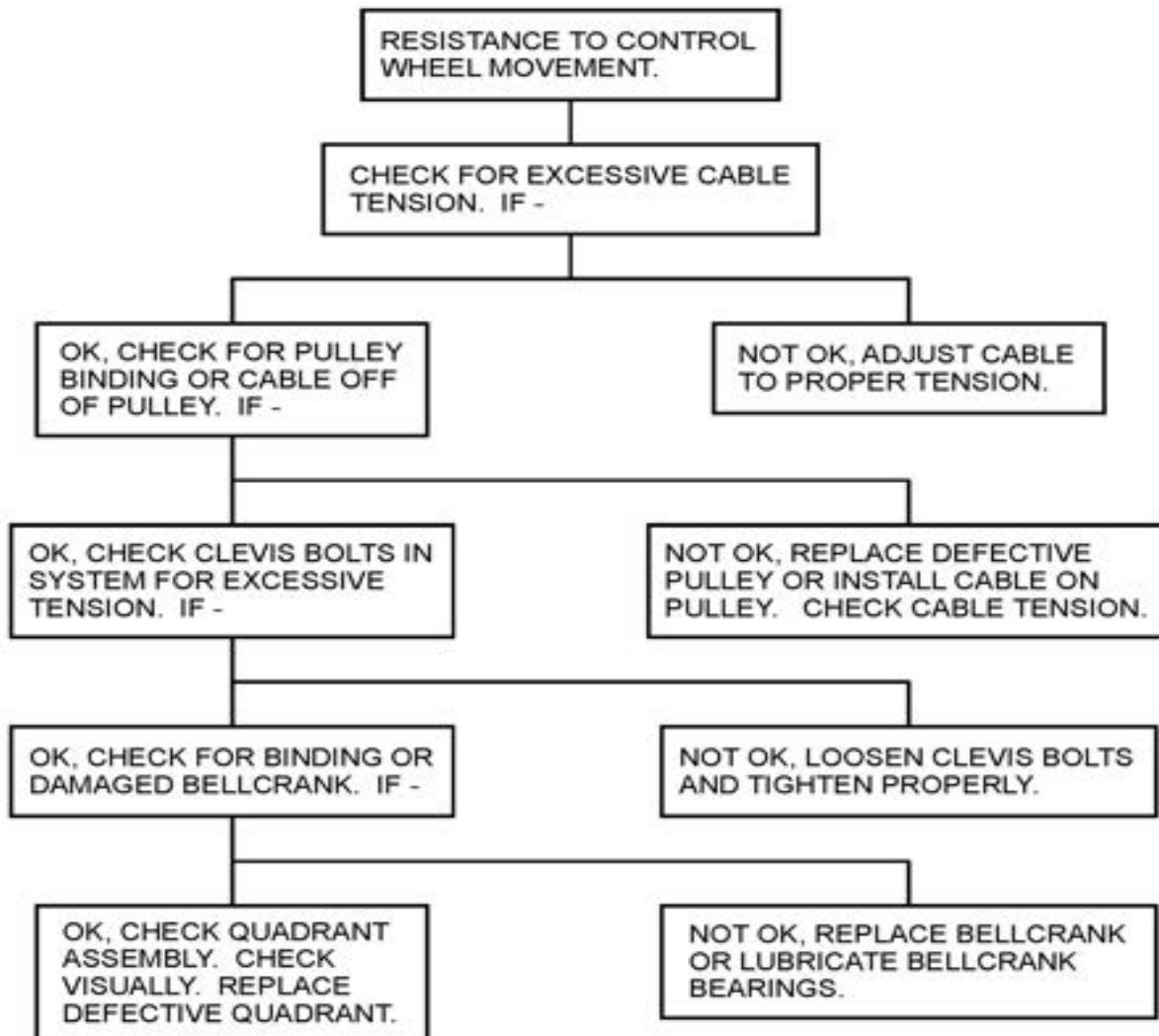


Figure 101 : Sheet 2 : Aileron System Troubleshooting Chart

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AILERON CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

- A. The ailerons receive input from the pilot or copilot control wheel through a series of cables, bellcranks and pushrods.
- B. Rotation of the control wheel rotates four bearing roller assemblies on the end of the control wheel tube, which in turn, rotates a square control tube assembly inside and extending from the control wheel tube. Attached to this square tube is a quadrant which operates the aileron system. This same arrangement is provided for both control wheels. Synchronization of the control wheels is obtained by the interconnect cable, turnbuckle and adjustment terminals. The forward end of the square control tube is mounted in a bearing block on firewall and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies on the end of the control wheel tube reduce friction as the control wheel is moved fore-and-aft for elevator system operation. A sleeve weld assembly containing the bearings which permit the control wheel tube to rotate within it, is secured to the control wheel tube by a sleeve and retaining ring in such a manner it moves fore-and-aft with the control wheel tube. This movement allows the push-pull tube attached to the sleeve weld assembly to operate an elevator arm assembly, to which one elevator cable is attached. A torque tube connects this arm assembly to the one on the opposite end of the torque tube, to which the other elevator cable is attached. When dual controls are installed, the copilot's control wheel is linked to the aileron and elevator control systems in the same manner as the pilots control wheel.

2. Control Wheel Removal/Installation

NOTE: Pilot and copilot control wheel removal/installation is typical.

- A. Remove Control Wheel (Refer to [Figure 201](#)).
 - (1) Disconnect electrical connector P1 from control wheel.
 - (2) Remove screws and washers securing control wheel to control tube.
 - (3) Remove control wheel.
- B. Install Control Wheel (Refer to [Figure 201](#)).
 - (1) Position control wheel in control tube and install screws and washers.
 - (2) Connect electrical connector to control wheel.

3. Control Column Removal/Installation

- A. Remove Control Column (Refer to [Figure 201](#)).
 - (1) Remove control wheel.
 - (2) For airplane serial numbers 20608336 and On and airplanes T20609038 and On. Airplane serial numbers 20608001 thru 20608335 and T20608001 thru T20609037 that are in compliance with Cessna Service Bulletin SEB-27-01, or latest revision.
 - (a) Remove and discard the safety wire from the screw that attaches the glide plug.
- NOTE:** Refer to Cessna Service Bulletin SEB-27-01, or latest revision, for additional information concerning the location of the safety wire that secures the attach screw to the glide plug and control tube assembly.
- (3) Remove the screw that attaches the glide plug to the control tube assembly.
 - (a) Remove the plug and glide assembly.
 - (4) Disconnect push-pull tube at sleeve assembly.
 - (5) Remove screws securing column support bracket assembly at instrument panel.
- NOTE:** To ease removal of control wheel tube assembly, snap ring may be removed from its locking groove to allow sleeve assembly additional movement.
- (6) Using care, pull control wheel tube assembly aft and work assembly out through instrument panel.
- NOTE:** If removal of control tube assembly is necessary, proceed to step (6).
- (7) Remove column support bracket assembly, remove safety clips and relieve direct cable tension at turnbuckles. Refer to [Chapter 6, Access/Inspection Plates - Description and Operation](#).
 - (8) Remove safety wire and relieve interconnect cable tension at turnbuckle.
 - (9) Remove safety wire and remove roll pin through quadrant and control tube assembly.
 - (10) Remove cotter pin, nut and washer from control tube assembly from bearing block on the forward side of the firewall.
 - (11) Using care, pull control tube assembly aft and remove quadrant.

B. Install Control Column (Refer to [Figure 201](#)).

NOTE: If control tube assembly was not removed, proceed to step (2).

- (1) Position control tube assembly through instrument panel and install quadrant.
- (2) Install roll pin through quadrant and control tube assembly. Safety wire roll pin.
- (3) Install column support bracket assembly on instrument panel.
- (4) With control through bearing block on firewall, install washer, nut, and cotter pin.

NOTE: Allow 0.030" minimum clearance between bearing block and nut after tightening

- (5) If snap ring was removed from sleeve assembly, reinstall.
- (6) Connect push-pull tube to sleeve assembly.
- (7) Install the glide plug assembly.
 - (a) Install the screw on the glide plug.
 - (b) For airplane serial numbers 20608336 and On and airplanes T20609038 and On. Airplane serial numbers 20608001 thru 20608335 and T20608001 thru T20609037 that are in compliance with Cessna Service Bulletin SEB-27-01, or latest revision.

- 1 Safety the screw that attaches the glide plug with safety wire. Refer to Chapter 20, [Safetying - Maintenance Practices](#).

NOTE: Refer to Cessna Service Bulletin SEB-27-01, or latest revision for additional information concerning the location and method to install the safety wire that secures the attach screw to the glide plug and control tube assembly.

- (8) Adjust the control column for freeplay.
 - (a) Tighten the screw sufficiently to eliminate lateral freeplay in the control column, yet not so tight as to produce any detectable fore-aft drag friction throughout the entire elevator control travel.

NOTE: Do not leave the screw loose when adjusting drag. This adjustment is similar to a typical wheel bearing adjustment, for example, tighten until all freeplay is removed and drag can be detected. Gradually back off (loosen) the adjustment screw in small steps of about 1/8th of a revolution per step until the point where minimum freeplay and no drag is obtained.

- (9) Install control wheel.
- (10) For rigging system. Refer to [Adjustment/Test](#).

4. **Bearing Roller Adjustment**

NOTE: Each bearing assembly has an 0.062" eccentric adjustment when installed, for aligning the control tube weld assembly and push-pull tube with the guide assembly.

A. Adjust Bearing Rollers (Refer to [Figure 201](#)).

- (1) Remove control wheel assembly.
- (2) Install column support bracket assembly (bearings on aft side) and leave loose with instrument panel.
- (3) Align control wheel tube assembly for free travel of push-pull tube along full length of guide assembly.
- (4) Center column support bracket assembly over tube and bearing assembly and secure plate to instrument panel.
- (5) Adjust each bearing to control wheel tube assembly and tighten bearings in place.
- (6) Remove column support bracket assembly and reinstall with bearings facing forward.

5. **Aileron Removal/Installation**

A. Remove Aileron (Refer to [Figure 201](#) and [Figure 204](#)).

- (1) Disconnect aileron pushrod at aileron.
- (2) Disconnect electrical bonding straps.
- (3) Remove screws and nuts attaching aileron hinges to trailing edge of wing.
- (4) Using care, pull aileron out and down to slide hinges from under wing skin and auxiliary spar reinforcements.

B. Install Aileron (Refer to [Figure 201](#)).

- (1) Position aileron hinges between skin and auxiliary spar reinforcements and install screws and nuts attaching hinges to

trailing edge of wing.

- (2) Reconnect electrical bonding straps.
- (3) Attach aileron pushrod to aileron.
- (4) Check aileron travel. Refer to Adjustment/Test below.

6. Aileron Bellcrank Removal/Installation

NOTE: Left and right aileron bellcrank removal/installation is typical.

A. Remove Aileron Bellcrank (Refer to Figure 201).

- (1) Remove access plates (520AB, 520BB, 620AB, and 620BB) inboard of bellcrank on underside of each wing. Refer to [Chapter 6, Access/Inspection Plates - Description and Operation](#).
- (2) Remove safety clip from carry through cable turnbuckle and relieve control cable tension by loosening turnbuckle.
- (3) Disconnect control cables from bellcrank.
- (4) Remove safety clip from direct cable turnbuckle and relieve control cable tension by loosening turnbuckle.
- (5) Disconnect control cables from bellcrank.
- (6) Disconnect aileron pushrod at bellcrank.
- (7) Remove nuts, washers and bolts securing bellcrank to wing structure.
- (8) Remove bellcrank through access opening, using care that bearing bushing is not dropped from bellcrank.

NOTE: Brass washers may be used as shims between lower end of bellcrank and lower bracket. Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings.

B. Install Aileron Bellcrank (Refer to Figure 201).

- (1) Install bellcrank to structure, ensuring bushing is in place.
- (2) Install brass washers between lower end of bellcrank and wing channel to shim out excess clearance.
- (3) Connect aileron pushrod to bellcrank.
- (4) Connect control cables to bellcrank. Ensure required spacers and bushings are properly installed.
- (5) Adjust cable tension and rig system. Refer to [Adjustment/Test](#).
- (6) Install safety clips on turnbuckles. Refer to [Chapter 20, Safetying - Maintenance Practices](#).
- (7) Install access plates (520AB, 520BB, 620AB, and 620BB) inboard of bellcrank on underside of each wing. Refer to [Chapter 6, Access/Inspection Plates - Description and Operation](#).

7. Adjustment/Test

A. Rig Aileron Cables (Refer to Figure 201, Figure 202, and Figure 203).

- (1) Remove the safety clips from the turnbuckles and release the cable tension on the direct and the carry-thru cables at the bell cranks in the wings.
- (2) Disconnect the push-pull rods at the ailerons.

CAUTION: Maintain specified control tension.

- (3) Remove safety clip from turnbuckle and adjust interconnect cable tension 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. Position control wheels level (synchronized).

NOTE: Prior to rigging the aileron system remove stop bolts. Clean the bolt(s) and the threads of the boss(es) per Loctite Manufacturer's instructions.

- (4) Tape a bar across both control wheels to hold them in neutral position.

CAUTION: Maintain specified control tension.

- (5) Adjust direct cable turnbuckles and carry-thru cable turnbuckle to position bellcranks approximately in neutral with 40 pounds, +10 or -10 pounds tension (177.93 N, +44.48 or -44.48 N) at 70 °F (21 °C) on carry-thru cable. Refer to the Charts in [Figure 203](#) for the correct tensions at other temperatures. Disregard tension on direct cables.
- (6) Adjust push-pull rods at each aileron until ailerons are neutral with reference to trailing edge of wing flaps. Ensure wing flaps are full UP when making this adjustment.

NOTE: Pushrod is adjustable at the aileron end only.

- (7) With ailerons in neutral position (streamlined), mount an inclinometer on trailing edge of both ailerons and set to 0 degrees.
- (8) Remove bar from control wheels and adjust aileron stop bolts to obtain the proper aileron travel, 21 degrees, +2 or -2 degrees up and 14 degrees 30 minutes, +2 or -2 degrees down.

NOTE: Apply LOCTITE GRADE "C", Loctite #290 to threads and reinstall in bellcrank, or Loctite #242 may be applied by capillary action after bolt is adjusted.

WARNING: Make sure ailerons move in the correct direction when operated by the control wheel.

- (9) Make sure safety clips are installed in all turnbuckles, all cables and cable guards are properly installed, all jam nuts are tight, and that you replace all items removed for access.

Figure 201 : Sheet 1 : Aileron Control System Installation

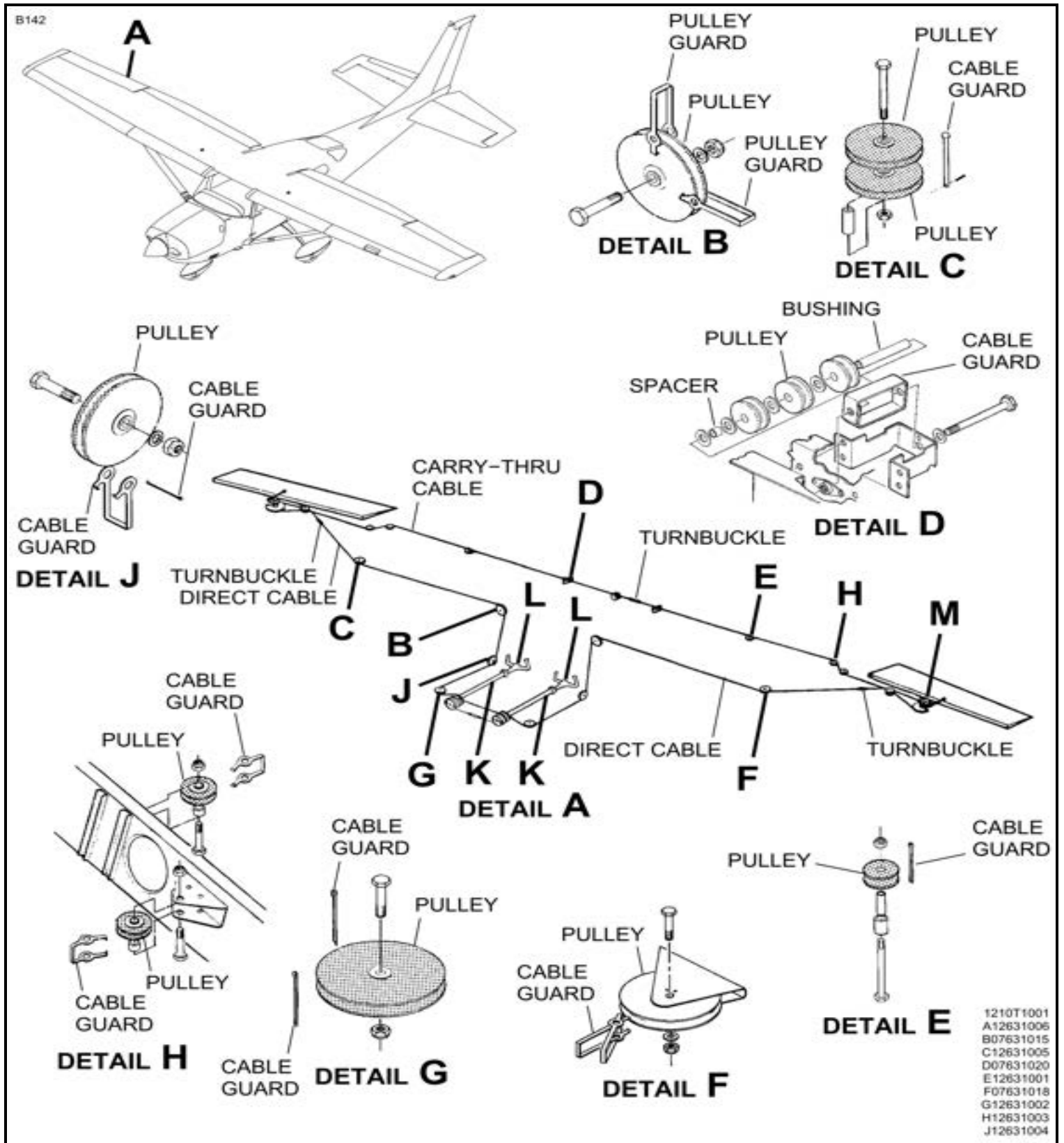


Figure 201 : Sheet 2 : Aileron Control System Installation

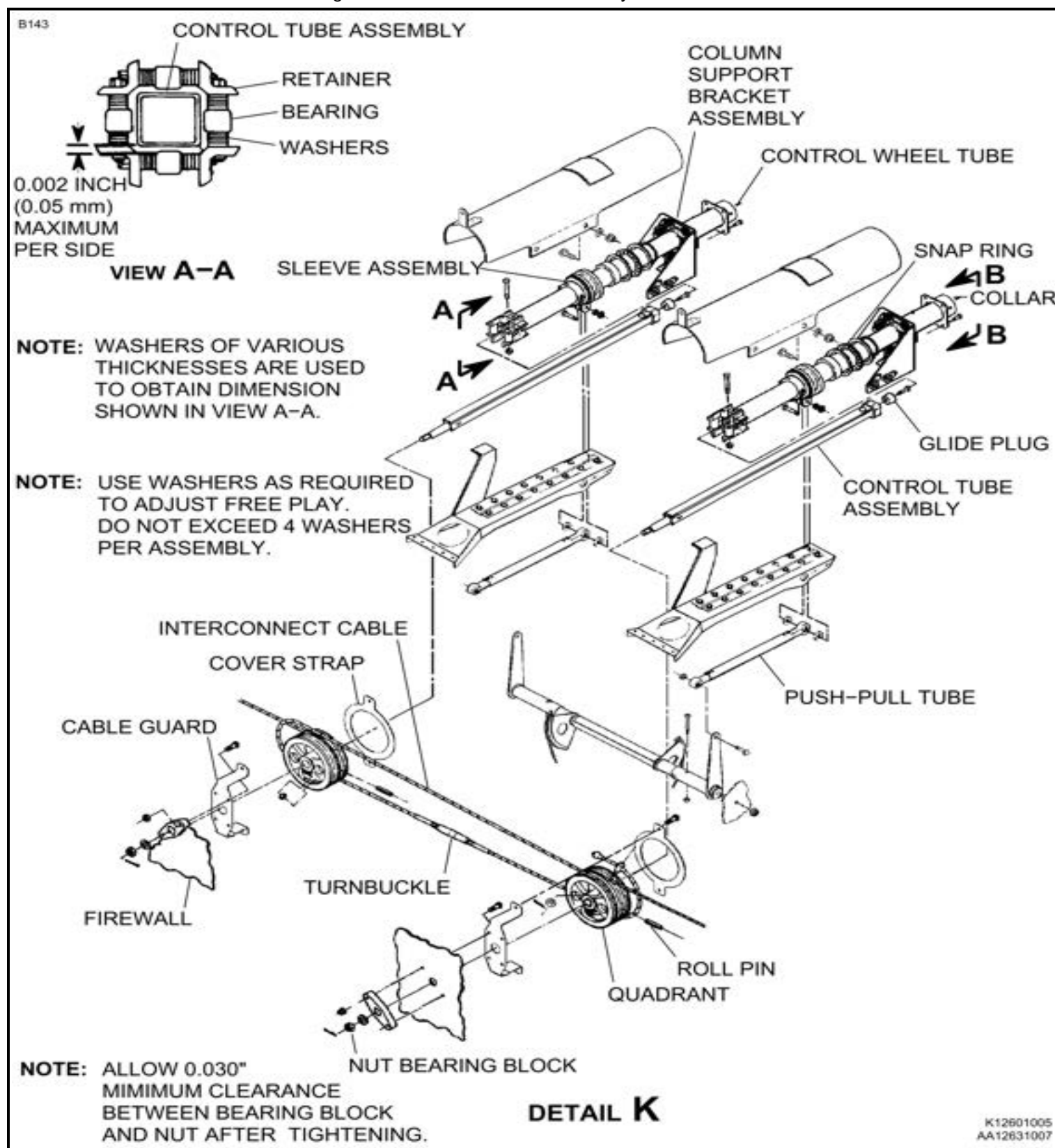


Figure 201 : Sheet 3 : Aileron Control System Installation

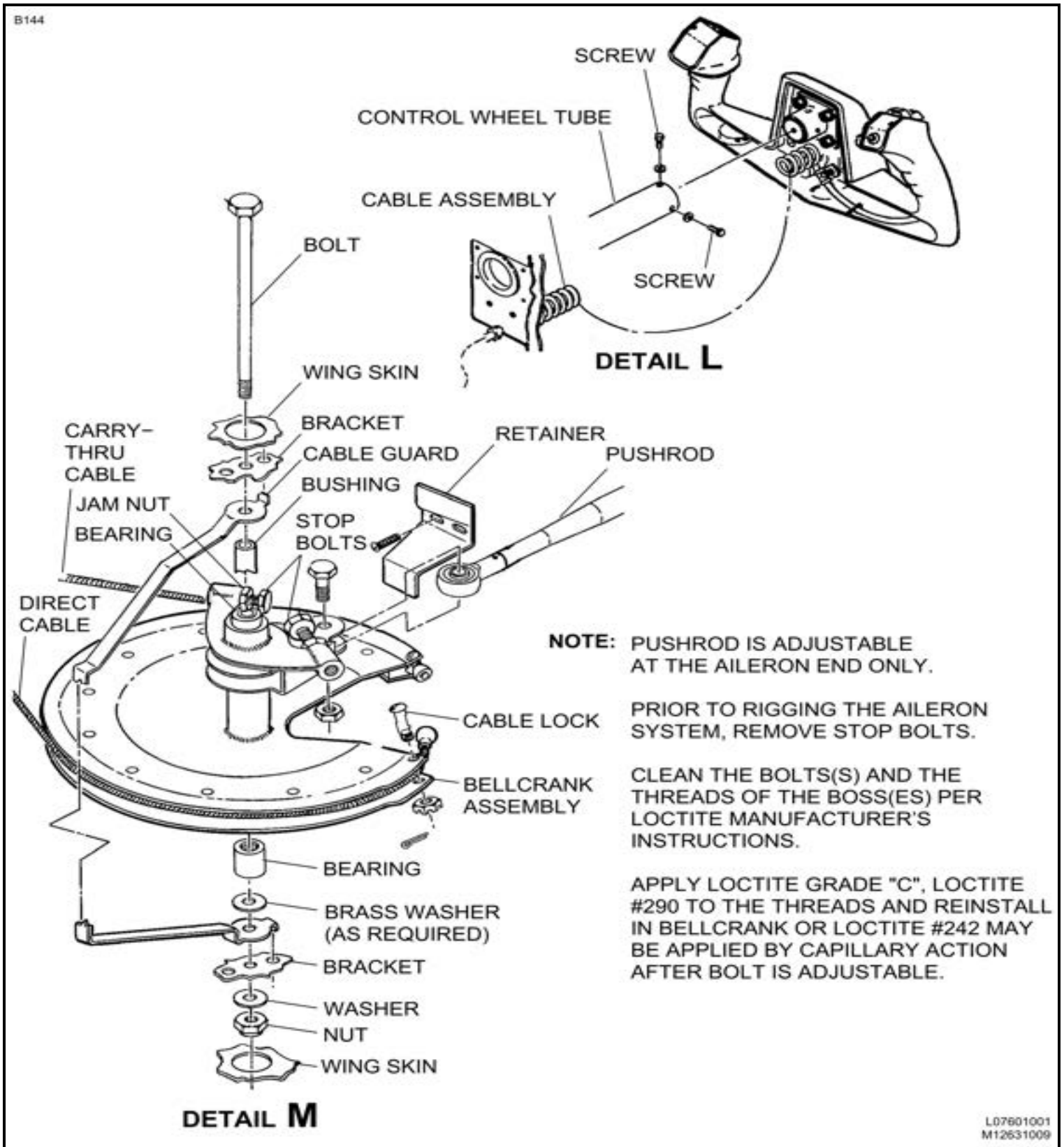


Figure 201 : Sheet 4 : Aileron Control System Installation

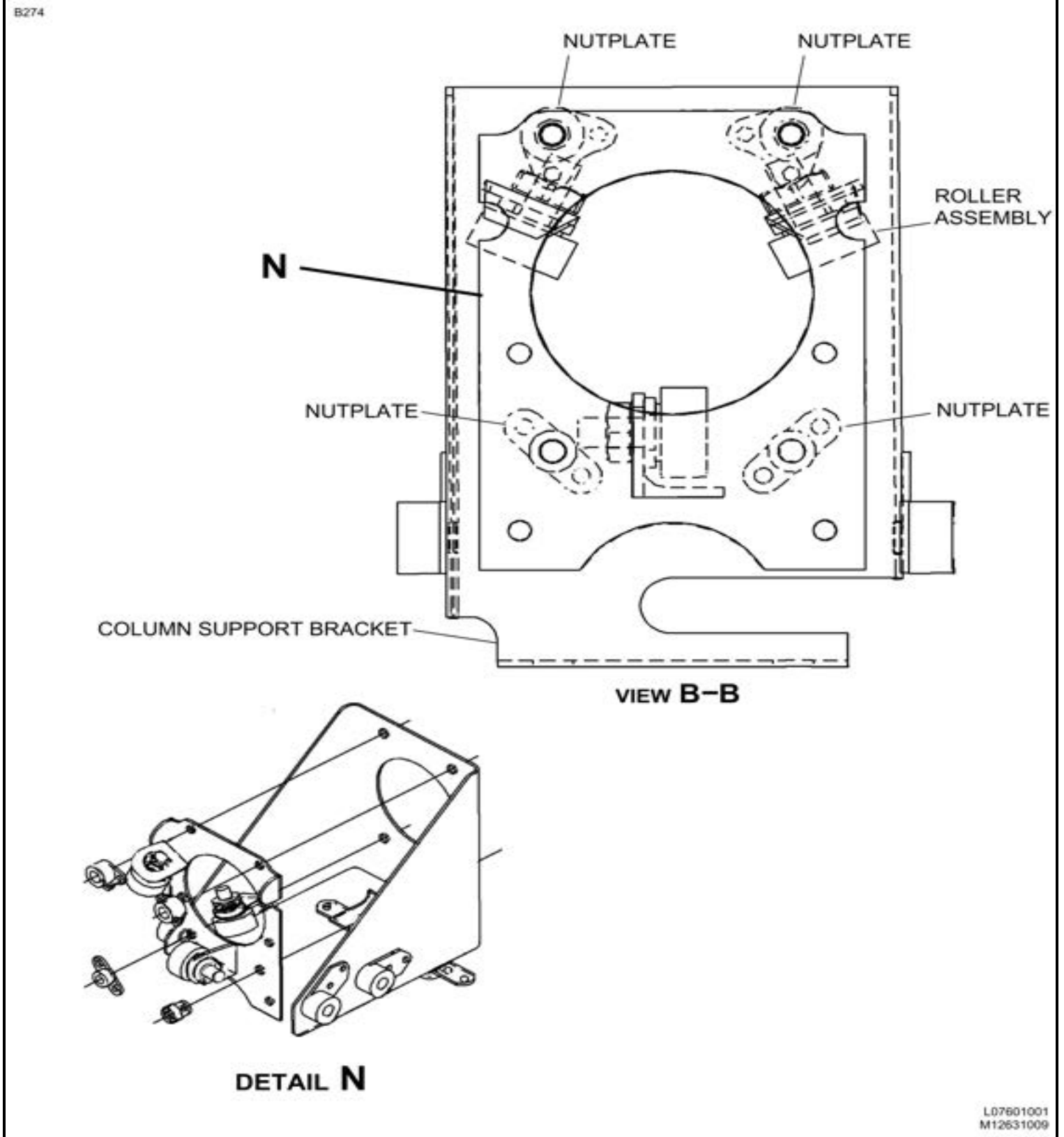
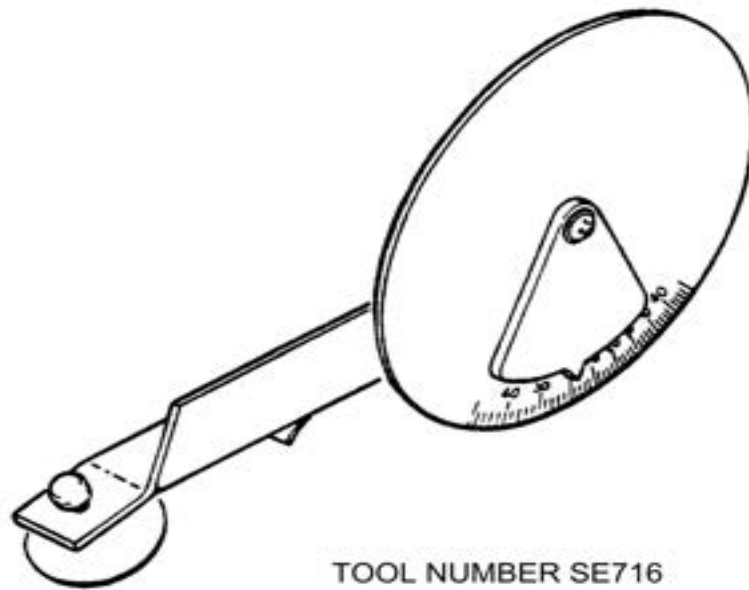


Figure 202 : Sheet 1 : Inclinator for Measuring Control Surface Travel

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Figure 203 : Sheet 1 : Aileron Cable Tension

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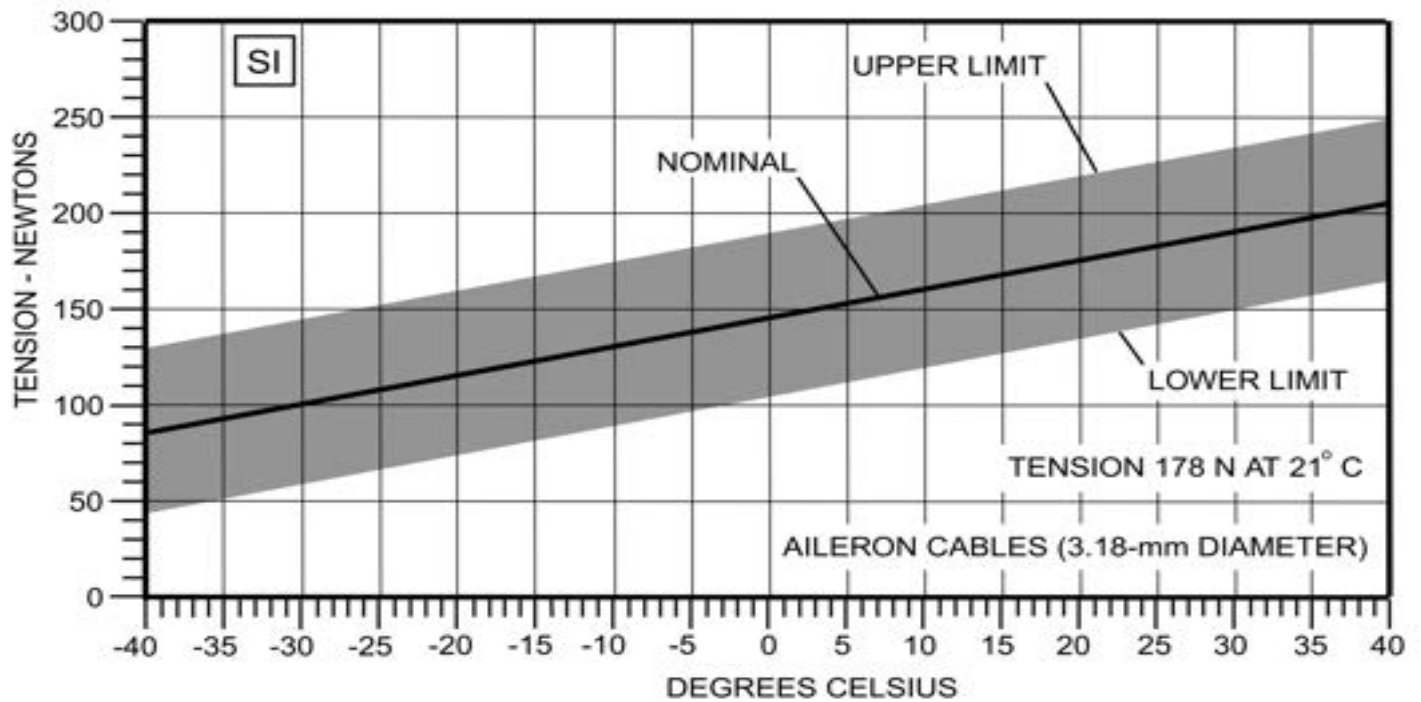
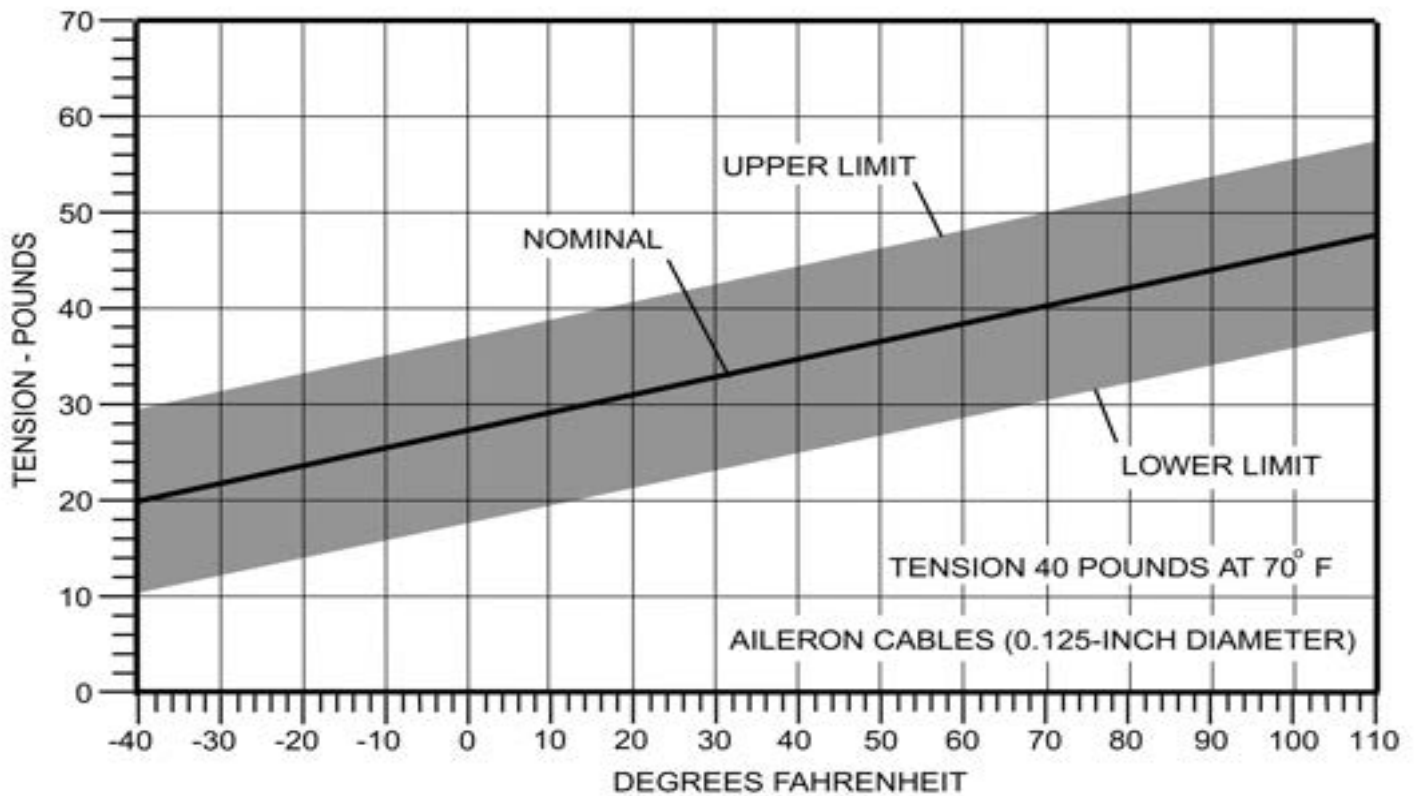
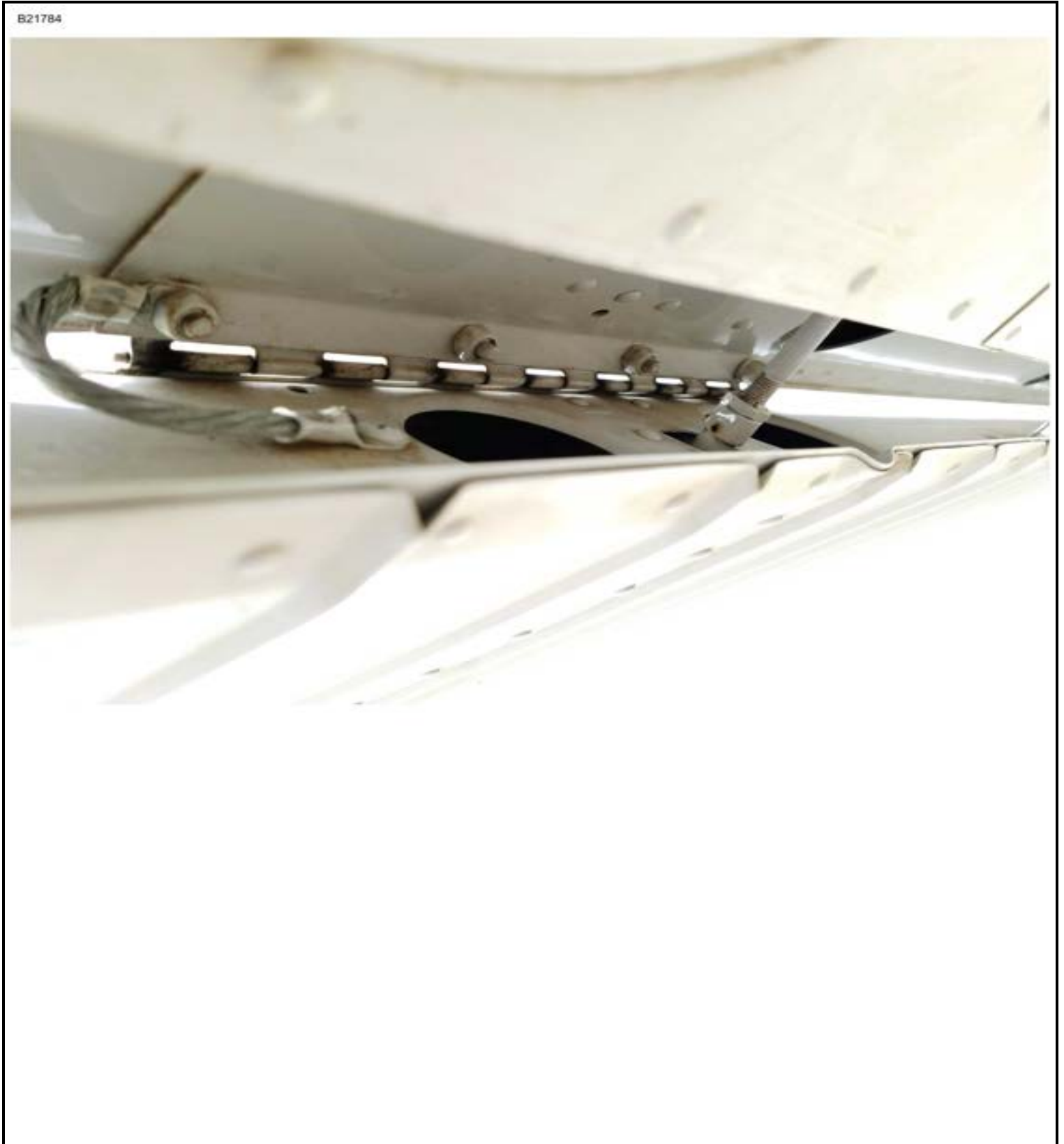


Figure 204 : Sheet 1 : Aileron Hinge Bonding Strap and Pushrod



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](#).

Figure 101 : Sheet 1 : Rudder System Troubleshooting Chart

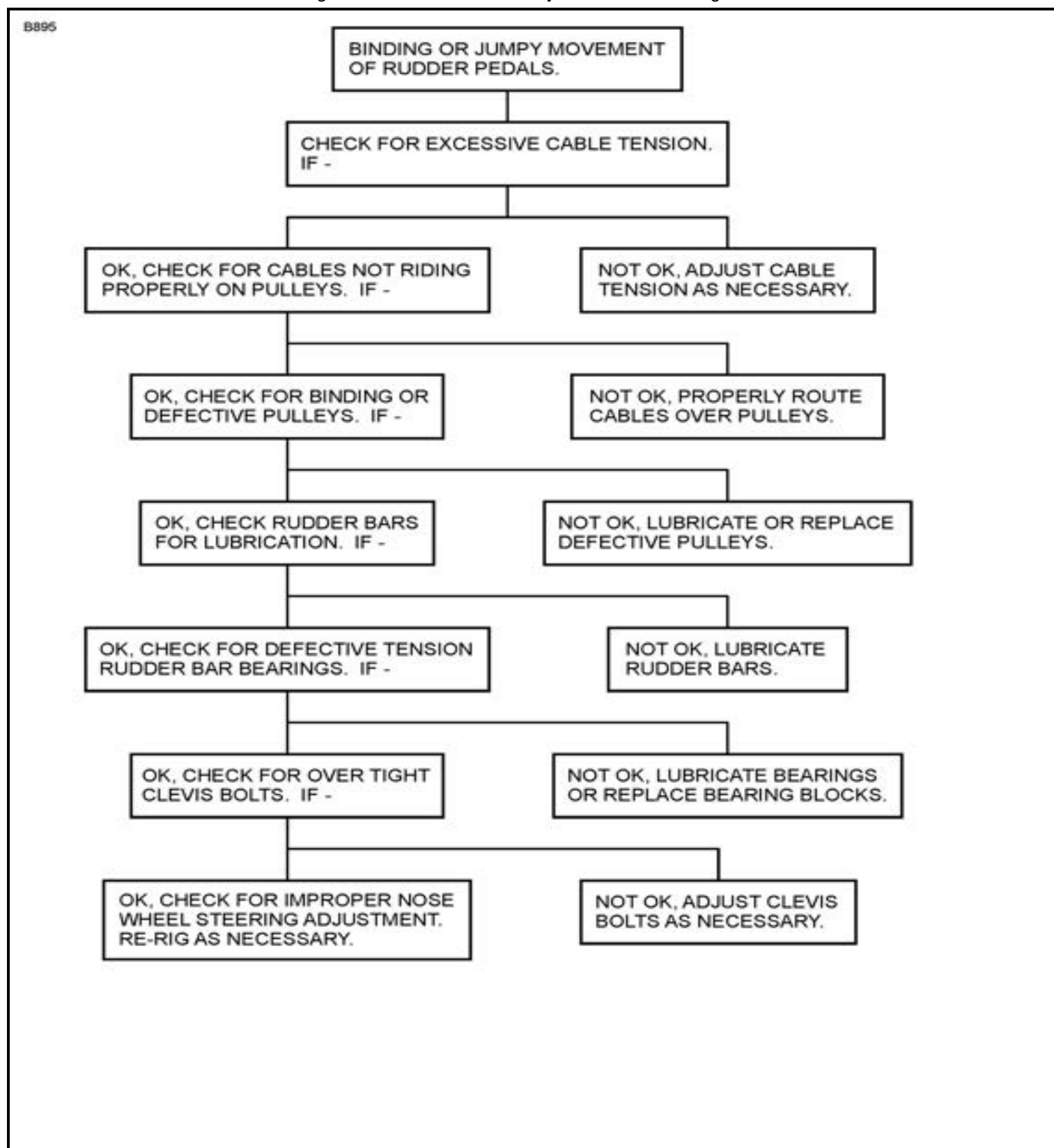
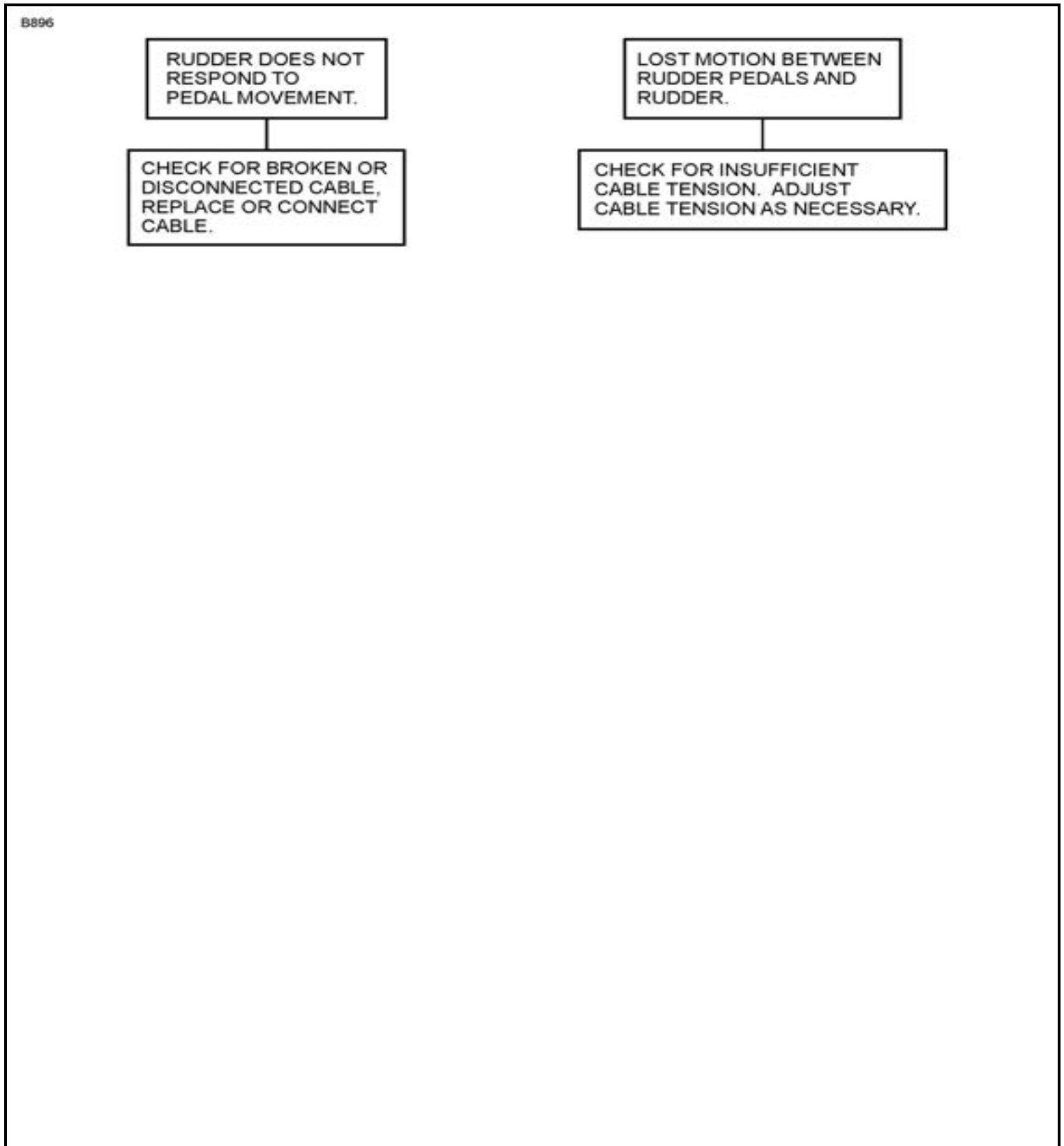


Figure 101 : Sheet 2 : Rudder System Troubleshooting Chart



RUDDER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

- A. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is comprised of rudder pedals, rudder bars, torque tubes, bearings, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering.

2. Rudder Pedal Assembly Removal/Installation

- A. Remove Rudder Pedal Assembly (Refer to Figure 201).

- (1) Remove pilot's and copilot's seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (2) Remove carpet and shield assemblies. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (3) Disconnect master cylinders and parking brake cables at pilot rudder pedals.
- (4) Remove rudder pedals and brake links.
- (5) Remove fairings (340AL and 340AR) for access to rudder cable turnbuckles. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (6) Remove safety clips from turnbuckles and relieve cable tension.
- (7) Disconnect right forward and left forward cables from rudder bar arms.
- (8) Disconnect nose gear steering bungee from rudder bar arm. The bungee serves for both rudder trim and nosewheel steering.
- (9) Disconnect the whiffletree link rod assemblies at arms.
- (10) Remove bolts securing bearing blocks and work rudder bars out of tunnel area.

NOTE: The two inboard bearing blocks contain clearance holes for the rudder bars at one end and a bearing hole at the other. Tag these bearing blocks for reference on reinstallation.

- B. Install Rudder Pedal Assembly (Refer to Figure 201).

- (1) Lubricate the rudder bar assemblies. Refer to Chapter 12, [Flight Controls - Lubrication](#).
- (2) Position rudder bars in area below instrument panel and secure bearing blocks with bolts.
- (3) Connect whiffletree link rod assemblies at arms.
- (4) Connect nose gear steering bungee to rudder bar arm.
- (5) Connect left forward and right forward cables to rudder bar arms.
- (6) Install rudder pedals and brake links.
- (7) Connect parking brake cables and master cylinders to pilot rudder pedals.
- (8) Re-rig rudder system and install safety clips. Refer to [Adjustment/Test](#).
- (9) Install pilot's and copilot's seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (10) Install carpet and shield assemblies. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (11) Install fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

3. Rudder Removal/Installation

- A. Remove Rudder (Refer to Figure 201).

- (1) Remove stinger.
- (2) Disconnect tail navigation light quick-disconnect JV001 at bottom of rudder.
- (3) Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles.
- (4) Disconnect cables from rudder bell crank.
- (5) With rudder supported, remove hinge bolts (including electrical bonding strap) and, using care, lift rudder free of vertical fin.

- B. Install Rudder (Refer to Figure 201).

- (1) With rudder supported, install hinge bolts (including electrical bonding strap) securing rudder to vertical fin. Torque nuts to 50 to 70 inch pounds plus free running torque.
- (2) Connect cables to rudder bell crank.

NOTE: Do not overtighten. Shackle must pivot freely.

- (3) Rig rudder system and safety wire turnbuckles. Lubricate system. Refer to Chapter 12, [Flight Controls - Lubrication](#).
- (4) Connect tail navigation light quick-disconnect JV001 at bottom of rudder.
- (5) Install stinger.

4. Rudder Control Cables Removal/Installation

A. Remove Rudder Cables ([Refer to Figure 201](#)).

- (1) Remove pilot's and copilot's seats. Refer to Chapter 25, [Front Seats and Rails - Maintenance Practices](#).
- (2) Remove center seats. Refer to Chapter 25, [Center Seats and Rails - Maintenance Practices](#).
- (3) Remove rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (4) Remove shield assemblies, carpet and baggage wall. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (5) Remove plates ([231AB](#), [231BB](#), [231DB](#), [231EB](#), [231HB](#), [231JB](#), and [310AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (6) Remove fairings ([340AL](#) and [340AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (7) Remove safety clips from turnbuckles and relieve tension on rudder cables.
- (8) Disconnect left and right rudder cables from rudder bell crank.
- (9) Disconnect left and right rudder cables from rudder bar arms.
- (10) Remove pulleys and cable guards as necessary to remove cables.

NOTE: To ease routing of cables, a length of wire may be attached to the end of the cable before being withdrawn from airplane. Leave wire in place, routed through structure; then attach cable being installed and pull the cable into position.

- (11) Remove rudder cables.

B. Install Rudder Cables ([Refer to Figure 201](#)).

- (1) If installed, attach cables to wires and pull cables through airplane structure.
- (2) Attach left and right rudder cables to rudder bell crank.
- (3) Attach left and right rudder cables to rudder bar arms.
- (4) Install pulleys and pulley guards. Ensure that cables are in pulley grooves before installing cable guards.
- (5) Rig rudder system in accordance with [Rudder Control Adjustment/Test](#).
- (6) Install plates ([231AB](#), [231BB](#), [231DB](#), [231EB](#), [231HB](#), [231JB](#), and [310AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (7) Install carpet and baggage wall. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (8) Install pilot's and copilot's seats. Refer to Chapter 25, [Front Seats and Rails - Maintenance Practices](#).
- (9) Install center seats. Refer to Chapter 25, [Center Seats and Rails - Maintenance Practices](#).
- (10) Install rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (11) Install 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](#) and [Figure 203](#)).

- (1) Remove fairings ([340AL](#) and [340AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (2) Tie down or weight tail to raise nosewheel free of ground.
- (3) Extend strut and ensure nose gear is centered against the external centering stop.
- (4) Remove pilot's shield assembly. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (5) Disconnect nose gear steering bungee from rudder bar arm.
- (6) Clamp rudder pedals in neutral position.
- (7) Remove safety clips on rudder cable turnbuckles.

CAUTION: Maintain specified control tension.

- (8) 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.

- (9) Remove clamps from rudder pedals.
- (10) Adjust rudder stop bolts to obtain 24 degrees, ± 1 degree, travel left and right, measured parallel to water line, or 27 degrees 13 minutes, ± 1 degree, travel left and right, measured perpendicular to hinge line.

NOTE: [Figure 202](#) may be used as a guide to attain correct rudder travel.

- (11) Install safety clips on rudder cable turnbuckles.
- (12) Check rudder travel as follows: [Refer to Figure 202.](#)
 - (a) Establish neutral position of rudder by clamping straightedge (such as wooden 2 X 4, 50 mm X 100 mm) on each side of fin and rudder, and block trailing edge of rudder half the distance between straightedges.
 - (b) Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
 - (c) Using soft lead pencil, mark rudder at the point corresponding to soft wire indexing point (neutral).
 - (d) Remove straightedges and blocks.
 - (e) Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder, in each direction of travel. Distance should be between 8.12 inches to 8.72 inches.
- (13) Connect nose gear steering bungee to rudder bar arm.
- (14) Rig rudder trim system. Refer to [Rudder Trim Adjustment/Test](#).
- (15) Install safety clips on rudder cable turnbuckles.
- (16) Install fairings ([340AL](#) and [340AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (17) Install shield assembly. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (18) Install pilot's and copilot's seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (19) Lower nosewheel to ground.

WARNING: Make sure that the rudder moves in the correct direction when operated by the rudder pedals.

- (20) Operate rudder system to check for ease of movement and full travel.

Figure 201 : Sheet 1 : Rudder Control System Installation

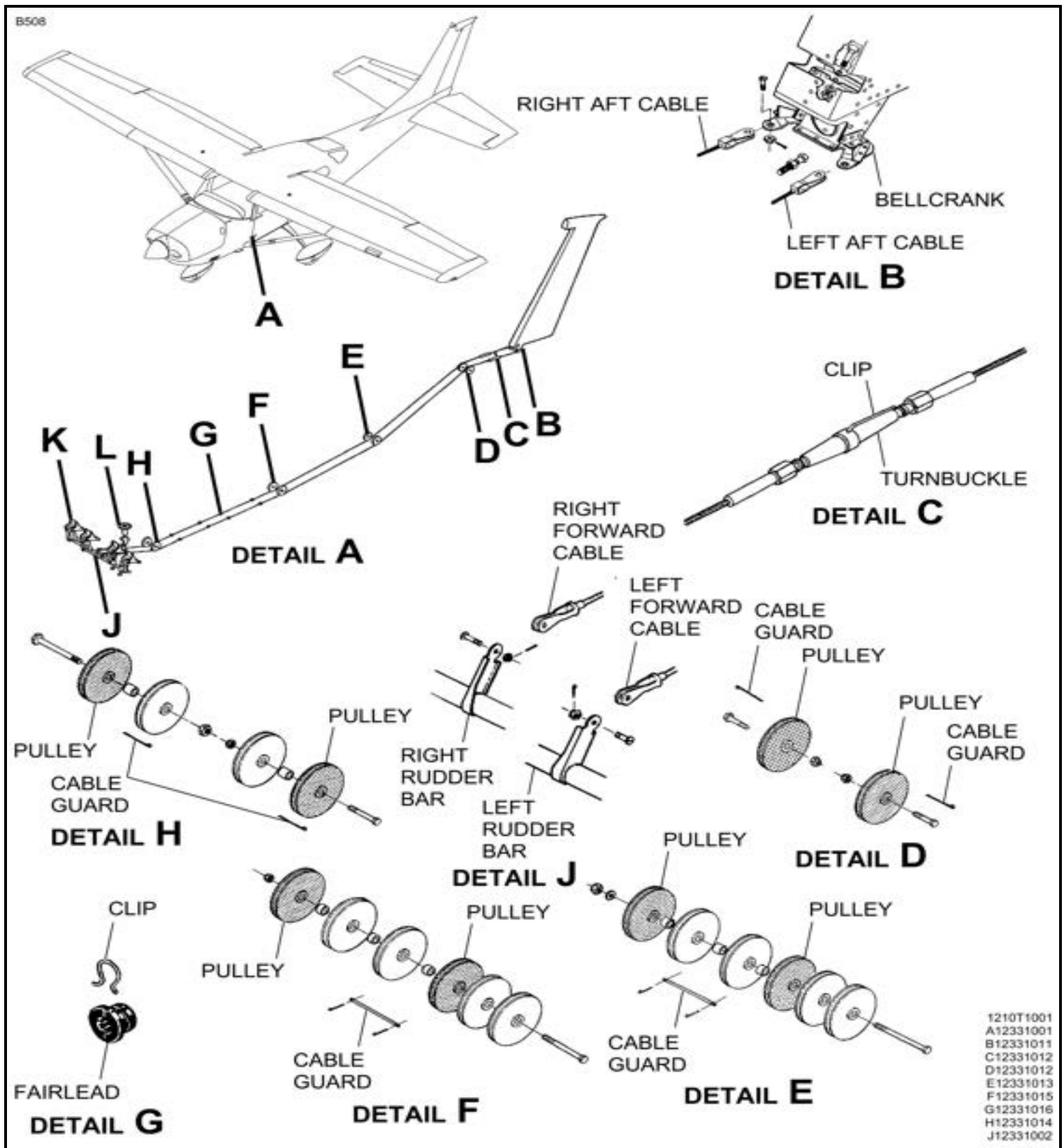


Figure 201 : Sheet 2 : Rudder Control System Installation

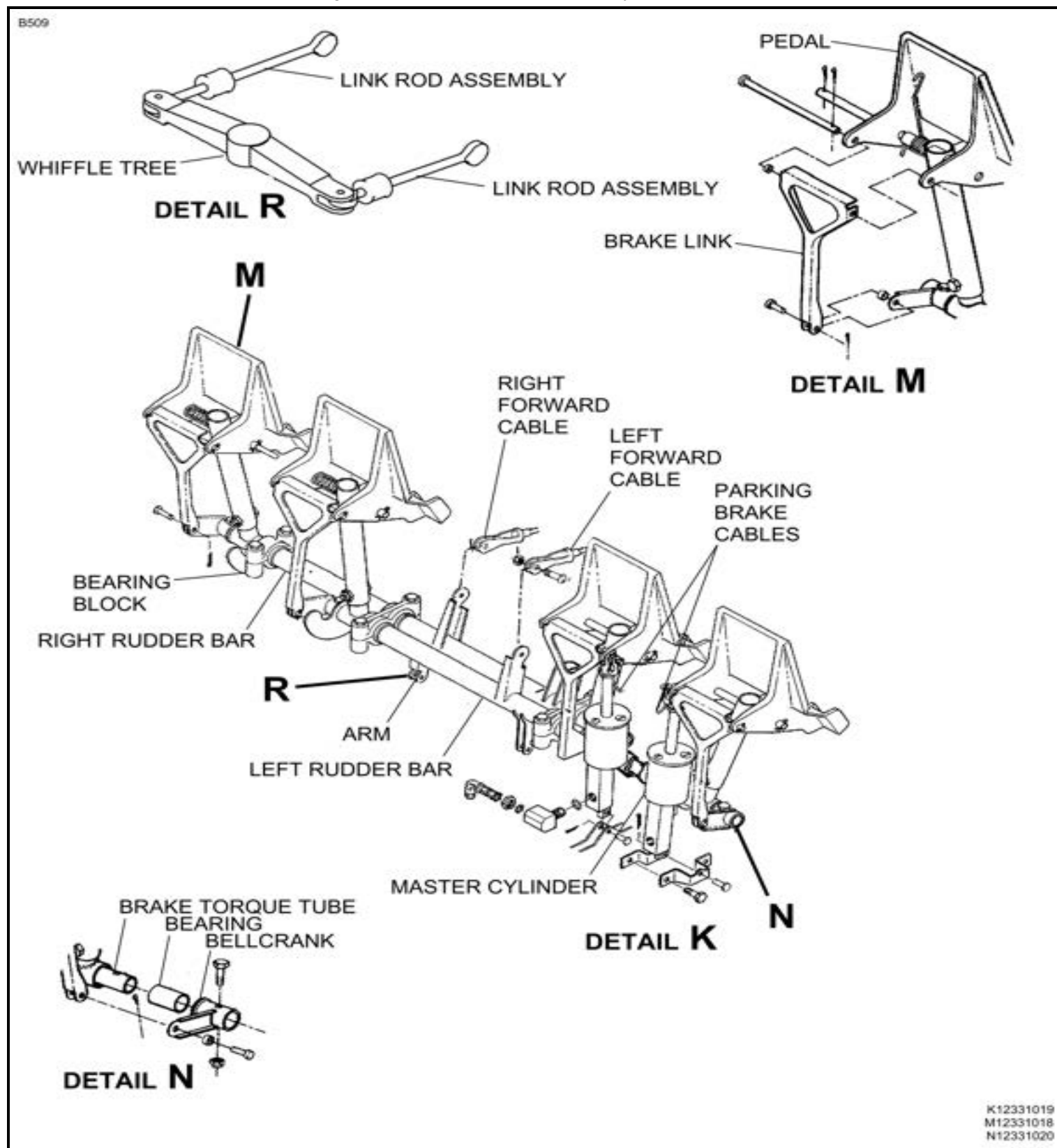


Figure 201 : Sheet 3 : Rudder Control System Installation

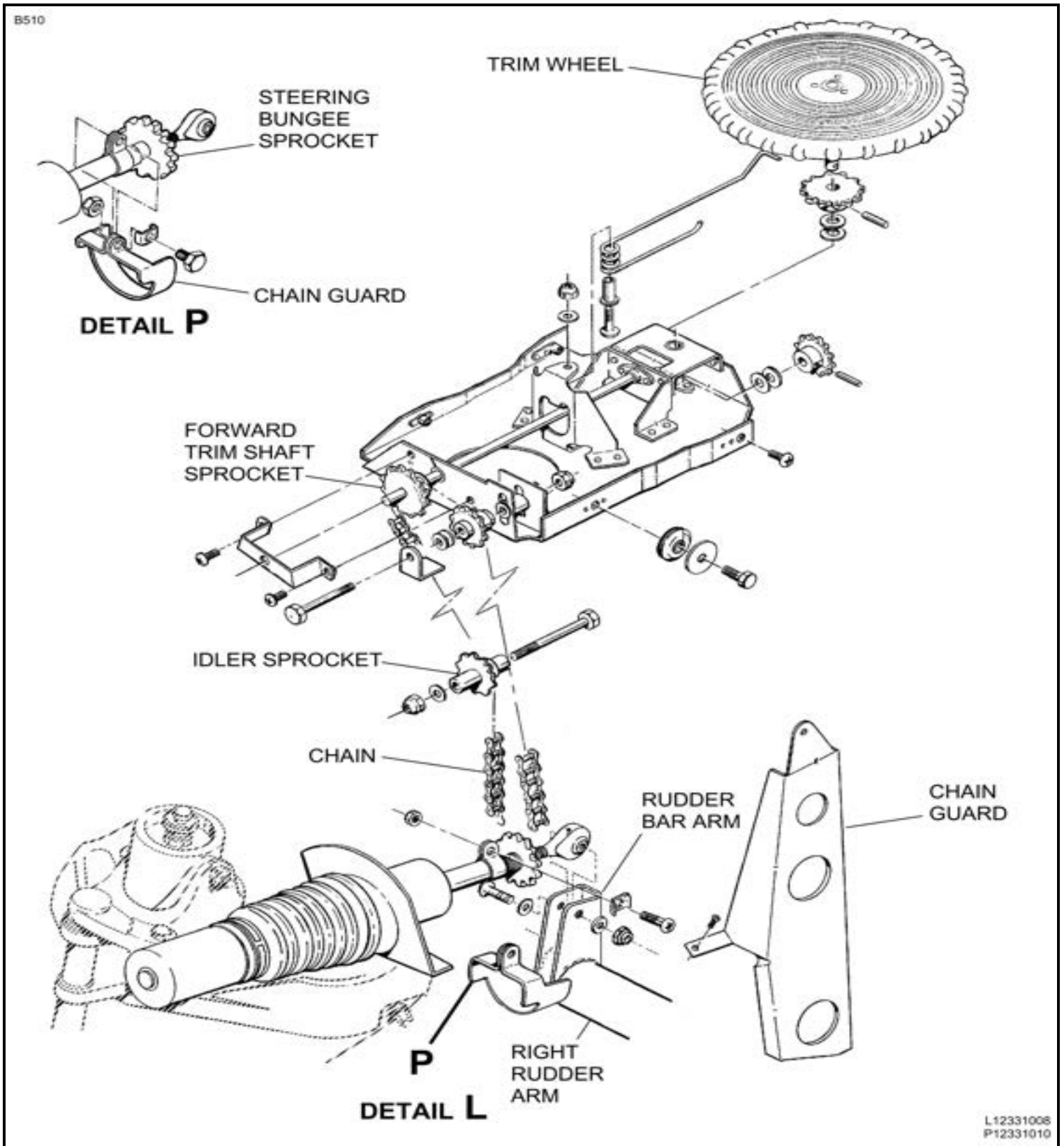
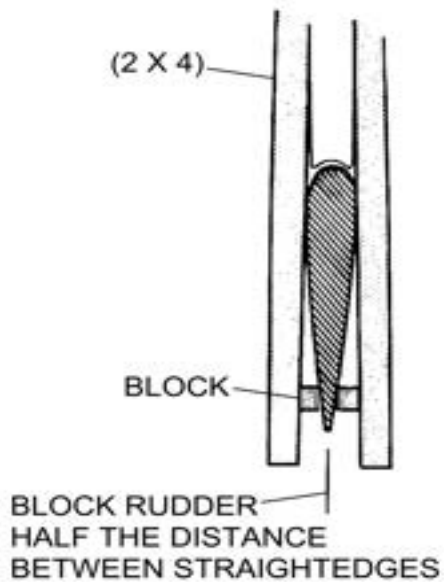


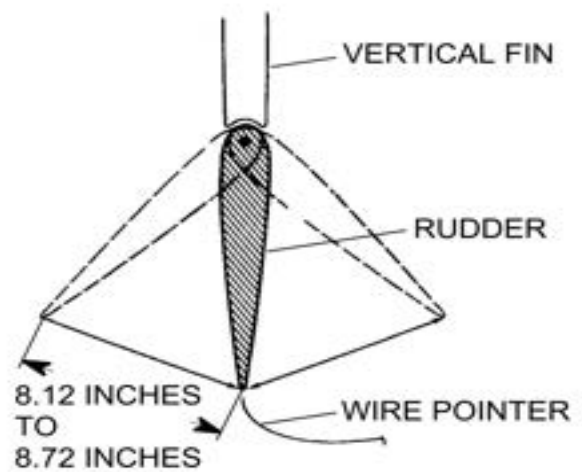
Figure 202 : Sheet 1 : Rudder Travel Adjustment

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STEP 1: ESTABLISHING NEUTRAL POSITION OF RUDDER.



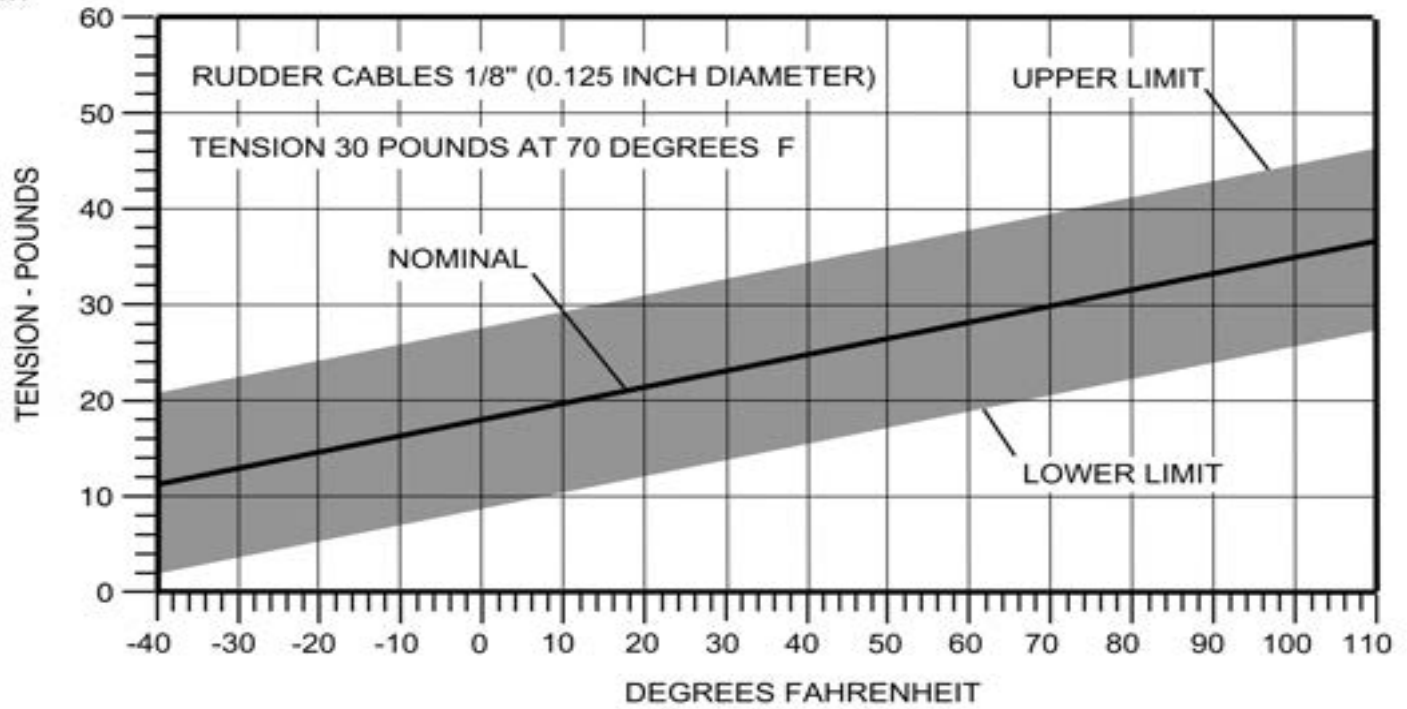
STEP 2: MEASURING RUDDER TRAVEL.



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Figure 203 : Sheet 1 : Rudder Cable Tension

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NOTE: ALLOW AIRPLANE TEMPERATURE TO STABILIZED FOR A PERIOD OF FOUR (4) HOURS BEFORE CHECKING CABLE TENSION

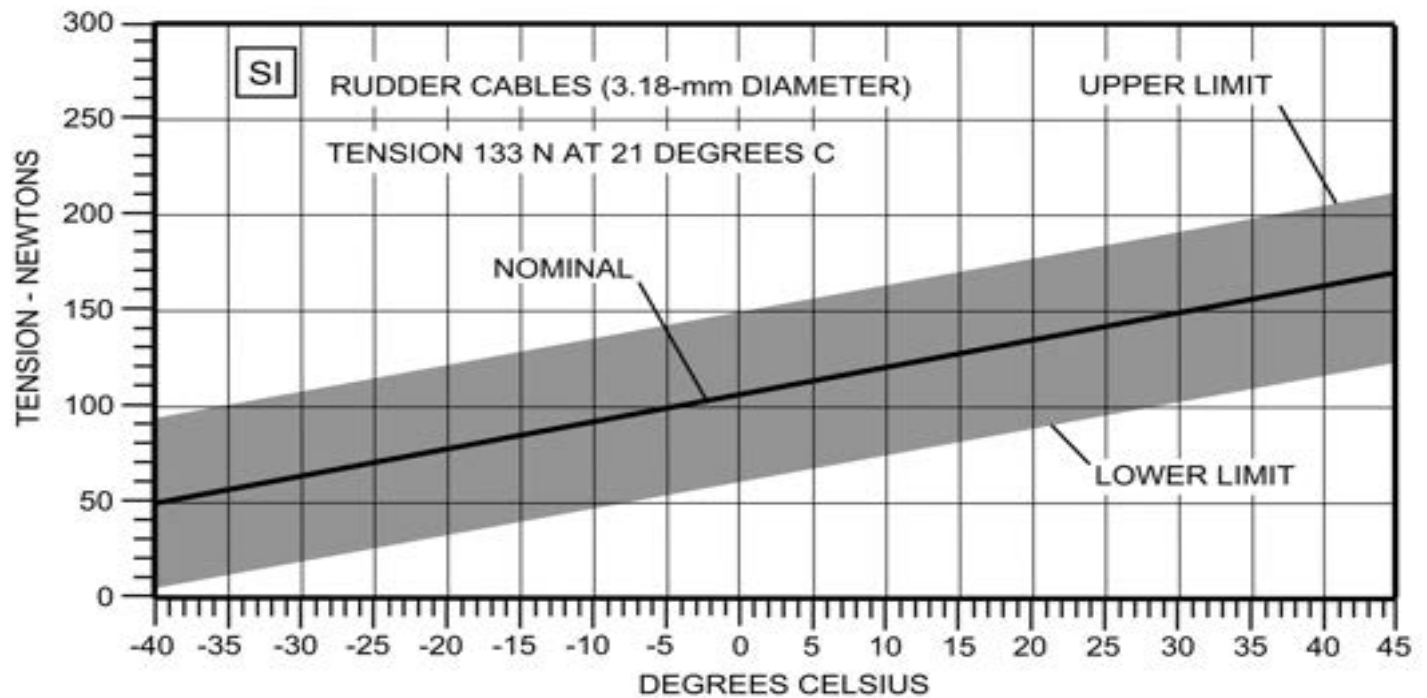


Figure 2 : Sheet 1 : Fuselage Panels

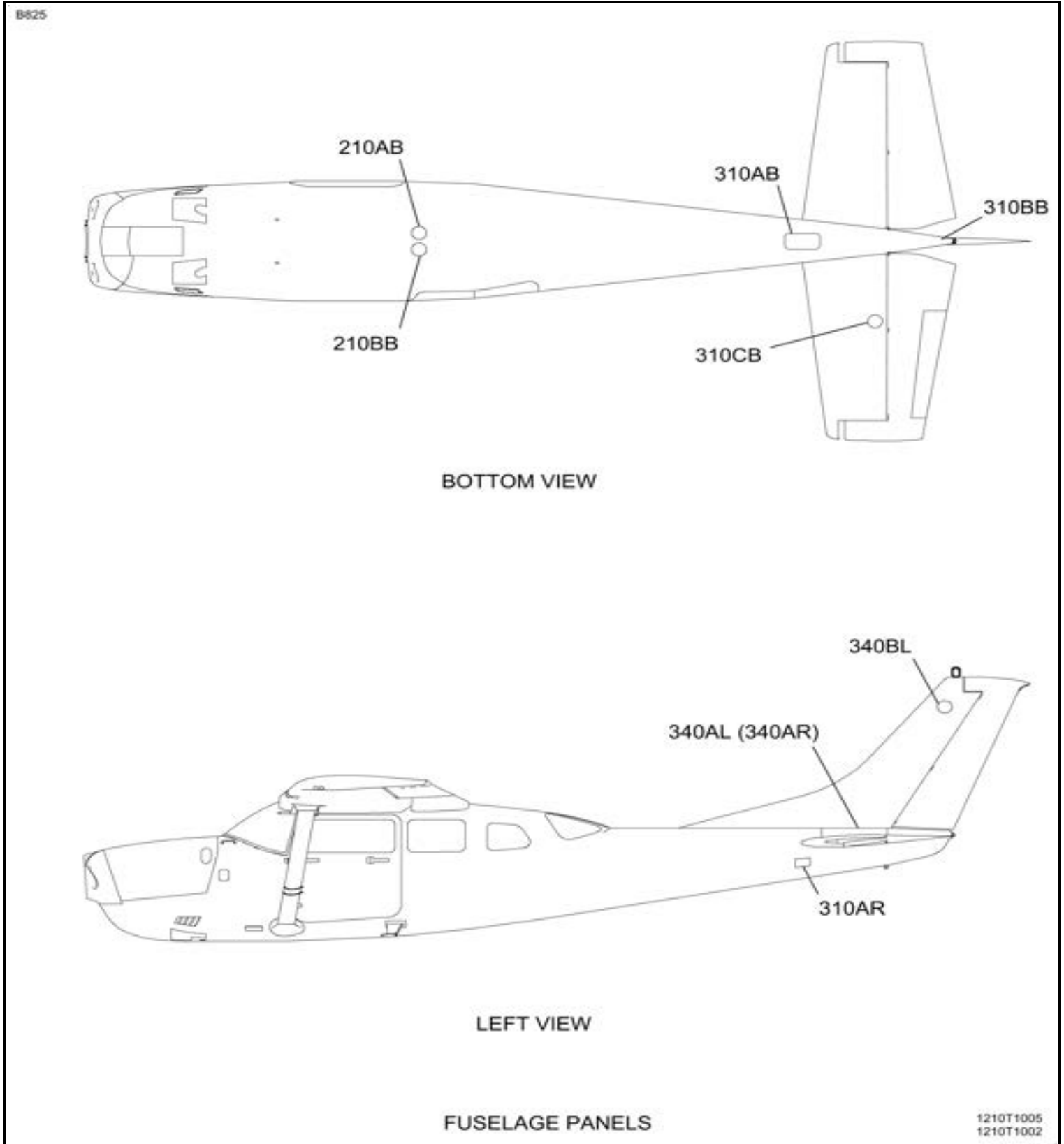


Figure 1 : Sheet 1 : Cabin Floorboard Panels

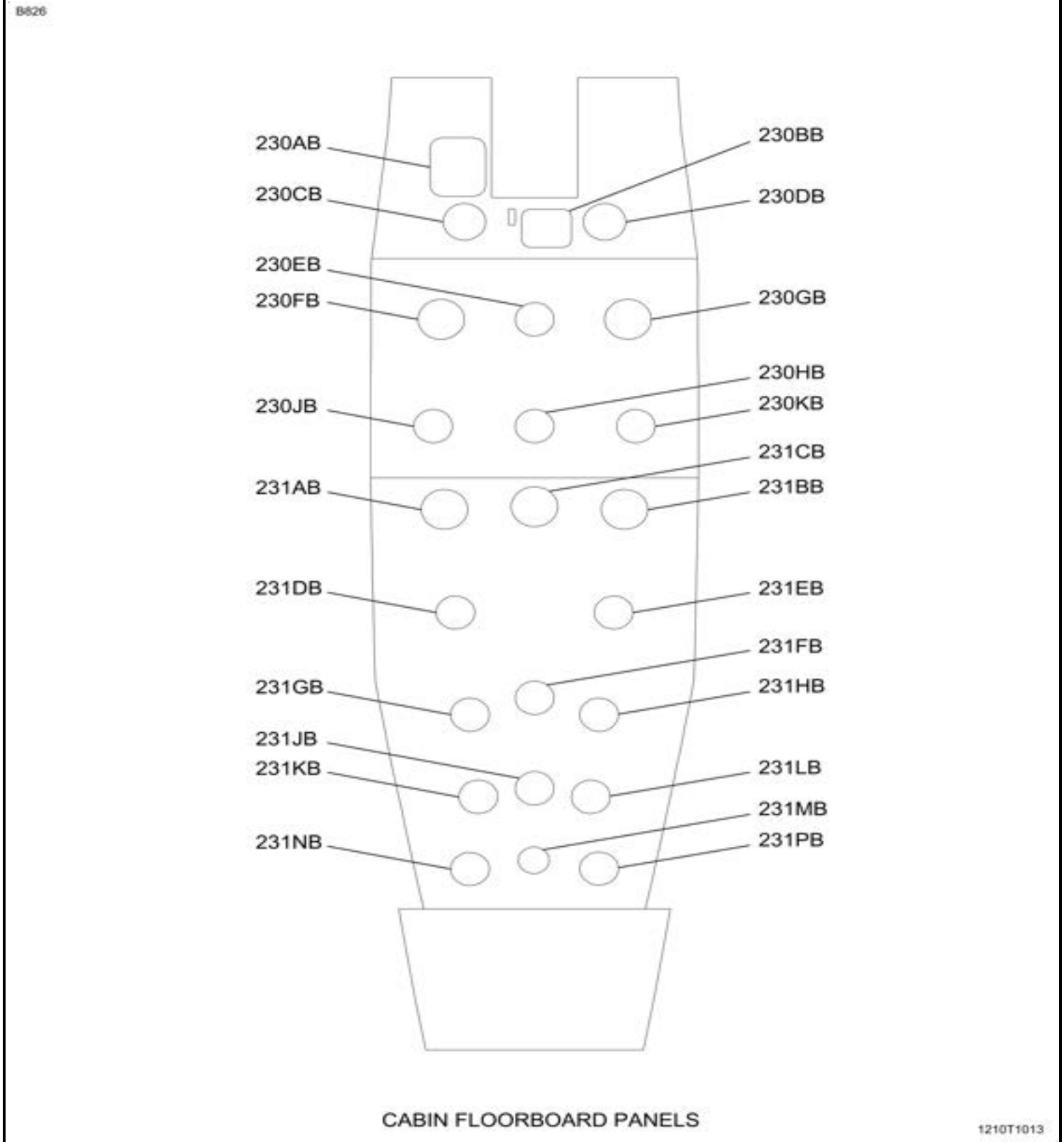
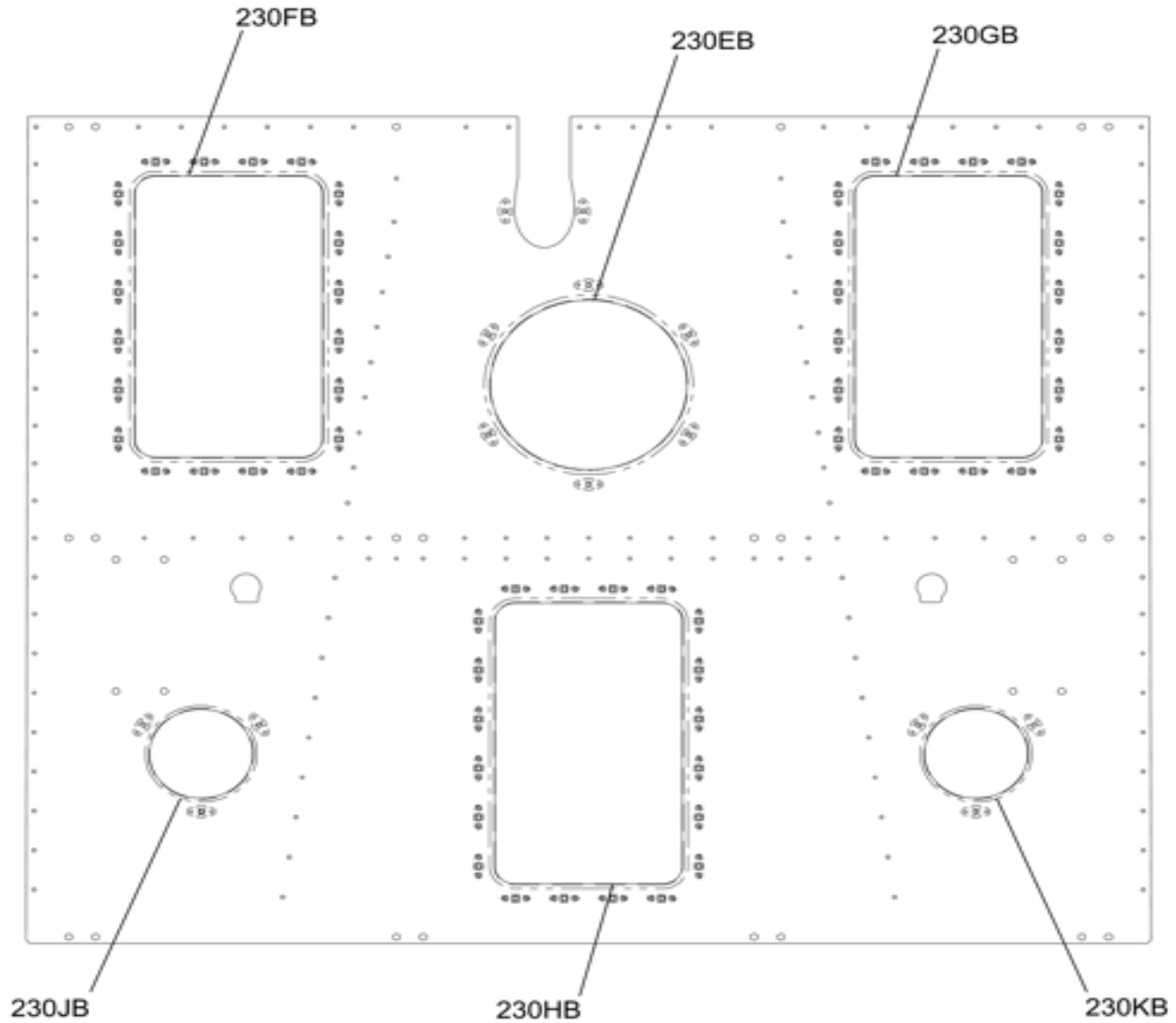


Figure 1 : Sheet 2 : Cabin Floorboard Panels

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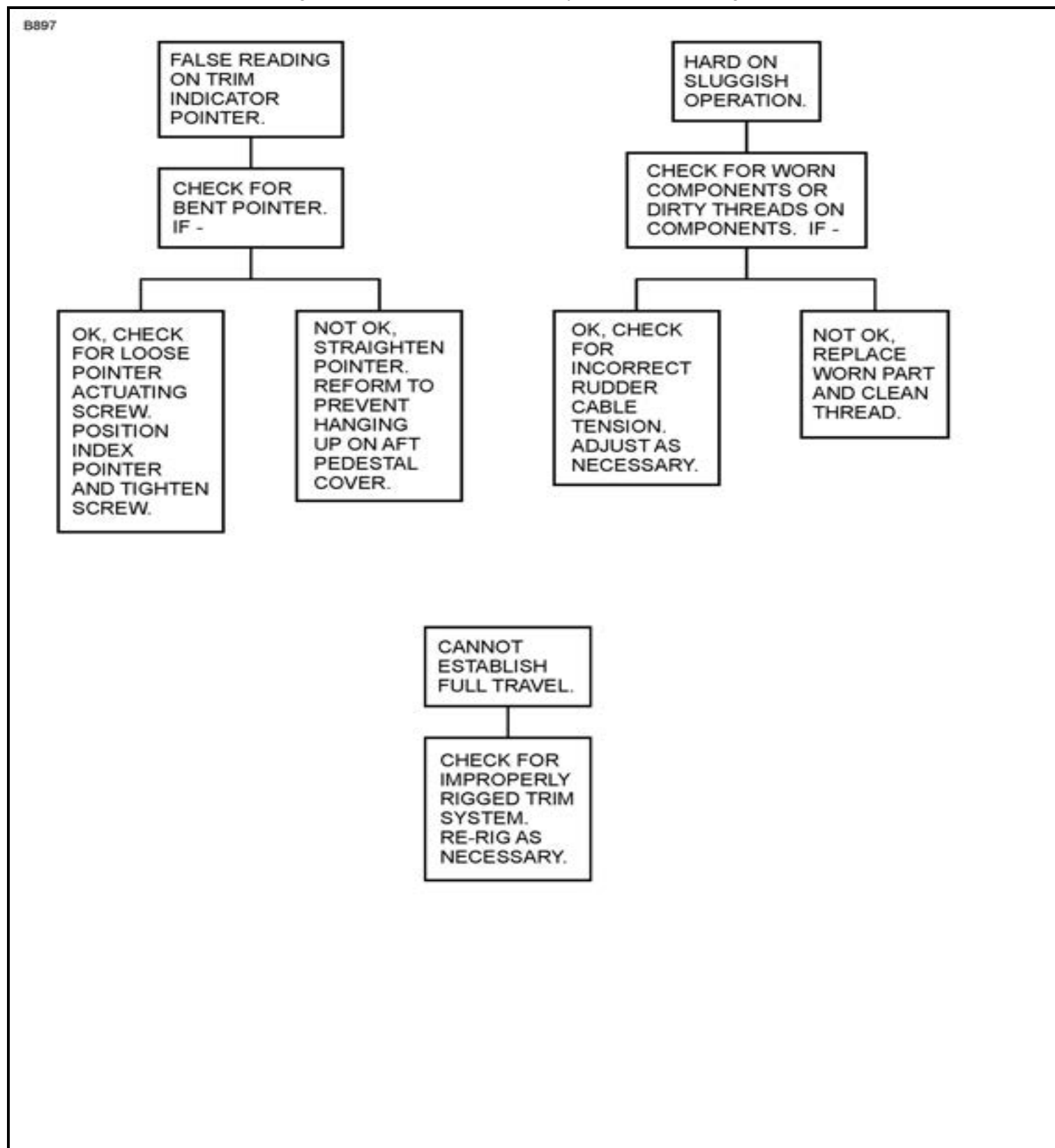
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RUDDER TRIM CONTROL - TROUBLESHOOTING

1. General

- A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Rudder Trim System Troubleshooting Chart



RUDDER TRIM CONTROL - 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 pilot's and copilot's seats. Refer to Chapter 25, [Front Seats and Rails - Maintenance Practices](#).
 - (2) Remove pedestal cover, carpet and shield assemblies. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (3) Loosen bolt securing idler sprocket and relieve tension on chain.
 - (4) Disconnect steering bungee from rudder bar arm.
 - (5) Remove chain guard from steering bungee sprocket.
 - (6) Remove chain from steering bungee sprocket and forward trim shaft sprocket.
 - (7) Remove clamp from nose gear steering bungee.
 - (8) Remove nose gear for access to steering bungee. Refer to Chapter 32, [Nose Landing Gear - Maintenance Practices](#).
- B. Install Rudder Trim System (Refer to [Figure 201](#)).
- (1) Install nose gear. Refer to Chapter 32, [Nose Landing Gear - Maintenance Practices](#).
 - (2) Install clamp on nose gear steering bungee.
 - (3) Install chain on steering bungee sprocket and forward trim shaft sprocket.
 - (4) Connect steering bungee to rudder bar arm.
 - (5) Position chain on idler sprocket
 - (6) Rig trim system. Refer to [Rudder Trim Adjustment/Test](#).
 - (7) Install chain guard on steering bungee sprocket.
 - (8) Install pedestal cover, carpet and shield assemblies. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (9) Install pilot's and copilot's seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).

3. Rudder Trim Adjustment/Test

- A. Rig Rudder Trim System (Refer to [Figure 201](#)).

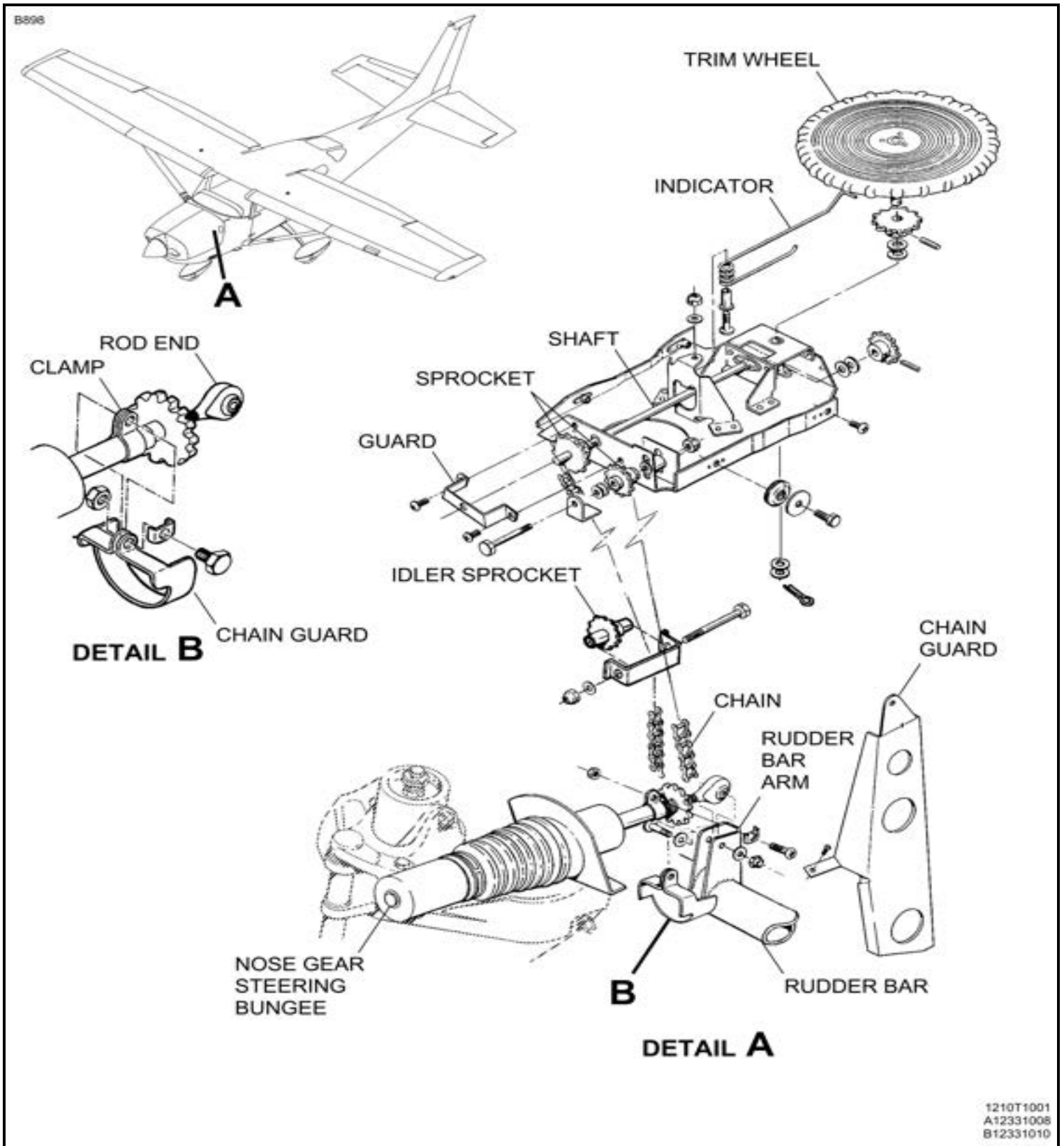
NOTE: Rudder control system must be rigged prior to rigging rudder trim system.

- (1) Remove pilot's and copilot's seats. Refer to Chapter 25, [Front Seats and Rails - Maintenance Practices](#).
- (2) Remove pedestal cover, carpet and shield assemblies. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (3) Disconnect nose gear steering bungee from rudder bar arm.
- (4) Tie down or weight airplane tail section to raise nose wheel free of the ground.
- (5) Extend nose gear strut and ensure nose gear is centered against external centering stop.
- (6) Loosen bolt securing idler sprocket, and slide idler sprocket in the adjustment slot and disengage chain from sprocket.
- (7) Clamp rudder pedals in neutral position,
- (8) Screw nose gear steering bungee sprocket in against bungee shaft, then screw rod end in against sprocket to obtain bungee shortest length.
- (9) Holding rod end to prevent turning, rotate sprocket until hole in rod end aligns exactly with sprocket hole on rudder bar arm. Connect rod end to rudder bar arm.
- (10) Engage chain on sprockets and tighten idler sprocket so chain is taut but not tight.
- (11) Remove clamps from rudder pedals.

WARNING: Ensure rudder moves in the correct direction when operated by the rudder trim control wheel.

- (12) Run rudder trim wheel through full range of travel, observing full indicator travel is reached before full bungee extension or contraction.
- (13) Lower nose wheel to ground.
- (14) Install pedestal cover, carpet and shield assemblies, Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (15) Install pilot's and copilot's seats. Refer to [Chapter 25, Front Seats - Maintenance Practices](#).

Figure 201 : Sheet 1 : Rudder Trim Installation



ELEVATOR CONTROL SYSTEM - TROUBLESHOOTING

1. General

- A. A troubleshooting chart has been developed to aid maintenance technician in system understanding. Refer to [Figure 101](#).

Figure 101 : Sheet 1 : Elevator System Troubleshooting Chart

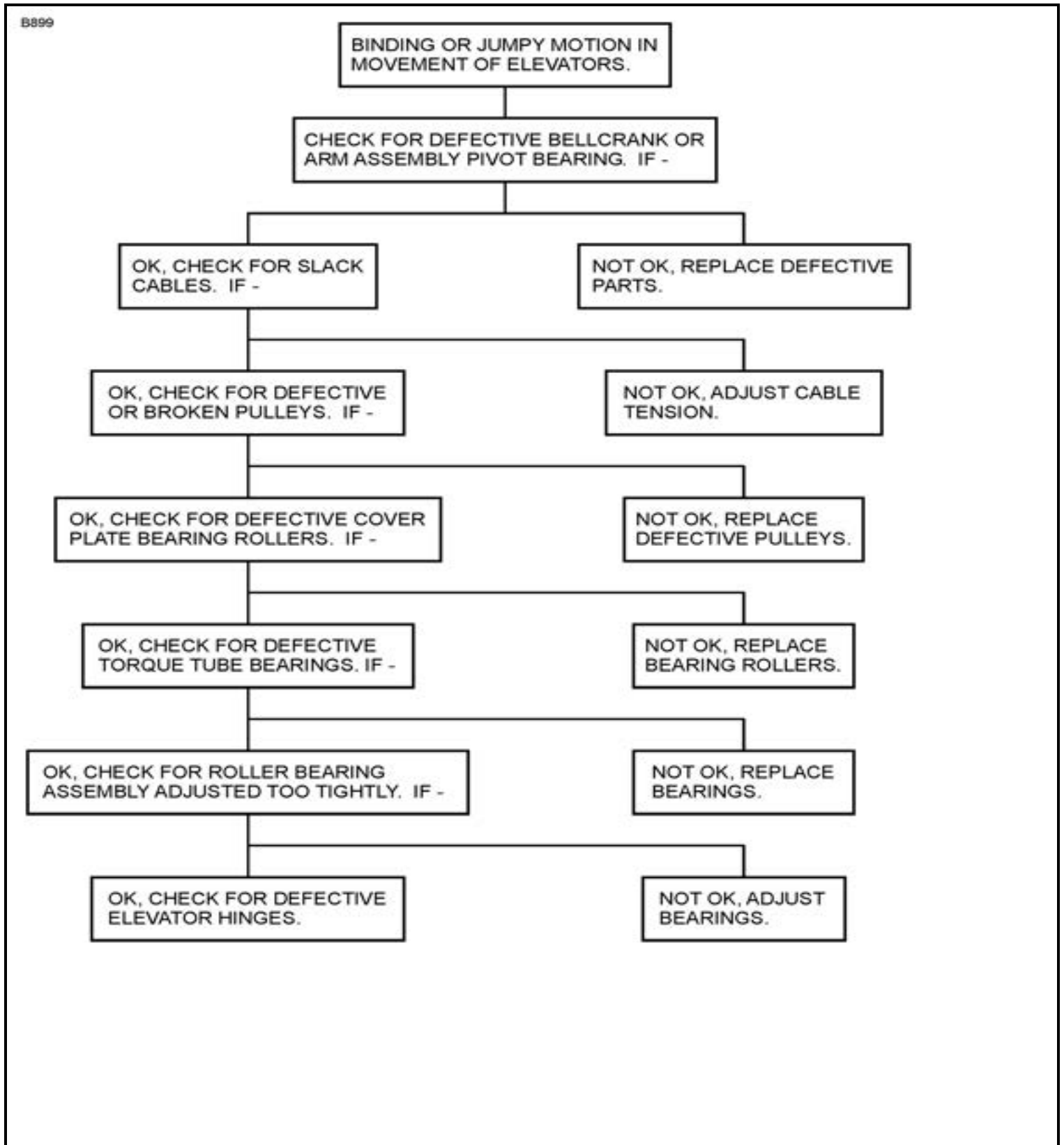
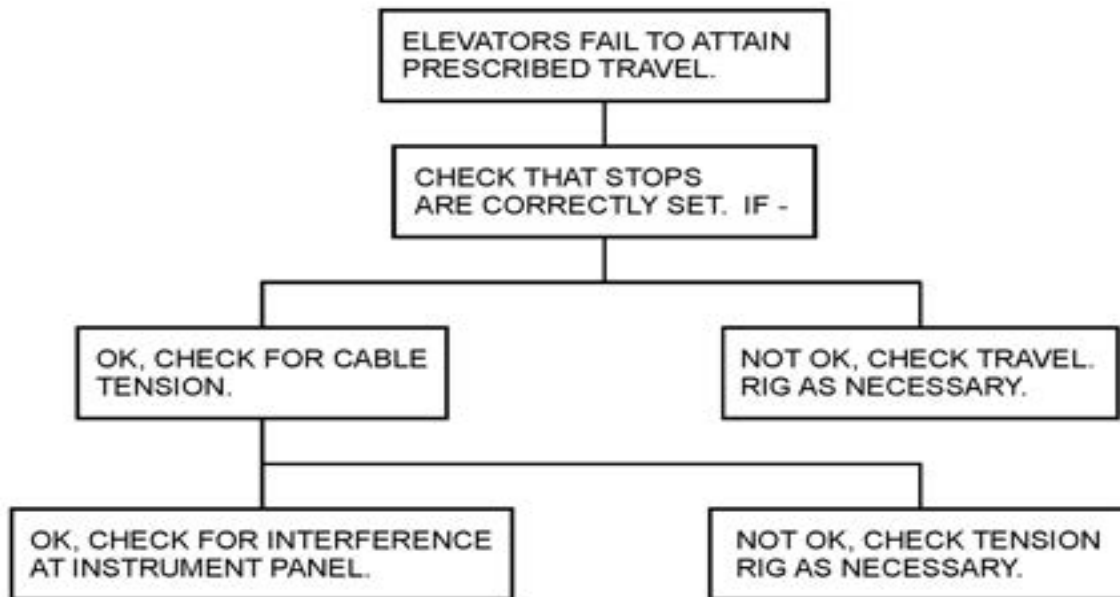


Figure 101 : Sheet 2 : Elevator System Troubleshooting Chart

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ELEVATOR CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

- A. Elevators are operated by forward and aft movement of the control wheels. This movement is transferred to the elevators through the control linkage, control columns, and a series of cables, pulleys, bell cranks, links and pushrods.

2. Elevator Removal/Installation

- A. Remove Elevator (Refer to [Figure 201](#)).

- (1) Remove Stinger.
- (2) Disconnect trim tab push-pull tube at tab actuator.

NOTE: If removing left elevator, omit this step.

NOTE: If trim system is not moved and actuator screw is not turned, re-rigging of trim system should not be necessary after reinstallation of elevator.

- (3) Remove bolts securing elevator torque tubes to arm assembly.

NOTE: Bolts are installed using EA9309-25GR adhesive. It may be necessary to apply heat in the area of the bolt shank to soften the epoxy prior to removing bolts.

- (4) Remove bolts from elevator hinges and electrical bonding straps.
- (5) Using care, remove elevator.

- B. Install Elevator (Refer to [Figure 201](#)).

- (1) Using care, install elevator.
- (2) Install elevator hinge bolts and electrical bonding straps.
- (3) Insert bolts into elevator torque tubes and arm assembly with a washer under the head of each bolt and under each nut. Apply Adhesive EA9309-25GR from Hysol Division, Dexter Corp., or its equivalent. Apply only to the shanks of bolts. Wipe off excess adhesive after installation.

NOTE: Set right hand elevator maintaining 0.18 inch dimension specified in [Figure 202](#).

- (4) If necessary, install trim tab push-pull tube at tab actuator and re-rig trim system.
- (5) Install stinger.

3. Cables and Pulleys Removal/Installation

- A. Remove Cables and Pulleys (Refer to [Figure 201](#)).

- (1) Remove pilot's and copilot's seats. Refer to [Chapter 25, Front Seats and Rails - Maintenance Practices](#).
- (2) Remove Center seats. Refer to [Chapter 25, Center Seats and Rails - Maintenance Practices](#).
- (3) Remove rear seat. Refer to [Chapter 25, Rear Seat - Maintenance Practices](#).
- (4) Remove carpet. Refer to [Chapter 25, Interior Upholstery - Maintenance Practices](#).
- (5) Remove access plates ([310BB](#), [230EB](#), [230HB](#), [231CB](#), [231FB](#), [231JB](#), [231MB](#) and [310AB](#)) Refer to [Chapter 6, Access/Inspection Plates - Description and Operation](#).

CAUTION: Position a support stand under tail tiedown ring to prevent the tailcone from dropping while working inside.

- (6) Remove safety clips/safety wire to relieve cable tension at turnbuckles and disconnect cables from cable links.
- (7) Disconnect cables from torque tube at control arm assemblies, left and right.
- (8) Remove cable guards and pulleys as necessary to work cables free of airplane.

NOTE: To ease routing of cables, a length of wire may be attached to the end of the cable before being withdrawn from airplane. Leave wire in place, routed through structure, then attach cable being installed and pull the cable into position.

- (9) Remove cables.

- B. Install Cables and Pulleys (Refer to [Figure 201](#)).

- (1) Route cables through structure.
- (2) Install pulleys and pulley guards. Ensure cables are positioned in pulley grooves before installing guards.
- (3) Connect cables to torque tube at control arm assemblies, left and right.

- (4) Connect cables to cable links.
- (5) Rig elevator system and safety turnbuckles. Refer to [Elevator Control Adjustment/Test](#).
WARNING: Ensure elevators travel in the proper direction when operated by the control column.
- (6) Install access plates.
- (7) Install carpet. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (8) Install rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (9) Install center seats. Refer to Chapter 25, [Center Seats and Rails - Maintenance Practices](#).
- (10) Install pilot's and copilot's seats. Refer to Chapter 25, [Front Seats and Rails - Maintenance Practices](#).

4. Elevator Bell Crank Removal/Installation

- A. Remove Elevator Bell Crank (Refer to [Figure 201](#)).
 - (1) Remove access plates ([231JB](#) and [310AB](#)) Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
 - (2) Remove safety clips/safety wire to relieve cable tension at turnbuckles and disconnect cables from cable links.
 - (3) Remove bolt and washer securing push-pull tube to bell crank.
 - (4) Remove nut, washers, spacers, elevator down springs, cable links and bolt from upper end of bell crank.
 - (5) Remove nut, bolt and cotter pin securing cable links to lower end of bell crank.
 - (6) Remove pivot bolt attaching bell crank to brackets.
 - (7) Remove bell crank.
- B. Install Elevator Bell Crank (Refer to [Figure 201](#)).
 - (1) Place bell crank in position and install pivot bolt. Replace any extra components removed to facilitate arm assembly removal.
 - (2) Install bolt, nut and cotter pin securing cable links to lower end of bell crank.
 - (3) Install nut, washer, spacers, elevator down springs and cable links to upper end of bell crank.
 - (4) Secure push-pull tube to arm assembly with bolt, washer and nut.
 - (5) Connect cables to cable links and set cable tension. Refer to [Elevator Control Adjustment/Test](#).
 - (6) Safety turnbuckles.
WARNING: Ensure elevators travel in the proper direction when operated by the control column.
 - (7) Install access plates.

5. Aft Elevator Arm Assembly Removal/Installation

- A. Remove Aft Elevator Arm Assembly (Refer to [Figure 201](#)).
 - (1) Remove stinger.
 - (2) Remove bolt securing push-pull tube to arm assembly.
 - (3) Remove bolts securing elevator torque tubes to arm assembly. A heat gun may be required to soften epoxy adhesive on bolts.
 - (4) Remove pivot bolt securing arm assembly and slide assembly from between elevator torque tubes.
- B. Install Aft Elevator Arm Assembly (Refer to [Figure 201](#)).
 - (1) Slide arm assembly between elevator torque tubes and secure with pivot bolts.
 - (2) Install bolts securing elevator torque tubes to arm assembly. When reinstalling bolts install a washer under the head of each bolt and under each nut. Apply adhesive EA9309-25GR from Hysol Division, Dexter Corp., or its equivalent, only to the shanks of bolts. Wipe off excess adhesive after installation.
NOTE: Set right hand elevator maintaining 0.18-inch dimension specified in [Figure 202](#).
 - (3) Secure push-pull tube to arm assembly using bolt.
 - (4) Install stinger.

6. Elevator Control Adjustment/Test

- A. Rig Elevator (Refer to [Figure 202](#) and [Figure 203](#)).
 - (1) Fabricate a Neutral Rigging Tool from 0.125 inch (3.18 mm) steel plate, 0.209 inch (5.3 mm) diameter drill rod, and 0.250

inch (6.35 mm) diameter drill rod. (Refer to [Detail B](#)).

- (2) Remove access plate ([310BB](#)) and fairings ([340AL](#) and [340AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

CAUTION: Position a support stand under tail tie-down to prevent the tailcone from dropping while working inside.

- (3) Install the neutral rigging tool to lock the elevator control in the neutral position.
- (4) Streamline the left elevator to neutral with horizontal stabilizer.

NOTE: Do not attempt to align the elevator trailing edges as there is a 0 degree 54' twist designed into the connecting torque tube. This twist causes the right elevator to be higher than the left.

NOTE: Disregard counterweight areas of the elevator when streamlining. These areas are contoured to be streamlined at cruising speed (elevators approximately 3 degrees down).

CAUTION: Maintain specified control cable tension.

- (5) While you hold the elevators in the neutral position, adjust the turnbuckles equally to 30 pounds, +10 or -10 pounds (133.45 N, +44.48 or -44.48 N), of cable tension at 70 °F (21 °C). Refer to the Charts in [Figure 203](#) for the correct tensions at other temperatures.

NOTE: The elevators must be supported to obtain correct cable tension.

- (6) Mount an inclinometer on elevator and, keeping elevator streamlined with stabilizer, set inclinometer to 0 degrees.
- (7) Remove neutral rigging tool.
- (8) Adjust bell crank up stop to attain 21 degrees, +1 or -1 degree, up travel.

NOTE: The holes in the bell crank stops are off center to give elevator travel adjustment.

NOTE: The bell crank stops can be turned in 90-degree increments to give approximately 1 degree of elevator travel.

- (9) Adjust bell crank down stop to attain 17 degrees, +1 or -1 degree, down travel.

WARNING: Ensure that elevators travel in the proper direction when operated by the control column.

- (10) Check sponge at control column in both up and down positions, and if necessary, readjust turnbuckles to prevent control column from hitting the instrument panels or firewall.
- (11) Safety turnbuckles.
 - (a) Use the single wrap preferred procedure with 0.040 inch (1.0 mm) stainless steel or monel safety wire. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
- (12) Install access plates ([310BB](#)) and fairings ([340AL](#) and [340AR](#)). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (13) Remove support stand.

Figure 201 : Sheet 1 : Elevator Control System

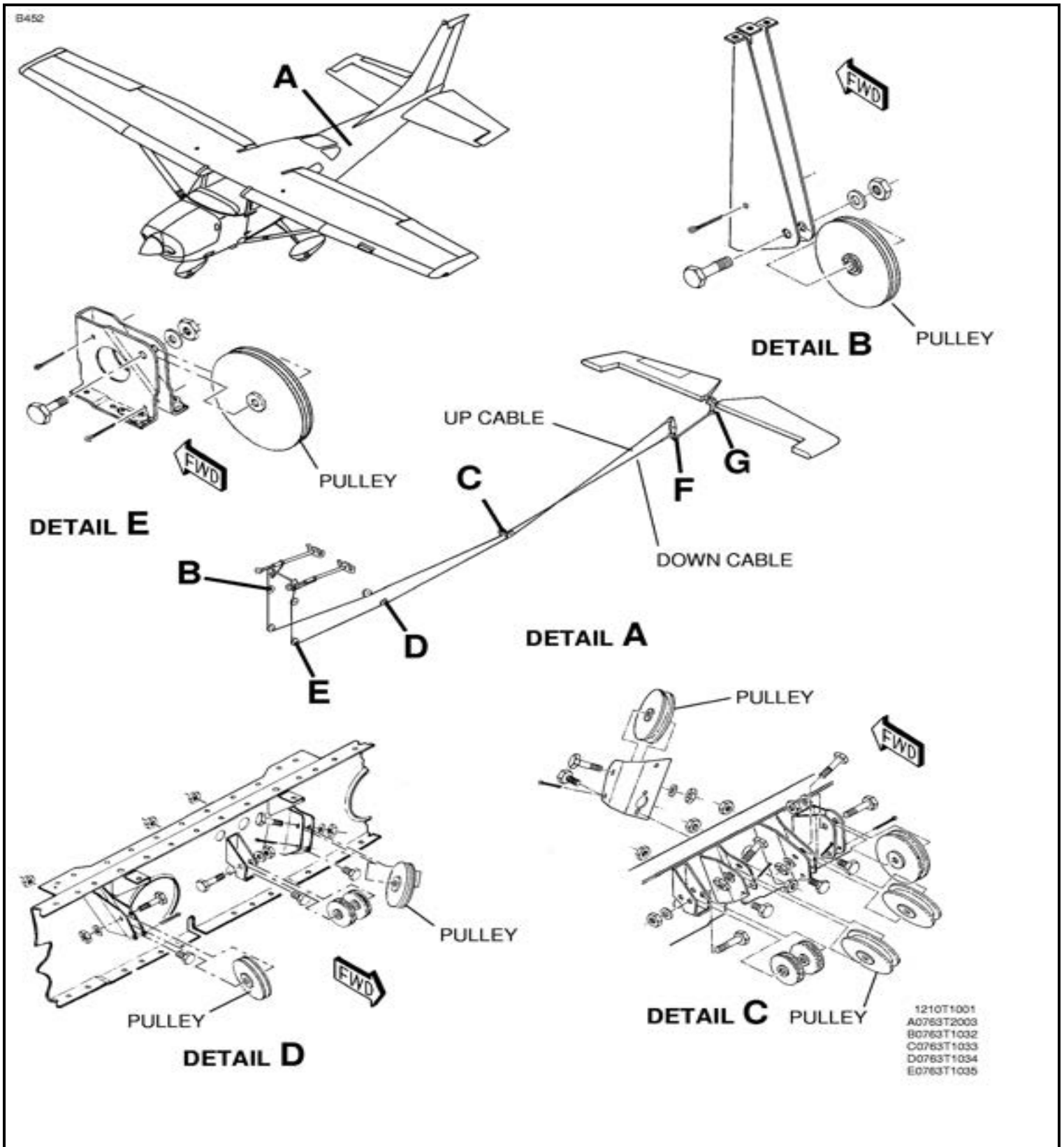


Figure 201 : Sheet 2 : Elevator Control System

B451

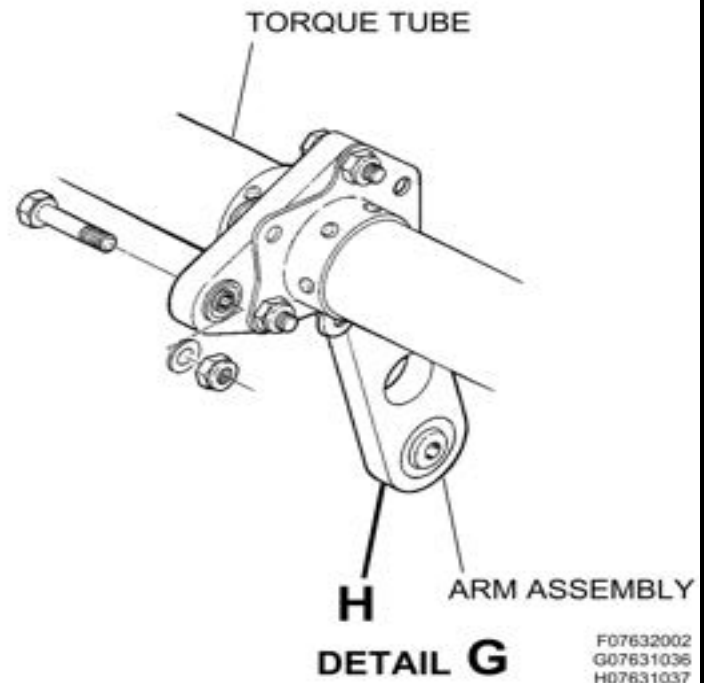
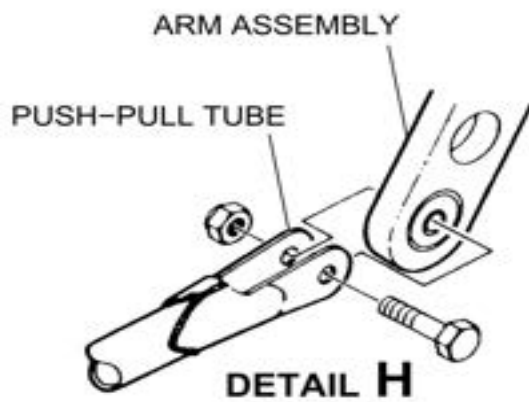
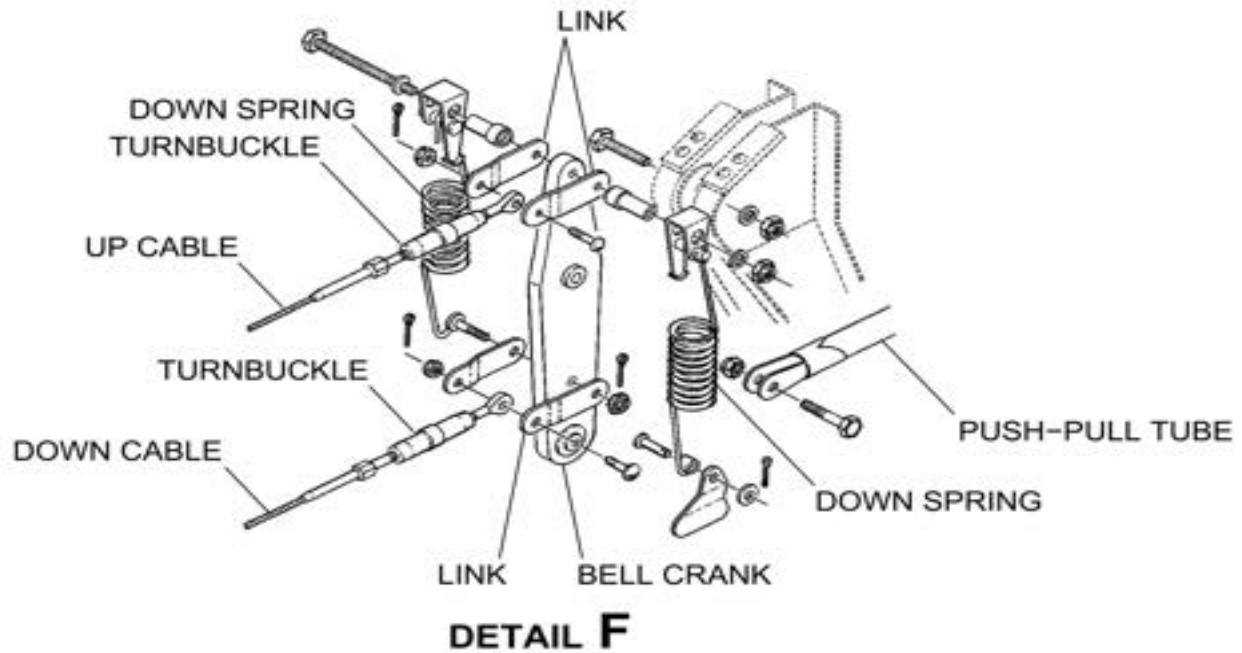


Figure 202 : Sheet 1 : Elevator Control System Rigging

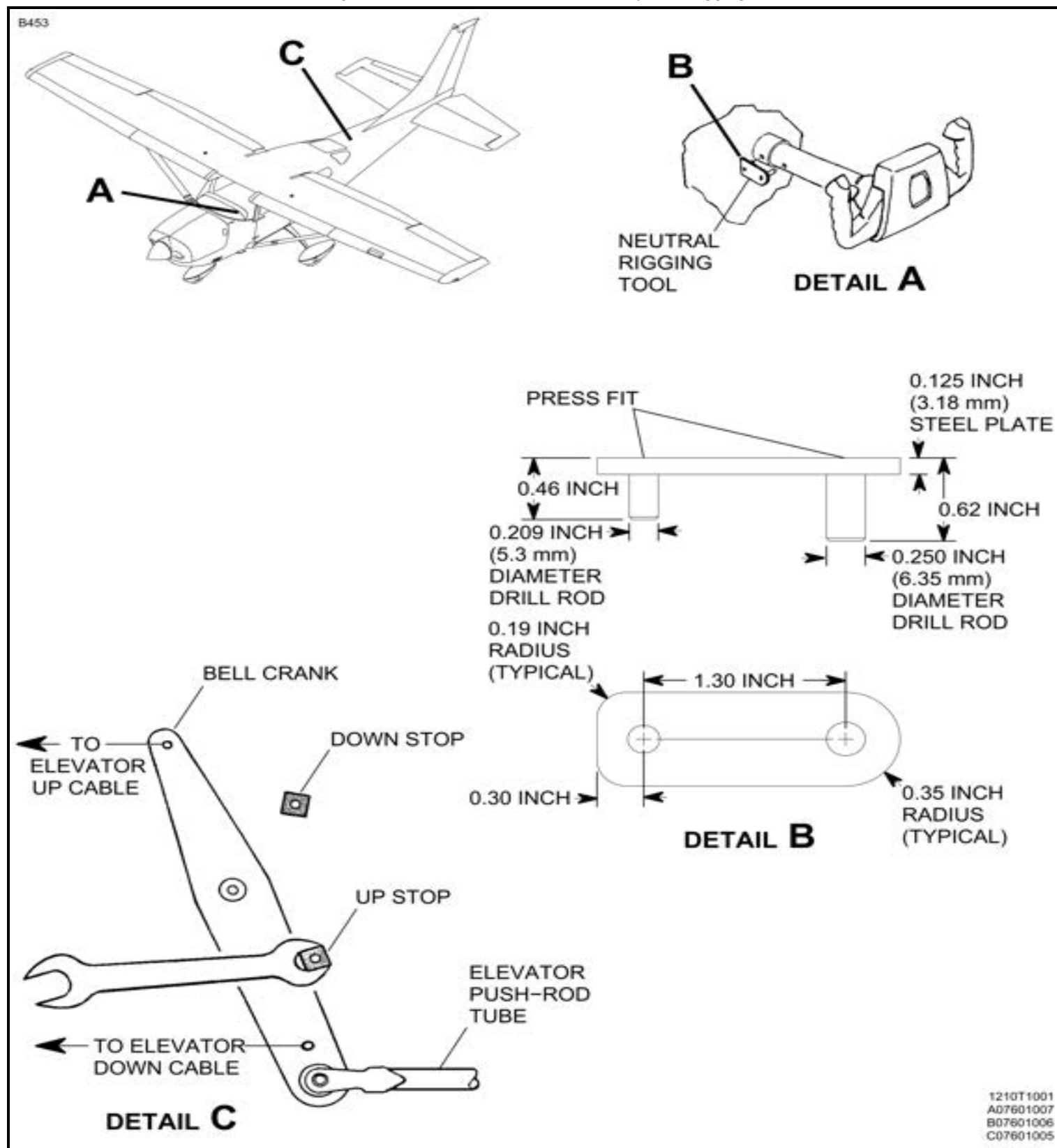
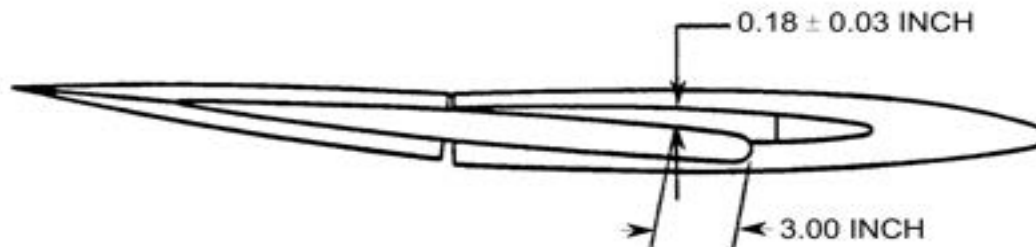
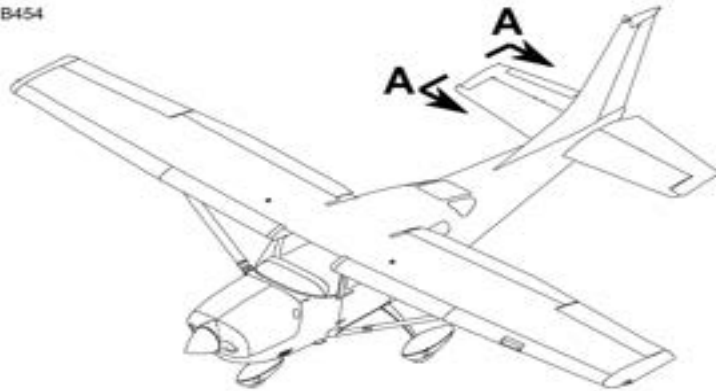


Figure 202 : Sheet 2 : Elevator Control System Rigging

B454



VIEW A-A

THIS VIEW APPLIES TO THE RIGHT ELEVATOR
WHEN THE LEFT ELEVATOR IS STREAMLINED

NOTE: DO NOT ATTEMPT TO ALIGN THE ELEVATOR TRAILING EDGES AS THERE IS A 0.54° TWIST DESIGNED INTO THE CONNECTING TORQUE TUBE. THIS TWIST CAUSES THE RIGHT ELEVATOR TO BE HIGHER THAN THE LEFT.

NOTE: DISREGARD COUNTERWEIGHT AREAS OF THE ELEVATOR WHEN STREAMLINING. THESE AREAS ARE CONTOURED TO BE STREAMLINED AT CRUISING SPEED (ELEVATORS APPROXIMATELY 3° DOWN).

1210T1001
AA07601020

Figure 203 : Sheet 1 : Elevator Cable Tension

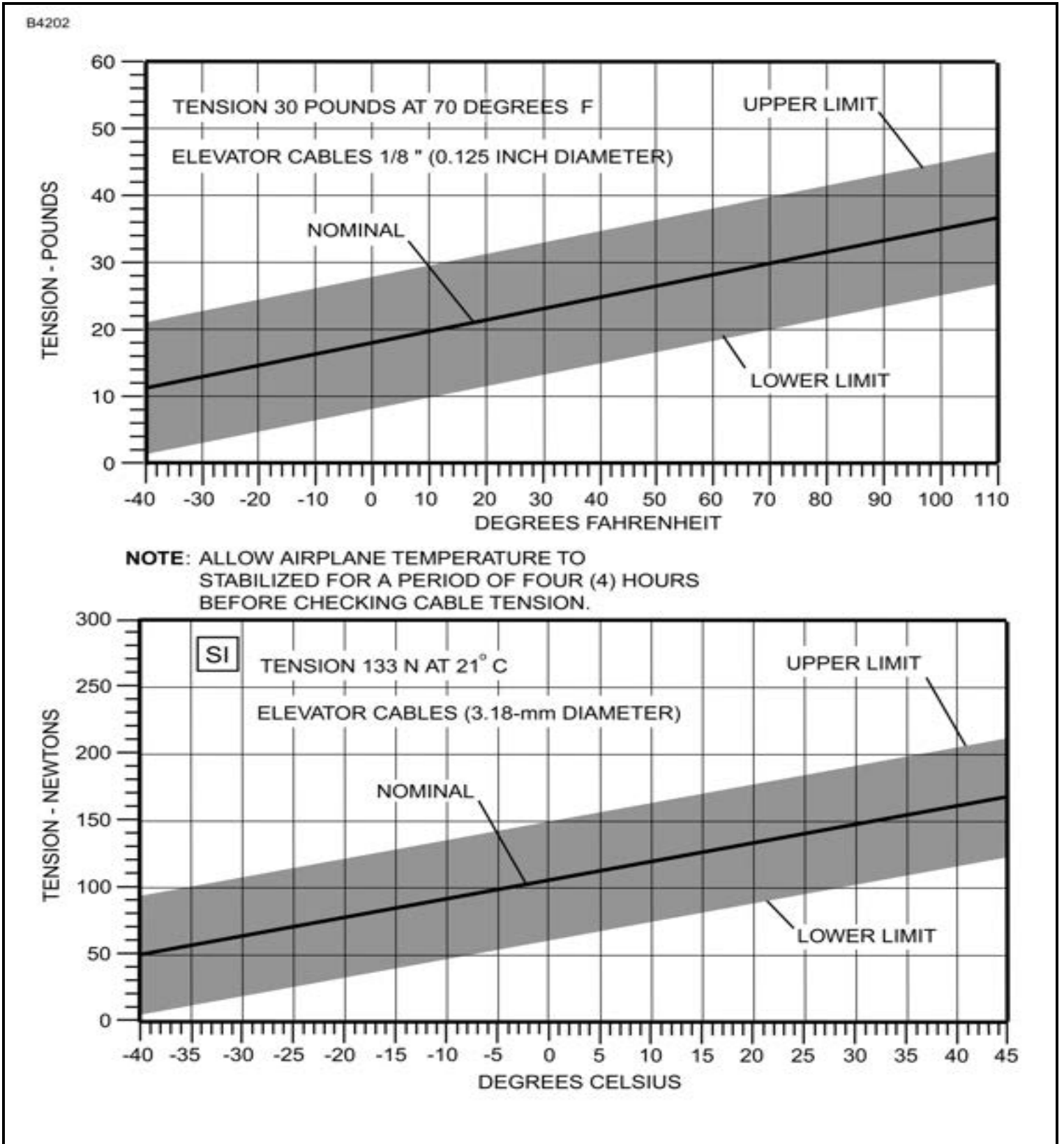


Figure 2 : Sheet 1 : Fuselage Panels

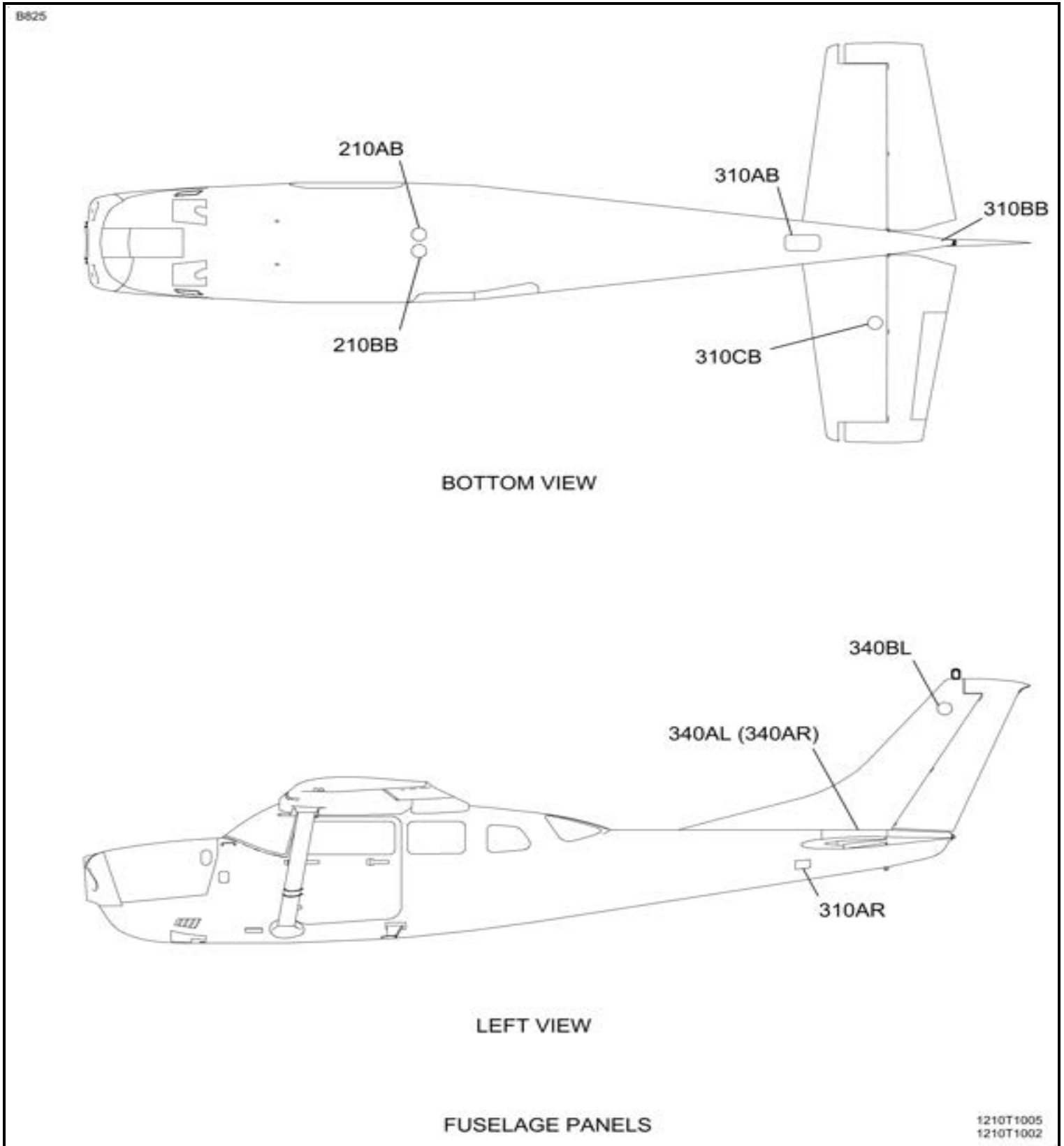


Figure 1 : Sheet 1 : Cabin Floorboard Panels

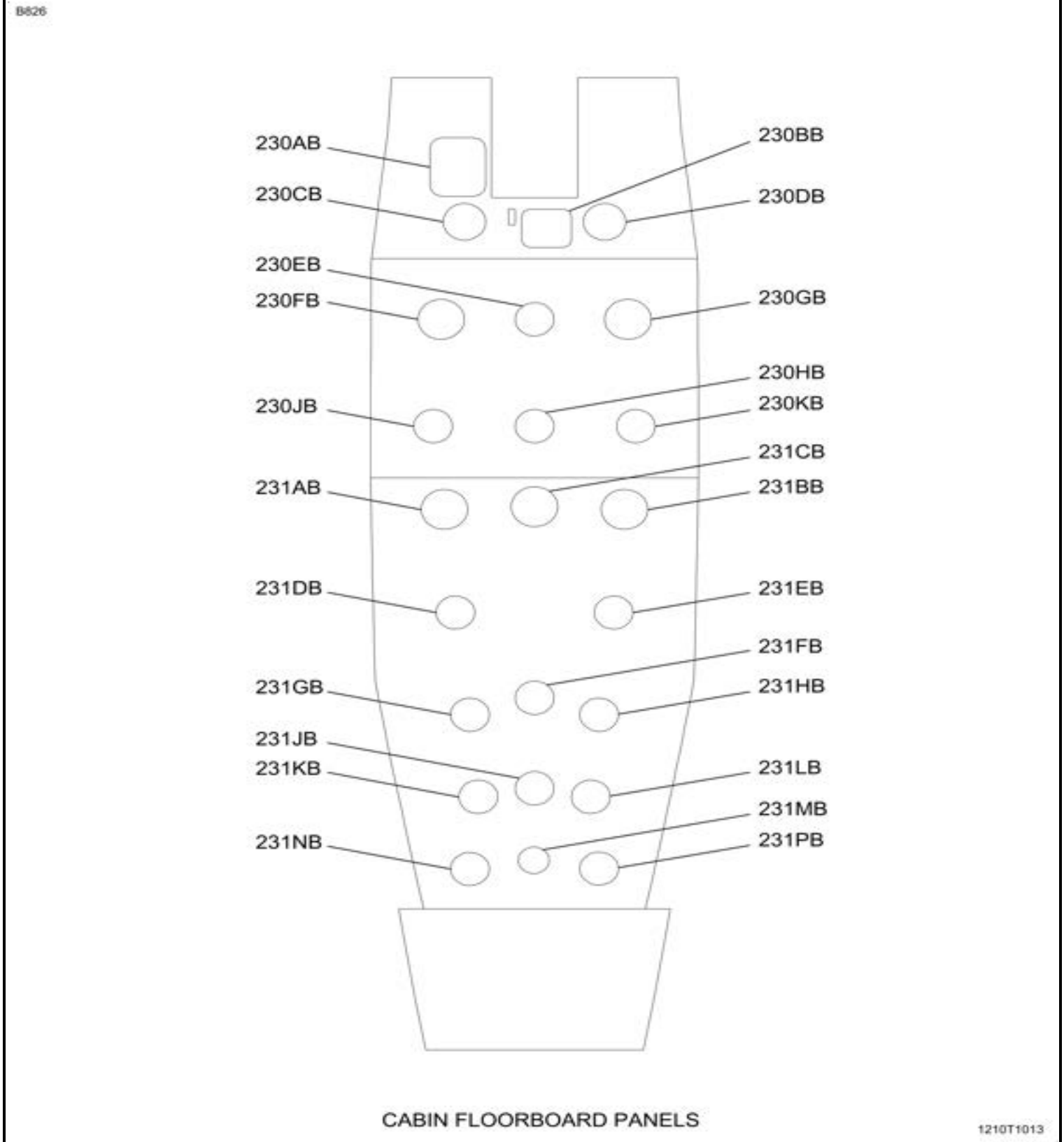
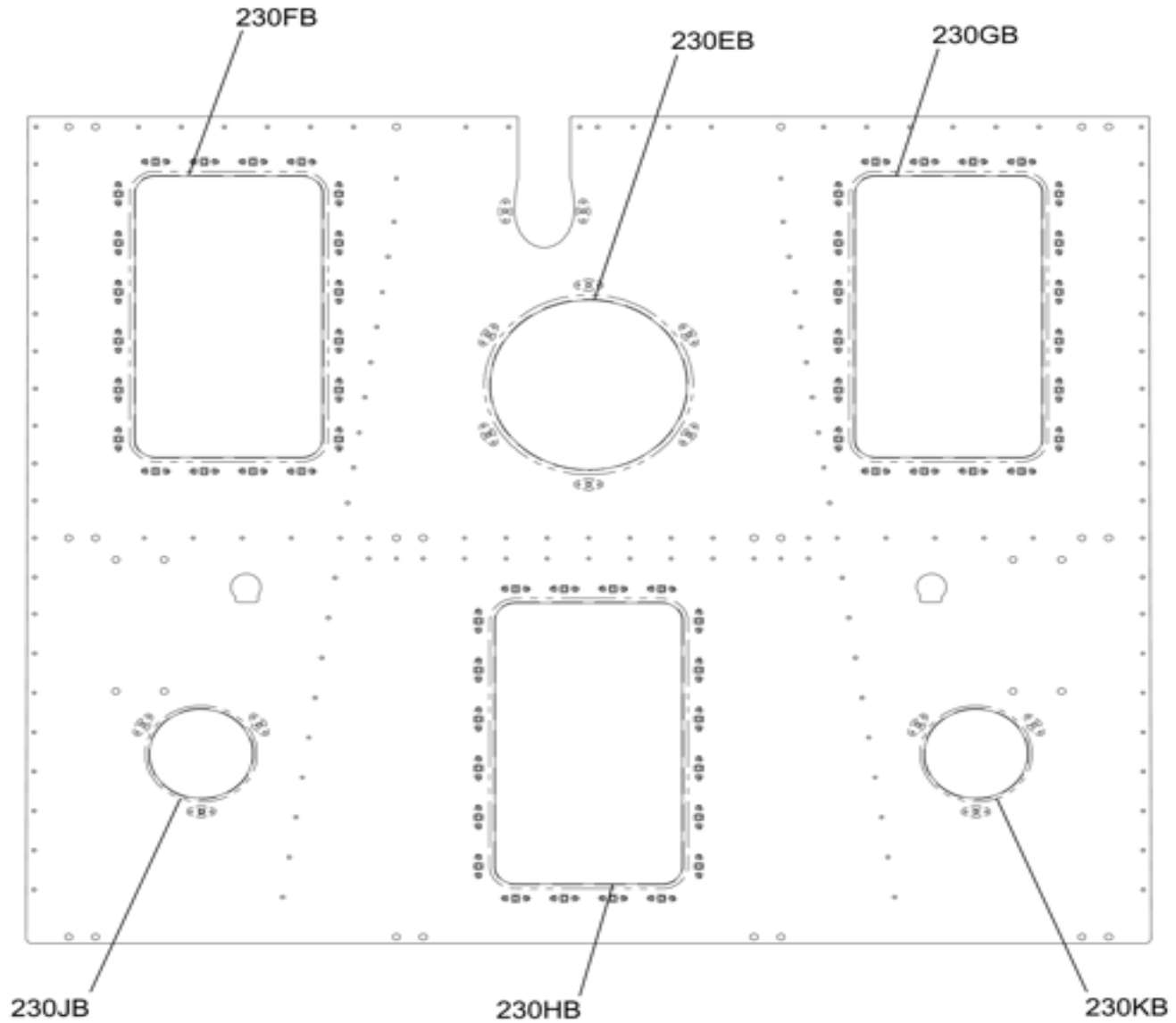


Figure 1 : Sheet 2 : Cabin Floorboard Panels

B20981



AIRPLANES 9197 AND ON

1210T821-1

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](#).

Figure 101 : Sheet 1 : Elevator Trim System Troubleshooting Chart

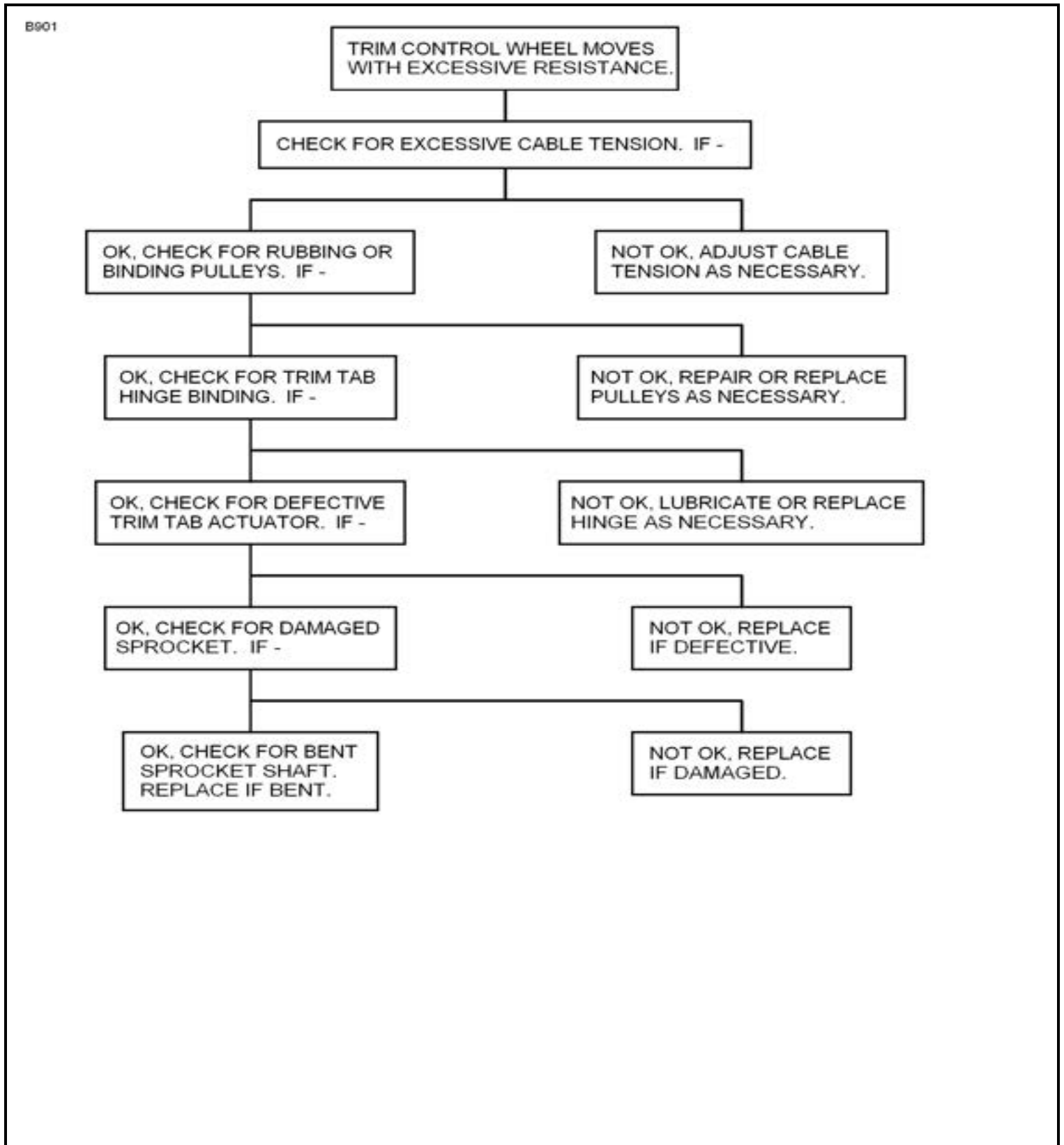


Figure 101 : Sheet 2 : Elevator Trim System Troubleshooting Chart

B902

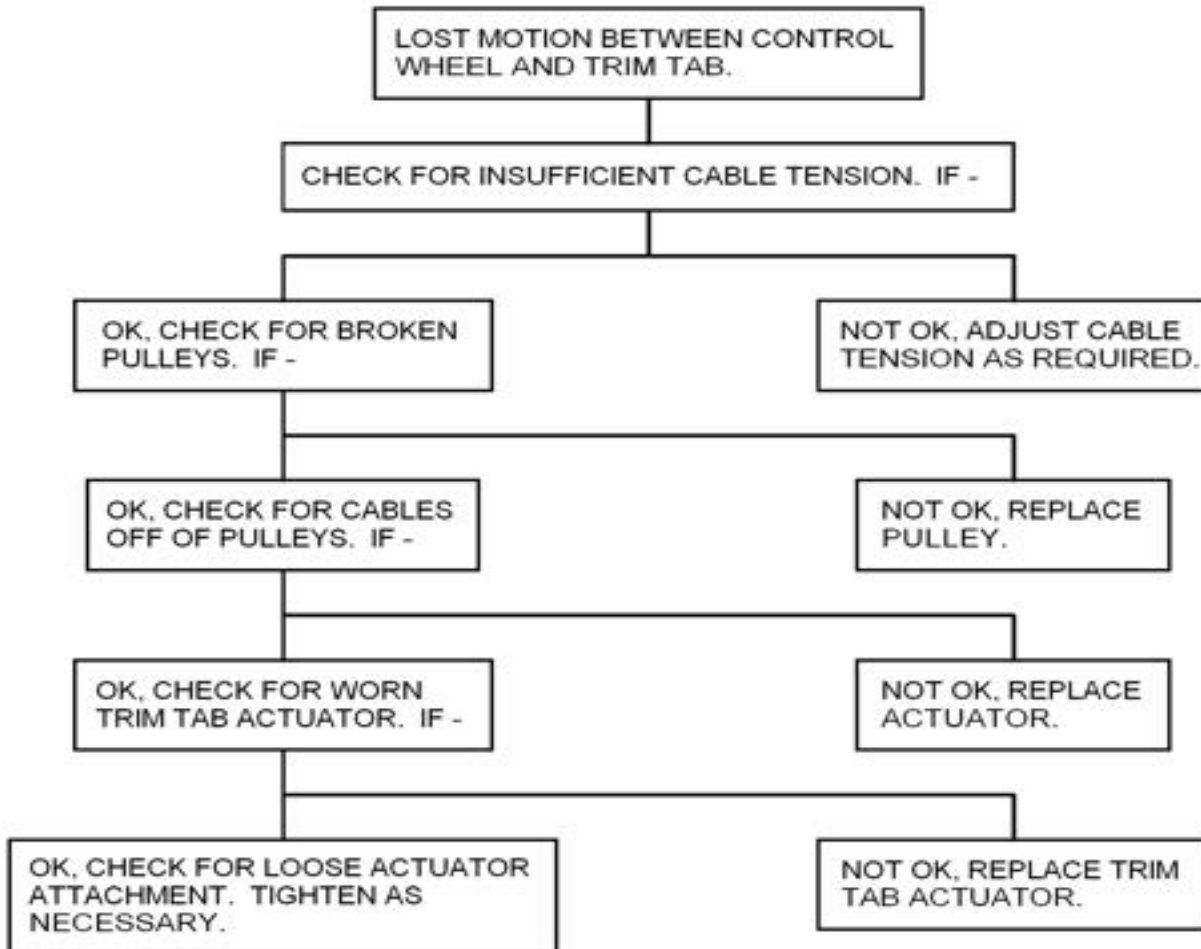
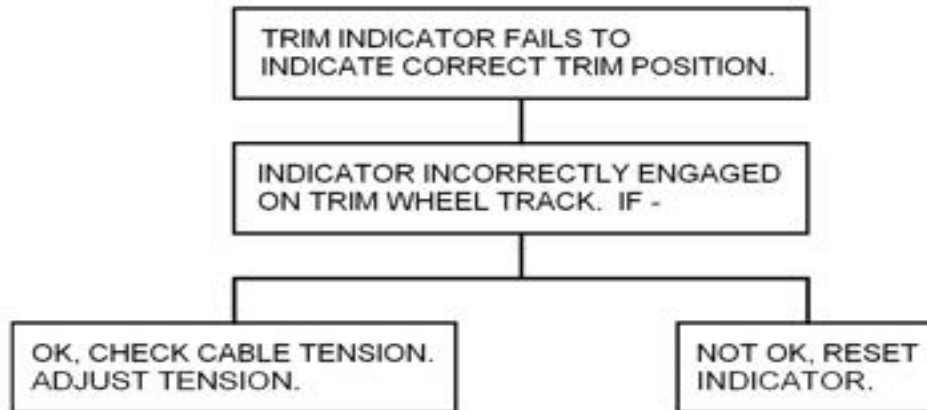


Figure 101 : Sheet 3 : Elevator Trim System Troubleshooting Chart

B903



ELEVATOR TRIM CONTROL - MAINTENANCE PRACTICES

1. General

- A. The elevator trim tab, located on the right elevator, is controlled by a trim wheel mounted in the pedestal. Power to operate the tab is transmitted from the trim control wheel by means of chains, cables, an actuator, and a push-pull tube. A mechanical pointer, adjacent to the trim wheel, indicates tab position. A nose up setting results in a tab down position.

2. Trim Tab Actuator Removal/Installation

- A. Remove Trim Tab Actuator (Refer to [Figure 201](#)).
- (1) Position a support stand under tail tiedown ring to prevent tailcone from dropping while person is working inside. Refer to Chapter 7, [Jacking - Maintenance Practices](#).
 - (2) Remove access plate (310CB) from lower side of right stabilizer. Refer to Chapter 6, [Access/Inspection Plates - Description and Operation](#).
 - (3) Remove rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
 - (4) Remove baggage curtain for access to elevator trim control cable stop blocks. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (5) Remove safety clip and relieve cable tension at turnbuckle.
 - (6) At the elevator hinge gap, disconnect push-pull tube from actuator.
 - (7) Remove chain guard.
 - (8) Remove chain from actuator sprocket.
 - (9) Remove screws attaching actuator to bracket, and carefully work actuator out through access opening.

- B. Install Trim Tab Actuator (Refer to [Figure 201](#)).

- (1) Place actuator in position and attach actuator to bracket using screws.
- (2) Install chain to actuator sprocket.
- (3) Install chain guard.
- (4) At the elevator hinge gap, connect push-pull tube from actuator.
- (5) Set cable tension at turnbuckle and install safety clip. Refer to [Trim Tab Control Adjustment/Test](#).
- (6) Install access plate.
- (7) Install baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (8) Install rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (9) Remove support stand.

CAUTION: Be sure trim tab moves in correct direction when the trim tab control wheel is moved toward the nose down position, the elevator trim tab moves up.

- (10) Perform a manual trim tab check. Make sure that when the trim tab control wheel moves to the nose down position, the elevator trim tab moves up.

- (11) Perform electric trim tab check. When engaging the electric trim, make sure the trim tab control wheel moves to the nose down position, the elevator tab moves up.

- (12) Perform electric trim override check, if applicable.

3. Trim Tab Actuator Disassembly/Assembly

- A. Disassemble Trim Tab Actuator (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. Assemble Trim Tab Actuator (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.
- (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) Examine the sealed bearing and screw assembly for wear and for parts that have scores. Check bearings, screw and threaded rod end for excessive wear and scoring. Refer to [Table 201](#) for dimensions.

Table 201. Actuator Wear Limits

COMPONENT	MAXIMUM DIMENSION	MINIMUM DIMENSION
Aft End Bearing Inside Diameter	0.249 Inch (6.32 mm)	0.248 Inch (6.30 mm)
Screw Assembly Outside Diameter	0.246 Inch (6.25 mm) (Shank)	0.245 Inch (6.22 mm) (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 (0.254 mm) 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. Inspect Trim Tab Free Play ([Figure 203](#)).
 - (1) Place elevator and trim tab in neutral position, and with elevator gust lock (gust lock goes in 1.30 inches (33.02 mm) from neutral), secure elevator from movement.
 - (2) Determine maximum amount of allowable free play.
 - (a) Measure chord length at extreme inboard end of trim tab.
 - (b) Multiply chord length by 0.025 to obtain maximum allowable free play.
 - (c) Measure free play at same point on trim tab that chord length was measured.
 - (d) Total free play must not exceed maximum allowable.
 - (3) Using moderate hand pressure (up and down), measure free play at trailing edge of trim tab.
 - (4) If trim tab free play is less than maximum allowable, the system is within prescribed limits.
 - (5) If trim tab free play is more than maximum allowable, check the following items for looseness while moving trim tab up and down.
 - (a) Check push-pull tube to trim tab horn assembly attachment for looseness.
 - (b) Check push-pull tube to actuator assembly threaded rod end attachment for looseness.
 - (c) Check actuator assembly threaded rod end for looseness in the actuator assembly.
 - (6) If looseness is apparent while checking steps (a) and (b), repair by installing new parts.
 - (7) If looseness is apparent while checking step (c), threaded rod end is out of tolerance and must be replaced.

6. Trim Tab Control Cables and Pulleys Removal/Installation

- A. Remove Cables and Pulleys (Refer to [Figure 201](#)).

- (1) Position a support stand under tail tie-down ring to prevent tailcone from dropping while person is working inside. Refer to [Chapter 7, Jacking - Maintenance Practices](#).
- (2) Remove pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (3) Remove center seats. Refer to Chapter 25, [Center Seats and Rails - Maintenance Practices](#).
- (4) Remove rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (5) Remove carpet and baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (6) Remove pedestal cover. Refer to, [Remove Pedestal Cover](#).
- (7) Remove access plates ([230DB](#), [230GB](#), [231LB](#), [310BB](#), and [310CB](#)), and fairings ([340AL](#) and [340AR](#)) Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (8) Remove stop blocks from control cables
- (9) Remove cable guard from actuator.
- (10) Remove safety clip from turnbuckle and disconnect cable.
- (11) Disconnect cables at cable ends.

NOTE: To ease routing of cables, a length of wire may be attached to the end of the cable before being withdrawn from airplane. Leave the wire in place, routed through the structure; then attach cable being installed and pull the cable into position.

- (12) Remove cable guards and pulleys.
- (13) Disengage chains from sprockets and remove cables from airplane structure.

B. Install Cables and Pulleys (Refer to [Figure 201](#)).

- (1) Attach cables to wires routed through airplane structure and pull cables into position.
- (2) Engage chains on sprockets and install chain guard on actuator.
- (3) Install pulleys and pulley guards.
- (4) Connect cable ends and install turnbuckle.

CAUTION: Be sure trim tab moves in correct direction when operated by trim control wheel. Nose down trim corresponds to tab up position.

- (5) Rig system. Refer to [Trim Tab Control Adjustment/Test](#).
- (6) Install access plates.
- (7) Install carpet and baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (8) Install pedestal cover. Refer to, [Install Pedestal Cover](#).
- (9) Install rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (10) Install center seats. Refer to Chapter 25, [Center Seats and Rails - Maintenance Practices](#).
- (11) Install pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (12) Remove support stand.

7. Trim Tab Control Wheel Removal/Installation

A. Remove Trim Tab Control Wheel (Refer to [Figure 201](#)).

- (1) Remove pilot and copilot seats. Refer to [Chapter 25, Front Seat And Rails - Maintenance Practices](#).
- (2) Remove pedestal cover. Refer to [Pedestal Cover Removal/Installation](#).
- (3) Remove screws and nuts securing chain guard to pedestal.
- (4) Remove nut securing indicator to pivot stud. Retain washers.
- (5) Loosen bolts securing idler sprockets to pedestal structure, slide idler sprockets in slotted holes and disengage drive chain from sprockets.
- (6) Remove bolts and remove chain guard using care not to bend pointer or drop parts into tunnel area.
- (7) Remove drive chain from trim wheel sprocket and carefully slide trim wheel from pivot stud.

B. Install Trim Tab Control Wheel (Refer to [Figure 201](#)).

- (1) Slide trim wheel on to pivot stud.

- (2) Engage drive chain on trim wheel sprocket.
- (3) Position bolts through chain guard and install washers, sprocket assemblies, and bushings on bolts.
- (4) Position drive chain on sprockets.
- (5) Engage aft chain on drive sprocket.
- (6) Position chain guard on pedestal, insert bolts through pedestal and install nuts, do not tighten idler sprockets nuts.
- (7) Install screws securing chain guard to pedestal.
- (8) Ensure drive chain is installed properly, then position idler sprockets in adjustment slots making drive chain taught but not tight and tighten nuts.
- (9) Adjust the chain tension so that when the trim tab is fully raised or lowered, the chain deflection for each side, between any of the sprockets, is .125 inch (3.18 mm). Deflection for both sides is 0.25 inch (6.35 mm) maximum.
- (10) Install pedestal cover. Refer to [Pedestal Cover Removal/Installation](#).
- (11) Install pilot and copilot seats. Refer to [Chapter 25, Front Seat And Rails - Maintenance Practices](#).

8. Pedestal Cover Removal/Installation

A. Remove Pedestal Cover

- (1) Turn fuel selector valve to OFF position and drain fuel from strainer and lines.
- (2) Remove fuel selector handle and placard.
- (3) Remove cowl flap handle knob and microphone mounting bracket.
- (4) Fold carpet back as necessary and remove screws securing cover to floor and pedestal.
- (5) Disconnect electrical wiring to pedestal lights.
- (6) Carefully work cover from pedestal to prevent damage.

B. Install Pedestal Cover.

- (1) Position cover on pedestal.
- (2) Connect electrical wiring to pedestal lights.
- (3) Install screws securing cover to floor and pedestal.
- (4) Install cowl flap knob and microphone mounting bracket.
- (5) Install fuel selector placard and handle.
- (6) Install carpet.

9. Trim Tab Control Adjustment/Test for Airplanes 20608001 thru 20608319 and Airplanes T20608001 thru T20608953 not incorporating SB10-27-01.

A. Set Trim Tab Control Cable Tension (Refer to [Figure 201](#), [Figure 204](#) and [Figure 205](#)).

NOTE: Allow airplane temperature to stabilize for a period of four (4) hours before checking cable tension.

- (1) Position a support stand under tail tiedown ring to prevent tailcone from dropping while person is working inside. Refer to [Chapter 7, Jacking - Maintenance Practices](#).
- (2) Remove rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (3) Remove baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (4) Remove access plates (230DB, 230GB, 231LB, 310BB) and fairings (340AL and 340AR).
- (5) Remove pedestal cover.
- (6) Loosen travel stop blocks on cables.
- (7) Disconnect actuator from trim tab push-pull tube.

CAUTION: Maintain specified control cable tension.

- (8) Adjust the turnbuckle as necessary to get 12.5 pounds, +2.5 or -2.5 pounds (55.60 N, +11.12 or -11.12 N) of cable tension at 70°F (21°C). Refer to [Figure 205](#) for the correct tensions at other temperatures.

NOTE: If chains or cables are being installed, permit actuator screw to rotate freely as chains and cables are connected.

- (9) Rotate trim wheel full forward. Ensure pointer does not restrict wheel movement. If necessary, reposition pointer.

- (a) Loosen nut at trim wheel pivot stud.
 - (b) Loosen screws securing chain guard far enough that trim wheel can be moved approximately 1/8 inch (3.18 mm), then reposition pointer using a thin screwdriver to pry trailing leg of pointer out of groove in trim wheel. Reposition pointer as required.
 - (c) Tighten nut and screws, but do not reinstall pedestal cover until rigging is complete.
- (10) With elevator and trim tab both in neutral (split the nonfaired difference between the inboard and outboard ends), place inclinometer on tab and set at zero.
- (11) Rotate actuator screw in or out as required to place tab up with a maximum of two degrees over travel, with actuator screw connected to push-pull tube.
- (12) Rotate trim wheel to position tab up and down, readjusting actuator screws required to obtain over travel in both directions.
- (13) Position stop blocks. (Refer to [Figure 204](#)).
- (a) Lower trim tab to 5 degrees, +1 or -0 degree.
 - (b) Position stop block (1) 13.75 inches (349.3 mm) aft of the center of the clevis on cable B.
 - (c) Attach stop block (1) to cable B.
 - 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).
 - (d) Position stop block (2) aft of and against stop block (1)
 - (e) Attach stop block (2) to cable A.
 - 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).
 - (f) Run trim tab up to 25 degrees, +1 or -0 degree, place stop block (3) against stop block (2).
 - (g) Attach stop block (3) to cable B.
 - 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).
- (14) Install pedestal cover and adjust trim tab pointer. Refer to, [Install Pedestal Cover](#).
- (a) Rotate the trim control wheel to put the trim tab in the neutral position.
 - (b) Locate the pointer at the "TAKE-OFF" triangle as viewed from the pilot seat. (Refer to step (9) and reposition pointer if necessary.)
 - (c) Bend pointer as required to clear pedestal cover.

NOTE: Pointer must not rub against pedestal cover or clear cover more than 0.125 inch (3.18 mm) maximum.

10. Trim Tab Control Adjustment/Test for Airplanes 20608320 and On and Airplanes T20608954 and On; Airplanes 20608001 thru 20608319 and Airplanes T20608001 thru T20608953 incorporating SB10-27-01.

- A. Set Trim Tab Control Cable Tension (Refer to [Figure 201](#), [Figure 205](#), and [Figure 206](#)).

NOTE: Allow airplane temperature to stabilize for a period of four (4) hours before checking cable tension.

- (1) Put a support stand under the tail tiedown ring. Refer to [Chapter 7, Jacking - Maintenance Practices](#).
- (2) Remove the rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).
- (3) Remove the baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (4) Remove the access plates (230DB, 230GB, 231LB, 310BB) and fairings (340AL and 340AR). Refer to Chapter 6, [Access/Inspection Plates - Description and Operation](#).
- (5) Remove the pedestal cover. Refer to [Pedestal Cover Removal/Installation](#).
- (6) Loosen the travel stop blocks on the cables.

- (7) Disconnect the actuator from the trim tab push-pull tube.

CAUTION: Maintain the specified control cable tension.

- (8) Adjust the turnbuckle as necessary to get 12.5 pounds, +2.5 or -2.5 pounds (55.60 N, +11.12 or -11.12 N) of cable tension at 70°F (21°C). Refer to [Figure 205](#) for the correct tensions at other temperatures.

NOTE: If chains or cables are being installed, let the actuator screw rotate freely as chains and cables are connected.

- (9) Rotate the trim wheel to the full forward position.

- (a) Adjust the pointer position if it prevents full travel of the trim wheel.

- 1 Loosen the nut at trim wheel pivot stud.
- 2 Loosen the screws that attach chain guard far enough that trim wheel can be moved approximately 1/8 inch (3.18 mm), then put the pointer in position using a thin screwdriver to pry the trailing leg of pointer out of the groove in the trim wheel.
- 3 Tighten the nuts and screws.

NOTE: Do not install the pedestal cover until rigging is complete.

- (10) With the elevator and trim tab in the neutral position (split the nonfaired difference between the inboard and outboard ends), put an inclinometer on the trim tab and set it to zero.

- (11) Rotate the actuator screw in or out as necessary to set the trim tab up with a maximum of two degrees over travel, with actuator screw connected to push-pull tube.

- (12) Rotate the trim wheel to move the tab up and down, adjust the actuator screws to get the necessary over travel in both directions.

- (13) Put the elevator and trim tab in the neutral position.

CAUTION: Make sure the elevator and trim tab are in the neutral position when stop block (1) is installed.

- (14) Put the stop blocks in position. (Refer to [Figure 206](#)).

- (a) Put the edge of stop block (1) 5 inches (127.0 mm) aft of the center of the clevis on cable B.

- (b) Attach stop block (1) to cable A.

- 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).

- (c) Move the trim tab to 25 degrees up, +1 or -0 degree.

- (d) Put stop block (2) aft of and against stop block (1).

- (e) Attach stop block (2) to cable B.

- 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).

- (f) Move the trim tab to 5 degrees down, +1 or -0 degree.

- (g) Put stop block (3) against stop block (2).

- (h) Attach stop block (3) to cable A.

- 1 Torque the nut on the bolt to 22.5 inch-pounds, +2.5 or -2.5 inch-pounds (2.54 N-m, +0.28 or -0.28 N-m).

- (15) Install the pedestal cover and adjust the trim tab pointer. Refer to [Pedestal Cover Removal/Installation](#).

- (a) Rotate the trim control wheel to put the trim tab in the neutral position.

- (b) Put the pointer to the "TAKE-OFF" triangle as viewed from the pilot seat. (Refer to step (9) and reposition pointer if necessary.)

- (c) Bend the pointer as required to clear pedestal cover.

NOTE: Pointer must not rub against pedestal cover or clear cover more than 0.125 inch (3.18 mm) maximum.

- (16) Safety the turnbuckle.

- (17) Make sure that the trim tab moves in correct direction when the trim wheel is rotated.

NOTE: Nose down trim indication corresponds to the trim tab in an UP position.

- (18) Install the baggage curtain. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

- (19) Install the rear seat. Refer to Chapter 25, [Rear Seat - Maintenance Practices](#).

- (20) Install access plates (230DB, 230GB, 231LB, 310BB) and fairings (340AL and 340AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (21) Remove the support stand.

Figure 201 : Sheet 1 : Elevator Trim Tab Control System

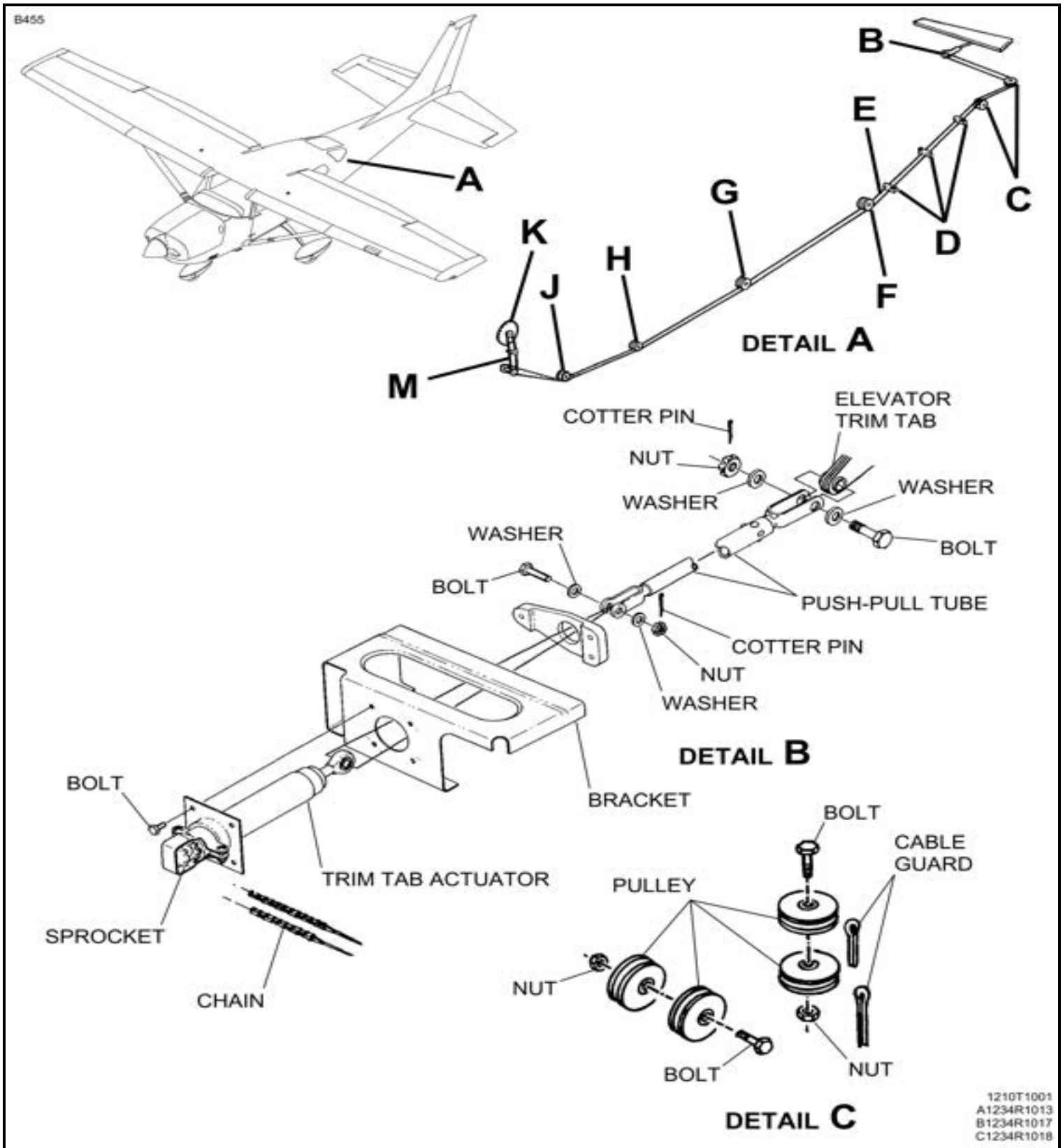


Figure 201 : Sheet 2 : Elevator Trim Tab Control System

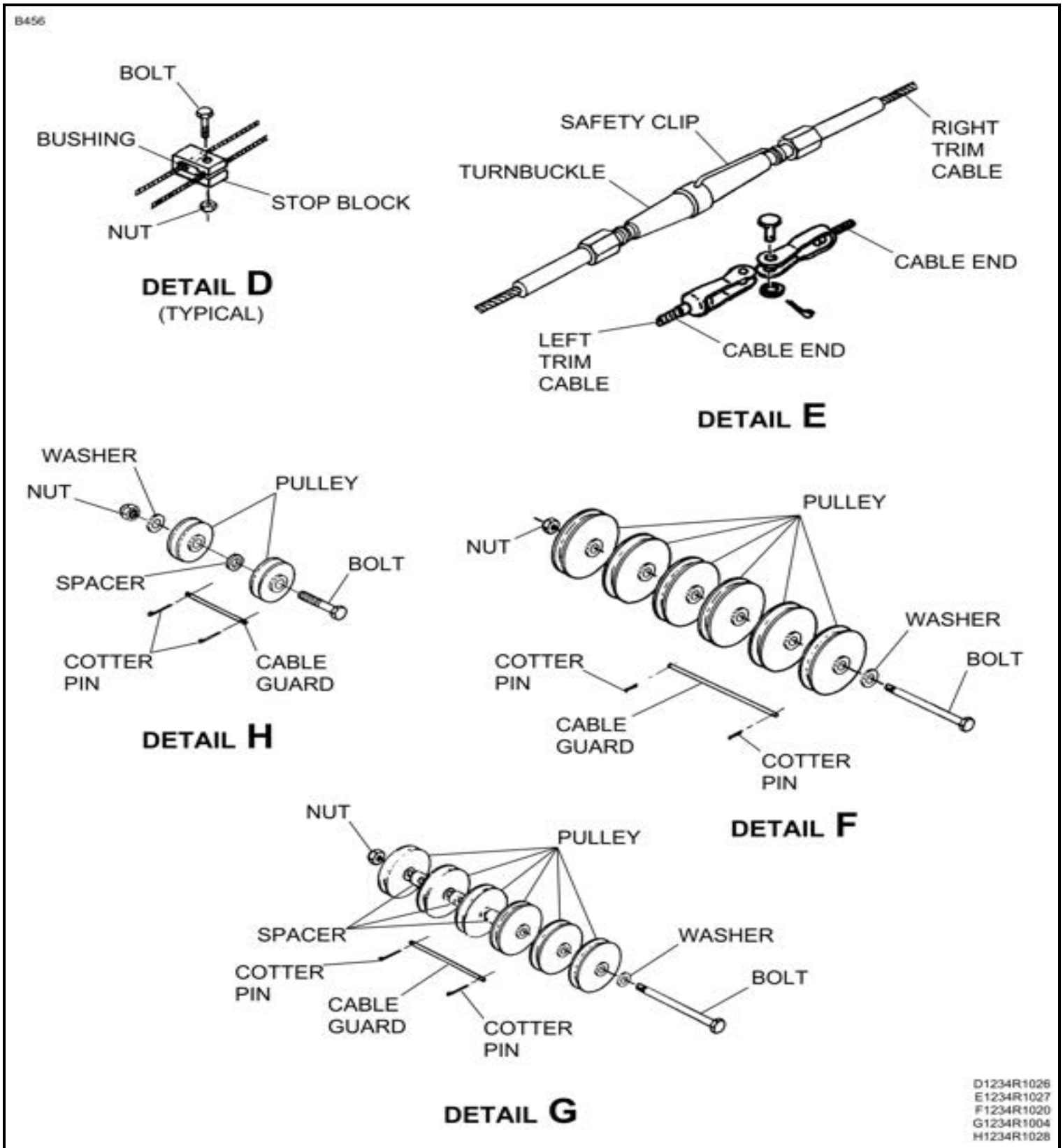


Figure 201 : Sheet 3 : Elevator Trim Tab Control System

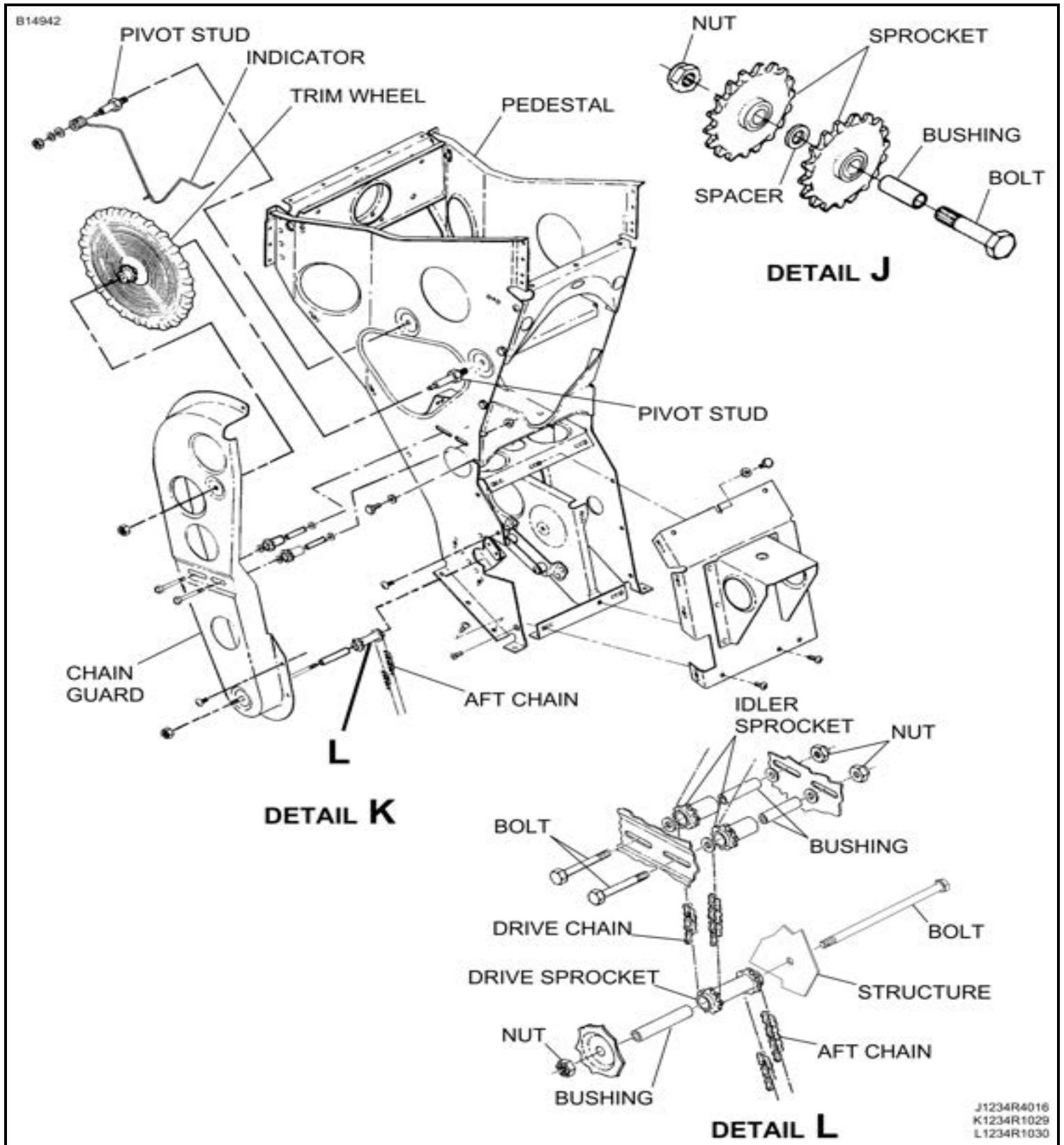
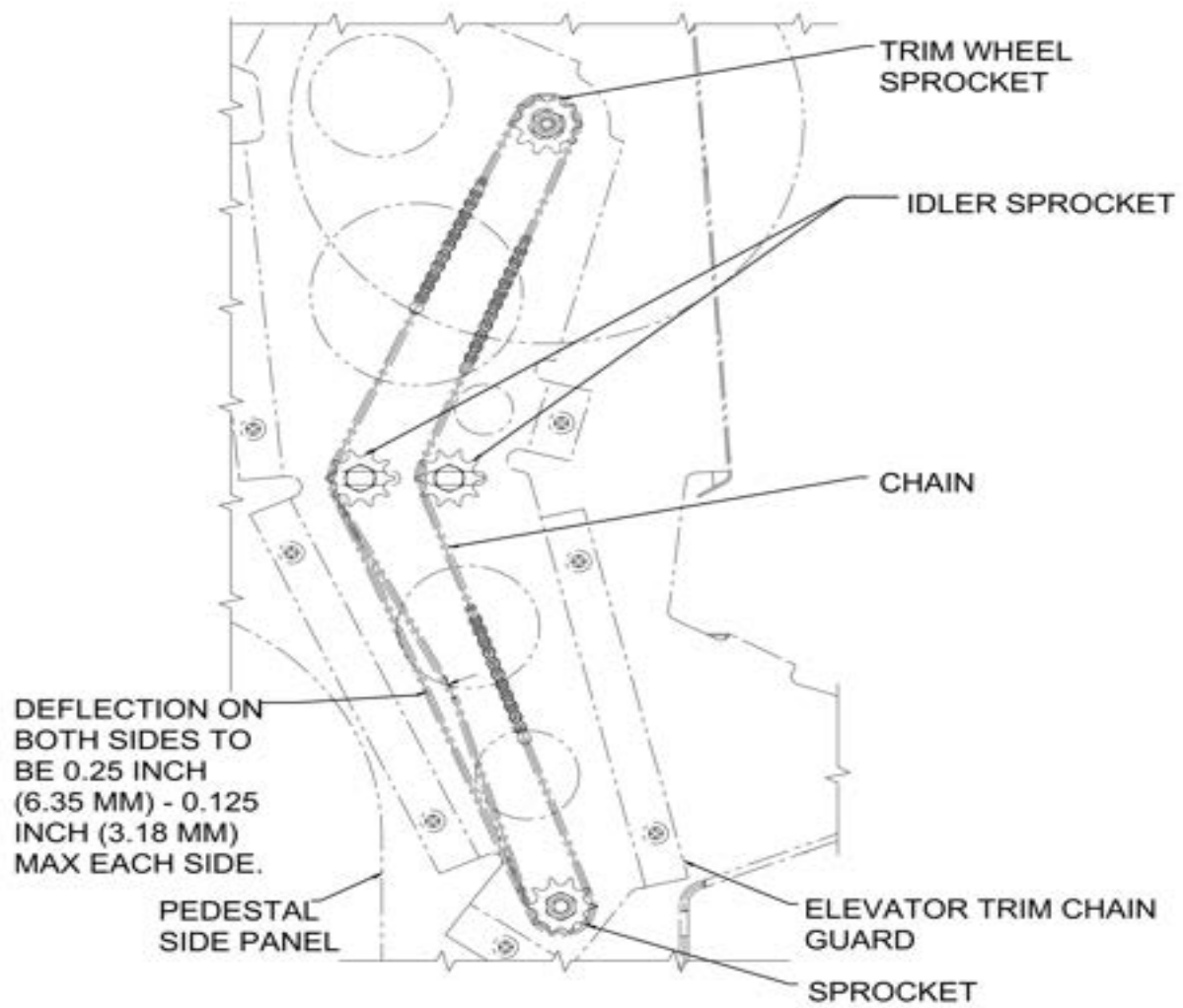


Figure 201 : Sheet 4 : Elevator Trim Tab Control System

B20954



DETAIL M

M1260T680

Figure 202 : Sheet 1 : Elevator Trim Tab Actuator Cleaning and Inspection

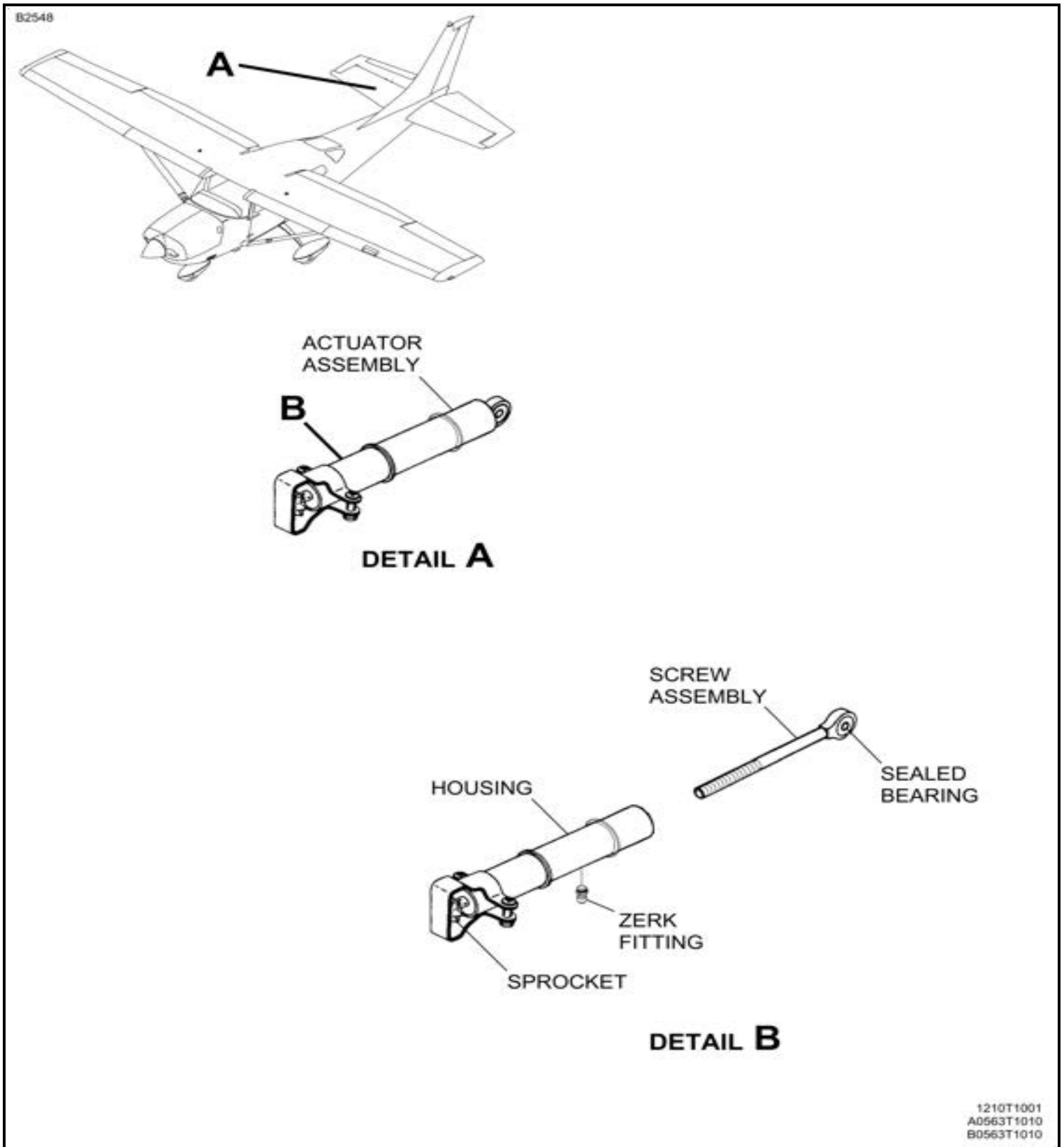
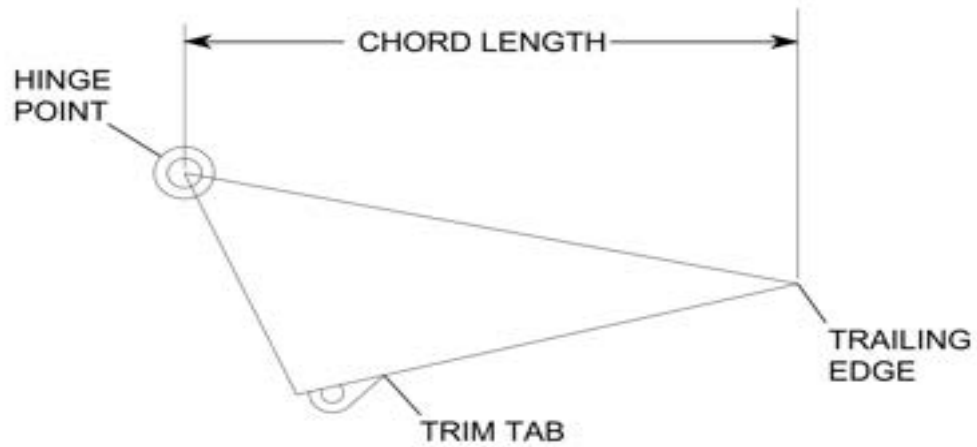
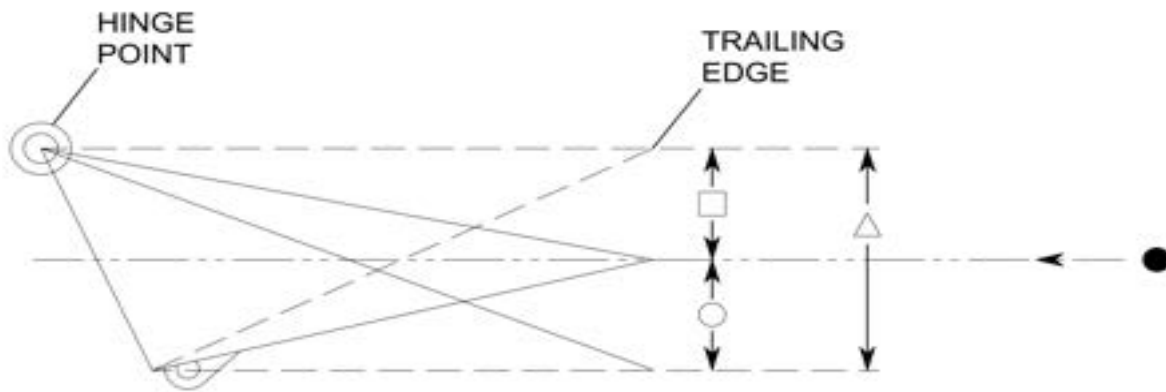


Figure 203 : Sheet 1 : Trim Tab Free Play Inspection

B1721



DETAIL C



SYMBOL	DESCRIPTION
□	FREE PLAY UP
●	NEUTRAL POSITION
○	FREE PLAY DOWN
△	TOTAL FREE PLAY

C0563T1012

Figure 204 : Sheet 1 : Elevator Trim Tab Travel Stop Adjustment for Airplanes 20608001 thru 20608319 and Airplanes T20608001 thru T20608953

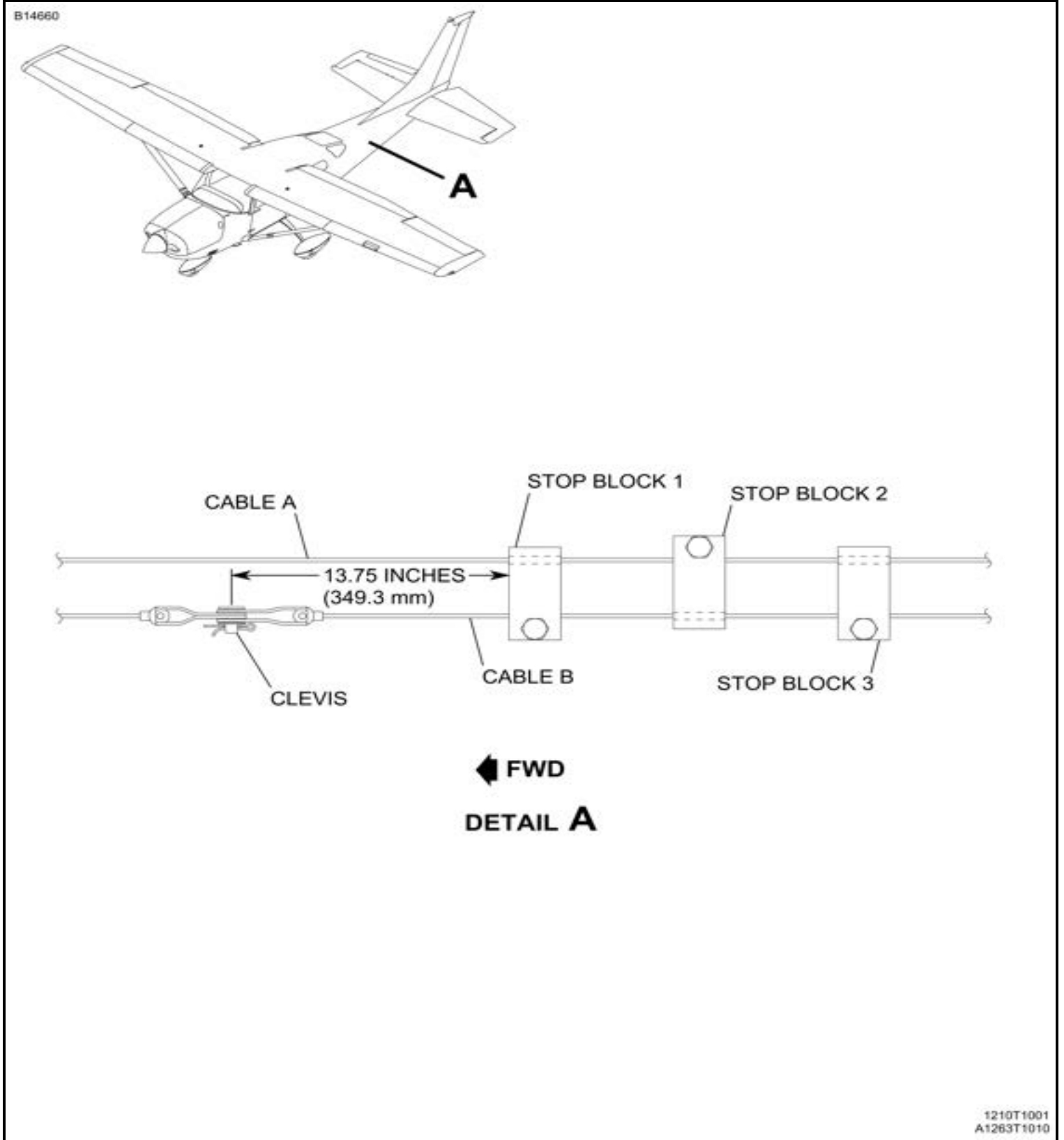


Figure 205 : Sheet 1 : Elevator Trim Cable Tension

B4205

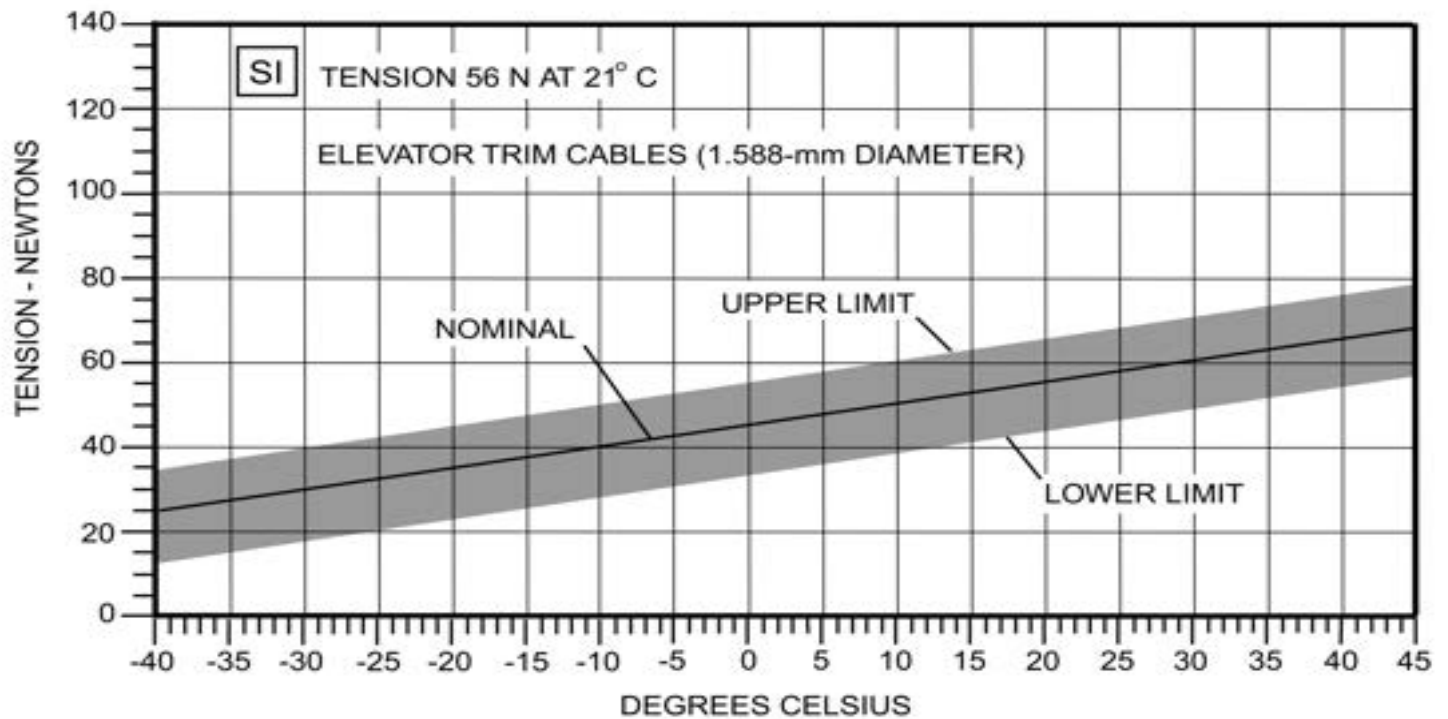
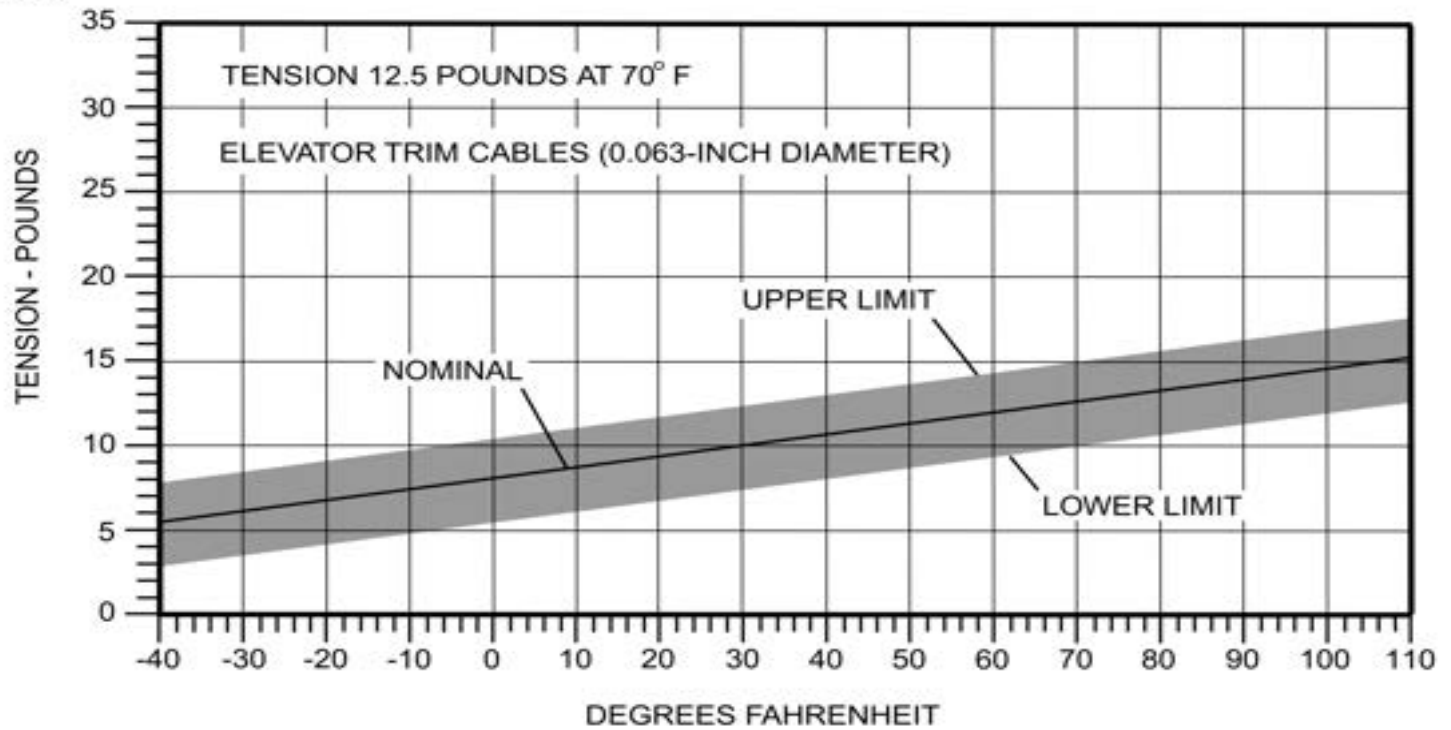


Figure 206 : Sheet 1 : Elevator Trim Tab Travel Stop Adjustment for Airplanes 20608320 and On and Airplanes T20608954 and On

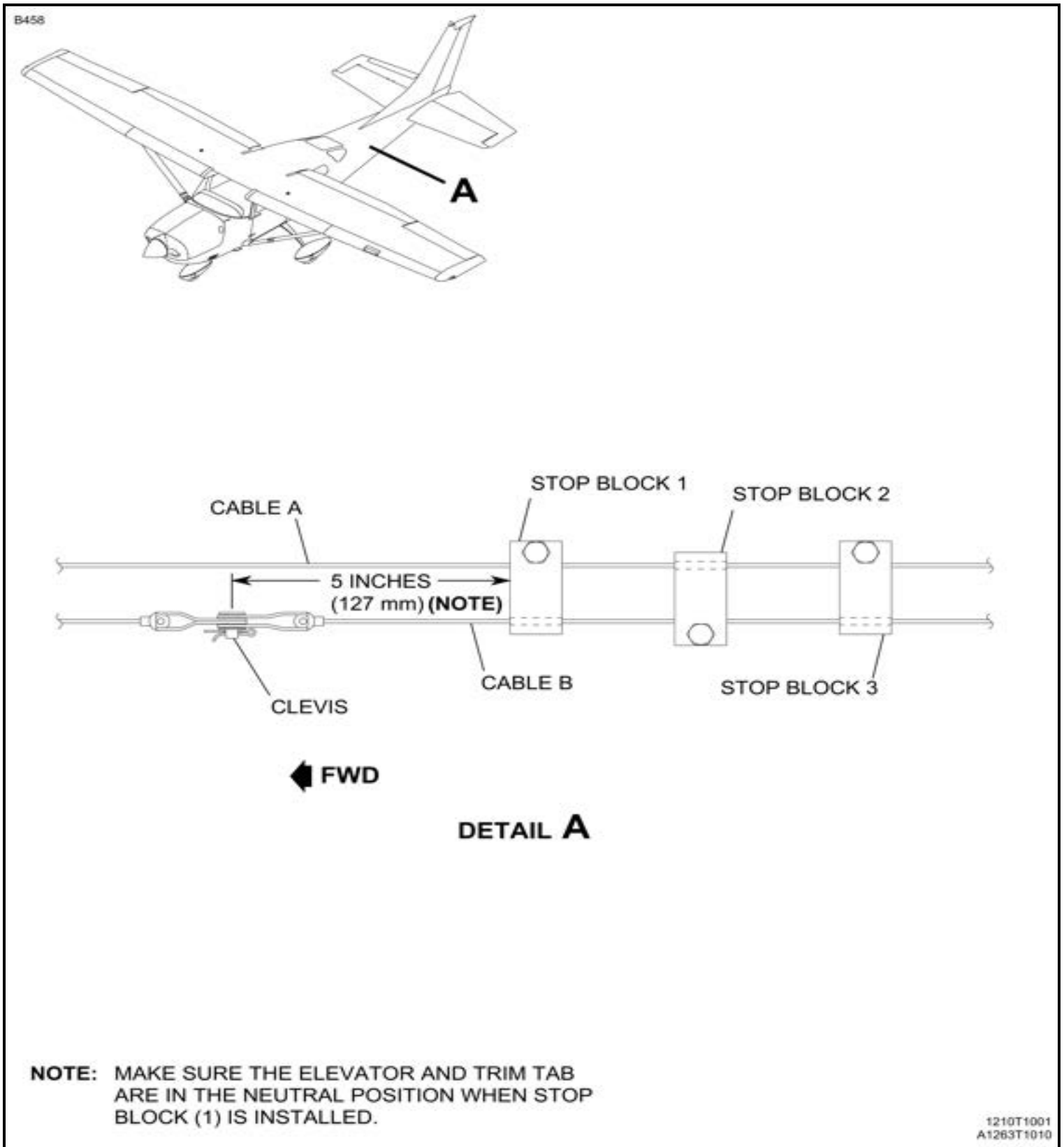


Figure 2 : Sheet 1 : Fuselage Panels

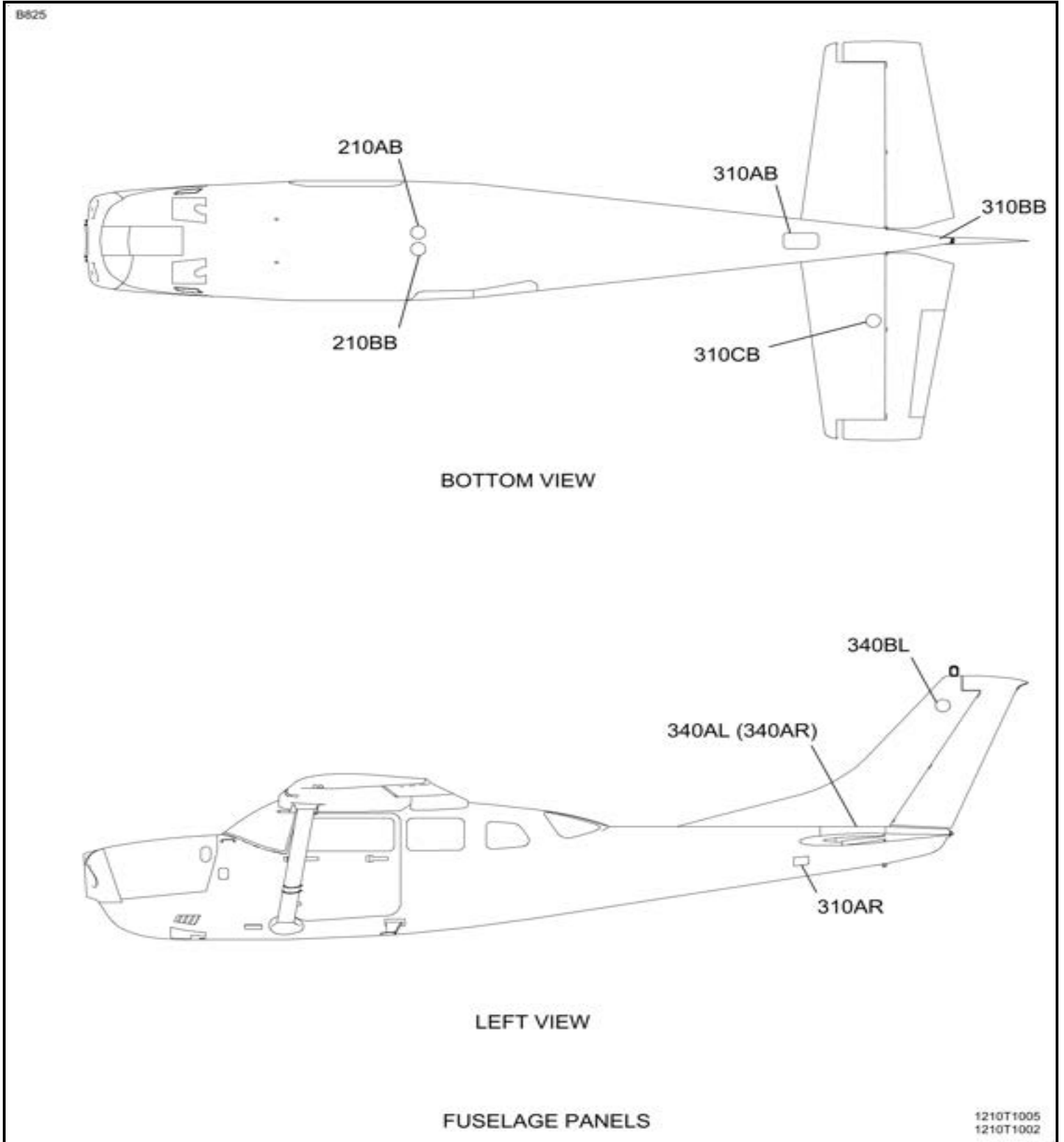


Figure 1 : Sheet 1 : Cabin Floorboard Panels

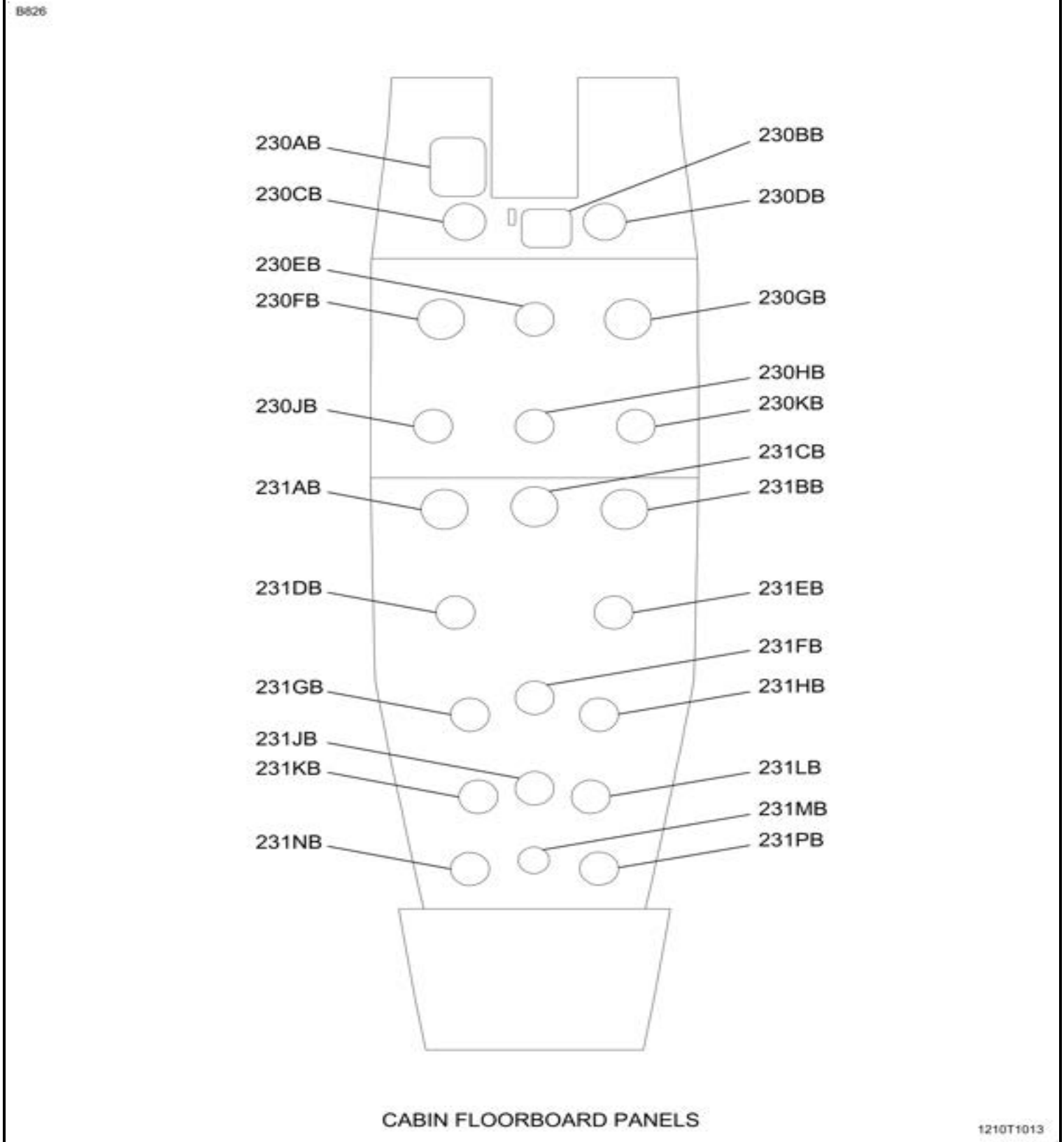
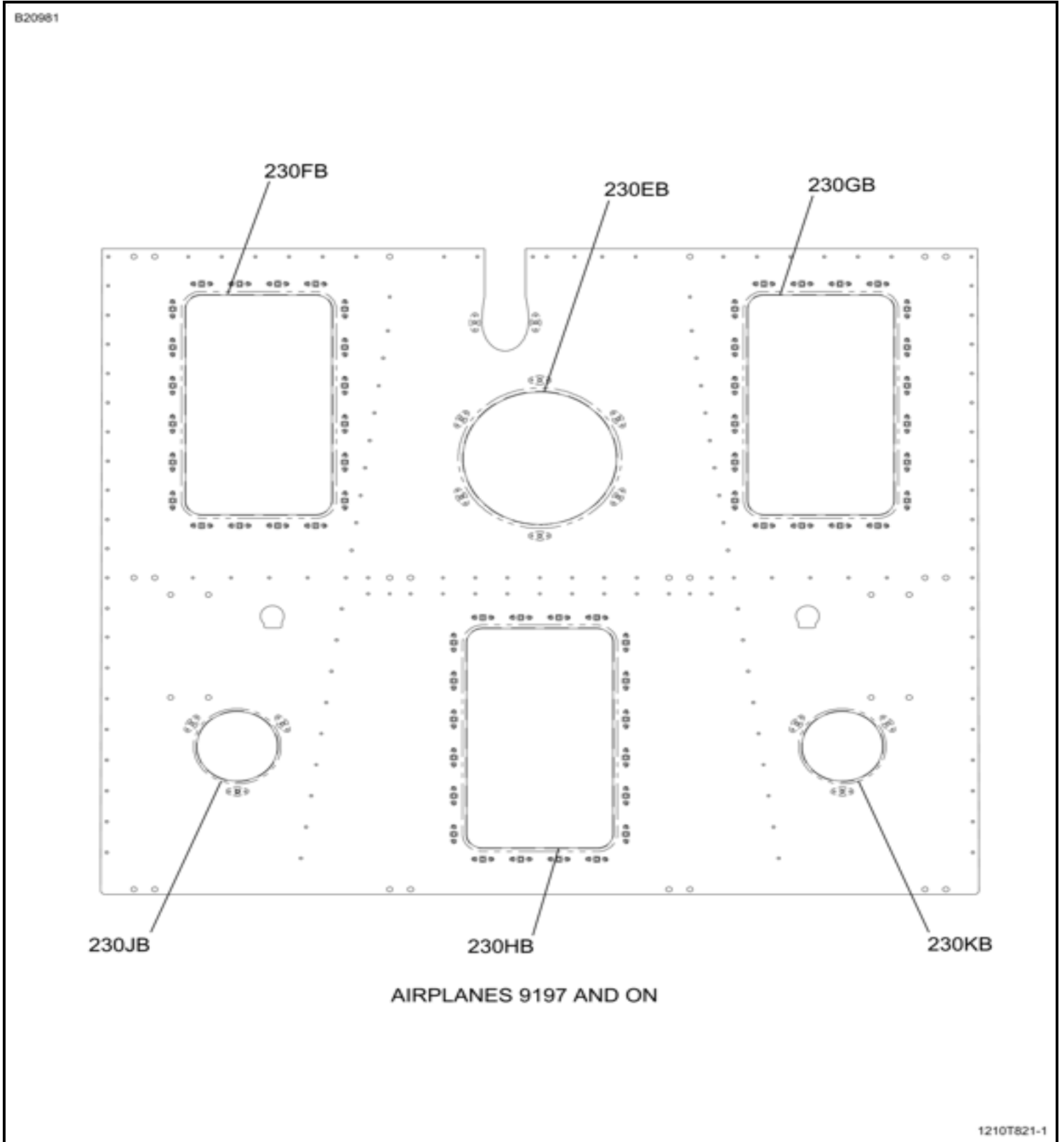


Figure 1 : Sheet 2 : Cabin Floorboard Panels



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](#).

Figure 101 : Sheet 1 : Flap System Troubleshooting Chart

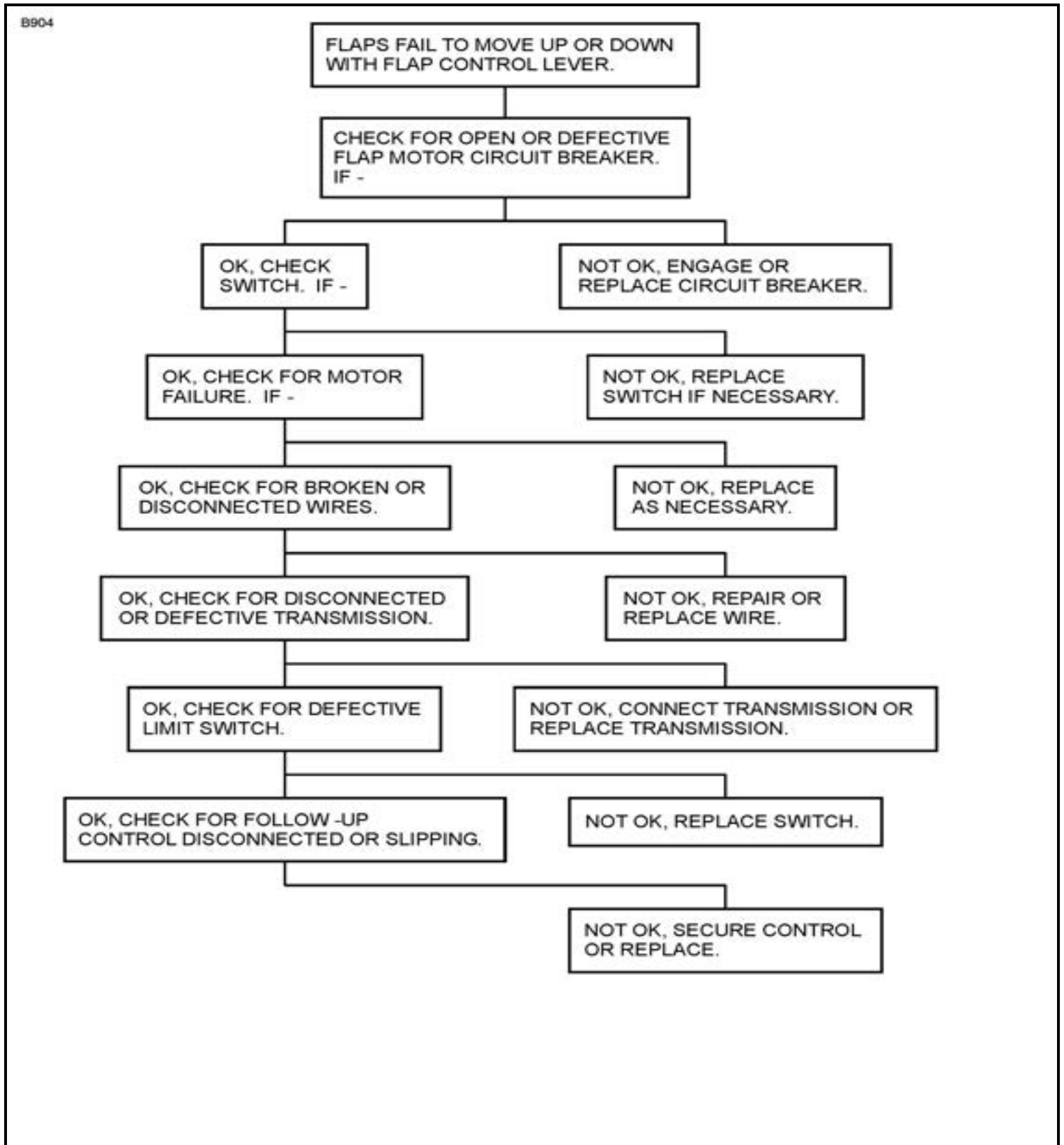


Figure 101 : Sheet 2 : Flap System Troubleshooting Chart

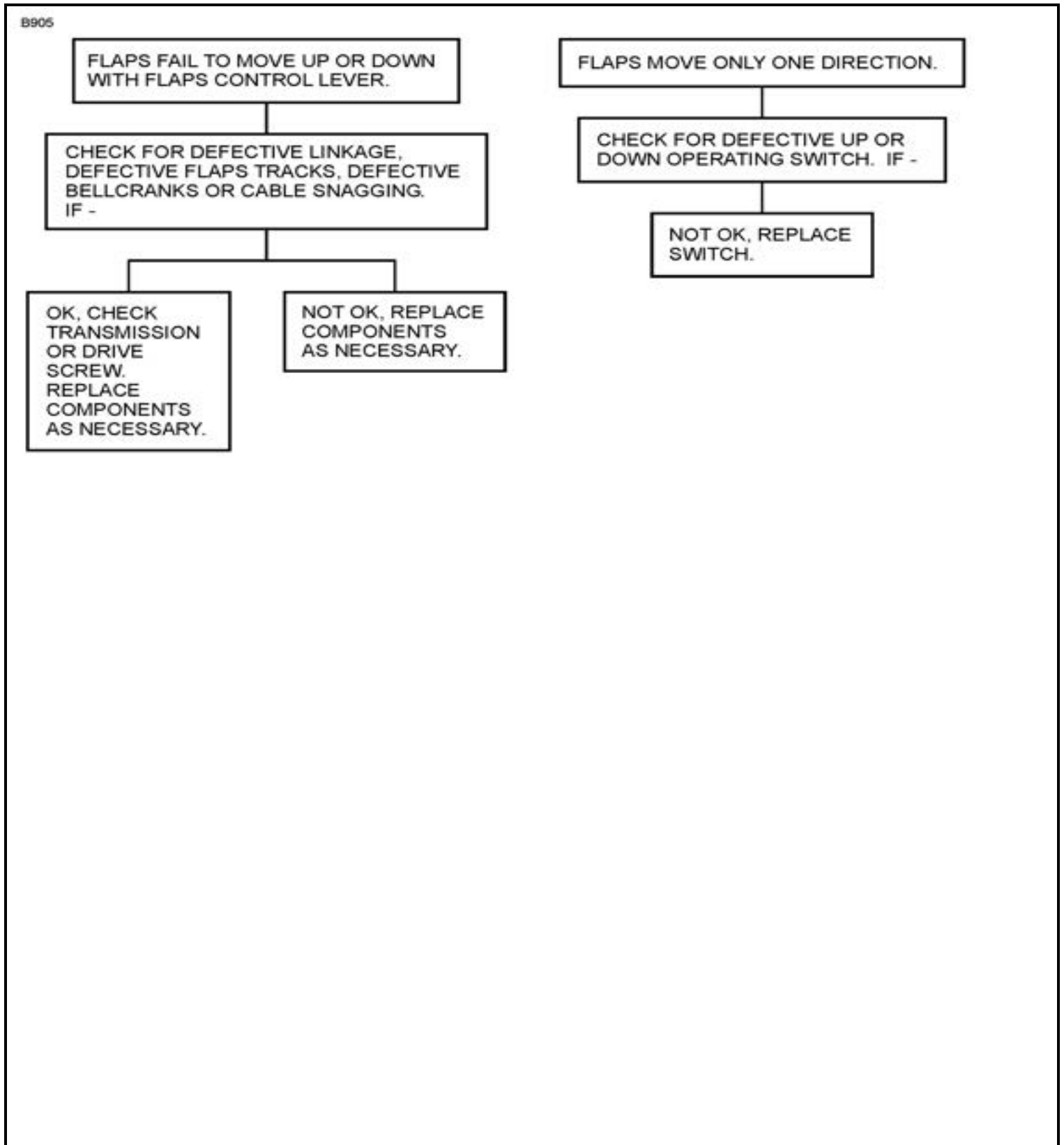
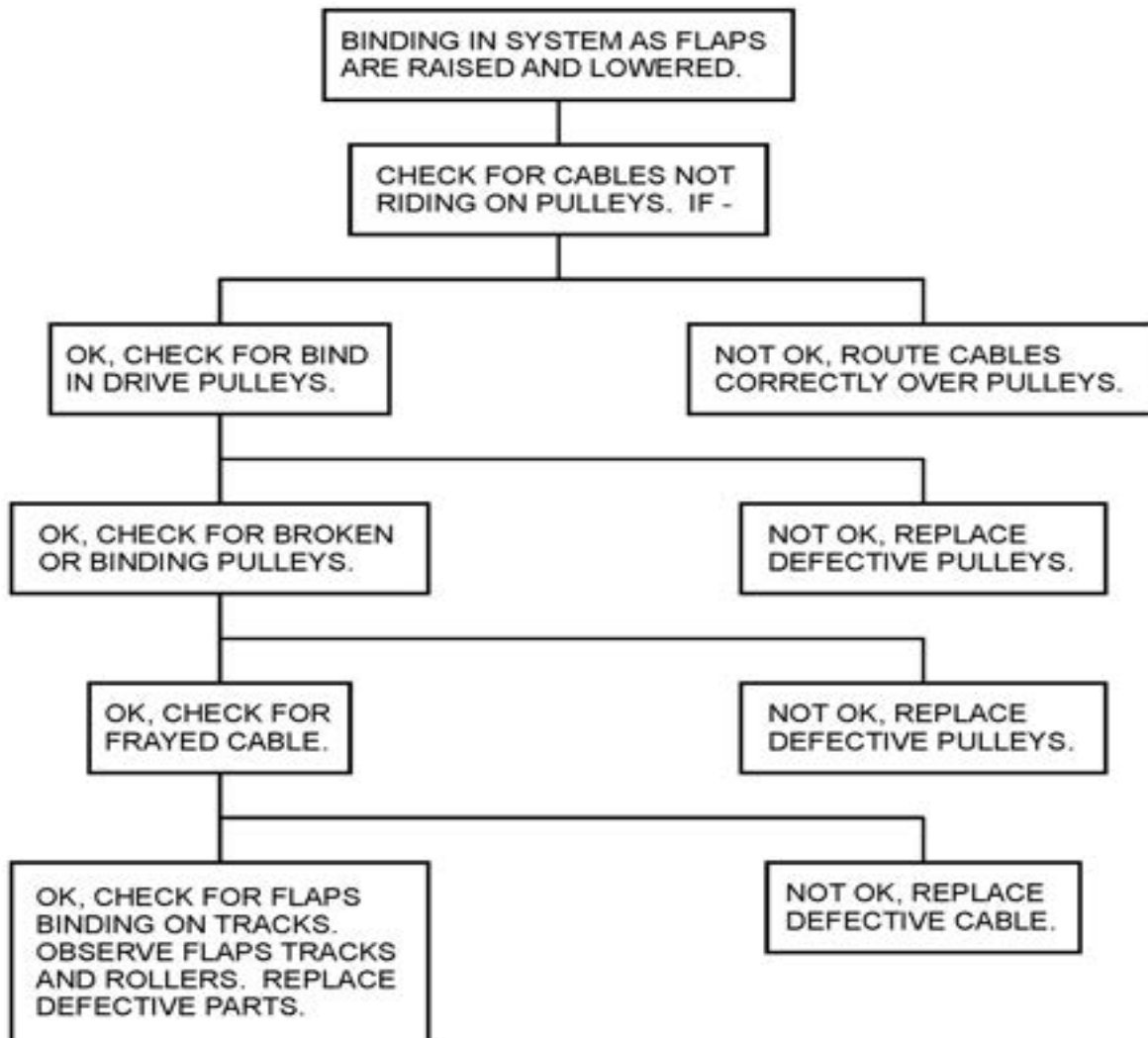


Figure 101 : Sheet 3 : Flap System Troubleshooting Chart

B906



FLAP CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

- A. The wing flap control system has an electric motor and transmission assembly, drive pulleys, push-pull rods, cables and a follow-up control. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys, cables and push-pull rods. Electrical power to the motor is controlled by two microswitches attached to a floating arm assembly, a cam lever and a follow-up control.
- B. As the flap control lever is moved to the necessary flap setting, the attached cam closes one of the microswitches, which operates the flap motor. As the flaps move to the position that was selected, the floating arm is turned by the follow-up control until the active microswitch clears the cam breaking the circuit and stops the motor.
- C. To reverse the flap direction, the control lever is moved in the opposite direction, causing the cam to close the second microswitch, which reverses the flap motor. The follow-up control moves the cam until it is clear of the second switch, stopping the flap motor. Limit switches at the flap actuator assembly control flap travel as the flaps get to the full UP or DOWN positions.

2. Flap Motor and Transmission Assembly Removal/Installation

- A. Remove the Flap Motor and Transmission Assembly (Refer to [Figure 201](#)).
 - (1) Lower the flaps.
 - (2) Disconnect the electrical power.
 - (3) Remove access plate [610JB](#). Refer to Chapter 6-20-02, 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 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 for use on installation.
 - (7) Disconnect the electrical connectors from the motor, and the limit switches.
 - (8) Carefully remove the assembly from the wing through the access opening.
- B. Install the Flap Motor and Transmission Assembly (Refer to [Figure 201](#)).
 - (1) Carefully install the assembly into the wing through the access opening. Make sure that the short end of the hinge is installed toward the top if you removed the hinge assembly from the transmission for any reason.
 - (2) Connect the electrical connectors to the motor and limit switches.
 - (3) Secure flap motor hinge to wing with bolt and brass washer.
 - (4) Turn the actuating tube out toward the bell crank.
 - (5) Install the bolt that attaches the actuating tube to the drive pulley.
 - (6) Connect electrical power.
 - (7) Make sure that the flaps operate correctly. Refer to [Flap System - Adjustment/Test](#) for rigging instructions.
 - (8) Install access plate [610JB](#). Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.

3. Flap Removal/Installation

- A. Remove the Flaps (Refer to [Figure 201](#)).
 - (1) Put the Master Switch (SI009) to ON.
 - (2) Lower the flaps using flap selector switch (SI008).
 - (3) Put the BAT portion of the Master Switch to BAT (off).
 - (4) Remove the access plates [511AT \(611AT\)](#), [511BT \(611BT\)](#), [511CT \(611CT\)](#), [511DT \(611DT\)](#), and [511ET \(611ET\)](#) from the leading edge of the flap. Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.
 - (5) Disconnect the push-pull rod at the flap bracket.
 - (6) Remove the bolts at each flap track. As the flap is removed from the wing, all of the washers, rollers and bushings will fall. Keep this hardware for installation.
- B. Install the Flaps (Refer to [Figure 201](#)).

NOTE: It is permitted to apply 3M Y8671 or equivalent polyurethane tape on upper flap skins as necessary to prevent chafing against the wing trailing edge.

 - (1) Make sure that the flap track slot width is 0.6 inches, +0.03 or -0.03 inches (14.5 mm, +0.76 or -0.76 mm).

- (a) When there is any width not within these limits, replace the flap track.
- (2) Install the flap to flap tracks using hardware kept from when the flap track was removed.
- (3) Connect push-pull rod to flap bracket.
- (4) Rig flaps. Refer to [Flap Control System Adjustment/Test](#).

NOTE: If push-pull rod adjustment was not disturbed, flap rigging will not be required.

- (5) Install the access plates [511AT \(611AT\)](#), [511BT \(611BT\)](#), [511CT \(611CT\)](#), [511DT \(611DT\)](#), and [511ET \(611ET\)](#) from the leading edge of the flap. Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.
- (6) Put the Master Switch (SI009) in the ON position.
- (7) Raise the flaps using flap selector switch (SI007).
- (8) Put the BATT portion of the Master Switch to the BAT (off) position.

4. Flap Drive Pulleys Removal/Installation

- A. Remove the Flap Drive Pulleys (Refer to [Figure 201](#)).

NOTE: Left and right are typical except as noted.

- (1) In the cockpit/cabin area, remove overhead center console. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (2) Remove the safety clips and loosen the flap adjustment turnbuckles.
- (3) Remove access plates [610JB and 610FB](#) for the right flap, and [510JB and 510FB](#) for the left flap. Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.
- (4) Remove the bolt that attaches the flap push-pull rod to the drive pulley.
- (5) Remove the bolt that attaches the synchronizing push-pull tube to the drive pulley, and gently lower the right flap.
- (6) Remove the bolt that attaches the actuating tube to the drive pulley and lower right flap.
- NOTE:** The actuating tube is only on the right wing flap.
- (7) Remove the cable locks that attach the control cables to the drive pulley.
- (8) Tag the cables for identification.
- (9) Remove the bolt that attaches the drive pulley to the wing structure.
- (10) Remove the drive pulley through the access opening, without dropping the bushing. Keep the brass washer between the drive pulley and wing structure for use during installation.
- (11) Tape the open ends of the drive pulley after removal to prevent the bearings from being damaged.

- B. Install the Flap Drive Pulleys (Refer to [Figure 201](#)).

- (1) In the left and right wing, install the drive pulley and bushing through the access opening, install the brass washer and attach it to the wing structure with a bolt.
- (2) In the left and right wing, remove the identification tags.
- (3) Install the cable locks that attach the control cables to the drive pulleys on left and right wing.
- (4) In the right wing, install the bushing and bolt that attach the actuating tube to the drive pulley.
- (5) Raise the flaps with the Flap switch (SI007).
- (6) Connect the synchronizing push-pull tube to drive pulley.
- (7) Connect the push-pull rod to the drive pulley.
- (8) In the cockpit/cabin area, adjust the flap drive cables as necessary. Refer to [Flap Control Adjustment/Test](#).
- (9) Install access plates [610JB and 610FB](#) for the right flap, and [510JB and 510FB](#) for the left flap. Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.
- (10) Install the overhead center console. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

5. Cables and Pulleys Removal/Installation

NOTE: Allow airplane temperature to stabilize for a period of four (4) hours before checking cable tension.

NOTE: Airplanes 20608001 thru 20608173, and Airplanes T20608001 thru T20608361 have a 0.094 inch (2.4 mm) diameter cable. Airplanes 20608174 and On, and Airplanes T20608362 and On have a 0.125 inch (3.2 mm) diameter cable.

- A. Remove the Cables and Pulleys (Refer to [Figure 201](#)).
- (1) Remove the overhead center console. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (2) Remove access plates [610CB](#), [610DB](#), [610FB](#), [610HB](#), [610JB](#), [610LB](#), [610NB](#), [610QB](#), [610SB](#), [610WB](#) on the right flap, and [510CB](#), [510DB](#), [510FB](#), [510HB](#), [510JB](#), [510LB](#), [510NB](#), [510QB](#), [510SB](#), [510WB](#) on the left flap. Refer to Chapter 6-20-02, [Access/Inspection Plates - Description and Operation](#).
 - (3) Disconnect the flap follow-up cable from the retract cable.
 - (4) Remove the safety clips from the forward retract cable and aft extend cable turnbuckles.
 - (5) Relieve the cable tension by carefully lowering the left flap.
 - (6) Remove the cable guards and pulleys.
 - (7) Attach a length of wire long enough to go through the structure, to the end of the cable being withdrawn from the airplane.
 - (8) Remove the cables.
 - (9) Leave the wire in place, routed through structure.
- B. Install the Cables and Pulleys (Refer to [Figure 201](#)).
- (1) Attach the new cables to wires, and pull cables into position.
 - (2) Install the pulleys and pulley guards.
 - (3) Connect the cables to the drive pulleys using cable locks.
 - (4) Adjust the cable tension.
 - (a) Airplanes 20608001 through 20608173, and Airplanes T20608001 thru T20608361, adjust cable tension to 70 pounds, +10 or -10 pounds (311 N, +44 or -44 N).
 - (b) Airplanes 20608174 and On, and Airplanes T20608362 and On, adjust cable tension to 130 pounds, +10 or -10 pounds (578 N, +44 or -44 N) at 70 °F (21 °C). Refer to [Figure 203](#) for the correct tensions at other temperatures.
 - (5) Rig the flap system. Refer to [Flap Control System Adjustment/Test](#).
 - (6) Connect the flap follow-up cable to the retract cable.
 - (7) Adjust the flap follow-up cable system. Refer to [Flap Follow-Up and Indicating System Adjustment/Test](#).
 - (8) Install the access plates.
 - (9) Install the center overhead console. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

6. Flap Control System Adjustment/Test

- A. Adjust the Flap Control System (Refer to [Figure 201](#), [Figure 202](#), and [Figure 203](#)).
- (1) Let the airplane temperature stabilize for four hours before you measure the cable tension.
 - (2) In the cockpit/cabin area, remove the overhead console. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (3) Remove access plates [610CB](#), [610DB](#), [610FB](#), [610HB](#), [610JB](#), [610LB](#), [610NB](#), [610QB](#), [610SB](#), [610WB](#) for the right flap, and [510CB](#), [510DB](#), [510FB](#), [510HB](#), [510JB](#), [510LB](#), [510NB](#), [510QB](#), [510SB](#), [510WB](#) for the left flap. Refer to Chapter 6-20-02, [Access/Inspection Plates - Description and Operation](#).
 - (4) Remove the safety clips from the turnbuckles.
 - (5) Relieve the cable tension by turning the turnbuckles.
 - (6) Disconnect the turnbuckles and then carefully lower left flap.
 - (7) Disconnect the push-pull rods at the drive pulleys in both wings and then carefully lower right flap.
 - (8) Remove the bolt that attaches the synchronizing push-pull tube to the drive pulley in the left wing.
 - (9) Disconnect the outboard flap push-pull rods from the bell cranks in both wings.
 - (10) Disconnect the actuating tube in the right wing only, from the drive pulley.
 - (11) Make sure that the retract cable is connected to the forward side of the right drive pulley and to the aft side of the left drive pulley.
 - (12) Make sure that the extend cable is connected to the aft side of the right drive pulley and to the forward side of the left drive pulley.
 - (13) Make sure that the right drive pulley rotates clockwise, when viewed from below, as the flaps are extended.
 - (14) Adjust the synchronizing push-pull tube in the right wing to 48.7 inches (1.2 m) between the centers of the rod end holes.

- (15) Tighten the jam nuts and connect the push-pull tube to the bell crank and drive pulley.
- (16) Adjust the travel on the flap motor so the centerline of the bolt hole for the inboard push-pull rod is 4.2 inches (106.7 mm) aft of the fuel well bulkhead.
- (17) Turn the actuating tube inward toward the transmission by hand until there is a measurement of 0.1 inch (2.5 mm) minimum to 0.25 inch (6.4 mm) maximum between the switch actuating collar and the transmission.
- (18) Loosen the setscrew on the actuating tube collar.
- (19) Hold the switch actuating collar to maintain a minimum of 0.1 inch (2.5 mm) and maximum of 0.25 inch (6.4 mm), and adjust the actuating tube in or out as necessary to get 10.2 inches, +0.1 inch or -0.1 inch (259.10 mm, +25.4 or -25.4 mm) from centerline to centerline of the actuating tube attach bolt and the flap motor transmission attach bolt.
- (20) Apply Loctite 242 or equivalent to the threads of the setscrew, and torque to 40 inch-pounds (4.52 Nm).

- (21) Attach the actuating tube to the drive pulley with a bolt and nut.
- (22) Hold the right flap full up, and adjust the push-pull rods to align with the drive pulley and bell crank attachment holes.
- (23) Connect push-pull rods and tighten lock nuts.

NOTE: The right flap and actuator must be correctly rigged before cables and left flap can be rigged.

- (24) Attach an inclinometer on the trailing edge of the right flap.
- (25) With the right flap in the full up position, loosen the setscrew and move the up limit switch adjustment block to operate the switch and turn off electrical power to the motor at full up position.
- (26) Tighten the setscrew.
- (27) Lower the right flap, and adjust the down limit switch block to operate the switch and turn off the electrical power to the motor at 40 degrees, +1 or -2 degrees of travel.
- (28) Tighten the setscrew.
- (29) Raise the right flap.
- (30) Adjust the synchronizing push-pull tube in the left wing to 48.7 inches (1.2 m) between the centers of the rod end holes, and tighten the jam nuts.
- (31) Connect push-pull tube to the bell crank and drive pulley.
- (32) Connect the control cables at the turnbuckles.
- (33) Make sure the cables are in the pulley grooves and the cable ends are installed correctly at the drive pulleys before tightening the turnbuckles.
- (34) Rig the flap control cable tension.
 - (a) On the Airplanes 20608001 thru 20608173, and Airplanes T20608001 thru T20608361, adjust the turnbuckles to position the left drive pulley so that the centerline of the bolt hole for the inboard push-pull rod attachment is 4.2 inches (106.7 mm) aft of the fuel well bulkhead. Make sure that you keep the centerline of the bolt hole for the inboard push-pull rod attachment at 4.2 inches (106.7 m) in the right wing. Make sure that you keep 70 pounds, +10 or -10 pounds (311 N, +44 or -44 N) cable tension at 70 °F (21 °C). Refer to [Figure 203](#) for the correct tensions at other temperatures.
 - 1 Adjust the cable tension. Adjust the retract cable first.
 - 2 Install safety clips in the turnbuckles. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
 - (b) On the Airplanes 20608174 and On, and Airplanes T20608362 and On, adjust the turnbuckles to position the left drive pulley so that the centerline of the bolt hole for the inboard push-pull rod attachment is 4.2 inches (106.7 mm) aft of the fuel well bulkhead. Make sure that you keep the centerline of the bolt hole for the inboard push-pull rod attachment at 4.2 inches (106.7 mm) in the right wing. Make sure that you keep 130 pounds, +10 or -10 pounds (578 N, +44 or -44 N) cable tension at 70 °F (21 °C). Refer to [Figure 203](#) for the correct tensions at other temperatures.
 - 1 Adjust the cable tension. Refer to [Figure 203](#). Adjust the retract cable first.
 - 2 Install safety clips in the turnbuckles. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
- (35) Hold the left flap full up, and adjust the push-pull rods to align with the drive pulley and bell crank attachment holes.
- (36) Connect the push-pull rods and tighten the lock nuts.
- (37) Operate the flaps several times, and make sure the flap motor goes off after each cycle.
- (38) Connect and rig the flap follow-up system. Refer to [Flap Follow-Up and Indicating System - Maintenance Practices](#).

(39) Do a check for the specified flap travel with the inclinometer attached to each flap separately.

NOTE: Since the flap rollers may not touch the bottom in the flap tracks with the flaps fully extended, some free play can be noticed in this position.

(40) Do an operational check.

(a) Make sure that all of the items are safety wired correctly.

(41) Install the access plates 610CB, 610DB, 610FB, 610HB, 610JB, 610LB, 610NB, 610QB, 610SB, 610WB for the right flap, and 510CB, 510DB, 510FB, 510HB, 510JB, 510LB, 510NB, 510QB, 510SB, 510WB for the left flap. Refer to Chapter 6-20-02, Access/Inspection Plates - Description and Operation.

(42) Install the overhead console. Refer to Chapter 25, Interior Upholstery - Maintenance Practices.

Figure 201 : Sheet 1 : Wing Flap Control System Installation

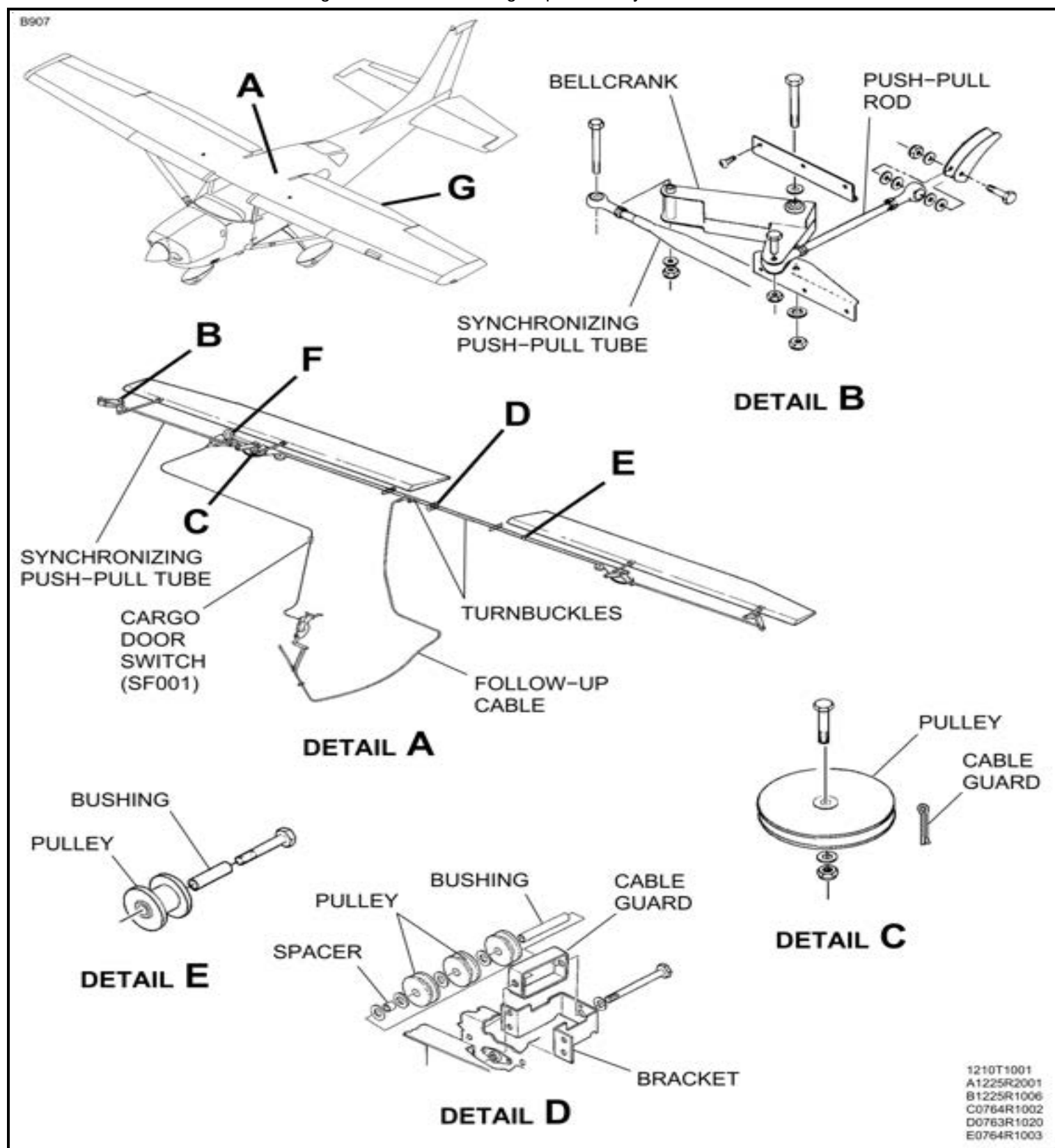


Figure 201 : Sheet 2 : Wing Flap Control System Installation

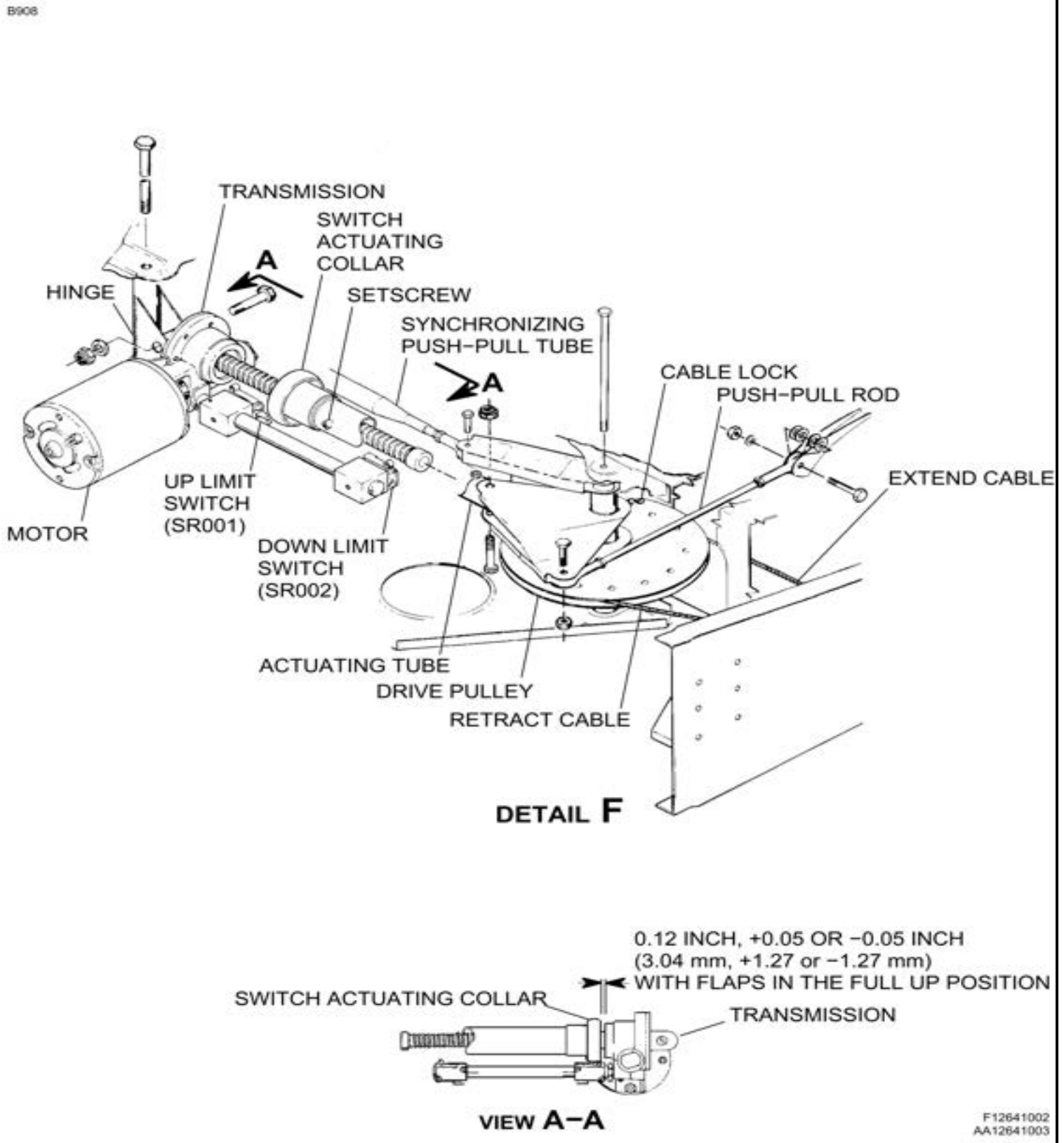


Figure 201 : Sheet 3 : Wing Flap Control System Installation

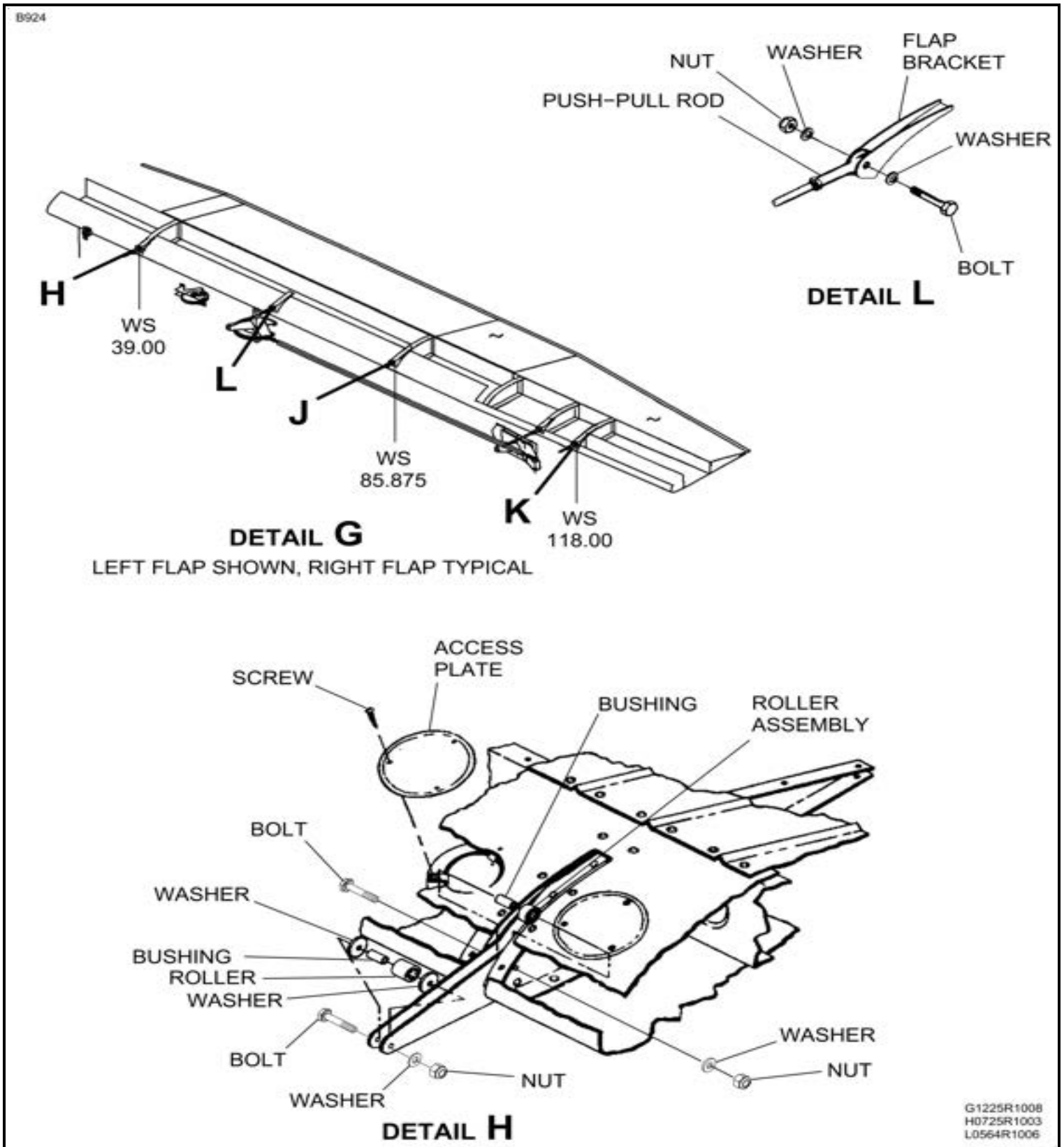


Figure 201 : Sheet 4 : Wing Flap Control System Installation

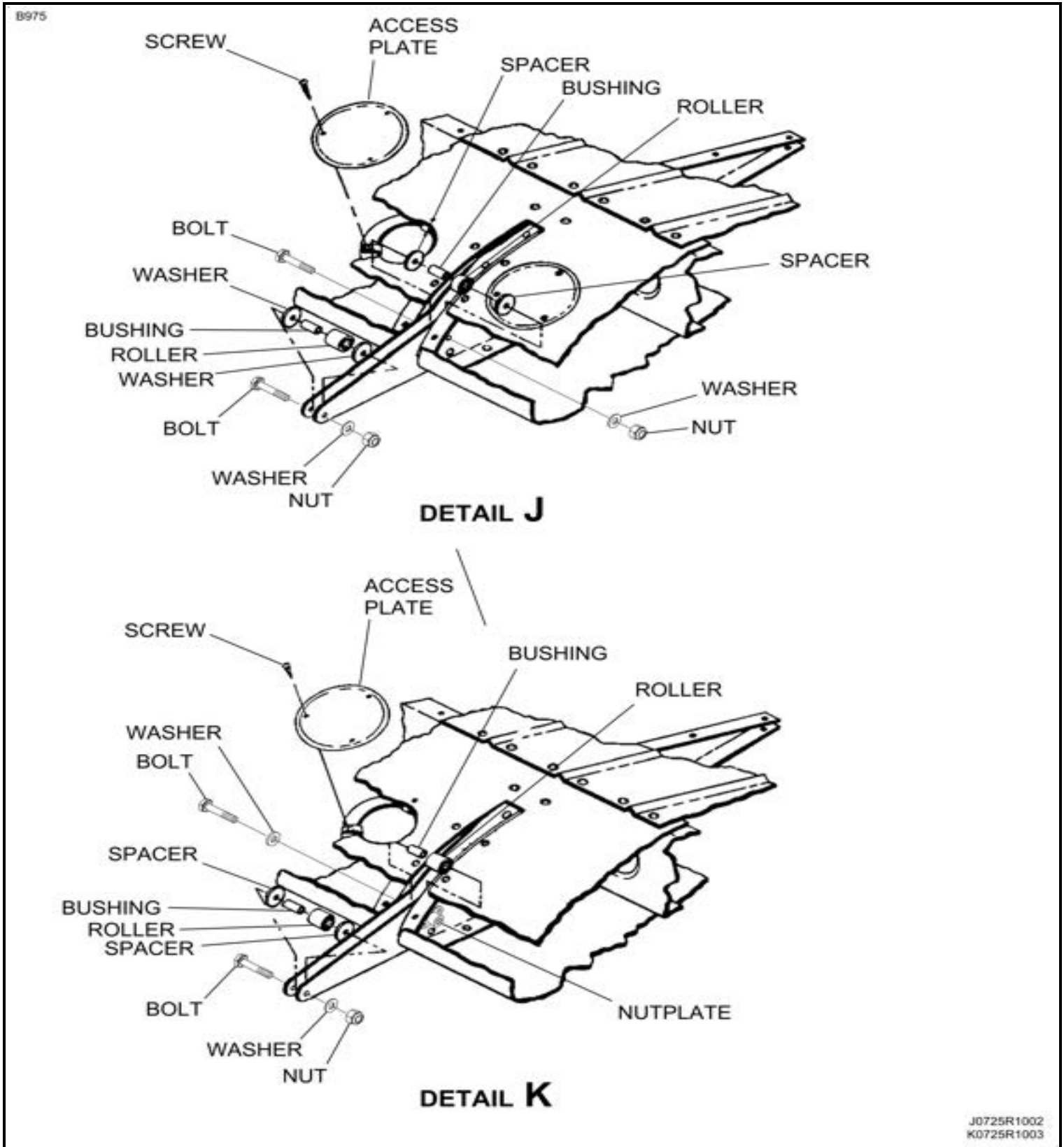


Figure 202 : Sheet 1 : Flap System Schematic

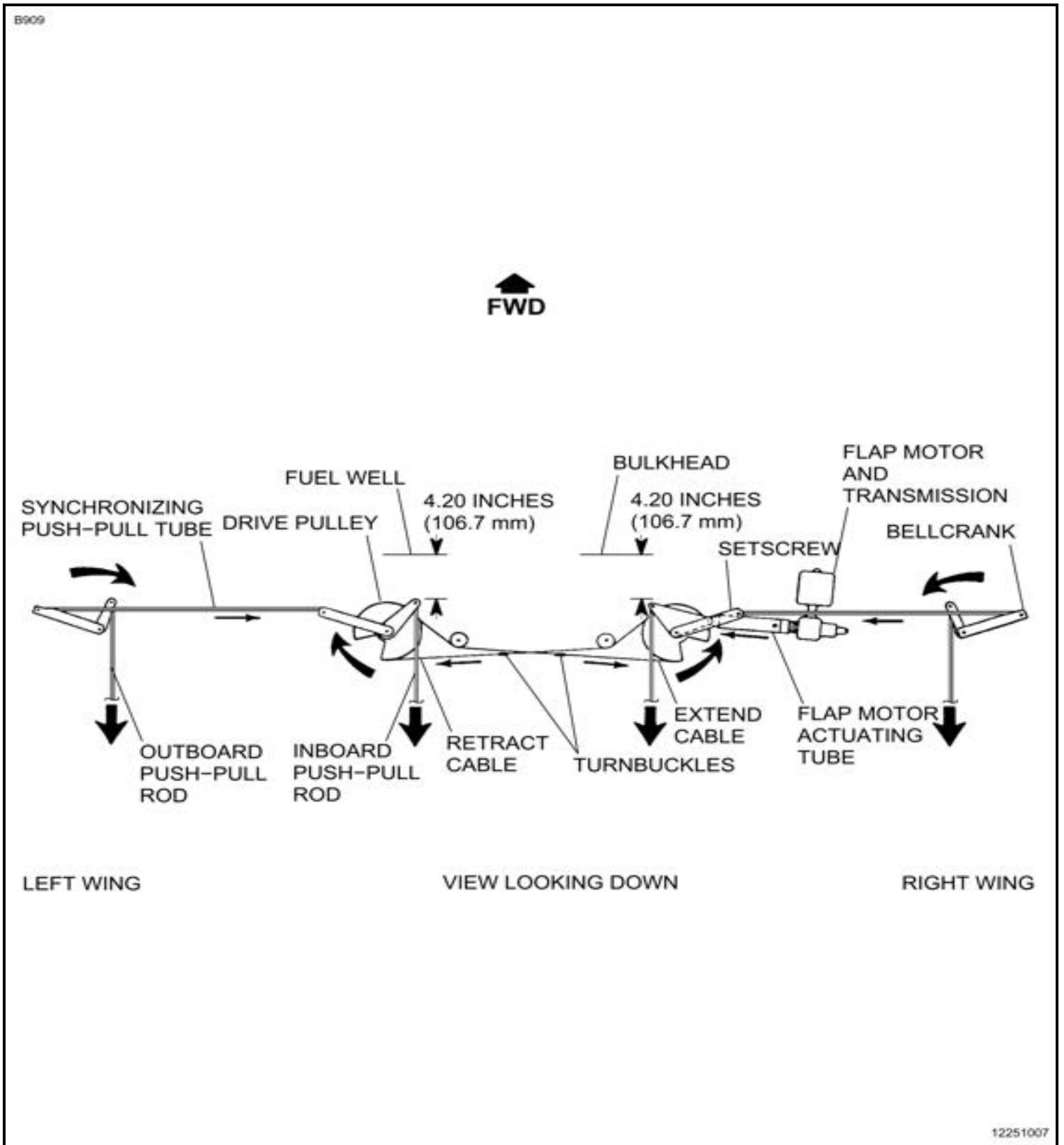


Figure 203 : Sheet 1 : Flap Cable Tension

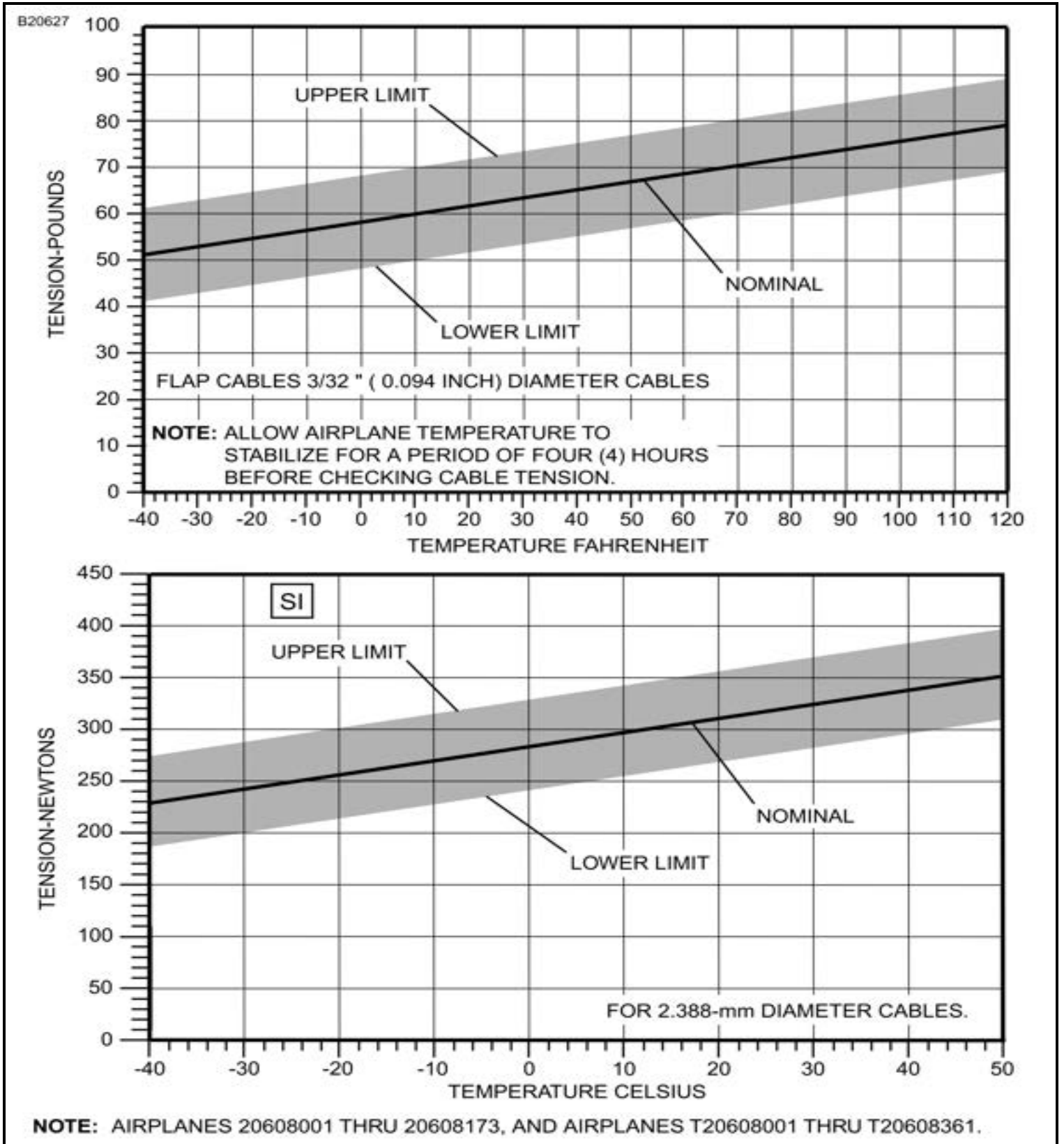


Figure 203 : Sheet 2 : Flap Cable Tension

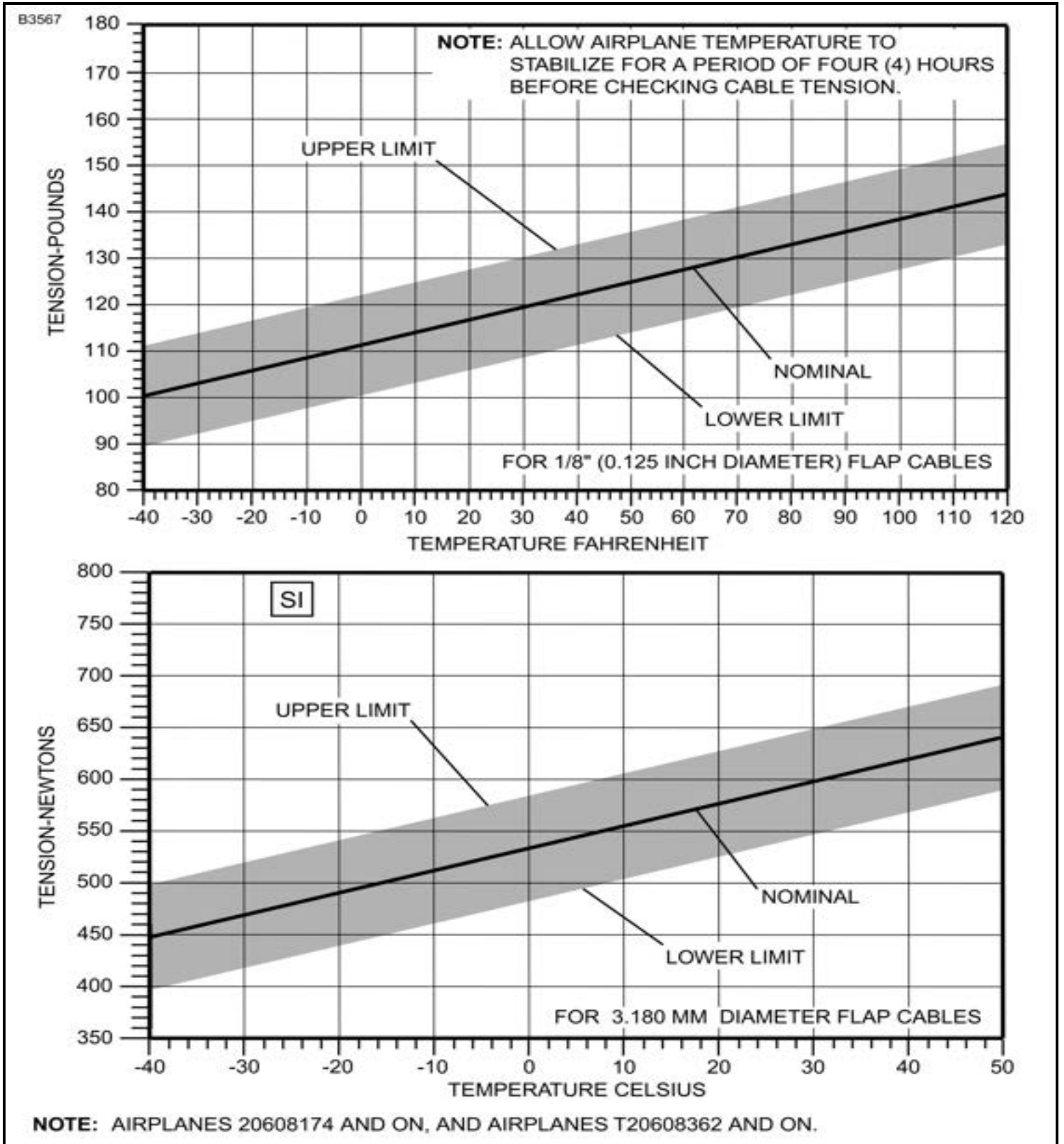


Figure 3 : Sheet 1 : Wing Access Panels

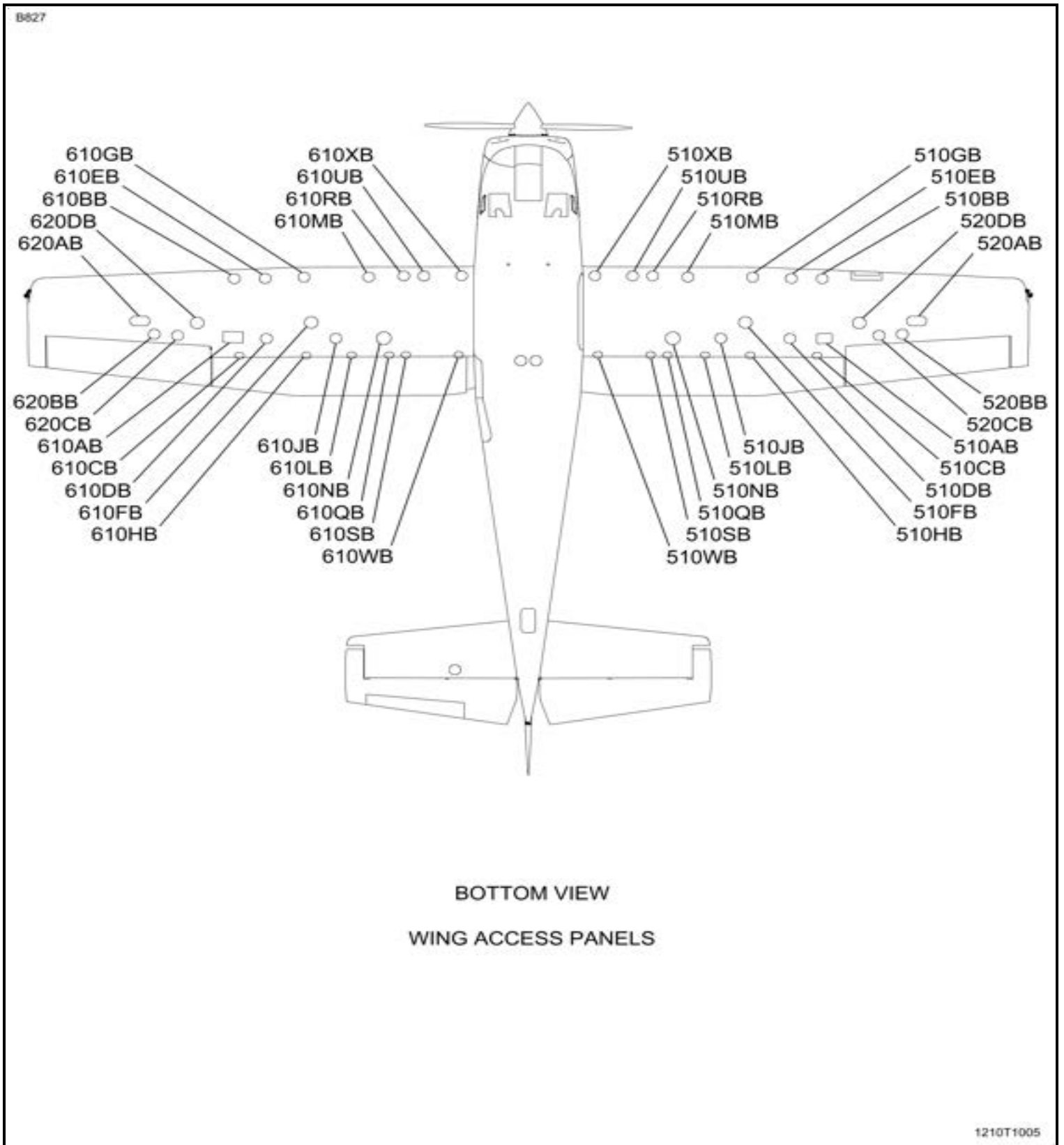


Figure 3 : Sheet 2 : Wing Access Panels

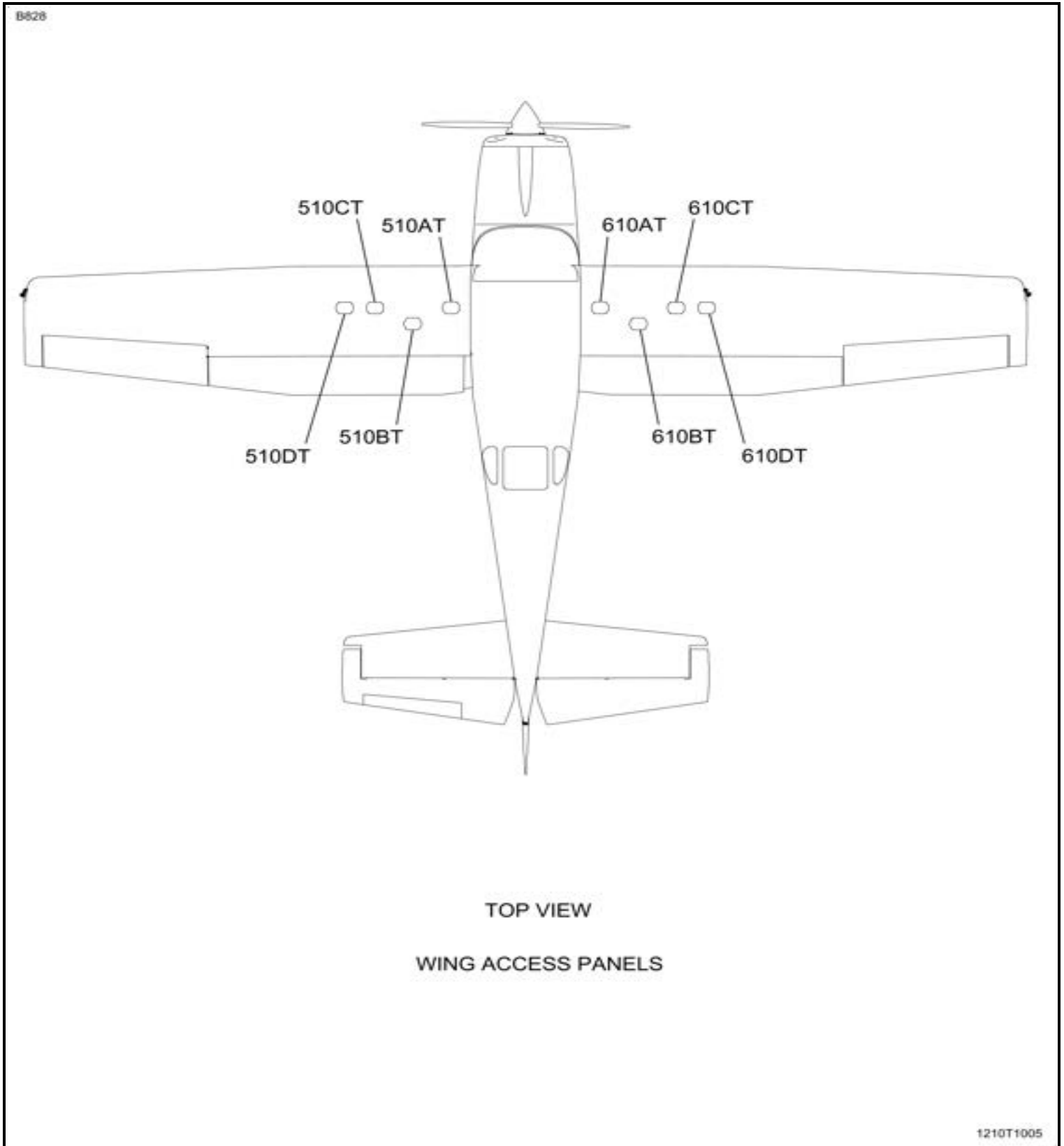
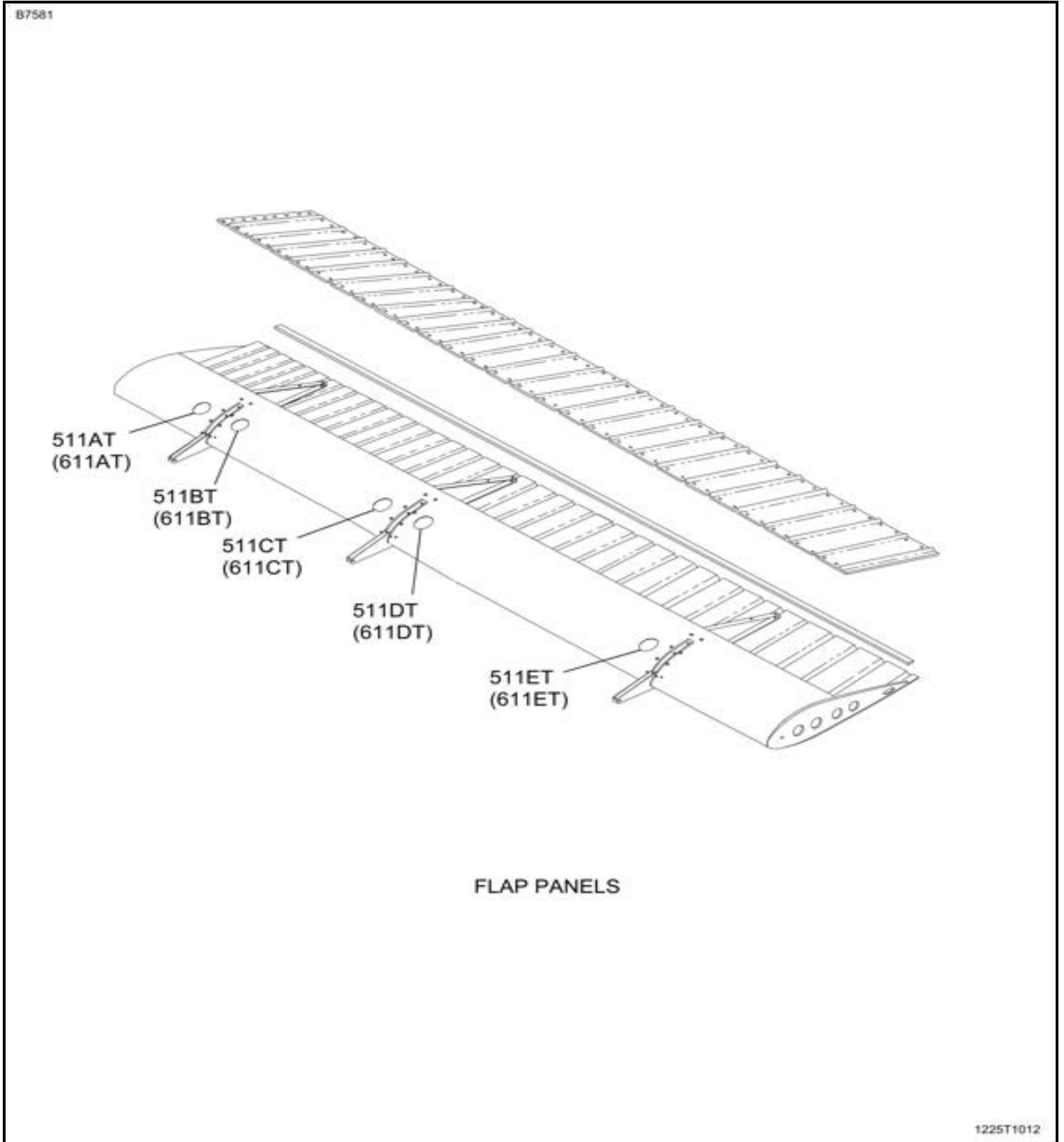


Figure 4 : Sheet 1 : Flap Panels



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 extend 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 pedestal cover.
 - (2) Remove flap UP and DOWN operating switches from switch mounting arm. Do not disconnect electrical wiring at switches.
NOTE: Insulators are installed between switches and switch mounting arm.
 - (3) Disconnect spring from bellcrank assembly.
 - (4) Remove knob from control lever.
 - (5) Remove cotter pin, washers, and pin securing switch mounting arm to bellcrank assembly. Discard cotter pin.
 - (6) 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 n-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. 700, 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 and DOWN operating switches on switch mounting arm, making sure to install insulators.
 - (4) Secure switch mounting arm on bellcrank assembly using pin, washers and new cotter pin.
 - (5) Connect spring to bellcrank assembly.
 - (6) Rig system. Refer to [Flap Follow-Up and Indicating System Adjustment/Test](#).
 - (7) Install pedestal cover.

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. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (3) Pull all slack from follow-up control cable, and with indicator in full up position, secure follow-up cable to retract cable with clamp assembly.
 - (4) Torque clamp nut to 45 inch-pounds, +5 or -5 inch- pounds (5.08 N.m, +0.56 or -0.56 N.m) and lock with a second nut.
 - (5) Connect spring to arm assembly.
 - (6) Make minor cable length adjustments at brackets by adjusting nuts.
 - (7) With control lever in the full UP position, adjust operating switch up and operating switch down, in slotted holes until cam is centered between switch rollers. Ensure control lever is in full UP position during this adjustment.
 - (8) Mount inclinometer on trailing edge of one flap and set to 0 Degrees.
 - (9) Turn master switch ON and move control lever to 10-degree position.
 - (10) If flaps travel is more than 10 Degrees, +2 or -2 degrees, adjust flap DOWN, operating switch away from cam and recycle flaps.
 - (11) Adjust flaps up operating switch in slotted holes for 0.062 inch (1.51 mm) clearance between switch roller and cam when the flaps down 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.

- (12) Turn master switch ON and run flaps through several cycles, stopping at various midrange settings and checking that cable tension is within limits. Retract cable tension may increase to 160 pounds (712 N) when flaps are fully retracted.
- (13) Check all rod ends and clevis ends for sufficient thread engagement, and all jamnuts are tight.
- (14) Install overhead center console. Refer to Chapter 25. [Interior Upholstery - Maintenance Practices](#).
- (15) Install pedestal cover. Refer to, [Remove Pedestal Cover](#).

Figure 201 : Sheet 1 : Wing Flap Control and Follow-Up System

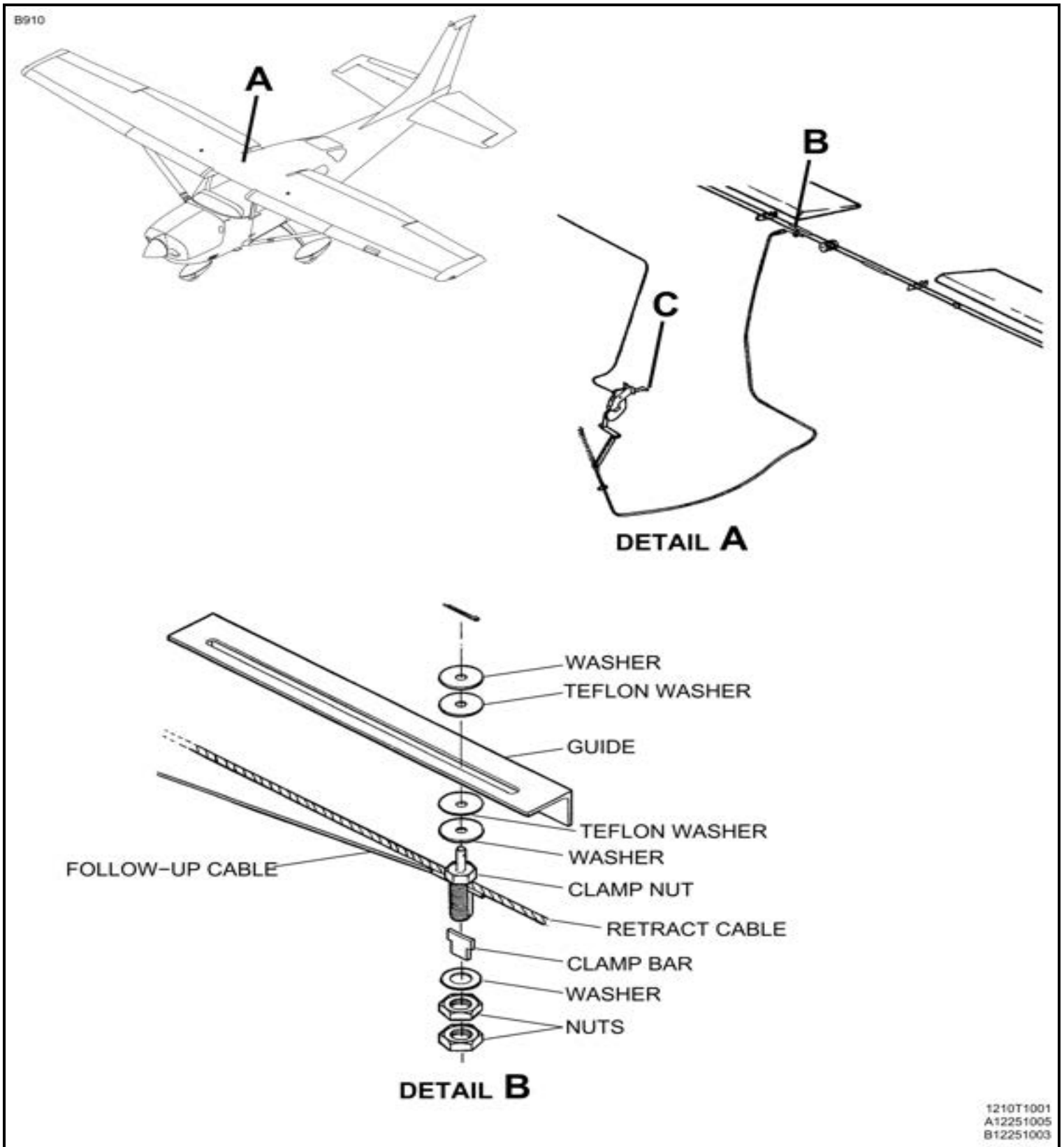
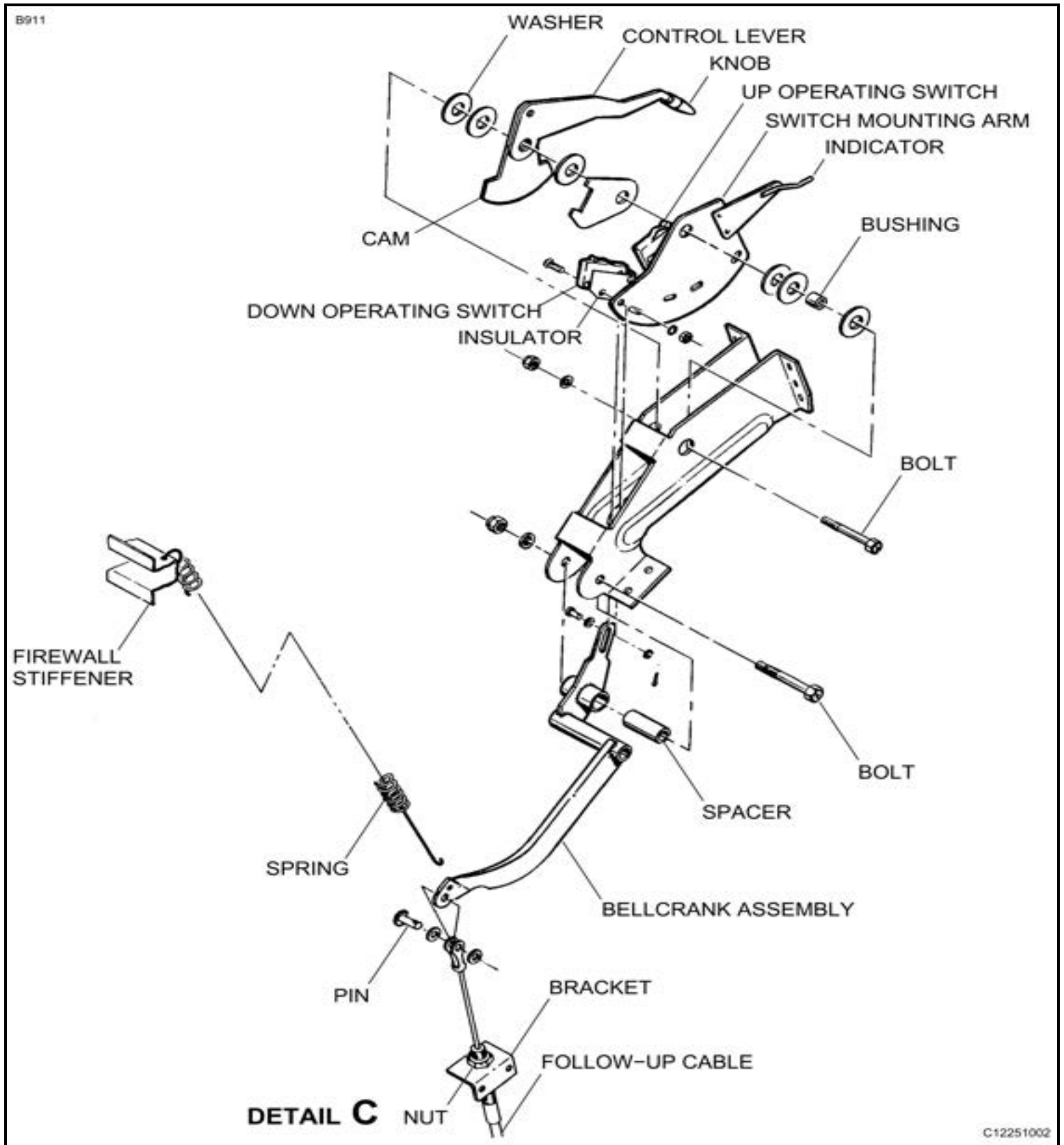


Figure 201 : Sheet 2 : Wing Flap Control and Follow-Up System



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 TailStand		Obtain locally	To secure tail.
Padded Block		Fabricate locally	To provide cushion between wing jack and wing spar.
Jack Pad	1200026-1	Textron Aviation	To provide a point to attach the jack.

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.

JACKING - MAINTENANCE PRACTICES

1. General

- A. When it is necessary to lift the airplane from the ground at all points, use the procedures that follow.

2. Tools, Equipment and Materials

- A. For a list of required tools, equipment and materials, refer to [Lifting and Shoring - General](#). Also refer to MK206-57-02 for procedures, if installed.

3. Jacking Procedure

- A. Lift the Airplane (Refer to [Figure 201](#)).

- (1) On airplanes without jack pad nutplates or MK206-57-02 installed, put wing jacks and padded blocks under the front spar, just outboard of the wing strut. Make sure that a padded block (1 inch X 4 inch X 4 inch with 0.25-inch rubber pad) is put firmly between the spar and jack.
- (2) On airplanes with jack pad nutplates or MK206-57-02 installed, do the steps that follow:
 - (a) Remove the screws from the jack pad nutplates and upper strut fairing. Lower the fairing away from the wing.
 - (b) Use screws to install the jack pad to the nutplates on the bottom of the wing just outboard of the wing strut.
 - (c) Put wing jacks under the jack pads.
- (3) Lift the wing jacks at the same time on the left and right wings until they are at the necessary height. Keep the wings as level as possible during the lift.

CAUTION: Do not let the tail move up during the jacking procedure. When put on jacks, the airplane is nose-heavy. Tail stands must have sufficient weight in all conditions. Also, the tail stand must be sufficiently strong to hold all the weight that can possibly move to the tailcone area during maintenance and cause a tail-heavy condition.

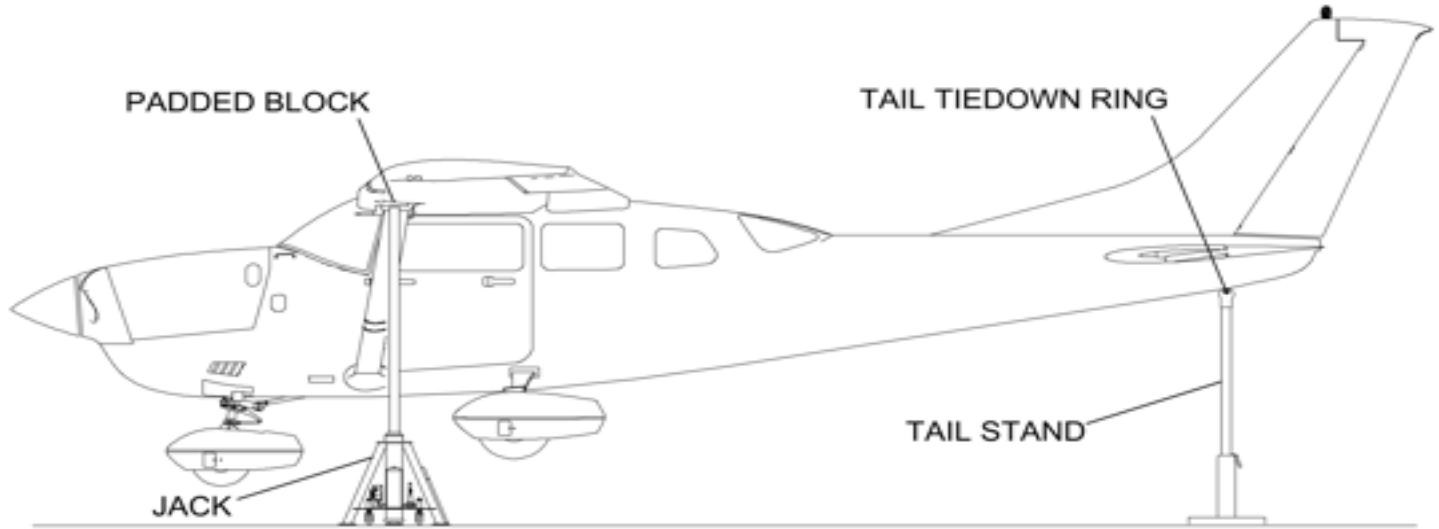
- (4) Carefully attach a tail stand to the tail tiedown ring.

- B. Lower the Airplane (Refer to [Figure 201](#)).

- (1) Remove the tail stand from tail tiedown ring.
- (2) Slowly lower the wing jacks at the same time until the main tires are on the ground.
- (3) Remove the wing jacks and jack pads from the wing area.
- (4) As necessary, put the upper strut fairing back into its place. Install the screws into the fairing and the nutplates in the wing.

Figure 201 : Sheet 1 : Airplane Jacking

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EMERGENCY LIFTING/HOISTING - MAINTENANCE PRACTICES

1. Lifting Procedure

CAUTION: Airplane should be at minimum weight if slings are used. Fuel and all other items such as cargo etc, should be removed.

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

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 section 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.

LEVELING - MAINTENANCE PRACTICES

1. General

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

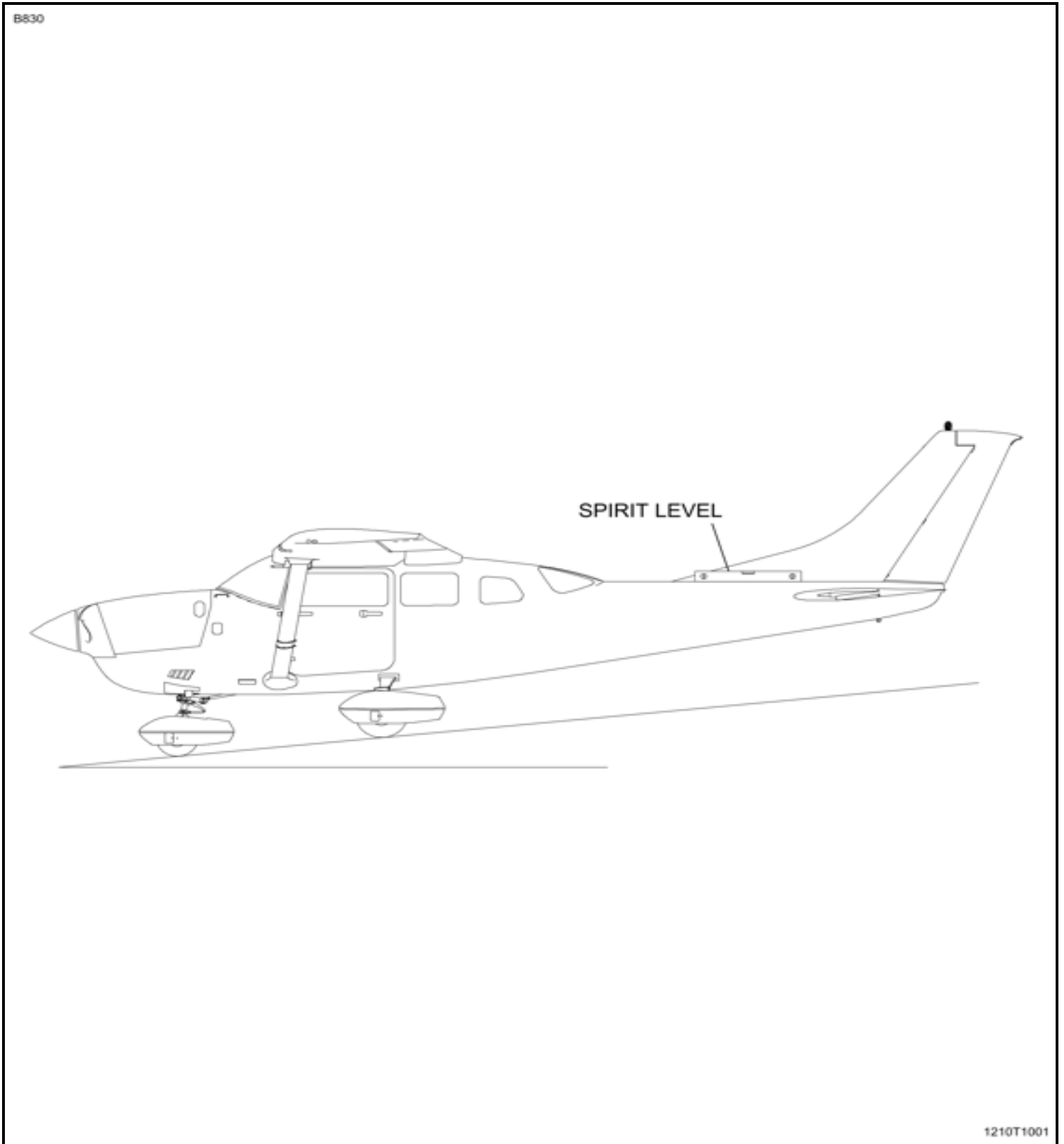
2. Tools, Equipment and Materials

- 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 front seat rails and placing the level across these points.
- B. Longitudinal Leveling.
 - (1) Place level on the top of the tailcone adjacent to the vertical fin.

Figure 201 : Sheet 1 : Airplane Leveling



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 2 5800 East Pawnee Road Wichita, KS 67218-5590	To prevent entry of moisture and/or foreign particles through cowling.
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.

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.
CAUTION: Do not set parking brake during cold weather, when accumulated moisture may freeze brakes, or when brakes are overheated.
 - (2) Set parking brake or chock main gear wheels.
 - (3) Install control column lock.

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 nonoperational storage 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. However, these 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 essential to good preservation and should be procured, if possible.

- A. Instructions For Temporary Storage:

WARNING: During all fueling procedures, fire fighting equipment must be available. Two ground wires from different points on the airplane connected to separate approved ground stakes shall be used in case of accidental disconnection of one ground wire. Ensure that fueling nozzle is grounded to the airplane.

- (1) Fill fuel tanks with the correct grade of gasoline.

NOTE: Tiedown rings should be used as grounding points for all grounding wires during refueling procedures.

- (2) Clean and wax airplane thoroughly.
- (3) Clean any oil or grease from tires and coat tires with a tire preservative. Cover tires to protect against grease and oil.
- (4) Either block up fuselage to relieve pressure on tires or rotate wheels every 30 days to change supporting points and prevent flat spotting on the tires.
- (5) Lubricate all airframe items and seal or cover all openings which allow moisture and/or dust to enter.
- (6) Charge the avionics standby battery and the Garmin GI 275 Standby Battery (If Installed).

NOTE: For maximum battery life, the avionics standby battery and Garmin GI 275 Standby Battery (if installed) must be kept partially charged with the aircraft main battery and external power.

- (a) Connect external power to the airplane.

- (b) Put the MASTER switch in the ON position.
 - (c) Allow the avionics standby battery and the Garmin GI 275 Standby Battery (if installed) to charge for 1 hour.
 - (d) Put the MASTER switch in the OFF position.
 - (e) Disconnect external power from the airplane.
- (7) Remove battery and store in a cool, dry place; service battery periodically and charge as required.
 - (8) Every 90 days, install a fully charged main aircraft battery and charge the avionics standby battery and the Garmin GI 275 Standby Battery (if installed). Use the battery charge procedure in this document.
 - (9) Disconnect spark plug leads and remove upper and lower spark plugs from each cylinder.
 - (10) Using a portable pressure sprayer, spray preservative oil through the upper spark plug hole of each cylinder with the piston in a down position. Rotate crankshaft as each pair of cylinders is sprayed.
 - (11) Rotate crankshaft so that no piston is at a top position. If the airplane is to be stored outside, stop two bladed propeller so that blades are as near horizontal as possible to provide maximum clearance for passing airplane.
 - (12) Again, spray each cylinder without moving the crankshaft to thoroughly cover all interior surfaces of the cylinder above the piston.
 - (13) Install spark plugs and connect spark plug leads. Apply preservative oil to the engine interior by spraying approximately two ounces of the preservative oil through the oil filler tube.
 - (14) Seal all engine openings exposed to the atmosphere, using suitable plugs. Attach a red streamer at each point where a plug is installed.
 - (15) If the airplane is to be stored outside, tie down and secure using procedures outlined in [Mooring - Maintenance Practices](#). In addition, the pitot tube, static source vents, air vent openings in the engine cowling and other similar openings should have protective covers installed to prevent entry of foreign material.
 - (16) Attach a warning placard to the propeller to the effect that the propeller shall not be moved while the engine is in storage.

4. Indefinite Storage

NOTE: Engines treated in accordance with the following procedure are protected against normal atmospheric corrosion for an indefinite period. However, periodic inspections should be performed to assure the integrity of preservation methods. Refer to [Inspection During Indefinite Storage](#).

A. Instructions for Indefinite Storage:

- (1) Operate engine until oil temperature reaches normal operating range. Drain engine oil sump.
- (2) Reinstall plug in sump when all oil has drained.
- (3) Disconnect battery.
- (4) Fill oil sump to normal operating capacity with thoroughly mixed corrosion preventative oil. Refer to [Parking, Mooring, Storage and Return to Service - General](#).
- (5) Remove top spark plugs, and with the crankcase full of oil, slowly turn the propeller through two revolutions. Let engine stand for ten minutes after which the propeller should be turned back and forth through 90 degrees for twelve cycles.
- (6) Drain the preservative oil.
- (7) With the piston approximately 1/4 turn before top center of the exhaust stroke, spray the exhaust port and valve of each cylinder using MIL-C-6529 oil, Type 1.
- (8) Using an airless spray gun, spray two ounces (60 ml) of MIL-C-6529 oil, Type 1, into each cylinder through the spark plug hole.
- (9) For all spraying the spray nozzle temperature shall be maintained between 200°F (93.33°C) and 220°F (104.44°C).
- (10) Install dehydrator plugs in the upper spark plug holes. Ensure dehydrator plugs are blue in color when installed.
- (11) Cover spark plug lead terminals with shipping plugs or other suitable covers.
- (12) With throttle in full open position, place a bag of desiccant in the induction air intake and seal opening with moisture resistant paper and tape.
- (13) Place a bag of desiccant in the exhaust tailpipe and seal openings with moisture resistant tape.
- (14) Seal cold air inlet to the heater muff with moisture resistant tape.
- (15) Seal engine breather tube by inserting a plug in the breather hose and clamping in place.

- (16) Seal all other engine openings exposed to atmosphere, using suitable plugs or nonhydroscopic tape.

NOTE: Attach a red streamer to each location where a plug or tape is installed. Either attach 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.

- (17) Drain corrosion preventative mixture from engine sump and reinstall drain plug.

NOTE: The corrosion preventative mixture is harmful to paint and should be wiped from painted surfaces immediately.

- (18) Attach a warning placard on the throttle control knob to the effect that the engine contains no lubricating oil. Placard the propeller to the effect that it should not be moved while the engine is in storage.

NOTE: As an alternate method of indefinite storage, the airplane may be serviced according to Temporary Storage procedures, run up at maximum intervals of 90 days, and then serviced again according to 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 should be inspected using the following procedure:

- (1) Inspect airframe for corrosion every 30 days.
- (2) Remove dust collections as frequently as possible.
- (3) Clean and wax airplane as required.
- (4) Inspect interior of at least one cylinder for corrosion every 30 days.

NOTE: Do not move crankshaft when inspecting interior of cylinder for corrosion.

7. Inspection During Indefinite Storage

- A. Airplanes in indefinite storage should be inspected using the following procedure:

- (1) Inspect cylinder dehydrator plugs every seven days. Change protex plugs if their color indicates an unsafe condition.
- (2) If dehydrator plugs have changed color in one half of the cylinders, all desiccant material in the engine should be replaced with new material.
- (3) Respray cylinder interiors with corrosion preventative mixture every six months and replace desiccant and dehydrator plugs.

NOTE: Before spraying, 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.

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) Secure control surfaces with the internal control lock and set brakes.
 - (2) Tie ropes, cables, or chains to the wing tiedown fittings located at the upper end of each wing strut. Secure the opposite ends of ropes, cables, or chains to ground anchors.
 - (3) Secure rope (no chains or cables) to forward mooring ring and secure opposite end to ground anchor.
 - (4) Secure the middle of a rope to the tail tiedown ring. Pull each end of rope away at a 45 degree angle and secure to ground anchors at each side of tail.
 - (5) Secure control lock on pilot control column. If control lock is not available, tie pilot control wheel back with front seat belt.
 - (6) These airplanes are equipped with a spring- loaded steering system which affords protection against normal wind gusts. However, if extremely high wind gusts are anticipated, additional external locks may be installed.

3. Brace Installation (required for float planes)

- A. Install Brace (Refer to [Figure 201](#)).

NOTE: This is for first time installation.

- (1) Remove left and right forward window molding for attachment of upper brace at wing spar carry-through.
- (2) Using the existing outboard spar bolts, secure upper brace to spar.

NOTE: Ensure proper hardware. Refer to The Model 206/T206 1997 And On Illustrated Parts Catalog, Chapter 10, Brace Installation - Float Plane.

NOTE: Discard any extra washers as required.

- (3) Trim window molding and glareshield as required to allow brace to pass through. Reinstall window molding.

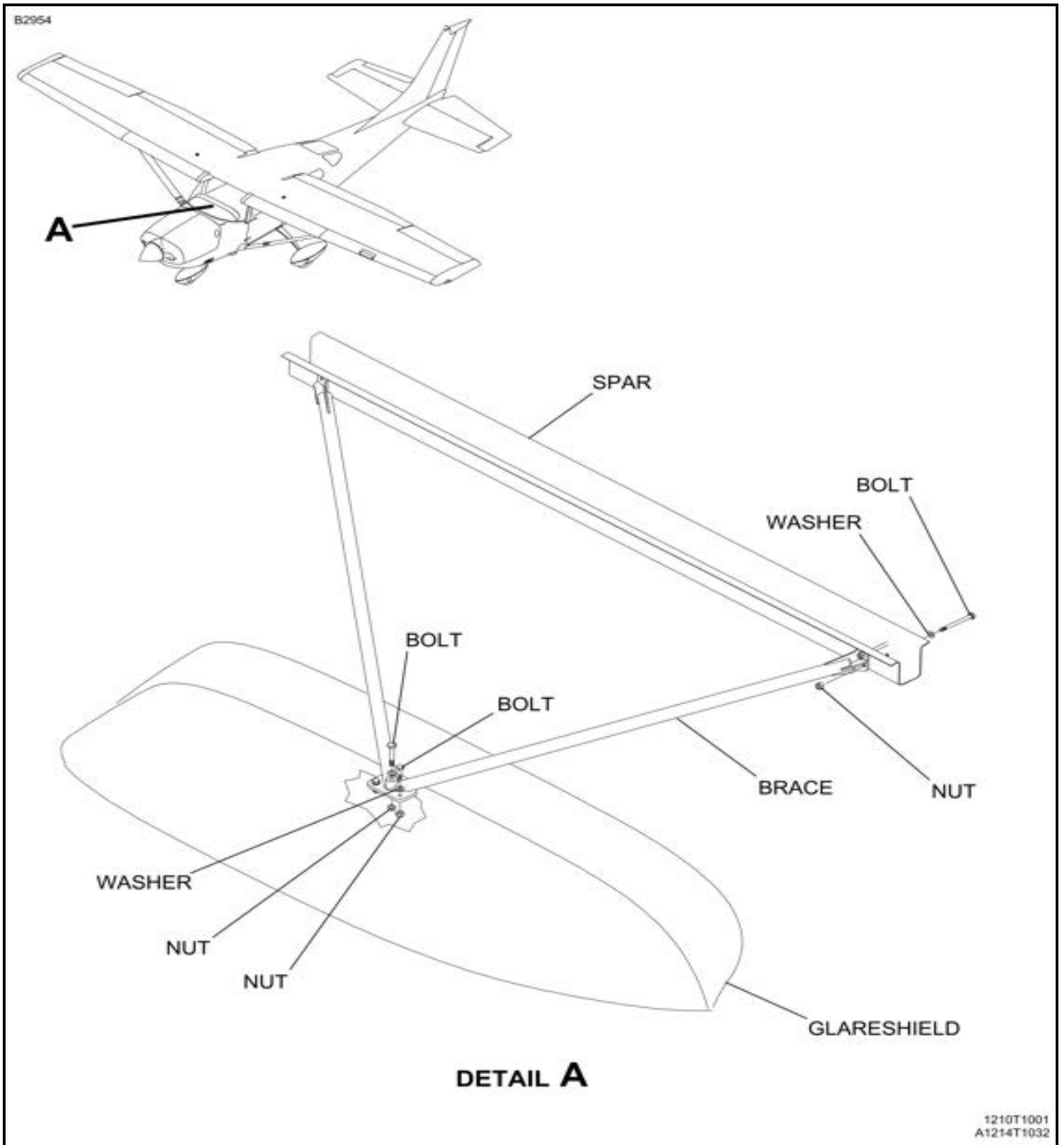
NOTE: Cut a straight line on outside of window molding, then cut a hole in the top and bottom. This allows it to be opened up and snapped around the brace allowing the brace to pass through the upholstery.

- (4) Remove pilot's inboard instrument panel and avionics as necessary for drilling center brace bolt holes.

CAUTION: Protect electrical and avionics from shavings.

- (5) Install center bolt, washer and nut to position brace and drill the two (2) .193 bolt holes. Secure center brace using bolts washers and nuts.
- (6) Remove shavings. Reinstall pilot's instrument panel and avionics.

Figure 201 : Sheet 1 : Brace Installation - Float Planes



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 with 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 (37.29 N.m.) 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 cylinder to check for possible liquid lock. Torque plug to 330 inch-pounds (37.29 N.m).
- (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.

STANDARD PRACTICES AIRFRAME - GENERAL

1. Scope

A. This chapter gives the maintenance practices to maintain and repair items of the airframe and systems that are typical to more than one area or system. Maintenance practices that are unique to a particular system or subject are given in the appropriate chapter and section in the maintenance manual.

NOTE: Equivalent alternatives can be used for the items that follow:

NAME	NUMBER	MANUFACTURER	USE
Overall Base Paint	Jet Glo High Solids System 710 Series	Sherwin-Williams 630 E. 13th St. Andover, KS 67002	Used as a topcoat overall color.
Acid Resistant Enamel	Jet-Glo Urethane 571-567	Sherwin-Williams 630 E. 13th St. Andover, KS 67002	Used as a topcoat for battery box.
Pretreatment Primer DOD-P-15328	728-013/ 702-701	Sherwin-Williams 630 E. 13th St. Andover, KS 67002	Pretreatment primer
Corrosion Resistant Primer MIL-PRF-23377G or later	513 x 419/ 910 x 942	Courtaulds Aerospace 1608 Fourth St. Berkeley, CA 94710	Corrosion protection primer.
Corrosion Resistant Primer MIL-PRF-23377G or later	02-Y-40 02-4-40 CATA	DEFT, Inc. 17451 Von Karman Ave. Irvine, CA 92714	Corrosion protection primer.
Corrosion Resistant Primer MIL-PRF-23377G or later	U-1201F/ U-1202F	Sterling Lacquer Mfg. 3150 Brannon Ave. St. Louis, MO 63139	Corrosion protection primer.
Corrosion Resistant Primer MIL-PRF-23377G or later	R4001-K14 MAX COR	U. S. Paint Corp. 831 S. 21st St. St. Louis, MO 63103	Corrosion protection primer.
Heat Resistant Enamel (Gray)	521- 520	Sherwin-Williams	Used for engine mount and hardware in the engine compartment.
Polishing Compound	808 Polishing Compound	DuPont	To rub out the overspray.
Cloth	Hex Wiping Cloth	Western Uniform & Towel Service 1707 N. Mosley	Used with solvent to clean the airplane exterior.
Tape	Masking Tape, Y-231	3M Co. 3M Center Minneapolis, Minn. 55144	To hold the masking paper in place.

2. Definition

- A. This chapter is divided into sections to aid maintenance personnel to find information. Read the Table of Contents to help find a applicable subject. A brief definition of the subjects and sections in this chapter is listed as follows.
- (1) The section on Material and Tool Cautions gives cautions and warnings applicable to maintenance on or around the airplane.
 - (2) The section on Torque Data gives tables, formulas, requirements and torque limits for different kinds of fasteners.
 - (3) The section on Safetying gives the correct procedures and use of safety wire/lockwire, cotter pins and lock clip installations.
 - (4) The section on Control Cables and Pulleys gives the construction, examination and storage of cable assemblies and pulleys.
 - (5) The section on Solvents, Sealants and Adhesives gives the procedures 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 has information for converting the more commonly used units of measure that are in the Maintenance Manual.

MATERIAL AND TOOL CAUTIONS - DESCRIPTION AND OPERATION

1. Mercury

CAUTION: Thermometers and other test equipment that contain mercury must not be used on the airplane.

A. Damage from Mercury Corrosion.

- (1) Mercury can penetrate any break in the finish, paint or seal coating of a metal structural element.
- (2) The corrosion and embrittlement that results from mercury to enter the airplane structure will be very rapid on structural members under load.
- (3) Moisture present on the metal surfaces will increase the corrosive and embrittlement process.
- (4) Soils, greases or other inert contaminants, will help prevent the start of the corrosion.
- (5) An oxide coat on a dry metallic surface will prevent an immediate action.
- (6) A bright, polished, shining or scratched surface will limit the corrosive process.
- (7) If corrosion and embrittlement has started, there is no known method to stop it. Destruction of the load carry capacity of the metal will result.

2. Maintenance Precautions

WARNING: During maintenance, repair and servicing of the airplane, many substances and environments encountered can cause injury if correct precautions are not obeyed.

- #### A.
- Carefully read and follow all instructions. Make sure to obey all cautions and warnings given by the manufacturer of the product being used. Use correct safety equipment as required. This includes eye protection, face shields, breathing devise, protective clothes and gloves. Fuel, engine oil, solvents, volatile chemicals, adhesives, paints and strong cleaning agents can cause injury with contact to the skin or eyes, or when vapors are breathed. When you sand composites or metals or otherwise work in an area where dust particles can be made, the area must be ventilated and the correct respirator must be used.

3. General Usage Solvents

- #### A.
- General usage solvents are included in the list that follows:

Methyl Propyl Ketone

Toluene

Isopropyl Alcohol

Acetone

Methylene Chloride

1,1,1-Trichloroethane

Naptha

ASTM D4080

- #### B.
- The chemicals/solvents are generally colorless, evaporate faster than water, and tend to give off vapors in greater quantities as their temperature increases. The vapors are generally heavier than air, which cause them to collect in low surface areas or push normal oxygen and air out of a confined area. This situation can lead to oxygen deficient atmospheres. Many general solvents are flammable.
- #### C.
- Solvents are hazardous to work with because of their flammability, rate of evaporation and reaction to oxidizers. Solvents can also be an irritant to the skin and eyes.
- #### D.
- A single spark, a smoldering cigarette, or even atmospheric conditions can ignite solvent vapors. The lower the flash point of the chemical, the more likely it is to become flammable. Generally, flash points of less than 100°F (37.8°C) are considered flammables. Examples of solvent flash points are shown below:

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)

- E. The rate of evaporation is closely tied to flammability, because normally the vapors must be present to ignite the liquid. Vaporization also lets solvents, even those that are not flammable, to get into the air and into the body's blood stream through the lungs.
- F. Solvents can also react explosively with oxidizers (chemicals that release oxygen). A very violent and uncontrollable reaction takes place which generates heat rapidly. For this reason, it is very important for each person to be aware of specific chemicals in use in the work area, and to obey the label on the containers. Chemical manufacturers are required to label each container with a diamond shaped symbol: red for flammable and yellow for oxidizers.
- G. Solvents can also damage the hands and skin. Solvents dry out skin and dissolve the natural oils. The condition can develop into an irritation. If left untreated with continuous exposure, it can progress to a dermatitis. Damaged skin allows other contaminants to worsen the condition because the contaminants have easier access to the deeper levels of the skin. In serious cases, blood poisoning is possible.
- H. The best defense against skin irritation is not to be exposed. If exposure is unavoidable, steps must be taken to limit exposure times. Too much exposure to these chemicals can lead to long term liver damage.

TORQUE DATA - MAINTENANCE PRACTICES

1. General

- A. To make sure of correct installation and to prevent over stress of components during installation, the torque values listed in this section and other applicable chapters of this manual must be used when you install and repair 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 with a torque wrench. Different adapters, used in combination with the torque wrench, can produce an actual torque to the nut or bolt which is different from the torque value. [Figure 201](#) helps calculate the 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) Break-away torque value is the value of torque required to start a nut rotating on a thread shaft. It does not represent running torque value. It must be noted that on some installations the break-away 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 must be free of dust, metal filings, etc. Lubricants, other than that on the nut as purchased, must not be used on any bolt installation unless specified.
 - (3) Assembly of threaded fasteners, such as bolts, screws and nuts, must 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 must be tightened firmly, but not to a specific torque value.
 - (6) Countersunk washers used with close tolerance bolts must be installed correctly to make sure of proper torque (refer to [Figure 202](#)).
 - (7) For Hi-Lok fasteners used with MS21042 self-locking nuts, fastener and nut must 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 must be tightened firmly, but not to a specific torque value. Screws used with dimpled washers must 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 correct operation of parts. On these installations, the assembly must be firm but does not bind.
 - (10) Castellated Nuts.
 - (a) Self-locking and non-locking castellated nuts, except MS17826, require cotter pins and must be tightened to the minimum torque value shown in [Table 201](#). The torque can be increased to install the cotter pin, but the increase must not be more than the alternate torque values.
 - (b) MS17826 self-locking, castellated nuts must be torqued per [Table 201](#).
 - (c) The end of the bolt or screw must extend through the nut at least two full threads, which include the chamfer.
 - (11) Joints that contain wood, plastics, rubber or rubber like materials must 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

3. Torque Requirements for Hi-Lok Fasteners

- A. Use [Table 202](#) to determine torque requirements for Hi-Lok fasteners.

NOTE: This table is used 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

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, non-lubricated parts. Threads must be free of dust and metal filings. Lubricants, other than on the nut as purchased, must 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 must 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.

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

- B. Use [Table 204](#) to determine torque requirements for threaded fasteners used as airframe electrical ground terminals.

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.

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	50	80	75	120
-3	3/16	70	105	95	140
-4	1/4	100	140	135	190
-5	5/16	130	180	170	240
-6	3/8	150	195	215	300
-8	1/2	270	350	470	550
-10	5/8	360	430	620	745
-12	3/4	460	550	855	1055
-16	1	700	840	1140	1400
-20	1 1/4	850	1020	1520	1825
-24	1 1/2	900	1080	1900	2280
-32	2	1800	2000	2660	2940

Figure 201 : Sheet 1 : Torque Wrench and Adapter Formulas

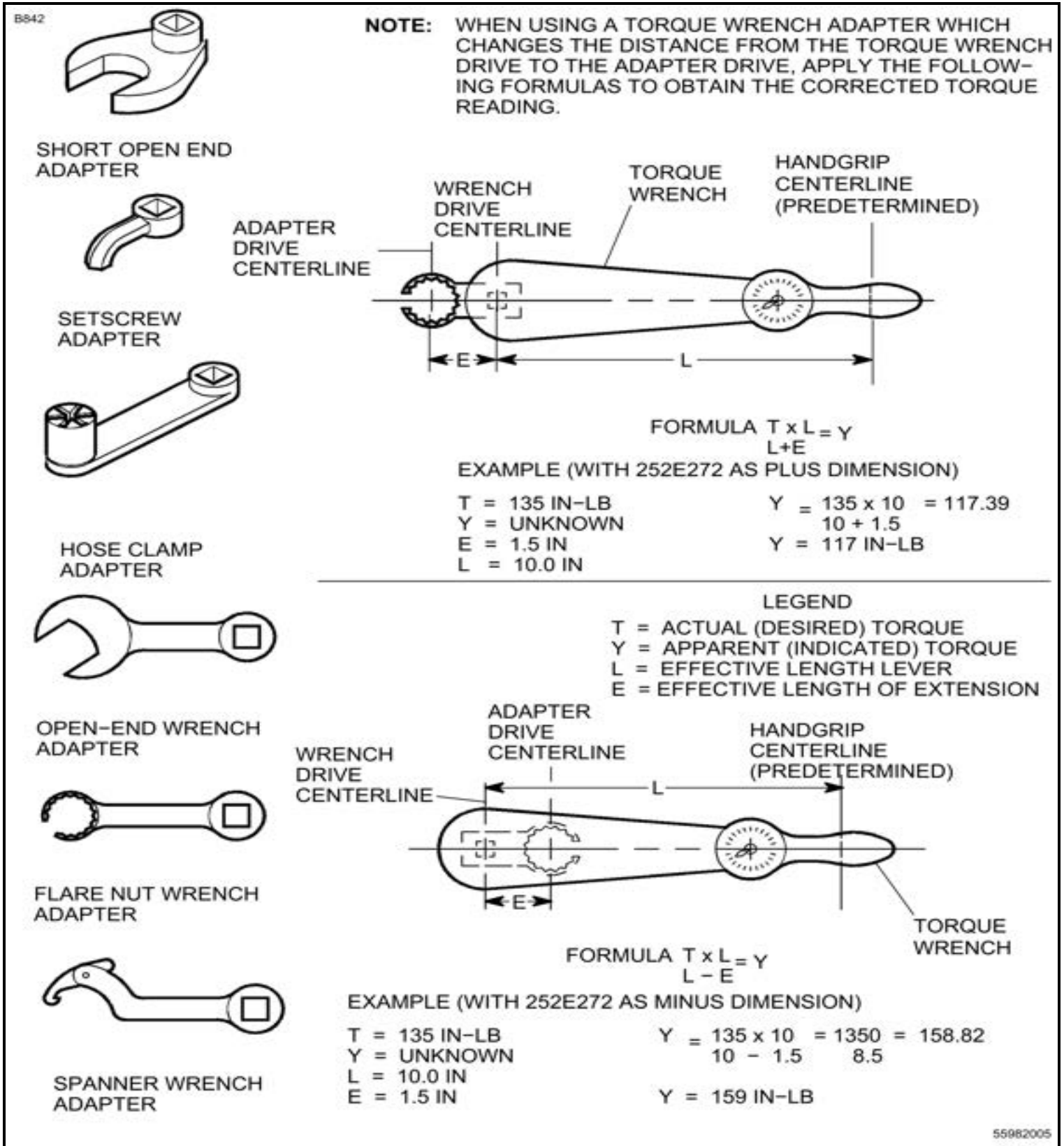
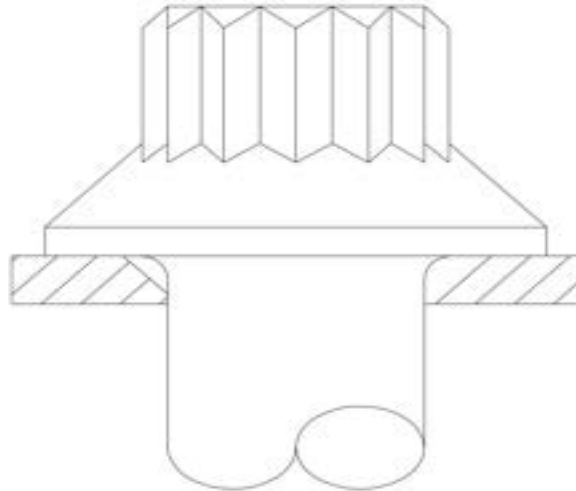


Figure 202 : Sheet 1 : Washer Installation Close Tolerance Bolts

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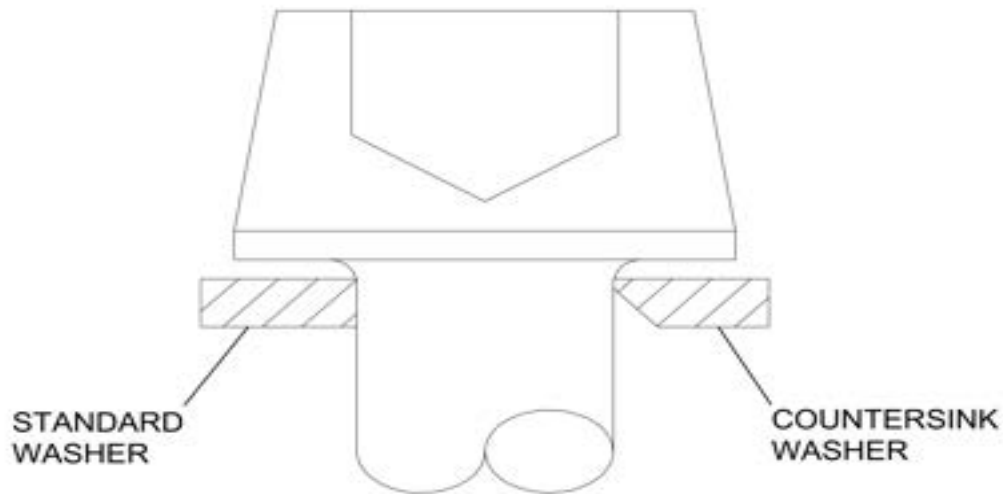
EXTERNAL WRENCHING HEAD



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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SAFETYING - MAINTENANCE PRACTICES

1. General

A. Safety Wire.

- (1) Inconel (Uncoated), Monel (Uncoated).
 - (a) Inconel and monel safety wire is 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 is to be used at temperatures up to 700°F (370°C) and inconel is to be used at temperatures up to 1500°F (815°C). Safety wire can be identified by the color of the finish. Monel and inconel color is natural wire color.
- (2) Copper is 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), is 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. Safety Cable.

- (1) Used as an alternative to corrosion-resistant steel lockwire.

C. Cotter Pin.

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

2. Safety Wire

NOTE: You can use safety cable as an alternative to safety wire. Refer to [Safety Cable Installation](#), in this section.

A. Wire Size.

- (1) The size of the safety wire shall be in accordance with the requirements of [Table 201](#).

Table 201. Safety Wire

MATERIAL	SIZE AND NUMBER (MS20995-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
Corrosion- Resistant Steel	C15	C20	C32		C41	C47		C91
Aluminum Alloy (Blue)		AB20	AB32		AB41	AB47		AB91
Copper (Yellow)	CY15	CY20						

- (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 inch 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.

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 are 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. A closely spaced pattern 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.

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: This does not necessarily apply to castellated nuts when the slot is close to the top of the nut, the wire will be more secure if it is made to pass along the side of the stud.

- (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 pet 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.
 - (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. Safetying Turnbuckles

- A. Use of Locking Clips (Refer to [Figure 203](#)).
 - (1) Prior to safetying, 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.

6. Safety Cable Installation

A. Tools and Equipment.

Name	Number	Manufacturer	Use
Ferrule, Safety Cable	SAE AS4536	Commercially available	To use with the safety cable.
Safety Cable	SAE AS4536	Commercially available	To prevent the movement of structural or other critical components that have had vibration, tension, or torque applied to them.
Safety Cable Application Tool	SCT Series	Daniels Manufacturing Corporation 526 Thorpe Rd. Orlando, FL 32824-8133	To install the Daniels safety cable.
Safety Cable Terminator Tool	BM Series	Bergen Cable Technology, LLC 343 Kaplan Drive Fairfield, NJ 07004	To install the Bergen safety cable.

B. Procedure (Refer to [Figure 205](#)).

- (1) Make sure that you obey the precautions for the safety cable as follows:

- (a) Wear eye protection when you cut the safety cable.
(b) Do not use a safety cable or a ferrule more than one time.
(c) Always discard the safety cable that you remove.
(d) Make sure that you use the correct type and dimension of safety cable for the applicable procedure.

NOTE: Safety cable that is not of the correct type, length, and dimension can break. This can occur when there is more than the specified tension limit for that type and dimension of safety cable.

- (e) Examine the safety cable for kinks, nicks, frayed edges, or other damage. If you find damage on the safety cable, you must discard the cable. Replace it with a new safety cable.
(f) The maximum span of the safety cable between two fasteners is 6 inches (15.24 cm).
(g) You must install the safety cable through the holes supplied for safetying. It is not permitted to install the safety cable in other locations not for safetying.
(h) Do not torque the bolt (or other fastener) to less or more than the specified value to align the holes. This is not permitted.
(i) Install the safety cable in the two-bolt pattern or the three-bolt pattern.

NOTE: The two-bolt pattern is the recommended procedure when there is an even number of fasteners.

- (j) Crimp the ferrule to the safety cable with one of the correct mechanical procedures.
(k) After installation, you must cut the unwanted safety cable from the ferrule that you crimped.
(l) The maximum permitted length of the safety cable that can extend from the ferrule is 0.031 inch (0.79 mm).
(m) Safety the cable to the maximum extension limits. Refer to [Table 202](#) and [Figure 205](#).

- 1 Refer to [Figure 205](#) to find the middle of the span between the two bolts.

- 2 Apply a light force of approximately 2 pounds (8.90 N) to the safety cable at the middle of the span.
- 3 Make sure that the safety cable does not stretch more than the maximum extension limits.

Table 202. Maximum Extension Limits

A	B	C
0.5 inch (12.70 mm)	0.152 inch (3.17 mm)	0.062 inch (1.57 mm)
1.0 inch (25.40 mm)	0.250 inch (6.35 mm)	0.125 inch (3.17 mm)
2.0 inches (50.80 mm)	0.375 inch (9.52 mm)	0.188 inch (4.77 mm)
3.0 inches (76.20 mm)	0.375 inch (9.52 mm)	0.188 inch (4.77 mm)
4.0 inches (101.60 mm)	0.500 inch (12.70 mm)	0.250 inch (6.35 mm)
5.0 inches (127.00 mm)	0.500 inch (12.70 mm)	0.250 inch (6.35 mm)
6.0 inches (152.40 mm)	0.625 inch (15.87 mm)	0.312 inch (7.92 mm)

- (2) A fastener will stay tight if you install the safety cable correctly. While movement or tension on the fastener causes it to loosen, the cable tension increases. This will hold the fastener in its position. Refer to [Figure 205](#) for examples of safety cable installation.

CAUTION: Do not use the safety cable or the ferrule again after you remove it. It can break if you apply too much force to it and cause damage to the equipment.

- (3) Install the safety cable through the holes in the fasteners.
- (4) Put a loose ferrule on the safety cable.
- (5) Put the end of the safety cable through the safety cable tool.
- (6) Apply tension to the preset load with the safety cable tool.
- (7) Crimp the ferrule with the safety cable tool.
- (8) Cut the unwanted cable from the crimped ferrule.
 - (a) Make sure that the maximum length of the cable that extends from the ferrule is not more than 0.031 inch (0.79 mm).

Figure 201 : Sheet 1 : Lockwire Safetying

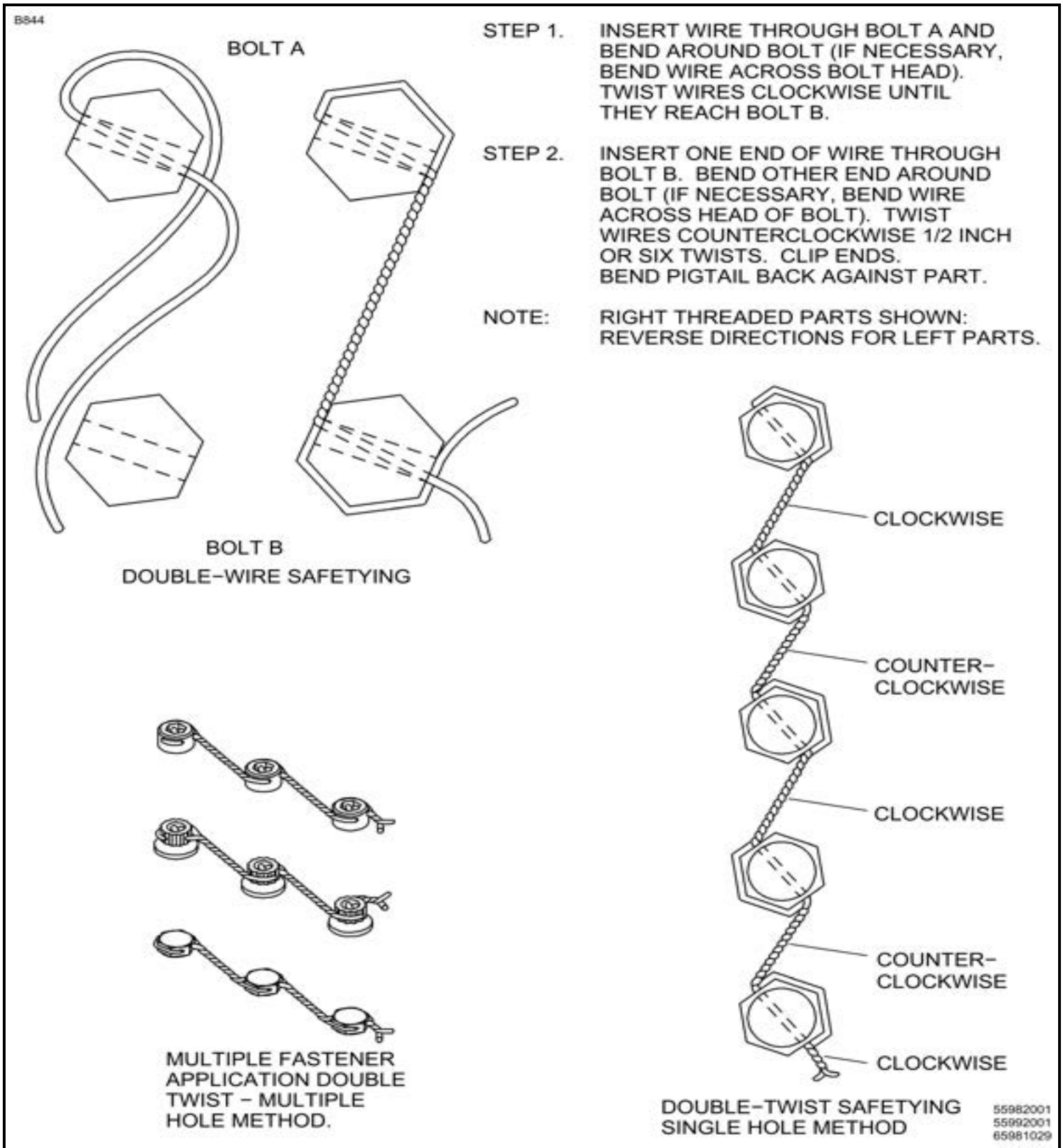
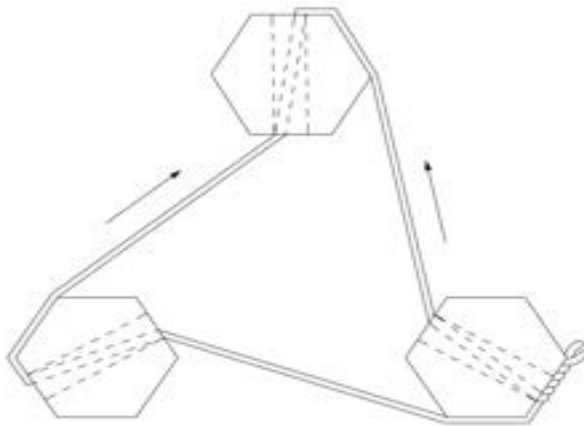
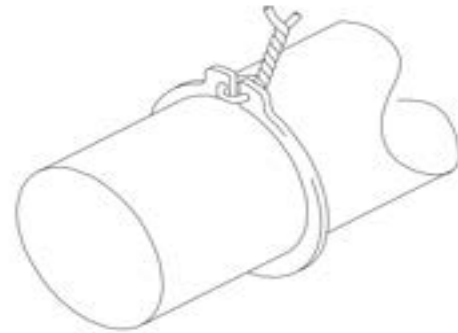


Figure 201 : Sheet 2 : Lockwire Safetying

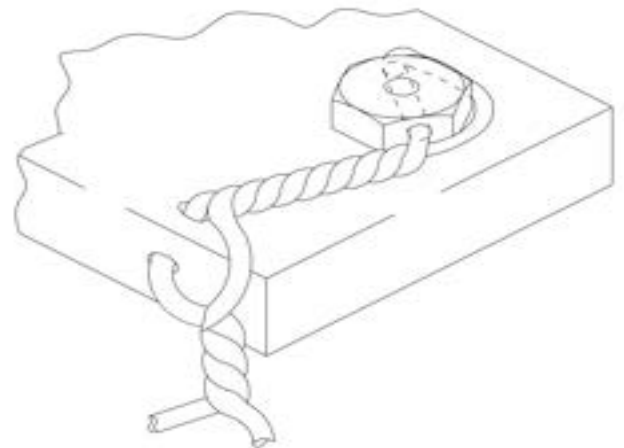
B845



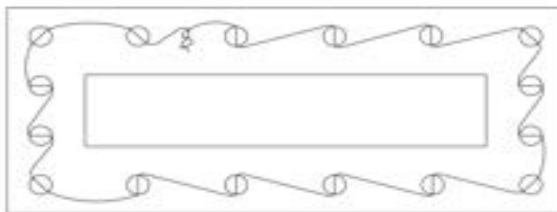
**SINGLE FASTENER APPLICATION
DOUBLE-TWIST METHOD**



**EXTERNAL SNAP RING
SINGLE-WIRE METHOD**



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



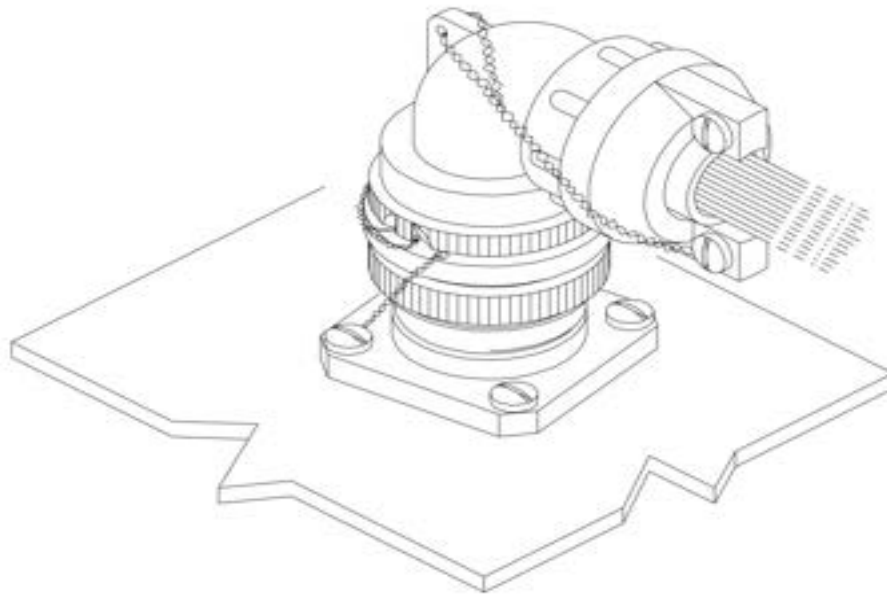
**SMALL SCREWS IN CLOSELY SPACED, CLOSED
GEOMETRICAL PATTERN, SINGLE WIRE METHOD**

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

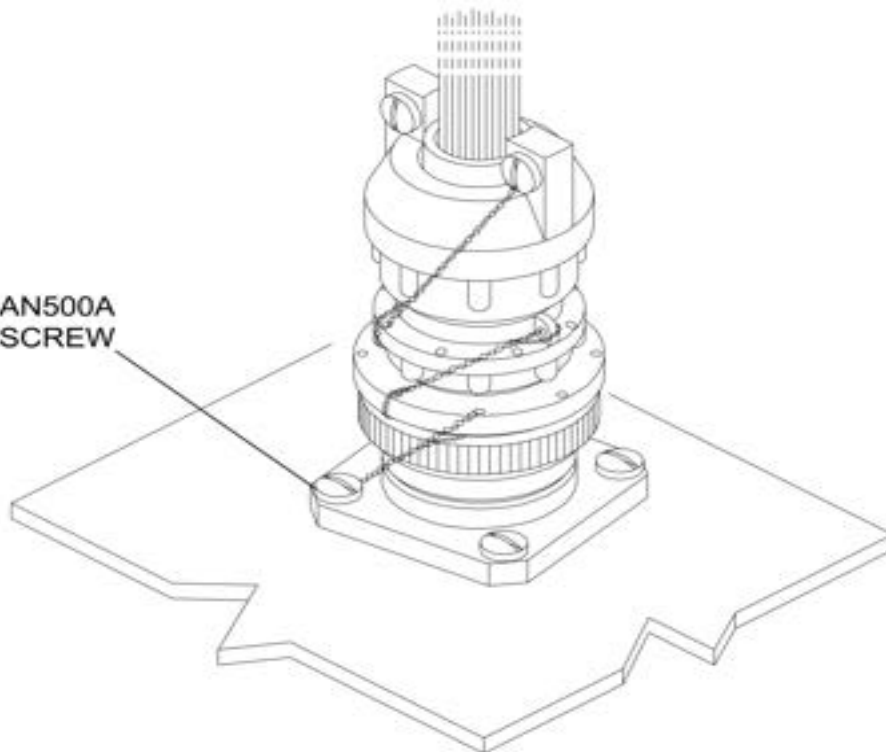
5598T1003
5598T1024
5598T1024
5598T1024

Figure 201 : Sheet 3 : Lockwire Safetying

B846



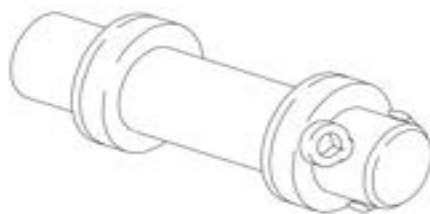
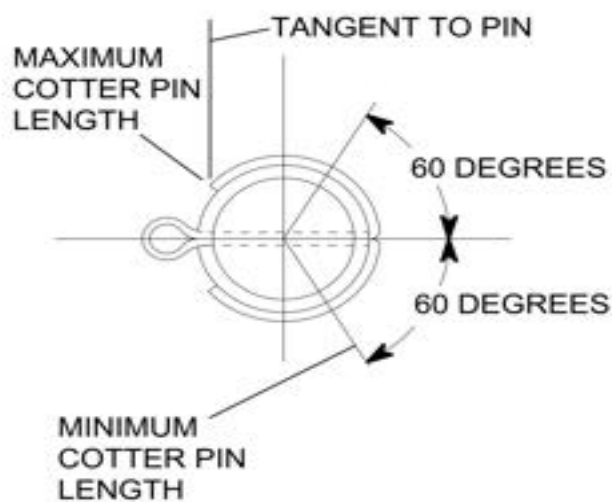
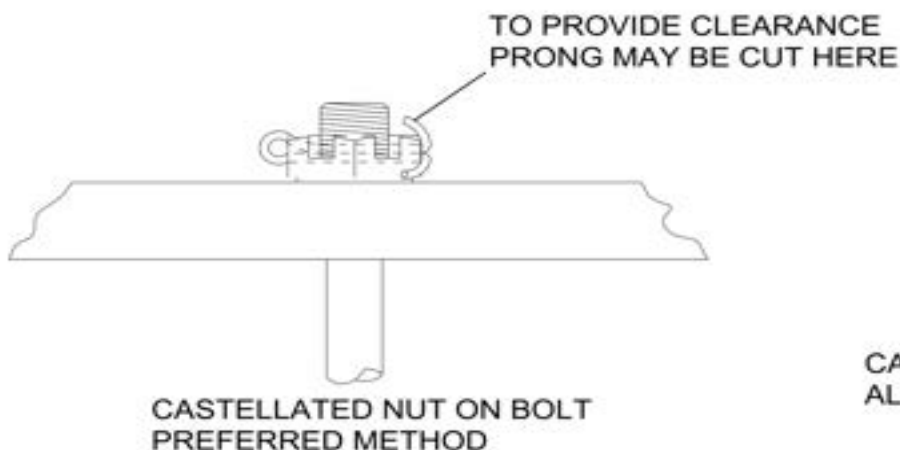
AN500A
SCREW



5598T1001
5598T1001

Figure 202 : Sheet 1 : Cotter Pin Safetying

B847



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

Figure 203 : Sheet 1 : Safelying Turnbuckle Assemblies

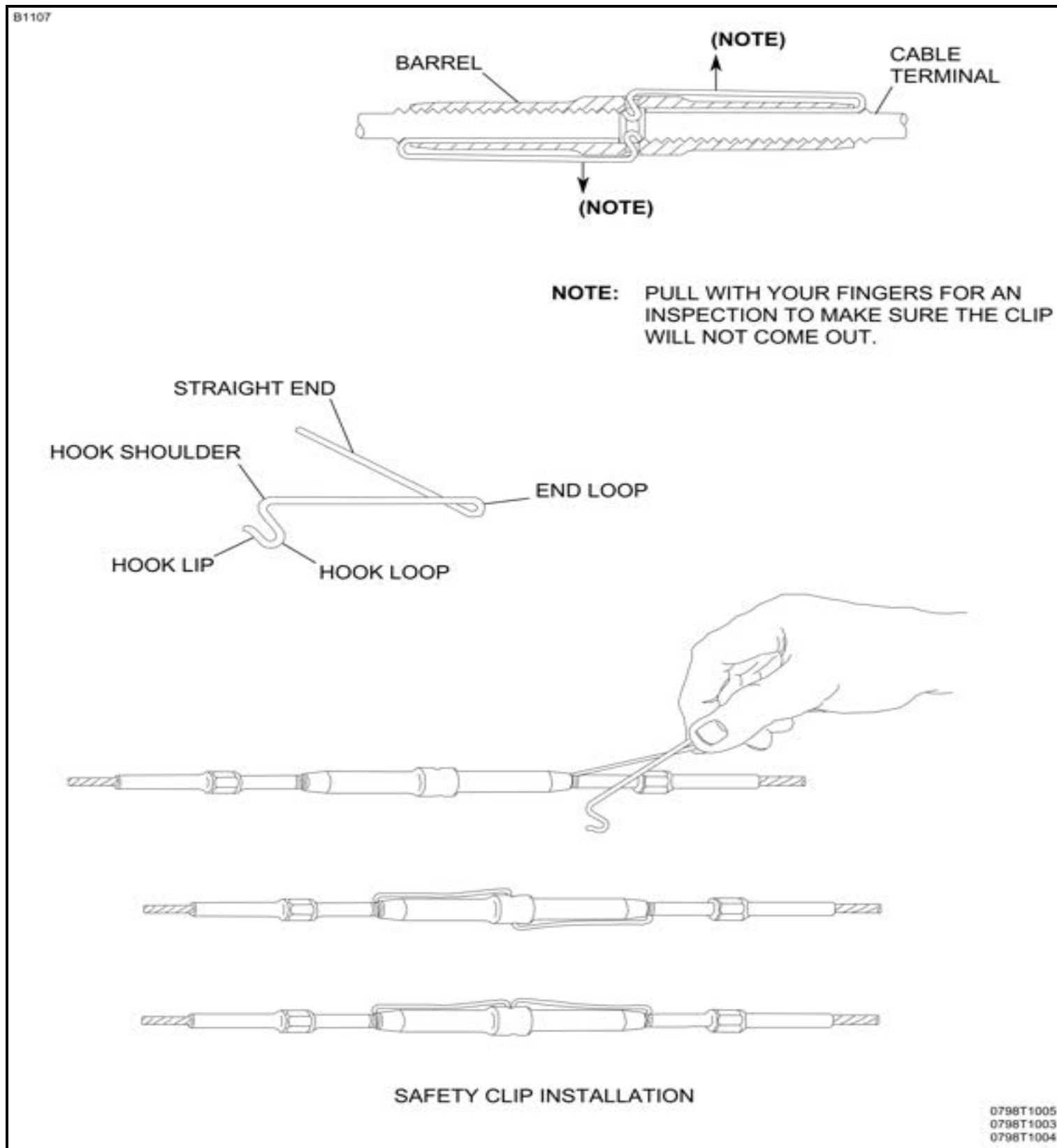


Figure 203 : Sheet 2 : Safetying Turnbuckle Assemblies

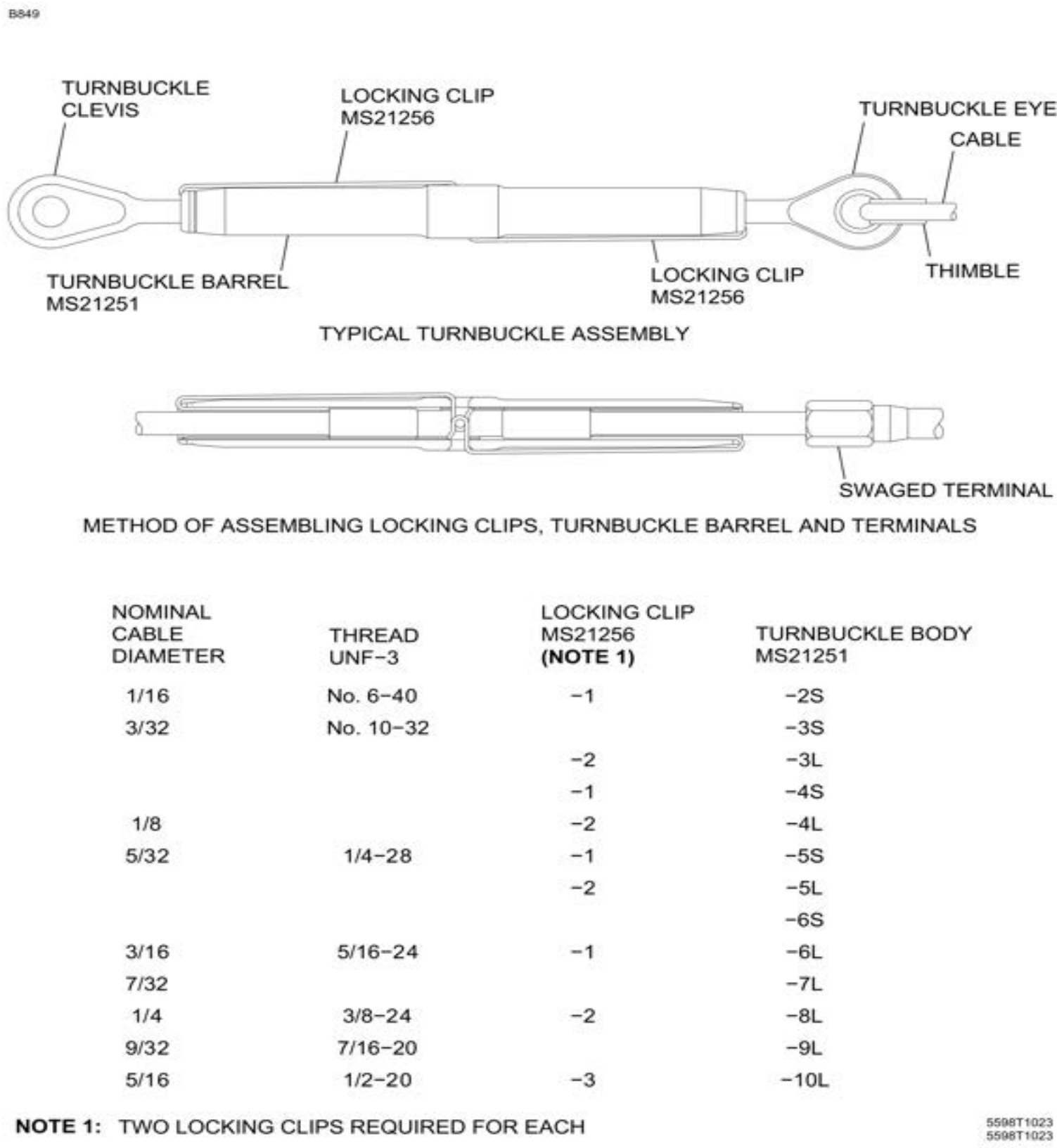


Figure 204 : Sheet 1 : Safetying Turnbuckle Assemblies

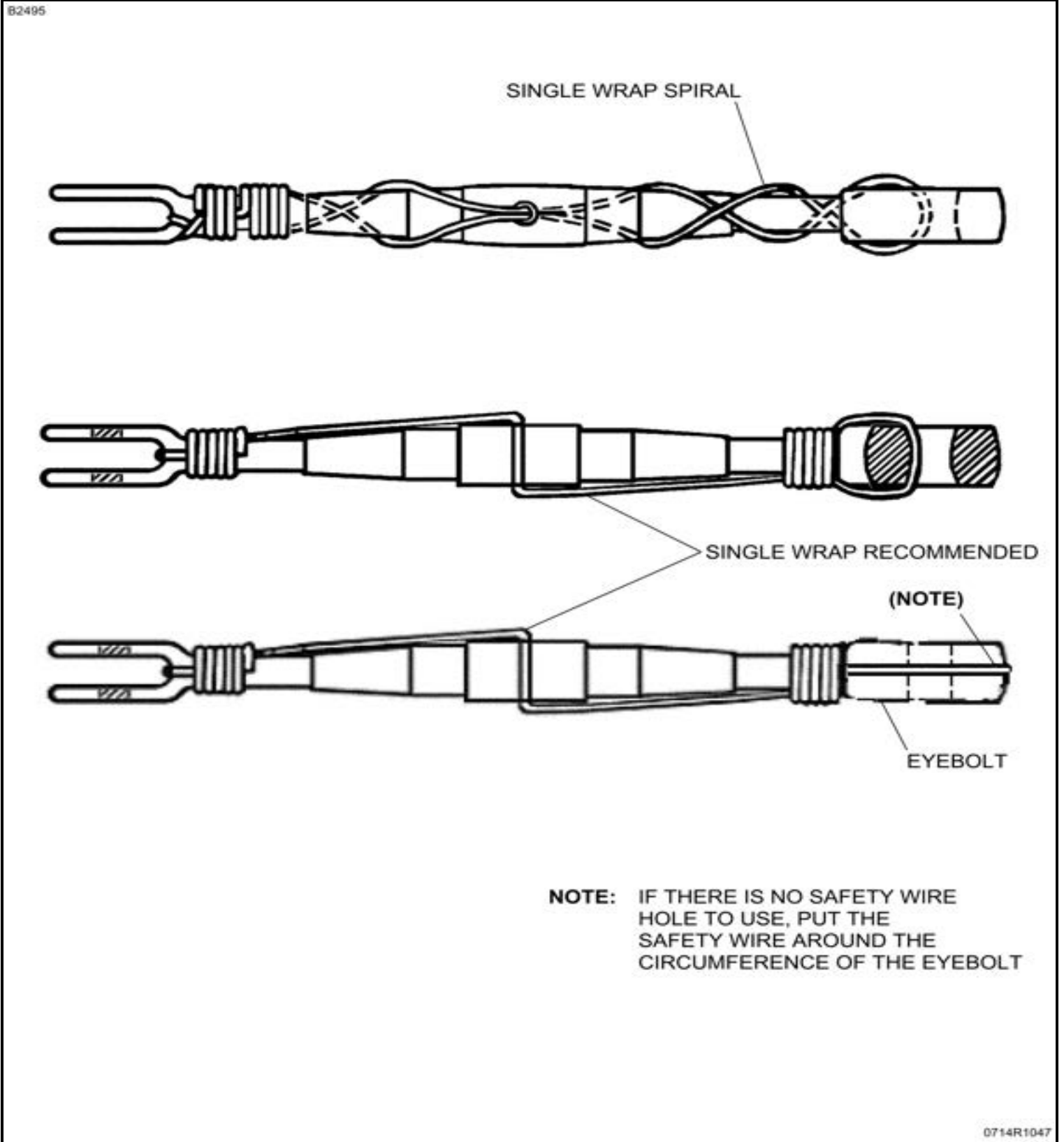
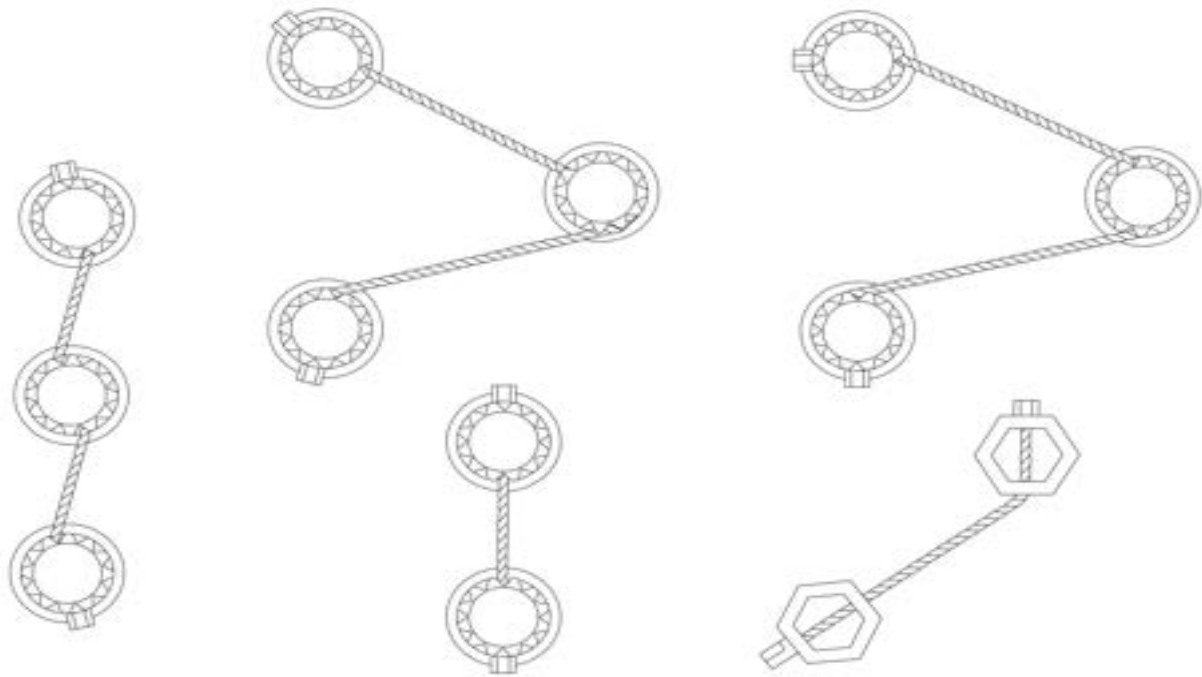
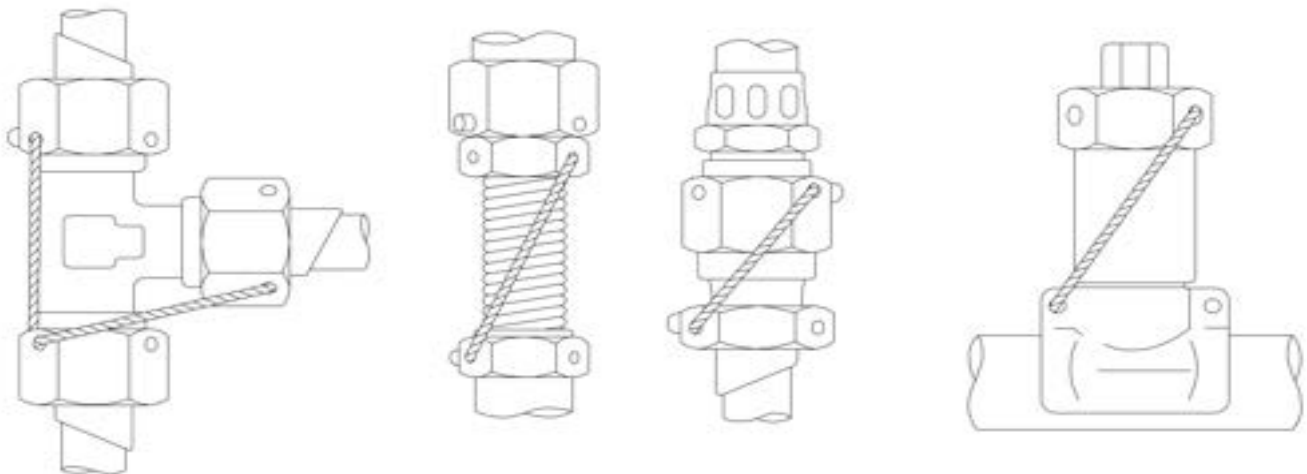


Figure 205 : Sheet 1 : Safety Cable Installation

B16404



Standard Hardware

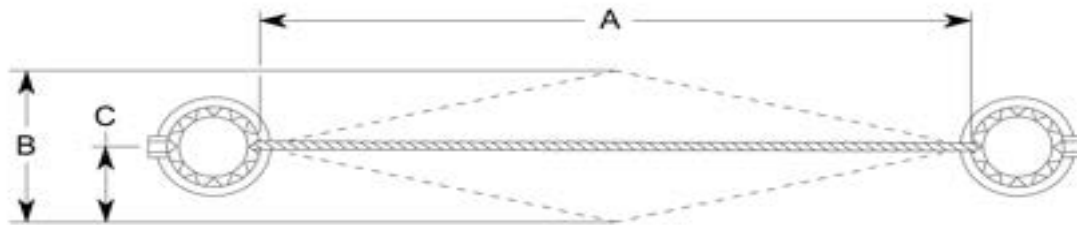


Tube Couplings

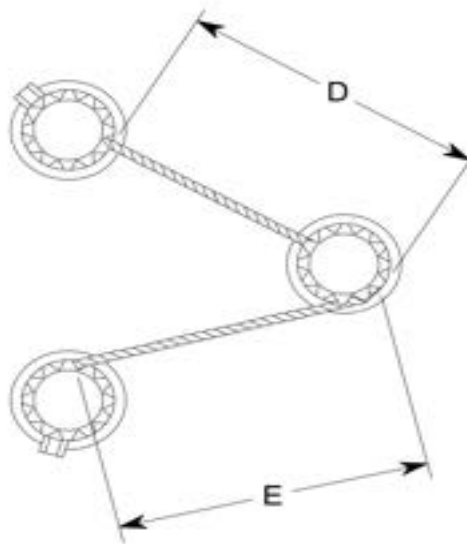
1280T1002

Figure 205 : Sheet 2 : Safety Cable Installation

B16405



For Three-Bolt Patterns
 $A = D + E$



Safety Cable Check For Maximum Extension Limits

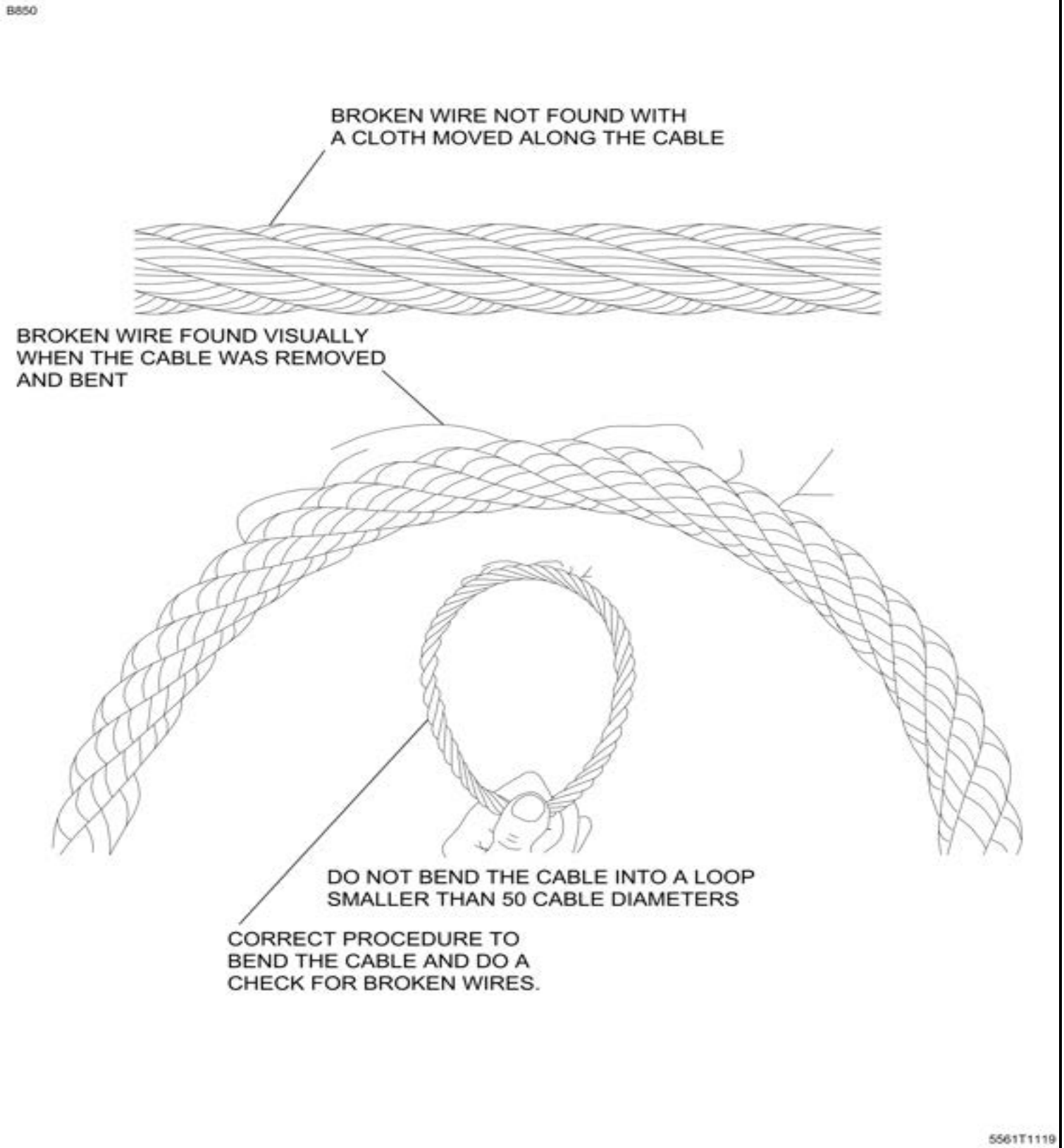
1280T1003

CONTROL CABLE WIRE BREAKAGE AND CORROSION LIMITATIONS - MAINTENANCE PRACTICES

1. Examination of Control Cables.

- A. Control cable assemblies are subject to many environmental conditions and forms of deterioration. Some deterioration, such as wire or strand breakage, is easy to identify. Other deterioration, such as internal corrosion or cable distortion, is harder to identify. The information that follows will help to find these cable conditions.
- B. Broken Wire Examination (Refer to [Figure 201](#)).
 - (1) Move a cloth along the length of the cable to examine for broken wires. This will find broken wires, if the cloth catches on the cable. Very important areas for wire breakage are those sections of the cable that pass through fairleads, across rub blocks, and around pulleys. If the cloth does not catch on any part of the cable, no more inspection is necessary. If the cloth catches on the cable or if it is thought that there are broken wires, a more detailed inspection is necessary. It is necessary that the cable be bent in a loop to make sure that there are broken wires. Loosen or remove the cable so that it can be bent in a loop as shown. While the cable is turned, examine the bent area for broken wires.
 - (2) Wire breakage criteria for cables in the flap, aileron, rudder, and elevator systems are as follows:
 - (a) Individual broken wires at random locations are permitted in primary and secondary control cables when there are no more than six broken wires in any 10 inches of the cable length.
- C. Corrosion.
 - (1) Carefully examine any cable for corrosion that has a broken wire in a section that does not touch wear-producing airframe components, such as pulleys, fairleads, or rub blocks. It can be necessary to remove and bend the cable to correctly examine it for internal strand corrosion, as this condition is usually not found on the outer surface of the cable. Replace the cable if internal corrosion is found. If the corrosion-preventative lubricant is removed from the cable and the metal is brighter than usual, examine the cable carefully for corrosion. For a description of control cable corrosion, refer to Chapter 51, [Corrosion - Description and Operation](#).

Figure 201 : Sheet 1 : Cable Broken Wire Examination



ELECTRICAL BONDING - MAINTENANCE PRACTICES

1. General

- A. This section describes airplane electrical bonding requirements and procedures. The following procedures and specification MIL-STD-464 - Electromagnetic Environmental Effects Requirements for Systems, govern installation and testing of electrical bonds and ground returns.
- B. Some electrical bonding requirements for static discharge wicks are shown in [Figure 214](#) in this section. Refer to Chapter 23, [Static Wicks - Maintenance Practices](#) for more required static discharging procedures.
- C. Poor electrical bonding can cause or contribute to a variety of operational problems in electrical, avionics, and communication systems, such as complete failure, reduced performance, or electromagnetic interference (EMI), or radio frequency interference (RFI) with navigation and communication systems.
- D. Maintenance personnel must follow recommended practices for establishing, remaking, testing, and protecting electrical bonds, particularly during routine maintenance activities.

NOTE: If a component is moved or the bond of an installed component is otherwise broken, the resistance of the connection must be verified again after installation.

- (1) Removal and installation of avionics and electrical equipment and mounting trays.
- (2) Assembly and reassembly of supporting structure for avionics or electrical equipment.
- (3) Reinstallation of control surfaces and removable fairings (including radome and stinger).

2. Definitions

- A. In this section, the applicable definitions are as follows:
 - (1) Method A (nonconductive) bonding is the usual method to seal the surfaces. This is done by cleaning a surface area that is larger than the connector that will be installed. A fillet seal of nonconductive sealant is then applied on and around the connector and the metal bonding surface. To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.
 - (a) The cleaned area must be between 0.063 inch (1.59 mm) and 0.250 inch (6.35 mm) more than the connector.
 - (b) The sealant must not be applied on screws, rivets, or other mounting hardware.
 - (2) Method B (conductive) bonding is a different method to seal the surfaces. This is done by cleaning a surface area that is smaller than the connector that will be installed. A fay seal of conductive sealant is then applied between the connector and the metal bonding surface.
 - (a) The cleaned area must not be more than, and not less than, the diameter of the contact area.
 - (b) The sealant must be applied between the connector and the bonding surface.
 - (c) The sealant on and around the bonding must then be removed (cleaned).
 - (3) Bond (Electrical) - A fixed union existing between two objects that provides good electrical conductivity due to a low-resistance path between the objects.
 - (4) Bonding (Electrical) - The process of making the necessary connections to provide good electrical conductivity between units or between unit and airplane ground.
 - (5) Ground - The common connection of the electrical circuits of a system or subsystem to a conductive medium (airplane primary structure) that becomes a common reference plane for all voltage potentials in the airplane.
 - (6) Grounding - The process of making the necessary connection(s) to provide a ground for an electrical, electronic, or radio frequency circuit.
 - (7) Primary structure - Load carrying members of the airframe, such as bulkheads, ribs, webs, and stringers, extending through two or more bulkheads or ribs. All primary structure is considered to be airplane ground.
 - (8) Secondary structure - Sheet metal or extruded metal parts attached to primary structure (or to secondary structure that is ultimately attached to primary structure) in at least two places by structural fasteners or by three or more rivets on each location.

3. Hardware and Material Usage

- A. The hardware and materials that are recommended to be used and those that are not to be used for electrical bonding are shown in the tables that follow:

Table 201. Cleaning Material

Aluminum Wool
Sandpaper
Stainless Steel Wool
Aluminum Oxide Cloth, High Purity
Bonding Rotary Brush
P-D-680 Solvent

Table 202. Bolts, Nuts, and Screws

Cadmium Plated Steel	Recommended for all areas other than engine compartment and fuel system.
Corrosion Resistant Steel	Recommended for engine compartment and fuel system.
Aluminum	Recommended for all areas other than engine compartment.
Self-Tapping Screws	Not to be used for bonding application.
Zinc Plated Screws	Not to be used for bonding application.
Spring, Self-Locking, Clip-in Instrument Mounting Nut	Not to be used for bonding application.
Wing Nuts	Not to be used for bonding application.

Table 203. Washers

Anodized	Not to be used for bonding application.
Zinc Plated	Not to be used for bonding application.
Unplated	Not to be used for bonding application.
NAS1149, MS35337, MS35339	Recommended for bonding in all areas.
Tooth Lock Washer	Not to be used for bonding application.

Table 204. Bonding Jumpers

MS25083	Recommended for bonding in all areas, other than fuel tanks.
On Aluminum Alloys	Use aluminum or MS25083 tinned copper jumpers.
On Steel Alloys	Use MS25083 copper, brass or bronze tinned coated jumpers only.
In Fuel System	Use S2876 aluminum only.

Table 205. Clamps

AN735	Recommended for bonding in all areas.
Cushion Clamps	Not to be used for bonding applications.
AN742	Not to be used for bonding applications.

Table 206. Nutplates

Cadmium and Silver Plated (Floating or Nonfloating)	Recommended for direct bonding applications.
Nonmetallic Insert, Dry Film Lube-Type	Not to be used for direct bonding applications.

Table 207. Low-Resistance Test Set (Bonding Meter)

Keithley Model 580 Micro-Ohmmeter (or
Equivalent)

Keithley Instruments, Inc.
Instrument Division
28775 Aurora Road
Cleveland, OH 44139

Megohmmeter Model 2850 (or Equivalent)

Associated Research, Inc.
3773 West Belmont Ave.
Chicago, IL 60618

Table 208. Permanent Ground Studs

VNS1924CA3-1-8

Recommended for permanent ground bonding in all areas.

Table 209. Permanent Ground Stud Pulling Head Adapter

VST1116-10

Voi-Shan

VST1116-8

8463 Higuera Street
Culver City, CA 90232-0512

4. Bonding Surface Cleaning

NOTE: If you can bond through the fasteners, it is recommended that you use Method B to install static wicks. If you cannot bond through the fasteners, it is necessary that you use Method B to install static wicks.

NOTE: Bonds between two metal surfaces and bonding jumper attachment points must be free of insulating material, such as paint, primer, grease, oil, and materials that prevent corrosion. A clean area is needed to make sure there is an adequate bond and to help get resistance measurements. The cleaned surface must be a clean and smooth finish that has not had too much material removed under the protective finish.

A. Method A (nonconductive) Surface Cleaning

(1) Clean the bonding surface area that is larger than the connector to be installed.

(a) Make sure that the cleaned area is between 0.063 inch (1.59 mm) and 0.250 inch (6.35 mm) more than the connector.

B. Method B (Conductive) Surface Cleaning

(1) Clean the bonding surface area that is smaller than the connector to be installed.

(2) A fay seal of conductive Type XV, Class B sealant is then applied between the metal surfaces.

C. Method A Steel and Aluminum Surface Cleaning

(1) Use medium Roloc surface condition disc pads (Scotchbrite) or medium EXL wheel 6A (Scotchbrite) that is no more than 0.50 inch (12.7 mm) larger than the diameter of the bonding surface of the connector.

NOTE: You are permitted to use 400 through 600 grit emery paper or cloth, or an equivalent fine sandpaper and/or aluminum oxide paper or cloth, stainless steel wool, or a stainless steel or monel bonding brush.

NOTE: You can use aluminum wool only on aluminum.

(2) Use IPA, MPK, or equivalent to clean the bonding surfaces.

(3) To clean aluminum that is not for a bonding jumper, make sure that the bonding surface is between 0.50 inch (12.7 mm) and 0.250 inch (6.35 mm) more than the connector.

NOTE: If the cleaned area is more than 0.50 inch (12.7 mm) more than the connector, you must apply primer, let it dry, then clean it again.

(4) To attach a bonding jumper, clean the bonding surface area to 150 percent of the diameter of the bonding jumper terminal.

(5) For bare aluminum, before an electrical bond is made, apply a chemical film treatment to the bonding surface.

NOTE: This will give the bond electrical and some corrosion protection.

D. Method B Steel and Aluminum Surface Cleaning

(1) Use medium Roloc surface condition disc pads (Scotchbrite) or medium EXL wheel 6A (Scotchbrite) that is no larger than the diameter of the bonding surface of the connector.

NOTE: You are permitted to use 400 through 600 grit emery paper or cloth, or an equivalent fine sandpaper and/or aluminum oxide paper or cloth, stainless steel wool, or a stainless steel or monel bonding brush.

NOTE: You can use aluminum wool only on aluminum.

(2) Use IPA, MPK, or equivalent to clean the bonding surfaces.

(3) To clean aluminum that is not for a bonding jumper, make sure that the bonding surface is no larger than the diameter, but no smaller than 50 percent of the bonding surface of the connector.

NOTE: If the cleaned area is larger than the diameter of the bonding surface, the surface must be primed, dried, then cleaned again.

(4) For bare aluminum, before an electrical bond is made, apply a chemical film treatment to the bonding surface.

NOTE: This will give the bond electrical and some corrosion protection.

E. Method A Magnesium Surface Cleaning

CAUTION: Do not use steel wool, stainless steel wool, or aluminum wool to clean magnesium alloys.

(1) Use medium Roloc surface condition disc pads (Scotchbrite) or medium EXL wheel 6A (Scotchbrite) that is no larger and no smaller than the diameter of the bonding surface of the connector.

NOTE: You are permitted to use 400 through 600 grit emery paper or cloth, or an equivalent fine sandpaper.

(2) Use IPA, MPK, or equivalent to clean the bonding surfaces.

F. Method B Magnesium Surface Cleaning

CAUTION: Do not use steel wool, stainless steel wool, or aluminum wool to clean magnesium alloys.

(1) Use medium Roloc surface condition disc pads (Scotchbrite) or medium EXL wheel 6A (Scotchbrite) that is no larger and no smaller than the diameter of the bonding surface of the connector.

NOTE: You are permitted to use 400 through 600 grit emery paper or cloth, or an equivalent fine sandpaper.

(2) Use IPA, MPK, or equivalent to clean the bonding surfaces.

5. Protective Coating Sealing

NOTE: Although you must apply a corrosion inhibitor to seal the perimeter of some electrical bonds after they are assembled, some electrical bonds must have a finish applied before you can apply the corrosion inhibitor.

NOTE: Method A (nonconductive) Sealing is done after the electrical bond is assembled. To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.

NOTE: Method B (conductive) Sealing is done during the electrical bond assembly.

A. All bonded surfaces requiring protective coating must be refinished per the original finish or color chemical film treated within as short a time as possible. Refinishing within a 24-hour period is highly recommended.

B. Sealant as Protective Coatings

(1) Do not use sealants as a protective coating on bulkhead electrical connectors in the pressure vessel (unless required for pressure seal).

(2) Do not apply sealants to equipment racks and equipment mounting surfaces.

(3) Do not apply sealants to stud-type ground blocks.

(4) Do not use sealants as a protective coating to feed-thru plates (unless required for the pressure seal).

NOTE: In areas where the surface already has chemical film applied, such as feed-thru plates on pressure bulkheads, it is not required to remove this finish and reapply chemical film to achieve bonding unless the bonding requirements cannot be met.

NOTE: A cleaned area must not be refinished until the electrical bond connection has been inspected and approved.

NOTE: Bonding jumpers do not need painting.

C. Method A (Nonconductive) Sealing

WARNING: Do not use conductive sealant in fuel tanks. Use only nonconductive sealants that are approved for use

in fuel tanks. The metal material in the conductive sealant can create a spark (arcing) in the fuel tank.

NOTE: For Method A sealing, it is recommended that you use corrosion-inhibitive polysulfide-based sealant.

NOTE: If you can bond through the fasteners, it is recommended that you use Method B to install static wicks. If you cannot bond through the fasteners, it is necessary that you use Method B to install static wicks.

(1) Method A sealing is applicable to use in the areas that follow:

- Feed-thru connectors out of the pressure vessels
- All electrical bonding in the fuel tanks
- Surface-mounted ground blocks where the fayed surface must be removed for electrical bonding
- Ground studs out of the pressurized area
- Bonding jumpers and straps out of the pressurized area

(2) For Method A sealing, you can use one of the sealants that follow:

- Type X, Class B sealant (for all but in fuel tank areas)
- Type I, Class B sealant (Polysulfide-based fuel, weather, and pressure sealant)
- Type V, Class A sealant (RTV silicone sealant)
- Type V, Class B sealant (RTV silicone sealant)

(3) Apply a fillet seal on and around the connector and the metal bonding surface.

- (a) To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.
- (b) Do not apply sealant on screws, rivets, or other mounting hardware.
- (c) Make sure that the sealant is applied between 0.063 and 0.125 inch (1.6 and 3.2 mm) larger than the cleaned area.

D. Method B (Conductive) Sealing

WARNING: Do not use conductive sealant in fuel tanks. Use only nonconductive sealants that are approved for use in fuel tanks. The metal material in the conductive sealant can create a spark (arcing) in the fuel tank.

NOTE: For Method B sealing, you must use corrosion-inhibitive polysulfide-based sealant.

NOTE: If you can bond through the fasteners, it is recommended that you use Method B to install static wicks. If you cannot bond through the fasteners, it is necessary that you use Method B to install static wicks.

(1) Method B sealing is applicable to use in the areas that follow:

- Feed-thru connectors out of the pressure vessels
- Surface-mounted ground blocks where the fayed surface must be removed for electrical bonding
- Ground studs out of the pressurized area
- Bonding jumpers and straps out of the pressurized area

(2) Use Type XV, Class B conductive sealant to apply a fillet seal on and around the bonding surface and the connector.

- (a) Do not use this sealant in fuel tank areas.
- (b) Make sure that the area of the sealant is no larger than the bonding surface of the connector.
- (c) Clean all sealant off of the area that is more than permitted.

6. Electrical Bonding Test

A. Electrical Bonding Criteria

(1) Bonding to primary structure (grounding) - Do this type of bonding only after the resistance between the bonded object and primary structure has been measured with a low-resistance test set (bonding meter) and found to be no more than the maximum allowable resistance for that application. For typical resistance values, refer to [Table 210](#).

NOTE: In many cases the object to be grounded is mounted on or attached to secondary structure, or otherwise separated from direct contact with primary structure. Grounding depends on both the satisfactory bonding of the mounting tray to secondary structure, and of the secondary structure to primary structure. The electrical bonding test is then done to measure resistance across each bond to identify the source(s) of poor grounding.

(2) Bonding one object to another - This type of bonding must be considered satisfactory only after the resistance between the objects has been measured with a bonding meter and found to be no more than the maximum allowable resistance for that application.

B. Using a Low-Resistance Test Set (Bonding Meter)

- (1) Follow manufacturers instructions included with test set for setup, operation, and reading of test set display.
- (2) Place or connect the probes on bare metal surfaces.
- (3) The probes should be placed as close as possible to the bonding area, preferably within six inches along surface of the object or structural member.
- (4) If it is necessary to remove paint or primer from a surface in order to provide good probe contact, apply the original (or equivalent) finish after an electrical bonding test.

NOTE: To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.

C. Electrical Bonding Test of Composite Panels

- (1) Leave out or remove one screw per 4 lineal feet of panel edge.
- (2) Make sure that countersink is free of paint or other insulating material.
- (3) Do the electrical bonding test between countersink(s) and primary structure.

7. Electrical Bond Type (Class)

A. Electrical Bond Classes

NOTE: The classes of electrical bonds are given in accordance to the type of material that is bonded together and the method used to bond the materials.

- (1) Type I usually applies to metallic components bonded together with direct metal to metal contact. Some examples are riveted skin bonds, equipment racks, and bulkhead connectors. These components will have a requirement of less than 0.0025 ohm maximum.
- (2) Type II usually applies to aluminum or steel components (i.e., landing gear, doors, and/or airplane structure) bonded together electrically by bonding jumpers, but can also be used when applied to bonds with multiple metal to metal contacts, such as, radome diverter strips to airplane structure or antennas mounted on metal fairings to the airplane structure with a requirement of less than 0.005 ohms.
- (3) Type III usually applies to adhesively bonded aluminum components bonded together electrically by bonding jumpers with a requirement of less than 0.005 ohms.
- (4) Type IV usually applies to connections between expanded aluminum mesh (or similar material) and the airframe through bonding jumpers and clips with a requirement of less than 0.005 ohms.
- (5) Type V usually applies to connections between conductive composite structure, such as, Carbon Fiber Composite (Graphite), and its metallic attachment hardware with a requirement of less than 0.005 ohms.
- (6) Type VI usually applies to connections for P-static protection between composite materials and metallic airplane structure with a requirement of less than 100,000 ohms.
- (7) Type VI-A usually applies to connections for P-static protection between P-static paint and a high-resistive, low-conductive gasket used in nonconductive fuel doors and the airplane structure with a requirement of less than 10,000,000 ohms.
- (8) Type VII usually applies to connections for P-static protection between nonconductive materials used in radomes or electrically-heated windshields and their metallic attachment hardware and/or airplane structure with a requirement of 1,000,000 ohms, but not more than 100,000,000 ohms.
- (9) Type VIII usually applies to connections for low conductive gaskets and metallic airplane structure with a requirement of 1,000,000 ohms or greater.
- (10) Type IX usually applies to connections for hydraulic and fuel lines and tubes, metallic tubing, seat frames (nonelectrical components) and electrical switches, circuit breakers, and ducts bonded to the airplane structure by different means, such as, clamps or attachment screws. Because this type includes many different installations, the maximum permitted resistance value can be different from one installation to another. These differences are specified in [Table 210](#).
- (11) Type X usually applies to connections for different fuel system hardware, such as, fuel filler nozzle, fuel vents, and fuel gages. Because this type includes many different installations, the maximum permitted resistance value can be different from one installation to another. These differences are specified in [Table 210](#).
- (12) Type XI usually applies to connections for flaps, slats, piano hinged surfaces, and roller bearing surfaces. This type includes several different installations. The maximum permitted resistance will be different from one installation to another. These differences are specified in [Table 210](#).

(13) Type XII usually applies to return-path grounds. This is for ground studs installed in metal airplane structures. Refer to [Table 210](#).

Table 210. Typical Resistance Values

OBJECT TO BE BONDED	METHOD OF BONDING	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)	BOND TYPE (CLASS)
All electrical and electronic equipment ground return bonds to basic structure	Direct metal case to structure	0.0025	I
		0.005	II
Antenna base	Metal base to metal fuselage through fasteners	0.0025	I
	Metal base to metal screen or expanded metal	0.05	IV
	Metal base to composite fairing through fasteners	0.5	V
Battery box to basic structure	Direct metal case to structure	0.0025	I
Bulkhead feed-thru connectors	Metal to metal	0.0025	I
Cable bundle shields	Direct attachment to connector backshell	0.0025	I
Electric trim (actuator assembly)	Direct metal to metal	0.0025	I
Electrical devices to enclosure	Direct attachment through attachment hardware or bonding jumper	0.0025	I
Electrical motors to adjacent structure	Direct metal to metal	0.0025	I
Engine to nacelle structure bond	Direct attachment by fasteners (metal nacelle)	0.0025	I
Honeycomb panel assemblies	Direct metal to metal attachment by fasteners	0.0025	I
Instrument panels to stationary panel	Direct metal to metal attachment by fasteners	0.0025	I
Instruments	Direct metal to metal	0.0025	I
Radio racks, shelves and brackets to adjacent primary structure	Direct metal to metal	0.0025	I
RFI noise filters (across joint)	Direct metal to metal	0.0025	I
Rivet skin joints and breaks (across joint) or structural joints or breaks (across joint)	Direct metal to metal	0.0025	I
Servos amplifier, gaging equipment instruments, etc.	Direct metal to metal	0.0025	I
Side console and electrical equipment panels to basic structure	Direct metal to metal by fasteners	0.0025	I
Starters, generator and alternator grounds (case to engine frame)	Direct metal case to structure	0.0025	I
Static wicks (metal surface)	Direct metal to metal attachment by fasteners	0.0025	I

Stationary instrument panels to primary structure	Direct metal to metal by fasteners	0.0025	I
Structural joints or breaks (across joint)	Direct metal to metal	0.0025	I
Wing tie down and ground point	Attachment through fasteners	0.0025	I
Wing to fuselage	Direct metal to metal or attachment bolts	0.0025	I
Wire Bundle Shields	Direct attachment to backshell	0.0025	I
		0.005	II
All electrical and electronic equipment ground return bonds to basic structure	Bonding jumper to structure	0.005	II
Baggage/Avionics compartment door	Bonding jumper across hinge	0.005	II
Battery box cover	Fastener to battery box	0.005	II
Bearings (roller and ball) Piano hinged surfaces	Bonding jumper	0.005	II
Cable bundle shields	Bonding jumper	0.005	II
Doors and Inspection plates	Fastener to airplane structure	0.005	II
Electric trim (actuator assembly)	Direct metal to metal or bonding jumper	0.0025	I
		0.005	II
Electrical devices to enclosure	Bonding jumper	0.005	II
Electrical motors to adjacent structure	Bonding jumper	0.0025	I
		0.005	II
Engine	Bonding jumper across mount	0.005	II
Honeycomb panel assemblies	Direct metal to metal	0.0025	I
	attachment by fasteners or by bonding agent	0.005	II
Instruments	Bonding jumper	0.005	II
Landing gear	Bonding jumper	0.005	II
Landing gear doors	Bonding jumper across hinge	0.005	II
Metal aileron	Bonding jumper across hinge	0.005	II
Metal cowls - removable	Fastener to engine frame	0.005	II
Metal elevator	Bonding jumper across hinge	0.005	II
Metal flap	Bonding jumper across actuator or roller/track	0.005	II
	(loaded configuration)	0.5	XI
Metal nacelle	Fastener to engine frame	0.005	II
Metal rudder	Bonding jumper across hinge	0.005	II
Panel feed-thru plates	Direct metal to adhesively bonded honeycomb or bonding jumper	0.03	III
		0.005	II
Servos amplifier, gaging equipment instruments, etc.	Bonding jumper	0.005	II
Trim tab	Bonding jumper across hinge	0.005	II

Wire Bundle Shields	Bonding jumper to structure	0.005	II
Panel feed-thru plates	Direct metal to adhesively bonded honeycomb	0.03	III
Antenna base	Metal base to composite fairing through fasteners	0.05	V
Composite cowls - removable	Fastener to engine frame	0.5	V
Engine to nacelle structure bond	Direct attachment by fasteners (composite nacelle)	0.5	V
Static wicks (composite surface)	Direct metal to composite surface and attachment by fasteners	0.5	V
Control cables and rods to movable surfaces equipment	Bonding through attachment hardware	0.01	IX
Electrical switches, circuit breakers and potentiometer in circuits exceeding 50 volts	Direct attachment through hardware	0.10	IX
Hydraulic cylinders	Direct metal to metal or bonding jumper	0.01	IX
Metal ducts	Direct metal to metal and attachment anchors	0.005	IX
Metal ducts (nonelectrical: rigid and flexible)	Bonding through clamp and attachment hardware	1.0	IX
Metallic tubing	Cable runs which terminate in a direct metal to metal contact	1.0	IX
Metallic tubing	Direct metal to metal	0.0025	I
Metallic tube wiggins fittings	Feed-thru hardware and attachment anchors	0.1	IX
Oxygen cylinders	Direct metal to metal or bonding jumper	0.01	IX
Radiators and heat exchangers	Bonding through attachment hardware	0.01	IX
Seat frame	Attachment through fasteners	0.01	IX
Shock mounts	Direct metal to metal through attachment hardware	0.01	IX
Fuel filler nozzle	Attachment through fasteners	0.005	X
Fuel nozzle jumper ground receptacle	Attachment through fasteners	0.003	X
Fuel vents scoops	Attachment through fasteners	0.005	X
Bearings (roller and ball) Piano hinged surfaces	Metal to metal through bearing or hinge	0.01	XI
Metal flap	Roller/track (loaded configuration)	0.5	XI
Hoods and canopies	Not applicable	Not required	Not required
Ground Studs	Base of the ground stud to the aircraft structure	0.0005	XII

8. Bonding Requirements

A. Current Path Return Bonds

- (1) Current return bonds are those required to complete the ground return path to the battery and/or the power generator source for all electrical and avionics equipment. This type of bond is accomplished with a standard hook-up wire. The location of the ground bond connection should be to primary structure. In some cases where the equipment is internally case grounded, current return may be accomplished by direct bonding of the surfaces and through the mounting hardware.
- (2) If the bonding surface resistance permitted in [Table 210](#) cannot be met by direct surface bonding, then the equipment or component in question must be bonded by a bolted bonding jumper.

B. Radio Frequency and Static Bonds

- (1) All electrical and electronic equipment and/or components should be installed in a manner to provide a continuous low-impedance path from the equipment enclosure to airplane primary structure.
- (2) All metallic pipes, tubes and hoses carrying fluids in motion should be bonded to basic structure.
- (3) [Table 210](#) includes equipment and areas of radio frequency and static bonds.
- (4) All control surfaces should have a bonding jumper between the airframe and the control surface. Where necessary, additional jumpers should be used between the control surface and structure to achieve the resistance level. A piano-type hinge may be considered as self-bonded, provided the resistance across the hinge halves is satisfactory.
- (5) All conducting items, such as metal lines and/or tubing carrying fluids or air in motion having a linear dimension of 24 inches or more and installed within one foot of unshielded transmitting antenna lead-ins should have a bond to structure. Refer to [bonding of pipes and tubing](#).

C. Shock Hazard and Lightning Protection Bonds

- (1) If the requirements of current path return bonds and radio frequency and static bonds have been successfully accomplished, then shock hazard and lightning protection bonds have been partially fulfilled.
- (2) Shock hazard pertaining to exposed conducting frames or surfaces (such as elevators, flaps, trim tabs) or parts of electrical or electronic equipment must have a low-resistance bond to primary structure.
- (3) Lightning protection is the bonding of cover assemblies, such as fuel fillers, fuel vents, pitot tubes, radome, plastic and fiberglass surfaces and control surfaces.
- (4) Typical resistance values are shown in [Table 210](#).

D. Bonding in Hazard Areas

- (1) To eliminate any possible source of ignition in areas prone to explosion or fire hazards, do not add any new bonding installations in hazard areas.

NOTE: Current return grounds must be avoided in fuel vapor areas.

E. Bonding Verification

- (1) For Type I through Type V, a small area of the protective finish must be removed or omitted to allow each probe to make electrical contact with the metallic or conductive composite surface. These test areas should be in close proximity to each other on adjacent sections of the airplane. On large panels it is recommended to do several tests approximately 4 feet (1.22 m) apart.

- (2) Electrical bonding test for composite panels is to be performed at clean screw countersink to metallic structure.

NOTE: To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.

NOTE: Upon completion of the electrical bonding test, the metallic surface must be refinished to protect from corrosion.

- (3) For Type VI thru VIII the bond between antistatic paint and metallic attachment hardware is measured using a megohmmeter. A piece of metallic tape is placed directly on the antistatic paint approximately 1.0 inch (25.4 mm) away from attachment hardware. The measurement is accomplished by attaching one probe to the metallic tape and the other probe to the metallic hardware. The measurement should be made with the megohmmeter placed on the 500 volt setting.

F. Bonding Connection

- (1) Bonding connections must be installed so vibration, expansion, contraction or relative movement, incident to normal service use, will not break or loosen the connection to the extent that resistance will vary during the movement.
 - (a) Bonding connections must be located in a protected area and whenever possible near an inspection door or an accessible location to permit inspection or replacement.

- (b) Parts must be bonded directly to the primary structure, rather than through other bonded parts, such as plumbing, conduits, etc.
- (c) All parts must be bonded to the primary structure with as short a lead as possible.
- (d) Bonding jumpers must be installed so that movable components are not impeded in their operation by the jumper.
- (e) Bonding connections must not be made by compression fastened through nonmetallic materials.
- (f) All bonding surfaces must be cleaned prior to installation of bond joint.
- (g) All nuts used in bonding must be of the all metal self-locking type (no nonmetallic inserts).
- (h) Radio frequency current returns must not be made through magnesium alloys.
- (i) Solder joints alone must not be used for bonding parts that are subject to movement and/or vibration.
- (j) All electrical bonding must be accomplished without affecting the structural integrity of the airframe.
- (k) Nonmetallic inserts or dry film lube nutplates must not be used for bonding application, such as antenna installation.
- (l) All AC ground returns must be connected separate from DC ground returns.
- (m) Shielded wire grounds must be attached directly to the primary structure unless otherwise noted.
- (n) Where possible, multiple bonding jumpers or dual system grounds (left system and right system) must not be connected to the same ground point on the primary structure.
- (o) Electrical bonding procedure must not reduce corrosion protection of bonded objects.

NOTE: **Apply sealant or corrosion resistant primer to bare metal for corrosion protection.**

9. Bonding Methods

- A. The following bonding methods are provided to accomplish satisfactory bonds on the airplane. In most cases, a single method will satisfy the requirements, while in others it may be necessary to use more than one method.
- (1) Typical Bolted Bonding Jumper Installation
 - (a) All bolted type jumpers should be as shown in [Figure 201](#) and [Figure 202](#). All jumper connections are made with number eight screws. Number six screws are used where edge distance will not permit the use of number eight screws.
 - (2) Bonding by Riveted and/or Bolted Skin Construction
 - (a) Close riveted and/or bolted skin construction is considered an adequate bond, provided the resistance value between bonding surfaces is 0.0025 ohm or less for current path return areas and 0.005 ohm for other areas.
 - (b) When bonding by riveted and/or bolted skin construction only is not possible, bonding as shown in [Figure 203](#) and [Figure 204](#) should be done.
 - (3) Bonding by Riveted and/or Bolted Bracket and Angle Construction
 - (a) Close riveted and/or bolted bracket and angle construction is considered to be an adequate bond provided the resistance value across bonding surfaces is 0.005 ohm or less.
 - (b) If the bracket and angle construction is used for current return path, then the resistance value across bonding surfaces and to primary structure must be 0.0025 ohm or less.
 - (c) Areas not meeting the requirements noted above must be bonded in accordance with [Figure 205](#) or by adding a bonding jumper across each joint to the primary structure.
 - (4) Bonding of Pipes and Tubing
 - (a) Metallic pipes and tubes supported with clean metal clamps to a metal structure member is thought to be a sufficient bond if the resistance value between the pipe or tube and primary structure is 0.1 ohm or less, except for inline Wiggins couplings, which are 1.0 ohm or less. Lines not meeting this requirement must be bonded as shown in [Figure 206](#) and [Figure 207](#).
 - (b) Metallic tubing routed from a valve through the airplane structure is a sufficient bond if the resistance value between the tubing and the airplane structure is 1.0 ohm or less. The resistance value between the bulkhead fitting or the valve to the airplane structure must be 0.0025 ohm or less. Refer to [Figure 213](#).
 - (5) Typical Access Panel or Door
 - (a) Fastening hardware such as screws, latches, and hinges are considered sufficient bonding for access panels and doors if the resistance value to the structure is 0.005 ohm or less. Refer to [Figure 208](#).

(6) Typical Antenna Bonding Installation

- (a) Fastening hardware, such as screws, nuts and nutplates, are considered adequate bonding for radio antennas, such as ADF loop, marker beacon, NAV, COM, etc., provided the fasteners have a direct contact with the metal base of the antenna and the fasteners are used in conjunction with nutplates or attachment hardware which are riveted into the structure of the airplane.
- (b) It is critical that all finishes which are nonconducting are removed from the interfacing contact area of the countersink and fastening hardware; however, it is usually not required to remove the finishes from the antenna mounting flange or bearing surface, providing the antenna meets the resistance value to structure as defined in [Table 210](#).

NOTE: To make sure that the finish is nonconductive, it is necessary that you use a micro-ohmmeter to do an electrical bonding test.

- (c) If the bonding requirement cannot be met by the above procedure, it may be required to remove the finishes from both the antenna flange and the airplane mounting surface.
- (d) If an antenna is mounted on a composite fairing, it may be required to remove the finishes from the antenna flange and clean the composite surface down to the outer layer.

NOTE: The outer layer will usually be the lightning protection material and care must be taken not to sand through the layer and conductive sealant used in conduction with the fasteners to achieve the bond.

- (e) On antennas not meeting the requirements noted above, refer to [Figure 209](#) and, if necessary, do the bonding as follows:

- 1 The bearing surface between the mounting screw head and antenna metal insert must be clean, free of paint and all insulating material. This must be done on at least 25 percent of the total mounting screws used for the installation of the antenna.
- 2 Screw head, nut and/or nutplate structure bearing surface must be clean and bonded by riveted and/or bolted skin construction. If required, the antenna mounting doubler must be bonded to basic structure by the same method.

(7) Ground Studs

NOTE: If ground stud is positioned where it will be exposed to moisture, such as in wheel well, RTV 108 sealant must be used to seal ground stud.

- (a) It is recommended to attach single ground wires to permanently installed ground studs rather than attach them to primary structure with removable screws. The stud must be correctly bonded to the primary structure and sealed for a permanent installation. The ground wires can then be attached to and removed from the stud with no effect to the bond. Refer to [Figure 210](#), [Figure 211](#), and [Figure 212](#).

(8) Static Wicks

NOTE: If you can bond through the fasteners, it is recommended that you use Method B to install static wicks. If you cannot bond through the fasteners, it is necessary that you use Method B to install static wicks.

- (a) Some electrical bonding requirements for bonding static wicks are shown in [Figure 214](#). Refer to Chapter 23, [Static Wicks - Maintenance Practices](#) for more required static discharging procedures.

10. Bonding Protection

- A. Bonding protection preserves the integrity of the electrical bond by preventing the entry of water, dirt, grease, oil, and corrosion between the bonded surfaces. It also prevents corrosion damage to structure.
- B. Finish
 - (1) All bonded surfaces requiring protective coating must be brushed chem film and refinished per the original finish within as short a time as possible.
 - (2) Refinishing within a 24-hour period is highly recommended. The surface should be brought back to original condition.
 - (3) Sealants are not recommended in the areas that follow:
 - (a) Bulkhead connectors within the pressure vessel (unless required for pressure seal).
 - (b) Equipment racks and equipment mounting surfaces.
 - (c) Stud-type grounding blocks.

(d) Feed-thru plates (unless required for pressure seal).

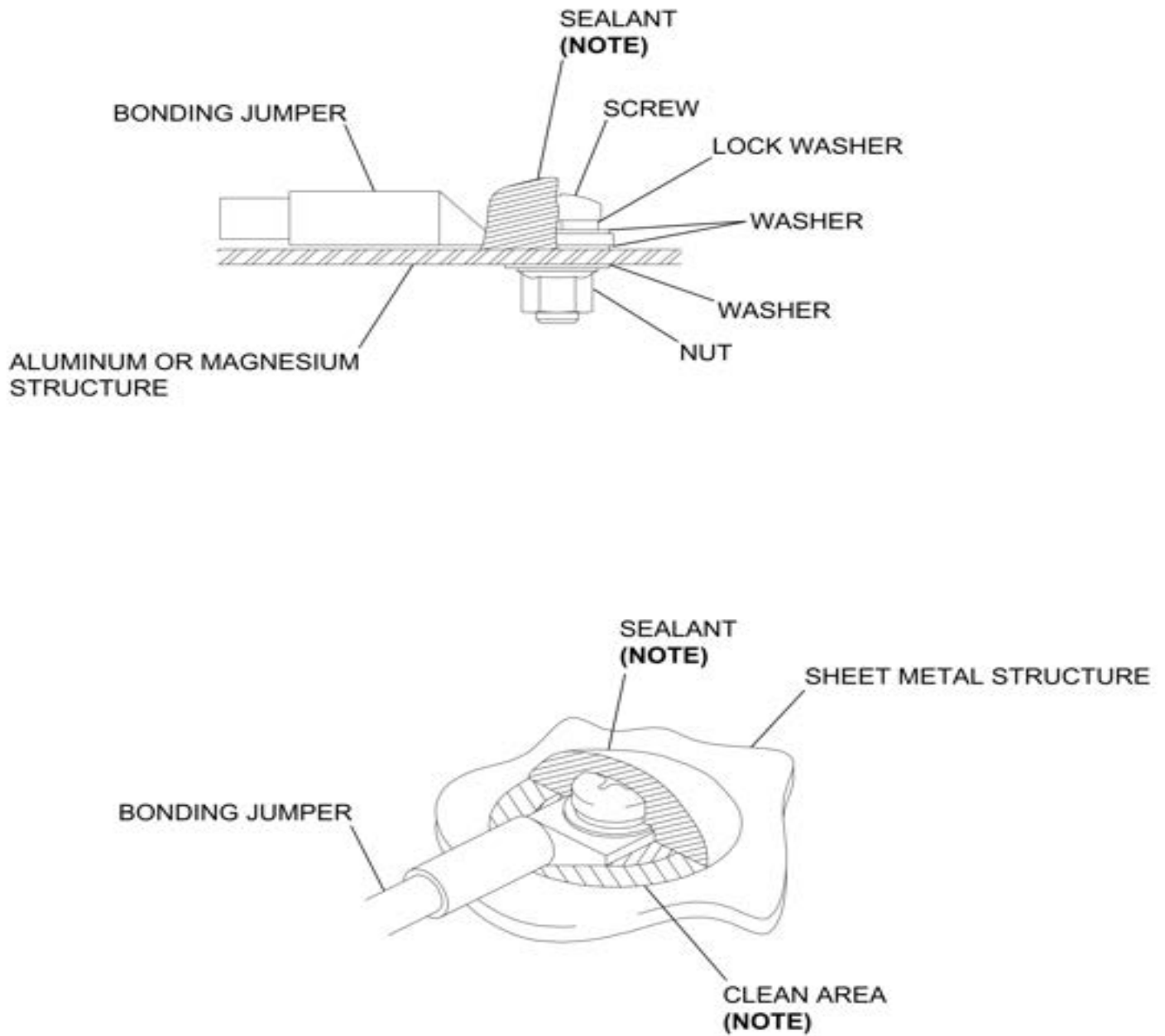
- (4) In areas where the surface already has chem film applied (i.e., feed-thru plates on aft and mid pressure bulkheads, etc.), it is not required to remove this finish and reapply chem film to achieve the bonding unless the bonding requirement cannot be met.
- (5) The cleaned area must not be refinished until the electrical bond connection has been inspected and approved.
- (6) Bonding jumpers do not need to be painted.

C. Sealing

- (1) Fillet seal the perimeter of all electrical bonding areas with Type I, or Type V, Class C sealant. (Refer to [Fuel, Weather and High Temperature Sealing - Maintenance Practices.](#))
- (2) Some areas, but not necessarily all, where it is applicable to seal, are as follows:
 - (a) Feed-thru connectors which are exposed to wide temperature changes, such as temperature changes outside the pressure vessel.
 - (b) Any bonding surface required within the fuel cells.
 - (c) Grounding blocks which require a large amount of the surface to be removed to achieve the electrical bond.
- (3) Apply the same type (or equivalent) of protective coating that was initially applied to bare areas remaining around the bonding area.

Figure 201 : Sheet 1 : Electrical Bonding - Typical Bonding Jumper Installation for Aluminum and Magnesium Alloys

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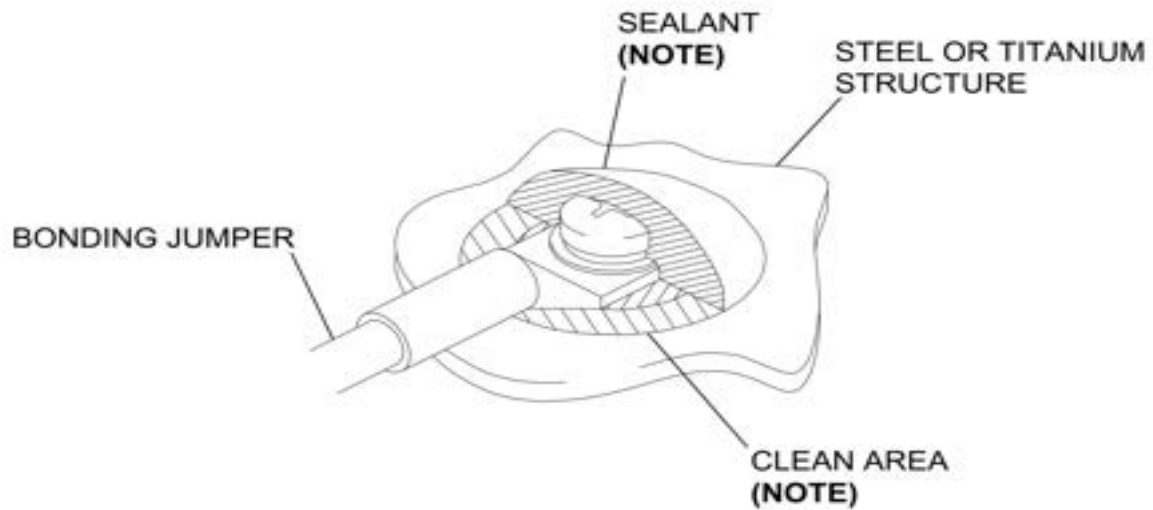
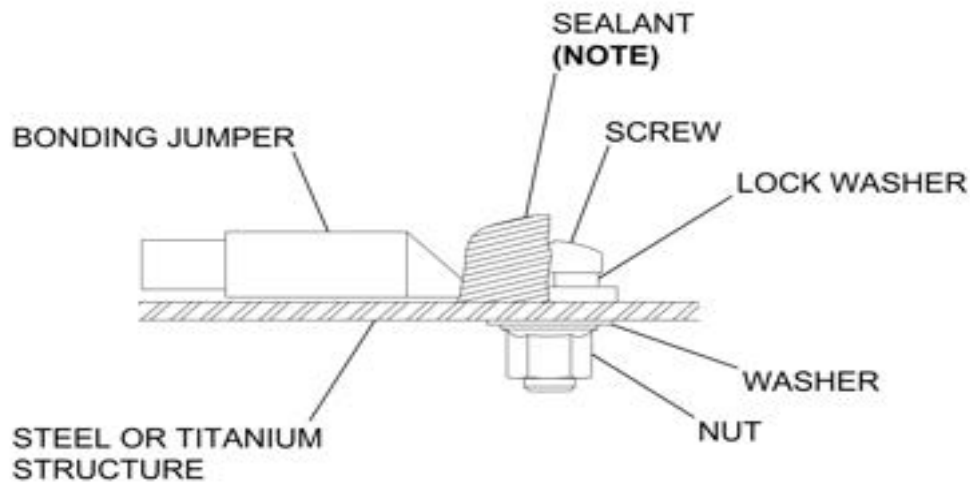


NOTE: USE METHOD A OR METHOD B
CLEANING AND SEALING PROCEDURES.

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Figure 202 : Sheet 1 : Electrical Bonding - Typical Bonding Jumper Installation for Steel and Titanium Alloys

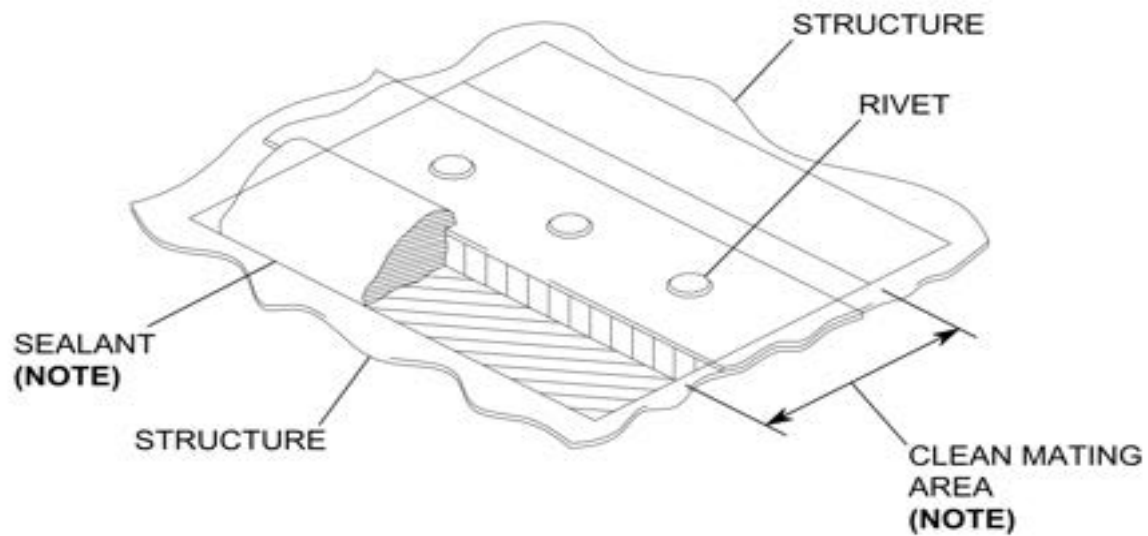
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NOTE: USE METHOD A OR METHOD B
CLEANING AND SEALING PROCEDURES.

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Figure 203 : Sheet 1 : Electrical Bonding - Typical Bonding Joint Installation for Riveted Sheet Metal Construction

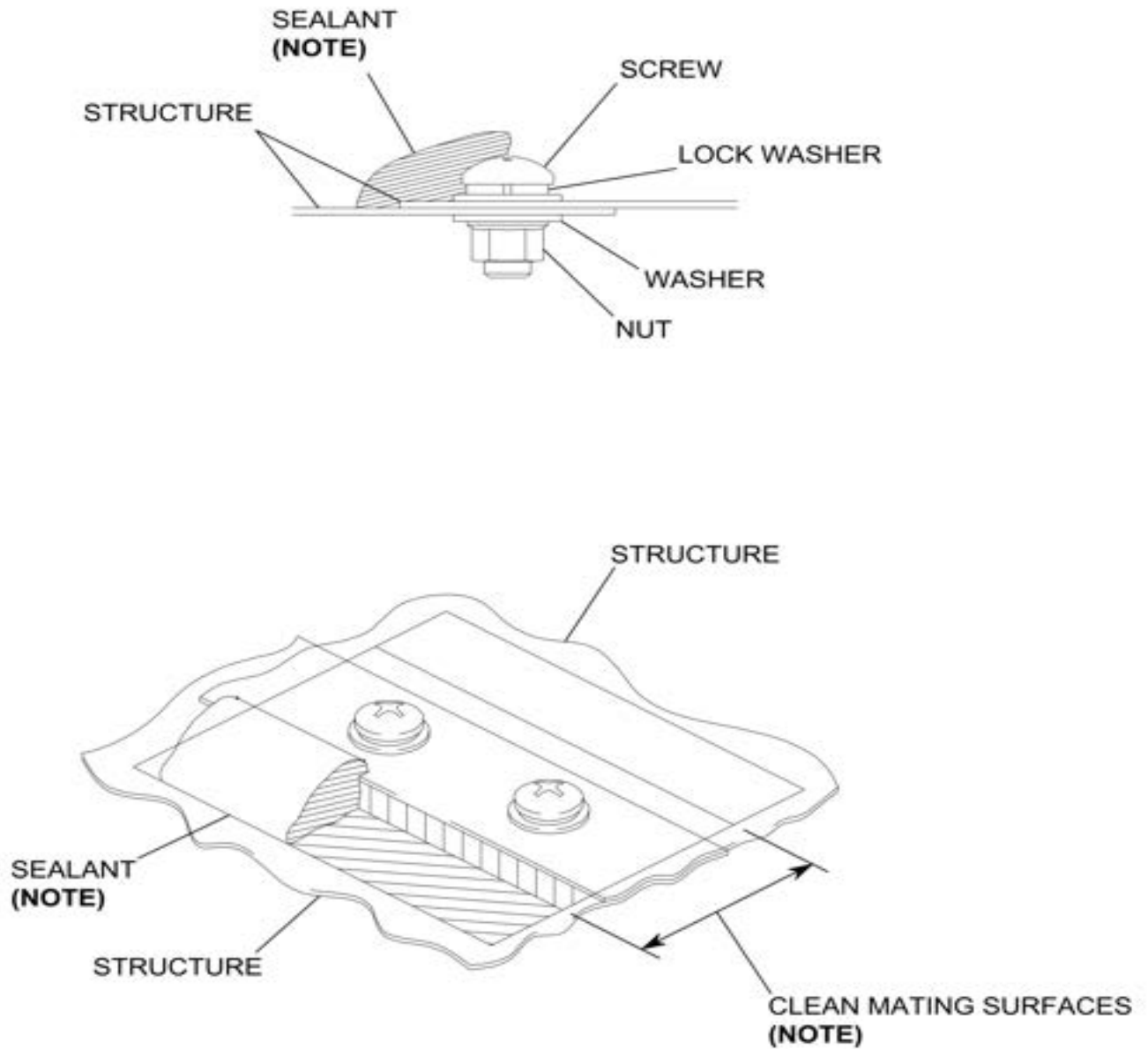


NOTE: USE METHOD A OR METHOD B
CLEANING AND SEALING PROCEDURES.

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Figure 204 : Sheet 1 : Electrical Bonding - Typical Bonding Joint Installation Using Sheet Metal Screws

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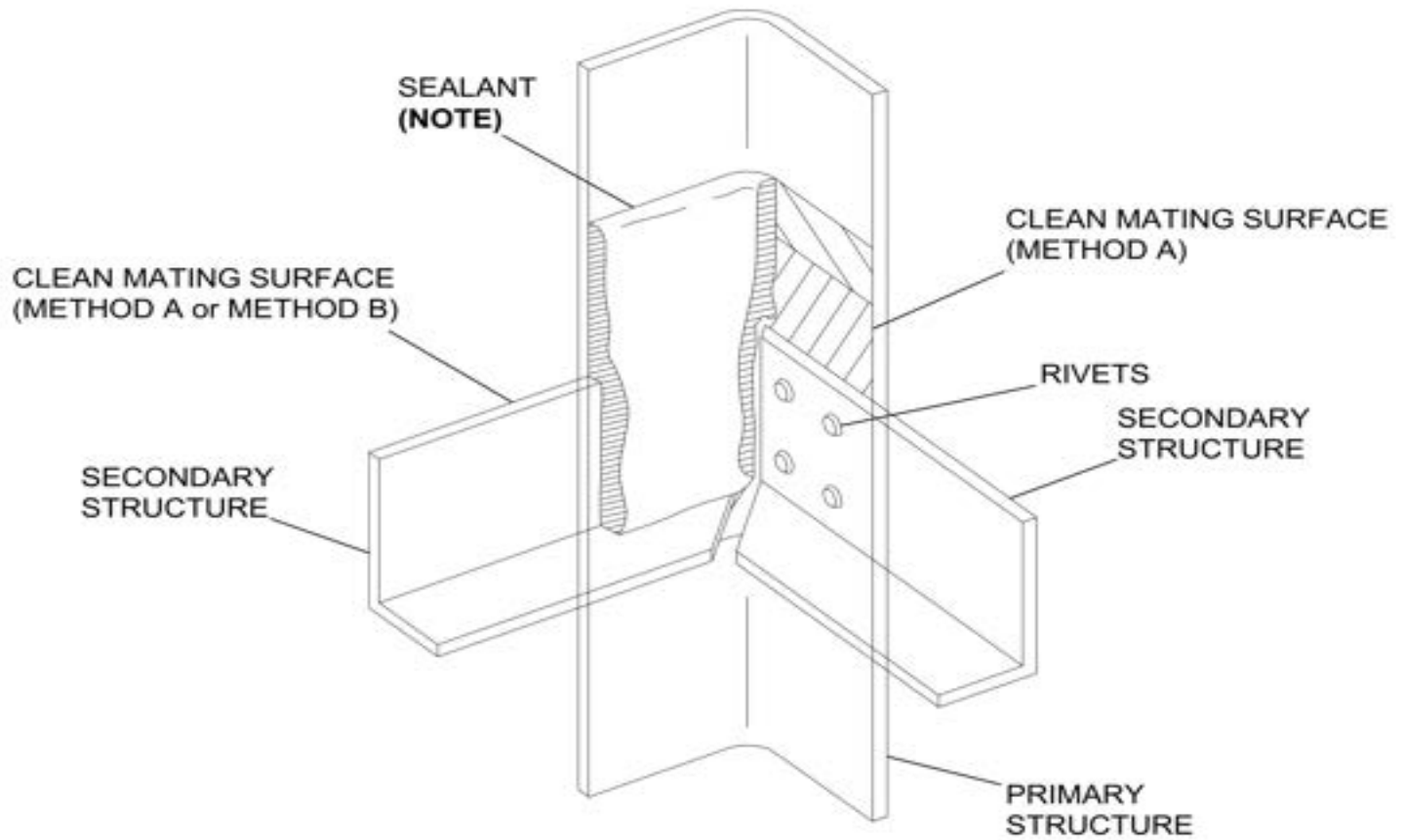


NOTE: USE METHOD A OR METHOD B
CLEANING AND SEALING PROCEDURES.

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Figure 205 : Sheet 1 : Electrical Bonding - Typical Bonding Installation on Bracket and/or Angle Construction

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NOTE: USE METHOD A OR METHOD B
CLEANING AND SEALING PROCEDURES.

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Figure 206 : Sheet 1 : Electrical Bonding - Typical Bonding Jumper Installation of Plumbing to Structure

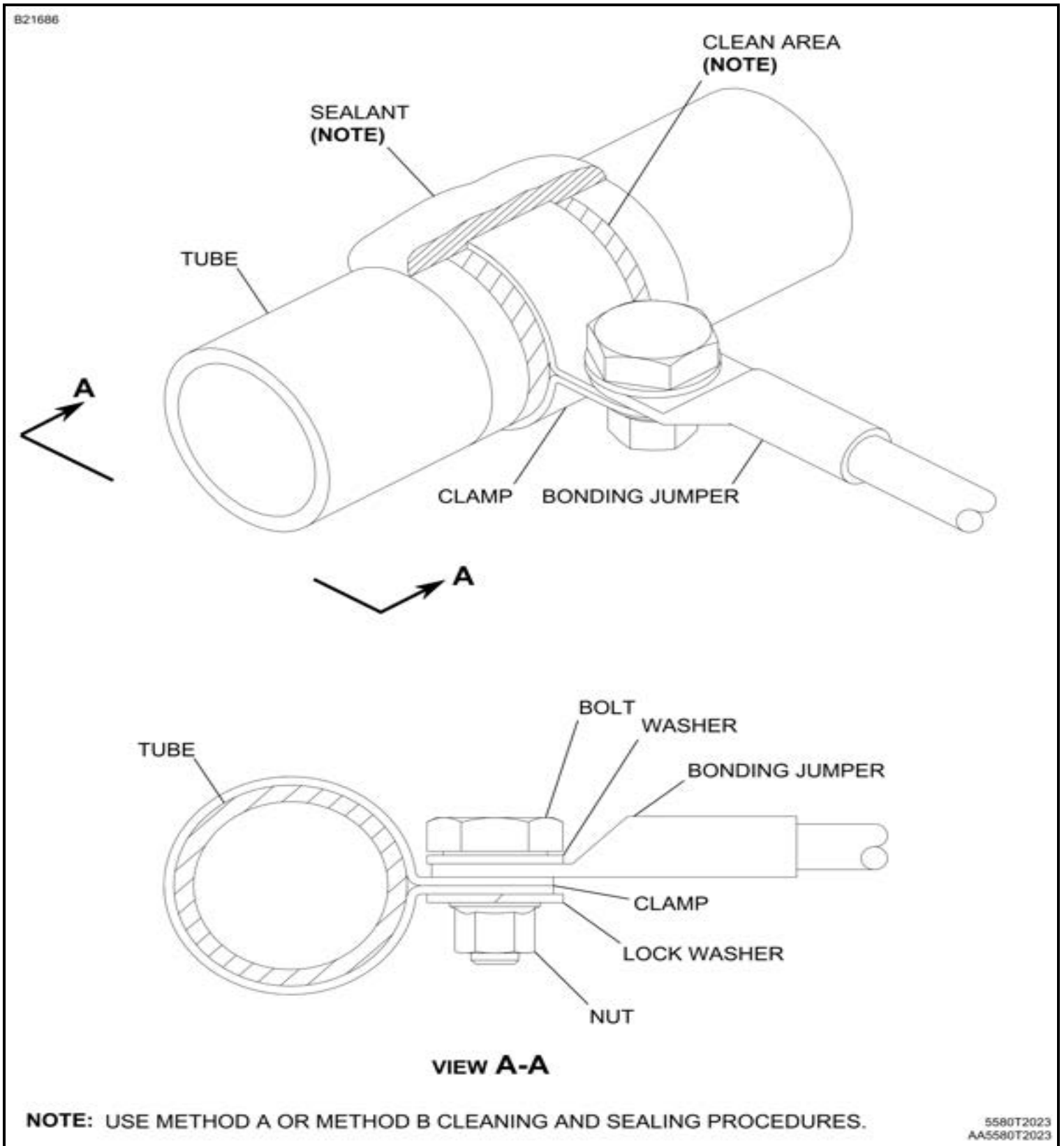


Figure 207 : Sheet 1 : Electrical Bonding - Typical Bonding Jumper Installation for Continuity of Plumbing

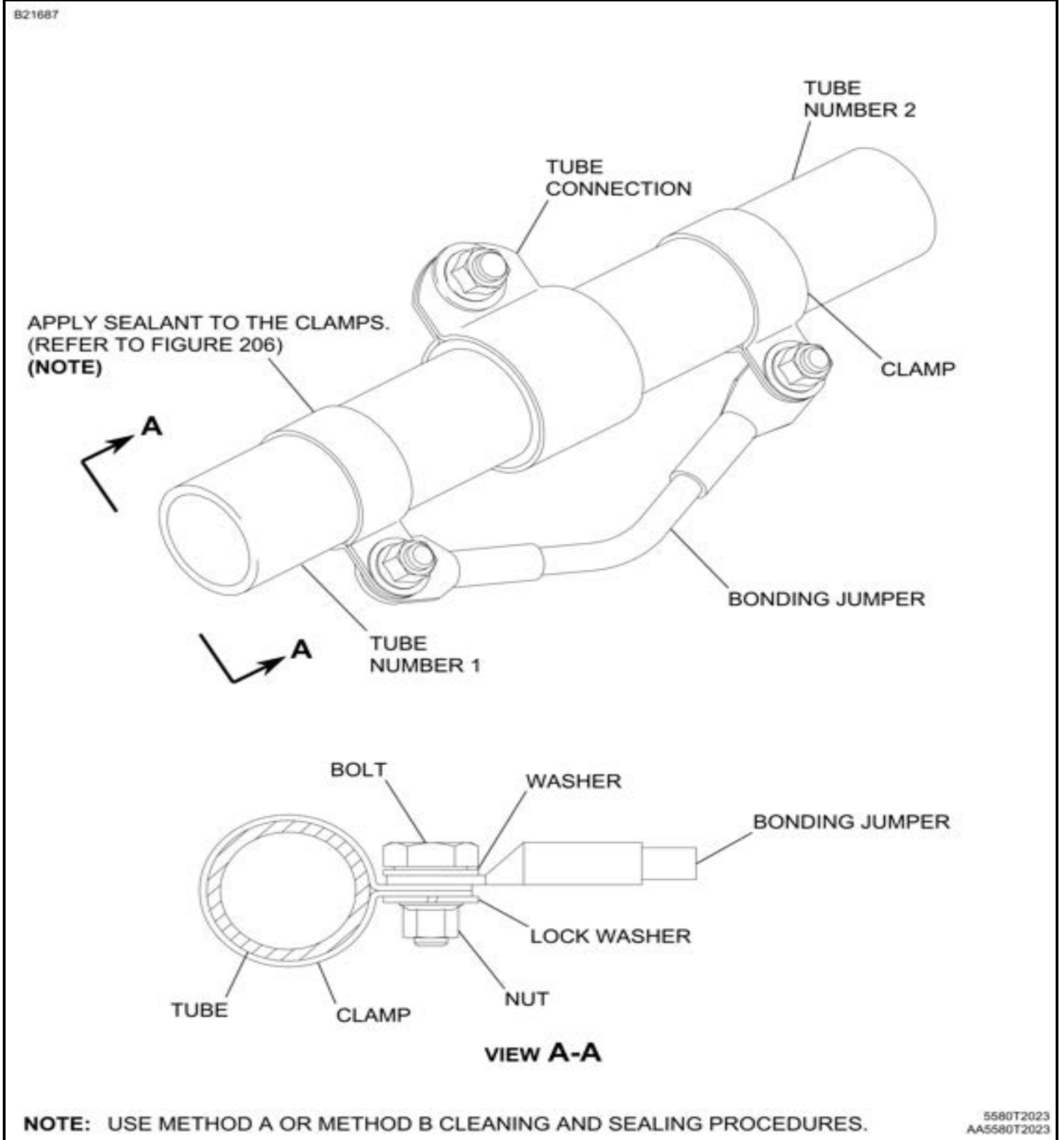


Figure 208 : Sheet 1 : Electrical Bonding - Typical Inspection Plate Bonding

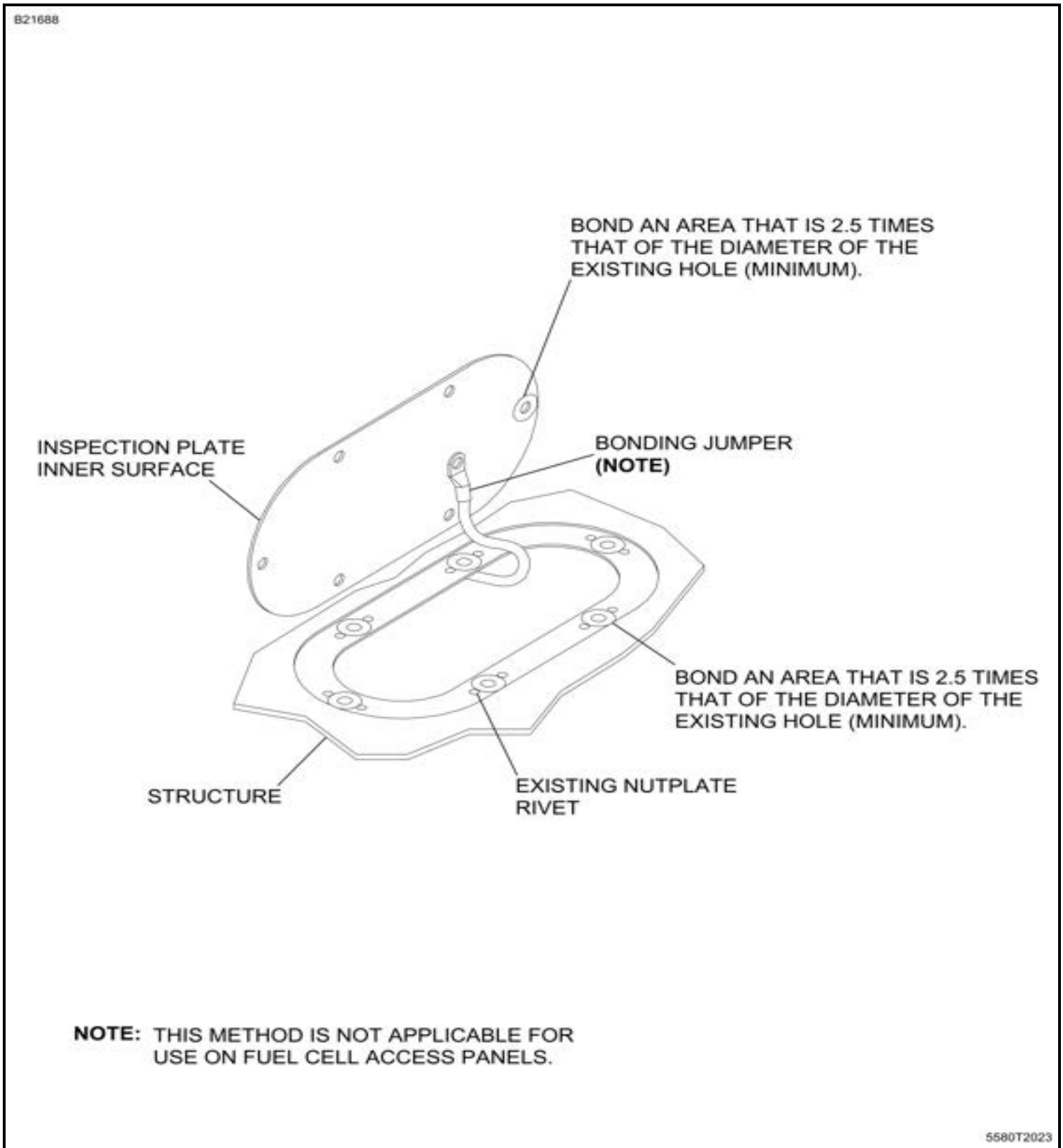


Figure 209 : Sheet 1 : Electrical Bonding - Typical Antenna Bonding

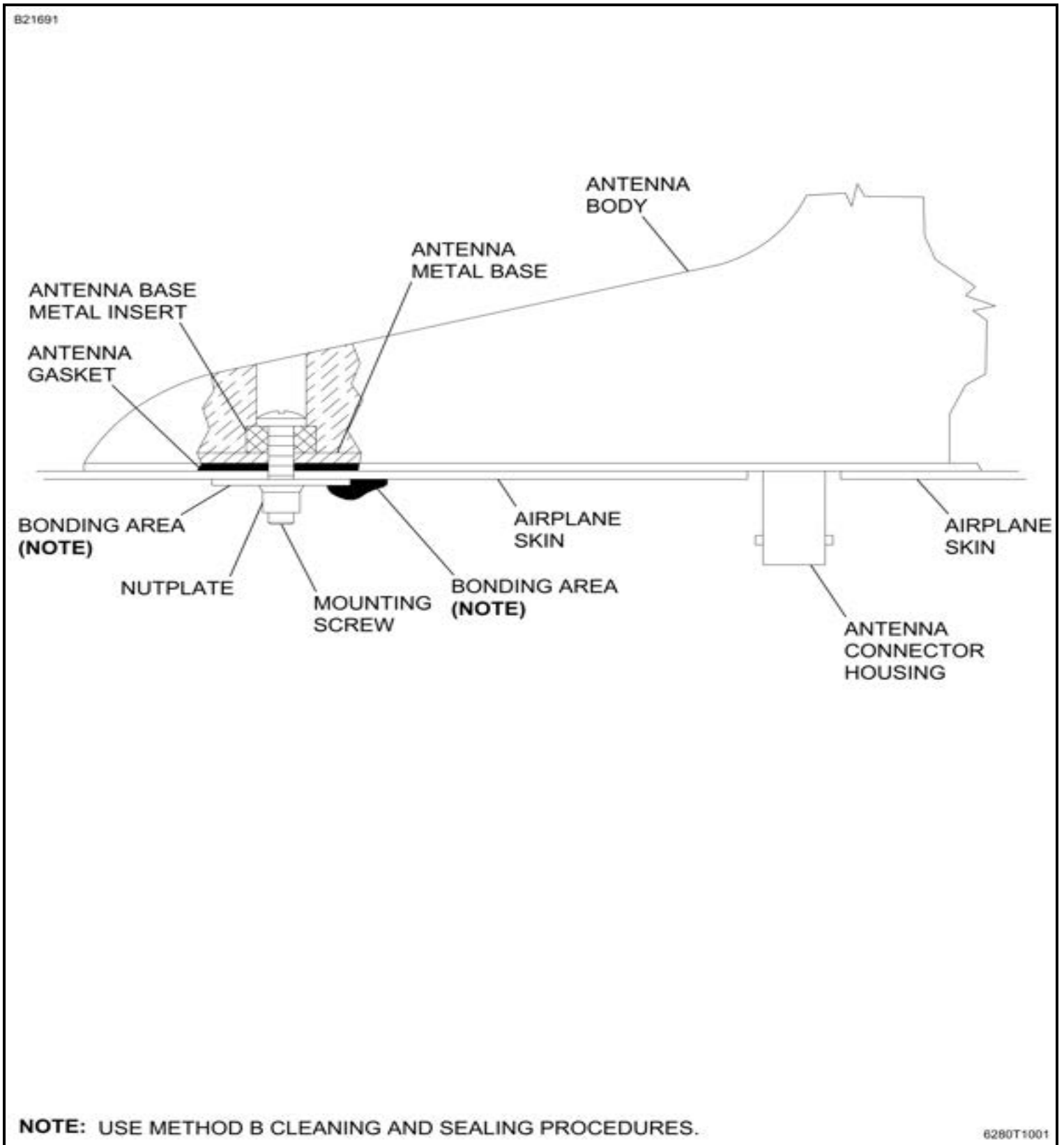
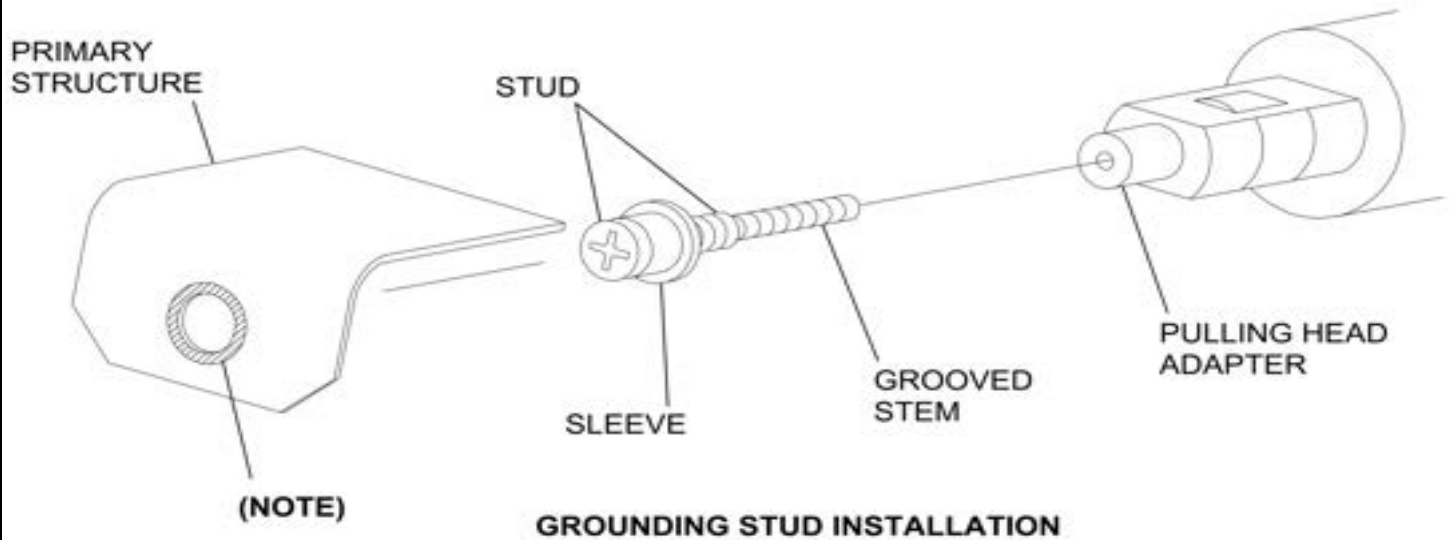
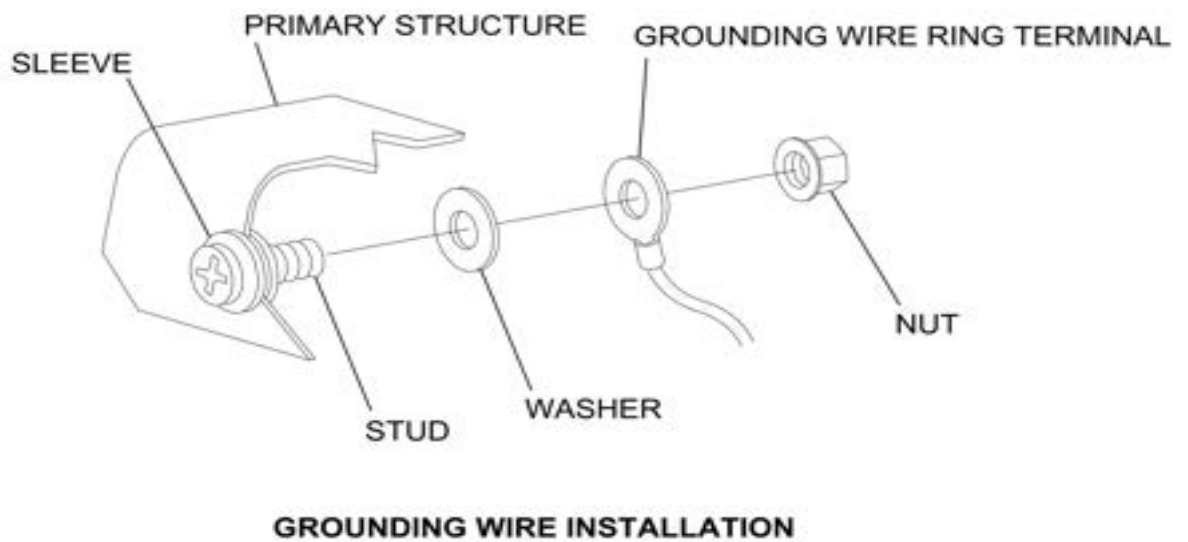


Figure 210 : Sheet 1 : Electrical Bonding - Typical Permanent Ground Stud Installation

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NOTE: REMOVE THE PRIMER SEALANT FROM THIS AREA.



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Figure 211 : Sheet 1 : Electrical Bonding - Cockpit Voice Recorder Removable Ground Stud Installation

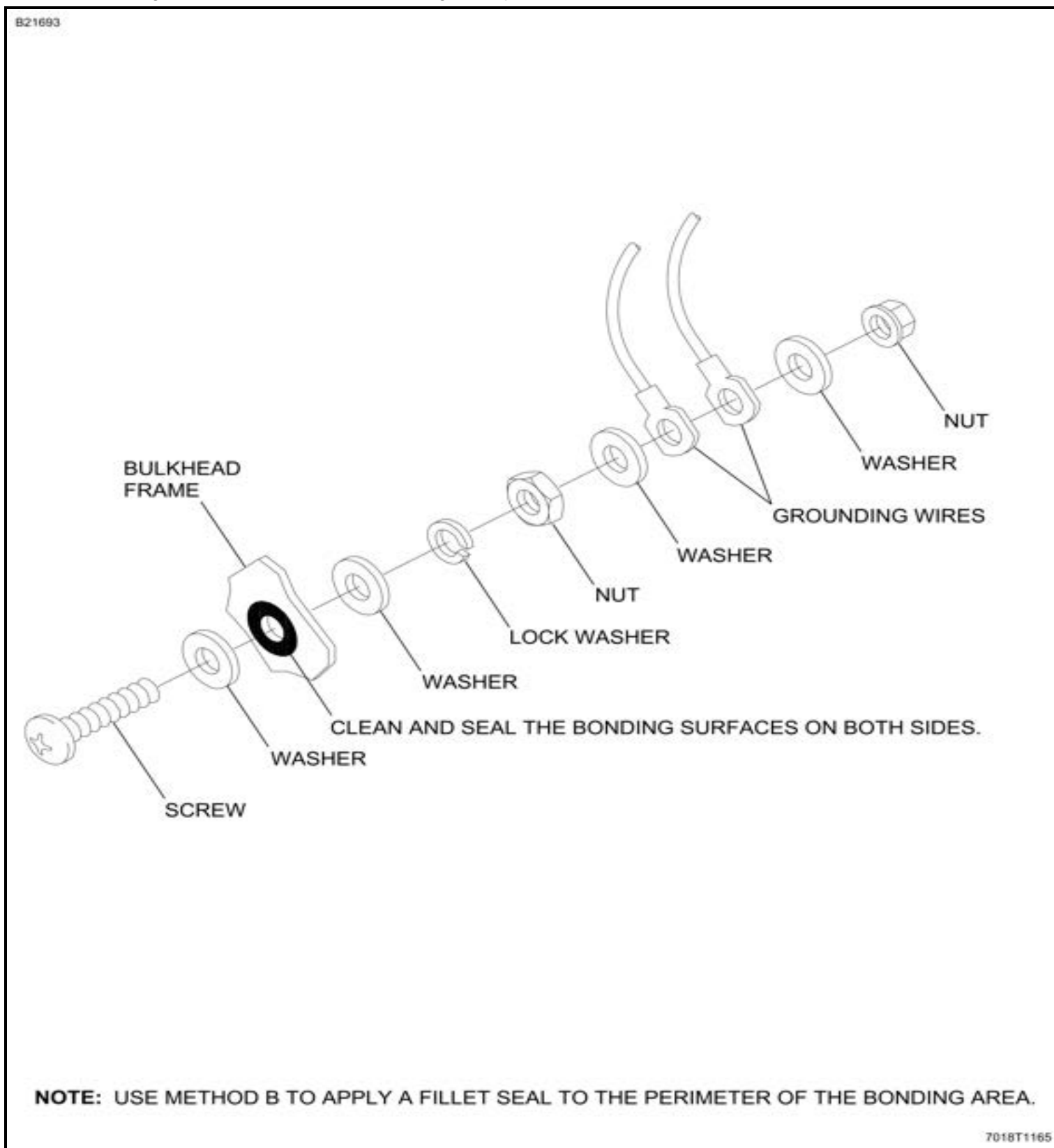
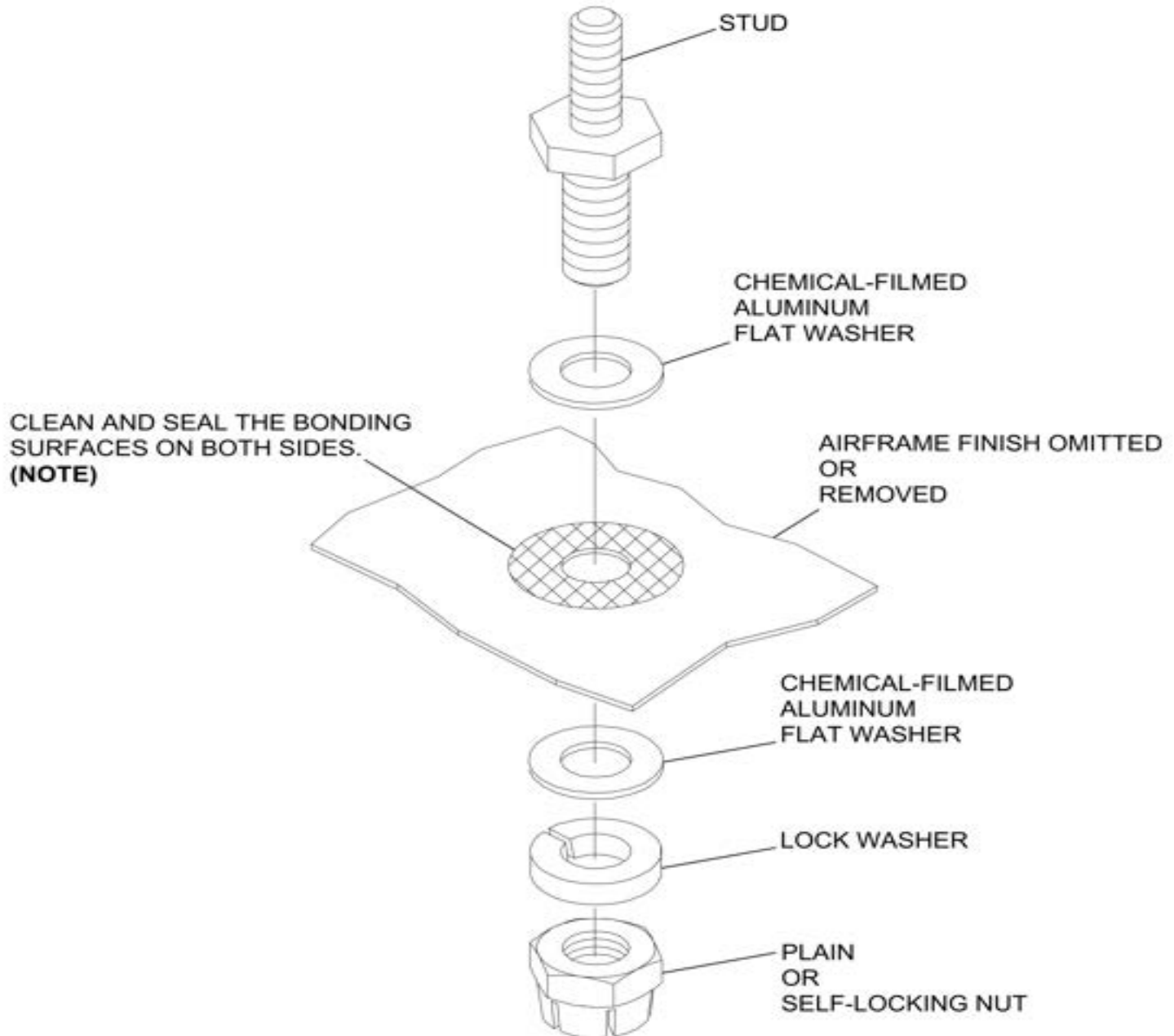


Figure 212 : Sheet 1 : Electrical Bonding - Electrical and Avionic Ground Stud Installation

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NOTE: USE METHOD B TO APPLY A FILLET SEAL TO THE PERIMETER OF THE BONDING AREA ON BOTH SIDES.

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Figure 213 : Sheet 1 : Electrical Bonding - Typical Metallic Tubing Route with a Bulkhead Fitting and a Valve

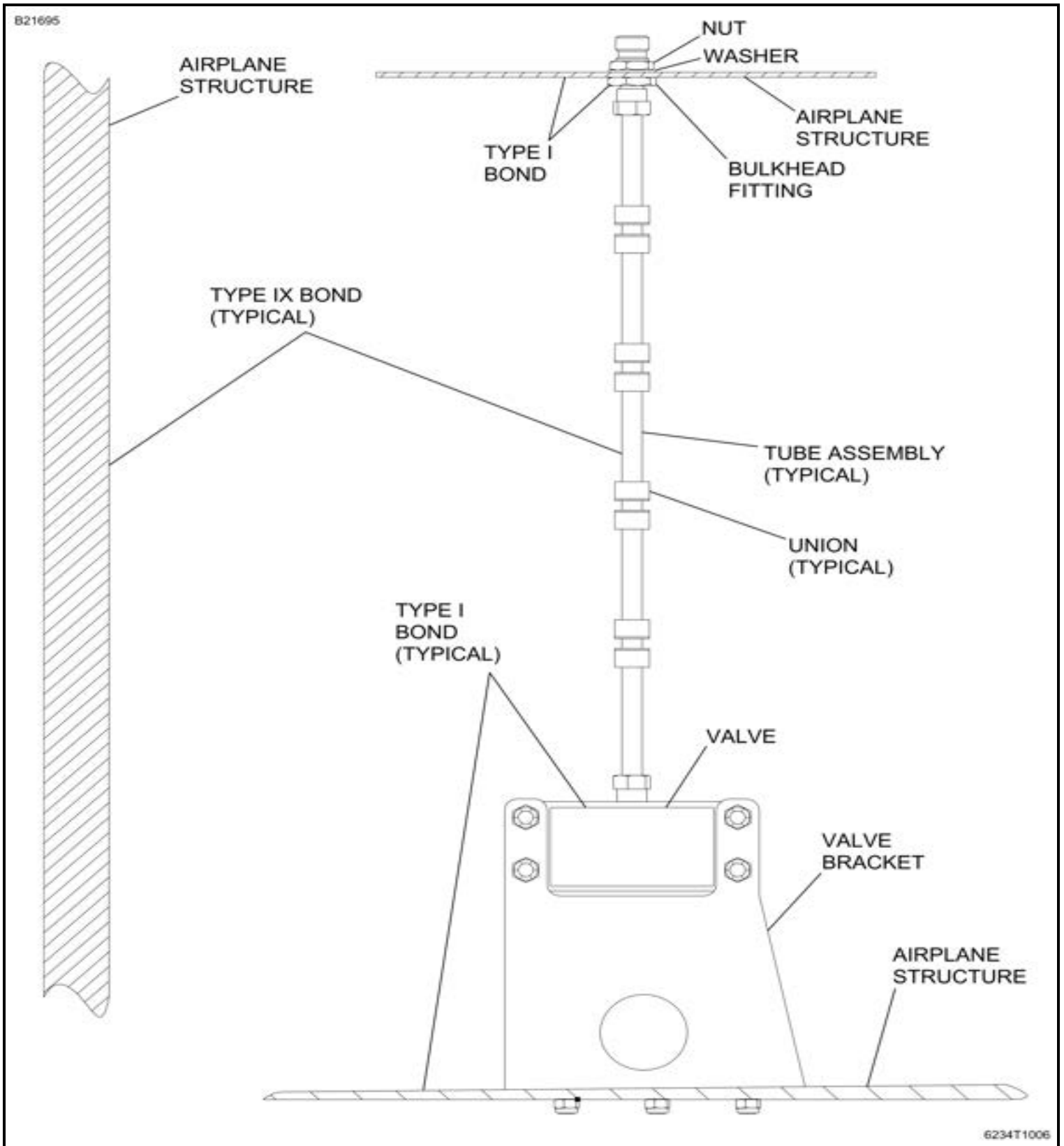
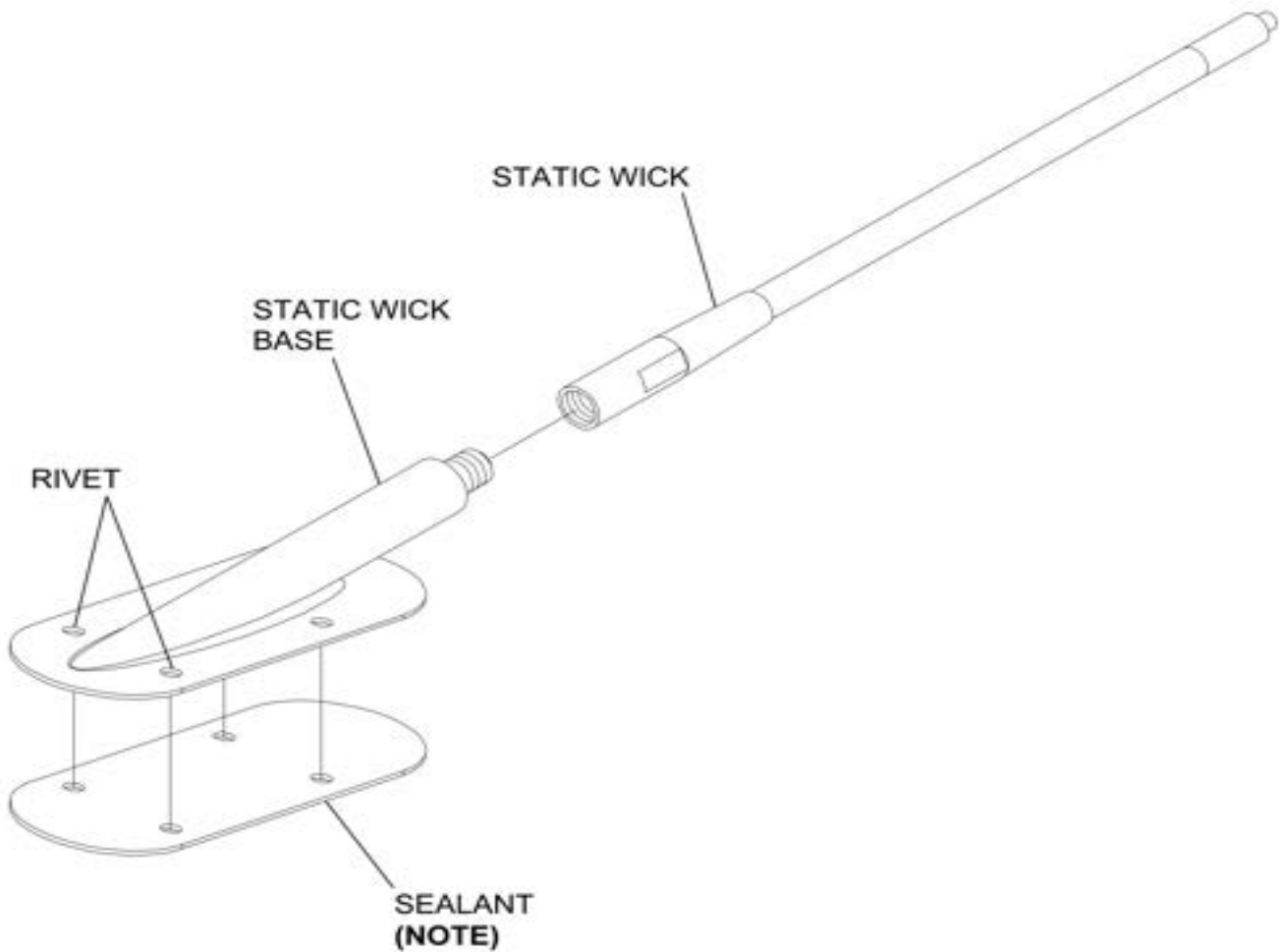


Figure 214 : Sheet 1 : Electrical Bonding - Typical Static Wick Installation

B21696



NOTE: METHOD B CLEANING AND SEALING PROCEDURES
ARE RECOMMENDED FOR ALL APPLICATIONS.

6314T1080

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.

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 issued to tell customers of acceptable alternatives 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, 1997.

2. Hand-Wipe Cleaning Operations

NOTE: All hazardous air pollutants (HAP) or volatile organic compounds (VOC) hand-wipe solvents that clean, must meet a composition requirement, have a vapor pressure less than or equal to 0.87 psi at 68°F (6 kPa at 20°C), or meet the requirements specified in an alternative compliance plan administered by the authority that permits and approved under Section 112 (1) of the Clean Air Act.

Table 1. Replacement Products for Hand-Wipe Cleaning Operation

SURFACE	APPROVED PRODUCT/NUMBER	SUPPLIER ADDRESS
All Metals and Painted Surfaces	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
		Available Commercially
All Plastics (Except Windows and Windshields)	Isopropyl Alcohol (TT-I-735)	Available Commercially
All Rubber (Natural or Synthetic) and Silicone	Isopropyl Alcohol (TT-I-735)	Available Commercially

3. Priming Operations

NOTE: Priming operations cannot be more than the maximum Hazardous Air Pollutant (HAP) limit of 2.9 lb./Gallon (350 Grams/Liter) (less water) per application. Priming operations cannot be more than the volatile organic compounds (VOC) limit of 2.9 lb./Gallon (350 Grams/Liter) (less water and exempt solvents) per application. Compliance of this limit can be completed through the use of layers that are less than the content limits, or with a monthly volume-weighted average to meet content limits.

Table 2. Replacement Products for Priming Operations

PRIMER APPLICATION	APPROVED PRODUCT/NUMBER	SUPPLIER ADDRESS
Corrosion Primer (Notes 1,4)	Corrosion Primer (513 X 419)	Courtaulds Aerospace
	(910 X 942)	1608 Fourth St. Berkeley, CA 94710
	Corrosion Primer (02-Y-40)	DEFT, Inc.
	(02-4-40 CATA)	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
Fuel Bay Primer (Notes 2, 4)	Fuel Bay Primer (10P30-5)	Dexter Crown Metro Aerospace East Water St. Waukegan, IL 60085
Pretreatment Primer (Notes 3, 4)	Pretreatment Primer (728-013/702-701)	Pratt & Lambert Industrial Coatings 630 E. 13th St. Andover, KS 67002

NOTE 1: Any primers which meet MIL-PRF-23377G or later requirements may be used.

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

NOTE 3: Any pretreatment primers that meet DOD-P-15328 can be used.

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

4. Topcoat Operations

NOTE: Topcoat operations cannot be more than the maximum Hazardous Air Pollutant (HAP) limit of 3.5 lb./Gallon (420 Grams/Liter) (less water) per application. Topcoat operations cannot be more than the volatile organic compounds (VOC) limit of 3.5 lb./Gallon (420 Grams/Liter) (less water and exempt solvents) per application. Compliance of this limit can be completed through the use of layers that are less than the content limits, or by the monthly volume-weighted average to meet content limits. Topcoats that meet the requirements of MIL-C-85285 can also be used.

Table 3. Replacement Products for Topcoat Painting Operations

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

Chemical Stripping	Turco T-6776 LO	Turco Products, Inc.
		Westminster, CA 92684
Mechanical Stripping (Note 5)	180 Grit or Finer	Available Commercially
	Media Stripper (Glass Beads or Walnut Shells)	Available Commercially

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

GENERAL SOLVENTS/CLEANERS - MAINTENANCE PRACTICES

1. General

- A. Solvents are used in a wide range of cleaning activities and selected solvents can be used in the removal of oil, grease and dirt from objects without harm to metal, plastics or elastomeric parts. Refer to Tools, Equipment and Materials.

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 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 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.

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.

- Wipe off all excess oil, grease or dirt from surface.
- 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.
- 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.
- With a clean dry cloth, immediately wipe the surface while the solvent is still wet. Do not allow the surface to evaporate dry.
- Repeat steps (b) through (d) until there is no discoloration on the drying cloth.

(2) Plastic or Rubber.

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

- Remove heavy soil from surface by washing with a water detergent solution.
- 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.
- 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

CLEANER/ SOLVENT	FEDERAL SPECIFI- CATION	TYPE CLASSIFI- CATION	USE/ DESCRIPTION FUNCTION	CAUTION/ WARNING
Dry	MIL-PRF-680	Type I -100°F Type II -140°F	General cleaning solvent. Dry cleaning of textile materials. Grease removal.	FLAMMABLE.
Methyl-n 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.	USE DISCRIMINATELY WITH ACRYLIC PLASTICS.
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.

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.

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 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 Kevlar 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.
 - (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 plastic, fiberglass, Kevlar and graphite composite 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

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.

CAUTION: 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 pivots, bearings and landing gear.
- (e) Mask all skin laps, inspection holes, drain holes, or any opening that would allow stripper to enter airplane structure.

CAUTION: High strength steel parts are very susceptible to hydrogen embrittlement. Acidic solutions, such as rust removers and paint strippers have been found to cause hydrogen embrittlement. Hydrogen embrittlement is an undetectable, time delayed process. Since the process is time

delayed, failure may occur after the part is returned to service. The only reliable way to prevent hydrogen embrittlement is not to use chemical rust removers or paint strippers on any steel parts such as landing gear springs.

- (4) Apply approved stripper by spray or brush method.

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 orbital type sander.

NOTE: Do not sand rivet heads.

- (12) If necessary to remove paint from inside skin joints, refer to Cleanout of Skin Joints.
- (13) If corrosion is encountered, refer to Chapter 51, [Corrosion - Description and Operation](#) 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.
- (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.

FUEL, WEATHER, AND HIGH-TEMPERATURE SEALING - MAINTENANCE PRACTICES

1. General

A. Procedures for application of sealants are given for various types of sealing required for the airplane.

2. Tools and Equipment

NOTE: Specified sealants, solvents that clean, parting agents, adhesion inhibitors and equipment are listed for use. Acceptable alternatives can be used to seal 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 5426 San Fernando Rd. Glendale, CA 91209	
	PR-1422	PRC-DeSoto International	
	PR-1440	PRC-DeSoto International	
	MC-236	Morton Aerospace Polymer Systems 9341 Anaconda Ave Garden Grove, CA 92641	

SEALANTS TYPE I, CLASS B-1/4, QUICK REPAIR - MIL-S-83318

NAME	NUMBER	MANUFACTURER	USE
Sealant	GC-435	Goal Chemical Sealant Corp.	Fuel, pressure and weather sealant. For limited repairs requiring rapid curing sealant.

SEALANTS TYPE I, CLASS B-1/2, B-2 OR B-4 - AMS-S-8802

NAME	NUMBER	MANUFACTURER	USE
Sealants	GC-408	Goal Chemical Sealant Corp.	Fuel, pressure and weather sealant spatula, faying seals application.
	Pro-Seal 890	PRC-DeSoto International	
	PR-1422	PRC-DeSoto International	
	Class B-1/2 Class B-2		
	PR-1440	PRC-DeSoto International	
	Class B-2 Class B-4		
	PR-1826	PRC-DeSoto International	
	MC-236	Morton Aerospace Polymer Systems	

SEALANTS TYPE I, CLASS C-20, C-48 OR C-80

NAME	NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 890	PRC-DeSoto International	Fuel, pressure and weather sealant. Suitable for faying surface sealing.

SEALANTS TYPE II, CLASS A

NAME	NUMBER	MANUFACTURER	USE
Sealant	Vangrip 14-30	Mid-West Industrial Chemical Company St. Louis, MO	Bonding main landing gear spring, step and brake line fairing
Sealant	Scotch-Grip 1357 Neutral	3M Company	
Sealant	Scotch-Grip 1300L	St. Paul, MN 55101	
Sealant	Fastbond 30-NF		
Sealant	Fastbond 2000-NF		

SEALANTS TYPE IV

NAME	NUMBER	MANUFACTURER	USE
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 V Extreme High Temperature RTV Sealant

Sealant	SS-69A	National Sealants and Lubricants, Inc. P.O. Box 1267 Magnolia, TX 7735-1267	To seal for very high temperature sealing.

SEALANTS TYPE VI

NAME	NUMBER	MANUFACTURER	USE
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

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR-1428 Class B2	PRC-DeSoto International	Used in areas for access.
	PR-1081 Class B2	PRC-DeSoto International	

SEALANT TYPE XI

NAME	NUMBER	MANUFACTURER	USE

Sealant	U000927S	Available from	Permanently pliable extruded tape for fixed windows.
		Cessna Parts Distribution Cessna Aircraft Company Department 701 5800 E. Pawnee Rd. Wichita, KS 67218-5590	

SEALANTS TYPE XIV CLASS B			
NAME	NUMBER	MANUFACTURER	USE
Sealant	AC-350	3m Garden Grove, CA 92841	Sealing main landing gear spring, step and brake line fairing, Fuselage Sealant.
Sealant	WS-8020RC	Royal Adhesives & Sealants Wilmington, CA 90744	

CLEANING SOLVENTS

NAME	NUMBER	MANUFACTURER	USE
Desoclean 110, 020k019		Commercially Available	Presealing cleaning.
Methyl-n Propyl Ketone		Commercially Available	Cleaning organic coating.
Isopropyl alcohol	Federal Specification TT-I-735	Commercially Available	Cleaning 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

NAME	NUMBER	MANUFACTURER	USE
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 No. 420		Application of sealant.
Round 1/8 orifice	Semco No. 440		Application of sealant.
Duckbill	Semco No. 8615		Application of sealant.

Duckbill	Semco No. 8648		Application of sealant.
Comb	Semco No. 8646		Application of sealant.
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.
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 definitions that follow are included to give a basic concept of the special terms used to seal. This list is not all inclusive but the more common terms are listed.
- (1) Absolute Sealing - No leaks are permitted. All openings of any kind 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) - Cure agent for sealants.
 - (3) Application Time - The quantity of time the 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 seal compound that is mixed with the accelerator before the application to make a fuel, temperature, pressure, weather and/or firewall seal material.
 - (5) Brush Coat - Apply an overcoat or continuous film of the correct seal compound with 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 must 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.)
- (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 must 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 must 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 must 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.

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.

- (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.
- (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.

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 must not be more than two months old when received. These sealants must not be more than six months old when used.
- (2) Unmixed sealants stored at temperatures exceeding 80°F (27°C) must be used within five weeks.
- (3) Sealants which have been premixed, degassed and flash frozen must be maintained at -40°F (-40°C) or lower and must not be received more than two weeks beyond the date of mixing. These sealants must not be used more than six weeks after the date of mixing.
- (4) Frozen sealant must 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 must 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 must 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 must be cleaned or lightly scuffed using ScotchBrite followed by solvent cleaning using Trichloroethane.

NOTE: Bond primer must not be removed.

- (8) Sealant materials may be applied to unprimed or primed surfaces. Nonchromated or epoxy primers must have good adhesion to the substrate material and must have aged at least 48 hours prior to sealant application. Adhesive bonding primer must be lightly scuffed and cleaned before applying sealant.
- (9) Sealants must 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 must always be applied to the pressure side of a joint if possible.
- (11) After application, sealants must be free of entrapped air bubbles and must not exhibit poor adhesion. All fillets must 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 must be evident around the complete periphery of the fastener to indicate adequate sealing. Sealant extruded through a hole by a rivet must be wiped from the end of the rivet before bucking. Threaded fasteners which have been shank or under head sealed must not be retorqued after the expiration of the application time of the sealant. Prior to torquing, sealant must be removed from the threads. In torquing, turn the nut rather than the bolt, if possible.
- (13) Pressure testing must not be accomplished until the sealant is cured.
- (14) Sealant must 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 must 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 must be performed during the working life of the faying sealant or the entire shank and area under fastener head must be fayed.

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 must 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 must be mixed or thinned in accordance with the manufacturers recommendations and thoroughly blended prior to application. All mixed sealant must 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, must 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 must be accurately weighed on scales that are calibrated and maintained for required accuracy.
- (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 must 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 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).

WARNING: The cartridge must 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 must be clean and dry.

- B. Remove all dust, lint, chips, shavings, etc. with a vacuum cleaner where necessary.

- C. Cleaning must be accomplished by scrubbing the surface with clean cheesecloth moistened with solvent. The cloth must 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) For solvents to be used for the cleaning in the integral fuel tank refer to [Tools and Equipment-Cleaning Solvents](#).

- D. The cleaning solvent must never be poured or sprayed on the structure.

- E. The cleaning solvent must 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 must be kept in safety containers and must be poured onto the cheesecloth. The cheesecloth must not be dipped into the solvent containers and contaminated solvents must not be returned to the clean solvent containers.

- G. Final cleaning must 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 must 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 must be held in the other hand and must be used to dry the structure. The solvent must be wiped from the surfaces before it evaporates.

- (2) The above procedure must 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 must 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 must wear clean white gloves to prevent surface contamination. In the event contamination does occur, the surfaces must be recleaned.
- J. Safety precautions must 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 must be electrically grounded before starting any cleaning or sealing operation.

9. Sealing Application

A. General.

- (1) All new sealing must be accomplished using the type of sealing material required for the area being sealed. All sealant repairs must be accomplished using the same type of sealing material as that which is being repaired.
- (2) Application time of the sealing compound must be strictly observed. Material which becomes too stiff and difficult to work or which does not wet the surface properly must be discarded even though the application time has not expired.
- (3) For an illustration of the integral fuel bay and sealing techniques, refer to [Figure 201](#).
- (4) Prior to sealant application, all surfaces to be sealed must be cleaned per step 8, [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 (Clecos 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) of 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.
 - 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 must be applied using a sealant gun or spatula.
- (3) When using a sealant gun for fillet sealing, the nozzle tip must be pointed into the seam or joint and must be maintained nearly perpendicular to the line of travel. A continuous bead of sealant must precede the tip and the tip size, shape and rate of travel must be such that sufficient sealant must be applied to produce the required fillet.
- (4) Fillets must 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 must be formed so that the highest portion of the fillet is centered over the edge of the structure or fitting. Lubrication in any form must not be used for smoothing purposes. In all cases, fillet size must 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 must 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 must 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 must extend past the end of the injection and then taper out.
- (8) Lap joint and seam fillets must be as shown in [Figure 202](#).
- (9) Butt joint fillets must be as shown in [Figure 202](#).
- (10) Bolts must be fillet sealed as shown in [Figure 202](#). The area for sealing must 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 must be fillet sealed as shown in [Figure 202](#). The area for sealing must 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 must be as shown in [Figure 202](#).
 - (a) Tooling holes must be plugged with a shank sealed soft rivet and then brush coated with Type I, Class A sealant.

10. Sealant Repair

- A. Materials - Repairs, in general, must 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 must be above 60°F (15°C) before the sealant is applied and must 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. 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 must be accomplished as follows:

- (a) Remove all damaged or faulty sealant to ensure solid residual material.
- (b) Sealant must be cut to produce a smooth continuous scarfed face. The sealant must be completely removed in the affected areas. The cutting tools must 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 must be removed.
- (d) Clean the area to be sealed, including the scarfed face of the old seal. Refer to step 8, [Cleaning](#).
- (e) Apply new fillet seals. Slight overlapping of the fresh material over the existing fillet is permissible. A large buildup of sealant must not be allowed.
- (f) Rework of a fillet which has been oversprayed or brushed with primer must be accomplished by a scarfed joint and removal of the fillet having primer on it, in the area of the repair. The primer must 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 must 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 must be accomplished by removing the discrepant brush coat. Clean the area of sealant removal and the surrounding structure and sealant. Refer to step 8, [Cleaning](#). Apply a new brush coat of sealant.

F. Integral Fuel Tank Sealing Using PR-1826 Class B Rapid Curing Sealant.

- (1) Remove damaged section of sealant with a sharp Plexiglas scraper. Taper all cuts in old sealant at 45-degree angles.
- (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 must 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 heavy 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 obtain a uniform thin coat of adhesion promoter. Thin enough to cover the surface, but not heavy enough to run.

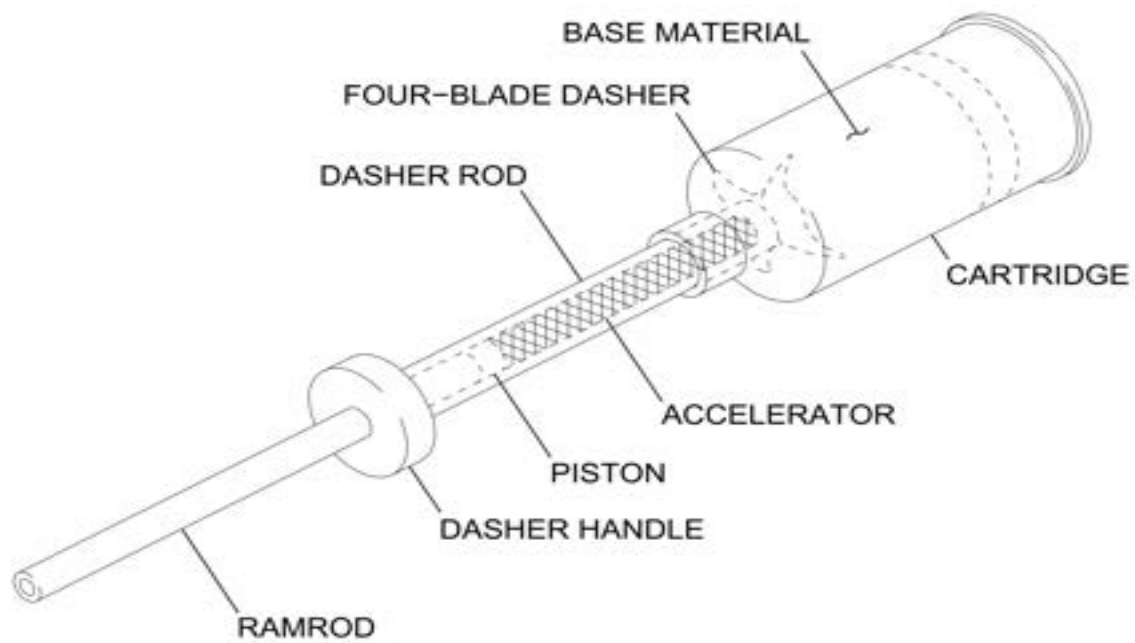
- (4) Mix PR-1826 Class B sealant according to instructions supplied with the material.
- (5) Apply PR-1826 Class B sealant, 0.125 to 0.375 inch (3.2 to 9.5 mm) thick, to the repair area with a spatula or paddle shaped tool. Firmly press sealant in place and form to desired shape. Overlap PR-1826 Class 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 must 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).

Figure 201 : Sheet 1 : Two-Part Sealant Cartridge

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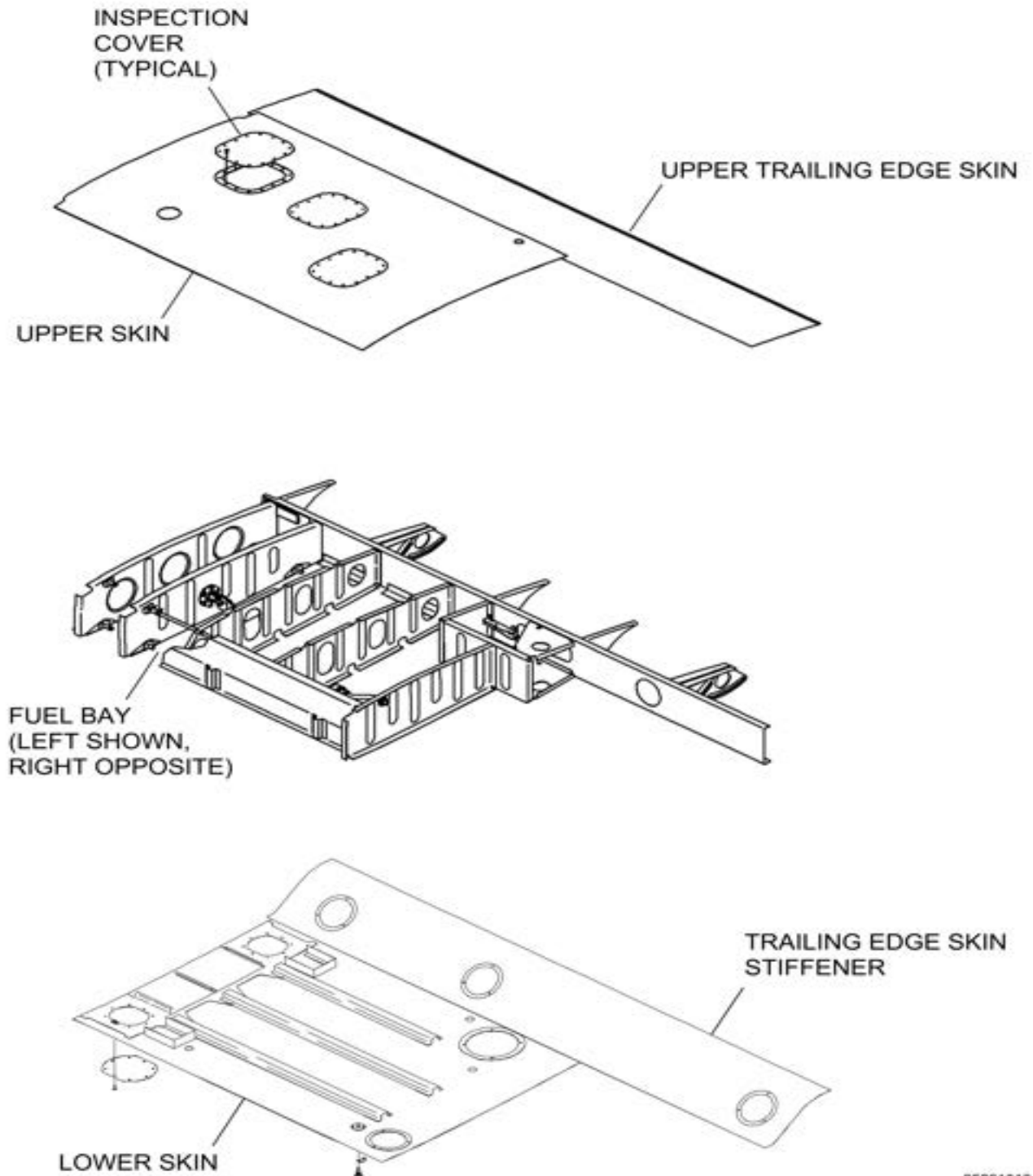


NOTE: CARTRIDGE IS DISPOSABLE AFTER USE.

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Figure 202 : Sheet 1 : Integral Fuel Bay Sealing

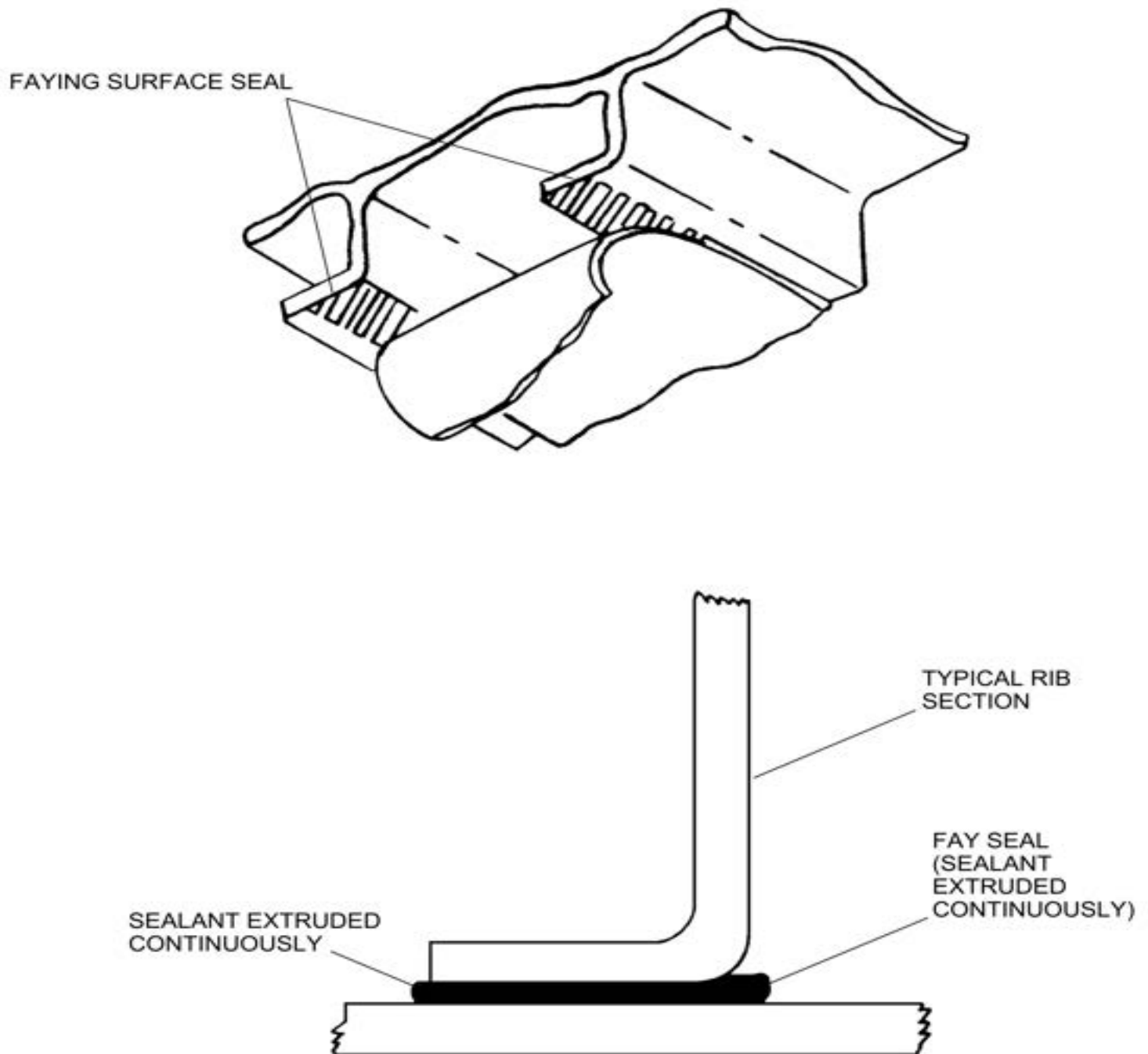
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Figure 202 : Sheet 2 : Integral Fuel Bay Sealing

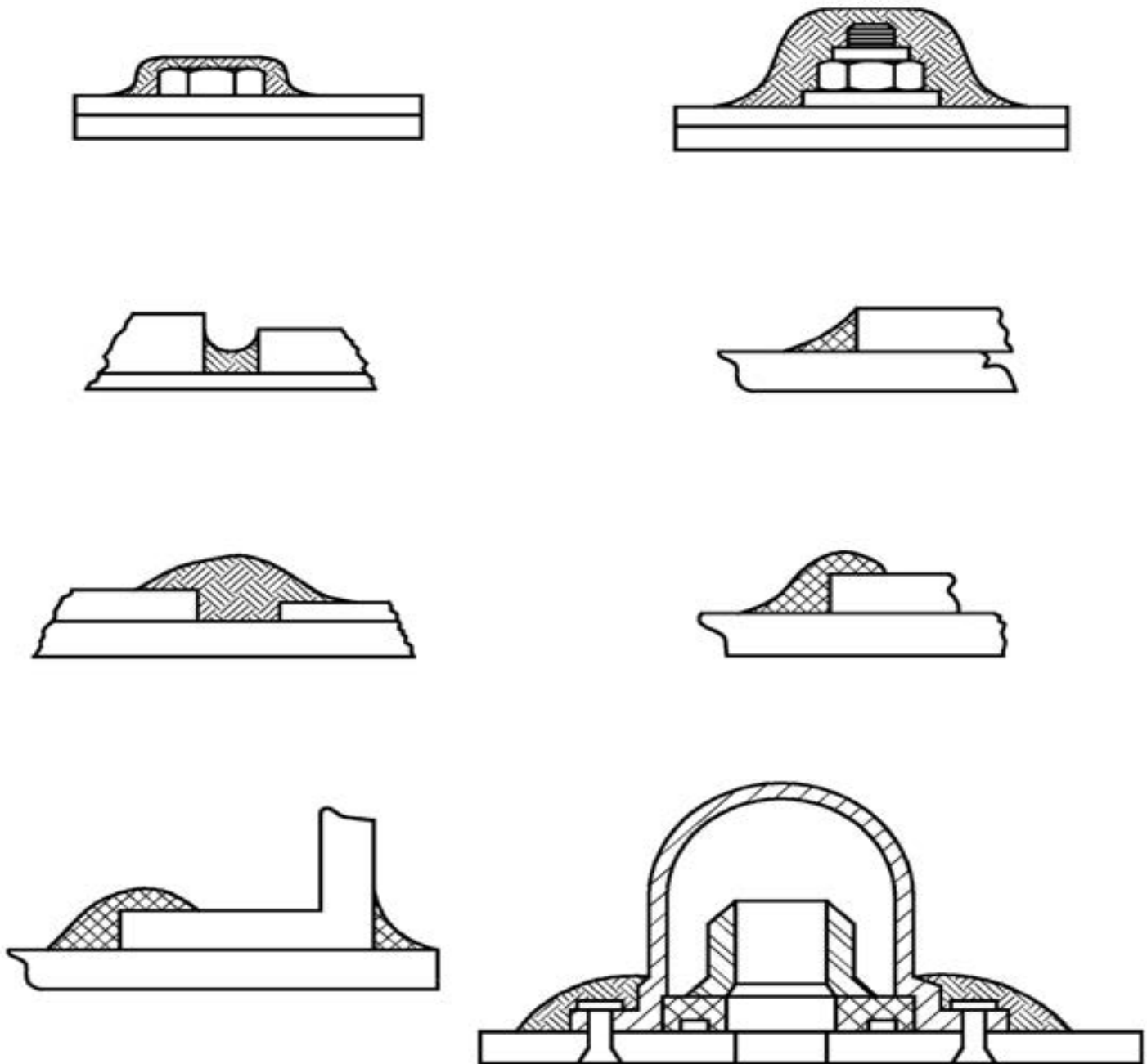
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Figure 202 : Sheet 3 : Integral Fuel Bay Sealing

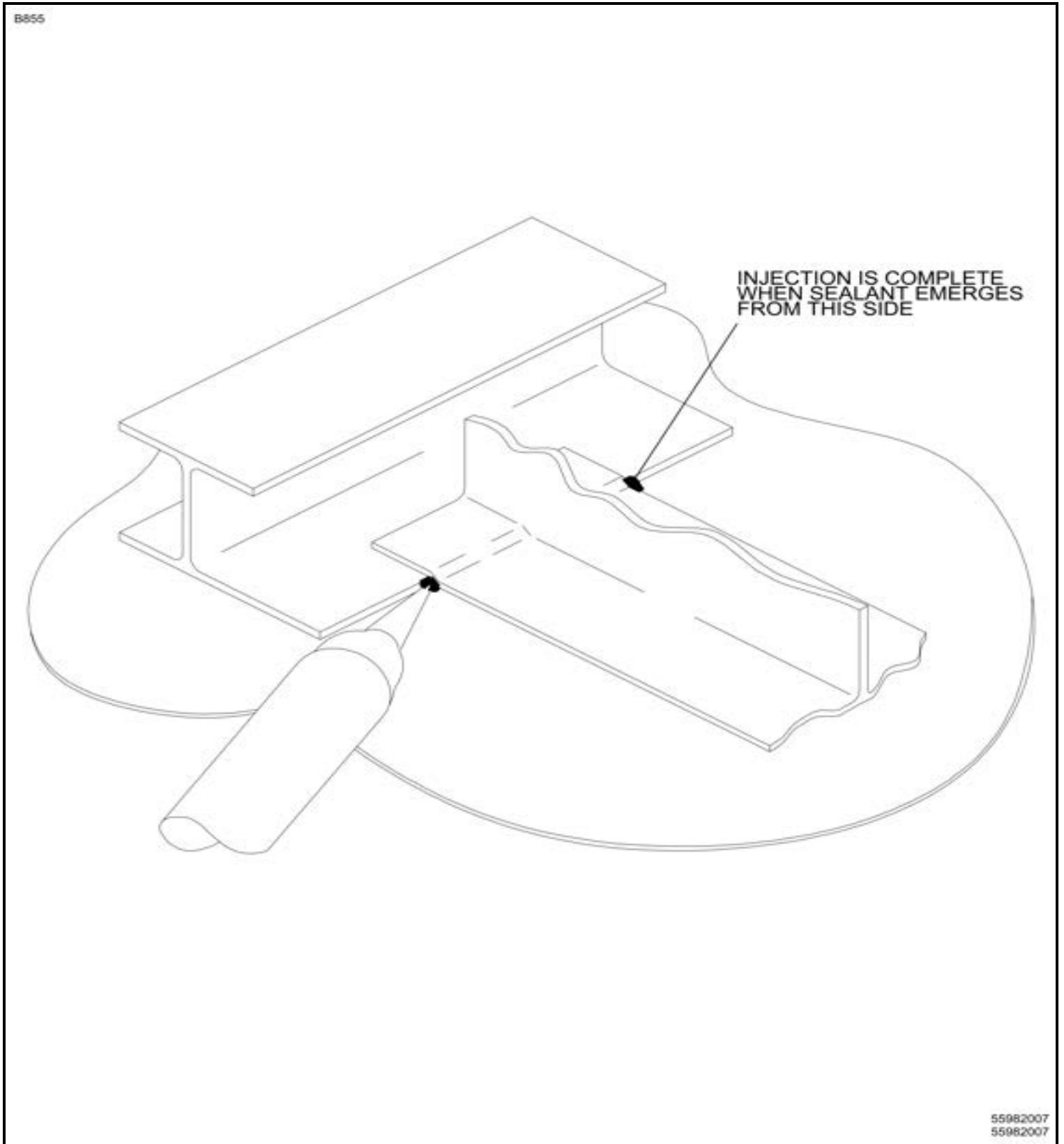
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NOTE: THE EXAMPLES SHOW TYPICAL CROSS SECTIONS OF DIFFERENT SEAL METHODS USED IN THE FUEL COMPARTMENT. THE MINIMUM SEALANT THICKNESS AT ANY POINT MUST NOT BE LESS THAN 0.060 INCH (1.5 mm).

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Figure 202 : Sheet 4 : Integral Fuel Bay Sealing



CONVERSION DATA - DESCRIPTION AND OPERATION

1. General

- A. This section contains information for converting the more commonly used measuring units found in this manual from the common United States system to the International System of Units (metric system).
- B. Other conversion factors may be found in manuals such as Standard for Use of the International System of Units (SI) : The Modern Metric System, prepared by ASTM, 100 Bar Harbor Drive, West Conshohocken, PA 19427-2959 USA.

2. Conversion Factors

- A. Distance and Length
 - (1) Multiply inches by 25.4 to obtain mm (millimeters).
 - (2) Multiply feet by 0.3048 to obtain m (meters).
- B. Mass
 - (1) Multiply ounces by 28.35 to obtain g (grams).
 - (2) Multiply pounds by 0.436 to obtain kg (kilograms).
- C. Temperature
 - (1) Subtract 32 from degrees Fahrenheit and multiply by 5/9 to obtain degrees in Celsius.
- D. Torque
 - (1) Multiply inch-pounds by 0.11298 to obtain Newton-meters.
 - (2) Multiply foot pounds by 1.3588 to obtain Newton-meters.
- E. Force
 - (1) Multiply pounds of forces by 4.4482 to obtain N (Newtons).
- F. Pressure
 - (1) Multiply pressure (psi) by 6.8948 to obtain kPa (kiloPascals).

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 2 5800 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	EIDorado LD-4	EIDorado Chemical Co. Inc. 14350 Lookout Road P. O. Drawer 34837 San Antonio, TX 78265-4837	To locate source of leak.
Methyl n-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.

FUEL CONTAMINATION - MAINTENANCE PRACTICES

1. General

- A. This section consists of information concerning fuel contamination. Included are definitions of various kinds of fuel contamination and the required actions when known fuel contamination exists.

2. Description

- A. Fuel is considered contaminated when it contains any foreign substances that are not provided under the fuel specification. These foreign substances normally consist of water, rust, sand, dust/dirt, microbial growth, unapproved additives and approved additives mixed at improper ratios to the fuel.
- B. All aviation fuels absorb moisture from the air and contain water in both suspended particle and liquid forms. Water contamination of the fuel is normally remedied by daily draining of water from the tanks utilizing the poppet drain valves.
- C. Particle contamination of fuels, consisting of sand, dirt and/or rust is usually caused by dirty refueling equipment, contaminated fuel storage equipment or damaged seals on fuel filler caps.
- D. All Model 206H and T206H airplanes, even those utilizing an anti-ice additive, in the fuel, require periodic inspections listed in this section. Refer to Chapter 12, [Fuel - Servicing](#), for the use of anti-ice, for controlling ice and microorganisms of bacteria and fungi.
- E. When unapproved additives are blended with the airplane fuel, it should be considered contamination. Also anti-icing additive blended with the fuel at the improper ratio renders the fuel contaminated, unless the ratio of anti-icing additive to fuel mixture by volume can be corrected by the addition of nonpreblended fuel or additional anti-ice additive.

3. Removing Fuel Contamination from Airplane Fuel Tanks

- A. The procedures which follow define various types of fuel contamination and the specific action required to remove the contamination.

CAUTION: Observe all applicable local and facility safety regulations when performing fuel system maintenance.
Refer to [Fuel Storage and Distribution - Maintenance Practices](#).

(1) Water contamination.

- (a) There is no way to prevent accumulation of water formed through condensation in fuel tanks. The rate of accumulation due to condensation varies with temperature of the fuel, but samples of fuel should be taken daily at each poppet drain valve. Any water discovered by taking samples should be removed immediately.

NOTE: Water suspended in fuel appears in the form of droplets that reflect light. High concentration of water droplets will cause fuel to have a cloudy or hazy appearance.

- 1 Using an approved container positioned under poppet drain valve, open drain valve.
- 2 Allow fuel to drain until no more water is being expelled.
- 3 Close poppet drain valve.
- 4 Repeat procedure at remaining poppet drain valves until all have been serviced.

(2) Dirt, sand and rust particle contamination.

- (a) Dirt, sand or rust particle contamination is normally discovered when taking daily fuel samples from the poppet drain valves or evidenced by particles found in the fuel filters. If contamination is discovered, the contamination must be removed immediately as follows:

- 1 Completely defuel the airplane. Refer to Chapter 12, [Fuel - Servicing](#).

NOTE: Fuel with known dirt, sand or rust particle contamination must be discarded as waste fuel.

- 2 Remove all fuel tank access plates. Refer to Chapter 6, [Access Plates and Panels Identification - Description and Operation](#). Also refer to [Fuel Storage and Distribution - Maintenance Practices](#).
- 3 Using tack rags (commercially available from paint supply manufacturers), begin wiping interior areas of all fuel tanks. Tack rags should be changed frequently to prevent redepositing contamination back into the tanks. Continue wiping until no more contamination is present on tack rags.
- 4 Before reinstalling fuel tank access panels, inspect the interior of the tanks using a mirror and approved light to be sure all contamination has been removed.
- 5 Clean or replace fuel filters.
- 6 Reinstall access plates on wing fuel tanks.

7 Refuel airplane. Refer to Chapter 12, [Fuel - Servicing](#).

- (3) Unapproved fuels contamination.
 - (a) Any fuels introduced into the airplane fuel tanks that are not approved for usage should be considered contamination. Refer to FAA Approved Airplane Flight Manual for approved fuels.
 - (b) If unapproved fuels are added to the airplane fuel tanks, the airplane must be completely defueled. Refer to Chapter 12, [Fuel - Servicing](#). After draining all residual fuel from the poppet drain valves, after defueling, the airplane may be refueled with an approved aviation fuel.
- (4) Improperly mixed anti-ice additive contamination.
 - (a) When mixing anti-ice, it must be mixed at a ratio as specified for the additive being used. Any mixture of additive in the fuel above or below the specified ratio must be considered fuel contamination.
 - (b) Should an improper mixture ratio of anti-ice to the fuel by volume be discovered, the airplane should be completely defueled per Chapter 12, [Fuel - Servicing](#), and refueled with properly blended fuel.

NOTE: As an alternative, the improper mixture may be corrected by the addition of the proper amount of non-preblended fuel or the addition of anti-ice to bring the mixture ratio to within the specified concentration by volume. The reblended fuel/additive mixture must be retested to ensure the proper mixture has been obtained before returning the airplane to service.

- (5) Unapproved additives and foreign liquids contamination.
 - (a) Should it be discovered that any unapproved additives or foreign liquids have been inadvertently introduced into the airplane fuel tanks, the airplane must be immediately completely defueled. All residual contaminated fuel must be removed by opening all poppet drain valves. Refer to Chapter 12, [Fuel - Servicing](#).
 - (b) When all residual fuel has been drained, close all poppet drain valves and refuel the airplane with an approved aviation fuel. Refer to FAA Approved Airplane Flight Manual for approved fuels.

NOTE: All fuels contaminated with unapproved additives or foreign liquids must be discarded as waste fuel.

- (c) Before returning the airplane to service, the fuel filters must be cleaned or replaced.

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), two reservoirs, a three position selector valve, an electrically driven auxiliary fuel pump, fuel strainer, and a fuel quantity indicating system.
- B. A fuel return system is installed on Airplanes 206008174 and On and Airplanes T206008362 and On. The fuel return system includes a restrictor fitting installed in the top of the fuel servo, a dual stack fuel selector valve, a check valve, and a drain valve assembly. The system will allow fuel/vapor to return to the main tank(s). The dual stack selector valve makes sure that fuel returns only to the tank that is selected as the feed tank.
- C. 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](#).
- D. A schematic of the entire fuel system is shown to aid in system understanding. Refer to [Figure 1](#).

NOTE: The illustration that shows the fuel return system is installed on Airplanes 206008174 and On and Airplanes T206008362 and On.

Figure 1 : Sheet 1 : Fuel System Schematic

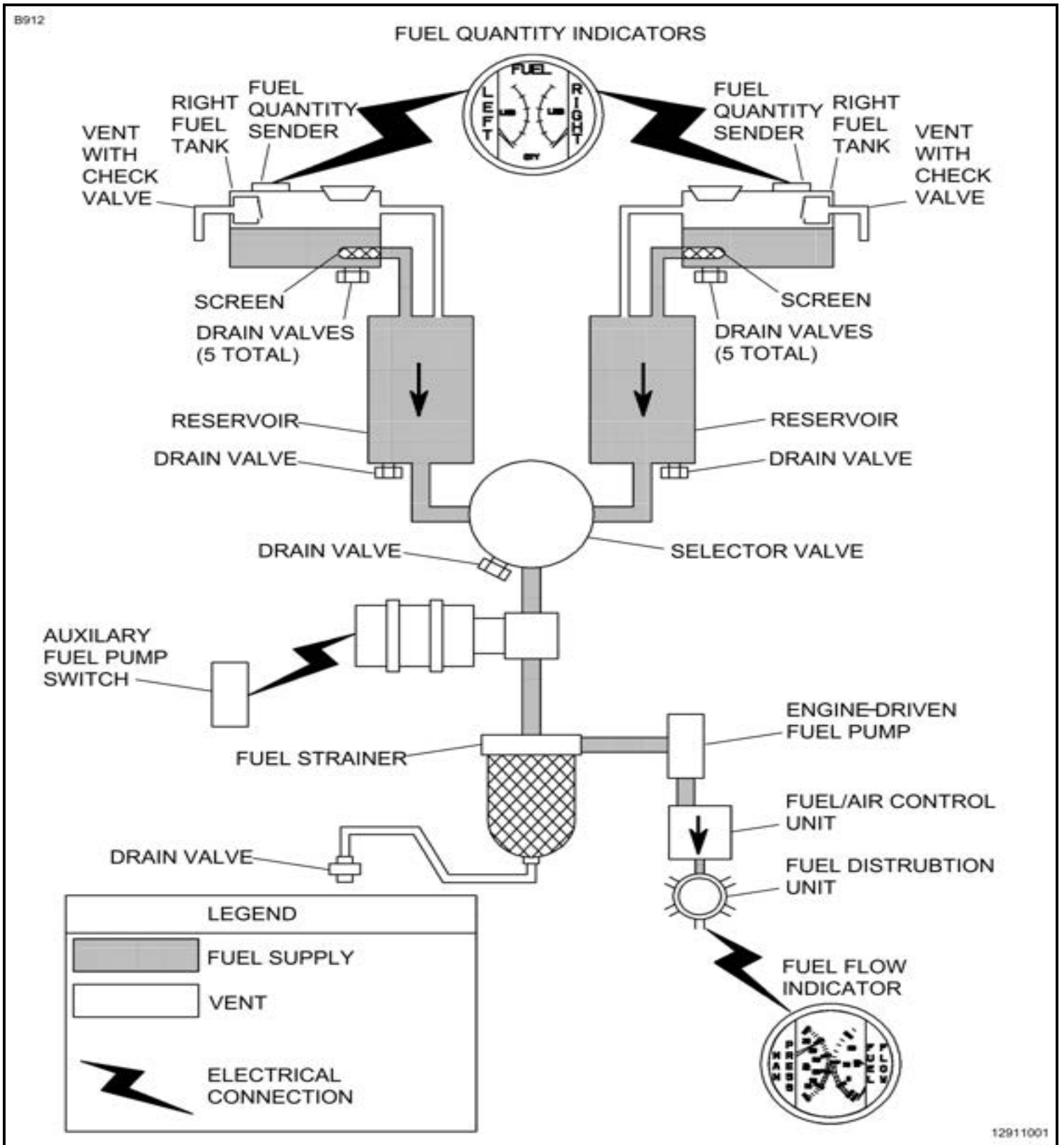
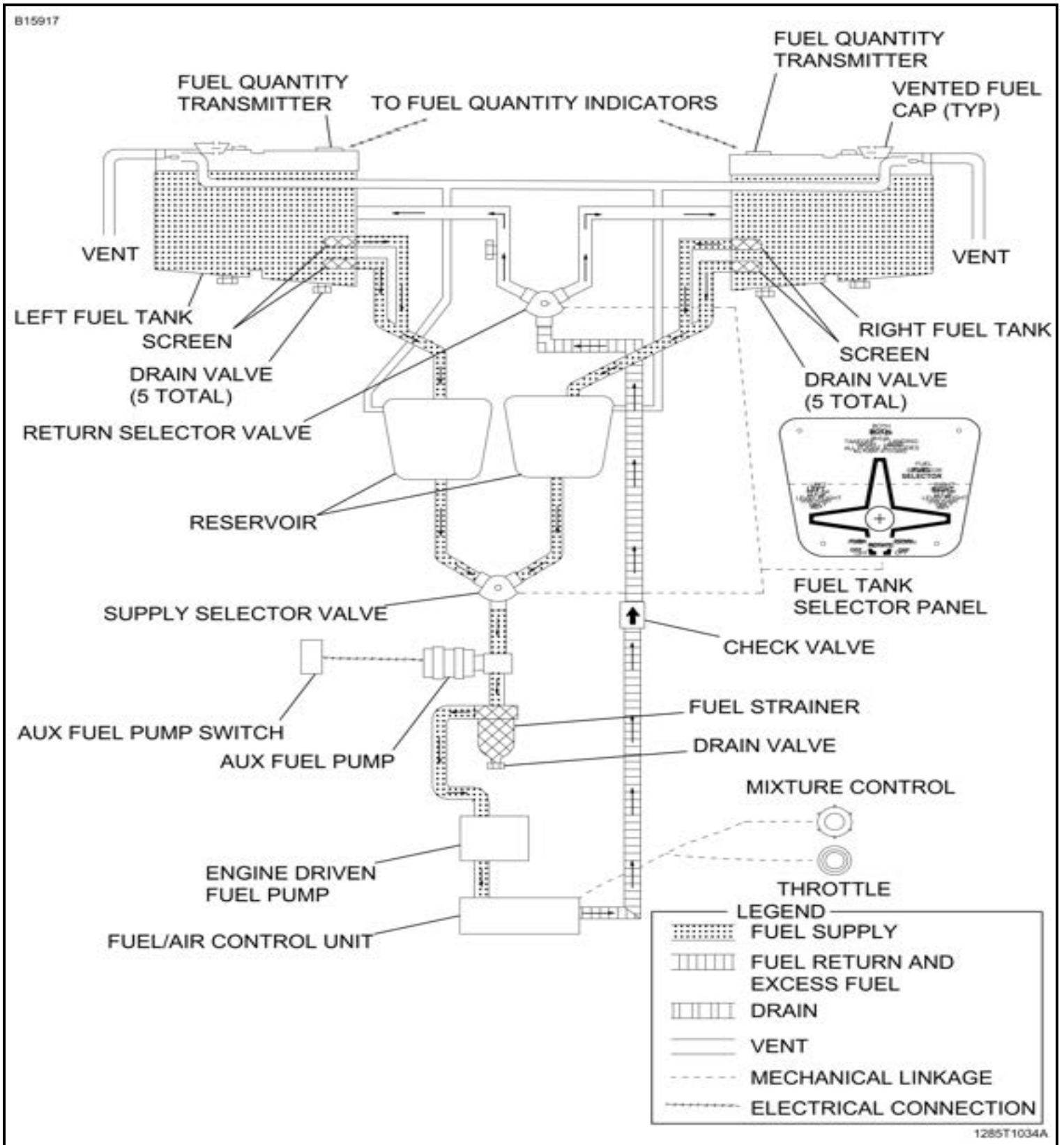


Figure 1 : Sheet 2 : Fuel System Schematic



FUEL STORAGE AND DISTRIBUTION - MAINTENANCE PRACTICES

1. General

- A. The fuel storage and distribution maintenance practices consist of fuel bay component removal/installation and adjustment/test (Refer to [Figure 201](#)).

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 the entrance 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 do work on 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/installation is typical. Five fuel drains are installed in each wing.

- A. Remove the Fuel Drain Valve (Refer to [Figure 202](#)).
 - (1) Remove the fuel from the airplane. Refer to Chapter 12, [Fuel - Servicing](#).
 - (2) Use a fuel sampler cup and press the fuel drain valve up to make sure the fuel bay is empty of fuel.
 - (3) Remove the safety wire from the fuel drain valve.
 - (4) Remove the fuel drain valve from the fuel bay.
- B. Install the Fuel Drain Valve (Refer to [Figure 202](#)).
 - (1) Install the fuel drain valve in the fuel bay and attach safety wire to the clip. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
 - (2) Add a sufficient quantity of fuel to cover the bottom of the fuel bays.
 - (3) Do a check of the fuel drain valves for leaks.

4. Fuel Reservoirs Removal/Installation

NOTE: The fuel reservoir removal/installation is typical for the left and right reservoirs.

- A. Remove the Fuel Reservoir (Refer to [Figure 203](#)).
 - (1) Set the fuel shutoff valve to the OFF position.
 - (2) Defuel the fuel tanks. Refer to Chapter 12, [Fuel - Servicing](#).
 - (3) Remove the pilot and copilot seat and carpet. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
 - (4) Remove the carpet from the forward cabin. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
 - (5) Remove the access panels [230CB](#) and [230DB](#) to get access to the reservoirs. Refer to Chapter 6, [Access/Inspection Plates - Description and Operation](#).
 - (6) Set a container under the fuel drain in the bottom of the fuselage and drain the fuel from the reservoir.

NOTE: Each fuel reservoir holds 0.41 gallons (1.55 liters).
 - (7) Disconnect the reservoir vent tube.
 - (8) Disconnect the reservoir inlet tube.
 - (9) Disconnect the reservoir outlet tube.
 - (10) Remove the screws installed in the reservoir to the airplane structure.
 - (11) Remove the reservoir from the airplane.
- B. Install the Fuel Reservoir (Refer to [Figure 203](#)).
 - (1) Put the fuel reservoir in the airplane and install with screws.
 - (2) Connect the reservoir outlet tube.
 - (3) Connect the reservoir inlet tube.
 - (4) Connect the reservoir vent tube.

- (5) Make sure the fuel reservoir drain is closed.
- (6) Put the fuel shutoff valve in the ON position.
- (7) Do a check on the fuel reservoir connections for any fuel leaks.
- (8) Turn on the auxiliary fuel pump and exam for positive fuel pressure on the fuel pressure gage.
- (9) Install the access panels [230CB](#) and [230DB](#). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (10) Install the carpet. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (11) Install the pilot and copilot seats. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).

5. Fuel Selector Shaft Removal/Installation

A. Remove the Fuel Selector Shaft (Refer to [Figure 204](#)).

- (1) Remove the button plug on the top of the fuel selector valve handle to show the screw in the handle.
- (2) Remove the screw and lift up on the handle to disconnect it from the fuel selector shaft.
- (3) Remove the metal placard from the pedestal.
- (4) Remove the pedestal cover. Refer to Chapter 27, [Pedestal Cover](#).
- (5) Remove the carpet as required. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (6) Remove the support assembly.
- (7) Remove the floor access plate [230BB](#). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (8) Remove and discard the cotter pin from the pin that attaches the fuel selector shaft to the fitting.
- (9) Remove the washer and pin from the fuel selector shaft.
- (10) Remove the fuel selector shaft from the fitting.

B. Install the Fuel Selector Shaft.

- (1) Put the fuel selector shaft into the fitting and install the pin, washer and a new cotter pin.
- (2) Install the floor access plate [230BB](#). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (3) Lay the carpet back into place and install the support assembly.
- (4) Install the pedestal cover. Refer to Chapter 27, [Pedestal Cover](#).
- (5) Install the placard on the pedestal.
- (6) Attach the selector handle onto the fuel selector shaft with the washer, screw and plug button.
- (7) Make sure of the correct rotation of the fuel selector handle through the LEFT, RIGHT, and BOTH selector positions.
- (8) Make sure that the selector handle can be pushed down and rotate to the OFF position.

6. Fuel Selector Valve Removal/Installation

A. Remove the Fuel Selector Valve (Refer to [Figure 204](#)).

- (1) Defuel the airplane. Refer to Chapter 12, [Fuel - Servicing](#).
 - (a) Set an applicable container under the fuel selector quick drain.
 - (b) Make sure the fuel selector valve is in the OFF position and remove the drain plug from the fuel selector valve.
 - (c) Turn the fuel selector valve to the BOTH position and drain the fuel from the door post fuel lines.
 - (d) Install the drain plug in the fuel selector valve and install safety wire. Refer to Chapter 20, [Safetying - Maintenance Practices](#).
- (2) Remove the button plug on the top of the fuel selector valve handle to show the screw.
- (3) Remove the screw and lift up on handle to disconnect it from the fuel selector valve shaft.
- (4) Remove the metal placard from the pedestal to get access to the valve, plumbing and universal joints.
- (5) Remove the pedestal cover. Refer to Chapter 27, [Elevator Trim Control - Maintenance Practices](#).
- (6) Remove the support assembly.
- (7) Remove the pilot and copilot seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (8) Remove the forward carpet as required to get to the access plate [230BB](#) that is aft of the pedestal. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (9) Remove access plate [230BB](#).

- (10) Disconnect the lower universal joint at the selector valve shaft.
- (11) Disconnect and put a cap on the fuel lines to selector valve, fuel supply and fuel return.
- (12) Remove the screws attaching the selector valve to the mounting plate and remove the valve from the airplane.

B. Install the Fuel Selector Valve (Refer to [Figure 204](#)).

- (1) Attach the selector valve to the mounting plate.
- (2) Connect the fuel lines to the valve.
- (3) Connect the lower universal joint to the valve shaft.
- (4) Install the access plate [230BB](#) and carpet. Refer to Chapter 6, Access/Inspection Plates - Description and Operation.
- (5) Install the support assembly.
- (6) Install the pedestal cover. Refer to Chapter 27, [Elevator Trim Control - Maintenance Practices](#).
- (7) Install the metal placard to the pedestal.
- (8) Install the fuel selector valve handle to the selector shaft with the screw.
- (9) Install the button plug on the fuel selector handle.
- (10) Make sure of the correct rotation of the fuel selector handle through the Left, Right, and Both positions.
- (11) Refuel the airplane. Refer to Chapter 20, [Fuel - Servicing](#).
- (12) Examine the selector valve for leaks.

7. Fuel Bay Vents Adjustment/Test

NOTE: A vent line is installed in the outboard end of each fuel bay. The vent line extends overboard through the lower wing skin near the point where the lift struts attach to the underside of the wings.

A. Adjust the Fuel Bay Vents. (Refer to [Figure 205](#) and [Figure 206](#)).

WARNING: Blocked vent lines and bleed holes will cause insufficient fuel or the pressurization of tanks by fuel expansion. Any fuel vent found blocked or restricted must be corrected before you return the airplane to service.

NOTE: Fuel vents may become blocked and not supply the engine with sufficient fuel. If the bleed hole in the vent valve becomes blocked, then pressurization can occur due to normal temperature variation. This would usually occur when the airplane engine is not operating. The procedures that follow must be used to do a check of the fuel vent and bleed system.

- (1) For a check of the serviceability of the fuel vent check valve, do the procedures that follow.
- (2) Attach a rubber tube to the end of the vent line under the wing.
- (3) Block the vent on the opposite wing from the one that is tested.
- (4) Blow into tube to slightly pressurize the tank. If any air can enter the tank, the vent line is open.
- (5) After the tank is slightly pressurized, insert the end of a rubber tube into a container of water and watch for a continuous stream of bubbles. The bubbles will indicate the bleed hole in the valve assembly is open which relieves the tank pressure.
- (6) After completing step B.(3), blow into the tube again to slightly pressurize the tank. Crimp rubber tube to keep the pressure in the tank.
 - (a) Loosen but do not remove the filler cap on the opposite wing to do a check of the cell crossover line.
 - (b) If the pressure escapes from the filler cap, the crossover line is open. Remove the rubber tube from the end of the vent line under the wing.
- (7) Complete steps B.(1) through B.(5) on the opposite wing.

NOTE: A serviceable wing fuel vent check valve will let positive pressure bleed through the bypass port from the fuel tank. An unserviceable wing fuel vent check valve will not let positive pressure to bleed through the bypass port from the fuel tank.

- (8) If the fuel vent check valve does not correctly operate, do the procedures that follow.
 - (a) Drain the fuel from the airplane. Refer to Chapter 12, [Fuel - Servicing](#).
 - (b) Open the applicable wing access panel [510KB](#) or [610KB](#) to get access 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.

- (d) Replace the fuel vent check valve with a new one. Make sure the bypass hole on the valve flap is installed at the top of the fuel bay.
- (e) Install and seal the applicable wing fuel bay access plate [510KB or 610KB](#). Make sure there is a complete seal of the access plate. Refer to Chapter 28, [Fuel Bay Sealing - Maintenance Practices](#).
- (f) Do a test to make sure the new fuel vent check valve operates correctly. Refer to steps 8.B.(1) through 8.B.(6).
- (g) Fill the fuel tank with fuel. Refer to Chapter 12, [Fuel - Servicing](#).
- (h) Do an inspection for leaks.
 - 1 If there are leaks, drain the fuel. Refer to Chapter 12, [Fuel - Servicing](#).
 - 2 Remove the wing access panels and seal until no leaks are evident. Refer to Chapter 28, [Fuel Bay Sealing - Maintenance Practices](#).
 - 3 Fill the fuel tank with fuel and do an inspection for leaks. Refer to Chapter 12, [Fuel - Servicing](#).
- (9) Make sure the fuel vent line is in the correct position in relation to the wing struts.

WARNING: One of the fuel vent lines must be positioned behind a lift strut. Use the dimensions called out in Figure 205. This position will supply protection from ice in at least one vent tube.

 - (a) Set 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.
 - 1 Removal of the strut cuff may be necessary to get a correct measurement when you use a scale.
 - 2 The distance from the wing skin to the bottom of the fuel vent line must be 3.50 inches +0.03 or -0.03 (88.90mm +0.762 or -0.762).
 - (b) Use a six-inch scale to measure the straight line distance from the back of the wing strut to the end of the fuel vent line.

NOTE: The distance from the strut to the end of the fuel vent line must be 1.12 inches +0.03 or -0.03 (28.45mm +0.762 or -0.762).
- (10) Complete the procedures that follow if adjustments are required for the fuel vent line.
 - (a) Remove the access/inspection plates [510KB or 610KB](#). Refer to Chapter 6, Inspection/Access Plates - Description and Operation.
 - (b) Loosen the clamp that attach the fuel vent line in position.
 - (c) Adjust by hand the fuel vent line to the correct dimensions.
 - (d) Tighten the clamp to attach the fuel vent line in position.
 - (e) Install the access/inspection plates [510KB or 610KB](#). Refer to Chapter 6, Inspection/Access Plates - Description and Operation.

B. Adjust the Fuel Tank Feed Rate.

- NOTE: Uneven fuel feed may occur with the fuel selector valve set in the BOTH position. This is caused by unequal pressure that act on the each of the fuel tank vents. This may be corrected if you use the procedures that follow.**
- NOTE: The procedures that follow can be completed during a sequence of routine flight operations. Flights for the only purpose of a check and to adjust the fuel tank feed rates is not recommended due to the amount of time required.**
- (1) Complete an inspection of the vent system.
 - (a) Make sure the ventilation lines are open.
 - (b) Make sure all connections are attached.
 - (c) Make sure that the system operates correctly.
 - (2) Park the airplane on level ground and set the fuel selector to the BOTH position. Refer to Chapter 10, [Parking - Maintenance Practices](#).
 - (3) Leave the airplane parked until the fuel tank levels are equal, or fill both tanks. Refer to Chapter 12, [Fuel - Servicing](#).
 - (4) Fly the airplane with the fuel selector in the BOTH position and climb to an altitude where the air is smooth.
 - (5) Trim the airplane for a straight and level flight.

- (a) Trim the rudder to center the ball of the turn coordinator to make sure the airplane is free of any yaw. Fly at the top of the green band on manifold pressure for a period of at least one hour.
- (6) At the end of the hour and while you are in a straight and level flight, write the fuel tank levels that show on the fuel quantity indicator.
- (7) If there is a fuel tank level difference of more than 5.0 gallons (19.0 liters), land the airplane, do a visual check of the fuel tank levels and then and complete one of the steps that follow.

CAUTION: One of the vents must remain positioned behind the strut as illustrated in [Figure 205](#) for ice protection.

- (a) Carefully bend by hand, outboard 0.25 inch (6.35mm) the underwing vent of the tank that has the highest level.
- (b) Carefully bend by hand, inboard 0.25 inch (6.35mm) the underwing vent of the tank that has the lowest level, providing the vent is not squarely behind the strut.
- (8) Repeat steps 8.C.(1) through 8.C.(7) during routine flights until the fuel feed rates for the tanks are within 5.0 gallons/hour of each other.

8. Vented Fuel Filler Cap Adjustment/Test

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.
- (2) Disconnect the safety chain (if installed) and use a cover or plug on the open tank to keep out foreign material.
- (3) Examine the large gasket and frictionless washer for condition and replace if necessary.
- (4) Carefully lift the edges of the umbrella to clean it and the bottom of the vent spring holder with cotton swabs and solvent to remove all contaminants. Use a second swab to clean and remove all cotton fibers on the bottom of the vent spring holder and umbrella valve.
 - (a) Do this step until the cotton swabs do not show discoloration.
- (5) Replace the umbrella if it continues to leak or is deteriorated.
 - (a) To help prevent a tear in the umbrella stem during removal, lubricate it with MIL-PRF-5606 hydraulic fluid.
 - (b) Lubricate the stem with MIL-PRF-5606 hydraulic fluid when you install the new umbrella.
 - (c) Use a small blunt tool to install the umbrella valve into the vent spring holder.
- (6) Connect the fuel cap to the safety chain (if installed).
- (7) Install the fuel cap in the adapter assembly.

9. Electric Auxiliary Fuel Pump Removal/Installation

A. Remove the Electric Auxiliary Fuel Pump (Refer to [Figure 208](#)).

- (1) Make sure the ALT/BAT MASTER switch is set in the OFF position.
- (2) Disconnect the battery ground cable from the battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
- (3) Set the fuel selector in the OFF position.
- (4) Remove the pilot seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (5) Remove the carpet as necessary. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).
- (6) Remove access plate [230AB](#) to get access to the pump. Refer to Chapter 6, [Access/Inspection Plates - Description and Operation](#).
- (7) Disconnect the fuel lines.
- (8) Disconnect the electrical connection (JN003) from the electric auxiliary fuel pump (UN007).
- (9) Loosen the clamps to the pump and remove the pump from the airplane.

B. Install the Electric Auxiliary Fuel Pump (Refer to [Figure 208](#)).

- (1) Set the pump in the clamps and tighten the clamps.
- (2) Connect the electrical connection (JN003) to the electric auxiliary fuel pump (UN007).
- (3) Connect all the fuel lines.
- (4) Install the access plate [230AB](#). Refer to Chapter 6, [Access/Inspection Plates - Description and Operation](#).
- (5) Install the carpet. Refer to Chapter 25, [Interior Upholstery - Maintenance Practices](#).

- (6) Install the pilot seat. Refer to Chapter 25, [Front Seats - Maintenance Practices](#).
- (7) Turn the fuel selector to BOTH.
- (8) Attach the battery ground cable to the battery. Refer to Chapter 24, [Battery - Maintenance Practices](#).
- (9) Set the ALT/BAT MASTER switch to ON.
- (10) Operate the pump and do a check for leaks and correct operation.

10. Fuel Strainer Disassembly/Cleaning/Assembly

A. Disassemble and Clean the Fuel Strainer (Refer to [Figure 209](#)).

- (1) Turn the fuel selector to the OFF position.
- (2) Disconnect the strainer drain tube.
- (3) Remove the safety wire, nut, washer and O-ring at the bottom of filter bowl and remove the bowl.
- (4) Carefully loosen the standpipe and remove the standpipe from the airplane.
- (5) Remove the filter assembly, O-ring and gasket.
- (6) Wash the filter assembly and bowl with soap and water, then dry them with compressed air.

B. Assemble the Fuel Strainer (Refer to [Figure 209](#))

- (1) Install a new gasket between the filter screen and top assembly.
- (2) Install the standpipe with the screen assembly and a new O-ring. Tighten the standpipe only finger tight.
- (3) Install the bowl with the nut, washer and a new O-ring. Torque the nut to 25 to 30 inch pounds (2.825 to 3.390 Nm).
NOTE: The step-washer at the bottom of bowl is installed so that the step fits against the O-ring.
- (4) Attach the strainer drain tube.
- (5) Close the strainer drain.
- (6) Set the fuel selector to BOTH.
- (7) Do a check for leaks.
- (8) Do a check for proper operation.
- (9) Attach a safety wire from the bottom nut to the top assembly. The safety wire must have a right hand wrap at least 45 degrees. Refer to Chapter 20, [Safetying - Maintenance Practices](#).

Figure 201 : Sheet 1 : Fuel System Installation

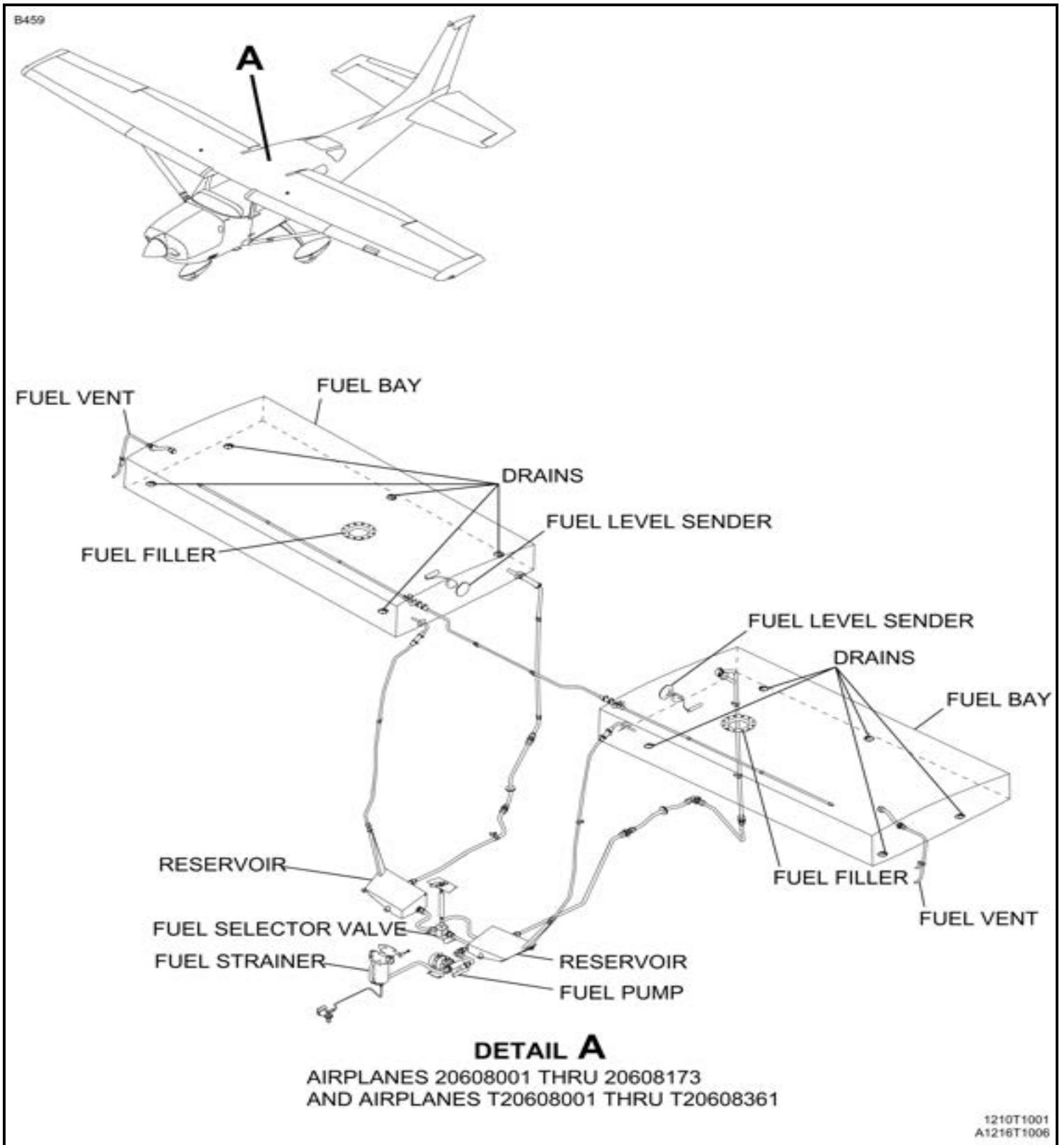
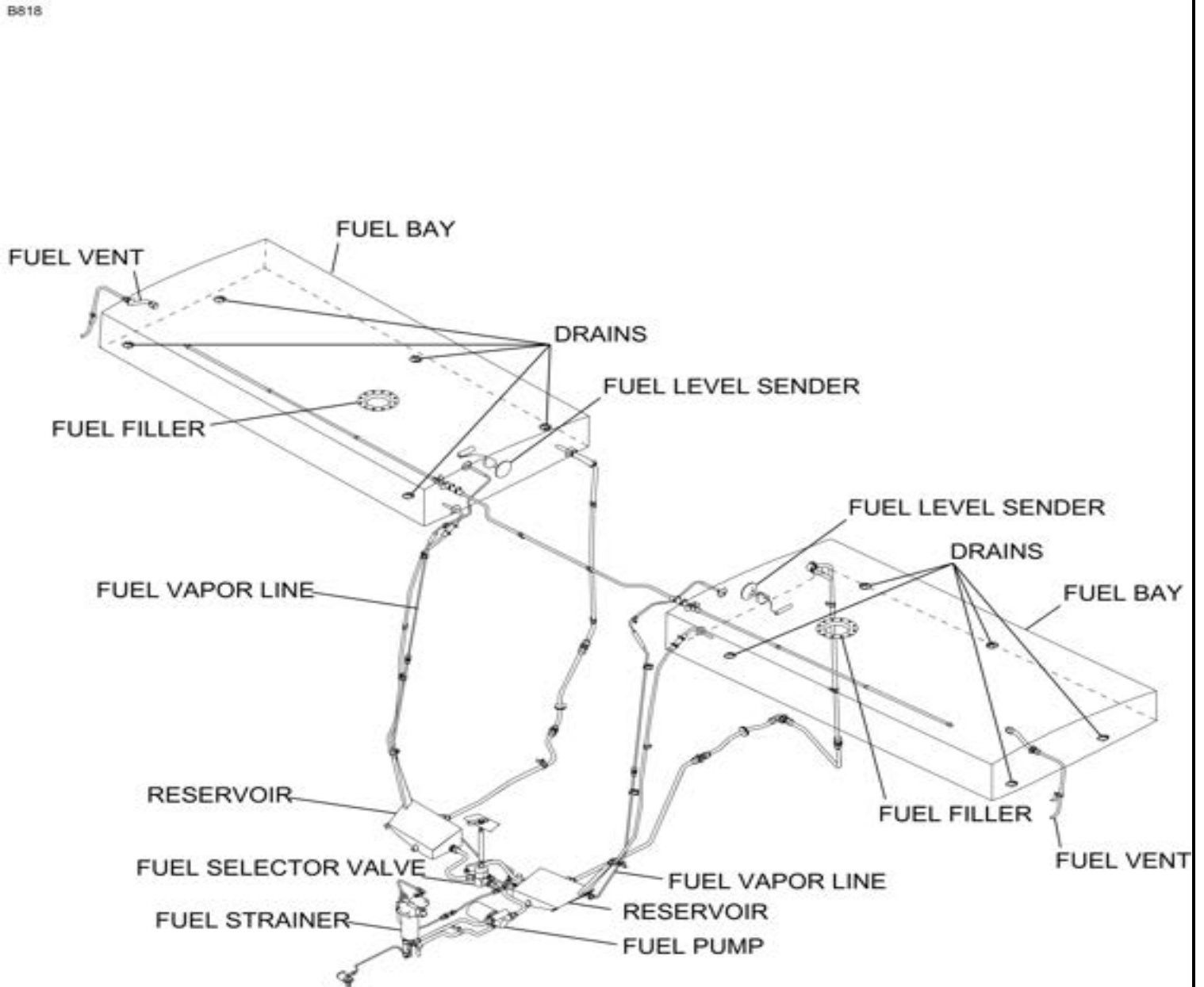


Figure 201 : Sheet 2 : Fuel System Installation



DETAIL A

AIRPLANES 20608174 AND ON
AND AIRPLANES T20608362 AND ON

A1216T1012

Figure 202 : Sheet 1 : External Fuel Drains

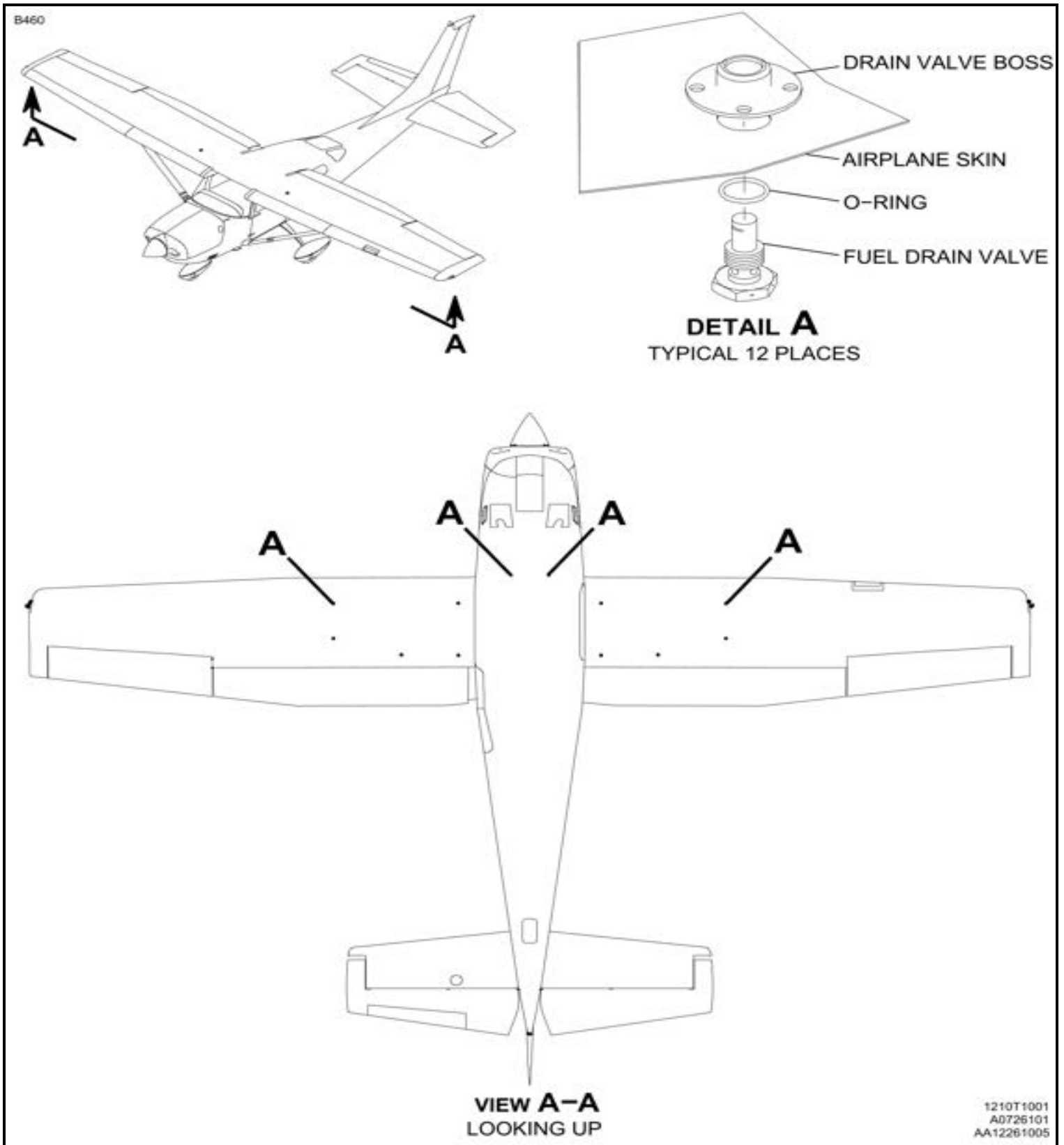


Figure 203 : Sheet 1 : Fuel Reservoir Installation

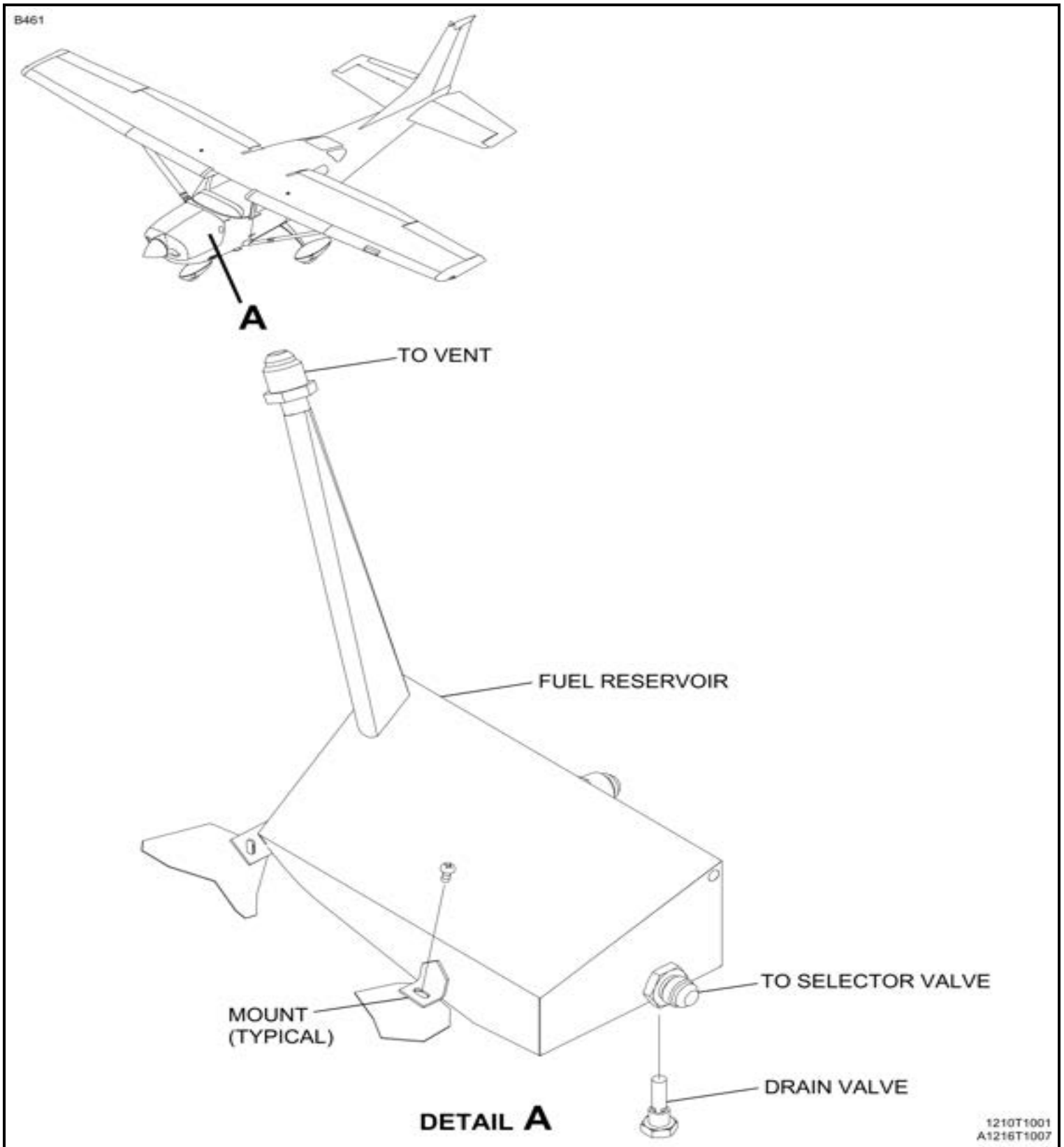


Figure 204 : Sheet 1 : Fuel Selector Valve Installation

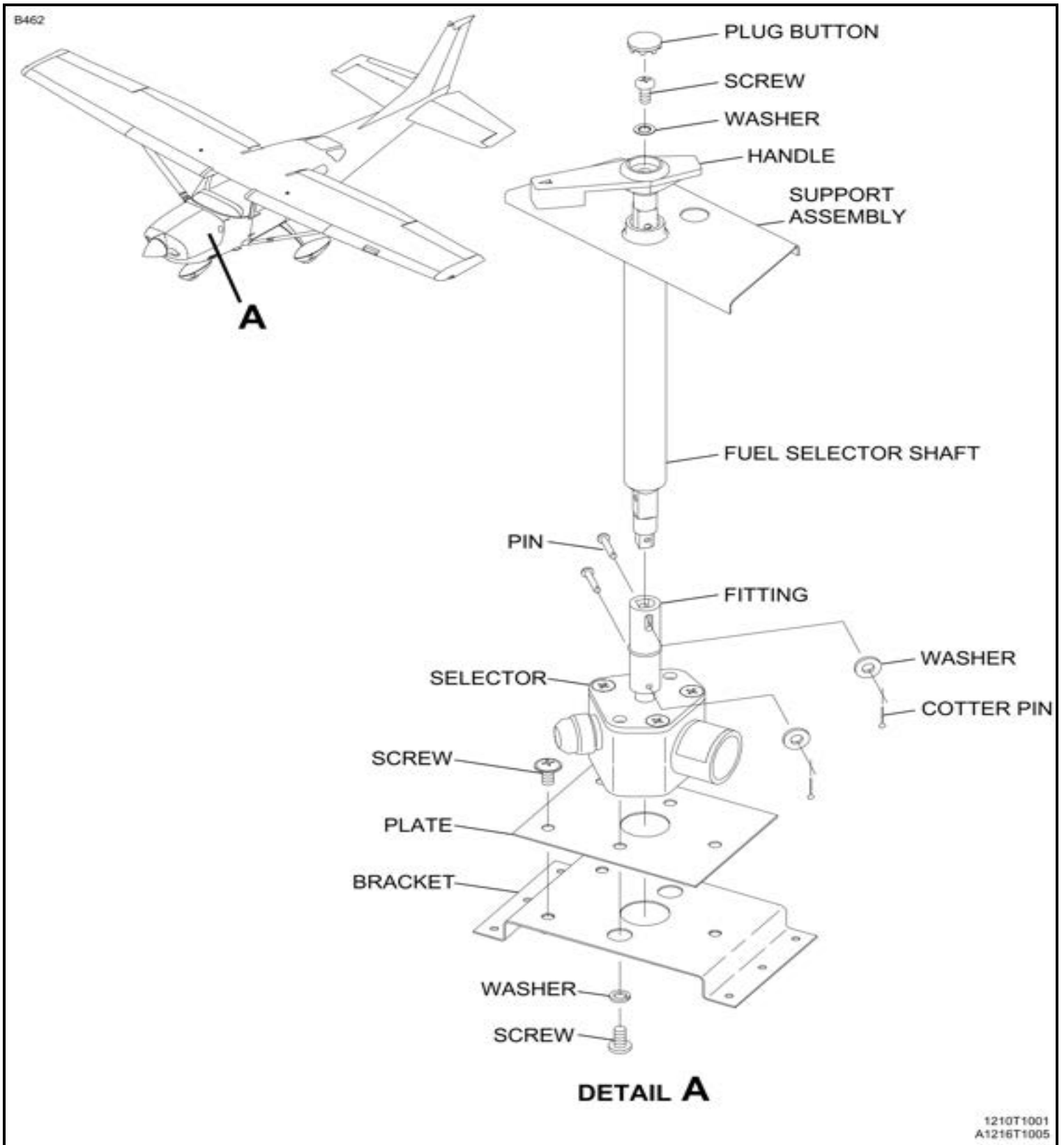


Figure 205 : Sheet 1 : Fuel Vent Location

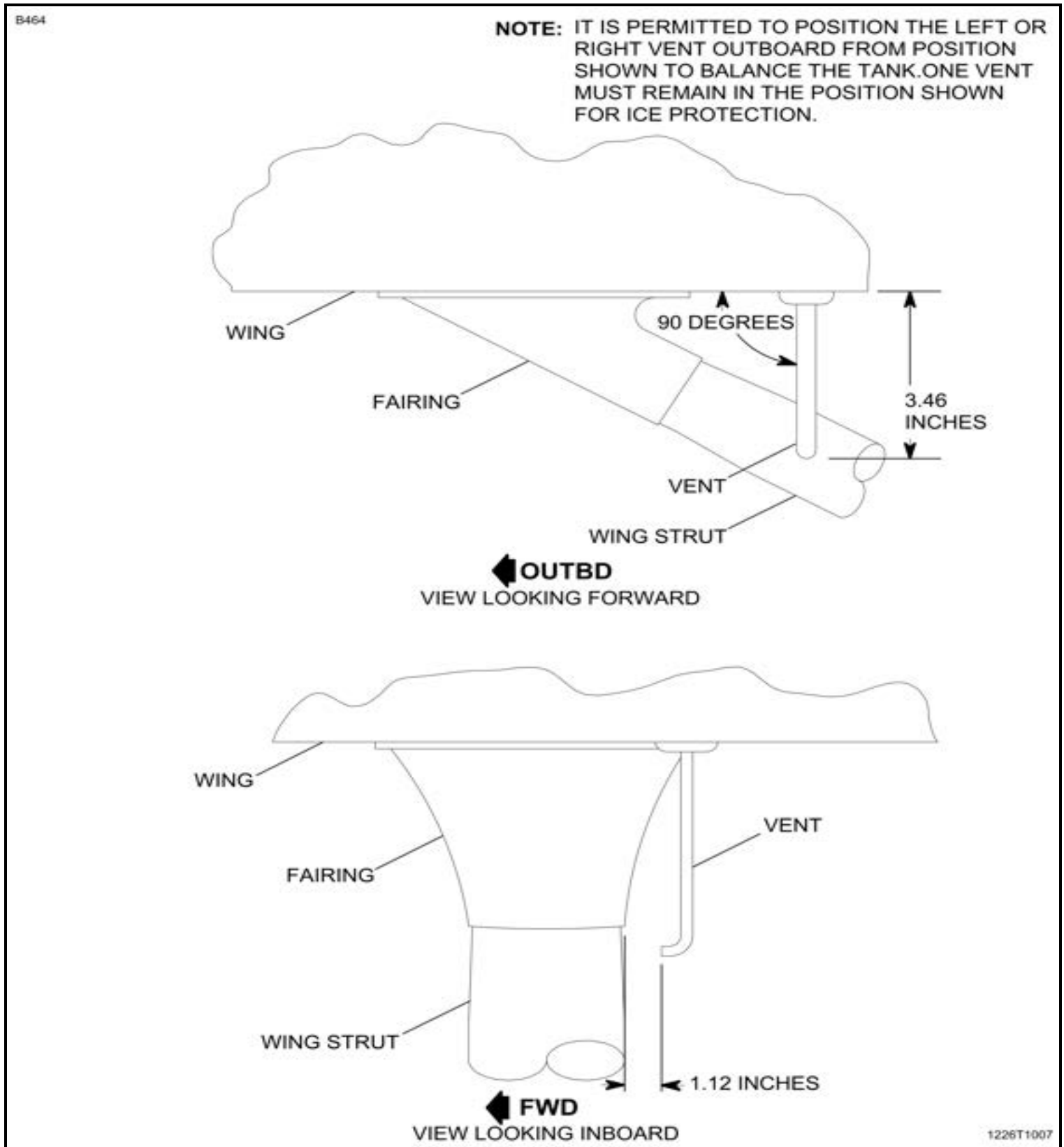


Figure 206 : Sheet 1 : Wing Fuel Tank Vent Check Valve

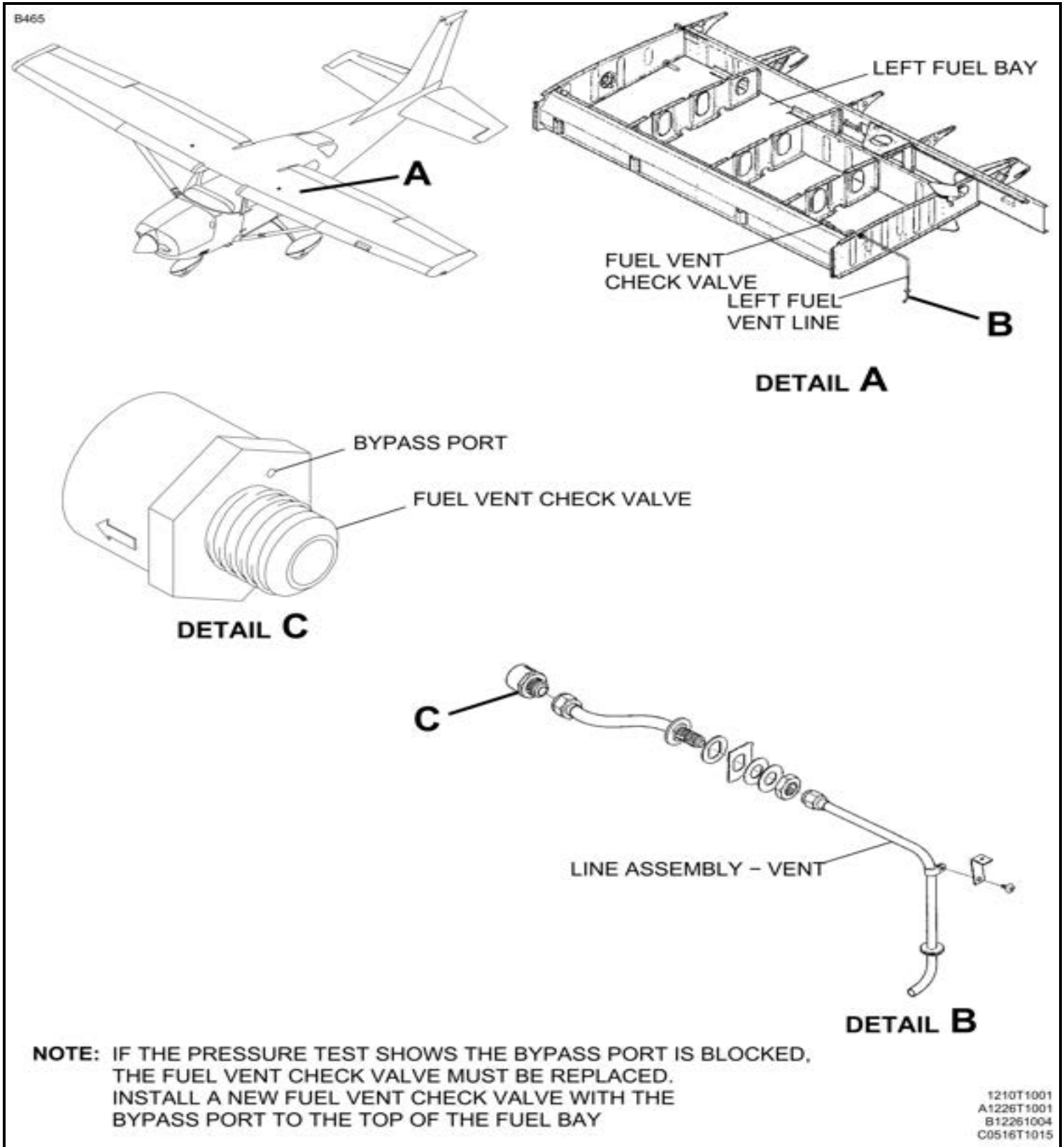


Figure 207 : Sheet 1 : Vented Fuel Filler Cap

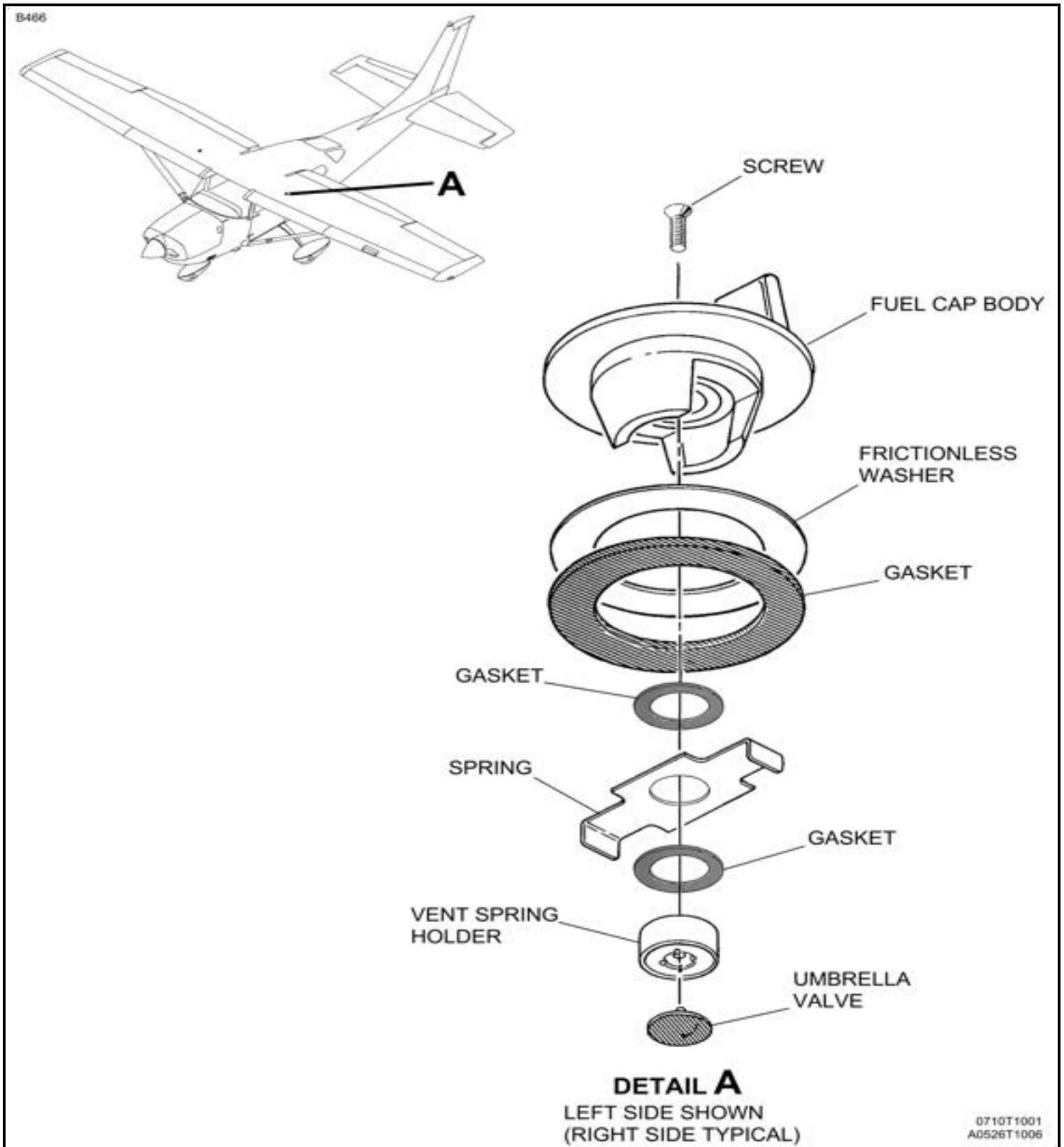


Figure 208 : Sheet 1 : Electric Auxiliary Fuel Pump

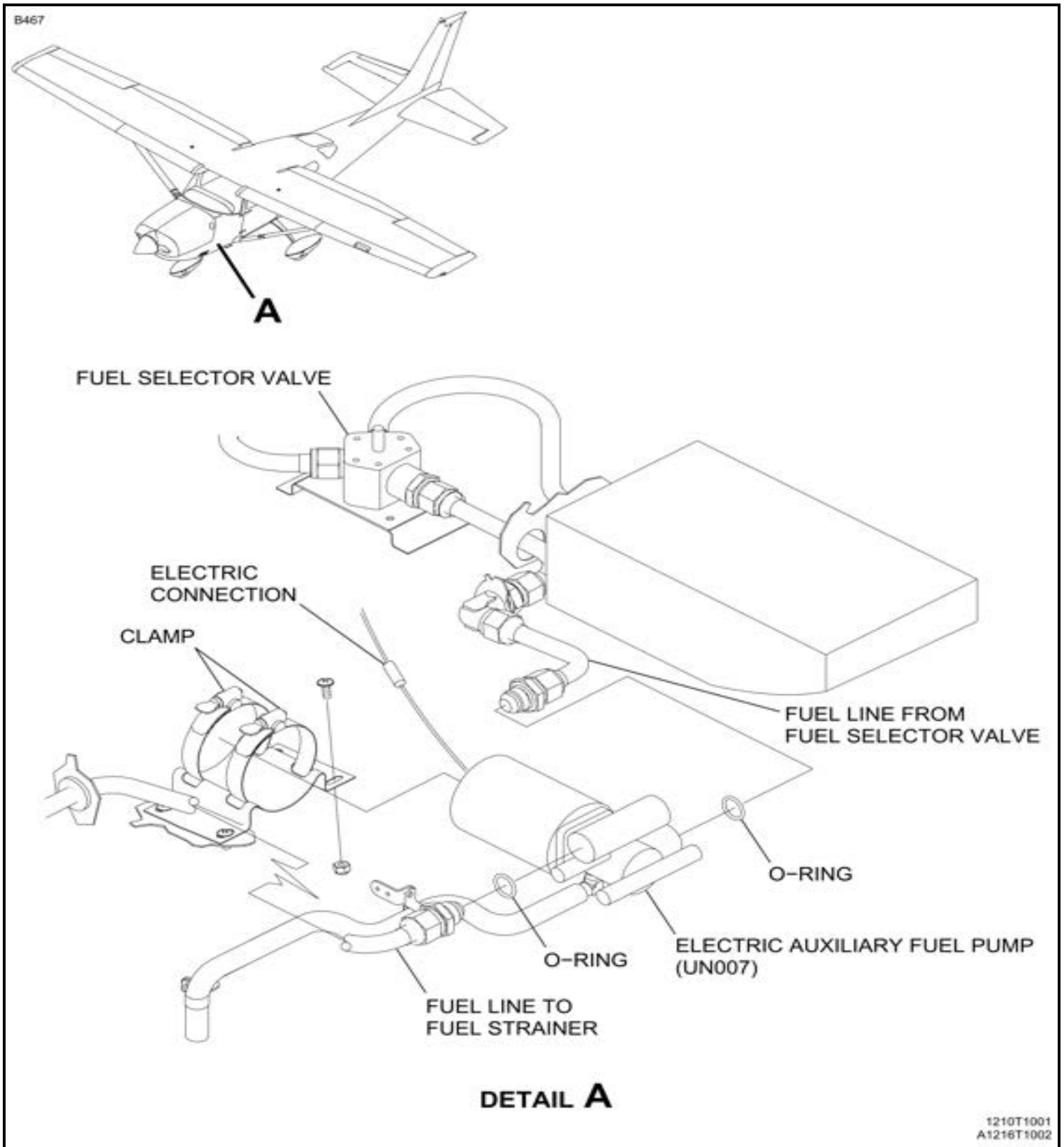


Figure 209 : Sheet 1 : Fuel Strainer Assembly

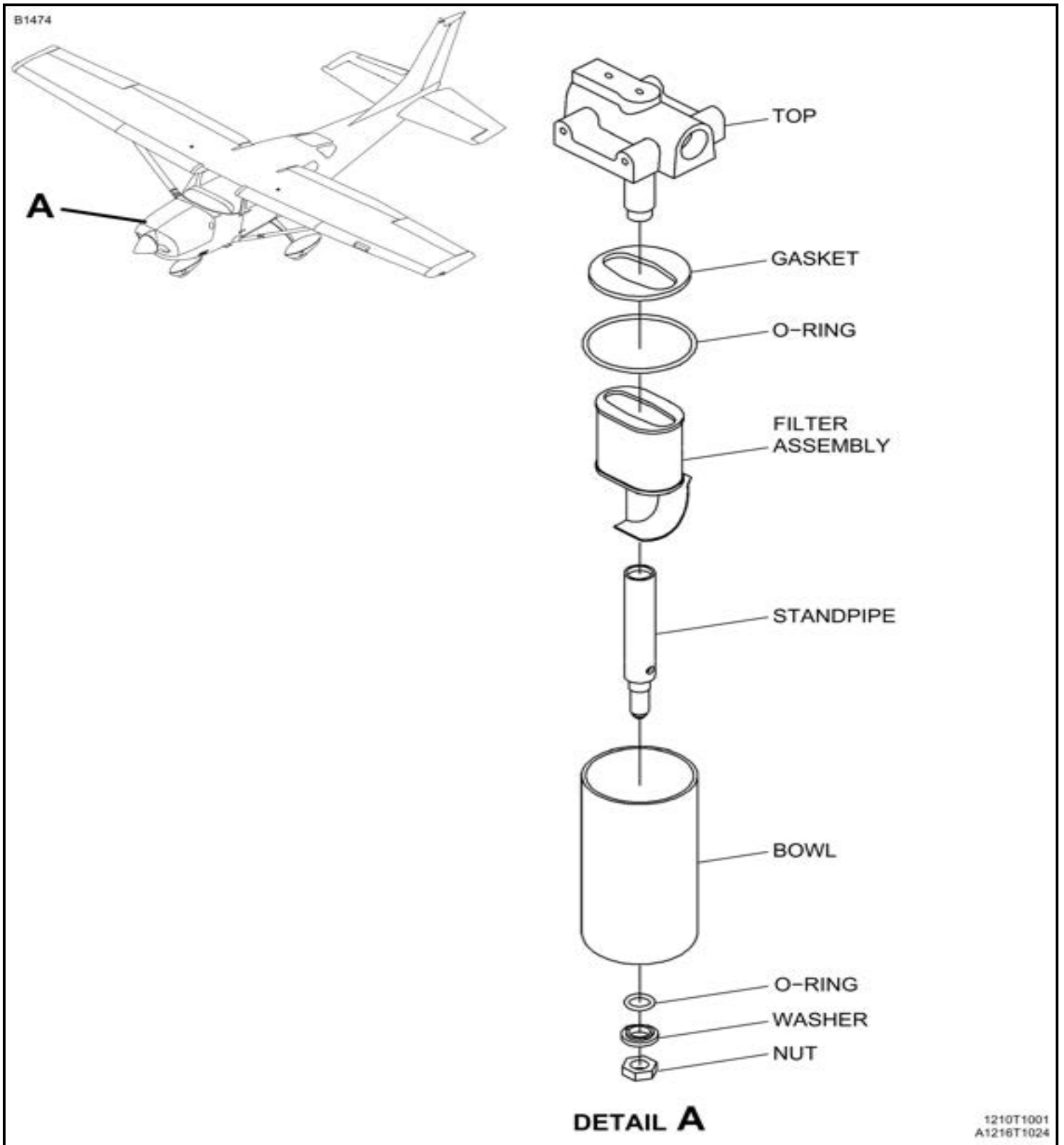


Figure 1 : Sheet 1 : Cabin Floorboard Panels

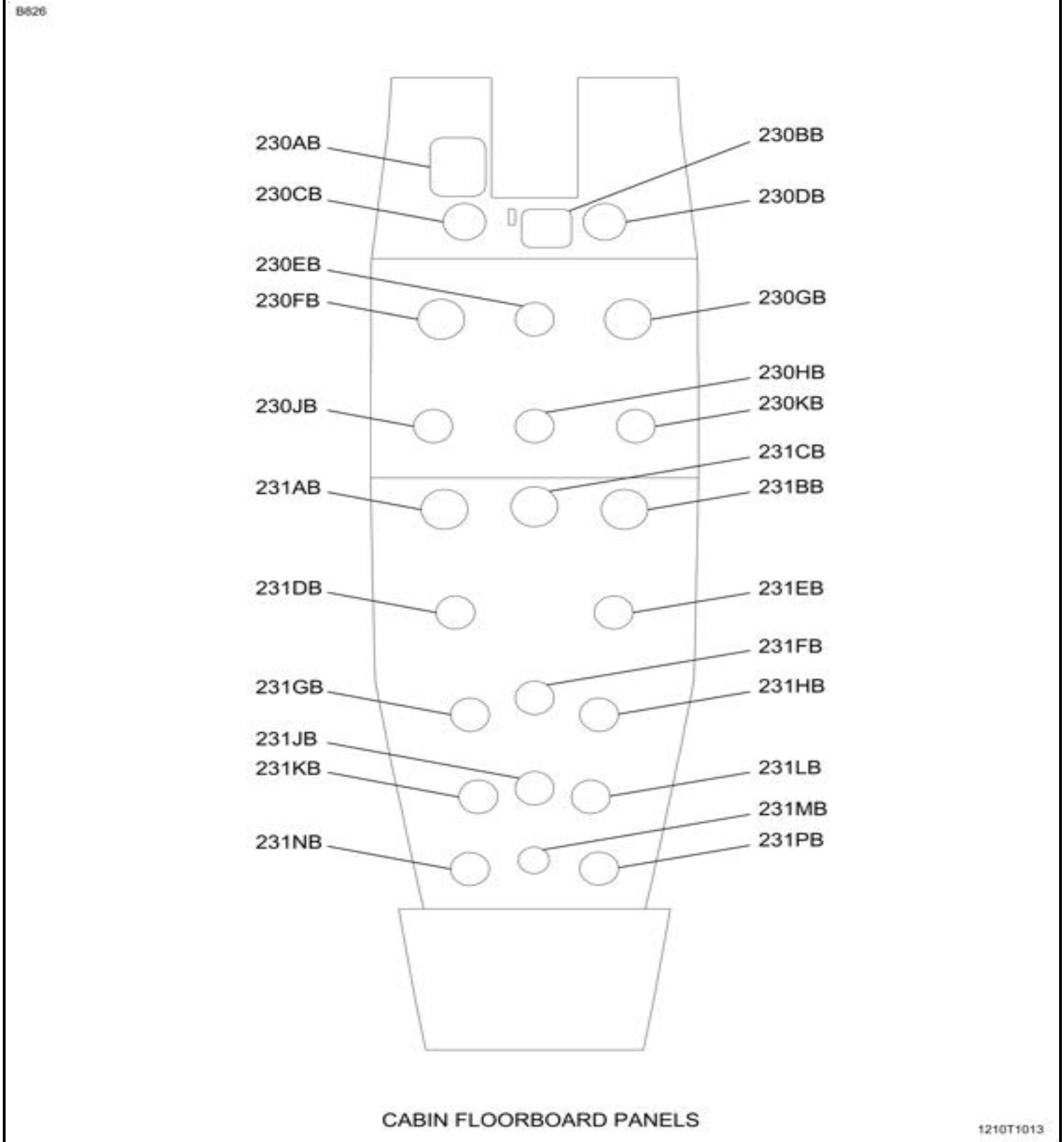
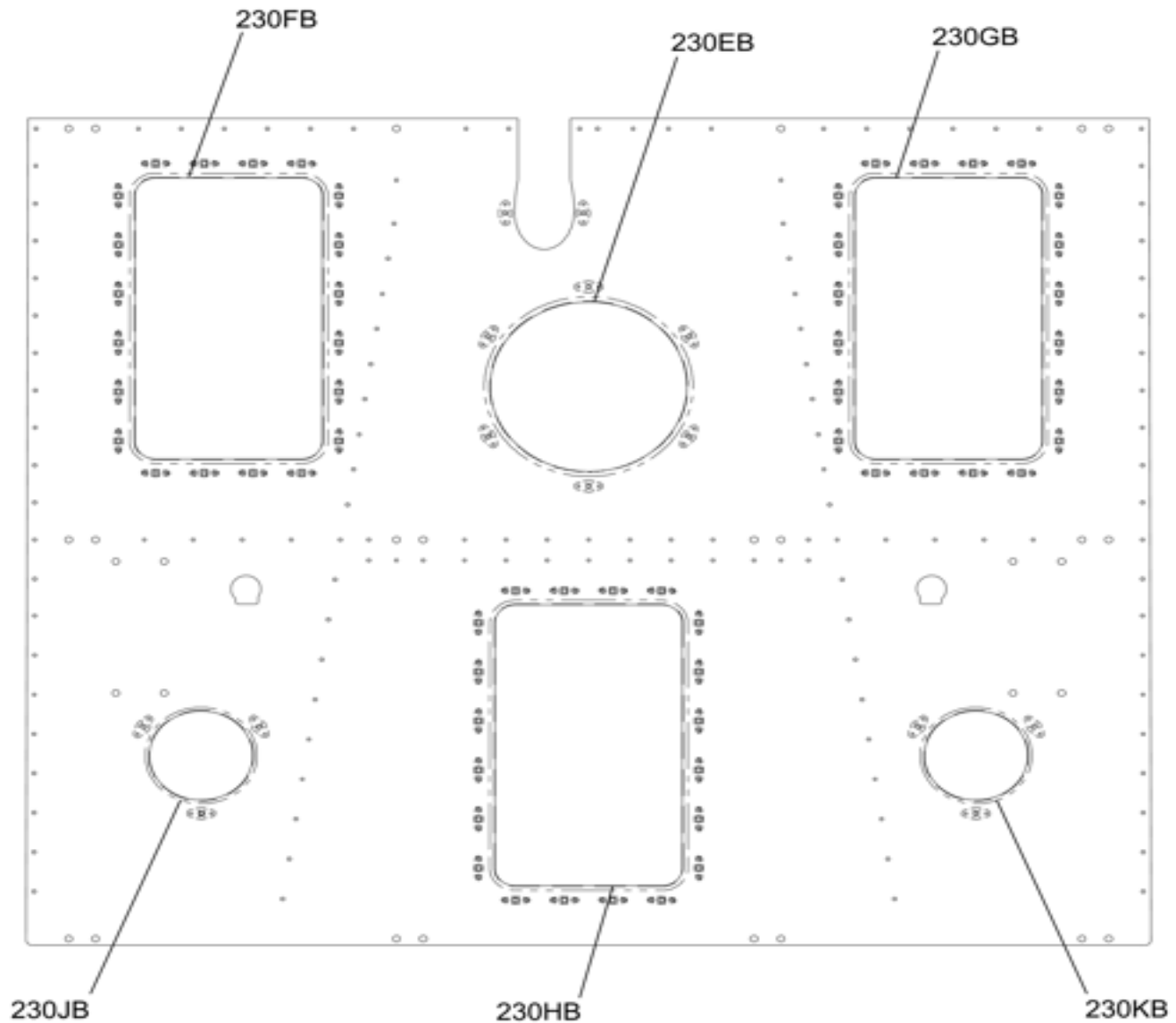


Figure 1 : Sheet 2 : Cabin Floorboard Panels

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AIRPLANES 9197 AND ON

1210T821-1

Figure 3 : Sheet 1 : Wing Access Panels

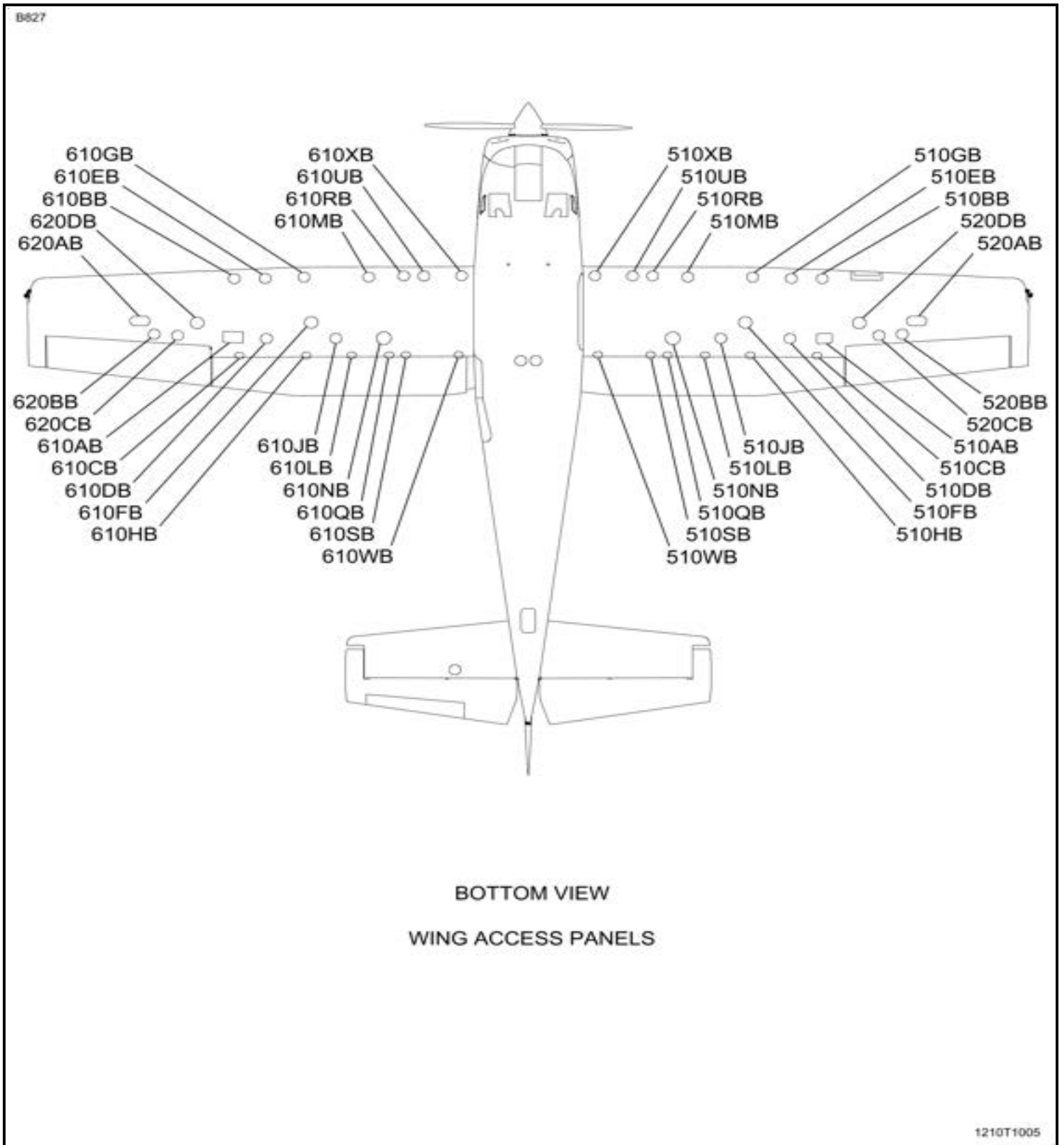
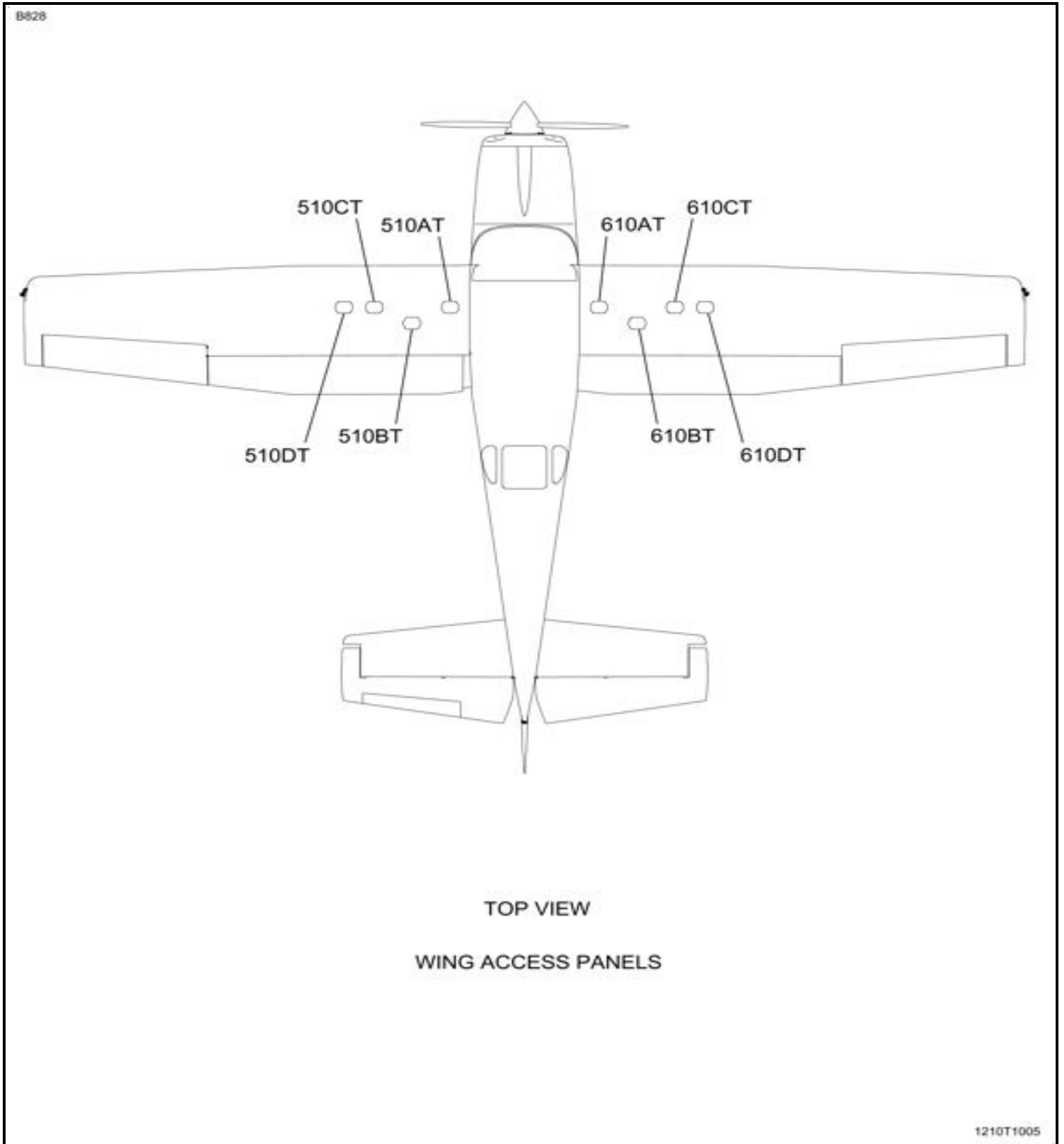


Figure 3 : Sheet 2 : Wing Access Panels



FUEL BAY SEALING - MAINTENANCE PRACTICES

1. General

- A. The fuel bays need to be resealed if a leak has started or if the wing has been repaired. These procedures give instructions on how to seal the fuel bays, classify fuel leaks and test the 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 put into four classes based on the observed size and condition of the leak. Immediate corrective action can be necessary prior to flight if the leak is found in some spots. The four classes of leaks are as follows and as shown 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 inches (19.05 mm to 38.1 mm) in diameter.
 - (3) Heavy Seep - An area from 1.50 inches to 4.00 inches (38.1 mm to 101.6 mm) in diameter.
 - (4) Running Leak - Size changes with spot and intensity of leak.
- B. Corrective action before flight is necessary for the leaks that follow.
 - (1) Running leaks in any area.
 - (2) Stains, seeps or heavy seeps in a closed area.
NOTE: A closed area is defined as the wing leading edge and the section of wing inboard or outboard of the fuel bays.
- C. Corrective action is necessary when the airplane is grounded for other maintenance for the leaks that follow.
 - (1) Stains, seeps or heavy seeps not in a closed area.

4. Sealing Fuel Leaks

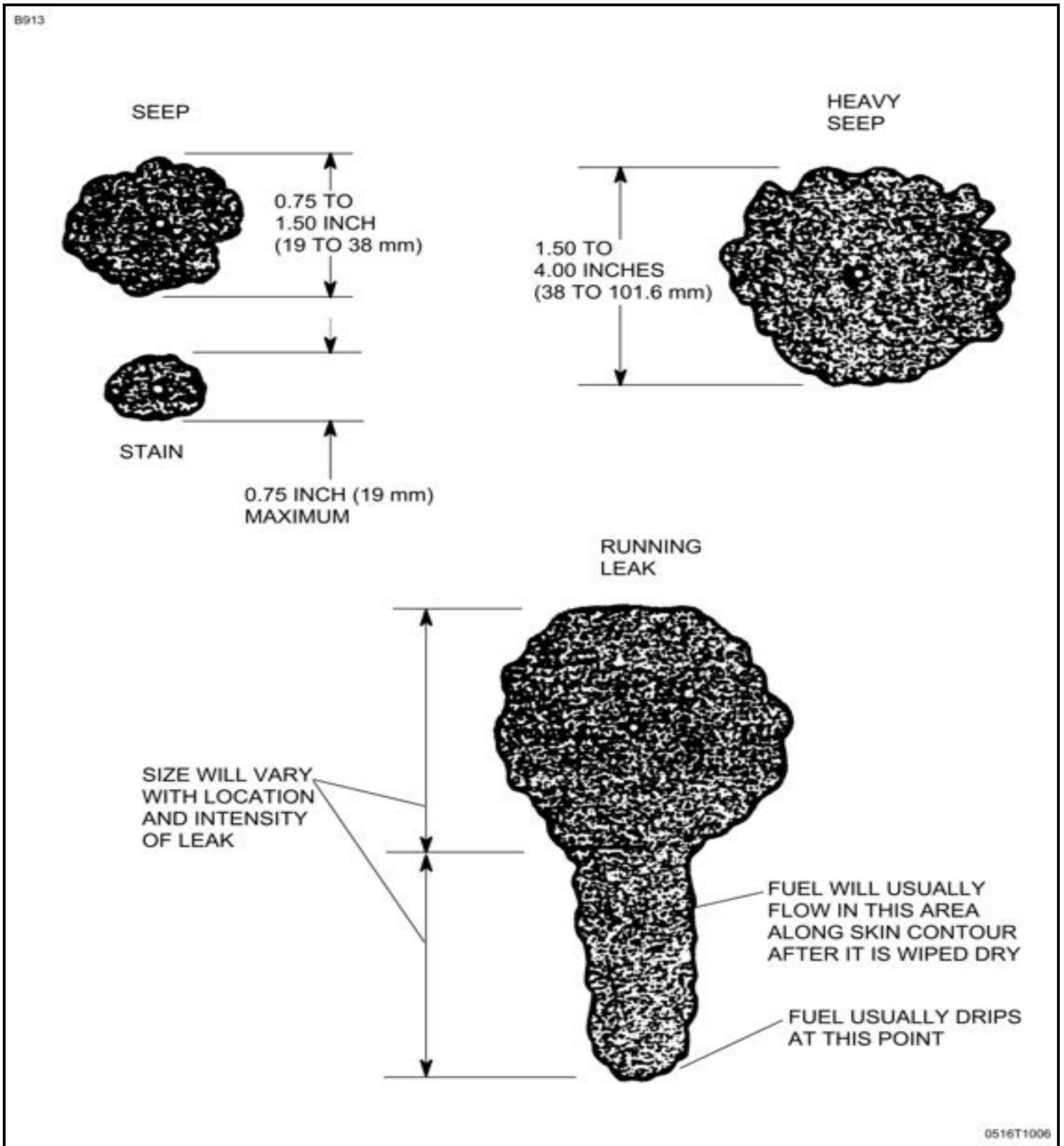
- A. Find the Source of the Leak.
NOTE: Fuel can flow along a seam or structure of the wing for several inches which can make the leak source difficult to find. A stained area is an indication of the leak source.
 - (1) Find fuel leaks in the fuel bay. Refer to [Test the Integral Fuel Bay](#).
 - (2) Another procedure to find the source of a fuel leak is to remove the access doors and blow with an air nozzle from the inside of the bay in the area of the leak while a soap-bubble solution is applied to the outside wing skin.
- B. Repair the Leak.
 - (1) Remove the sealant in the area of the leak.
 - (2) Clean the area and apply a fillet seal. Push the sealant into the area with the leak with a small paddle. Make sure to remove all of the air bubbles.
 - (3) If a leak occurs around a rivet or bolt, replace the rivet or loosen the bolt, torque and seal around the nut plate.
 - (4) Apply Type VIII sealant to the correct areas. Refer to Chapter 20, [Fuel, Weather and High-Temperature Sealing - Maintenance Practices](#).
 - (5) Let the sealant cure completely.
 - (6) Do a test of the fuel bay for leaks. Refer to [Test the Integral Fuel Bay](#).

5. Test the Integral Fuel Bay

- A. The fuel system has two vented, integral fuel tanks (one in each wing). The procedure that follows must be used only after the sealant has fully cured.
 - (1) Remove the vent line from the vent fitting and cap fitting.
 - (2) Disconnect the fuel lines from the bay.
 - (3) Attach a water manometer that can measure 20 inches (0.508 m) of water to one of the bay fittings.
 - (4) Connect a well-regulated supply of air (0.5 PSI (3.45 kPa) maximum) or 13.8 (0.351 m) inches of water to the other bay fitting. Nitrogen can be used where the bay is exposed to temperature changes during the test.
 - (5) Make sure that the filler cap is installed and sealed.
 - (6) Apply pressure slowly until there is 0.5 PSI (3.45 kPa).

- (7) Monitor the pressure. If it the pressure does not stay at 0.5 PSI (3.45 kPa), apply a soap solution as necessary to see where there is a leak.
- (8) Let the pressure stabilize for 15 to 30 minutes.
- (9) If the bay holds for 15 minutes without pressure loss, the seal is satisfactory.
- (10) Seal and do the test again if any leaks are found.

Figure 201 : Sheet 1 : Classification of Fuel Leaks



FUEL QUANTITY INDICATION SYSTEM - TROUBLESHOOTING

1. Troubleshooting

- A. This section provides troubleshooting information for the fuel quantity indication system on airplanes with the CAN bus fuel sensors.

TROUBLE	PROBABLE CAUSE	REMEDY
RED Xs OVER THE FUEL QUANTITY INDICATORS.	1. Proper software configuration not loaded.	Check the software configuration. Refer to Software Configuration Check .
	2. No information transmitted between the fuel quantity sensor and the Integrated Avionics Unit (GIA).	Check the system wiring. Refer to the System Wiring Resistance Check .
	3. No electrical power to the fuel quantity sensors.	Check for power to the sensor in question. Refer to System Power Check .
	4. Damaged fuel quantity sensor.	Remove the fuel quantity sensor in question and connect it to the connector on the opposite side. If the problem follows the sensor, replace it. Refer to Fuel Quantity Indication System-Removal/Installation . If the problem does not follow the sensor, contact Cessna Customer Services at 316-517-5800.
Questionable Fuel Quantity Indication Value	1. Proper software configuration not loaded.	Check the software configuration. Refer to Software Configuration Check .
	2. A Fuel Quantity Calibration necessary.	Do a fuel quantity calibration. Refer to Fuel Quantity System Calibration (Airplanes with Garmin G1000 and CAN bus type fuel level sensors) .

2. Software Configuration Check

- A. Check the software configuration.
- Put the BAT MASTER switch and the AVIONICS MASTER switches to the ON position to start the G1000 system in normal mode.
 - Disengage the MFD and both PFD circuit breakers.
 - After 10 seconds, engage both PFD circuit breakers while the ENT button is pushed on the PFD.
 - Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
- NOTE:** The PFD is now in the configuration mode.
- Use the Flight Management System (FMS) outer knob to go to the GIA page group.
 - Use the FMS inner knob to go to the CAN CONFIGURATION page.
 - Push the inner FMS knob to start the cursor.
 - Use the outer FMS knob to move the cursor over CHNL 1.
 - Use the FMS inner knob to go to the CHNL 2.
 - Make sure that the values on the PFD match the values in Tables 101 and 102.
 - If the values on the PFD do not match the values in Tables 101 and 102, load the configuration data. Refer to [Fuel Quantity Indication System-Adjustment/Test](#).

Table 101. CAN I/O (Inputs/Outputs)

	SET	ACTIVE
INPUT DATA	VIBRO-METER FUEL PROBE	VIBRO-METER FUEL PROBE
OUTPUT DATA	OFF	OFF

SPEED	0000125000	0000125000

Table 102. FUEL PACKETS PRESENT

	SET	ACTIVE
FUEL QNTY L #1	ON	ON
FUEL QNTY L #2	OFF	OFF
FUEL QNTY L #3	OFF	OFF
FUEL QNTY L #4	OFF	OFF
FUEL QNTY L #5	OFF	OFF
FUEL QNTY C #1	OFF	OFF
FUEL QNTY C #2	OFF	OFF
FUEL QNTY R #1	ON	ON
FUEL QNTY R #2	OFF	OFF
FUEL QNTY R #3	OFF	OFF
FUEL QNTY R #4	OFF	OFF
FUEL QNTY R #5	OFF	OFF

3. System Wiring Resistance Check

A. Check the system wiring resistance. Refer to [Figure 101](#)

- (1) Remove electrical power from the plane.
- (2) Remove the headliner to get access to the wing root. Refer to Chapter 25, [Cabin Panels - Removal/Installation](#).
- (3) Test the system as described in Table 103, Continuity and Resistance Test
 - (a) If necessary, repair the damaged wiring.

Table 103. Continuity and Resistance Test

Airplane Configuration	Pins to measure		Acceptable Resistance (Ohms)
	Positive meter lead	Negative meter lead	
Left sensor (PL900) disconnected to take measurements on PL900. Right sensor connected. Airplane master switches OFF.	Pin 3 (CAN BUS HI)	Pin 4 (CAN BUS LO)	Approximately 120Ω
	Pin 3 (CAN BUS HI)	Airplane ground	Greater than 100kΩ
	Pin 4 (CAN BUS LO)	Airplane ground	Greater than 100kΩ
	Pin 3 (CAN BUS HI)	Pin 1 (28VDC)	Greater than 100kΩ
	Pin 4 (CAN BUS LO)	Pin 1 (28VDC)	Greater than 100kΩ
	Pin 6 (CONFIG 0)	Pin 11 (CONFIG RETURN)	Approximately 0Ω
	Pin 12 (CAN TERM RES START)	Pin 5 (CAN TERM RES END)	Approximately 0Ω
	Make sure pins 7, 8, 9, 10, and 13 have no connection.		
Right sensor (PR900) disconnected to take measurements on PR900. Left sensor connected. Airplane master switches OFF.	Pin 3 (CAN BUS HI)	Pin 4 (CAN BUS LO)	Approximately 120Ω
	Pin 3 (CAN BUS HI)	Airplane ground	Greater than 100kΩ
	Pin 4 (CAN BUS LO)	Airplane ground	Greater than 100kΩ
	Pin 3 (CAN BUS HI)	Pin 1 (28VDC)	Greater than 100kΩ
	Pin 4 (CAN BUS LO)	Pin 1 (28VDC)	Greater than 100kΩ
	Pin 9 (CONFIG 0)	Pin 11 (CONFIG RETURN)	Approximately 0Ω
	Pin 12 (CAN TERM RES START)	Pin 5 (CAN TERM RES END)	Approximately 0Ω

		Make sure pins 6, 7, 8, 10, and 13 have no connection.		
	Both sensors (PR900 and PL900) disconnected. Take measurements on PR900. Airplane master switches OFF.	Pin 3 (CAN BUS HI)	Pin 4 (CAN BUS LO)	Greater than 1kΩ

4. System Power Check

A. Check the System Power.

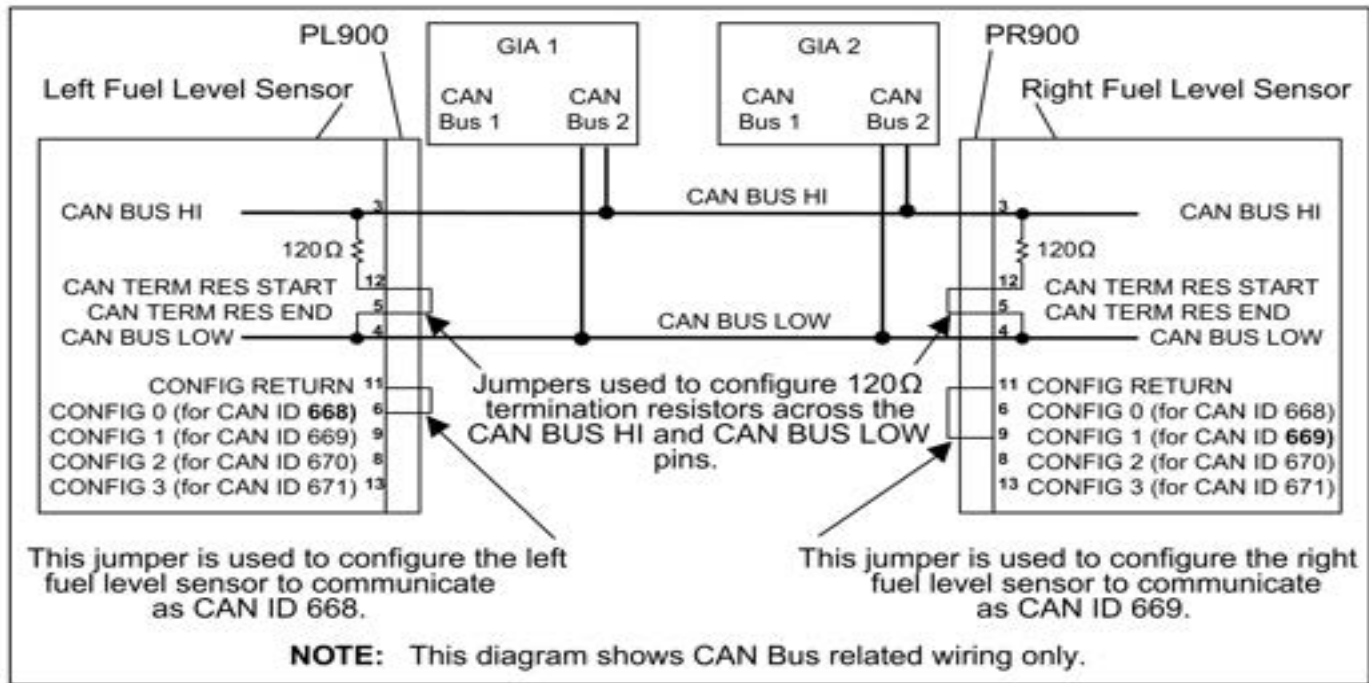
- (1) Disengage the NAV1 ENG circuit breaker on the ESS BUS.
- (2) Put a wires in Pin 1 (28VDC) and Pin 2 (GROUND) of the connector.
- (3) Put the voltmeter probes on the wire to the applicable pin.

CAUTION: Make sure the wires or probes do not touch when the NAV1 ENG circuit breaker is engaged. If the wires or probes touch, the inline system protection fuse will open.

- (4) Engage the NAV1 ENG circuit breaker.
- (5) Make the system reads 28 volts.
 - (a) If the system does not have power, troubleshoot the power distribution system including the inline system protection fuse.
- (6) Disengage the NAV1 ENG circuit breaker.
- (7) Remove the wires from the connector.

Figure 101 : Sheet 1 : CAN Bus Wiring Diagram

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FUEL QUANTITY INDICATION SYSTEM - REMOVAL/INSTALLATION

1. General

A. This section gives the instructions for removal and installation of the components fuel quantity indication system.

2. Float-type Fuel Level Sender Removal/Installation

NOTE: The removal and installation of the float-type fuel level senders is typical for the left and right fuel bays.

A. Remove the Fuel Level Sender (Refer to [Figure 401](#)).

- (1) Drain the fuel from 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 fuel level sender float arm.
- (4) Remove the screws that attach the fuel level sender to the nut ring and retain for installation.
- (5) Carefully remove the fuel sender and gasket from the fuel bay.

B. Install the Fuel Level Sender (Refer to [Figure 401](#)).

- (1) Connect an ohmmeter between the ground terminal and center terminal to check the resistance of the fuel level sender as applicable:
 - (a) If tanks are empty, check resistance is 3 ohms, +2 or -2 ohms.
 - (b) If tanks are full, check resistance is 90 ohms, +5 or -5 ohms.
- (2) Do an inspection of the gasket for cracks, splits or other damage that will keep the gasket from a correct seal. If the gaskets are damaged or there are fuel leaks, install a new gasket. Install a new gasket when you install a new fuel level sender.

CAUTION: Do not bend the fuel level sender float arm.

CAUTION: Do not attach the screw to the nut ring without the insulator. The fuel level sender can operate incorrectly without the insulator.

- (3) Carefully install the fuel quantity sender into the fuel bay and attach the nut ring with screws and insulator.

NOTE: If this is a new fuel quantity sender, use the new screws and insulators that came with the fuel quantity sender.

- (4) Connect the wire ring terminals to the fuel level sender.
- (5) Install the headliner. Refer to Chapter 25, [Cabin Panels - Removal/Installation](#).
- (6) Fill the fuel cell with fuel. Refer to Chapter 12, [Fuel - Servicing](#).
 - (a) If the fuel sender is new, you must do a fuel quantity calibration check.
- (7) Make sure there are no leaks.
- (8) Do a fuel quantity calibration and check. Refer to [Fuel Quantity Calibration and Check](#).

3. Fuel Quantity Indicator Removal/Installation

A. Make sure the fuel level senders operates correctly before the fuel quantity indicator is replaced.

- (1) Connect an ohmmeter between the ground terminal and center terminal to check the resistance of the fuel level sender as applicable:
 - (a) If tanks are empty, check resistance is 3 ohms, +2 or -2 ohms.
 - (b) If tanks are full, check resistance is 90 ohms, +5 or -5 ohms.
- (2) Make sure the resistance is 3 ohms, +2 or -2 ohms when the tanks are empty.
- (3) Make sure the resistance is 90 ohms, +5 or -5 ohms when the tanks are full.

B. Remove the Indicator (Refer to [Figure 401](#)).

- (1) Make sure the electrical power is OFF.
- (2) Get access to the forward of the fuel quantity indicator and disconnect the electrical connector.
- (3) Remove the screws that attach the indicator to the instrument panel and remove the indicator from the airplane.

C. Install the Indicator (Refer to [Figure 401](#)).

NOTE: Fuel quantity calibration must be done after installing sender. Refer to [Fuel Quantity Calibration](#).

- (1) Connect the electrical connector to the indicator.
- (2) Put the indicator in position and attach to the instrument panel with screws.
- (3) Make sure the fuel quantity gauge operates correctly.

4. Can Bus Fuel Level Sensor Removal/Installation

A. Remove the Sensor (Refer to [Figure 402](#).)

- (1) Make sure the electrical power is OFF.
- (2) Defuel the airplane. Refer to Chapter 12, [Fuel - Servicing](#).
- (3) Remove the headliner to get access to the wing root. Refer to Chapter 25, [Cabin Panels - Removal/Installation](#).
- (4) Disconnect the electrical connector from the fuel level sensor.
- (5) Disconnect the fuel level sensor ground braid.
- (6) Remove the screws that attach the fuel level sensor to the bracket.

CAUTION: Do not bend the fuel level sensor tube on the structure inside or outside the tank. A bent tube will give incorrect operation.

- (7) Carefully remove the fuel level sender from the fuel bay
 - (a) Carefully rotate the sensor tip forward of the mounting hole.
 - (b) Carefully pull the sensor out and forward of the mounting hole.

B. Install the Sensor (Refer to [Figure 402](#).)

NOTE: If the fuel level senders are replaced, the system must be calibrated. Refer to [Fuel Quantity Calibration and Check](#).

- (1) Install the new gaskets on the fuel level sensor.

CAUTION: Do not bend the fuel level sensor tube on the structure inside or outside the tank. A bent tube will give incorrect operation.

- (2) Carefully install the fuel level sender in the fuel bay.
 - (a) Put the sensor in position so that the sensor tip is in the hole in the tank and the sensor housing is toward to the front of the airplane.
 - (b) Put the sensor tube into the tank.

NOTE: When the sensor tube is put into the tank correctly, the sensor tip should point forward.

- (c) Carefully turn the sensor tip down when all of the sensor tube is inside the tank.
- (3) Attach the fuel level sensor with screws.
- (4) Torque the screws to 20 inch-pounds by cross pattern sequence.
- (5) Connect the electrical connector to fuel level sensor.
- (6) Connect the fuel level sensor ground braid.
- (7) Install the headliner. Refer to Chapter 25, [Cabin Panels - Removal/Installation](#).
- (8) Do a check of the fuel quantity calibration. Refer to [Fuel Quantity System Calibration \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).

Figure 401 : Sheet 1 : Fuel Quantity System Installation

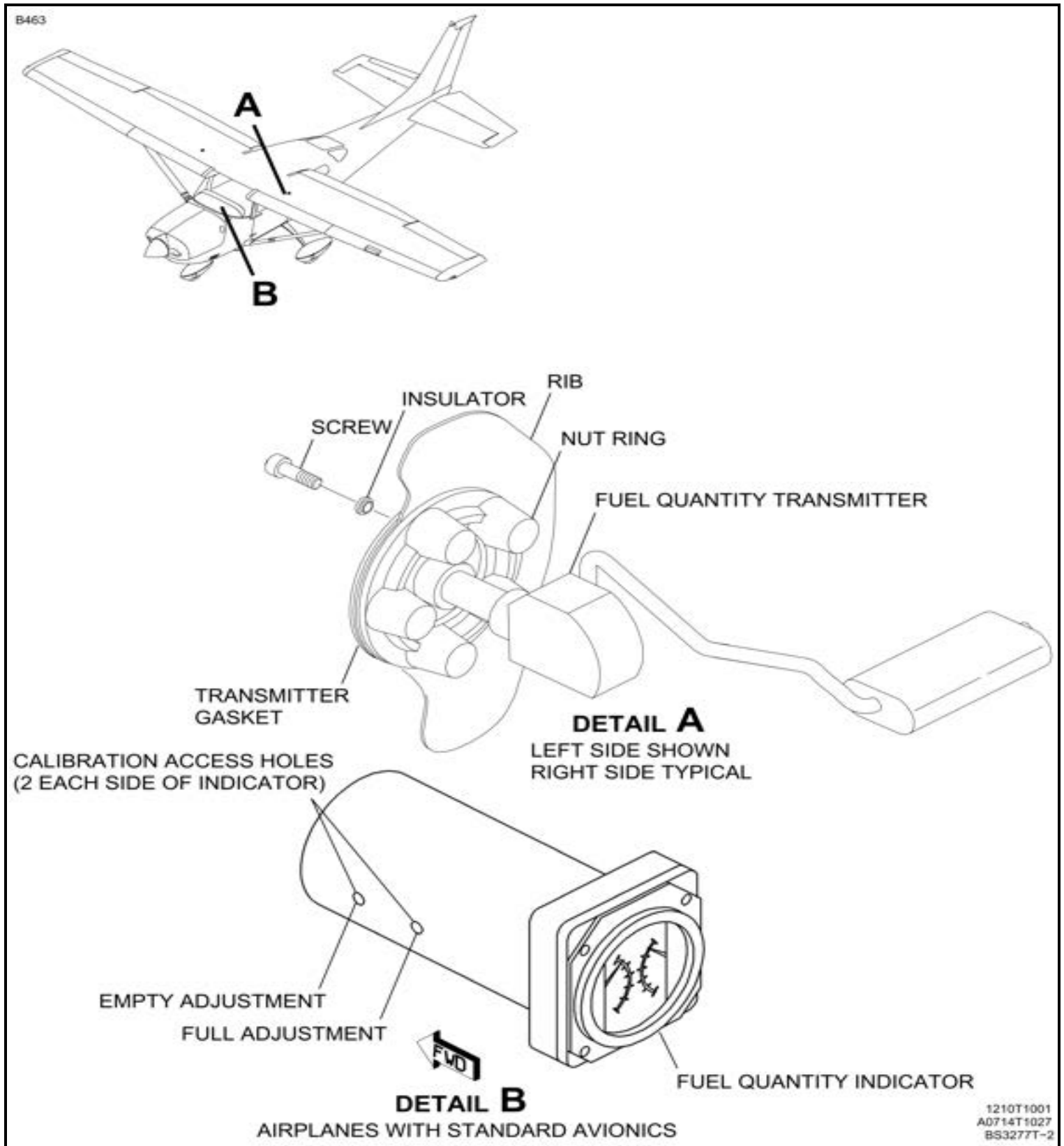
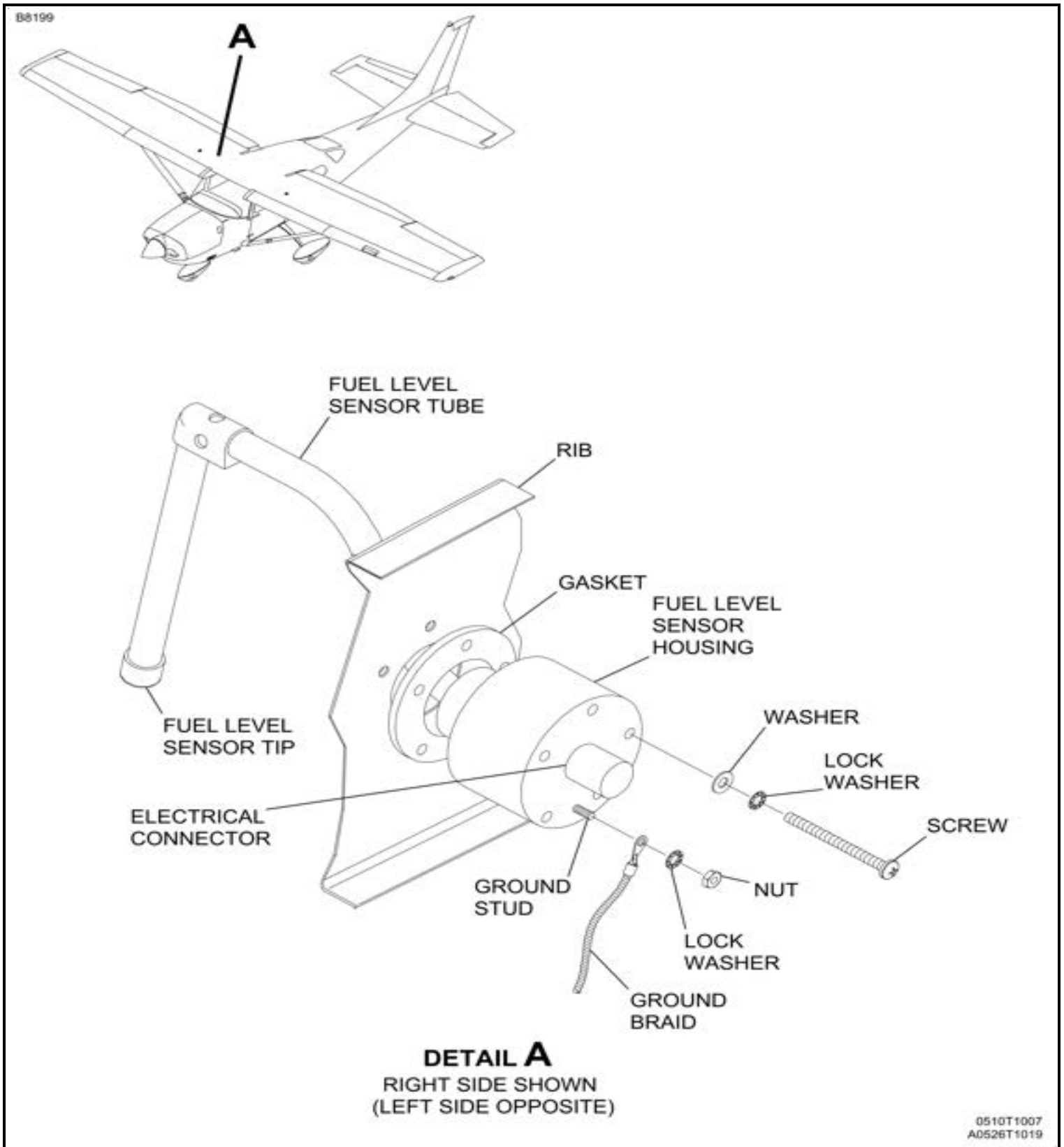


Figure 402 : Sheet 1 : Fuel Level Sensor



FUEL QUANTITY INDICATION SYSTEM - 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 Pilot's Operating Handbook for the amount of 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.
- (2) Turn the NORM/OPEN switch on the text 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 Check Setup (Airplanes with Garmin G1000 and float-type fuel level senders).

NOTE: All G1000 airplanes must have software version 563.03 or later. The software version is shown on the upper right corner of the MFD on the first page shown 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.

A. Do a Fuel Quantity Calibration and Check Setup.

- (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 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 and the AVIONICS MASTER switches to the ON position to start the G1000 system in normal mode.
- (9) Make sure the fuel quantity indications do not show red Xs.
- (10) Disengage both NAV1 ENG circuit breakers and make sure that red Xs are shown for the fuel quantity.
- (11) Engage both NAV1 ENG circuit breakers and make sure no red Xs are shown for the fuel quantity.
- (12) After 60 seconds with no red Xs, make sure LOW FUEL L and LOW FUEL R annunciations are seen.
NOTE: The annunciations will be seen when the fuel quantity indicates less than 8 gallons for 60 seconds.
- (13) Disengage the MFD and both PFD circuit breakers.
- (14) After 10 seconds, engage both PFD circuit breakers while the ENT button is pushed on the PFD.
- (15) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.
- (16) Use the Flight Management System (FMS) outer knob to go to the CAL page group.
- (17) Use the FMS inner knob to go to the FUEL TANK CALIBRATION page.
- (18) Engage the MFD circuit breaker while the ENT button is pushed on the MFD.
- (19) 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.
- (20) Use the FMS outer knob to go to the GRS page group on the MFD.
- (21) Use the FMS inner knob to go to the GRS/GMU CALIBRATION page on the MFD.
- (22) Do the steps that follow:
 - (a) If only a fuel quantity system check is needed, do a [Fuel Quantity System Check \(Airplanes with Garmin G1000 and float-type fuel level senders\)](#).
 - (b) If a fuel quantity system calibration is needed, do a [Fuel Quantity System Calibration \(Airplanes with Garmin G1000 and float-type fuel level senders\)](#).

4. Fuel Quantity System Calibration (Airplanes with Garmin G1000 and float-type fuel level senders).

A. Do the Fuel Quantity System Calibration.

- (1) If not completed before, do the [Fuel Quantity System Calibration and Check Setup \(Airplanes with Garmin G1000 and float-type fuel level senders\)](#).
- (2) 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.
- (3) 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.
- (4) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (5) Turn the inner FMS knob to select LEFT.
NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.
- (6) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
- (7) Calibrate empty for the left fuel tank.
 - (a) Make sure that the CALIBRATED TOTAL value shown for the LEFT tank is stable.

- (b) Push the EMPTY softkey and push the enter (ENT) button to add or overwrite the 0.00 GL calibration point in the CALIBRATION TABLE.
 - (c) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon (-0.38 and +0.38l) for the LEFT tank.
 - (d) 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 use the DELETE softkey to delete them. Calibrate empty for the left fuel tank again if more than one calibration point was found.
- (8) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (9) Turn the inner FMS knob to select RIGHT.
- NOTE:** After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.
- (10) Calibrate empty for the right fuel tank.
- (a) Make sure that the CALIBRATED TOTAL value shown for the RIGHT tank is stable.
 - (b) Push the EMPTY softkey and push the ENT button to add or overwrite the 0.00 GL calibration point in the CALIBRATION TABLE.
 - (c) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon (-0.38 and +0.38l) for the RIGHT tank.
 - (d) 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 use the DELETE softkey to delete them. Calibrate empty for the right fuel tank again if more than one calibration point was found.
- (11) Do the [Fuel Quantity System Check \(Airplanes with Garmin G1000 and float-type fuel level senders\)](#).

5. Fuel Quantity System Check (Airplanes with Garmin G1000 and float-type fuel level senders).

A. Do the Fuel Quantity System Check.

- (1) If not completed before, do the [Fuel Quantity System Calibration and Check Setup \(Airplanes with Garmin G1000 and float-type fuel level senders\)](#).
- (2) 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.
- (3) Add 8 gallons of fuel (low fuel level) to the left fuel tank. Refer to Chapter 12, [Fuel - Servicing](#).
- (4) Make sure fuel is sensed in the LEFT tank.
- (5) Add 8 gallons of fuel (low fuel level) to the right fuel tank. Refer to Chapter 12, [Fuel - Servicing](#).
- (6) Make sure fuel is sensed in the RIGHT tank.
- (7) Move the wing tips approximately 5 inches up and down for approximately 10 seconds.
- (8) Let the airplane become stable for approximately 30 seconds.
- (9) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
- (10) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (11) Turn the inner FMS knob to select LEFT.

NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.

- (12) Make sure the CALIBRATED TOTAL value for the LEFT tank is stable and between 6.0 to 9.6 gallons.
- (13) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (14) Turn the inner FMS knob to select RIGHT.

NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.

- (15) Make sure the CALIBRATED TOTAL value for the RIGHT tank is stable and between 6.0 to 9.6 gallons.
- (16) If the values are in tolerance, the procedure is complete.

- (17) 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 6.0 to 9.6 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 6.0 to 9.6 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.
- (18) Make sure the tires are inflated to the correct pressure if necessary.
- (19) Remove blocks from under the gear if necessary.
- (20) Put the AVIONICS switch to the OFF position.
- (21) Put the BAT MASTER switch to the OFF position.

6. Fuel Quantity System Calibration and Check Setup (Airplanes with Garmin G1000 and CAN bus type fuel level sensors).

NOTE: All G1000 airplanes must have software version 563.03 or later. The software version is shown on the upper right corner of the MFD on the first page shown 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 sensors 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 Check Setup.

- (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. 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) Put the BAT MASTER switch and the AVIONICS MASTER switches to the ON position to start the G1000 system in normal mode.
- (7) Make sure the fuel quantity indications do not show red Xs.
- (8) Disengage the NAV1 ENG circuit breaker on the ESS BUS and make sure that red Xs are shown for the fuel quantity.
- (9) Engage the NAV1 ENG circuit breaker on the ESS BUS and make sure no red Xs are shown for the fuel quantity.
- (10) After 60 seconds with no red Xs, make sure LOW FUEL L and LOW FUEL R annunciations are seen.

NOTE: The annunciations will be seen when the fuel quantity indicates less than 8 gallons for 60 seconds.
- (11) Disengage the MFD and both PFD circuit breakers.
- (12) After 10 seconds, engage the MFD circuit breaker while the ENT button is pushed 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) 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) Engage both PFD circuit breakers while the ENT button is pushed on the PFD.
- (17) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.
- (18) Use the Flight Management System (FMS) outer knob to go to the CAL page group.
- (19) Use the FMS inner knob to go to the FUEL TANK CALIBRATION page.
- (20) Do the steps that follow:
 - (a) If only a fuel quantity system check is needed, do a [Fuel Quantity System Check \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).
 - (b) If a fuel quantity system calibration is needed, do a [Fuel Quantity System Calibration \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).

7. Fuel Quantity System Calibration (Airplanes with Garmin G1000 and CAN bus type fuel level sensors).

- A. Do the Fuel Quantity System Calibration.
 - (1) If not completed before, do the [Fuel Quantity System Calibration and Check Setup \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).
 - (2) Make sure the software configuration is correct. Refer to [Fuel Quantity Indication System- Troubleshooting](#).
 - (a) If the configuration is correct, continue the calibration procedure.
 - (b) If the configuration is not correct, do a [CAN Bus Fuel Level Sensor Configuration Load](#).
 - (3) 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.
 - (4) 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.
 - (5) Push the SCALE softkey to select the scale function.
NOTE: The SCALE softkey will be gray with black letters when it is selected.
NOTE: The scale function needs to be selected when overwriting the 0.00 GL calibration points for both the left and right tank.
 - (6) Push the TNK SEL softkey to highlight the CURRENT TANK field.
 - (7) Turn the inner FMS knob to select LEFT.
NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.
 - (8) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
 - (9) After 30 seconds, make sure that the CALIBRATED TOTAL value shown for the LEFT tank is stable.
 - (10) Push the EMPTY softkey and push the enter (ENT) button to overwrite the 0.00 GL calibration point in the CALIBRATION TABLE.
NOTE: There should be several calibration points in the CALIBRATION TABLE.
 - (11) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon (-0.38 and +0.38l) for the LEFT tank.
 - (12) Push the TNK SEL softkey to highlight the CURRENT TANK field.
 - (13) Turn the inner FMS knob to select RIGHT.
NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.
 - (14) After 30 seconds, make sure that the CALIBRATED TOTAL value shown for the RIGHT tank is stable.

- (15) Push the EMPTY softkey and push the ENT button to overwrite the 0.00 GL calibration point in the CALIBRATION TABLE.

NOTE: There should be several calibration points in the CALIBRATION TABLE.

- (16) Make sure that the CALIBRATED TOTAL values are between -0.10 and +0.10 gallon (-0.38 and +0.38l) for the RIGHT tank.
- (17) Do the [Fuel Quantity System Check \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).

8. Fuel Quantity System Check (Airplanes with Garmin G1000 and CAN bus type fuel level sensors).

A. Do the Fuel Quantity System Check.

- (1) If not completed before, do the [Fuel Quantity System Calibration and Check Setup \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).
- (2) 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.
- (3) Make sure the CALIBRATED VALUE on the CALIBRATION TABLE on the PFD agrees with the values in the Verification Table.

- (a) On PFD on the FUEL TANK CALIBRATION page, find the CALIBRATED VALUE next to 0.00 GL. Find that number on the Verification Table in a "0.00 GL Calibrated Value" column.

- (b) On the Verification Table, find the value in the 2.00 GL Calibrated Value (+0.3 or -0.3) column next to the chosen 0.00 GL Calibrated Value.

- (c) Compare the 2.00 GL Calibrated Value on Verification Table to the 2.00 GL CALIBRATED VALUE on the PFD.

NOTE: For example, if the 0.00 GL CALIBRATED VALUE is 6.00000 then the 2.00 GL CALIBRATED VALUE should be 13.70000, +0.3 or -0.3.

- (d) If the 2.00 GL CALIBRATED VALUE does not agree with the Verification Table, +0.3 or -0.3, do a [Fuel Calibration Initialization Data Load](#) and a [Fuel Quantity System Calibration \(Airplanes with Garmin G1000 and CAN bus type fuel level sensors\)](#).

0.00 GL Calibrated Value	2.00 GL Calibrated Value (+0.3 or -0.3)	0.00 GL Calibrated Value	2.00 GL Calibrated Value (+0.3 or -0.3)	0.00 GL Calibrated Value	2.00 GL Calibrated Value (+0.3 or -0.3)	0.00 GL Calibrated Value	2.00 GL Calibrated Value (+0.3 or -0.3)
0.00000	8.19149	0.10000	8.28330	0.20000	8.37511	0.30000	8.46691
0.40000	8.55872	0.50000	8.65053	0.60000	8.74234	0.70000	8.83415
0.80000	8.92596	0.90000	9.01777	1.00000	9.10957	1.10000	9.20138
1.20000	9.29319	1.30000	9.38500	1.40000	9.47681	1.50000	9.56862
1.60000	9.66043	1.70000	9.75223	1.80000	9.84404	1.90000	9.93585
2.00000	10.02766	2.10000	10.11947	2.20000	10.21128	2.30000	10.30309
2.40000	10.39489	2.50000	10.48670	2.60000	10.57851	2.70000	10.67032
2.80000	10.76213	2.90000	10.85394	3.00000	10.94574	3.10000	11.03755
3.20000	11.12936	3.30000	11.22117	3.40000	11.31298	3.50000	11.40479
3.60000	11.49660	3.70000	11.58840	3.80000	11.68021	3.90000	11.77202
4.00000	11.86383	4.10000	11.95564	4.20000	12.04745	4.30000	12.13926
4.40000	12.23106	4.50000	12.32287	4.60000	12.41468	4.70000	12.50649
4.80000	12.59830	4.90000	12.69011	5.00000	12.78191	5.10000	12.87372
5.20000	12.96553	5.30000	13.05734	5.40000	13.14915	5.50000	13.24096
5.60000	13.33277	5.70000	13.42457	5.80000	13.51638	5.90000	13.60819
6.00000	13.70000	6.10000	13.79181	6.20000	13.88362	6.30000	13.97543
6.40000	14.06723	6.50000	14.15904	6.60000	14.25085	6.70000	14.34266
6.80000	14.43447	6.90000	14.52628	7.00000	14.61809	7.10000	14.70989

7.20000	14.80170	7.30000	14.89351	7.40000	14.98532	7.50000	15.07713
7.60000	15.16894	7.70000	15.26074	7.80000	15.35255	7.90000	15.44436
8.00000	15.53617	8.10000	15.62798	8.20000	15.71979	8.30000	15.81160
8.40000	15.90340	8.50000	15.99521	8.60000	16.08702	8.70000	16.17883
8.80000	16.27064	8.90000	16.36245	9.00000	16.45426	9.10000	16.54606
9.20000	16.63787	9.30000	16.72968	9.40000	16.82149	9.50000	16.91330
9.60000	17.00511	9.70000	17.09691	9.80000	17.18872	9.90000	17.28053
10.00000	17.37234	10.10000	17.46415	10.20000	17.55596	10.30000	17.64777
10.40000	17.73957	10.50000	17.83138	10.60000	17.92319	10.70000	18.01500
10.80000	18.10681	10.90000	18.19862	11.00000	18.29043	11.10000	18.38223
11.20000	18.47404	11.30000	18.56585	11.40000	18.65766	11.50000	18.74947
11.60000	18.84128	11.70000	18.93309	11.80000	19.02489	11.90000	19.11670
12.00000	19.20851	12.10000	19.30032	12.20000	19.39213	12.30000	19.48394
12.40000	19.57574	12.50000	19.66755	12.60000	19.75936	12.70000	19.85117
12.80000	19.94298	12.90000	20.03479	13.00000	20.12660	13.10000	20.21840
13.20000	20.31021	13.30000	20.40202	13.40000	20.49383	13.50000	20.58564
13.60000	20.67745	13.70000	20.76926	13.80000	20.86106	13.90000	20.95287
14.00000	21.04468	14.10000	21.13649	14.20000	21.22830	14.30000	21.32011
14.40000	21.41191	14.50000	21.50372	14.60000	21.59553	14.70000	21.68734
14.80000	21.77915	14.90000	21.87096	15.00000	21.96277	15.10000	22.05457
15.20000	22.14638	15.30000	22.23819	15.40000	22.33000	15.50000	22.42181
15.60000	22.51362	15.70000	22.60543	15.80000	22.69723	15.90000	22.78904
16.00000	22.88085	16.10000	22.97266	16.20000	23.06447	16.30000	23.15628
16.40000	23.24809	16.50000	23.33989	16.60000	23.43170	16.70000	23.52351
16.80000	23.61532	16.90000	23.70713	17.00000	23.79894	17.10000	23.89074
17.20000	23.98255	17.30000	24.07436	17.40000	24.16617	17.50000	24.25798
17.60000	24.34979	17.70000	24.44160	17.80000	24.53340	17.90000	24.62521
18.00000	24.71702	18.10000	24.80883	18.20000	24.90064	18.30000	24.99245
18.40000	25.08426	18.50000	25.17606	18.60000	25.26787	18.70000	25.35968
18.80000	25.45149	18.90000	25.54330	19.00000	25.63511	19.10000	25.72691
19.20000	25.81872	19.30000	25.91053	19.40000	26.00234	19.50000	26.09415
19.60000	26.18596	19.70000	26.27777	19.80000	26.36957	19.90000	26.46138

- (4) Add 8 gallons of fuel (low fuel level) to the left fuel tank. Refer to Chapter 12, [Fuel - Servicing](#).
- (5) Make sure fuel is sensed in the LEFT tank.
- (6) Add 8 gallons of fuel (low fuel level) to the right fuel tank. Refer to Chapter 12, [Fuel - Servicing](#).
- (7) Make sure fuel is sensed in the RIGHT tank.
- (8) Make sure that the airplane is level at 2.0 degrees nose up and 0.0 degrees wings level attitude.
- (9) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (10) Turn the inner FMS knob to select LEFT.

NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.

- (11) After 30 seconds, make sure the CALIBRATED TOTAL value for the LEFT tank is stable and between 6.2 to 9.8 gallons.

- (12) Push the TNK SEL softkey to highlight the CURRENT TANK field.
- (13) Turn the inner FMS knob to select RIGHT.
NOTE: After turning the inner FMS knob, some versions of software will make it necessary to push the ENT button to select the tank.
- (14) After 30 seconds, make sure the CALIBRATED TOTAL value for the RIGHT tank is stable and between 6.2 to 9.8 gallons.
- (15) If the values are in tolerance, the procedure is complete.
- (16) If the CALIBRATED TOTAL values are not in the range:
 - (a) Move the wing tips 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) After 30 seconds, make sure the CALIBRATED TOTAL value for the LEFT tank is stable and between 6.2 to 9.8 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) After 30 seconds, make sure the CALIBRATED TOTAL value for the RIGHT tank is stable and between 6.2 to 9.8 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.
- (17) Put the AVIONICS switch to the OFF position.
- (18) Put the BAT MASTER switch to the OFF position.

9. Fuel Calibration Initialization Data Load

- A. Load the Fuel Calibration Initialization Data.
 - (1) Disengage both PFD circuit breakers (ESS and AVN BUS 1) and the MFD circuit breaker on the avionics circuit breaker panel.
 - (2) Remove the database cards from the bottom SD card slots on the PFD and MFD.
 - (3) Install the SD loader card in the top SD card slot on the PFD.
 - (4) Start the system in configuration mode.
 - (a) Engage the MFD circuit breaker while the ENT button is pushed on the MFD.
 - (b) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.
NOTE: The MFD is now in the configuration mode.
 - (c) Engage the PFD circuit breakers while the ENT button is pushed on the PFD.
 - (d) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.
 - (5) Push the NO softkey when asked "DO YOU WANT TO UPDATE THE SYSTEM FILES?".
 - (6) Use the FMS knobs to go to the SYSTEM group's SYSTEM UPLOAD page .
 - (7) Push the inner FMS knob to start the cursor.
 - (8) Use the cursor to highlight the applicable model for the AIRFRAME menu.
 - (9) Push the ENT button.
 - (10) Turn the inner FMS knob to expand the FILE menu.
 - (11) Highlight the file INITIALIZE FUEL CAL DATA.
 - (12) Push the ENT button.
 - (13) Push the LOAD softkey to start the software update.
NOTE: Every time after the "INITIALIZE FUEL CAL DATA" is loaded the Fuel Quantity System Calibration (Airplanes with Garmin G1000 and CAN bus type fuel level sensors) must be performed for each tank.
 - (14) Monitor the upload status.

- (a) If the upload fails, push the LOAD softkey again. If the upload fails five times, contact Cessna Customer Service for assistance; (316) 517-5800 or Fax (316) 942-9006.
- (b) If the upload is successful, push the ENT button to accept the end of the upload.
- (15) Push the "UPDT CFG" softkey.
- (16) Select "YES" when asked "Update Config Module?".
- (17) Push the ENT button.
- (18) When the update is complete, push the ENT button.
- (19) Disengage both PFD and MFD circuit breakers.
- (20) Install the database cards in the bottom SD card slots on the PFD and MFD.
- (21) Remove the SD loader card from the top SD card slot on the PFD.
- (22) Start the system in configuration mode.
 - (a) Engage the MFD circuit breaker while the ENT button is pushed on the MFD.
 - (b) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.
NOTE: The MFD is now in the configuration mode.
 - (c) Engage the PFD circuit breakers while the ENT button is pushed on the PFD.
 - (d) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.

10. CAN Bus Fuel Level Sensor Configuration Load

A. Load the CAN Bus Fuel Level Sensor Configuration.

- (1) Disengage both PFD circuit breakers (ESS and AVN BUS 1) and the MFD circuit breaker on the avionics circuit breaker panel.
- (2) Remove the database cards from the bottom SD card slots on the PFD and MFD.
- (3) Install the SD loader card in the top SD card slot on the PFD.
- (4) Start the system in configuration mode.
 - (a) Engage the MFD circuit breaker while the ENT button is pushed on the MFD.
 - (b) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.
NOTE: The MFD is now in the configuration mode.
 - (c) Engage the PFD circuit breakers while the ENT button is pushed on the PFD.
 - (d) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.
- (5) Push the NO softkey when asked "DO YOU WANT TO UPDATE THE SYSTEM FILES?".
- (6) Use the FMS knobs to go to the SYSTEM group's SYSTEM UPLOAD page .
- (7) Push the inner FMS knob to start the cursor.
- (8) Use the cursor to highlight the applicable model for the AIRFRAME menu.
- (9) Push the ENT button.
- (10) Turn the inner FMS knob to expand the FILE menu.
- (11) Highlight the file CESSNA NAV III CAN BUS FUEL LEVEL SENSORS.
- (12) Push the ENT button.
- (13) Push the LOAD softkey to start the software update.
- (14) Monitor the upload status.
 - (a) If the upload fails, push the LOAD softkey again. If the upload fails five times, contact Cessna Customer Service for assistance; (316) 517-5800 or Fax (316) 942-9006.
 - (b) If the upload is successful, push the ENT button to accept the end of the upload.
- (15) Push the "UPDT CFG" softkey.
- (16) Select "YES" when asked "Update Config Module?".

- (17) Push the ENT button.
- (18) When the update is complete, push the ENT button.
- (19) Disengage both PFD and MFD circuit breakers.
- (20) Install the database cards in the bottom SD card slots on the PFD and MFD.
- (21) Remove the SD loader card from the top SD card slot on the PFD.
- (22) Start the system in configuration mode.
 - (a) Engage the MFD circuit breaker while the ENT button is pushed on the MFD.
 - (b) Release the ENT button after the words INITIALIZING SYSTEM show on the MFD.
NOTE: The MFD is now in the configuration mode.
 - (c) Engage the PFD circuit breakers while the ENT button is pushed on the PFD.
 - (d) Release the ENT button after the words INITIALIZING SYSTEM show on the PFD.
NOTE: The PFD is now in the configuration mode.